ESL-TR-06-06-08

ENERGY EFFICIENCY/RENEWABLE ENERGY IMPACT IN THE TEXAS EMISSIONS REDUCTION PLAN (TERP)

VOLUME II – SUMMARY REPORT

Annual Report to the
Texas Commission on Environmental Quality
September 2004 – December 2005

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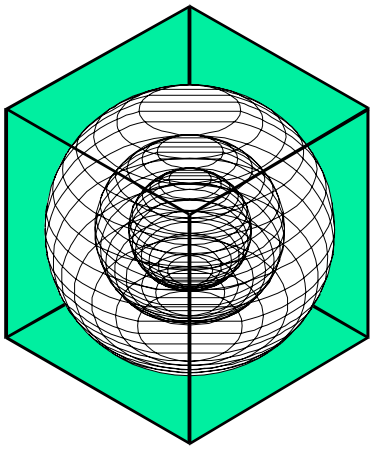
June 2006
Revised August 2006



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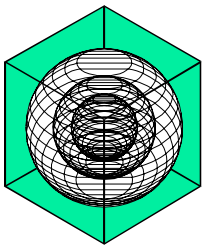

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September 12, 2006

Chairman Kathleen Hartnett White
Texas Council on Environmental Quality
P. O. Box 13087
Austin, TX 78711-3087

Dear Chairman White:

The Energy Systems Laboratory (ESL) at the Texas Engineering Experiment Station of the Texas A&M University System is pleased to provide its fourth annual report, "Energy Efficiency/Renewable Energy Impact in the Texas Emissions Reduction Plan (TERP)," as required under Texas Health and Safety Code Ann. § 388.003 (e), Vernon Supp. 2002 (Senate Bill 5, 77R as amended 78 R & 78S).

The ESL is required to annually report the energy savings from statewide adoption of the Texas Building Energy Performance Standards in Senate Bill 5 (SB 5), as amended, and the relative impact of proposed local energy code amendments in the 41 Texas non-attainment and affected counties as part of the Texas Emissions Reduction Plan (TERP).

Please contact me at (979) 862-8480 should you or any of the TCEQ staff have any questions concerning this report or any of the work presently being done to quantify emissions reductions from energy efficiency and renewable energy measures as a result of the TERP implementation.

Sincerely,

Dan Turner

W. Dan Turner, P.E.
Director

Enclosure

cc: Commissioner R. B. "Ralph" Marquez
Glenn Shankle, Executive Director

Disclaimer

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VOLUME II – TECHNICAL REPORT

Energy Efficiency / Renewable Energy Impact In The Texas Emissions Reduction Plan

1 EXECUTIVE SUMMARY

The Energy Systems Laboratory, in fulfillment of its responsibilities under Texas Health and Safety Code Ann. § 388.003 (e), Vernon Supp. 2002, submits its fourth annual report, Energy Efficiency/Renewable Energy (EE/RE) Impact in the Texas Emissions Reduction Plan to the Texas Commission on Environmental Quality.

The report is organized in three volumes.

Volume 1 – Summary Report – provides an executive summary;
Volume II – Technical Report – provides a detailed report of activities, methodologies and findings;
Volume III – Technical Appendix – contains detailed data from simulations for each of the 41 counties included in the analysis.

In 2001, the Texas Emissions Reduction Plan (TERP), established by the 77th Texas Legislature with the enactment of Senate Bill 5 (SB 5), identified that Energy Efficiency and Renewable Energy (EE/RE) measures make an important contribution to a comprehensive approach for meeting the minimum federal ambient air quality standards. In 2003 and 2005, the 78th and 79th Legislatures enhanced the use of EE/RE programs for meeting the TERP. The 78th Legislature enhanced the use of EE/RE programs for meeting TERP goals by requiring the Texas Commission on Environmental Quality (TCEQ) to promote EE/RE as a means to improve air quality standards and to develop a methodology for computing emissions reduction for the State Implementation Plan (SIP) from EE/RE programs. The 79th Legislature again expanded the scope of the SIP-eligible credits by adding savings from the State Renewable Portfolio Standards from the generation of electricity from renewable sources; specifically requiring the TCEQ to develop methods to quantify emissions reductions from renewable energy; and requiring the Energy Systems Laboratory to develop at least 3 alternative methods for achieving a 15 percent greater potential energy savings in residential, commercial and industrial construction.

The TERP legislation adopted the energy efficiency provisions of the International Residential Code (IRC) and the International Energy Conservation Code (IECC) for residential, commercial and industrial buildings. Under the TERP legislation, the Energy Systems Laboratory (Laboratory) at the Texas Engineering Experiment Station of the Texas A&M University System must determine the energy savings from energy code adoption and, when applicable, from more stringent local codes or above-code performance ratings and must report these reductions annually to the TCEQ.

Using data available from the TCEQ and the U.S. Environmental Protection Agency (US EPA) with procedures developed by the Laboratory, the following results were determined for energy-code compliant new residential single- and multi-family construction in non-attainment and affected counties built in 2004:

- The annual savings in 2005 amounted to 348,794 megawatt hours (MWh) of electricity and 690,579 million Btus of natural gas. The resultant annual NOx reductions were 268 tons (2007 eGRID[1, 2]).

[1] eGRID, is the EPA's emissions and generation resource integrated database. This publicly available database can be found at *www.epa.gov/airmarkets/eGRID/*. In this report the 2007 version of eGRID was used. This eGRID was specially created for Texas by Art Diem at the USEPA, and includes specific assumptions about plant closures, new plant additions, and capacity factor for annual and Ozone Season Day (OSD) periods that are projected to occur in 2007.

[2] The 2007 version of eGRID used in this report does not consider the coal-fired electricity generating plants proposed by TXU in the Spring of 2006.

- On the peak Ozone Season Day (OSD), the savings would have been 1,799 MWh/day and 1,210 million Btu (MBtu) of natural gas, resulting in peak-OSD NOx emissions reductions of 1.26 tons (2007 eGRID).
- Beginning in 2005, the Laboratory worked with the TCEQ to integrate NOx emissions reductions (iNOxERM) across state agencies implementing EE/RE programs to that the results can be evaluated consistently. As required by the legislation, the TCEQ receives reports: from the Laboratory on savings from code compliance and renewables; from the Public Utilities Commission of Texas (PUCT) on the impacts of the utility-administered programs designed to meet the mandated energy efficiency goals of SB7 and SB5; and from the State Energy Conservation Office (SECO) on the impacts of energy conservation in state agencies and political subdivisions. The Laboratory has also requested data about electricity generated from wind turbines from the Electric Reliability Council of Texas (ERCOT).

  Total cumulative, integrated NOx reductions from these programs were determined to be 5,711.58 tons/year, and 15.43 tons/peak-OSD in 2009, and 6,034.93 tons/year and 17.14 tons/peak-OSD in 2013, which contain the following contributions from the Laboratory, PUCT, SECO, and green power provided by wind turbine[3] renewable energy sources (i.e., ERCOT) programs:
  - energy efficiency savings from code-compliant new construction: 900.52 tons/year, and 4.47 tons/peak-OSD in 2009; and 1,167.49 tons/year with 5.75 tons/peak-OSD in 2013 (2007 eGRID);
  - the PUCT-SB 7 and SB 5 programs: 1,483.22 tons/year, and 3.98 tons/peak-OSD in 2009, and 1,981.05 tons/year, and 5.31 tons/peak-OSD in 2013 (2007 eGRID);
  - the SECO program, 447.10 tons/year, and 1.29 tons/OSD in 2009, and 699.86 tons/year, and 1.76 tons/peak-OSD in 2013; and
  - the Wind/ERCOT program: 2,880.74 tons/year and 5.69 tons/peak-OSD in 2009 and 2,186.33 tons/year and 4.32 tons/peak-OSD in 2013.

The Laboratory was requested to analyze the stringency of several residential and commercial energy codes, including: the 2003 and 2006 IECC, and ASHRAE Standard[4] 90.1-2004 (i.e., commercial buildings), ASHRAE Standard[5] 90.2-2004 (i.e., residential buildings). ASHRAE Standard 90.2-2004 was found to be more stringent for fenestration U-values, external shading and Domestic Hot Water (DHW), and less stringent in geometry and orientation, slab-on-grade construction for Heating Degree Days (HDD) HDD > 2400, total fenestration losses and ceiling attic U-values. ASHRAE Standard 90.2-2004 also had conflicting requirements regarding performance evaluations of ceilings, walls and ducts. The 2006 IECC was found to be less stringent for many of the 41 counties in Texas when compared to the current residential code (i.e., the 2000 IECC with 2001 Supplement). ASHRAE Standard 90.1-2004 was found to be more stringent than ASHRAE Standard 90.1-1999, which is mostly due to reductions in allowed lighting power levels.

The Laboratory provided technical assistance to the TCEQ, PUCT, SECO and ERCOT, as well as Stakeholders participating in the Energy Code and Renewables programs. In 2005, the Laboratory worked closely with the TCEQ to develop an integrated NOx emissions reduction (iNOxERM) calculation that provided the TCEQ with a creditable NOx emissions reduction from energy efficiency and renewable energy (EE/RE) programs reported to the TCEQ in 2005 by the Laboratory, PUCT, SECO, and ERCOT (i.e., wind)[6]. At the request of the TCEQ, the Laboratory also developed procedures for quantifying NOx

[3] The green power provided by wind turbine installations is currently monitored by the Electric Reliability Council of Texas (ERCOT).

[4] ASHRAE Standard 90.1 - 2004, Energy Standard for Buildings Except Low-rise Residential Buildings, American Society of Heating Refrigerating and Air-conditioning Engineers, Atlanta, GA.

[5] ASHRAE Standard 90.2 - 2004, Energy - Efficient Design for Low-Rise Residential Buildings, American Society of Heating Refrigerating and Air-conditioning Engineers, Atlanta, GA. Although Standard 90.2 is not currently referenced by the 2000/2001 IECC, in 2005, efforts were initiated by ASHRAE to make Standard 90.2 equivalent to the IECC. Hence, the Laboratory was required to review Standard 90.2 to determine if it was more/less stringent than the 2000/2001 IECC.

[6] In 2005 the Texas State Energy Conservation Office (SECO) requested technical assistance from the USDOE, through the National Renewable Energy Laboratory (NREL), to review the procedures used in TCEQ's integrated NOx emissions reductions calculations. Although preliminary results indicated a favorable finding, a final report has not been delivered by NREL.

emissions reductions from wind turbines that include weather normalization[7], and quantification of NOx emissions reductions from pilot lights attributable to residential furnace replacements and potential reductions from the elimination of standing pilot lights in domestic water heaters. At the request of the Dallas-Fort Worth International Airport, the Laboratory developed quantifications of NOx emissions reductions from energy-efficiency improvements at the Rent-a-Car facility at the Dallas-Fort Worth (DFW) International Airport.

The Laboratory has also enhanced the previously developed emissions reductions calculator[8] by: expanding the capabilities to include all counties in ERCOT; including the collection and assembly of meteorological (i.e., weather) data from 1999 to the present from 17 NOAA weather stations; expanding the calculator to be able to analyze energy efficiency improvement to K-12 schools; developing new modules for municipal water and wastewater calculations; enhancing the underlying computer platform for the calculator; and developing verification procedures for the savings currently calculated and reported by the Laboratory, including calibrated simulations for two office buildings, one residence and one K-12 school, and utility bill analysis of representative residences built before and after the implementation of the Statewide building code (i.e., 2000 IECC with 2001 Supplement)[9].

To accelerate the transfer of technology developed as part of the Senate Bill 5 program, the Laboratory:

- delivered an invited presentation to the US EPA's Air Innovations Conference in Chicago, August, 2005;
- delivered six papers at the International Conference on Enhanced Building Operations at Carnegie Mellon University in Pittsburg, PA, in October 2005;
- hosted the Energy Leadership and Emissions Reduction and Conference in Dallas, in November 2005;
- developed an article for the *ibpsaNEWS* newsletter[10]; and
- published technical reports on advanced window simulations, and methods for reducing residential energy use by 50%.

The Laboratory has and will continue to provide leading edge technical assistance to the TCEQ, counties and communities working toward obtaining full SIP credit for the energy efficiency and renewable energy projects that are lowering emissions and improving the air for all Texans. The Laboratory will continue to provide superior technology to the State of Texas through efforts with the TCEQ and US EPA. The efforts taken by the Laboratory have produced significant success in bringing EE/RE closer to US EPA acceptance in the SIP.

The Energy Systems Laboratory provides the fourth annual report, Energy Efficiency/Renewable Energy (EE/RE) Impact in the Texas Emissions Reduction Plan (TERP), to the Texas Commission on Environmental Quality (TCEQ) in fulfillment of its responsibilities under Texas Health and Safety Code Ann. § 388.003 (e), Vernon Supp. 2002.

If any questions arise, please contact us by phone at 979-458-0675, or by email at SB5info@esl.tamu.edu.

[7] The weather normalization procedures for green power purchases from wind generated electricity primarily involve normalization for wind speed to allow for electricity purchased in 2005 to be projected to the 1999 base year. Additional information about this can be found in Volume II.

[8] In the Fall of 2003, the Laboratory formed a partnership with the Texas Commission for Environmental Quality (TCEQ) and the USEPA to enhance the Emissions Reduction Calculator. Since then, the Laboratory has worked closely with the TCEQ, using funding provided by the USEPA, to enhance the calculator, which includes the addition of two new modules for calculating energy savings from improvements to water and waste water systems. Additional information about these new modules is contained in Volume II.

[9] See Volume II for additional information about each of these topics.

[10] *ibpsaNEWS* is the electronic newsletter for the International Building Performance Simulation Association, co-sponsored by the US DOE.

2 ACKNOWLEDGEMENTS

This work has been completed as a fulfillment of the requirements in Texas Health Code, Senate Bill 5, Section 388.003. Portions of the work in this annual report were funded by grant from the US EPA through the Texas Commission on Environmental Quality (TCEQ). Similarly, selected Code training workshops were funded by the US DOE through the Texas State Energy Conservation Office (SECO).

The authors are also grateful for the timely input provided by the following individuals, and agencies: Mr. Art Diem, US EPA, for providing the eGRID database; Mr. Steve Anderson and Mr. Alfred Reyes, TCEQ, for contributing helpful insight about improvement to the Emissions Reduction Calculator.

Numerous additional individuals at the Laboratory contributed significantly to this report, including: Dr. David Claridge, Ms. Sherrie Hughes, Mr. Kelly Milligan, Mr. Jim Sweeney, Mr. Piljae Im, Mr. Seongchan Kim, Ms. Jaya Mukhopadhyay, Mr. Soolyeon Cho, Ms. Mini Malhotra, and Mr. Suwon Song.

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY 3

2 ACKNOWLEDGEMENTS 6

3 OVERVIEW 19

3.1 Legislative Background 19

3.2 Laboratory Funding for the TERP 20

3.3 Progress in FY 2005 20
3.3.1 Energy and NOx Emissions Reduction from New Construction (Residential and Commercial) 21
3.3.2 Code Adoption 23
3.3.3 Technology for Calculation and Verifying Emissions Reductions from Energy Used in Buildings 23
3.3.4 Evaluation of Additional Technologies for Reducing Energy Use in Existing Buildings 24

3.4 Planned Focus for 2005/2006 24

4 INTRODUCTION 25

4.1 Background 25

4.2 Energy Systems Laboratory's Responsibilities in the TERP 28
4.2.1 (SB 5) Section 386.205. Evaluation of State Energy Efficiency Programs (w/PUCT)... 28
4.2.2 (SB 5) Sec. 388.003. Adoption of Building Energy Efficiency Performance Standards. 28
4.2.3 (SB 5) Sec. 388.004. Enforcement of Energy Standards Outside of Municipality. 28
4.2.4 (SB 5) Sec. 388.007. Distribution of Information and Technical Assistance. 29
4.2.5 (SB 5) Sec. 388.008. Development of Home Energy Ratings. 29
4.2.6 (HB 1365) Sec. 388.004. Enforcement of Energy Standards Outside of Municipality... 29
4.2.7 (HB 1365) Sec. 388.009. Energy-Efficient Building Program. 29
4.2.8 (HB 3235) Sec. 388.009. Certification of Municipal Inspectors..... 30
4.2.9 (SB 20, HB 2481, HB 2129). Additional Energy-Efficiency Initiatives. 30

5 PROGRESS: SEPTEMBER 2004 TO DECEMBER 2005 31

5.1 (SB 5) Section 386.205. Evaluation of State Energy-Efficiency Programs (w/PUCT). 31
5.1.1 Implemented Procedures for Evaluating State Energy-Efficiency Programs 31

5.2 (SB 5) Sec. 388.003. Adoption of Building Energy-Efficiency Performance Standards. 31
5.2.1 Provide Code Training Sessions 31
5.2.2 Provide Recommendations on Code Upgrades. 32
5.2.3 Provided Analysis Concerning the Use of ASHRAE Standard 90.2 as Compliant to the 2000 IECC with the 2001 Supplement..... 33
5.2.4 Summary of ASHRAE Standard 90.1 Standards Committee Activities during 2005, and Ongoing Subcommittee Actions. 33
5.2.4.1 Summary Comment on the Status of the 90.1 Standard. 33
5.2.4.2 Reported Work of the SSPC 90.1 Full Committee..... 34
5.2.4.3 Reported Work of the ECB Subcommittee. 35
5.2.4.4 Reported Work of the Envelope Subcommittee. 35
5.2.4.5 Reported Work of the Lighting Subcommittee. 36
5.2.4.6 Reported Work of the Mechanical Subcommittee. 37
5.2.5 Laboratory's Senate Bill 5 Web Site "eslsb5.tamu.edu"..... 37
5.2.6 Provide Technical Assistance to the TCEQ. 44
5.2.7 Proposed Procedure for Allocating Emissions Reductions from Wind Energy, March 2005. 44

5.2.8 Developed Survey for Texas Renewable Energy Industries Association Members. 46
5.2.9 Presentation at the USEPA Air Innovations Conference, Chicago, IL, August 24-25, 2005. 46
5.2.10 Held Wind/Renewables Stakeholder's Meeting. 51
5.2.11 Presented Six Papers at the 5th International Conference for Enhanced Building Operation, Pittsburg, PA, October 2005. 54
5.2.12 Published Article in *ibpsaNEWS*, October 2005. 56
5.2.13 Preliminary Analysis of Measures to Reduce Residential Energy use by 15% Above Code-Compliance. 57
5.2.14 Analysis of Simulation Methods for Evaluating Improved Fenestration Using the DOE-2.1e Simulation Program. 65
5.2.15 Calculated Emissions Reductions at the Rent-a-Car Facility at the Dallas-Fort Worth International Airport, December 2005. 69
5.2.16 Calculated Emissions Reductions from Pilot Light Elimination in Furnace Replacements. 74
5.2.17 Calculated Emissions Reductions from Pilot Light Elimination in Domestic Water Heaters (DHW). 79
5.2.18 Review of Local Amendments 84

6 CALCULATED NOx REDUCTION POTENTIAL FROM IMPLEMENTATION OF THE IECC / IRC 84

6.1 Calculated 2005 Electricity and Natural Gas Savings Due to the Implementation of the IECC / IRC to New Residential Construction (Single-family and Multi-family), and Commercial Buildings Using Code-traceable, Fuel-Neutral Simulation. 84
6.1.1 2005 Results for New Single-family Residential Construction. 92
6.1.2 2005 Results for New Multi-family Residential Construction. 108
6.1.3 2005 Results for New Residential Construction (Single-family and Multi-family), using 1999 eGRID. 123
6.1.4 Estimated 2007 Savings for 2005 New Residential Construction (Single-family and Multi-family), using 2007 eGRID. 129
6.1.5 2005 Results for Commercial Construction. 133
6.1.6 2005 Results for New Commercial Construction using 1999 eGRID. 134
6.1.7 Estimated 2007 Savings for 2005 New Commericial Construction using 2007 eGRID. 134

Table 57: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Assembly and Education Building Types (USDOE 2004). 145
6.1.8 2005 Results for New Residential Construction (Single-family and Multi-family), and Commercial Construction. 177
6.1.9 2005 Results for New Residential (Single-family and Multi-family), and Commercial Construction using 1999 eGRID. 177
6.1.10 2005 Results for New Residential (Single-family and Multi-family) and Commercial Construction using 2007 eGRID. 183

6.2 Comparison of 2005 Emissions Reductions Vs. 2004 Emissions Reductions Calculations 187
6.2.1 Changes to the Code-compliant Simulations. 191
6.2.2 Change in the Assumption for Peak Day Calculations: 192
6.2.3 Change to the Number of Building Permits for the 41 Counties for 2005: 192
6.2.4 Use of New Updated Data on the Percentage of Housing Types: 193
6.2.5 Use of 2007 25% Annual and Ozone Season Day eGRID: 193

7 CALCULATION OF INTEGRATED NOx EMISSIONS REDUCTIONS FROM MULTIPLE STATE AGENCIES PARTICIPATING IN THE TEXAS EMISSIONS REDUCTION PLAN (TERP). 202

7.1 Background. 202

7.2 Description of Analysis Method. 202

7.3 Calculation Procedure. 205
7.3.1 Single Family. 205
7.3.2 ESL-Multi-family. 208
7.3.3 PUCT-SB 7 211
7.3.4 PUCT-SB 5 Grants Program. 214
7.3.5 SECO. 218
7.3.6 Wind-ERCOT. 226

7.4 Results 231

7.5 Planned Work for 2006 Integrated NOx Emissions Calculations. 234

8 ENHANCEMENTS TO THE EMISSIONS REDUCTION CALCULATOR 235

8.1 Web Structure. 235

8.2 Municipal Water and Wastewater Module 243
8.2.1 M1 MODEL - Storm Sewer/Infiltration Sanitary Sewage Separation 243
8.2.1.1 M1 Model Description 243
8.2.1.2 M1 Model Input Screens and Output Report 247
8.2.2 M2 Model - High Efficiency Pump/Motor Replacement. 251
8.2.2.1 Description of the M2 Model. 251
8.2.2.2 M2 Model Input Screens and Output Report. 252

8.3 Weather Data. 257
8.3.1 Expansion of the Weather Data to include all ERCOT Counties using 17 Weather Stations. 257
8.3.2 Development of a Web-based Data Archive 267

9 PLANNED VERIFICATION TO THE EMISSIONS CALCULATOR (eCALC) 274

9.1 Utility Billing Analysis 274

9.2 On-site Inspections 283

9.3 Calibrated Simulations 283
9.3.1 Standard Office building 283
9.3.2 K-12 Elementary School. 285
9.3.3 High Performance Office Building 290
9.3.4 Residential Building 294
9.3.5 Solar Test Bench 298

10 REFERENCES 301

11 REPORTS CONTAINED ON THE ACCOMPANYING CDROM 306

11.1 Volume I Summary Report 306

11.2 Volume II Technical Report 306

11.3 Volume III Technical Report 306

11.4 Technical Papers Published in the Proceedings of the 5th International Conference for Enhanced Building Operations, Pittsburg, PA. 306
11.4.1 Baltazar-Cervantes, J.C., Liu, Z., Gilman, D., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Retrofits to Municipal Water Supply and Wastewater Facilities." 306
11.4.2 Liu, Z., Gilman, D., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Street Light and Traffic Light Retrofits." 306
11.4.3 Baltazar-Cervantes, J.C., Gilman, D., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Solar Thermal and Solar Photovoltaic Installations." ... 306

11.4.4 Ahmed, M., Gilman, D., Mukhopadhyay, J., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Code-compliant Single-family and Multi-family Construction." 306
11.4.5 Ahmed, M., Gilman, D., Kim, S., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Code-compliant Commercial Construction." 306
11.4.6 Liu, Z., Baltazar-Cervantes, J.C., Gilman, D., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Green Power Purchases from Texas Wind Energy Providers." 306

11.5 Haberl, J., Im, P., Culp, C., Yazdani, B., Fitzpatrick, T., Bryant, J., Turner, D. 2005. "A Simulation Methodology to Estimate NOx Emissions Reductions From the Implementation of the 2000 IECC/IRC Conservation Code in Texas," IBPSA Newsletter, Vol. 15, No. 2, pp. 39-48 (October)..... 306

11.6 Report on NOx, SOx and CO2 Emissions Reductions From Continuous Commission at the Rent-a-Car Facility at the Dallas-Fort Worth International Airport. 306

TABLE OF FIGURES

Figure 1: US EPA Non-attainment (dark shade) and affected counties (light shade)..... 26
Figure 2: Available NWS, TMY2 and WYEC2 weather files compared to IECC / IRC weather zones for Texas..... 27
Figure 3: Laboratory's Senate Bill 5 Web Page "eslsb5.tamu.edu"..... 38
Figure 4: Web Page Containing Information about the Laboratory's SB 5 Responsibilities. 38
Figure 5: Web Page Containing Related Reports and Other Documents for the SB 5 Program. 39
Figure 6: Web Page Containing Testimonials and Presentations to the Legislature. 39
Figure 7: Web Page Containing the Laboratory's Role in Senate Bill 5. 40
Figure 8: Web Page Containing Available Weather Data Compiled as Part of the Emissions Calculations.40
Figure 9: Web Page Containing Related Links for Other Useful Sites. 41
Figure 10: Web Page for the Laboratory's Emissions Calculator. 41
Figure 11: Web Page Containing New Quick Emissions Calculator (New 2006)..... 42
Figure 12: Web Page Containing Information about Code Trainings. 42
Figure 13: Web Page Containing Archival Material from the 2004 Emissions Reduction and Energy Leadership Summit, December 15-16, 2004, San Antonio, Texas. 43
Figure 14: Web Page Containing Archival Material from the 2005 Emissions Reduction and Energy Leadership Summit, November 7-10, 2005, Dallas, Texas..... 43
Figure 15: Monthly Daily Turbine Power vs. NOAA Wind Speed..... 45
Figure 16: Electricity Produced by the Windmill for 1999-2002. 45
Figure 17: Survey Letter Sent to Texas Renewable Energy Industries Association Members..... 46
Figure 18: Slides Presented at the USEPA Air Innovations Conference (August 24-25, 2005). 47
Figure 19: Slides Presented at the USEPA Air Innovations Conference (August 24-25, 2005). 48
Figure 20: Slides Presented at the USEPA Air Innovations Conference (August 24-25, 2005). 49
Figure 21: Slides Presented at the USEPA Air Innovations Conference (August 24-25, 2005). 50
Figure 22: Letter of Invitation to the Wind/Renewables Stakeholder's Meeting, August 30, 2005..... 51
Figure 23: Slides Presented at Wind/Renewables Stakeholder's Meeting, August 30, 2005 (Part 1)..... 52
Figure 24: Slides Presented at Wind/Renewables Stakeholder's Meeting, August 30, 2005 (Part 2)..... 52
Figure 25: Cover of ibpsaNEWS Article about Emissions Calculations Work in Texas. 56
Figure 26: DOE-2 Simulation Model of the Base-case House..... 60
Figure 27: Annual Energy Use for Individual Application of Measures..... 63
Figure 28: Annual Energy Use for Combined Application of Measures..... 63
Figure 29: Effect of Combined Application of Measures on Annual Energy Use. 64
Figure 30: Laboratory Report on Emissions Reductions at the RAC at Dallas-Fort Worth Airport. 70
Figure 31: Electricity consumption patterns before and after the implementation of the Continuous Commissioning® measures on the Rent-a-Car facility of the Dallas-Fort Worth International Airport for the FY 2005..... 71
Figure 32: Annual NO_x emissions reduction on the Rent-a-Car facility of the Dallas-Fort Worth International Airport based on 1999 weather data from Continuous Commissioning® measures (1999 eGRID). 72
Figure 33: OSD period NO_x emissions reduction on the Rent-a-Car facility of the Dallas-Fort Worth International Airport based on 1999 weather data from Continuous Commissioning® measures during the OSD period of July 15 thru September 15, 1999 (1999 eGRID). 72
Figure 34: Annual NO_x emissions reduction on the Rent-a-Car facility of the Dallas-Fort Worth International Airport based on 2005 weather data (10/2004–9/2005) from Continuous Commissioning® measures (2007 eGRID). 73
Figure 35: OSD period NO_x emissions reduction on the Rent-a-Car facility of the Dallas-Fort Worth International Airport based on 2005 weather data (10/2004–9/2005) from Continuous Commissioning® measures during the OSD period of July 15 thru September 15, 2005 (2007 eGRID). 73
Figure 36: Average Texas Population Growth Rate Used for Furnace Analysis. 74
Figure 37: NOx Emissions Reductions from Furnace Replacements (2001 to 2020). 78
Figure 38: Average Texas Population Growth Rate Used for DHW Analysis..... 79
Figure 39: NOx Emissions Reductions from Pilot Light Elimination in DHW (2005 to 2020). Upper graph shows savings for all residences. Lower graph shows savings for new construction only. 83

Figure 40: Changes in NAHB Percentage Distribution for SF Homes from 2004 to 2005. 85
Figure 41: 2005 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Single-family. .. 102
Figure 42: 2005 Annual and OSD NOx Reductions From IECC / IRC by PCA for Single-family Residences by County Using 1999 eGRID. 103
Figure 43: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Single-family Residences by County using 2007 eGRID. 107
Figure 44: 2005 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Multi-family Residences by County using 1999 eGRID. 117
Figure 45: 2004 Annual and OSD NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 1999 eGRID. 118
Figure 46: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 2007 eGRID. 122
Figure 47: 2005 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Single-family and Multi-family Residences by County. 125
Figure 48: 2005 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Single-family and Multi-family Residences by County. 126
Figure 49: 2005 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 1999 eGRID). 127
Figure 50: 2005 OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 1999 eGRID). 128
Figure 51: 2005 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 2007 eGRID). 131
Figure 52: 2005 Peak OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 2007 eGRID). 132
Figure 53: Analysis Method for Calculating the 2005 Energy and Emissions Savings from Commercial Buildings. 135
Figure 54: 1999 to 2003 New Commercial Building Construction (sq. ft. x 1000), Part 1 (Dodge 2005). 142
Figure 55: 1999 to 2003 New Commercial Building Construction (sq. ft. x 1000), Part 2 (Dodge 2005). 143
Figure 56: 2003 New Commercial Building Construction (sq. ft. x 1000) Used to Project 2005 Construction (Source: Dodge/McGraw-Hill 2005). 144
Figure 57: Calculated ASHRAE Standard 90.1-1989 and 1999 Annual Electricity Use for Assembly, Education, Retail, Food, Lodging, Office, and Warehouse Building Types (USDOE 2004). 149
Figure 58: Calculated ASHRAE Standard 90.1-1989 and 1999 Annual Natural Gas Use for Assembly, Education, Retail, Food, Lodging, Office, and Warehouse Building Types (USDOE 2004). 150
Figure 59: Calculated ASHRAE Standard 90.1-1989 and 1999 OSD Electricity Use for Assembly, Education, Retail, Food, Lodging, Office, and Warehouse Building Types (USDOE 2004). 151
Figure 60: Calculated ASHRAE Standard 90.1-1989 and 1999 OSD Natural Gas Use for Assembly, Education, Retail, Food, Lodging, Office, and Warehouse Building Types (USDOE 2004). 152
Figure 61: Typical Office Building Used for Annual to OSD calculation (3-story shown). 156
Figure 62: Comparison of Annual Energy Use ASHRAE Standard 90.1-1989 vs 90.1-1999. 159
Figure 63: Simulated Electricity and Natural Gas for Building Built to 90.1-1989 Standard for OSD (07/15 – 09/15). 160
Figure 64: Simulated Electricity and Natural Gas for Building Built to 90.1-1989 Standard for OSD (07/15 – 09/15). 160
Figure 65: 2005 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Commercial Buildings with 7% T&D losses. 167
Figure 66: 2005 Annual and OSD NOx Reductions from Electricity Savings from the IECC / IRC by PCA for Commercial Buildings by County using 1999 eGRID with 7% T&D losses. 168
Figure 67: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Commercial Buildings by County using 1999 eGRID and 7% T&D losses. 170
Figure 68: 2005 Annual and OSD NOx Reductions from Electricity from the IECC / IRC by PCA for Commercial Buildings by County using 2007 eGRID and 7% T&D losses. 174
Figure 69: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Commercial Buildings by County using 2007 eGRID and 7% T&D losses. 176
Figure 70: 2005 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Single-family and Multi-family Residences and for Commercial Buildings by County. 179

Figure 71: 2005 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Single-family and Multi-family Residences and for Commercial Buildings by County. 180
Figure 72: 2005 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 1999 eGRID). 181
Figure 73: 2005 OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 1999 eGRID). 182
Figure 74: 2005 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 2007 eGRID). 185
Figure 75: 2005 OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 2007 eGRID). 186
Figure 76: 2004 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County. 188
Figure 77: 2005 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 1999 eGRID)..... 188
Figure 78: 2005 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 2007 eGRID)..... 189
Figure 79: 2004 Peak OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County..... 189
Figure 80: 2005 OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 1999 eGRID). 190
Figure 81: 2005 OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (Using 2007 eGRID). 190
Figure 82: Impact of Changes in the Simulation Input for Single-family Residences on the Annual Electricity and Natural Gas Consumption (Harris County). 197
Figure 83: Impact of Changes in the Simulation Input for Single-family Residences on the Annual Electricity and Natural Gas Consumption (Tarrant County)..... 198
Figure 84: Impact of Changes in the Simulation Input for Multi-family Residences on the Annual Electricity and Natural Gas Consumption (Harris County). 201
Figure 85: Impact of Changes in the Simulation Input for Multi-family Residences on the Annual Electricity and Natural Gas Consumption (Tarrant County)..... 201
Figure 86: Process Flow Diagram of the NOx Emissions Reduction Calculations. 204
Figure 87: Cumulative OSD NOx Emissions Reduction Projections until 2013..... 231
Figure 88: Percentage Division of the NOx Emissions Reductions for the Different Program (2013 Projection)..... 232
Figure 89: Cumulative OSD NOx Emissions Reduction Projections until 2010..... 232
Figure 90: Percentage Division of the NOx Emissions Reductions for the Different Program (2010 Projection)..... 233
Figure 91: Map of Texas Showing Counties to be Included in 2006 Integrated Savings Reporting. 234
Figure 92: Block-diagram Showing Interactive-functionality of the Emissions Reduction Calculator..... 237
Figure 93: Laboratory's Emissions Reduction Calculator (Main eCALC Screen)..... 238
Figure 94: System Architecture for Enhanced Version of e2Calc. 239
Figure 95: New Screen Layout for Enhanced Version of e2CALC (Single-family, Multi-family, Office, Retail). 239
Figure 96: New Screen Layout for Enhanced Version of e2CALC (Public Buildings, Street Lights, Traffic Lights, Water and Wastewater). 240
Figure 97: Example of New Artwork to Enhanced Version of e2Calc: Entry Screen. 240
Figure 98: Example of New Artwork to Enhanced Version of e2Calc: Code Compliance Calculator. 241
Figure 99: Enhancement to the SECO Web Page for Collection of Information for Reporting Emissions Reductions. 242
Figure 100: Flow Chart for M1 Model. 244
Figure 101: Sample Input for Growth Factors. 245
Figure 102: IMT Regression Results from the 2-Step Analysis. 245

Figure 103: IMT Regression Results from the 2-Step Analysis. 246
Figure 104: M1 Model Input Screens. 248
Figure 105: M1 Model Input Screens. 248
Figure 106: M1 Model Input Screens. 249
Figure 107: M1 Model Input Screens. 249
Figure 108: Sample Output Report Sent to the User. 250
Figure 109: Flow Chart for the M2 Model. 252
Figure 110: M2 Model Input Screens. 253
Figure 111: M2 Model Input Screens. 254
Figure 112: M2 Model Input Screens. 255
Figure 113: M2 Model Input Screens. 255
Figure 114: M2 Model Input Screens. 256
Figure 115: M2 Output Report Sent to the User. 256
Figure 116: Main Screen of the Senate Bill 5 Web Page Showing the New Weather Data Button. 258
Figure 117: Available Weather Stations in Texas for 41 Non-attainment and Affected Counties. 259
Figure 118: Available Weather Stations in Texas for all ERCOT Counties 265
Figure 119: Grouping of Weather Stations in Texas for all ERCOT Counties. 265
Figure 120: Available Weather Stations in Texas for all ERCOT Counties Showing 2000/2001 and 2006 Climate Zones. 266
Figure 121: Weather Data Web Page Screenshot Showing the ERCOT Area and the Available Locations with Data. 267
Figure 122: Available File Types and Years for Each Available Location. The Screenshot Shows the Corresponding Files for Dallas, TX. 268
Figure 123: Hourly Data Set Time Series Plots for Dallas, TX on 2004. 269
Figure 124: Daily Data Set Time Series Plots for Dallas, TX on 2004. 270
Figure 125: Map of College Station Showing Approximate Area of Town used for Demonstration of Pre/Post 2001 Building Code Implementation. 275
Figure 126: Close-up Map Showing Approximate Area of Town used for Demonstration of Pre/Post 2001 Building Code Implementation. 275
Figure 127: Analysis of houses chosen for demonstration of utility billing analysis. Building permit date vs. conditioned area (upper graph), building permit date vs. area above 1500 sq. ft. (middle graph), and building permit date vs. average annual electricity use (kWh/sq. ft.-day) (lower graph). 276
Figure 128: Photographs of Houses used in Demonstration of Utility Billing Analysis. 277
Figure 129: Utility Billing Data for 13 Houses Built Before the Adoption of the 2001 IECC. 278
Figure 130: Utility Billing Data for 13 Houses Built After the Adoption of the 2001 IECC. 279
Figure 131: Sample Analysis for 3 Houses Built Before the Adoption of the 2001 IECC. 280
Figure 132: Sample Analysis for 3 Houses Built After the Adoption of the 2001 IECC. 281
Figure 133: Average Weather-normalized Difference for Houses Built Before and After the 2001 IECC. 282
Figure 134: Standard Office Building (Texas A&M University Systems Building, College Station, Texas). 283
Figure 135: Standard Office Building (Example of Weekly Inspection Plots). 284
Figure 136: Monthly Electricity Utility Bills for Five K-12 Schools in College Station, Texas. 285
Figure 137: Monthly Natural Gas Utility Bills for Five K-12 Schools in College Station, Texas. 286
Figure 138: Normalized Comparison of Monthly Utility Bills for Five K-12 Schools in College Station, Texas. 287
Figure 139: Photo and Preliminary Computer Simulation of Case Study Elementary School. 288
Figure 140: Example Weekly Inspection Plots From Case Study Elementary School. 289
Figure 141: High Performance Office Building (Robert E. Johnson Building, Austin, Texas). 291
Figure 142: High Performance Office Building (Example of Weekly Inspection Plots). 293
Figure 143: Results from Calibrated Simulations for the REJ Building. 293
Figure 144: Residential Building (Habitat Residence, Bryan, Texas). 294
Figure 145: Residential Building (Example of Weekly Inspection Plots). 296
Figure 146: Schematic of Duct Model Addition to Calibrated Simulation of Habitat House. 297
Figure 147: Photos of the Laboratory's Solar Test Bench. 298
Figure 148: Weekly Inspection Plots from the Laboratory's Solar Test Bench. 299
Figure 149: Results From Measured Transmittance Tests from the Laboratory's Solar Test Bench. 300

TABLE OF TABLES

Table 1: IECC / IRC Residential and ASHRAE 90.1 Commercial Building Code Workshops for Senate Bill 5 during the Period September 2004 to August 2005. 32
Table 2: PNNL Analysis of Texas State Code Adoption Analysis: Lighting Requirement (USDOE 2005).36
Table 3: Coefficients of 3PC Model for Monthly Daily Turbine Power. 45
Table 4: Attendee list for August, 2006 Stakeholder's meeting. 53
Table 5: Base-case House Characteristics. 60
Table 6: List of Building Properties for the Base-case House and Energy-efficient Option. 61
Table 7: Various Costs Associated with the Base-case House and the Maximum Energy-efficient Option. 62
Table 8: Transmittance, absorptance and reflectance properties of the selected glazing..... 67
Table 9: Difference in Energy Consumption: a) Quick to Thermal mass mode b) SC to WINDOW-5 Option. 67
Table 10: Percentage Difference in Energy Consumption: a) Quick to Thermal Mass Mode b) SC to WINDOW-5 Option..... 68
Table 11: NO_x, SO_x and CO_2 Savings from CC® Measures at the RAC at Dallas-Fort Worth Airport..... 69
Table 12: Monthly Savings for the fiscal year 2005 and potential monthly savings in the year 1999 obtained from the Continuous Commissioning® measures..... 71
Table 13: Reference Information for Residential Furnaces. 75
Table 14: Reference Information for Pilot Lights for Residential Furnace Calculations. 76
Table 15: Reference Information for Housing Units and Annual Population Estimates. 77
Table 16: Input Paramters for Residential Furnace Pilot Light Replacement Analysis..... 77
Table 17: Reference Information Regarding the Households Using Natural Gas for DHW. 80
Table 18: Reference Information from Survey of Water Heater Manufacturers. 80
Table 19: Reference Information for NOx Emissions from DHW Pilot Lights. 81
Table 20: Reference Information for Housing Units in Texas..... 82
Table 21: Input Paramters for Pilot Light Elimination in DHW..... 82
Table 22: 2005 Code and Pre-code Simulation Results for Individual Residence for Bastrop (Single Family and Multi-Family). 87
Table 23: 2005 Code and Pre-code Annual Simulation Results for Bastrop (Single Family). 88
Table 24: 2005 Code and Pre-code Peak-Day Simulation Results for Bastrop (Single Family). 89
Table 25: 2005 Code and Pre-code Annual Simulation Results for Bastrop (Multi-Family). 90
Table 26: 2005 Code and Pre-code Peak OSD Simulation Results for Bastrop (Multi-Family). 91
Table 27: 1999 and IECC / IRC Code-compliant Building Characteristics used in the DOE-2 Simulation for Single-family Residential..... 94
Table 28: 2005 Annual and Peak-day Electricity Savings from Implementation of the IECC / IRC for Single-family Residences..... 95
Table 29: 2005 Allocation of PCA for each of 41 Non-attainment and Affected Counties. 96
Table 30: 2005 Totalized Annual Electricity Savings from IECC / IRC by PCA for Single-family Residences. 97
Table 31: 2005 Annual NOx Reductions from IECC / IRC by PCA for Single-family Residences by County Using 1999 eGRID. 98
Table 32: 2005 Totalized OSD Electricity Savings from IECC / IRC by PCA for Single-family Residences. 99
Table 33: 2005 OSD NOx Reductions from IECC / IRC by PCA for Single-family Residences by County Using 1999 eGRID. 100
Table 34: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Single-family Residences by County using 1999 eGRID..... 101
Table 35: 2005 Annual NOx Reductions from IECC / IRC by PCA for Single-family Residences by County using 2007 eGRID. 104
Table 36: 2005 OSD NOx Reductions from IECC / IRC by PCA for Single-family Residences by County using 2007 eGRID. 105
Table 37: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Single-family Residences by County using 2007 eGRID..... 106

Table 38: 1999 and IECC / IRC Code-compliant Building Characteristics used in the DOE-2 Simulation for Multi-family Residential. 110
Table 39: 2005 Annual and OSD Electricity and Natural Gas Savings from Implementation of the IECC / IRC for Multi-family Residences. 111
Table 40: 2005 Totalized Annual Electricity Savings from IECC / IRC by PCA for Multi-family Residences. 112
Table 41: 2005 Annual NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 1999 eGRID. 113
Table 42: 2005 Totalized OSD Electricity Savings from IECC / IRC by PCA for Multi-family Residences. 114
Table 43: 2005 OSD NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 1999 eGRID. 115
Table 44: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 1999 eGRID. 116
Table 45: 2005 Annual NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 2007 eGRID. 119
Table 46: 2005 OSD NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 2007 eGRID. 120
Table 47: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 2007 eGRID. 121
Table 48: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (Using 1999 eGRID). 124
Table 49: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 2007 eGRID). 130
Table 50: Commercial Building Descriptions from USDOE (2004) Report and Dodge (2005). 136
Table 51: Floor Area from CBEC (1999, 2003) Database for Retail and Food Type Commercial Buildings. 136
Table 52: 1999 to 2003 New Commercial Building Construction (sq. ft. x 1000) (Source: Dodge/McGraw-Hill 2005). Table shows Dodge data before merging into PNNL building types (sq. ft. x 1000) (Part 1). 137
Table 53: 1999 to 2003 New Commercial Building Construction (sq. ft. x 1000) (Source: Dodge/McGraw-Hill 2005). Table shows Dodge data before merging into PNNL building types (sq. ft. x 1000) (Part 2). 138
Table 54: 1999 to 2003 New Commercial Building Construction (sq. ft. x 1000) (Source: Dodge/McGraw-Hill 2005). Table shows Dodge data before merging into PNNL building types (sq. ft. x 1000) (Part 3). 139
Table 55: 1999 to 2003 New Commercial Building Construction (sq. ft. x 1000) (Source: Dodge/McGraw-Hill 2005). Table shows Dodge data merged into PNNL building types (sq. ft. x 1000). 140
Table 56: 2003 New Commercial Building Construction (sq. ft. x 1000) Used to Project 2005 Construction (Source: Dodge/McGraw-Hill 2005). 141
Table 57: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Assembly and Education Building Types (USDOE 2004). 145
Table 58: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Retail and Food Building Types (USDOE 2004). 146
Table 59: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Loding and Office Building Types (USDOE 2004). 147
Table 60: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Warehouse Building Type (USDOE 2004). 148
Table 61: Calculated ASHRAE Standard 90.1-1989 and 1999 Annual Electricity and Natural Gas Savings for Assembly, Education, Retail, and Food Types (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represents an energy use increase (+). 153
Table 62: Calculated ASHRAE Standard 90.1-1989 and 1999 Annual Electricity and Natural Gas Savings for Lodging, Office, and Warehouse Building Types (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represents an energy use increase (+). 154

Table 63: Calculated ASHRAE Standard 90.1-1989 and 1999 OSD Electricity and Natural Gas Savings for Assembly, Education, Retail, and Food Types (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represents an energy use increase (+). 155
Table 64 Calculated ASHRAE Standard 90.1-1989 and 1999 OSD Electricity and Natural Gas Savings for Lodging, Office, and Warehouse Building Types (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represets an energy use increase (+). 156
Table 65: Office/Retail Simulation Input Parameters (LOADS). 157
Table 66: Office/Retail Simulation Input Parameters (SYSTEMS and PLANT). 158
Table 67: Simulated Electricity and Natural Gas for Building Built to 90.1-1989 Standard for Annual and OSD (07/15 – 09/15). 161
Table 68: 2005 Allocation of PCA for each of 41 Non-attainment and Affected Counties. 161
Table 69: Totalized Annual Electricity Savings from 90.1-1999 by PCA for Commercial Buildings. 162
Table 70: 2005 Annual NOx Reductions from IECC / IRC by PCA for Commercial Buildings by County using 1999 eGRID. 163
Table 71: 2005 Totalized OSD Electricity Savings from IECC / IRC by PCA for Commercial Buildings (w/7% T&D). 164
Table 72: 2005 OSD NOx Reductions from Electricity Savings from the IECC / IRC by PCA for Commercial Buildings by County using 1999 eGRID (w/7% T&D). 165
Table 73: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Commercial Buildings by County using 1999 eGRID (w/7% T&D). 166
Table 74: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Commercial Buildings by County using 1999 eGRID. 169
Table 75: 2005 Annual NOx Reductions from Electricity From the IECC / IRC by PCA for Commercial Buildings by County using 2007 eGRID and 7% T&D losses. 171
Table 76: 2005 OSD NOx Reductions from Electricity from the IECC / IRC by PCA for Commercial Buildings by County using 2007 eGRID and 7% T&D losses. 172
Table 77: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Commercial Buildings by County using 2007 eGRID and 7% T&D losses. 173
Table 78: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Commercial Buildings by County using 2007 eGRID and 7% T&D losses. 175
Table 79: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 1999 eGRID). 178
Table 80: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 2007 eGRID). 184
Table 81: Comparison of 2005 Emissions Reductions vs. 2004 Emissions Reductions from Implementation of the IECC / IRC to Single-family and Multi-family Residential Construction. 191
Table 82: Description of Steps for Comparison of 2004 vs. 2005 Energy and NOx Reductions for Single-Family Residence. 195
Table 83: Comparison of 2004 vs. 2005 Energy and NOx Emissions Reductions for Single-family House (Harris County). 196
Table 84: Comparison of 2004 vs. 2005 Energy and NOx Emissions Reductions for Single-family House (Tarrant County). 197
Table 85: Description of Steps for Comparison of 2004 vs 2005 Energy and NOx Reductions for Multi-Family. 199
Table 86: Comparison of 2004 vs 2005 Energy and NOx Emissions Reductions for Multi-family House (Harris County). 199
Table 87: Comparison of 2004 vs 2005 Energy and NOx Emissions Reductions for Multi-family House (Tarrant County). 200
Table 88: Annual and OSD MWh Savings for ESL-Single-family Program. 206
Table 89: Projected MWh Savings for ESL-Single-family According to Power Control Authorities (PCA). 206
Table 90: Example of NOx Emissions Reduction Calculations According to Counties and PCA. 207
Table 91: Cumulative NOx Emissions Reductions According to SIP Areas and Counties (ESL-Single-family). 207

Table 92: Annual and OSD MWh Savings for ESL-Multi-family Program. 209
Table 93: Projected MWh Savings for ESL-Multi-family According to Power Control Authorities (PCA) and Counties. 209
Table 94: Example of NOx Emissions Reduction Calculations According to Counties and PCA. 210
Table 95: NOx Emissions Reduction Values According to SIP Areas and Counties (ESL-Multi-family). 210
Table 96: Annual and OSD MWh Savings for PUCT-SB 7 Program. 212
Table 97: Projected MWh Savings for PUCT-SB 7 According to Power Control Authorities (PCA). 212
Table 98: Example of NOx Emissions Reduction Calculations According to Counties and PCA. 212
Table 99: Cumulative NOx Emissions Reduction Values According to SIP Areas and Counties (PUCT-SB 7). 213
Table 100: Annual and OSD MWh Savings for PUCT-SB 5 Grants Program. 215
Table 101: Projected MWh Savings for PUCT-SB 5 Grants Program According to Power Control Authorities (PCA). 215
Table 102: Example of NOx Emissions Reduction Calculations According to Counties and PCA. 216
Table 103: NOx Emissions Reduction Values According to SIP Areas and Counties (PUCT-SB 5 Grants Program). 217
Table 104: Summary of the Projects Submitted under the SECO Program. 219
Table 105: Summary of the Projects Submitted under the SECO Program (cont'd). 220
Table 106: Summary of the Projects Submitted under the SECO Program (cont'd). 221
Table 107: Summary of the Projects Submitted under the SECO Program (cont'd). 222
Table 108: Summary of the Projects Submitted under the SECO Program (cont'd). 223
Table 109: Projected Annual and OSD MWh Savings for SECO by County. 223
Table 110: Example of NOx Emissions Reduction Calculations According to Counties and PCA. 224
Table 111: NOx Emissions Reduction Values According to SIP Areas and Counties (SECO). 225
Table 112: Annual and OSD MWh Production According to Wind Farms and PCAs from 2001 to 2004. 227
Table 113: Projected Annual and OSD MWh Savings for Wind-ERCOT. 228
Table 114: Example of NOx Emissions Reduction Calculations According to Counties and PCA. 229
Table 115: NOx Emissions Reduction Values According to SIP Areas and Counties (Wind-ERCOT). 230
Table 116: Final Adjustment Factors used for the Calculation of the Annual and OSD NOx Savings for the Different Programs. 231
Table 117: Annual and OSD MWh Savings for the Different Programs. 233
Table 118: Annual and OSD NOx Emissions Reduction Values for the Different Programs. 233
Table 119: Input Categories and Factors for the 2006 Integrated NOx Emissions Reporting. 234
Table 120: Sample Input for Monthly Wastewater Treated and Electricity Consumption. 245
Table 121: Example Predicted Annual and OSD Period Energy Savings in 2007 and 2010. 247
Table 122: List of Available Weather Files in Texas (Listed by Symbol). 259
Table 123: Assignment of Weather Stations for 41 Non-attainment and Affected Counties (NOAA, TMY2, F-CHART, PV F-CHART, NAHB, Climate Zone, HDD, CDD, 90.1-1989, 90.1-1999). 260
Table 124: Availability of Weather Data for 41 Non-attainment and Affected County (NOAA, NREL, TCEQ, ESL). 261
Table 125: Main NOAA Weather Stations used in eCALC. 262
Table 126: Summary of Weather Data Assignments for ERCOT Counties. 263
Table 127: Assignment of NWS Weather Stations for all ERCOT Counties. 264
Table 128: List of Available Weather Files in Texas (Listed by Symbol). 266
Table 129: Extraction of the Dallas, TX, Daily Data in CSV Format. 271
Table 130: Extraction of the Dallas, TX, Hourly Data in CSV Format. 272
Table 131: Extraction of the TRY Format File Needed for Packing the DOE-2 File. 273
Table 132: Standard Office Building (Listing of Monitored Channels). 284
Table 133. High Performance Office Building (Listing of Monitored Channels). 292
Table 134: Residential Building (Listing of Monitored Channels). 295

3 OVERVIEW

The Energy Systems Laboratory (Laboratory) is pleased to provide our fourth annual report, Energy Efficiency/Renewable Energy Impact in the Texas Emissions Reduction Plan (TERP), to the Texas Commission on Environmental Quality (TCEQ) in fulfillment of its responsibilities under Texas Health and Safety Code Ann. § 388.003 (e), Vernon Supp. 2002. This annual report:

- Provides an estimate of the energy savings and NOx reductions from energy code compliance in new residential construction in 41 counties;
- Describes the technology developed to enable the TCEQ to substantiate energy and emissions reduction credits from energy efficiency and renewable energy initiatives (EE/RE) to the U.S. Environmental Protection Agency (US EPA), including the development of a web-based emissions reductions calculator; and
- Outlines progress in advancing EE/RE strategies for credit in the State Implementation Plan (SIP).

The report is organized in three volumes.

Volume I – Summary Report – provides an executive summary;
Volume II – Technical Report – provides a detailed report of activities, methodologies and findings;
Volume III – Technical Appendix – contains detailed data from simulations for each of the forty-one counties included in the analysis.

3.1 Legislative Background

The TERP was established in 2001 by the 77th Legislature through the enactment of Senate Bill 5 to:

- Ensure that Texas air meets the Federal Clean Air Act requirements (Section 707, Title 42, United States Code); and
- Reduce NOx emissions in non-attainment and affected counties through mandatory and voluntary programs, including the implementation of energy efficiency and renewable energy programs (EE/RE).

To achieve the clean air and emissions reduction goals of the TERP, SB 5 created a number of EE/RE programs for credit in the SIP:

- Adopts statewide Texas Building Energy Performance Standards (TBEPS) as the building energy code for all residential and commercial buildings;
- Provides that a municipality or county may request the Laboratory to determine the energy impact of proposed energy code changes;
- Provides for an annual evaluation by the Public Utility Commission of Texas (PUCT), in cooperation with the Laboratory, of the emissions reduction of energy demand, peak electric loads and the associated air contaminant reductions from utility-sponsored programs established under SB 5 and utility-sponsored programs established under the electric utility restructuring act (Section 39.905 Utilities Code);
- Establishes a 5% per year electricity reduction goal each year for facilities of political subdivisions in non-attainment and affected counties from 2002 through 2007; and
- Requires the Laboratory to report to the TCEQ the energy savings (and resultant emissions reduction) from implementation of building energy codes and to identify the municipalities and counties whose codes are more or less stringent than the unamended code.

The 78th Legislature (2003), through HB 1365 and HB 3235, amended TERP to enhance its effectiveness with additional energy efficiency initiatives, including:

- Requires the TCEQ to conduct outreach to non-attainment and affected counties on the benefits of implementing energy efficiency measures as a way to meet the air quality goals under the federal Clean Air Act;
- Requires the TCEQ develop a methodology for computing emissions reductions from energy efficiency initiatives;
- Authorized a voluntary Energy-Efficient Building Program at the General Land Office (GLO), in consultation with the Laboratory, for the accreditation of buildings that exceed the state energy code requirements by 15% or more;
- Authorizes municipalities to adopt an optional, alternate energy code compliance mechanism through the use of accredited energy efficiency programs determined to be code-compliant by the Laboratory, as well as the US EPA's Energy Star New Homes program; and
- Requires the Laboratory to develop and administer a statewide training program for municipal building inspectors seeking to become code-certified inspectors for enforcement of energy codes.

The 79th Legislature (2005), through SB 20, HB 2481 and HB 2129, amended SB 5 to enhance its effectiveness by adding the following additional energy efficiency initiatives:

- Requires 5,880 MW of generating capacity from renewable energy technologies by 2015;
- Includes 500 MW from non-wind renewables;
- Requires PUCT to establish a target of 10,000 megawatts of installed renewable capacity by 2025;
- Requires TCEQ to develop methodology for computing emissions reductions from renewable energy initiatives and the associated credits;
- Requires the Laboratory to assist TCEQ in quantifying emissions reductions credits from energy efficiency and renewable energy programs;
- Requires Texas Environmental Research Consortium (TERC) to contract with the Laboratory to develop and annually calculate creditable emissions reductions from wind and other renewable energy resources for the state's SIP; and
- Requires the Laboratory to develop at least three alternative methods for achieving a 15 % greater potential energy savings in residential, commercial and industrial construction.

3.2 Laboratory Funding for the TERP

The Laboratory received $182,000 in FY 2002; $285,000 in FY 2003; $950,421 in FY 2004; and $952,019 in FY 2005. The Laboratory has also supplemented these funds with competitively awarded federal grants to provide the needed statewide training for the new mandatory energy codes and to provide technical assistance to cities and counties in helping them implement adoption of the legislated energy efficiency codes, and a grant from the US EPA through the TCEQ in 2005 to enhance the web-based EE/RE emissions calculator.

3.3 Progress in FY 2005

Since September 2004, the Energy Systems Laboratory has accomplished the following activities in fulfillment of its responsibilities under SB 5:

- Estimated energy and resultant NOx reductions from implementation of the Texas Building Energy Performance Standards (IECC/IRC codes) to new residential and commercial construction for all non-attainment and affected counties;
- Enhanced the web-based "Emissions Reduction Calculator" for determining emissions reduction from energy efficiency improvements in residential and commercial construction, municipal projects and renewable energy projects;
- Enhanced the Laboratory's IECC/IRC Code-Traceable Test Suite for determining emissions reduction due to code and above-code programs;

- Continued development and testing of key procedures for validating simulations of building energy performance;
- Provided energy code training workshops, including: 15 residential, 12 commercial IECC/IRC energy code training sessions and 3 ASHRAE Standard 90.1 workshops throughout the State of Texas;
- Maintained and updated the Laboratory's Senate Bill 5 website;
- Maintained a builder's residential energy code Self-Certification Form (Ver.1.3) for use by builders outside municipalities;
- Responded to hundreds of phone and email inquiries on code implementation and verification issues;
- Analyzed the stringency of several residential and commercial energy codes, including ASHRAE Standard 90.2-2004, the 2003 IECC, the 2004 IECC, the 2006 IECC, and ASHRAE Standard 90.1-2004;
- Hosted the Energy Leadership and Emissions Reductions Conference, November 7-10, 2005, in Dallas. Conference sessions included key talks by TCEQ, EPA, DOE and the Laboratory about quantifying emissions reductions from EE/RE opportunities and guidance on key energy efficiency and renewable energy topics;
- Provided technical assistance to the TCEQ regarding specific issues, including:
    - Development of an integrated NOx emissions reductions (iNOxERM) reporting procedure[11] to TCEQ for ESL, PUCT, SECO and ERCOT;
    - Developed a procedure for weather normalizing NOx emissions reductions from power provided by wind energy;
    - Quantified emissions reductions from retrofits at the Rent-a-Car center at the Dallas-Fort Worth International Airport;
    - Quantified emissions reductions from the elimination of pilot lights in replacement furnaces and domestic water heaters;
- Enhanced web-based emissions reduction calculator, including:
    - Expanded emissions reductions calculator to include all counties in ERCOT;
    - Gathered, cleaned and posted weather data archive for 17 NOAA stations;
    - Developed new water/wastewater design modules (w/EPA grant);
    - Developed new computer architecture to allow for synchronous calculations, user accounts, and code-compliance;
- Developed preliminary verification procedures, including:
    - Completion of calibrated simulation of high efficiency office building;
    - Worked towards a calibrated simulation of an office building;
    - Worked towards a calibrated simulation of a K-12 school;
    - Worked towards a calibrated simulation of a Habitat for Humanities residence; and
    - Developed preliminary utility bill comparison for residences.

These activities were designed to more accurately calculate the creditable NOx emissions reductions from EE/RE initiatives contained in the TERP, and to assist the TCEQ, local governments, and the building industry with effective implementation and reporting.

3.3.1 Energy and NOx Emissions Reduction from New Construction (Residential and Commercial)

State adoption of the energy efficiency provisions of the International Residential Code and International Energy Conservation Code became effective September 1, 2001. The Laboratory has developed and delivered training to assist municipal inspectors to become certified energy inspectors. The Laboratory also supported code officials with guidance on interpretations as needed. This effort, based on a requirement of HB 3235, 78th Texas Legislature, supports a more uniform interpretation and application of energy codes throughout the state. In general, the State is experiencing a true market transformation from low energy efficiency products to high energy efficiency products. These include Low Solar Heat Gain windows, higher efficiency appliances, increased insulation, lower thermal loss ducts and in builder participation in

[11] These procedures are currently under review by the USDOE, through the National Renewable Energy Laboratory (NREL).

"above-code" code programs such as Energy Star New Homes, which previously had no state baseline and almost no participation.

Annual energy savings[12] from energy code-compliant, new residential construction built in 2005 amounted to 263,656 MWh/year saved from single-family residential; 10,157 MWh/year saved from multi-family residential; 75,072 MWh/year saved from commercial construction; and 690,579 MBtu/year saved from residential and commercial construction.

In the 41 non-attainment and affected counties, the resultant ***annual*** NOx reductions in 2005 were calculated to be 268 tons NOx/year (2007 eGRID), which include:

- 180 tons NOx/year from single-family residential (263,656 MWh/year saved);
- 7 tons NOx/year from multi-family residential (10,157 MWh/year saved);
- 49 tons NOx/year from commercial construction (75,072 MWh/year saved); and
- 32 tons NOx/year from natural gas savings from single-family, multi-family residential and commercial construction (690,579 MBtu/year saved).

For the ***peak ozone season day (OSD),*** the NOx reductions in 2005 are calculated to be 1.26 tons of NOx/peak-OSD, which represents:

- 0.88 tons NOx/day from single-family residential (1,299 MWh/day saved);
- 0.03 tons NOx/day from multi-family residential (43.05 MWh/day saved);
- 0.29 tons NOx/day from commercial (457.17 MWh/day saved); and
- 0.06 tons NOx/day from natural gas savings from single-family, multi-family and commercial construction (1,210 MBtu/day saved).

Total cumulative NOx reductions[13] were determined to be 5,711.58 tons/year, and 15.43 tons/peak-OSD in 2009; and 6,034.93 tons/year and 17.14 tons/peak-OSD in 2013, which contain the following contributions from the Laboratory, the Public Utilities Commission, the State Energy Conservation Office, and green power provided by wind turbines[14] renewable energy sources Wind/ERCOT programs:

- from energy efficiency savings from code-compliant new construction: 900.52 tons/year, and 4.47 tons/peak-OSD in 2009; and 1,167.49 tons/year with 5.75 tons/peak-OSD in 2013 (2007 eGRID);
- from the PUCT SB 7 and SB 5 programs: 1,483.22 tons/year, and 3.98 tons/peak-day-OSD in 2009; and 1,981.05 tons/year, and 5.31 tons/peak-OSD in 2013 (2007 eGRID);
- from the SECO program, 447.10 tons/year, and 1.29 tons/OSD in 2009; and 699.86 tons/year, and 1.76 tons/peak-OSD in 2013; and
- from the Wind/ERCOT program[15]: 2,880.74 tons/year and 5.69 tons/peak-OSD in 2009; and 2,186.33 tons/year and 4.32 tons/peak-OSD in 2013.

Additional details of the analysis are reported in this report.

[12] These annual energy savings do include 7% transmissions and distribution losses, but do not include discount or degradations factors.

[13] The total cumulative NOx reductions for new residential and commercial construction for the years 2005 to through 2013 include a one-time 20% discount factor and a 5% annual degradation factor, as recommended by TCEQ. Discount factors for PUC, SECO and green power purchases are 25%, 60% and 25%, respectively, also as recommended by TCEQ. All cumulative calculations used a transmission and distribution loss of 7%.

[14] The green power provided by wind turbine installations is currently monitored by the Electric Reliability Council of Texas (ERCOT).

[15] The results for this 2005 report include findings from the preliminary wind analysis performed for the TCEQ using 2005 data provided by ERCOT. As part of the Laboratory's legislative 2005/2006 work a new, more accurate weather-normalization procedures are being developed to improve the NOx emissions reductions estimates. Additional information about the new procedures is provided in Volume II.

3.3.2 Code Adoption

State adoption of the International Residential Code energy provisions and International Energy Conservation Code became effective September 1, 2001, although anecdotal evidence in the form of telephone queries reported observations and training workshop interactions through 2002 and, to a lesser extent, 2003, indicated a rolling start rather than an overnight implementation.

Our emphasis in 2005 has been on the continued delivery of training aimed at assisting municipal inspectors to become certified energy inspectors (in one of several designations maintained by the International Energy Code Council) and supporting code officials with guidance on interpretations as needed. This effort, begun in 2003 and based on a requirement of HB 3235 of the 78th Texas Legislature, is designed to support a more uniform interpretation and application of energy codes throughout the state. In general, the State has enjoyed a true market transformation in the supply of certain products, such as Low Solar Gain windows, and in builder participation in "above-code" code programs, which previously had no state baseline and almost no participation.

In the Houston area in particular, participation in above-code programs was driven by state acceptance of a program certification, such as Energy Star, as an acceptable demonstration of code compliance outside of municipal jurisdictions and availability of utility-based marketing support. The basic code adoption and implementation, jurisdiction by jurisdiction, remains a little uneven.

In 2005, efforts were also initiated to work with the Laboratory's Stakeholders to determine the most effective path toward the transition to SEER 13 air conditioners, which included several meetings and discussion about how to accomplish this.

3.3.3 Technology for Calculation and Verifying Emissions Reductions from Energy Used in Buildings

In 2004, the Laboratory developed a web-based Emissions Reduction Calculator, known as "***eCalc,***" which contains the underlying technology for determining emissions reductions from power plants that generate the electricity for the user. The Emissions Reduction Calculator is being used to calculate emissions reductions for consideration for SIP credits from energy efficiency programs in the TERP. The TCEQ and the US EPA are currently reviewing the Laboratory's proposed technology and recent refinements for estimating NOx emissions reductions from additional energy efficiency and renewable energy (EE/RE) measures.

In 2005, the Laboratory enhanced the calculator to provide additional functions and usability. This enhanced engineering analysis software addressed major challenges:

- How to quantify and validate the persistence of energy savings from EE/RE energy measures;
- How to transform electricity reductions into spatial (location) and temporal (time-of-day) distributions of emissions reductions from electric utility power plants;
- How to quantify cumulative multi-year emissions reductions that account for reduced emissions from the associated power plants according to the US EPA's eGRID database using the specially prepared 2007 version of eGRID; and
- How to weather-normalize NOx emissions estimates for renewable sources, such as wind and solar.

In 2005, the Laboratory's Emissions Reduction Calculator used a specially prepared 2007 version of the US EPA's eGRID database to identify where emissions are produced. The Laboratory has also enhanced the previously developed emissions calculator by:

- Expanding the capabilities to include all counties in ERCOT; including the collection and assembly of weather from 1999 to the present from 17 NOAA weather stations;
- Expanding the calculator to be able to analyze energy efficiency improvement to K-12 schools;
- Developing new modules for municipal water and waste-water calculations;

- Enhancing the underlying computer platform for the calculator; and developing verification procedures for the savings currently calculated and reported by the Laboratory, including calibrated simulations for a two office buildings, a residence and one K-12 school, and utility bill analysis of representative residences built before and after the implementation of the Statewide building code.

3.3.4 Evaluation of Additional Technologies for Reducing Energy Use in Existing Buildings

The Laboratory provided technical assistance to the TCEQ, the PUCT, SECO and ERCOT, as well as Stakeholders participating in the Energy Code and Renewables programs.

- In 2005, the Laboratory worked closely with the TCEQ to develop an integrated NOx emissions reductions (iNOxERM) calculation that provided the TCEQ with a creditable NOx emissions reductions from energy efficiency and renewable energy (EE/RE) programs reported to the TCEQ in 2005 by the Laboratory, PUCT, SECO, and ERCOT (i.e., wind).
- At the request of the TCEQ, the Laboratory also developed procedures for quantifying NOx emissions reductions from wind turbines that includes weather normalization and the quantification of NOx emissions reductions from pilot lights attributable to residential furnace replacements, and potential reductions from the elimination of standing pilot lights in domestic water heaters.
- At the request of the Dallas-Fort Worth International Airport, the Laboratory developed quantifications of NOx emissions reductions from energy efficiency improvements at the Rent-a-Car facility at the DFW Airport.

3.4 Planned Focus for 2005/2006

In FY 2006, the Energy Systems Laboratory is continuing its cooperative efforts with the TCEQ, PUCT, SECO, US EPA and others to ensure EE/RE measures remain a cost-effective solution to clean air, and continue to support the energy efficiency and renewable energy opportunities of the TERP. The Laboratory team will:

- Assist the TCEQ to obtain SIP credits from energy efficiency and renewable energy using the Laboratory's Emissions Reduction Calculator technology;
- Verify, document and report energy efficiency and renewable energy savings in all TERP EE/RE programs for the SIP in each non-attainment and affected county using the TCEQ/US EPA approved technology;
- Assist the PUCT with determining emissions reductions credits from energy efficiency programs funded by SB 7 and SB 5;
- Assist political subdivisions and Councils of Governments with calculating emissions reductions from local code changes and voluntary EE/RE programs for SIP inclusion;
- Develop low-cost methods and techniques to implement 15% above code energy efficiency in low-priced and moderately-priced residential housing;
- Continue to develop creditable procedures for calculating NOx emissions reductions from green renewable technologies, including wind power, solar energy and geothermal energy systems;
- Continue development of well-documented, iNOxERM methodologies for calculating and reporting NOx reductions, including a unified database framework for required reporting to TCEQ of potentially creditable measures from the ESL, PUCT, and SECO SB 5 initiatives;
- Complete the analysis of the stringency of several residential and commercial energy codes, including ASHRAE Standard 90.1-2004, and the 2006 IECC; and
- With the assistance of the TCEQ and EPA, expand all analysis to include all counties in Texas.

The Laboratory has and will continue to provide leading-edge technical assistance to counties and communities working toward obtaining full SIP credit for the energy efficiency and renewable energy

projects that are lowering emissions and improving the air for all Texans. The Laboratory will continue to provide superior technology to the State of Texas through efforts with the TCEQ and US EPA. The efforts taken by the Laboratory have produced significant success in bringing EE/RE closer to US EPA acceptance in the SIP.

4 INTRODUCTION

4.1 Background

In 2001, the Texas Legislature adopted the Texas Emissions Reduction Plan, identifying thirty-eight counties in Texas where a focus on air quality improvements was deemed critical to public health and economic growth. Sixteen were designated by the US EPA as non-attainment areas, twenty-two others were designated by Senate Bill 5 as affected areas. These areas are shown on the map in Figure 1 as non-attainment (dark-shaded) and affected (shaded). The sixteen counties designated as non-attainment counties include: Brazoria, Chambers, Collin, Dallas, Denton, El Paso, Fort Bend, Hardin, Harris, Jefferson, Galveston, Liberty, Montgomery, Orange, Tarrant, and Waller Counties. The twenty-two counties designated as affected counties include: Bastrop, Bexar, Caldwell, Comal, Ellis, Gregg, Guadalupe, Harrison, Hays, Johnson, Kaufman, Nueces, Parker, Rockwall, Rusk, San Patricio, Smith, Travis, Upshur, Victoria, Williamson, and Wilson County. In 2003, three additional counties were classified as affected counties, including: Henderson, Hood and Hunt counties, bringing the total to forty-one counties (sixteen non-attainment and twenty-five affected counties).

These counties represent several geographic areas of the state, which have been assigned to different climate zones by the 2001 IECC[16] as shown in Figure 2, based primarily on Heating Degree Days (HDD). These include climate zone 5 or 6 (i.e., 2,000 to 2,999 HDD_{65}) for the Dallas-Ft. Worth and El Paso areas, and climate zones 3 and 4 (i.e., 1,000 to 1,999 HDD_{65}) for the Houston-Galveston-Beaumont-Port Author-Brazoria areas. Also shown on Figure 2 are the locations of the various weather data sources, including the Typical Meteorological Year (TMY2) (NREL 1995) stations, the Weather Year for Energy Calculations (WYEC2) (Stoffel 1995) weather stations, the National Weather Service weather stations, (NWS) (NOAA 1993) weather stations, the ASHRAE 90.1 1989 weather locations[17], the ASHRAE 90.1 1999 weather locations, the solar stations measured by the National Renewable Energy Laboratory (NREL)[18], the solar stations measured by the TCEQ[19], and F-CHART and PV F-CHART weather locations[20].

[16] The "2000 IECC" notation is used to signify the 2000 International Residential Code (IRC), which includes the International Energy Conservation Code (IECC) as modified by the 2001 Supplement (IECC 2001), published by the ICC in March of 2001, as required by Senate Bill 5.

[17] The ASHRAE 90.1-1989 and 90.1-1999 weather stations are used in the emissions calculator for determining the building characteristics.

[18] The NREL stations were the primary source of the 1999 global horizontal, direct normal and diffuse solar radiation used to determine the 1999 peak-day and annual emissions for the DOE-2 simulations for code-compliant housing and commercial buildings.

[19] The TCEQ stations were used as the secondary source for global horizontal solar radiation when the NREL sites were missing data or no NREL site was nearby.

[20] The F-Chart and PV F-Chart weather locations are used to determine the solar thermal or electricity produced by the systems specified by the use in the emissions calculation. The monthly energy or electricity production from F-Chart or PV F-Chart is then weather-normalized using ASHRAE's Inverse Model Toolkit to develop coefficients that are then used to determine the 1999 annual and peak day energy or electricity production for emissions calculations.

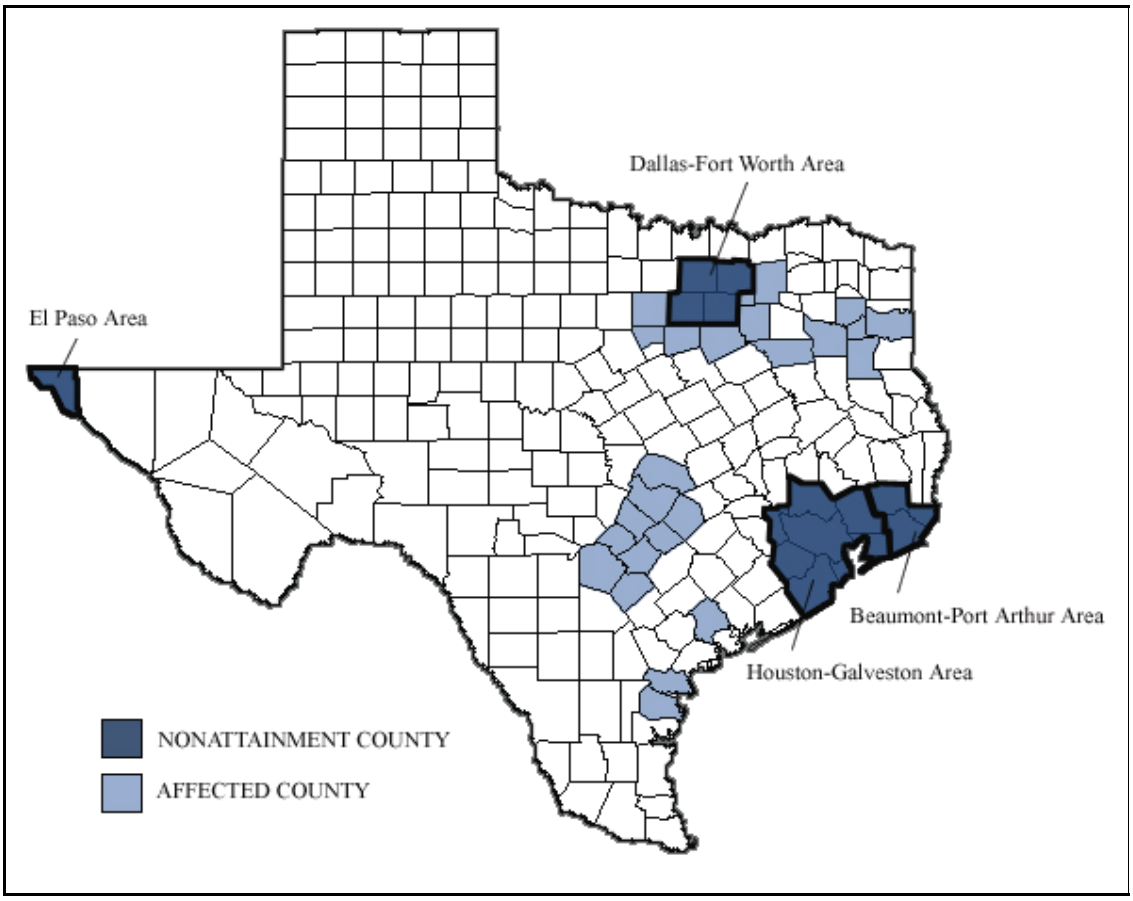
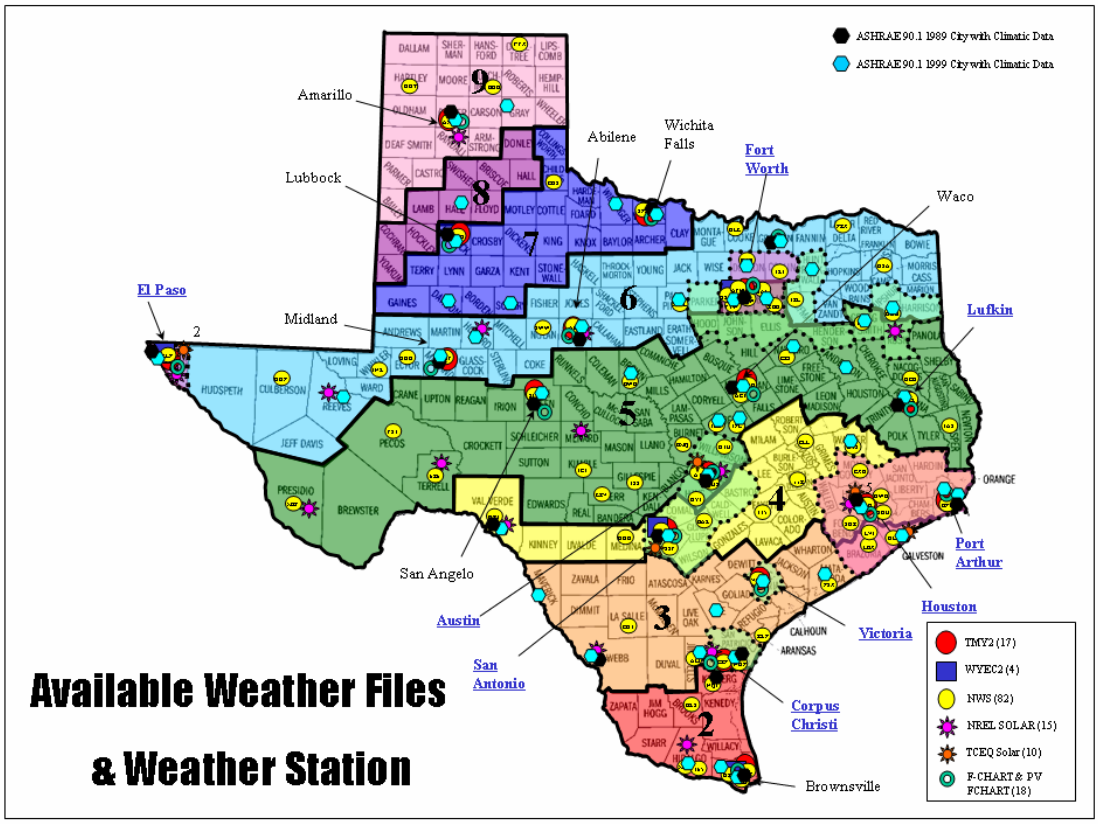


Figure 1: US EPA Non-attainment (dark shade) and affected counties (light shade).



List of Available Weather Files and Weather Stations of Texas

Texas Weather Stations (NOAA)

1 Abilene Regional Airport (ABI)
2 Alice International Airport (ALI)
3 Amarillo International Airport (AMA)
4 Angleton / Lake Jackson Brazori (LBX)
5 Arlington Municipal Airport (GKY)
6 Austin - Bergstrom International (AUS)
7 Austin Camp Mabry (ATT)
8 Borger Hutchinson County Airport (BGD)
9 BRENHAM: BRENHAM MUNICIPAL AIRPORT (11R)
10 Brownsville S Padre Isl International (BRO)
11 BROWNWOOD: BROWNWOOD REGIONAL AIRPORT (BWD)
12 Burnet Municipal Airport (BMQ)
13 Childress Municipal Airport (CDS)
14 College Station (CLL)
15 Conroe Montgomery County Airport (CXO)
16 Corpus Christi International Airport (CRP)
17 CORPUS CHRISTI: CORPUS CHRISTI NAS/TRUAX FIELD ARPT (NGP)
18 Corsicana Campbell Field (CRS)
19 Cotulla La Salle Co Airport (COT)
20 Dalhart Municipal Airport (DHT)
21 Dallas - FortWorth International Airport (DFW)
22 Dallas Love Field (DAL)
23 Dallas Redbird Airport (RBD)
24 Del Rio International Airport (DRT)
25 Denton Municipal Airport (DTO)
26 Dyess Terrell County Airport (6R6)
27 El Paso International Airport (ELP)
28 FALFURRIAS : BROOKS COUNTY AIRPORT (BKS)
29 FortStockton Pecos County Airport (FST)
30 FortWorth Alliance Airport (AFW)
31 FortWorth Meacham (FTW)
32 FREDERICKSBURG: GILLESPIE COUNTY AIRPORT (T82)
33 GAINESVILLE : GAINESVILLE MUNICIPAL AIRPORT (GLE)
34 Galveston Scholes Field (GLS)
35 GEORGETOWN : GEORG ETOWN MUNICIPAL AIRPORT (GTU)
36 Harlingen Rio Grande Valley I (HRL)
37 Hondo Municipal Airport (HDO)
38 Houston Bush Intercontinental (IAH)
39 Houston Clover Field (LVJ)
40 Houston Hooks Memorial Airport (DWH)
41 Houston Sugarland Mem (SGR)
42 Houston William P Hobby Airport (HOU)
43 Huntsville Municipal Airport (UTS)
44 JASPER : JASPER COUNTY-BELL FIELD AIRPORT (JAS)
45 Junction Kimble County Airport (JCT)
46 KERRVILLE : KERRVILLE MUN/LOUIS SCHREINER FLD AIRPORT (ERV)
47 KILLEEN : KILLEEN MUNICIPAL AIRPORT (ILE)
48 KINGSVILLE : KINGSVILLE NAS AIRPORT (NQI)
49 LA GRANGE : FAYETTE REGIONAL AIR CENTER AIRPORT (3TS)
50 Longview ETx Rgnl Airport (GGG)
51 Lubbock International Airport (LBB)
52 Lufkin Angelina Cty Airport (LFK)
53 MARFA : MARFA MUNICIPAL AIRPORT (MRF)
54 McAllen Miller International Airport (MFE)
55 McKinney Municipal Airport (TKI)
56 Midland International Airport (MAF)
57 Mineral Wells Airport (MWL)
58 MOUNT PLEASANT : MOUNT PLEASANT REGIONAL AIRPORT (OSA)
59 NACOGDOCHES : A L MANGHAM JR REGIONAL AIRPORT (OCH)
60 New Braunfels Municipal Airport (BAZ)
61 Odessa Schlemeyer Field (ODO)
62 Palacios Municipal Airport (PSX)
63 PARIS : COX FIELD AIRPORT (PRX)
64 PERRYTON : PERRYTON OCHILTREE COUNTY AIRPORT (PYX)
65 Pine Springs Guadalupe Mounta (GDP)
66 Port Arthur Se Tx Rgnl Airport (BPT)
67 Port Isabel Cameron County Airport (PIL)
68 Rockport Aransas Co Airport (RKP)
69 San Angelo Mathis Field (SJT)
70 San Antonio International Airport (SAT)
71 San Antonio Stinson Municipal Airport (SSF)
72 SAN MARCOS : SAN MARCOS MUNICIPAL AIRPORT (HYI)
73 SWEETWATER : AVENGER FIELD AIRPORT (SWW)
74 TEMPLE: DRAUGHON-MILLER CNTRL TEXAS REGIONAL ARPT (TPL)
75 Terrell Municipal Airport (TRL)
76 Tyler Pounds Field (TYR)
77 Victoria Regional Airport (VCT)
78 WACO : MC GREGOR EXECUTIVE AIRPORT (PWG)
79 Waco Regional Airport (ACT)
80 WICHITA : MID VALLEY AIRPORT (T65)
81 Wichita Falls Municipal Airport (SPS)
82 Wilbarger Co Airport (INK)

Texas TMY2 Weather Files

1 Abilene
2 Amarillo
3 Austin
4 Brownsville
5 Corpus Christi
6 El Paso
7 FortWorth
8 Houston
9 Lubbock
10 Lufkin
11 Midland
12 PortArthur
13 San Angelo
14 San Antonio
15 Victoria
16 Waco
17 Wichita Falls

Texas WYEC2 Weather Files

1 El Paso
2 Brownsville
3 FortWorth
4 San Antonio

NREL Solar Stations

1 Abilene
2 Austin
3 Big Spring
4 Canyon
5 Clear Lake
6 Corpus Christi
7 Del Rio
8 Edinburg
9 El Paso
10 Laredo
11 Mesquite
12 Odessa
13 Pecos
14 Presidio
15 Sanderson

TCEQ Solar Stations

1 Bexar
2 Travis
3 El Paso (2)
4 Galveston
5 Harris (5)

FCHART and PV FCHART (New Weather File)

1 ABILENE
2 AMARILLO
3 AUSTIN
4 BROWNSVILLE
5 CORPUS CHRISTI
6 EL PASO
7 FORT WORTH
8 HOUSTON
9 LUBBOCK
10 LUFKIN
11 MIDLAND-ODESSA
12 PORT ARTHUR
13 SAN ANGELO
14 SAN ANTONIO
15 SHERMAN
16 VICTORIA
17 WACO
18 WICHITA FALLS

Figure 2: Available NWS, TMY2 and WYEC2 weather files compared to IECC / IRC weather zones for Texas.

4.2 Energy Systems Laboratory's Responsibilities in the TERP.

In 2001, Texas Senate Bill 5 outlined the following responsibilities for the Energy Systems Laboratory (ESL) within the TERP:

- Sec. 386.205. Evaluation of State Energy Efficiency Programs.
- Sec. 388.003. Adoption of Building Energy Efficiency Performance Standards.
- Sec. 388.004. Enforcement of Energy Standards Outside of Municipality.
- Sec. 388.007. Distribution of Information and Technical Assistance.
- Sec. 388.008. Development of Home Energy Ratings.

These responsibilities were updated in 2003:

1) With House Bill 1365, including modifications to:

- Sec. 388.004. Enforcement of Energy Standards Outside of Municipality.
- Sec. 388.009. Energy-Efficient Building Program.

2) With House Bill 3235, including modifications to:

- Sec. 388.009. Certification of Municipal Building Inspectors.

These responsibilities were further updated in 2005:

1) With Senate Bill 20, House Bill 2481, and 2129.

In the following sections each of these tasks is further described.

4.2.1 (SB 5) Section 386.205. Evaluation of State Energy Efficiency Programs (w/PUCT).

The Laboratory is instructed to assist the Public Utility Commission of Texas (PUCT) and provide an annual report that quantifies by county the reductions of energy demand, peak loads, and associated emissions of air contaminants achieved from the programs implemented under this subchapter and from those implemented under Section 39.905, Utilities Code (i.e., Senate Bill 7).(SB 5) Sec. 388.003. Adoption of Building Energy Efficiency Performance Standards.

Senate Bill 5 adopts the energy efficiency chapter of the 2001 International Residential Code (2001 IRC) as an energy code for single-family residential construction, and the 2001 International Energy Conservation Code (2001 IECC) for all other residential, commercial and industrial construction in the state. It requires that municipalities establish procedures for administration and enforcement, and ensure that code-certified inspectors perform inspections.

Senate Bill 5 provides that local amendments, in non-attainment areas and affected counties, may not result in less stringent energy efficiency requirements. The Laboratory is to review local amendments, if requested, and submit an annual report of savings impacts to the TCEQ. The Laboratory is also authorized to collect fees for certain of its tasks in Sections 388.004, 388.007 and 388.008.

4.2.3 (SB 5) Sec. 388.004. Enforcement of Energy Standards Outside of Municipality.

For construction outside of the local jurisdiction of a municipality, Senate Bill 5 provides for a building to comply if:

a) a building certified by a national, state, or local accredited energy efficiency program shall be considered in compliance;
b) a building with inspections from private code-certified inspectors using the energy efficiency chapter of the International Residential Code or International Energy Conservation Code shall be considered in compliance; and
c) a builder who does not have access to either of the above methods for a building shall certify compliance using a form provided by the Laboratory, enumerating the code-compliance features of the building.

4.2.4 (SB 5) Sec. 388.007. Distribution of Information and Technical Assistance.

The Laboratory is required to make available to builders, designers, engineers, and architects code implementation materials that explain the requirements of the International Energy Conservation Code and the energy efficiency chapter of the International Residential Code. Senate Bill 5 authorizes the Laboratory to develop simplified materials to be designed for projects in which a design professional is not involved. It also authorizes the Laboratory to provide local jurisdictions with technical assistance concerning implementation and enforcement of the International Energy Conservation Code and the energy efficiency chapter of the International Residential Code.(SB 5) Sec. 388.008. Development of Home Energy Ratings.

Senate Bill 5 requires the Laboratory to develop a standardized report format to be used by providers of home energy ratings (HERs). The form must be designed to give potential buyers information on a structure's energy performance, including certain equipment. Senate Bill 5 requires the Laboratory to establish a public information program to inform homeowners, sellers, buyers, and others regarding home energy ratings.

4.2.6 (HB 1365) Sec. 388.004. Enforcement of Energy Standards Outside of Municipality.

In 2003, House Bill 1365 modified Section 388.004 of Senate Bill 5 to include the following new requirements:

- That builders shall retain for three years documentation which shows their building is in compliance with the Texas Building Energy Performance Standards, and that builders shall provide a copy of the compliance documentation to homeowners.
- That single-family residences built in unincorporated areas of counties, which were completed on or after September 1, 2001, but not later than August 31, 2003, are considered in compliance with the Texas Building Energy Performance Standards.

To help builders comply with these requirements, the Laboratory will enhance the current form, which is posted on the Laboratory's Senate Bill 5 website.

4.2.7 (HB 1365) Sec. 388.009. Energy-Efficient Building Program.

In 2003, House Bill 1365 modified the TERP, adding a new Section 388.009. In this section the General Land Office, the TCEQ and the Laboratory, working with an advisory committee, may develop an energy-efficient building accreditation program for buildings that exceed the building energy performance standards under Section 388.003 by 15% or more. This program shall be updated annually to include best available energy-efficient building practices. This program shall use a checklist system to produce an energy-efficient building scorecard to help: (1) home buyers compare potential homes and, by providing a copy of the completed scorecard to a mortgage lender, qualify for energy-efficient mortgages under the National Housing Act; and (2) communities qualify for emissions reduction credits by adopting codes that meet or exceed the energy-efficient building or energy performance standards established under this chapter. This effort may include a public information program to inform homeowners, sellers, buyers, and others regarding energy-efficient building ratings. The Laboratory shall establish a system to measure the reduction in energy and emissions produced under the energy-efficient building program and report those savings to the commission.

4.2.8 (HB 3235) Sec. 388.009. Certification of Municipal Inspectors.

Also in 2003, House Bill 3235 modified the TERP to add the new Section 388.009. In this section the Laboratory is required to develop and administer a state-wide training program for municipal building inspectors who seek to become code-certified inspectors. To accomplish this, the Laboratory will work with national code organizations to assist participants in the certification program and is allowed to collect a reasonable fee from participants in the program to pay for the costs of administering the program. This program is required to be developed no later than January 1, 2004, with state-wide training sessions starting no later than March 1, 2004.

4.2.9 (SB 20, HB 2481, HB 2129). Additional Energy-Efficiency Initiatives.

The 79th Legislature, through SB 20, HB 2481 and HB 2129, amended SB 5 to enhance its effectiveness by adding the following additional energy-efficiency initiatives, including requiring 5,880 MW of generating capacity from renewable energy technologies by 2015, and 500 MW from non-wind renewables.

This legislation also requires PUCT to establish a target of 10,000 MW of installed renewable capacity by 2025, and requires TCEQ to develop a methodology for computing emissions reductions from renewable energy initiatives and the associated credits. The Laboratory is to assist TCEQ in quantifying emissions reductions credits from energy-efficiency and renewable-energy programs, through a contract with the Texas Environmental Research Consortium (TERC) to develop and annually calculate creditable emissions reductions from wind and other renewable energy resources for the state's SIP.

Finally, this legislation requires the Laboratory to develop at least 3 alternative methods for achieving a 15 % greater potential energy savings in residential, commercial and industrial construction. To accomplish this, the Laboratory will be using the code-compliance calculator to ascertain which measures are best suited for reducing energy use without requiring substantial investments.

5 PROGRESS: SEPTEMBER 2004 TO DECEMBER 2005

5.1 (SB 5) Section 386.205. Evaluation of State Energy-Efficiency Programs (w/PUCT).

5.1.1 Implemented Procedures for Evaluating State Energy-Efficiency Programs

In 2004 the Laboratory held several meetings with the Public Utility Commission of Texas to discuss the development of a framework for reporting emissions reduction from the State Energy Efficiency Programs administered by the PUCT. The State Energy-Efficiency Programs administered by the PUCT include programs under Senate Bill 7 (i.e., Section 39.905 Utilities Code) and Senate Bill 5.

In 2003 and 2004, the Laboratory worked with the TCEQ to identify a method to help the PUCT more accurately report their deemed savings as peak-day savings in 1999, using the Laboratory's new emissions reductions calculator. In 2005, this method was implemented in the TCEQ's Integrated Emissions Calculations, which is reported in this report.

5.2 (SB 5) Sec. 388.003. Adoption of Building Energy-Efficiency Performance Standards.

5.2.1 Provide Code Training Sessions

Section 388.009 requires the Laboratory to develop and administer a state-wide training program for municipal building inspectors who seek to become code-certified inspectors. To accomplish this, the Laboratory developed the Energy Code Workshops which are based on the 2003 International Energy Conservation Code (IECC) as published by the International Code Council (ICC). Three workshops are offered, Residential Energy Code Training, Commercial Requirements of the International Energy Conservation Code and ASHRAE 90.1. Additional training sessions and presentations are provided to meet specific needs of building organizations, associations and local jurisdictions upon special requests.

The Residential Energy Code Training Workshop and Commercial Requirements of the International Energy Conservation Workshop both include an overview of Senate Bill 5 (SB 5) and extensive instruction on Chapters 1 through 3 and 9 and 10 of the IECC, which include the General requirements, definitions, and design conditions. The Residential Workshop also includes detailed instruction on Chapters 4, 5 and 6, which are the specific regulations relating to residential construction, in addition to a comparison of the IECC and the energy provisions of the International Residential Code (IRC). The Commercial Workshop includes detailed instruction on Chapters 7 and 8, which relate to commercial regulations and a summary of the relationship between ASHRAE 90.1 and the commercial provisions of the IECC.

The ASHRAE 90.1 Workshop includes a brief overview of SB 5 and a summary of the relationship between ASHRAE 90.1 and the Commercial provisions of the IECC. Detailed instruction on the requirements of Sections 5 through 9 and Appendixes of the ASHRAE are included.

Table 1: IECC / IRC Residential and ASHRAE 90.1 Commercial Building Code Workshops for Senate Bill 5 during the Period September 2004 to August 2005.

Location	Residential	Commercial	ASHRAE 90.1
San Marcos	August 17	August 18	
Dallas	September 7	September 8	
Austin		September 21	September 24
LaPorte	November 3	November 4	
McAllen	December 1	December 2	
San Antonio	December 14		December 17
Waco	February 11		
Katy	March 15		
Dallas	April 4	April 5	April 6
Missouri City	April 21	April 22	
San Antonio	May 7		
San Antonio	May 17	May 18	
Arlington	May 23	May 24	
Lubbock	June 7	June 8	
College Station	July 20	July 21	
Corpus Christi	July 23	July 24	

During the 77th Legislature, Senate Bill 5 (SB 5) adopted the 2000 International Residential Code (IRC) as the energy code for single-family residential construction and the 2000 edition of the International Energy Conservation Code (IECC), with the 2001 Supplement for all other residential, commercial and industrial construction in the state. It requires that municipalities establish procedures for administration and enforcement, and ensure that code-certified inspectors perform inspections.

These codes are published by the International Code Council (ICC), which publishes a new edition every three years and a supplement in the intervening years. The 2003 Codes have been reviewed and determined to be no less stringent than the editions currently adopted by SB 5. Transition to the 2003 IRC and IECC can be easily accomplished.

5.2.2 Provide Recommendations on Code Upgrades.

During the 77th Legislature Senate Bill 5 (SB 5) adopted the 2000 International Residential Code (IRC) as the energy code for single-family residential construction, and the 2000 edition of the International Energy Conservation Code (IECC), with the 2001 Supplement for all other residential, commercial and industrial construction in the state. It requires that municipalities establish procedures for administration and enforcement, and ensure that code-certified inspectors perform inspections.

These codes are published by the International Code Council (ICC), which publishes a new edition every three years and a supplement in the intervening years. The 2003 Codes have been reviewed and determined to be no less stringent that the editions currently adopted by SB 5. Transition to the 2003 IRC and IECC can be easily accomplished.

The 2004 IECC Supplement has been reviewed and several major changes are included. The provisions for single-family construction in both the IECC and IRC were completely rewritten and modified, including removal of the window-to-wall ratio for residential construction. Also, the number of Climate Zones in the United States has been reduced from 19 to 8. The full impact of these changes is being analyzed at this time and recommendations will soon be available. Transition to the 2004 will take more education and training for cities, inspectors and contractors across the US. The 2006 editions of the IRC and IECC should be published in March 2006 and a comparison of the 2006 to the 2000/2001 will begin soon thereafter.

5.2.3 Provided Analysis Concerning the Use of ASHRAE Standard 90.2 as Compliant to the 2000 IECC with the 2001 Supplement.

The Energy Systems Laboratory in the Texas A&M University System is mandated under Senate Bill 5 to review any proposed amendments to the International Energy Conservation Code as to whether they will increase or decrease the stringency.

In line with this charge, the Laboratory reviewed ASHRAE 90.2-2004 in comparison with IECC 2004 and the results are as follows:

ASHRAE is more stringent than IECC in the following areas:

1. Fenestration U-value
2. Ceiling with attic U-values in most cities in New York and Utah (Performance design)
3. External Shading
4. Domestic Hot Water

ASHRAE is less stringent than IECC in the following areas:

1. Geometry and orientation
2. Slab on grade in HDD>2500
3. Fenestration totals
4. Ceiling with attic U-values in HDD>2000 (prescriptive design)
5. Ceiling with attic U-values in most cities in Texas (Performance design)

Other areas of concern:

1. Wall - Removal of wall insulation requirement when adjacent to unconditioned spaces.
2. Window internal shading - ASHRAE uses the Shading Coefficient analysis while the IECC is Solar Heat Gain Coefficient.
3. Walls and roof absorptivity - ASHRAE has no provision to require homeowners to maintain high reflectance roofs for the life of the building.

We were unable to simulate the following due to unclear and/or conflicting requirements:

1. Ceilings (ASHRAE)
2. Walls (ASHRAE)
3. Thermal mass (ASHRAE and IECC)
4. Ducts (ASHRAE)

5.2.4 Summary of ASHRAE Standard 90.1 Standards Committee Activities during 2005, and Ongoing Subcommittee Actions.

This section reports on the activities of the ASHRAE 90.1 Standards Committee during 2005 as well as some of the ongoing 90.1 subcommittee actions that will become addenda items in the future. Information presented is from the 2005 ASHRAE meetings in Orlando (January) and in Denver (June.) Keeping track of this information is important to Texas and the TCEQ since not all changes to the ASHRAE Standard 90.1 have a positive impact on energy reduction. Hence, the Laboratory must analyze the proposed changes and be ready to provide a recommendation to the legislature about whether the code change is more or less stringent than ASHRAE Standard 90.1-1999, which is the code referenced by Senate Bill 5. Much of the Standard 90.1 subcommittees' recent work has centered on updates to the 2001 version of ASHRAE 90.1, resulting in the 2004 version (now published), plus issuing new addenda that will result in the 2007 version. The 90.1 Standards Subcommittee work is presented in the following order: ECB (Energy Cost Budget), Envelope, Lighting and Mechanical.

5.2.4.1 Summary Comment on the Status of the 90.1 Standard.

A major emphasis in the 90.1-2004 version has been on simplification. The 2004 version incorporates 32 addenda from the previous 2001 version and has been reformatted. Each chapter still addresses the same

topics as before, but the section numbers within the chapters have been revised to be consistent from chapter to chapter. Consequently, virtually all of the sub-section numbers have changed between the 2001 version and the 2004 version.

Of the addenda, only two were related to the building envelope requirements: (a) addendum "h" updated the reference standards and addendum "am" revised the climate groupings, changing them from 26 zones to 8 major climate zones. Some zones are further subdivided into moist, dry, and marine. This change simplifies the use of the Standard by reducing the number of building envelope tables with very similar requirements. Appendix B in the 2001 version had 26 pages of building envelope requirements corresponding to the 26 climate zones; now, these have been moved to Section 5 (Envelope), involving only 9 pages to cover the 8 climate zones. Countering the reductions are some substantive additions, specifically a new appendix (Appendix G), netting an additional 10 pages to the new 2004 version. Appendix "G" is a "Performance Rating Method" that parallels much of the Energy Cost Budget (ECB) method in Section 11. However, this new appendix is informative and does not contain requirements necessary for conformance and, rather than addressing cost, it rates the "efficiency" of building designs that exceed the requirements of the standard.

The 2004 version of ASHRAE 90.1 Standard has been determined by the USDOE to have an increased level of stringency that will net energy savings in the buildings to which it is applied. Of all changes from the 2001 version, the reduced lighting power densities account for around 75% of the overall energy savings.

5.2.4.2 Reported Work of the SSPC 90.1 Full Committee.

The substantive discussions relate to the 2007 version and beyond. Ideas being considered are:

- Simplification of the current ASHRAE 90.1 into a very succinct prescriptive book and placing all the trade-off methods (e.g., Energy Cost Budget Method) in a separate guideline. This change, if approved by the board, would occur in the next code revision cycle and can be part of the 90.1-2007 version. The ECB committee suggested that they are in favor of the simplification proposal only if the ECB and all other trade-off methods will be part of the standard.
- ASHRAE 90.1 committee position on the changes in IECC Chapter 8 proposed for the current code hearing. The full committee voted on its position on 22 proposed changes to the IECC 2003/2004 supplement for the 2005 code hearing. They strongly opposed 2 changes, supported/strongly supported 6 changes and remained neutral on the remaining proposed changes. The changes that the committee opposed were: a) change in the definition of the residential building from "3 floors or less" to "5 floors or less" as this would be in direct conflict with the definition in 90.1, and b) change in the efficiency requirements of all package equipment so they are in compliance with the National Energy Conservation Act.
- Hearings and voting on several Continuous Maintenance (CM) proposals for the ASHRAE 90.1 2004 were also held. The 90.1 committee voted on a number of addenda under CM proposals and some interpretation questions were put forward to the different subcommittees. Approved for public review were Addenda V, B, and AK. Addendum V addresses the ventilation controls in high occupancy areas (section 6.4.3.8) and suggests that demand control ventilation should be required in areas in excess of 500 sq. ft. and a design occupancy of 40 people per 1000 sq. ft. Addendum B corrects the capacities of Single Packaged Vertical Air conditioners and Single Packaged Vertical Heat pumps that were established as separate equipment in the the 2001 version. Addendum AK addresses the changes in the requirement of the testing of heat rejection equipment and adds a third party performance certification testing program. A proposal for adding places of worship, theatres and buildings that are not occupied overnight and for several days to the exception to the chilled and hot water reset was rejected on the basis of there being no justification that this exception would save energy or cost. A couple of proposals related to calculating window-to-wall ratios in below-grade walls and the deletion of cool roof insulation credit (exception to 5.3.1.1 ASHRAE 90.1 2001) were rejected on the basis that there were not sufficient data presented to validate the claim of energy savings.
- The full committee opened the topic of considering a Performance Standard approach by listening to a proposal by the ECB committee. This approach would replace the prescriptive method by limiting

each building type/climate zone combination to an annual energy use in terms of Btus/sq. ft. or kWh/sq. ft. The topic will be revisited at future ASHRAE meetings, with no timetable declared at this time.

- All the 90.1 subcommittees were asked to evaluate the stringency of the ASHRAE 90.1 Standard vs. the IECC, though most subcommittees have concluded that the two standards have evolved toward each other in stringency because of the frequent updates and communications among the code/standard bodies. This will likely get less emphasis in the future.

5.2.4.3 Reported Work of the ECB Subcommittee.

The ECB subcommittee efforts have been focused on an evaluation how some of the LEED requirements relate to or impact the ASHRAE Standard 90.1, specifically on limitations on minimum "process loads" in buildings. The ECB method uses baseline systems in the whole-building energy simulation modeling. The ECB committee is addressing the determination of new residential baseline systems for apartments and dorms, which heretofore were only packaged terminal a/c and heat pump units. This effort is still ongoing. The committee also wishes to simplify the formula for calculating the fan power in the new Appendix G of the Standard. Some of the notable deliberations were:

- Review comments on LEED NC-2.2. The subcommittee also reviewed the LEED NC-2.2. It was decided in order to get LEED certification as well as an approved design permit, the proposed design should comply with both: a) the mandatory requirements of the ASHRAE 90.1-2004 (without amendments), and b) the prescriptive requirements or performance requirements of ASHRAE 90.1-2004 (without amendments) or the local code whichever is more stringent. For EA credit No. 1 (Optimizing energy performance, page 40, LEED NC 2.2), the main concern is that, for the base case, the minimum process load is 25%. So for a building with very high process loads, it will be very difficult to achieve LEED certification or a green building status. The other question that came up was what are references behind the 25% minimum limit? It was also suggested that for buildings with high process loads, a separate path should be provided for earning credits.
- Baseline fan power for PTAC and PTHP for Appendix G. Previously, only PTACs and PTHPs were being considered as baseline systems. The subcommittee voted on simplifying the formula used to calculate the baseline fan power (section G3.1.2.9, page 177, ASHRAE 90.1-2004) should be simplified. One suggestion was that instead of using a formula to come up with the fan power, the requirement should be in tabulated form for different system sizes. The other suggestion was to use the formula for large systems and use tabulated values for small units.
- Simplification of ASHRAE 90.1. On the issue of simplifying ASHRAE 90.1, the ECB subcommittee commented that they are in favor of simplifying and suggested to divide the code into two portions: a) Code of small commercial buildings with simple systems; and b) Code for large commercial buildings with complex systems. The subcommittee is in favor of simplicity but will advocate the continuing inclusion of ECB and other trade-off methods in the main code.

5.2.4.4 Reported Work of the Envelope Subcommittee.

As noted earlier, the building envelope criteria from the 26 previous building envelope tables have now been condensed into 8 building envelope tables on 9 pages in Section 5. Mostly, the building envelope requirements are the same to those in *Standard 90.1-2001*. Occasionally, there are a few cases of increased stringency and reduced stringency due to this regrouping.

The Envelope subcommittee keeps in close touch with changes that are simultaneously occurring with the IECC International Energy Conservation Code portions. The IECC 2004 Supplement includes approximately two dozen code changes from the IECC-2003 version. Among these, Chapters 3 (design conditions) and 9 (climate) were deleted, and replaced with a new Chapter 3 containing new 8-zone climate groupings. The requirements for low-rise residential buildings in Chapters 4, 5, and 6 were substantially rewritten and condensed into one chapter. The requirements for other residential buildings and nonresidential buildings were in Chapters 7 and 8. Chapter 7 was deleted and the references to *ASHRAE/IESNA Standard 90.1* were incorporated into Chapter 8. The requirements in Chapter 8 were not

rewritten, but there were 14 code changes approved for Chapter 8. Of the code changes, only one was related to the building envelope requirements. It condensed the building envelope criteria into two tables (one for opaque components and one for fenestration), each of which contain 8 climate zone groupings.

The Envelope subcommittee has organized into task groups (T.G.) to confront a variety of specialty areas. Some of their work and/or issues are reported below:

- Continuous Air Barrier T.G. – The issue of continuous air barriers and methods for establishing reference energy costs in different parts of the country continues to be an important issue in the Envelope committee. This has been debated heavily in a large volume of e-mail communications during most of 2005. The committee has derived much of its data from Tyvek.
- International Climate Data T.G. – This work has concentrated on acquiring climate data for Taiwan and China.
- Opaque Envelope T.G. – This T.G. is working on a new calculation engine for Trade-Off compliance, but still needs more input from the Subcommittee during the next ASHRAE meetings in 2006.
- Fenestration Cost and Rating T.G. – Issues relate to limitation on west-facing fenestration in prescriptive compliance option. The committee questioned what alternate methods could be used in lieu of the prescriptive methods to determine the permissible limits of glazing. It was claimed that the use of fenestration is constrained by the site situations but that the alternate approach to a prescriptive limit to fenestration on the west face would be to use ENVSTD. It was noted that a designer can use either the prescriptive or the performance paths; the choice of prescriptive means less options but lower cost to achieve compliance. The feeling was expressed that site and orientation are very important parameters and that future versions of the Standard need to recognize this. It was pointed out that ENVSTD is no longer available on the ASHRAE website. It was felt that COMCHECK could be used as an alternate and that ENVSTD might be found on other websites. The T.G. is also working on a proposal to allow shading credit for partially opaque overhangs in the prescriptive compliance option. A procedure is being developed to use solar transmission fraction instead of SHGC, possibly obtaining the transmission data derived from NFRC 300 ratings. The proposal is still being developed.
- Cool Roof Credit Format T.G. – This T.G. is revising the text for Sections 5 and 12, as well as a revised table.

5.2.4.5 Reported Work of the Lighting Subcommittee.

The Lighting UPD (uniform power density) requirements in the 90.1 Standard have been continually lowered (made more stringent) over the past several years in response to the increased efficiency of newer lighting technologies and sharpening of realization of actual lighting levels required for specific tasks. The ASHRAE 90.1 Standard has lowered its average UPD requirement by approximately 0.44 watts per square foot between the 2001 version and the 2004 version. This yields savings not only in annual energy costs but also in the installed fixture costs. The new UPD values bring 90.1-2004 into almost perfect parity with the new 2004 Supplement to the IECC 2003. Very little e-mail communication within the Lighting Subcommittee has ensued during 2005, but a very pertinent document was produced by PNNL (Pacific Northwest National Laboratory) to DOE, addressing "Texas State Code Adoption Analysis: Lighting Requirement." This report uses the current mix of buildings within the State and a projected growth rate of new and renovated buildings to estimate the energy savings for the State over the next 25 years. The Energy Systems Laboratory has expanded the projected variables to show the net benefit to the State in terms of cost savings and emission reductions. This analysis reveals an annual cost savings of $115 million in 2006, increasing to $1,227 million by 2030. Thus, the accumulated savings over the 25-year period are shown to be $16,757 million. The table follows.

Table 2: PNNL Analysis of Texas State Code Adoption Analysis: Lighting Requirement (USDOE 2005).

Statewide annual energy and cost impacts from 90.1-2004 lighting amendments								
Year	New floor area (Mil SF)	Cum floor area (Mil SF)	Annual Electricity Savings (Mil kWh)	Cum Electricity Savings (Mil kWh)	Extra annual gas (Giga Btu)	Extra cum gas (Giga Btu)	Annual Savings (Mil 2004$)	NOX Emissions reductions

2006	214	214	396	396	40	40	115	
2007	218	432	799	1195	90	130	235	
2008	222	654	1209	2404	140	270	269	
2009	226	880	1626	4030	191	461	304	
2010	230	1110	2050	6080	242	703	339	
2015	251	2322	4279	22942	500	2684	528	
2020	275	3648	6704	51532	766	5980	738	
2025	300	5098	9342	92877	1038	10623	969	
2030	328	6683	12213	148102	1316	16644	1227	
Totals	6683		148102		16644		16757	

5.2.4.6 Reported Work of the Mechanical Subcommittee.

The Mechanical Subcommittee has mainly focused on a variety of requests for interpretations of the 90.1 Standard and continuous maintenance proposals. A good deal of time was spent at the 2005 ASHRAE meetings debating a proposal to change fan power limitations. This topic is still under debate. The Mechanical Subcommittee also examined 17 proposed code changes to the IECC 2003. These involved economizer requirements, shutoff dampers, duct and pipe insulation, VAV fan controls, water heating equipment and temperature controls. Though not having legislative authority over the IECC code, the 90.1 Mechanical Subcommittee voted to: strongly support two of the IECC changes, support six, oppose three, and strongly oppose four of them.

The mechanical tasks are divided within the subcommittee by working groups (W.G.). These are: the Fan Power Limitation W.G., the Energy Recovery W.G., and the Reformatting W.G. The Fan Power W.G. is considering giving credit for increased motor efficiency, using kW/HP as the metric. It was noted that this would also be a method to satisfy some of the LEED rating points, and thus would also have to be incorporated into Appendix G. Discussion on this proposal will continue in Chicago (2006.) The committee continues to work on continuous maintenance proposals relating to condenser heat recovery, gas boiler efficiencies, interaction with other ASHRAE Standards such as 55 (Comfort) and 62 (Ventilation), exhaust air energy recovery, and centrifugal water-cooled chiller efficiencies.

5.2.5 Laboratory's Senate Bill 5 Web Site "eslsb5.tamu.edu".

Since the Fall of 2001, the Laboratory has maintained a Senate Bill 5 webpage (http://eslsb5.tamu.edu), where information is provided to builders, code officials, the design community and homeowners about Senate Bill 5, including (Figure 3):

- A 'What's New' Section includes:
  - Information from the Stakeholder's meetings
  - The Laboratory's letters regarding tradeoffs
  - DOE's response to the Laboratory's request for SEER 13 info
  - ESL Code Training Schedules
  - Information From the Laboratory's 2004 & 2005 Air Emissions Conferences
  - TCEQ's Guide for Emissions Calculations
- Other material organized under links include:
  - About: General information about the ESL Mission, and SB 5 responsibilities
  - Reports: Reports, papers and other documents concerning the Laboratory's SB 5 work
  - Testimonials: Presentations to the Legislature, etc
  - Role: Information about the Laboratory's role in SB 5
  - Weather: Weather data compiled as part of the Laboratory's emissions calculations
  - Links: Related links to other useful sites
  - eCalc v1.1: The Laboratory's Emissions Calculator
  - Emissions Calculator: New "quick" version of the Emissions Calculator (New for 2006)

Figure 4 through Figure 14 show the associated web pages for the Laboratory's Senate Bill 5 web page.

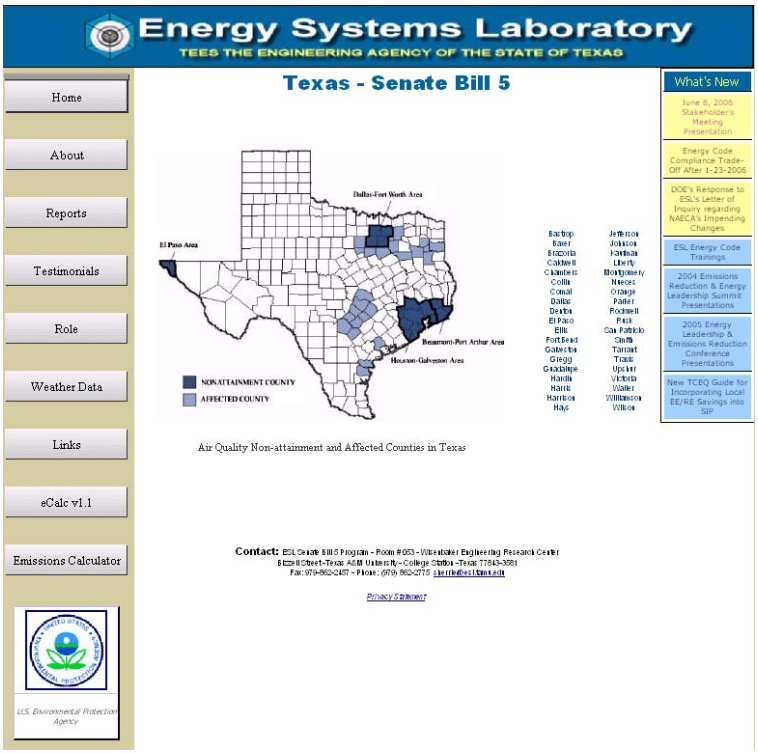


Figure 3: Laboratory's Senate Bill 5 Web Page "eslsb5.tamu.edu".

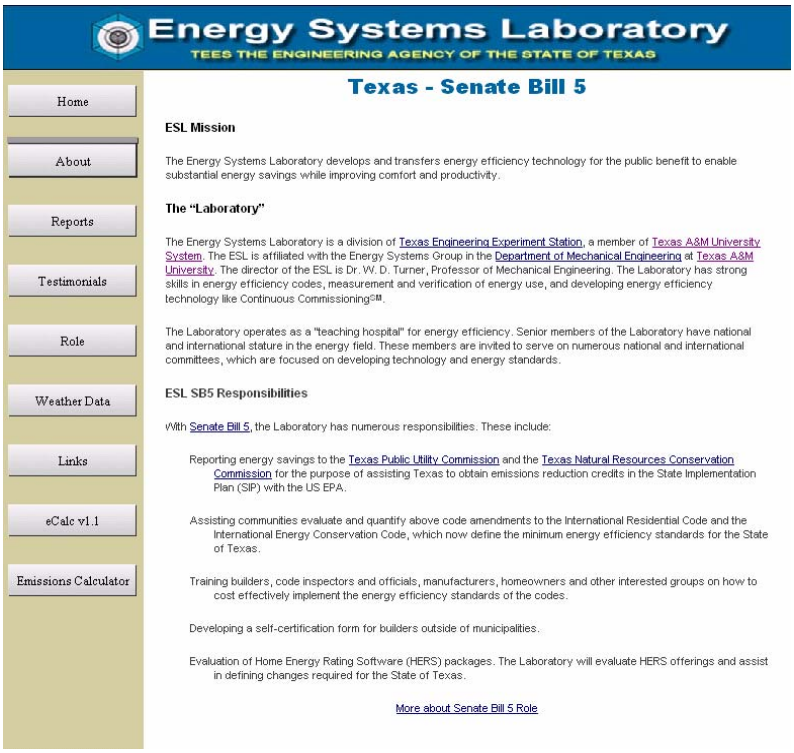


Figure 4: Web Page Containing Information about the Laboratory's SB 5 Responsibilities.

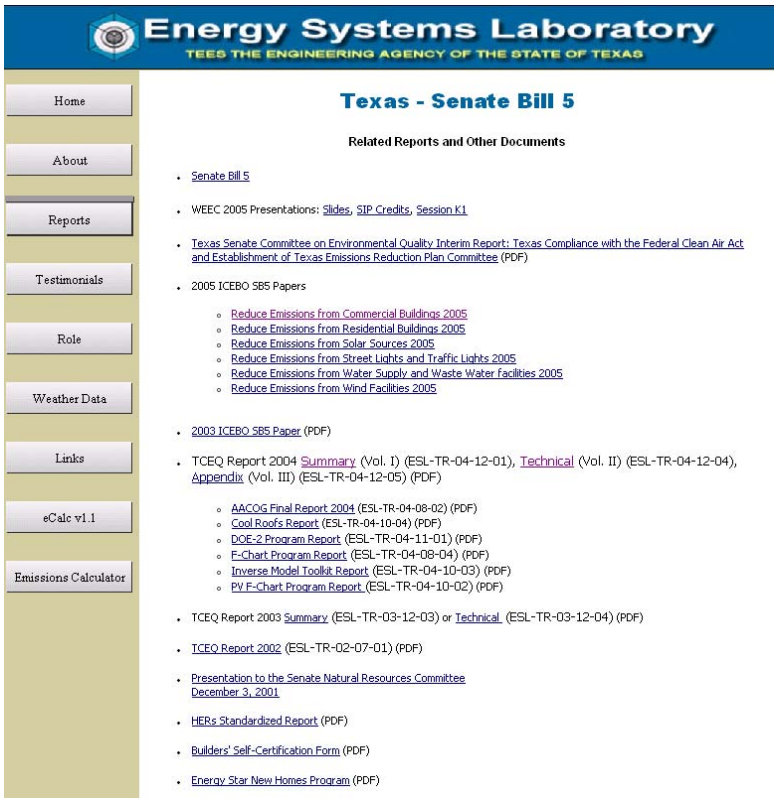


Figure 5: Web Page Containing Related Reports and Other Documents for the SB 5 Program.

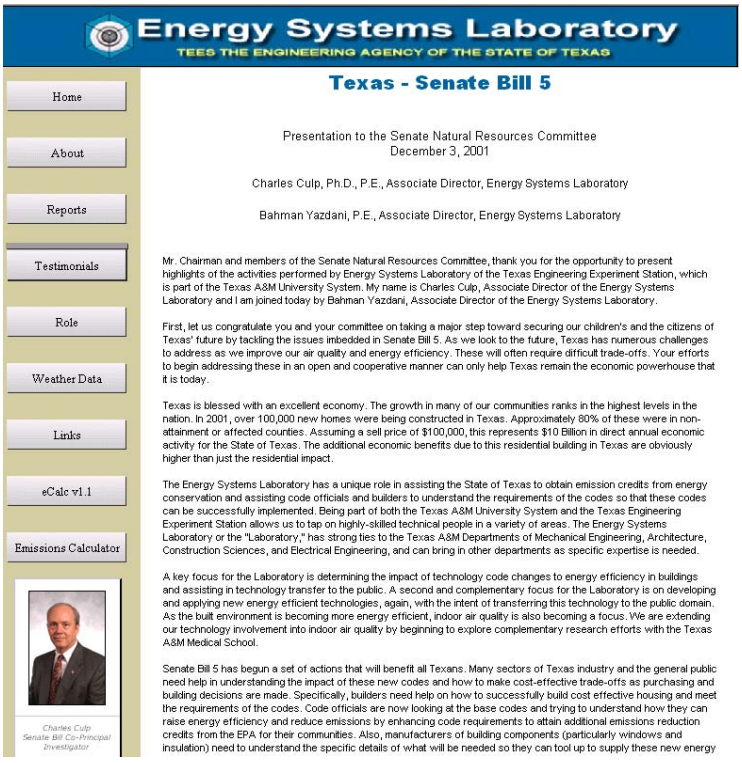


Figure 6: Web Page Containing Testimonials and Presentations to the Legislature.

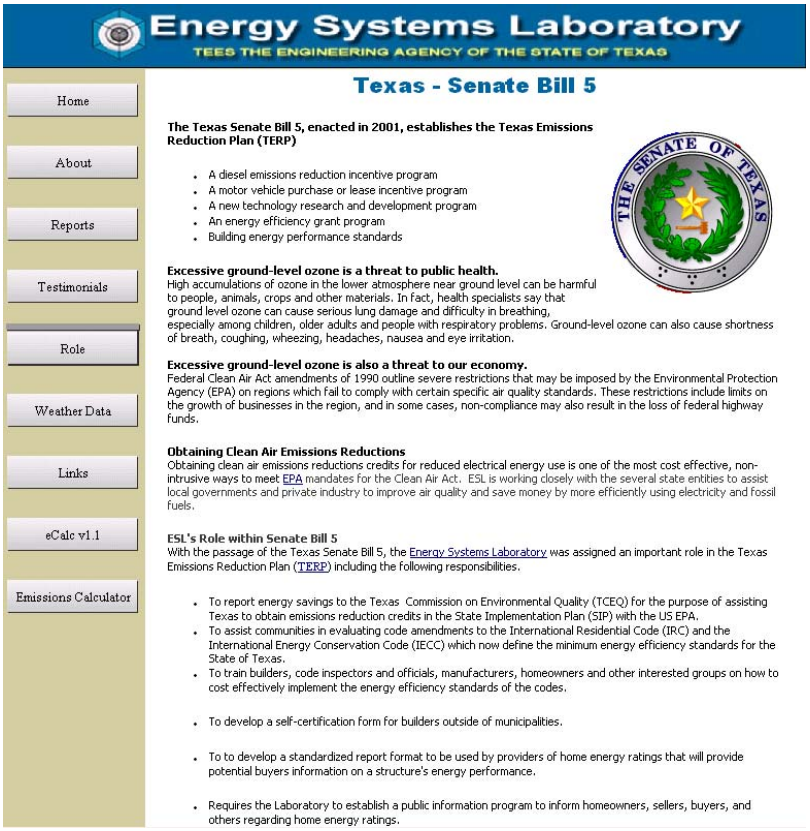


Figure 7: Web Page Containing the Laboratory's Role in Senate Bill 5.

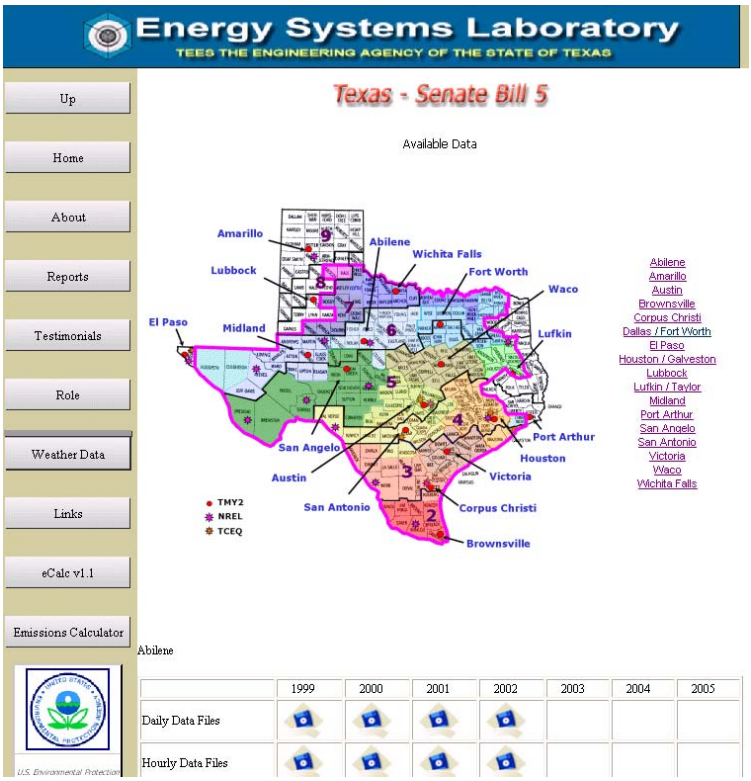


Figure 8: Web Page Containing Available Weather Data Compiled as Part of the Emissions Calculations.

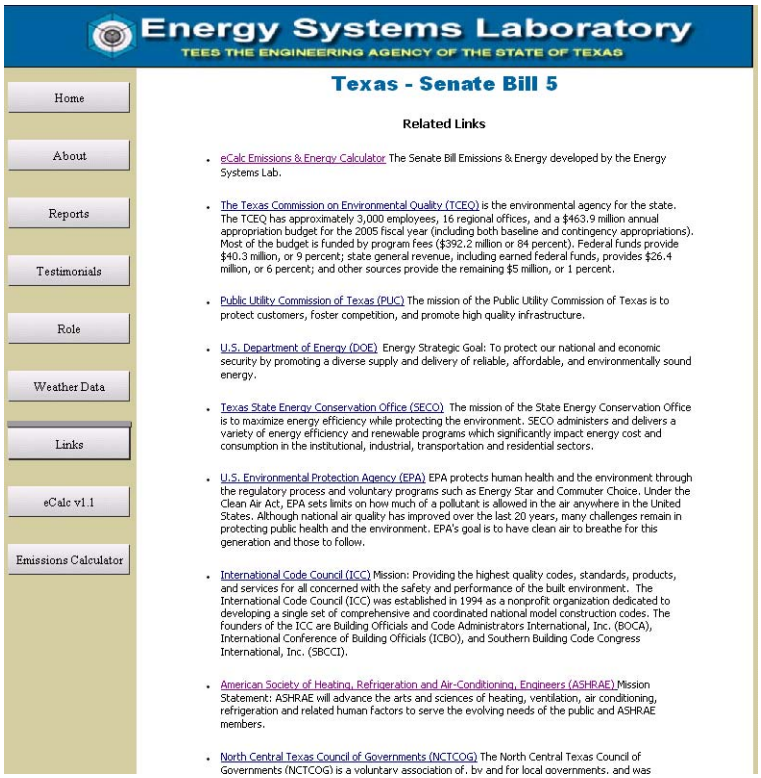


Figure 9: Web Page Containing Related Links for Other Useful Sites.

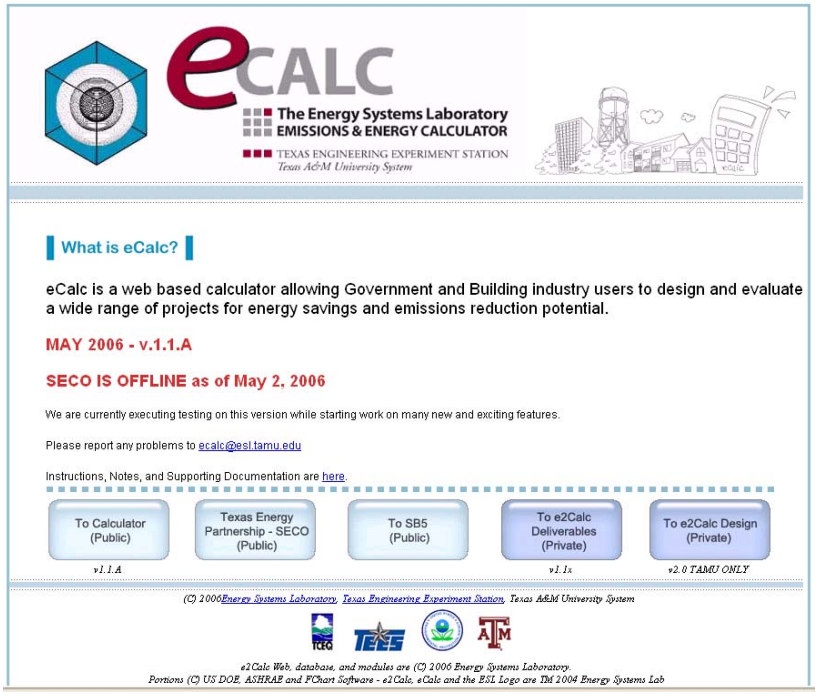


Figure 10: Web Page for the Laboratory's Emissions Calculator.

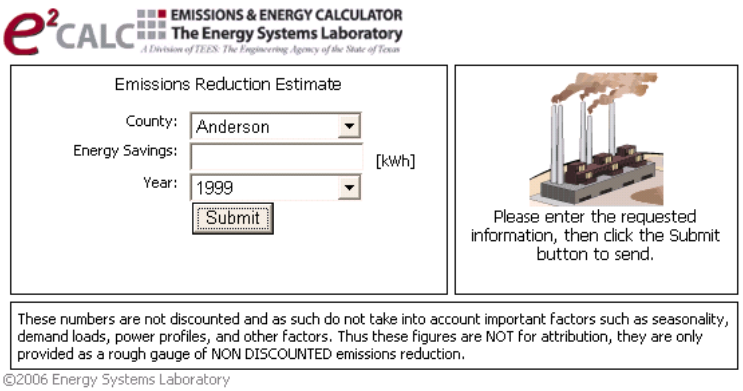


Figure 11: Web Page Containing New Quick Emissions Calculator (New 2006).

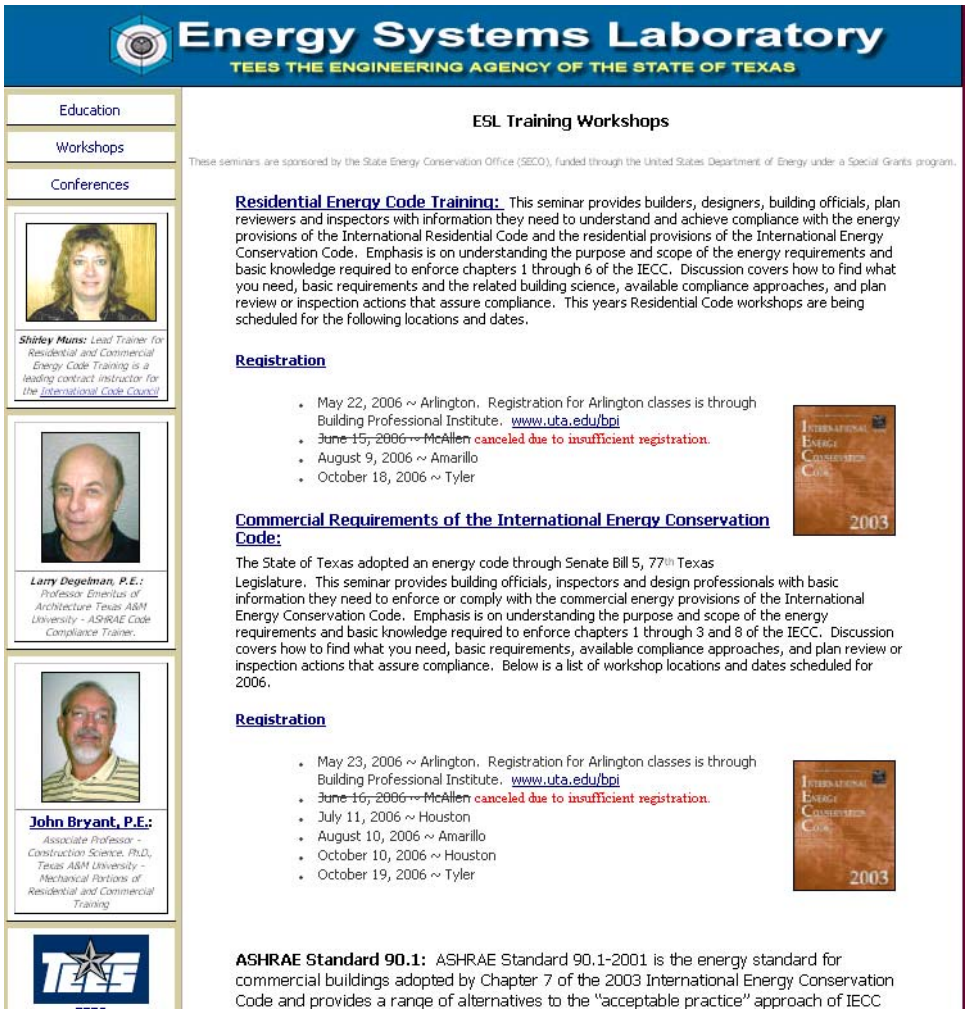


Figure 12: Web Page Containing Information about Code Trainings.

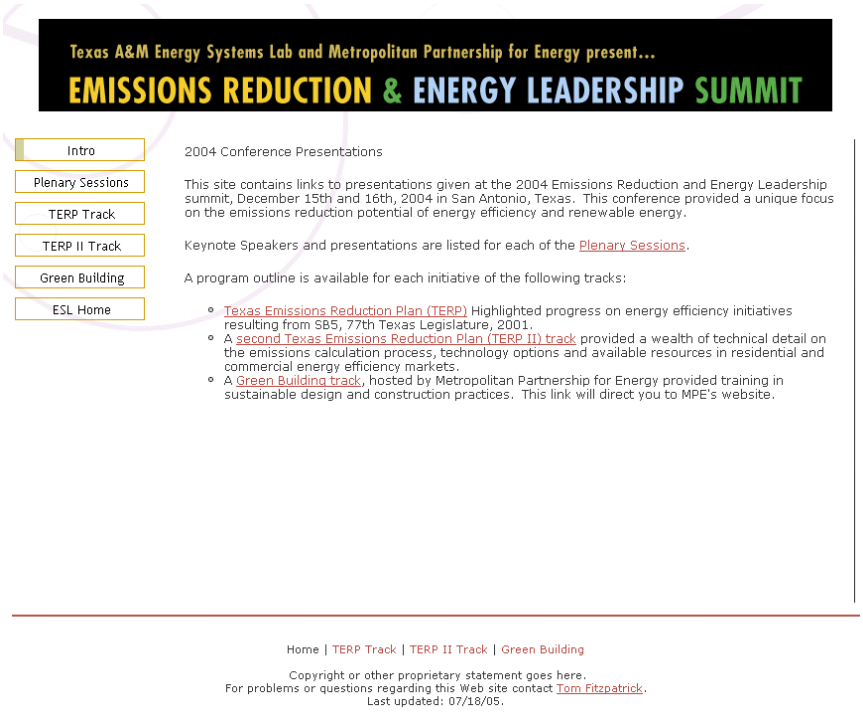


Figure 13: Web Page Containing Archival Material from the 2004 Emissions Reduction and Energy Leadership Summit, December 15-16, 2004, San Antonio, Texas.

Figure 14: Web Page Containing Archival Material from the 2005 Emissions Reduction and Energy Leadership Summit, November 7-10, 2005, Dallas, Texas.

5.2.6 Provide Technical Assistance to the TCEQ.

The Laboratory receives approximately 10 to 20 calls per week from code officials, builders, home owners and municipal officials regarding the building code and emissions calculations. A complete file of these transactions is maintained at the Laboratory. Specific Technical Assistance responses are contained in the related sections of this report.

5.2.7 Proposed Procedure for Allocating Emissions Reductions from Wind Energy, March 2005.

1) Estimating 1999 and 2007 NOx emissions credits from a future green power purchase from a specific wind energy provider for a specified annual REC purchase within the ERCOT region.

This procedure would develop a monthly average performance profile for a wind energy provider within the ERCOT region, which would allow for the future performance of the wind energy provider to be predicted. The data needed for this step would be 12 months of actual electricity production data from the wind turbine, or wind farm, and the coincident hourly wind data from the nearby NOAA weather station. The monthly total electricity production would then be regressed against the average monthly wind speed for the same period. An example of the analysis is provided in Figure 15 where the monthly total electricity produced by an actual wind turbine has been plotted against the measured average daily wind speed (NOAA) for the same period.

In Table 3 the coefficients from the three-parameter regression, which has been used to characterize the power output from this wind turbine are shown. These coefficients would then be used to predict the monthly performance of the wind turbine for a specific year, or for an average year as shown in Figure 16, which shows the predicted monthly electricity production for the windmill for the years 1999 through 2002.

This procedure proposes to use average monthly electricity production to estimate the annual REC purchase from this wind turbine. This estimated annual REC purchase would then be proportioned into monthly totals according to the predicted average electricity production shown in Figure 16. Peak day NOx emissions reductions would then be estimated using eGRID for the appropriate PCA for the Ozone Season Day (OSD) in the 1999 base year and for the OEP in 2007 using the coefficients from the regression model, which would be driven by the actual wind data for 1999 for the county in which the windmill is located.

2) Verifying actual electricity purchased from a specific wind energy provider for a specified annual REC purchase within the ERCOT region, including the calculation of 1999 and 2007 NOx emissions

This procedure would use the actual annual electricity produced by the wind turbine or wind farm to verify the REC purchase. The data needed for this step would be 12 months of actual electricity production data from the wind turbine, or wind farm, and the coincident hourly wind data from the nearby NOAA weather station. The monthly total electricity production would then be regressed against the average monthly wind speed for the same period, in a similar fashion as was previously shown in Figure 15. Peak OSD NOx emissions reductions would then be calculated for the actual electricity purchase using eGRID for the appropriate PCA for the Ozone Season Day (OSD) in the 1999 base year and for the OSD in 2007 using the coefficients from the regression model of the *actual electricity produced*, which would be driven by the actual wind data for 1999 for the county in which the windmill is located.

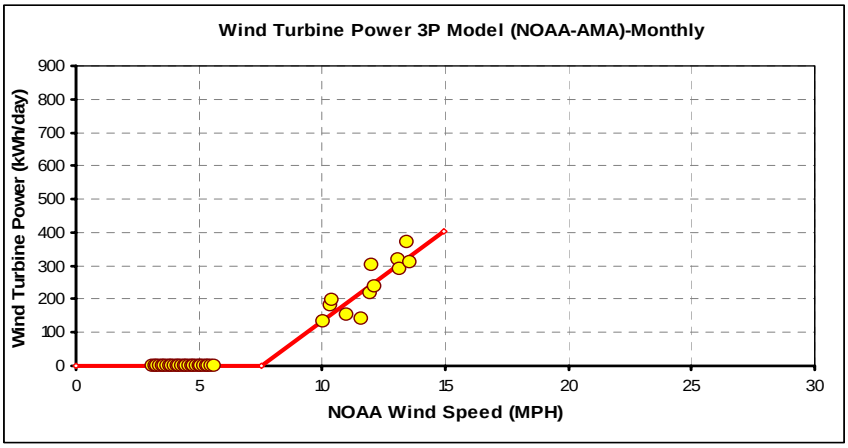


Figure 15: Monthly Daily Turbine Power vs. NOAA Wind Speed.

Table 3: Coefficients of 3PC Model for Monthly Daily Turbine Power.

3PC-NOAA-AMA	
Ycp	0.0150
Right Slope	54.1917
Change Point	7.5007
R2	0.9676
AdjR2	0.9667
RMSE	21.8854
CV-RMSE	0.2911608

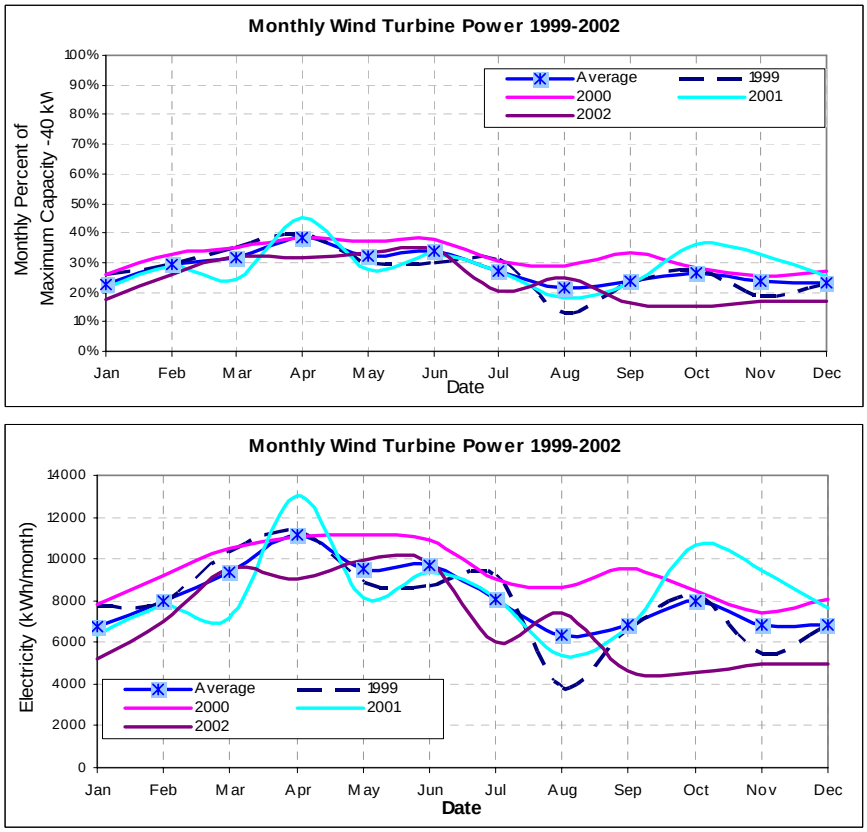
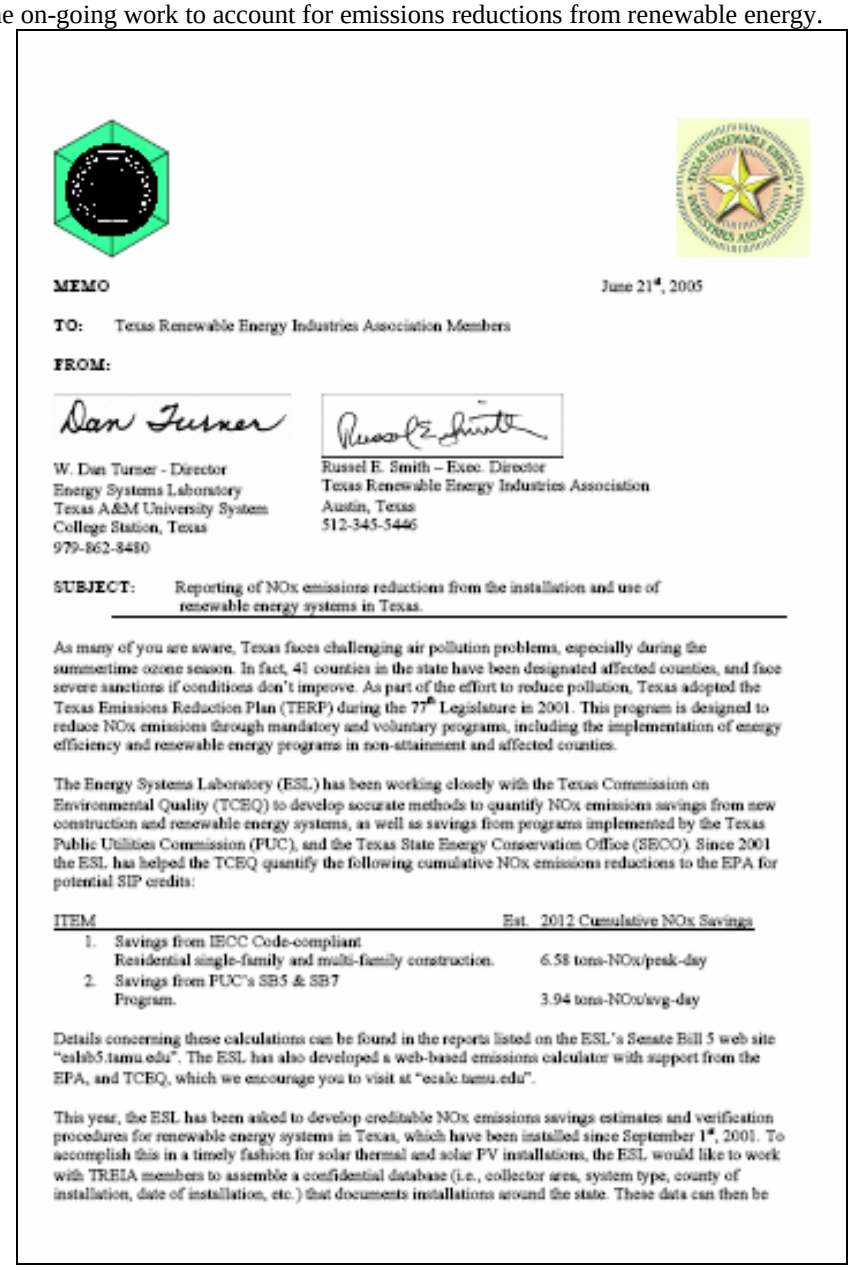


Figure 16: Electricity Produced by the Wind Turbine for 1999-2002.

5.2.8 Developed Survey for Texas Renewable Energy Industries Association Members.

In June of 2005, the Laboratory, together with the Texas Renewable Energy Industries Association (TREIA), developed a survey letter that was mailed to all members of TREIA. Figure 17 shows the letter that was sent to the TREIA members asking for their help in assembling a database of solar thermal and solar PV installations in Texas since September 2001. The results from this survey initated the database to be used for the on-going work to account for emissions reductions from renewable energy.



MEMO June 21st, 2005

TO: Texas Renewable Energy Industries Association Members

FROM:

Dan Turner

W. Dan Turner - Director
Energy Systems Laboratory
Texas A&M University System
College Station, Texas
979-862-8480

Russel E. Smith – Exec. Director
Texas Renewable Energy Industries Association
Austin, Texas
512-345-5446

SUBJECT: Reporting of NOx emissions reductions from the installation and use of renewable energy systems in Texas.

As many of you are aware, Texas faces challenging air pollution problems, especially during the summertime ozone season. In fact, 41 counties in the state have been designated affected counties, and face severe sanctions if conditions don't improve. As part of the effort to reduce pollution, Texas adopted the Texas Emissions Reduction Plan (TERP) during the 77th Legislature in 2001. This program is designed to reduce NOx emissions through mandatory and voluntary programs, including the implementation of energy efficiency and renewable energy programs in non-attainment and affected counties.

The Energy Systems Laboratory (ESL) has been working closely with the Texas Commission on Environmental Quality (TCEQ) to develop accurate methods to quantify NOx emissions savings from new construction and renewable energy systems, as well as savings from programs implemented by the Texas Public Utilities Commission (PUC), and the Texas State Energy Conservation Office (SECO). Since 2001 the ESL has helped the TCEQ quantify the following cumulative NOx emissions reductions to the EPA for potential SIP credits:

ITEM	Est. 2012 Cumulative NOx Savings
1. Savings from IECC Code-compliant Residential single-family and multi-family construction.	6.58 tons-NOx/peak-day
2. Savings from PUC's SB5 & SB7 Program.	3.94 tons-NOx/avg-day

Details concerning these calculations can be found in the reports listed on the ESL's Senate Bill 5 web site "eslsb5.tamu.edu". The ESL has also developed a web-based emissions calculator with support from the EPA, and TCEQ, which we encourage you to visit at "ecalc.tamu.edu".

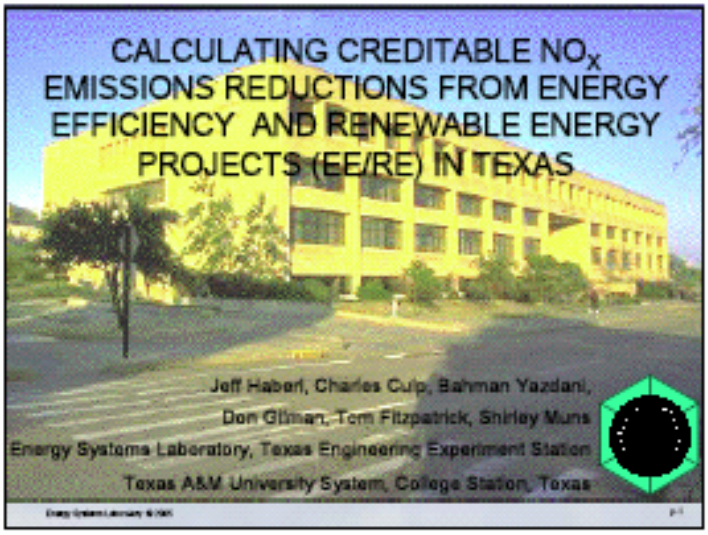
This year, the ESL has been asked to develop creditable NOx emissions savings estimates and verification procedures for renewable energy systems in Texas, which have been installed since September 1st, 2001. To accomplish this in a timely fashion for solar thermal and solar PV installations, the ESL would like to work with TREIA members to assemble a confidential database (i.e., collector area, system type, county of installation, date of installation, etc.) that documents installations around the state. These data can then be

Figure 17: Survey Letter Sent to Texas Renewable Energy Industries Association Members.

5.2.9 Presentation at the USEPA Air Innovations Conference, Chicago, IL, August 24-25, 2005.

In August 2005, the Laboratory was invited by the USEPA to give a presentation on the Emissions Reductions calculations that have been developed for the TCEQ as part of one of their Best Practice sessions at the conference. Figure 18 through Figure 21 are images of the presentation given at the

conference. After the presentation there was a question and answer session where several states expressed interest in using the procedures developed in Texas for their state.



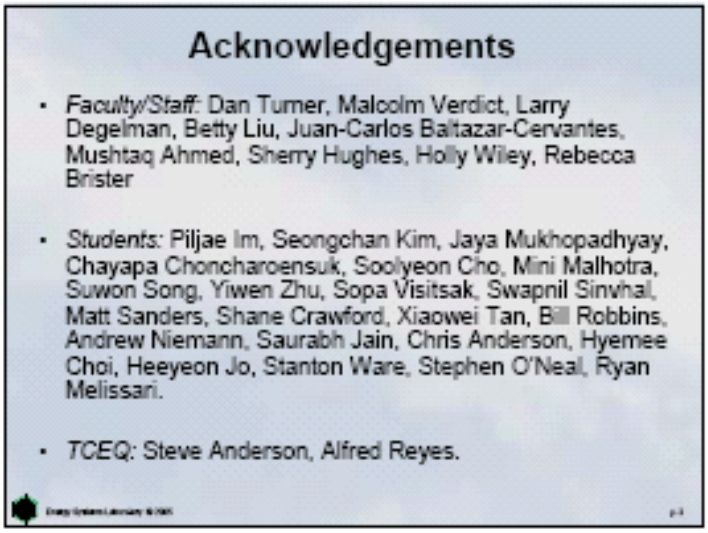
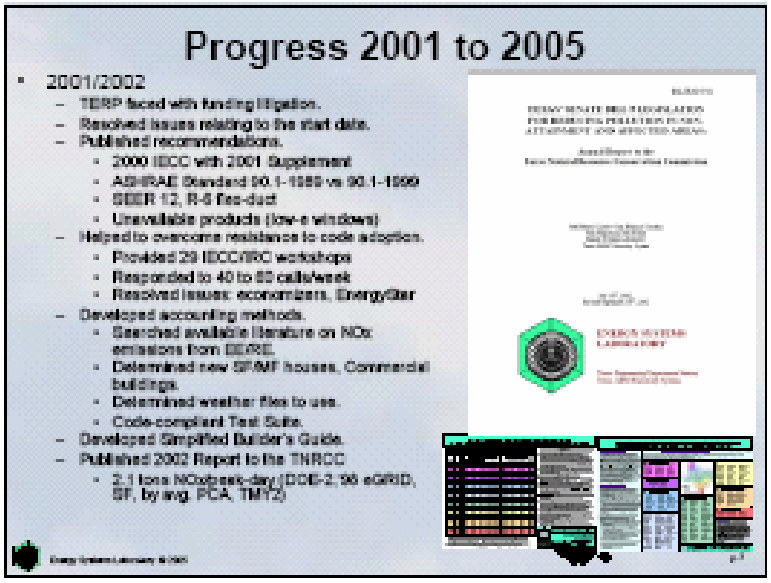


Figure 18: Slides Presented at the USEPA Air Innovations Conference (August 24-25, 2005).



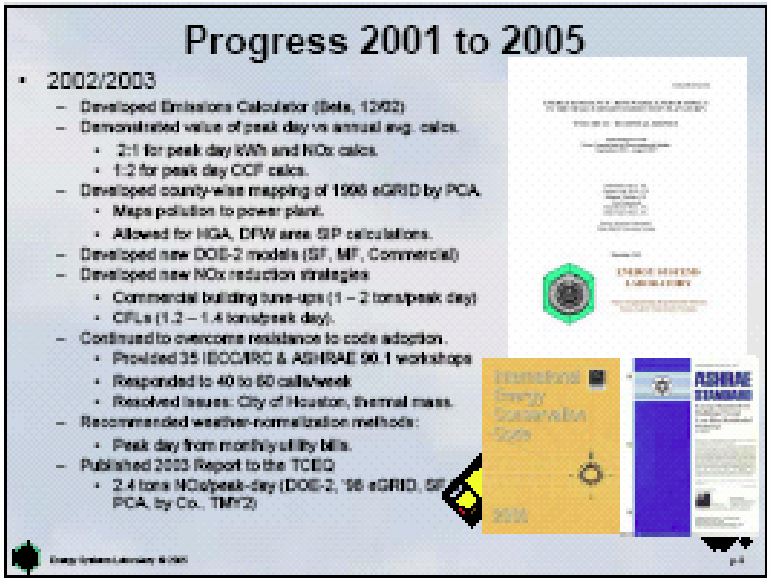
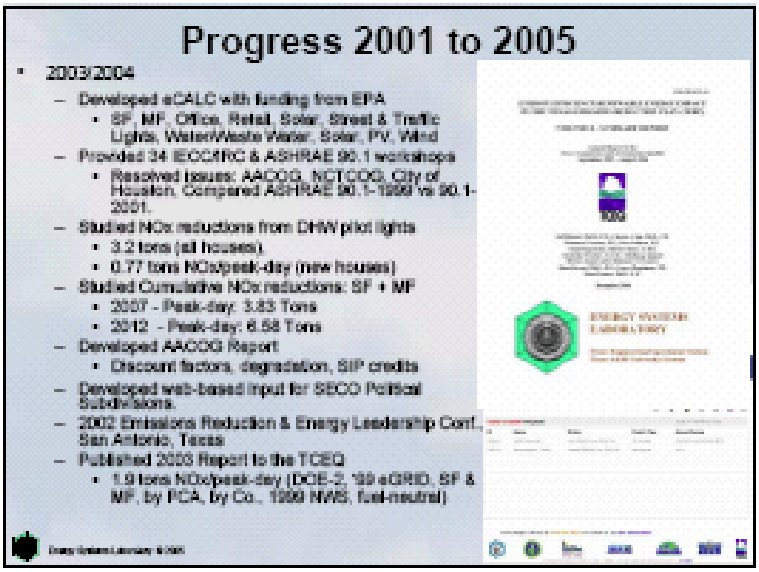


Figure 19: Slides Presented at the USEPA Air Innovations Conference (August 24-25, 2005).



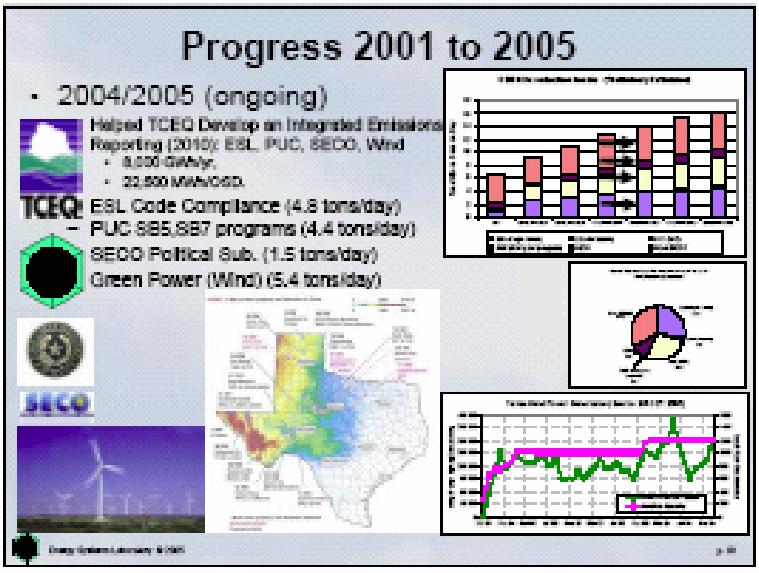
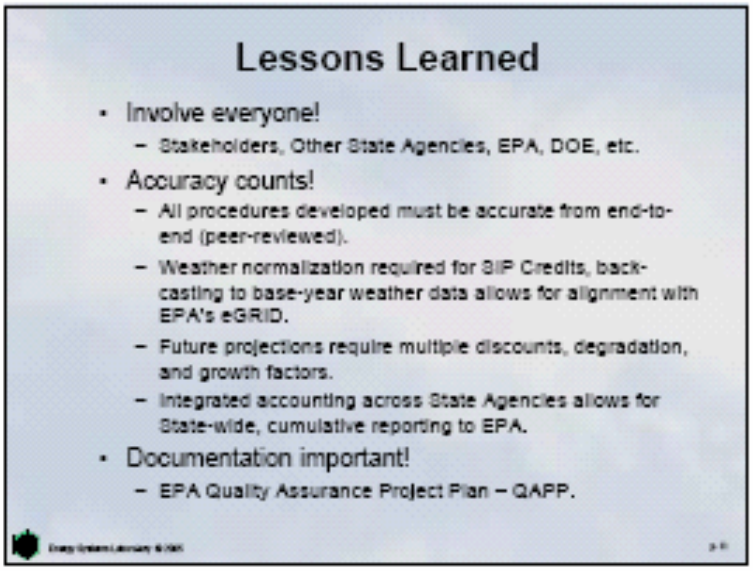


Figure 20: Slides Presented at the USEPA Air Innovations Conference (August 24-25, 2005).



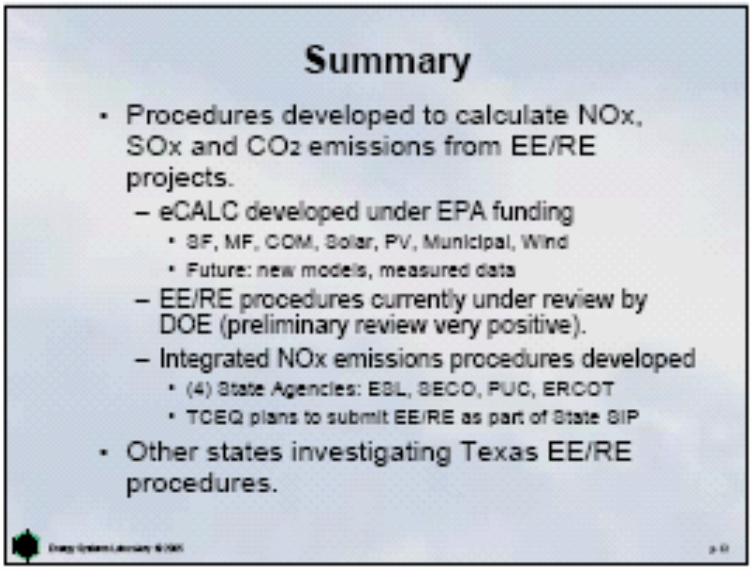
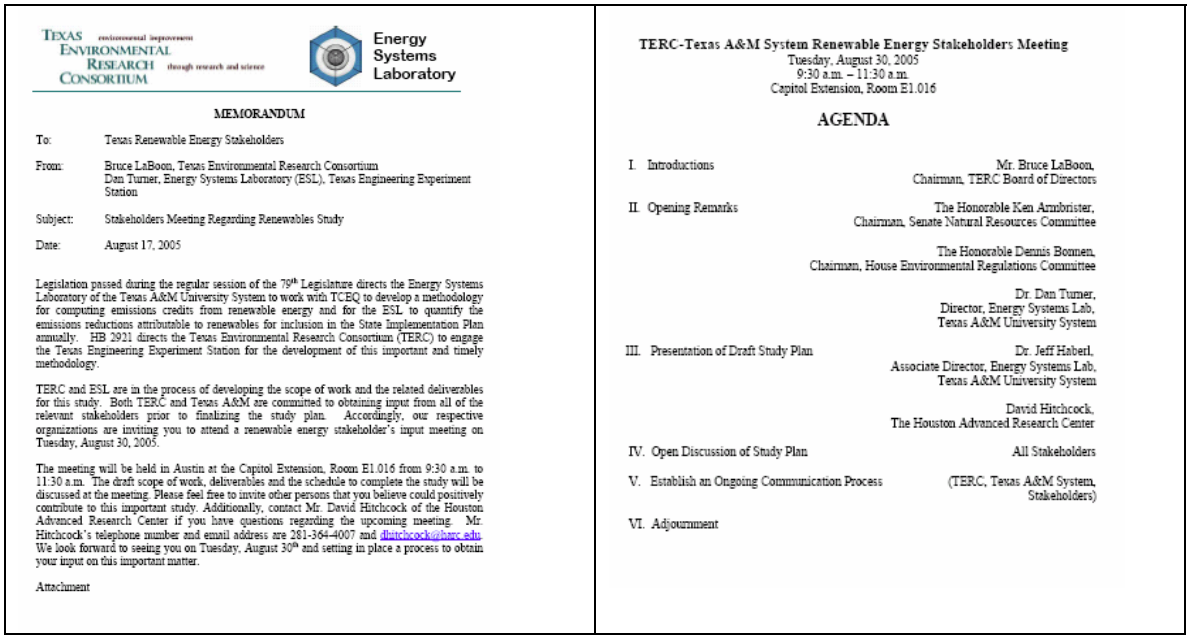


Figure 21: Slides Presented at the USEPA Air Innovations Conference (August 24-25, 2005).

5.2.10 Held Wind/Renewables Stakeholder's Meeting.

Legislation passed during the regular session of the 79th Legislature directed the Energy Systems Laboratory to work with the TCEQ to develop a methodology for computing emissions reductions attributable to renewable energy and for the Laboratory to quantify the emissions reductions attributable to renewables for inclusion in the State Implementation Plan (SIP) annually. HB 2921 directed the Texas Environmental Research Consortium (TERC) to engage the Texas Engineering Experiment Station for the development of this methodology.

To initiate this effort, the TERC and Texas A&M held a Stakeholder's meeting at the Texas State Capitol on Tuesday, August 30, 2005. At this meeting the draft scope of work, schedule and deliverables were discussed. Figure 22 shows the invitation letter that was sent to Stakeholders, and Figure 23 and Figure 24 contain the slides that were used at the meeting. Table 4 contains a list of the attendees.



Texas Environmental Research Consortium — environmental improvement through research and science

Energy Systems Laboratory

MEMORANDUM

To: Texas Renewable Energy Stakeholders

From: Bruce LaBoon, Texas Environmental Research Consortium
Dan Turner, Energy Systems Laboratory (ESL), Texas Engineering Experiment Station

Subject: Stakeholders Meeting Regarding Renewables Study

Date: August 17, 2005

Legislation passed during the regular session of the 79th Legislature directs the Energy Systems Laboratory of the Texas A&M University System to work with TCEQ to develop a methodology for computing emissions credits from renewable energy and for the ESL to quantify the emissions reductions attributable to renewables for inclusion in the State Implementation Plan annually. HB 2921 directs the Texas Environmental Research Consortium (TERC) to engage the Texas Engineering Experiment Station for the development of this important and timely methodology.

TERC and ESL are in the process of developing the scope of work and the related deliverables for this study. Both TERC and Texas A&M are committed to obtaining input from all of the relevant stakeholders prior to finalizing the study plan. Accordingly, our respective organizations are inviting you to attend a renewable energy stakeholder's input meeting on Tuesday, August 30, 2005.

The meeting will be held in Austin at the Capitol Extension, Room E1.016 from 9:30 a.m. to 11:30 a.m. The draft scope of work, deliverables and the schedule to complete the study will be discussed at the meeting. Please feel free to invite other persons that you believe could positively contribute to this important study. Additionally, contact Mr. David Hitchcock of the Houston Advanced Research Center if you have questions regarding the upcoming meeting. Mr. Hitchcock's telephone number and email address are 281-364-4007 and dhitchcock@harc.edu. We look forward to seeing you on Tuesday, August 30th and setting in place a process to obtain your input on this important matter.

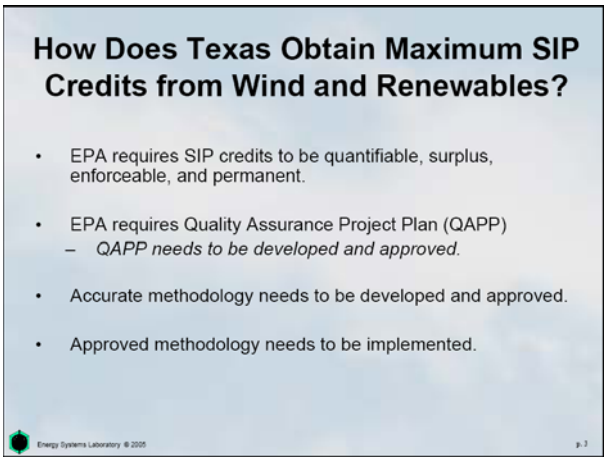
Attachment

TERC-Texas A&M System Renewable Energy Stakeholders Meeting
Tuesday, August 30, 2005
9:30 a.m. – 11:30 a.m.
Capitol Extension, Room E1.016

AGENDA

I.	Introductions	Mr. Bruce LaBoon, Chairman, TERC Board of Directors
II.	Opening Remarks	The Honorable Ken Armbrister, Chairman, Senate Natural Resources Committee
		The Honorable Dennis Bonnen, Chairman, House Environmental Regulations Committee
		Dr. Dan Turner, Director, Energy Systems Lab, Texas A&M University System
III.	Presentation of Draft Study Plan	Dr. Jeff Haberl, Associate Director, Energy Systems Lab, Texas A&M University System
		David Hitchcock, The Houston Advanced Research Center
IV.	Open Discussion of Study Plan	All Stakeholders
V.	Establish an Ongoing Communication Process	(TERC, Texas A&M System, Stakeholders)
VI.	Adjournment	

Figure 22: Letter of Invitation to the Wind/Renewables Stakeholder's Meeting, August 30, 2005.



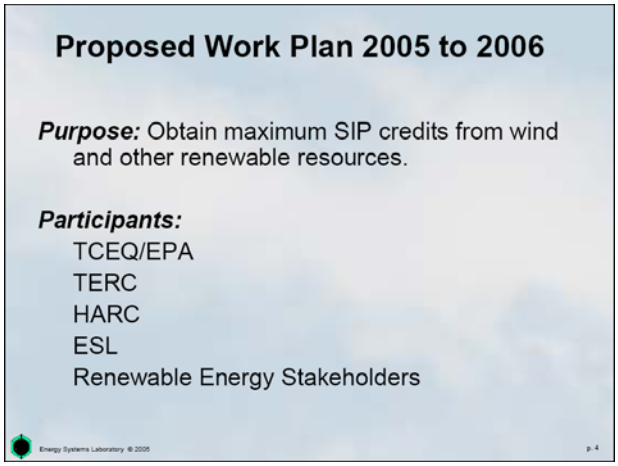


Figure 23: Slides Presented at Wind/Renewables Stakeholder's Meeting, August 30, 2005 (Part 1).

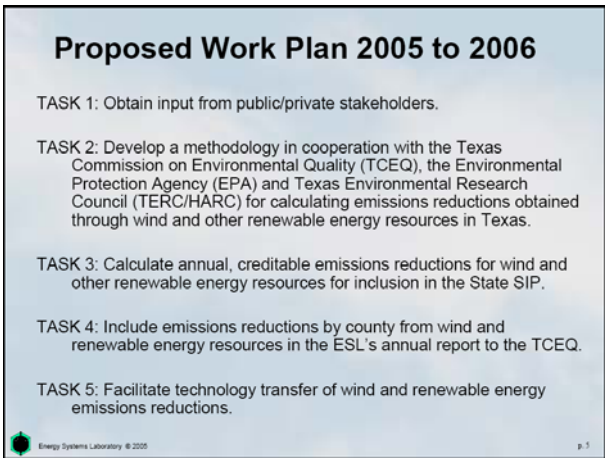


Figure 24: Slides Presented at Wind/Renewables Stakeholder's Meeting, August 30, 2005 (Part 2).

Renewable Energy Stakeholder's Meeting		
Austin, Texas - August 30, 2005		
Attendee Name	**Organization**	**E-Mail Address**
Donald McArthur	Texas Genco	dmcarthur@txgenco.com
Rusty Hodapp	DFW Airport Board	rhodapp@dfwairport.com
Amy Fitzgerald	Texas Electric Co-ops	amyf@texas-ec.org
Irvin Bilsky	Environmental Consultant/EPEC	irvinbilsky@msn.com
Tracy Hester	Bracewell & Giuliani	tracy.hester@bracewellgiuliani.com
Don Lewis	TXDOT	dlewis1@dot.state.tx.us
Jon W. Fainter, Jr.	AECT	john@aect.net
Soll Sussman	GLO	soll.sussman@glo.state.tx.us
Walt Baum	AECT	walt@aect.net
Chad Adams	Ellis County	chad.adams@co.ellis.tx.us
Diane Mazuca	TCEQ	dmazuca@tceq.state.tx.us
Travis Brown	Public Citizen	tbrown@citizen.org
Mary Miksa	TAB	mmiksa@txbiz.org
Sarah Bagwell	Senator Shapiro	sarah.bagwell@senate.state.tx.us
Scott Anderson	Environmental Defense	sanderson@environmentaldefense.org
Jess Totten	PUC	jesstotten@puc.state.tx.us
Tom Smith	Public Citizen	smitty@citizen.org
Dan Titerle	SAWS	dtiterle@saws.org
Pam Groce	SECO	pam.groce@cpa.state.tx.us
Shelly Botkin	Office of the Lt. Governor	shelly.botkin@ltgov.state.tx.us
Mary-Jo Rowan	SECO	mary-jo.rowan@cpa.state.tx.us
Ned Ross	FPL Energy	ned_ross@fpl.com
Russel E. Smith	TREIA	R1346@aol.com
Jeff Trucksess	Good Company	jtrucksess@goodcompanyasssociates.com
Mari Villarreal	Solar	mariv@onr.com
Dan Turner	ESL	danturner@tees.tamus.edu
Robert King	Good Company	rking@goodcompanyassociates.com
Dan Hinkle	Solar	kdan@airmail.net

Sheet 1

Bahman Yazdani	ESL	bahmanyazdani@tees.tamus.edu
Mike Sloan	Wind Coalition	Sloan@veia.com
Joni Brown	City of Victoria	jbrown@victoriatx.org
Nelson H. Nease	Cardinal Glass	nnease@bbrsaustin.com
Tom Fitzpatrick	ESL	tfitzpatrick@mail.utexas.edu
Cathy Reiley	TEES	c-reiley@tamu.edu
Malcolm Verdict	ESL	malcolmverdict@esl.tamu.edu
Dub Taylor	SECO	dub.taylor@cpa.state.tx.us
Michael Hoke	Environmental Reg. Committee	michael.hoke_hc@house.state.tx.us
Gregg Cooke	Gunter Slavich	cooke@gsfpc.com
John Hall	TERC	jhallpa@aol.com
Jeff Haberl	ESL	jeffhaberl@tees.tamus.edu
Jim Lester	TERC	none given
Rebecca Brister	ESL	rebeccabrister@tees.tamus.edu

Table 4: Attendee list for August, 2006 Stakeholder's meeting.

5.2.11 Presented Six Papers at the 5th International Conference for Enhanced Building Operation, Pittsburg, PA, October 2005.

Six papers were prepared and presented at the 5th International Conference for Enhanced Building Operation, in Pittsburg, PA, in October 2005. Copies of these papers have been posted on the Laboratory's Senate Bill 5 web page. Titles and abstracts for each of the papers are as follows.

Baltazar-Cervantes, J.C., Liu, Z., Gilman, D., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Retrofits to Municipal Water Supply and Wastewater Facilities," *Proceedings of the 5th International Conference for Enhanced Building Operation*s, Pittsburg, PA, published on CDROM (October).

This paper presents the procedures developed and used to calculate the electricity savings from potential retrofits to municipal water supply and wastewater facilities. The methodology integrates the ASHRAE Inverse Model Toolkit (IMT)[21] used for weather normalization, a peak-extractor for calculating peak-day electricity savings and the use of the EPA's Emissions and Generations Resource Integrated Database (eGRID[22]) for calculating potential NO_x emissions reductions for the electric utility provider associated with the user.

Liu, Z., Gilman, D., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Street Light and Traffic Light Retrofits," *Proceedings of the 5th International Conference for Enhanced Building Operations*, Pittsburg, PA, published on CDROM (October).

This paper presents the procedures that have been developed and used to calculate the electricity savings from street and traffic lighting retrofits, which includes the use of the ASHRAE Inverse Model Toolkit (IMT) for weather normalization, a peak-extractor for calculating peak-day electricity savings, and the use of the EPA's Emissions and Generations Resource Integrated Database (eGRID) for calculating NOx emissions reductions for the electric utility provide associated with the user.

Baltazar-Cervantes, J.C., Gilman, D., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Solar Thermal and Solar Photovoltaic Installations." *Proceedings of the 5th International Conference for Enhanced Building Operation*s, Pittsburg, PA, published on CDROM (October).

This paper presents the procedure that have been developed and used to assess the potential emission reductions due to the electricity savings from the application of some of the most common solar thermal and solar photovoltaic systems. The methodology to estimate the potential NOx emission reduction integrates legacy analysis tools, including the F-CHART[23], PV F-CHART[24]. ASHRAE's Inverse Model Toolkit (IMT) [25] is used to perform the weather normalization and for calculating peak-day electricity

[21] IMT, the inverse modeling toolkit is a FORTRAN 90 application for regression modeling of building energy use. Its development was sponsored by ASHRAE 1050-RP in support of ASHRAE GPC-14. IMT is capable of identifying traditional linear, least-squares regression models. it is also capable of identifying special change-point and variable-base degree-day models that have been shown to be especially useful for modeling building energy use.

[22] eGRID, ver. 2, is the EPA's emissions and generation resource integrated database. This publicly available database can be found at *www.epa.gov/airmarkets/eGRID/*. In this report the 2007 version of eGRID was used. This eGRID was specially created for Texas by Art Diem at the USEPA, and includes specific assumptions about plant closures, new plant additions, and capacity factor for annual and Ozone Season Day (OSD) periods that are projected to occur in 2007.

[23] F-CHART is the well known solar thermal design method, developed by the University of Wisconsin, which is used to select and analyze solar thermal systems. The program provides monthly-average performance for selected system, including: domestic water heating systems, space heating systems, pool heating systems and others (Klein and Beckman 1983).

[24] PV F-CHART is the well known solar photovoltaic system analysis and design program. The program provides an hourly performance profile for monthly-average days. The calculations are also based upon methods developed at the University of Wisconsin, which use the utilizability concept to account for the statistical variation of radiation and load (Klein and Beckman 1985).

[25] IMT, the Inverse Model Toolkit, is a FORTRAN 90 application that performs regression modeling of building energy use. Its development was sponsored by ASHRAE 1050-RP in support of ASHRAE GUIDELINE 14-2002. IMT is capable of identifying

savings. The EPA's Emissions and Generations Resource Integrated Database (eGRID) [26] is used for calculating the NO_x emissions reductions for the electric utility provider associated with the user.

Ahmed, M., Gilman, D., Mukhopadhyay, J., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Code-compliant Single-family and Multi-family Construction," *Proceedings of the 5th International Conference for Enhanced Building Operation*s, Pittsburg, PA, published on CDROM (October).

This paper provides a detailed description of the procedures that have been developed and used to calculate the electricity and gas savings in new single-family and multi-family construction that is built to meet the 2000 IECC Code. Included in the description is the explanation of the simulation model created for code-compliant and pre-code characteristics, which are used for calculating NOx emissions reductions for the electric utility provider associated with the user.

Ahmed, M., Gilman, D., Kim, S., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Code-compliant Commercial Construction," *Proceedings of the 5th International Conference for Enhanced Building Operation*s, Pittsburg, PA, published on CDROM (October).

This paper provides a detailed description of the procedures that have been developed to calculate the electricity and natural gas savings in new office and retail construction that is built in compliance with Chapter 8 of the IECC 2000 Code[27]. For most parts the commercial portion of the IECC 2000 code (i.e., Chapter 8), refers to the ASHRAE 90.1-1999 as current code requirement for commercial construction. Included in the description is an explanation of the simulation models created for code-compliant and pre-code characteristics[28], which are used for calculating NOx emissions reductions for the electric utility provider associated with the user.

Liu, Z., Baltazar-Cervantes, J.C., Gilman, D., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Green Power Purchases from Texas Wind Energy Providers," *Proceedings of the 5th International Conference for Enhanced Building Operation*s, Pittsburg, PA, published on CDROM (October).

This paper provides a detailed description of the procedures that have been developed to calculate the emissions reductions from electricity provided by wind energy providers in the Texas ERCOT region, including an analysis of actual hourly wind power generated from a wind turbine in Randall County, Texas.

traditional linear, least-squares regression models. It is also capable of identifying special change-point and variable-base degree-day models that have been shown to be especially useful for modeling building energy use (Kissock et al. 2002).

[26] eGRID, ver. 2, is the EPA's emissions and generation resource integrated database. This publicly available database can be found at *www.epa.gov/airmarkets/eGRID/*.

[27] Simulations for office and retail commercial construction were created first since they represent the largest two categories of commercial construction in the state. Additional simulation types are being developed for the largest energy using categories.

[28] The "pre-code" designation is meant to represent commercial construction characteristics that were in use before the passage of the Texas Emissions Reduction Plan, which became effective in September 2001. In the case of commercial construction, "pre-code" is meant to represent commercial construction that is compliant with ASHRAE Standard 90.1-1989.

5.2.12 Published Article in *ibpsaNEWS*, October 2005.

This article[29] provides a detailed description of the procedures that have been developed to calculate the emissions reductions from new code-compliant residential construction in Texas. IBPSA is an international organization of building simulators.

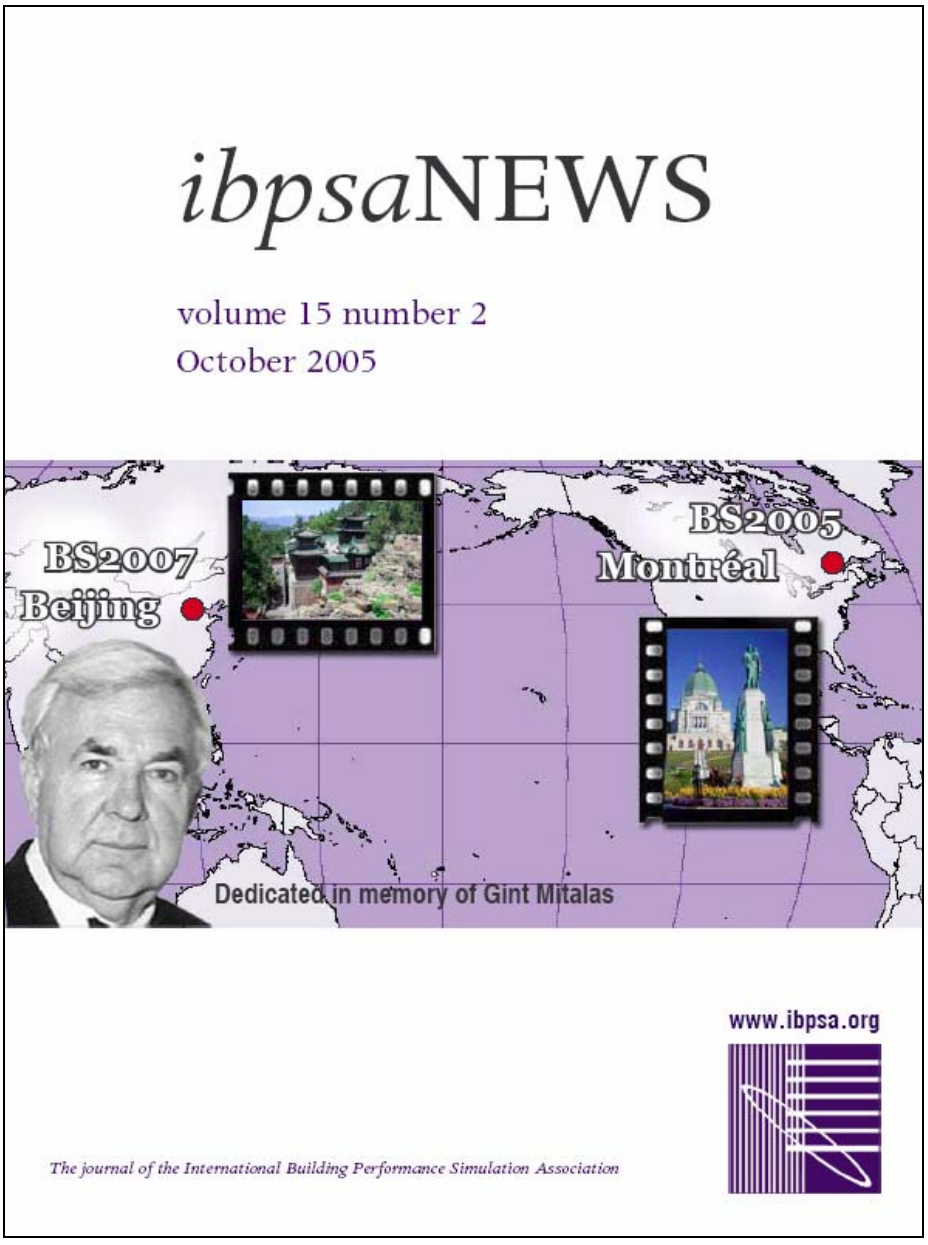


Figure 25: Cover of ibpsaNEWS Article about Emissions Calculations Work in Texas.

[29] Haberl, J., Im, P., Culp, C., Yazdani, B., Fitzpatrick, T., Bryant, J., Turner, D. 2005. "A Simulation Methodology to Estimate NOx Emissions Reductions From the Implementation of the 2000 IECC/IRC Conservation Code in Texas," *IBPSA Newsletter*, Vol. 15, No. 2, pp. 39-48 (October).

5.2.13 Preliminary Analysis of Measures to Reduce Residential Energy use by 15% Above Code-Compliance.

In the 79th Legislature, Regular Session, House Bill 2129 Required the Laboratory to develop at least 3 alternative methods for achieving a 15 percent greater potential energy savings in residential, commercial and industrial construction. As part of this effort an analysis was developed to determine practical, energy-efficient strategies for reducing residential energy use in hot and humid climates. Strategies considered include: efficient building envelope, improved fenestration, efficient lighting, appliances, and HVAC and DHW systems. These strategies were analyzed with a DOE-2 simulation model of a 2000/2001 International Energy Conservation Code (IECC) compliant single-family, detached house in Houston, Texas. The results of this analysis showed that the proper selection of measures can accomplish a 55% total annual energy reduction for a code-compliant house in a hot and humid climate, which consists of energy use reduction of 78% for space cooling, 53% for domestic water heating, 17% for space heating, and 44% for other end-uses (i.e., lighting, equipment, heating/cooling fans, and pump and miscellaneous).

In order to quantify the energy savings from different measures, a simulation model was used for a 2000/2001 IECC (IECC 2000) code-compliant base-case house, which was then modified to simulate the different scenarios with energy-efficient measures applied individually and in combination. The cost-effectiveness of these measures was then assessed using the annualized life-cycle cost analysis. The tasks performed for this study included: determination of the base-case house characteristics, development of the DOE-2 simulation model, analysis of energy saving measures for individual building components, and analysis of the individual and combined application of measures for maximum energy-efficiency. For this study, a DOE-2 simulation model of a 2000/2001 IECC compliant single-family, detached house in Houston, Texas, was selected as the base-case house.

Table 5 lists the main characteristics of the base-case house. The general characteristics of the house such as, the size of the house, occupancy, type of construction and building systems were determined from the housing survey data by the National Association of Home Builders (NAHB 2003) and the U.S. Census Bureau (USCB 2002), supplemented by assumptions based on the typical characteristics of a similar house. The characteristics of the building envelope and windows, efficiency of HVAC and DHW systems, and internal loads were chosen to conform to the 2000/2001 IECC standard design (Chapter 4).

The DOE-2 simulation model of the house was adopted from the input file, SNGFAM2ST.INP version 1.14, developed by the Energy Systems Laboratory, Texas A&M University (Ahmed et al. 2005a). This input file uses parameters for various building characteristics, which can be assigned different values using an external file. For this study, the house was first simulated with the base-case characteristics as listed in

Table 6. The values of the parameters were then modified to simulate scenarios with different building characteristics, to evaluate their effect on the energy use.

Five building components were selected for the analysis that include: (a) building configuration (aspect ratio and number of floors); (b) roof and wall properties (exposure, R-value, absorptance and emissivity); (c) construction type (layering of materials and air tightness); (d) fenestration properties (e.g. window distribution on different orientations, overhang projection, U-factor, and SHGC); and (e) air-conditioner and DHW system efficiencies. For each component, the effect of incremental change in the associated properties on the building energy use was analyzed in combination by assigning different values to the corresponding parameters of the input file. The results of the simulations demonstrated the combination of properties with the highest energy-saving potential for each of the five building components analyzed (Malhotra 2005, Malhotra and Haberl 2006).

The results of the analysis of energy-saving measures for individual building components were used to determine strategies for developing the maximum energy-efficient house, which include: airtight construction with structural insulated panels (SIPs), reflective roof and exterior walls, improved windows, and efficient air-conditioner and DHW system. Also, energy-efficient lighting (IESNA 2000) and appliances (ACEEE 2004) were considered for simulating the maximum energy-efficient house.

Table 6 lists these strategies in the order they were applied to the base-case house. The cost-effectiveness of the analyzed strategies was compared for their individual and combined application, using the annualized life-cycle cost analysis method (ASHRAE 2003, Haberl 1993). Table 7 also lists the various costs associated with the applied measures. The first year costs were obtained from product information data (Malhotra 2005). The energy costs were calculated using the DOE-2 simulation results, assuming the utility rates to be 0.09 $/kWh for the electricity and 0.8 $/therm for the natural gas. The maintenance and replacement costs were determined from the average life of the measures, assuming 25 year life of the building. Also, economic factors, such as the inflation rate (Inflationdata 2005), mortgage rate (Bankrate 2005), and insurance and property tax, were defined to calculate the annualized costs. Figure 27 and Figure 28 show the annual end-use energy use for the individual and combined application of measures to the base-case house.

Figure 27 shows that the largest space cooling savings (33%) were achieved from the SEER-15 air-conditioner, followed by 28% savings from overhangs with 75% of the windows on the south. A 53% domestic water heating energy savings was achieved from the high efficiency instantaneous water heater with electronic ignition. The largest equipment energy savings (20%) was achieved from the horizontal-axis clothes washer. Compact fluorescent lamps (CFLs) saved 75% lighting energy use. Among all the measures applied individually, the instantaneous water heater with electronic ignition had the highest total annual energy-saving potential (19% savings), followed by 7% each from overhangs with window redistribution favoring the south side, and from the CFLs.

Figure 28 shows that the space cooling, domestic water heating and equipment energy use comprised a significant part of the total energy use (24%, 36% and 28%, respectively, of the base-case house), and that the space heating and lighting energy use were only 1% and 8% of the total energy use of the base-case house. Whereas, after the combined application of all the measures, the space cooling and domestic water heating energy use could be significantly reduced with the equipment energy contributing the most (42%) to the total energy use of the efficient house.

Figure 29 shows the impact of the combined application of the measures on the space heating, space cooling, domestic water heating, other end-uses, and total energy use. This graph includes the results of the simulation for different building configurations that includes east-west to north-south aspect ratio of 1:3 to 3:1 for one and two-story configurations. In this figure, measures with the highest incremental savings have the steepest slope.

The following observations were made:

1. As compared to a square-shaped, one-story, base-case house, a two-story house elongated along the east-west axis saved cooling energy. However, with a high reflectance roof, the two-story house became more energy consuming than a one-story house because of the increased wall area (window areas remained equal).
2. The impact of changing the building configuration on the energy use diminished as more efficient building systems and components were incorporated in the house.
3. The instantaneous water heater without a pilot light was the most effective strategy, followed by CFLs. Other measures providing significant energy savings included the addition of overhangs, high reflectance roof, efficient windows, and efficient appliances.

By applying energy-efficient measures to the base-case house, the maximum reduction of 78% was achieved in space cooling energy use, followed by 53% reduction in domestic water heating energy use, 44% for other end-uses that include lighting, equipment, heating/cooling fans, and pump and miscellaneous, and a 17% reduction in space heating energy use. The space heating energy savings were less because some of the measures resulted in small heating energy penalty. A maximum of 55% total energy savings could be achieved from combining all the measures.

The results of the energy analysis demonstrated that the proper selection of measures can accomplish 55% total annual energy reduction for a code-compliant house in a hot and humid climate, which consists of energy use reduction of 78% for space cooling, 53% for domestic water heating, 17% for space heating,

and 44% for other end-uses. The savings correspond to those reported by Parker et al. (2000) in a test house of characteristics similar to those used in this study. Considering the annualized life-cycle cost, CFLs, instantaneous DHW system with electric ignition, high SEER air-conditioner, efficient appliances, argon-filled low-e windows, and maximum windows on south with overhangs were found to be cost-effective. For the measures that increased the life-cycle cost less expensive alternatives should be considered for cost-effectiveness.

This study analyzed the energy-saving measures that can be simulated with the DOE-2 program. This excluded the analysis of many other energy-saving measures such as, daylighting, natural ventilation, solar thermal and photovoltaic, heat pumps, radiant heating systems, combined space and water heating systems etc. These measures can be analyzed using other simulation programs in conjunction with the DOE-2 to maximize energy savings.

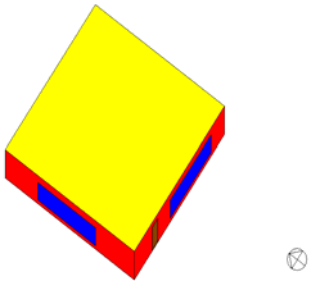


Figure 26: DOE-2 Simulation Model of the Base-case House.

Table 5: Base-case House Characteristics.

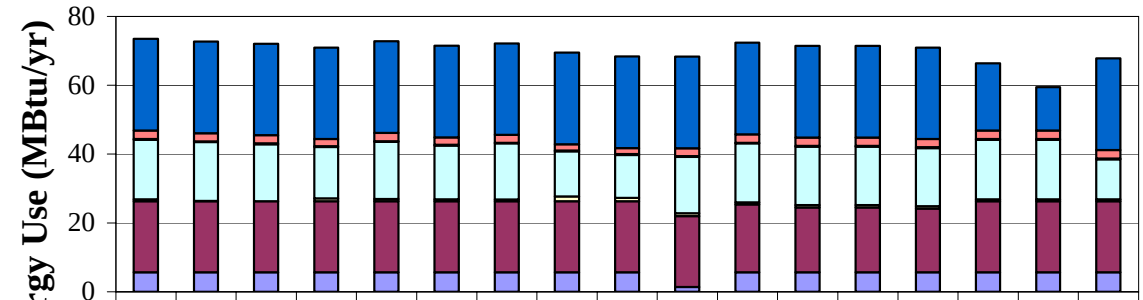
Building configuration	2,500 sq. ft., four bedroom, square shape, one-story, single-family detached house
Construction type	Light-weight wood-frame
Exterior walls	2 x 4 studs @ 16" o.c., R-11 fiber-batt cavity insulation, brick fascia on the exterior
Roof	2 x 10 studs @ 16" o.c., R-30 ceiling insulation, aspen gray asphalt shingle roofing
Windows	Gross window area: 18% of conditioned floor area, distributed equally on all four sides
	Double pane low-e air-filled windows; aluminum window frames with thermal break
	No exterior shading
Underground floor	Slab-on-grade floor with 4” heavy weight concrete, no perimeter insulation
HVAC Systems	SEER-10 electric split air conditioner, 78% AFUE natural gas furnace, ducts in the conditioned space
DHW system	40 -gallon gas water heater with a standing pilot light

Table 6: List of Building Properties for the Base-case House and Energy-efficient Option.

Steps	Properties	Base-case Characteristics	Energy-efficient Design Measures
1		Base-case house	-
2a	Construction	Wood-frame construction	SIP construction
2b	Ventilation	No mechanical ventilation	Energy recovery ventilator
3	Roofing	Gray asphalt shingle roofing (absorptance = 0.82)	White fiber-cement shingles (absorptance = 0.23)
4	Exterior wall surface	Light buff fascia brick (absorptance = 0.55)	White semi-gloss paint (absorptance = 0.25)
5	Glazing	Double pane air-filled low-e (U = 0.47, SHGC = 0.4)	Double pane argon-filled low-e (U = 0.29, SHGC = 0.28)
6	Window frames	Aluminum window frames with thermal break	Vinyl window frames
7a	Exterior shading	No shading	4 ft. deep overhangs on all sides
7b	Window distribution	Equal window area on all sides	75% on south, 15% on north, 5% on east and 5% on west
8	Lighting	Incandescent lamps	Compact fluorescent lamps
9	Refrigerator	Conventional model (660 kWh/yr)	Energy star model (392 kWh/yr)
10	Freezer	Conventional model (900 kWh/yr)	Energy star model (353 kWh/yr)
11	Dishwasher	Conventional model (696 kWh/yr)	Energy star model (181 kWh/yr)
12	Clothes washer	Conventional model (816 kWh/yr)	Energy star model (186 kWh/yr)
13	Domestic water heater	Tanktype, with a standing pilot light (EF = 0.54)	Instantaneous, with electronic ignition (EF = 0.85
14	Air-conditioner	SEER-10 air-conditioner	SEER-15 air-conditioner

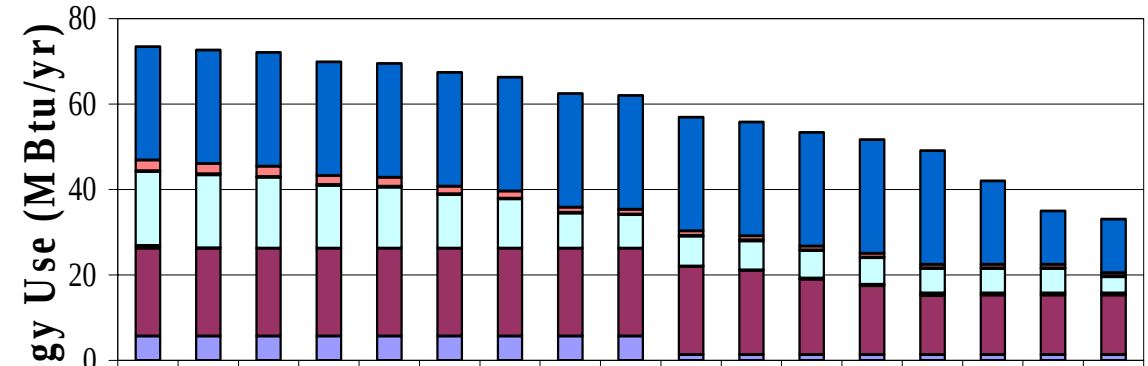
Table 7: Various Costs Associated with the Base-case House and the Maximum Energy-efficient Option.

Item No.	Energy-Efficient Measures	First Year Costs				Annual Energy Costs			Maintenance and Replacement Cost		
		Base-case Cost ($)	Increased Cost ($)	Difference ($)	Cumulative Increase (%)	Individual Application ($)	Incremental Application ($)	Cumulative Decrease (%)	Maintenance Cost ($)	Replacement Cost ($)	Year
1	Base-case House	$224,598	-	-	-	$1,438	$1,438	-	$100 (Annual)	$26	Annually (for Lighting)
										$550	10 (for DHW System)
										$2,548	15 (for AC, Clothes Washer and Dishwasher)
										$850	20 (for Refrigerator and Freezer)
2a	SIP Construction	$220,650	$222,857	$2,207	0.98%	$1,426	$1,426	-0.85%	$100	As Above (for the Base-case)	
2b	+ Energy Recovery Ventilator	$0	$1,099	$1,099	0.49%	$1,411	$1,411	-1.89%	$100	As Above (for the Base-case)	
3	High-Albedo Roofing	$2,500	$5,000	$2,500	1.11%	$1,371	$1,356	-5.75%	$100	As Above (for the Base-case)	
4	High-Albedo Exterior Walls	$7,475	$6,325	($1,150)	-0.51%	$1,417	$1,344	-6.57%	$100	$1,500	10 (for Repainting the Walls)
5	Argon-Filled Low-e Windows	$5,300	$6,096	$796	0.35%	$1,386	$1,287	-10.53%	$100	As Above (for the Base-case)	
6	Vinyl Window Frames	$6,096	$7,500	$1,405	0.63%	$1,406	$1,259	-12.50%	$100	As Above (for the Base-case)	
7a	Overhangs	$0	$2,520	$2,520	1.12%	$1,317	$1,160	-19.37%	$100	As Above (for the Base-case)	
7b	+ 75% Windows on the South	$0	$0	$0	0.00%	$1,295	$1,146	-20.33%	$100	As Above (for the Base-case)	
8	Efficient Lighting	$26	$279	$252	0.11%	$1,301	$1,010	-29.79%	$100	As Above (for the Base-case)	
9	Efficient Refrigerator	$550	$800	$250	0.11%	$1,409	$981	-31.78%	$100	$250	Added to the 20th Year Replacement Cost
10	Efficient Freezer	$300	$530	$230	0.10%	$1,380	$915	-36.36%	$100	$230	Added to the 20th Year Replacement Cost
11	Efficient Dishwasher	$500	$1,149	$649	0.29%	$1,380	$869	-39.62%	$100	$649	Added to the 15th Year Replacement Cost
12	Efficient Clothes Washer	$600	$950	$350	0.16%	$1,371	$794	-44.78%	$100	$350	Added to the15th Year Replacement Cost
13	Tankless Water Heater	$550	$950	$400	0.18%	$1,326	$686	-52.32%	$100	$400	Added to the10th Year Replacement Cost
14	SEER-15 AC	$1,448	$2,637	$1,189	0.53%	$1,286	$635	-55.84%	$100	$1,189	Added to the15th Year Replacement Cost
		Total		$12,696	5.65%	Total		-55.84%			



	Base-case	SIP Const.	SIP Const. + ERV	High-Refl. Roof	High-Refl. Walls	Ar-fill Low-e Win.	Vinyl Win. Frames	Over-hangs	+ 75% Win. on S	CFLs	Eff. Ref.	Eff. Freezer	Eff. DW	Eff. CW	Inst. DHW Sys.	+ Electro. Igni.	SEER-15 AC
DHW	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	19.5	12.5	26.6
Vent Fans	2.5	2.4	2.4	2.1	2.4	2.2	2.3	1.9	1.8	2.3	2.5	2.4	2.4	2.4	2.5	2.5	2.5
Pumps	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Cooling	17.3	17.1	16.6	15	16.6	15.6	16.3	13.1	12.5	16.4	17.1	17	17	16.9	17.3	17.3	11.6
Heating	0.6	0.1	0	0.8	0.7	0.6	0.5	1.4	1	0.8	0.6	0.7	0.7	0.7	0.6	0.6	0.6
Equipment	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	19.7	18.8	18.8	18.5	20.6	20.6	20.6
Lights	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	1.4	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Total	73.49	72.72	72.05	71.71	72.76	71.56	72.19	69.46	68.31	68.45	72.42	71.36	71.36	71.01	66.44	59.43	67.71

Figure 27: Annual Energy Use for Individual Application of Measures.



	Base-case	+ SIP Const.	+ ERV	+High-Refl. Roof	+High-Refl. Walls	+ Ar-fill Low-e	+ Vinyl Frames	+ Over-hangs	+ 75% Win. on S	+ CFLs	+ Eff. Ref.	+ Eff. Freezer	+ Eff. DW	+ Eff. CW	+ Inst. DHW Sys.	+ Electro. Igni.	+ SEER-15 AC
DHW	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	19.5	12.5	12.5
Vent Fans	2.5	2.4	2.4	2.1	2.1	1.8	1.7	1.2	1.1	1	1	0.9	0.9	0.8	0.8	0.8	0.8
Pumps	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Cooling	17.3	17.1	16.6	14.7	14.3	12.5	11.5	8.2	7.8	7	6.8	6.4	6.2	5.7	5.7	5.7	3.8
Heating	0.6	0.1	0	0	0	0	0	0	0	0.1	0.1	0.3	0.3	0.6	0.5	0.5	0.5
Equipment	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	19.7	17.6	16.1	13.8	13.9	13.9	13.9
Lights	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Total	73.49	72.72	72.05	69.55	69.51	67.35	66.26	62.55	62.01	56.88	55.83	53.43	51.71	49.05	42.11	35.10	33.18

Figure 28: Annual Energy Use for Combined Application of Measures.

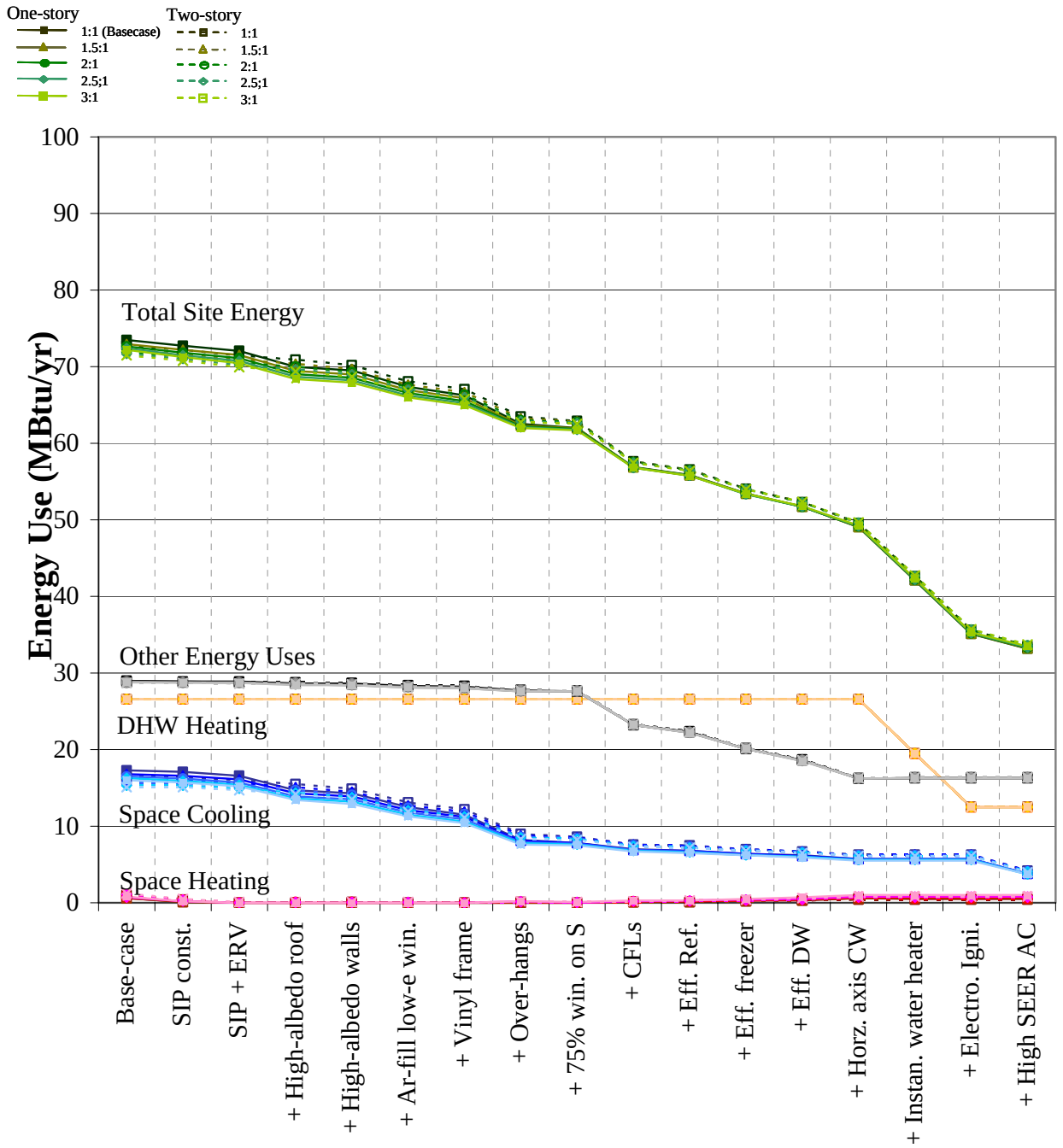


Figure 29: Effect of Combined Application of Measures on Annual Energy Use.

5.2.14 Analysis of Simulation Methods for Evaluating Improved Fenestration Using the DOE-2.1e Simulation Program.

In the 79th Legislature, Regular Session, House Bill 2129 Required the Laboratory to develop at least 3 alternative methods for achieving a 15 % greater potential energy savings in residential, commercial and industrial construction. Therefore, an analysis was performed to investigate the inaccuracies of calculating energy savings using the shading coefficient (SC)/pre-calculated ASHRAE weighting factor method (i.e., Quick mode) versus simulations performed with the more accurate WINDOW-5/custom weighting factor method (i.e., Thermal mode) in the DOE-2.1e program.

DOE-2.1e gives several options for calculating heat gain through windows (LBNL 2000). In the shading coefficient (SC) method, the program first calculates the angle-dependent solar heat gain using transmission coefficients for clear, 1/8" glass using the angle-dependent polynomial developed by ASHRAE Task Group on Energy Requirements-TGER (1975). The solar heat gain is then calculated by multiplying this result with the shading coefficient value input by the user. In the method referencing the WINDOW-5 program, the user uses a four digit code to reference a window in the input file from a pre-assembled, user-defined library file (i.e., WIN.DAT) which contains a list of WINDOW-5 generated output files arranged by four digit code numbers. The DOE-2.1e program references these files for incident angle dependent solar heat gain coefficient (SHGC) values which are used by the DOE-2.1e program. A number of studies have shown that the SHGC more accurately accounts for the angle-dependent transmittance properties than the SC method of assessing solar heat gain through windows, and WINDOW-5 includes more accurate convection coefficients (Reilly et al. 1992).

DOE-2.1e uses weighting factors to calculate the thermal loads and space temperatures (LBNL 1981). Two options are available to specify the weighting factors. In the pre-calculated weighting factor method, a pre-calculated floor weight is assigned to represent thermal capacity of each space (or in some cases the entire building). In the custom weighting factor method, the entire construction assembly is elaborately specified.

The DOE-2.1e (Version 119) program was selected as the simulation program to be used for obtaining the results. A customized input file was created to facilitate the numerous simulations that needed to be run for this study. The building model used for the DOE-2.1e input file was based on the 2000/2001 IECC specifications for a single family building. This model has been developed by the Energy Systems Laboratory, to calculate the energy savings from code adoption (Haberl et al. 2003). The model is a single-story light weight structure (13 lb/sq. ft.) with a garage attached on the west side of the building.

This version of the input file uses electricity for space cooling with heating energy and heating for domestic hot water provided by natural gas. Houston was used as the climate location for this study since it represents a sizable percentage of the population living in the ozone non-attainment areas identified by the Environmental Protection Agency. The TMY2 weather file (NREL 1995) for Houston was used to carry out simulations. Three glazing options, Single Pane Clear (SPC), Double Pane Clear (DPC) and Double Pane Low-E (DPlow-E), were selected for the purpose of the analysis. Properties of the glazing types selected are presented in Table 8. Results from both the LOADS and SYSTEMS section of DOE-2's simulation output were analyzed and are presented in terms of hourly / daily reports, annual reports and peak load reports.

To obtain a detailed analysis of the impact of activating DOE-2's custom weighting factors (Thermal mode) and using the WINDOW-5 program for fenestration specifications, one week in August and one week in January were considered for a detailed analysis. The appropriate hourly data were extracted from DOE-2's hourly reports and plotted for analysis. The combined hourly solar and conduction loads were examined from the DOE-2 LOADS sub-program, while hourly zone temperature, cooling electricity and heating fuel use were analyzed from the DOE-2's SYSTEMS sub-program.

The study used this opportunity to demonstrate the advantages of using the more accurate methods for modeling Thermal mass (i.e., the WINDOW-5 and CWF modeling method) over conventionally used

methods (i.e., SC and Quick mode of input). Subsequently, results are presented as a difference in percentage savings for SC and WINDOW-5 for both Quick and Thermal mass methods of input. The results for both annual and peak loads are tabulated in Table 9 and Table 10. An analysis of the percentage savings when going from DPC to DPlowE is presented.

When going from the lower performance glazing to a higher performance glazing, a comparison of SC and WINDOW-5 methods shows that the SC method yields a savings of 8.8 MBtu (13.27%) while the WINDOW-5 yields a savings of 6.8 MBtu (10.43%), which over-predicts the savings by 2.0 MBtu (21.42%). On activating the custom weighting factors, the SC method yields a savings of 5.9 MBtu (9.95%) while the WINDOW-5 yields a savings of 5.0 MBtu (8.53%), which over-predicts the savings by 0.9 MBtu (14.24%).

When considering peak cooling, when going from the lower performance glazing to a higher performance glazing, a comparison of SC and WINDOW-5 methods shows that the SC method yields a savings of 7.53 kBtu/hr (29.39%) while the WINDOW-5 yields a savings of 6.09 kBtu (26.59%), which over-predicts the savings by 1.45 kBtu/hr (9.52%). On activating the custom weighting factors, the SC method yields a savings of 5.01 kBtu/hr (27.02%) while the WINDOW-5 yields a savings of 4.34 kBtu/hr (25.19%), which over-predicts the savings by 0.67 kBtu/hr (6.76%). When considering peak heating, when going from the lower performance glazing to a higher performance glazing, a comparison of SC and WINDOW-5 methods shows that the SC method yields a savings of -3.36 kBtu/hr (21.88%) while the WINDOW-5 yields a savings of -2.17 kBtu (14.11%), which over-predicts the savings by -1.19 kBtu/hr (35.51%). On activating the custom weighting factors, the SC method yields a savings of -2.48 kBtu/hr (19.71%) while the WINDOW-5 yields a savings of -2.43 kBtu/hr (16.18%), which over predicts the savings by -0.05 kBtu/hr (17.89%).

From the first section of analysis it is concluded that the cooling and heating loads are affected by zone temperatures which are significantly different for each of the four options tested. Activating DOE-2's custom weighting factors reduces the solar conduction loads, cooling electric loads and heating fuel loads by approximately 30 - 50%. However, using the WINDOW-5 method for fenestration specification in the input file has a small annual impact, with reductions in solar conduction loads, cooling electric loads and heating fuel loads of approximately 10 - 20%.

Table 8: Transmittance, absorptance and reflectance properties of the selected glazing.

(Source: WINDOW-5 output files, ASHRAE 1975)

Type of Glazing	Properties		
	% Transmittance	% Absorptance	% Reflectance
Single Pane Clear (ASHRAE 1975)	86	8	6
Single Pane Clear (1000)	83.7	8.8	7.5
Double Pane Clear (2000)	70.5	16.8	12.8
Double Pane Low-E (2661)	35.8	28.7	35.5

Table 9: Difference in Energy Consumption: a) Quick to Thermal mass mode b) SC to WINDOW-5 Option.

TABLE: PERCENT. ...TAINED FROM USING DIFFERENT OPTIONS IN ...ATING & COOLING REPORT						
				SC	WINDOW5	DIFFERENCE
		% SAVING FORMULA		SAVING	SAVING	SC-W5
			Annual BEPS (Mbtu/yr)	4.30	5.00	-0.70
			Annual Heating (Mbtu/yr)	2.70	2.80	-0.10
			Annual Cooling (Mbtu/yr)	1.40	1.90	-0.50
			Peak Hourly Heating (Kbtu/hr)	-4.13	-3.23	-0.90
	SP-DP	((SP-DP)/SP)*100	Peak Hourly Cooling (Kbtu/hr)	2.55	3.11	-0.55
			Annual BEPS (Mbtu/yr)	13.10	11.80	1.30
			Annual Heating (Mbtu/yr)	4.00	3.50	0.50
			Annual Cooling (Mbtu/yr)	7.90	7.20	0.70
			Peak Hourly Heating (Kbtu/hr)	-7.49	-5.40	-2.09
	SP-LOWE	((SP-LE)/SP)*100	Peak Hourly Cooling (Kbtu/hr)	10.09	9.19	0.90
			Annual BEPS (Mbtu/yr)	8.80	6.80	2.00
			Annual Heating (Mbtu/yr)	1.30	0.70	0.60
			Annual Cooling (Mbtu/yr)	6.50	5.30	1.20
			Peak Hourly Heating (Kbtu/hr)	-3.36	-2.17	-1.19
QUICK	DP-LOWE	((DP-LE)/SP)*100	Peak Hourly Cooling (Kbtu/hr)	7.53	6.09	1.45
			Annual BEPS (Mbtu/yr)	2.40	3.30	-0.90
			Annual Heating (Mbtu/yr)	1.70	1.90	-0.20
			Annual Cooling (Mbtu/yr)	0.70	1.20	-0.50
			Peak Hourly Heating (Kbtu/hr)	-3.23	-3.72	0.49
	SP-DP	((SP-DP)/SP)*100	Peak Hourly Cooling (Kbtu/hr)	1.49	1.80	-0.31
			Annual BEPS (Mbtu/yr)	8.30	8.30	0.00
			Annual Heating (Mbtu/yr)	2.10	1.80	0.30
			Annual Cooling (Mbtu/yr)	5.40	5.70	-0.30
			Peak Hourly Heating (Kbtu/hr)	-5.70	-6.15	0.45
	SP-LOWE	((SP-LE)/SP)*100	Peak Hourly Cooling (Kbtu/hr)	6.50	6.14	0.36
			Annual BEPS (Mbtu/yr)	5.90	5.00	0.90
			Annual Heating (Mbtu/yr)	0.40	-0.10	0.50
			Annual Cooling (Mbtu/yr)	4.70	4.50	0.20
			Peak Hourly Heating (Kbtu/hr)	-2.48	-2.43	-0.05
CWF	DP-LOWE	((DP-LE)/SP)*100	Peak Hourly Cooling (Kbtu/hr)	5.01	4.34	0.67

Table 10: Percentage Difference in Energy Consumption: a) Quick to Thermal Mass Mode b) SC to WINDOW-5 Option.

TABLE: PERCENTAGE DIFFERENCE OBTAINED FROM USING DIFFERENT OPTIONS IN BEPS AND PEAK HEATING & COOLING REPORT							
				SC	WINDOW5	DIFFERENCE	% DIFFERENCE
		% SAVING FORMULA		% SAVING	% SAVING	SC-W5	((SC-W5)/SC)*100
			Annual BEPS (Mbtu/yr)	6.09	7.12	-1.03	-16.94
			Annual Heating (Mbtu/yr)	40.30	30.77	9.53	23.65
			Annual Cooling (Mbtu/yr)	6.25	9.55	-3.30	-52.76
			Peak Hourly Heating (Kbtu/hr)	21.20	17.35	3.85	18.14
	SP-DP	((SP-DP)/SP)*100	Peak Hourly Cooling (Kbtu/hr)	9.06	11.95	-2.89	-31.88
			Annual BEPS (Mbtu/yr)	18.56	16.81	1.75	9.41
			Annual Heating (Mbtu/yr)	59.70	38.46	21.24	35.58
			Annual Cooling (Mbtu/yr)	35.27	36.18	-0.91	-2.59
			Peak Hourly Heating (Kbtu/hr)	38.44	29.01	9.43	24.52
	SP-LOWE	((SP-LE)/SP)*100	Peak Hourly Cooling (Kbtu/hr)	35.79	35.37	0.42	1.18
			Annual BEPS (Mbtu/yr)	13.27	10.43	2.84	21.42
			Annual Heating (Mbtu/yr)	32.50	11.11	21.39	65.81
			Annual Cooling (Mbtu/yr)	30.95	29.44	1.51	4.87
			Peak Hourly Heating (Kbtu/hr)	21.88	14.11	7.77	35.51
QUICK	DP-LOWE	((DP-LE)/SP)*100	Peak Hourly Cooling (Kbtu/hr)	29.39	26.59	2.80	9.52
			Annual BEPS (Mbtu/yr)	3.89	5.33	-1.44	-37.06
			Annual Heating (Mbtu/yr)	48.57	35.19	13.39	27.56
			Annual Cooling (Mbtu/yr)	3.98	7.45	-3.48	-87.40
			Peak Hourly Heating (Kbtu/hr)	20.43	19.86	0.57	2.80
	SP-DP	((SP-DP)/SP)*100	Peak Hourly Cooling (Kbtu/hr)	7.43	9.44	-2.02	-27.15
			Annual BEPS (Mbtu/yr)	13.45	13.41	0.04	0.32
			Annual Heating (Mbtu/yr)	60.00	33.33	26.67	44.44
			Annual Cooling (Mbtu/yr)	30.68	35.40	-4.72	-15.39
			Peak Hourly Heating (Kbtu/hr)	36.12	32.83	3.28	9.09
	SP-LOWE	((SP-LE)/SP)*100	Peak Hourly Cooling (Kbtu/hr)	32.44	32.25	0.18	0.56
			Annual BEPS (Mbtu/yr)	9.95	8.53	1.42	14.24
			Annual Heating (Mbtu/yr)	22.22	-2.86	25.08	112.86
			Annual Cooling (Mbtu/yr)	27.81	30.20	-2.39	-8.60
			Peak Hourly Heating (Kbtu/hr)	19.71	16.18	3.53	17.89
CWF	DP-LOWE	((DP-LE)/SP)*100	Peak Hourly Cooling (Kbtu/hr)	27.02	25.19	1.83	6.76

5.2.15 Calculated Emissions Reductions at the Rent-a-Car Facility at the Dallas-Fort Worth International Airport, December 2005.

The Laboratory was contracted to fulfill a *Continuous Commissioning*® (*CC*®)[30] project on the Rent-a-Car facility (RAC) of the Dallas-Fort Worth International Airport (DFWIA) in which energy savings are directly related to an emissions reduction that can be credited (Figure 30). The purpose of this study is to estimate the creditable emissions reductions from energy-efficiency CC® measures in the RAC of DFWIA.

The energy savings were evaluated thru weather normalized inverse modeling. Baseline data, pre-CC®, and post-CC® data were modeled as a function of the weather. The electricity savings were calculated by the difference of the baseline model and the measured post-CC® data of the facility (see Figure 31). Similarly, these models were applied to weather of 1999 and the potential savings at that year were documented.

The documented savings at RAC were then converted to NO_x, SO_x, and CO_2emissions reduction on a tons/year and tons/peak-day basis using TCEQ/ESL's emissions reduction methodology and EPA's eGRID emissions data base as shown in Table 11. The total potential emissions (NO_x, SO_x, and CO_2) reduction for year 1999 and the projected ones for 2007 and corresponding OSD periods are presented. The potential emissions reduction of SO_x and CO_2 for the year 1999 was not evaluated because eGRID tables for that year were not available.

Table 11: NO_x, SO_x and CO_2 Savings from CC® Measures at the RAC at Dallas-Fort Worth International Airport.

Emissions	Potential Emissions Reductions for 1999		Potential Emissions Reductions for 2007	
	Annual (Tons/yr)	OSD (Tons/day)	Annual (Tons/yr)	OSD (Tons/day)
NO_x	3.710320	0.012782	1.64387	0.00554
SO_x	N/A	N/A	1.11594	0.00362
CO_2	N/A	N/A	1316.468	4.62669

The methodology used to determine the energy savings and the estimate of savings in 2007, from electricity reductions, is critical if reported savings are to be given credit by TCEQ. Project savings are first *discounted* if the projects were not fully commissioned and monitored on a monthly basis. Secondly, reported savings are further reduced using a *degradation* factor to account for the overall retrofit loss of efficiency over time. These factors are fully described below.

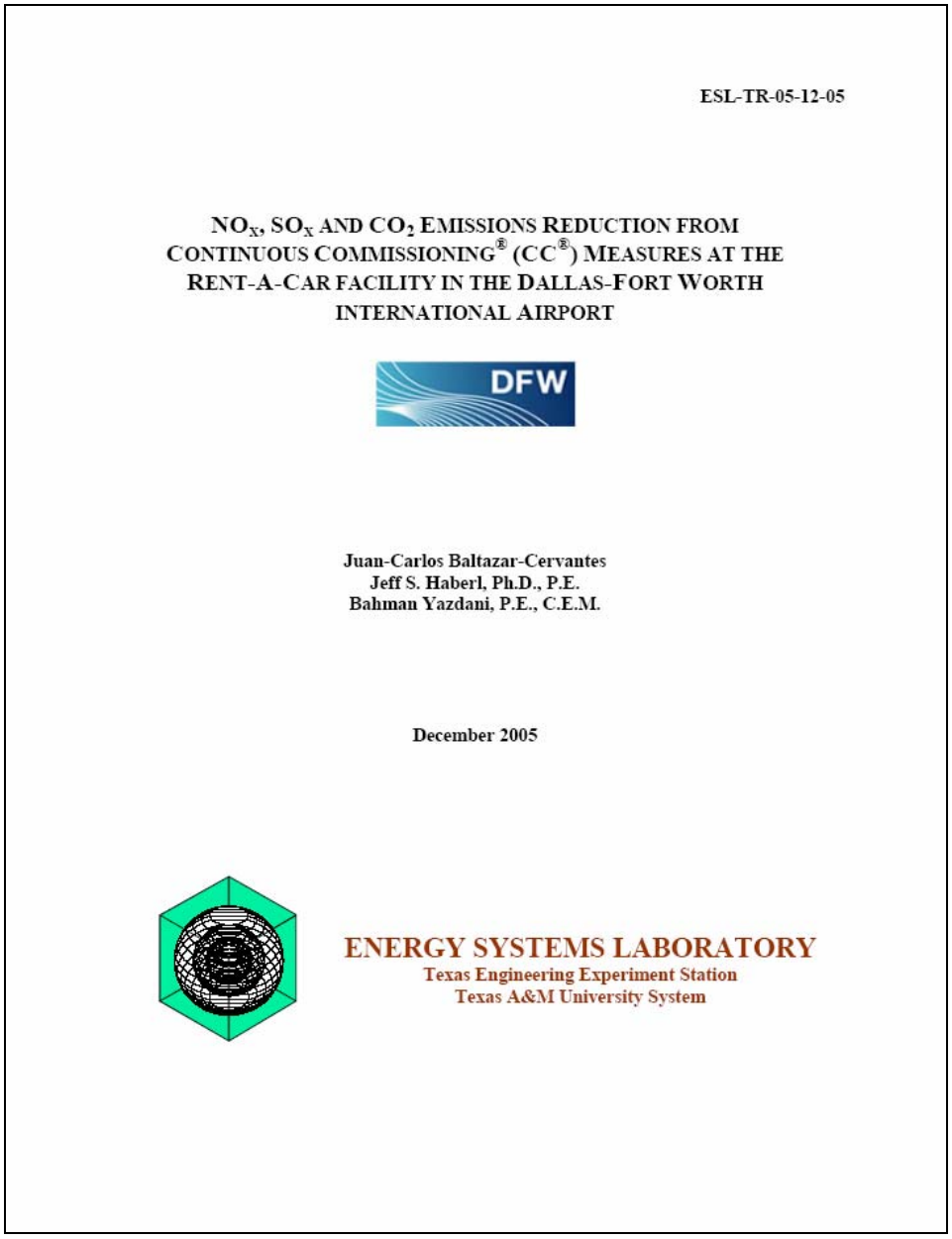
The operational efficiency of energy retrofits such as lighting, motors, HVAC equipment, controls, pumps, etc., may decrease over time due to normal wear and uneven operations and maintenance (O&M). Savings degradation of 0% to 5% per year was reported by Greg Katz in 1996.[31] This range is dependent upon whether or not the project was tracked with monthly utility bills (i.e., 5%), or savings were measured with hourly data loggers and systems were continuously maintained through good O&M practices (i.e., 0%). Based on the Katz study and the Laboratory's experience, we recommend that project savings estimates, absent utility bill information, or monitoring data reflect an across-the-board loss of project efficiency of 4% per year. Accordingly, a 0% degradation factor was utilized for this report.

The annual electricity savings after the Continuous Commissioning® measures were implemented are 1,890,218 kWh with an OSD average savings of 6,548 kWh/day (see Table 12). These energy savings are affected by an additional 10% from Transmissions and Distribution (T&D) losses. The translation of the

[30] Continuous Commissioning® and CC® are trademarks registered by the Texas Engineering Experimentation Station of Texas A&M University. For more information please contact the Energy Systems Laboratory at esl.tamu.edu.
[31] Kats, G.H. et al. (1996) "Energy Efficiency as a Commodity," ACEEE Summer Study on Energy Efficiency in Buildings.

energy patterns to the year 1999 would produce annual energy savings for 1,848,229 and 6,367 kWh/day daily average savings in the corresponding OSD.

The Power Control Area (PCA) for the RAC of the DFW International Airport from the period October 2004 through April 25, 2005, was TXU, but after that period to the present the utilities have been provided by Reliant (see Table 12). The annual total electricity savings and OSD electricity savings were entered into the eGRID spreadsheet according to the providers' PCA.



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NO_X, SO_X AND CO_2 EMISSIONS REDUCTION FROM CONTINUOUS COMMISSIONING® (CC®) MEASURES AT THE RENT-A-CAR FACILITY IN THE DALLAS-FORT WORTH INTERNATIONAL AIRPORT

DFW

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Bahman Yazdani, P.E., C.E.M.

December 2005

ENERGY SYSTEMS LABORATORY
Texas Engineering Experiment Station
Texas A&M University System

Figure 30: Laboratory Report on Emissions Reductions at the RAC at Dallas-Fort Worth International Airport.

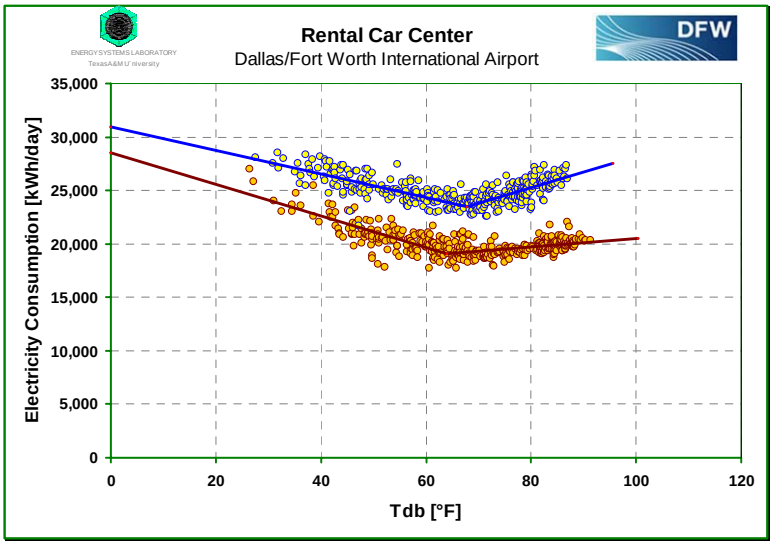


Figure 31: Electricity consumption patterns before and after the implementation of the Continuous Commissioning® measures on the Rent-a-Car facility of the Dallas-Fort Worth International Airport for the FY 2005.

Table 12: Monthly Savings for the fiscal year 2005 and potential monthly savings in the year 1999 obtained from the Continuous Commissioning® measures.

Rental Car Center - DFW International Airport

MONTHLY SAVINGS (1999)	(PRICE 0.0674 $/kWh)	
	kWh	US$
Jan-99	131,642	$ 8,873
Feb-99	126,130	$ 8,501
Mar-99	141,799	$ 9,557
Apr-99	141,071	$ 9,508
May-99	153,959	$ 10,377
Jun-99	171,178	$ 11,537
Jul-99	191,335	$ 12,896
Aug-99	205,214	$ 13,831
Sep-99	164,822	$ 11,109
Oct-99	150,067	$ 10,114
Nov-99	135,885	$ 9,159
Dec-99	135,127	$ 9,108
	1,848,229	**$ 124,571**

OSD => 7/15/1999 - 9/15/1999	
OSD Savings	401,115
OSD Daily AverageSavings	6,367

MONTHLY SAVINGS	(PRICE 0.0674 $/kWh)	
	kWh	US$
Sep-04	14,397	$ 970
Oct-04	118,728	$ 8,002
Nov-04	157,451	$ 10,612
Dec-04	142,024	$ 9,572
Jan-05	134,653	$ 9,076
Feb-05	121,325	$ 8,177
Mar-05	112,271	$ 7,567
Apr-05	143,573	$ 9,677
May-05	174,623	$ 11,770
Jun-05	184,514	$ 12,436
Jul-05	206,214	$ 13,899
Aug-05	201,473	$ 13,579
Sep-05	193,369	$ 13,033
Oct-05	153,450	$ 10,343
FY05	**1,890,218**	**$ 127,401**
Total	2,058,065	$ 138,714

OSD => 7/15/2005 - 9/15/2005	
OSD Savings	412,509
OSD Daily AverageSavings	6,548

	PCA	Measured	Baseline	Savings		
		Total Use kWh	Total Use kWh	kWh	%	US$
FY2005 (10/01/2004 - 04/25/2005)	**TXU**	**4,225,222**	**5,129,880**	**904,658**	**17.64%**	**$60,974**
FY2005 (04/26/2005 - 09/30/2005)	**Reliant**	**3,116,232**	**4,101,791**	**985,559**	**24.03%**	**$66,427**
		7,341,454	**9,231,671**	**1,890,218**	**20.48%**	**$127,401**

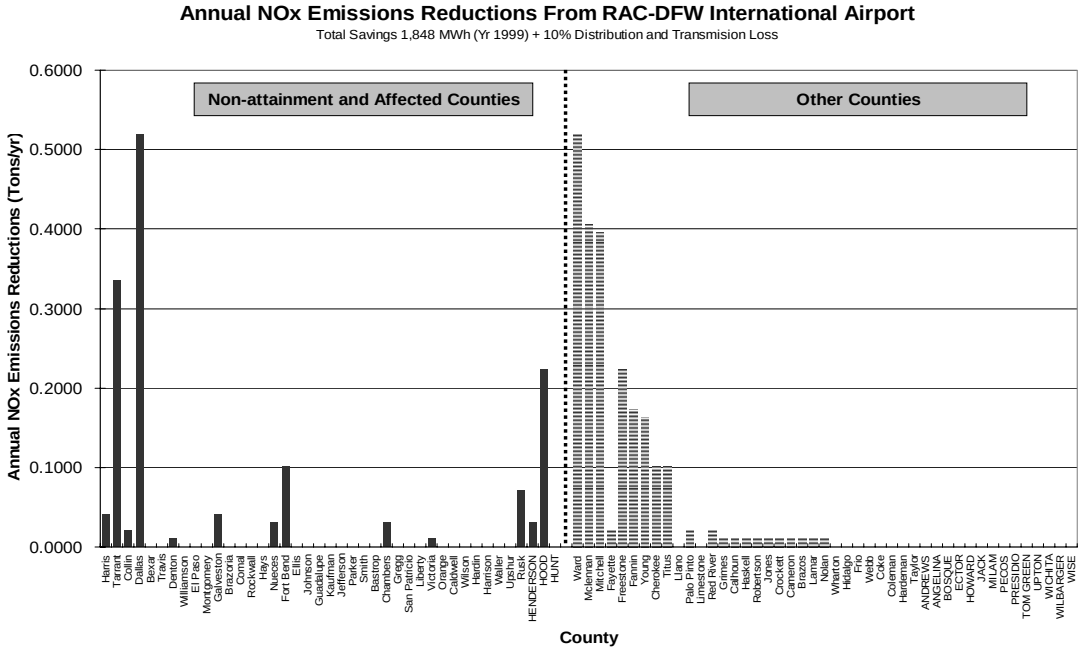


Figure 32: Annual NO_x emissions reduction on the Rent-a-Car facility of the Dallas-Fort Worth International Airport based on 1999 weather data from Continuous Commissioning® measures (1999 eGRID).

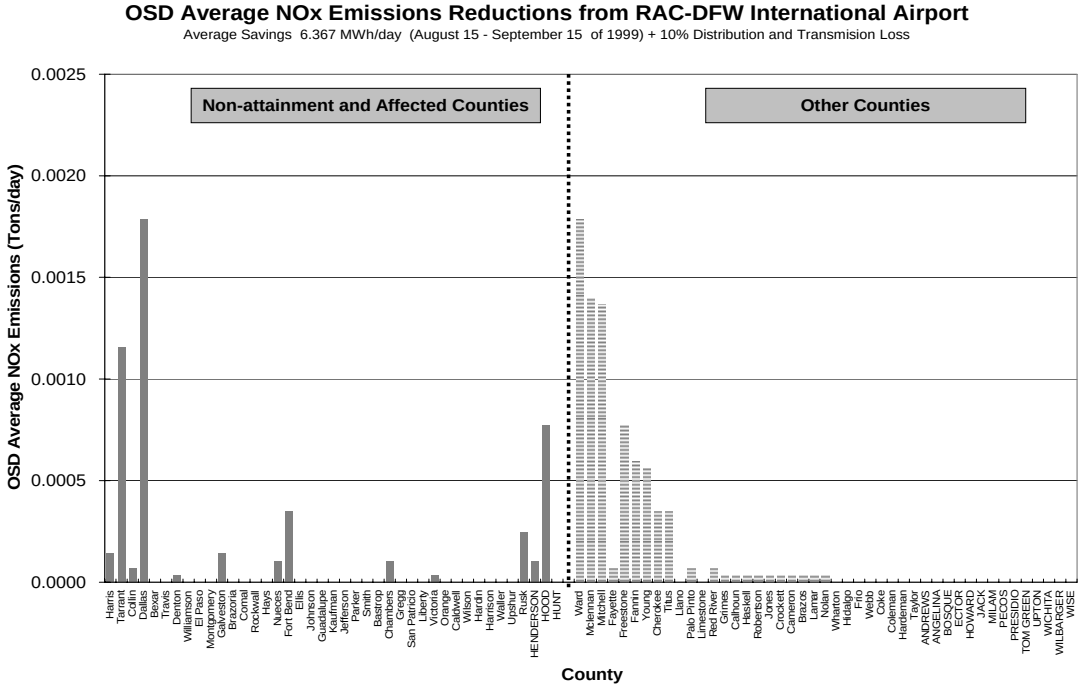


Figure 33: OSD period NO_x emissions reduction on the Rent-a-Car facility of the Dallas-Fort Worth International Airport based on 1999 weather data from Continuous Commissioning® measures during the OSD period of July 15 thru September 15, 1999 (1999 eGRID).

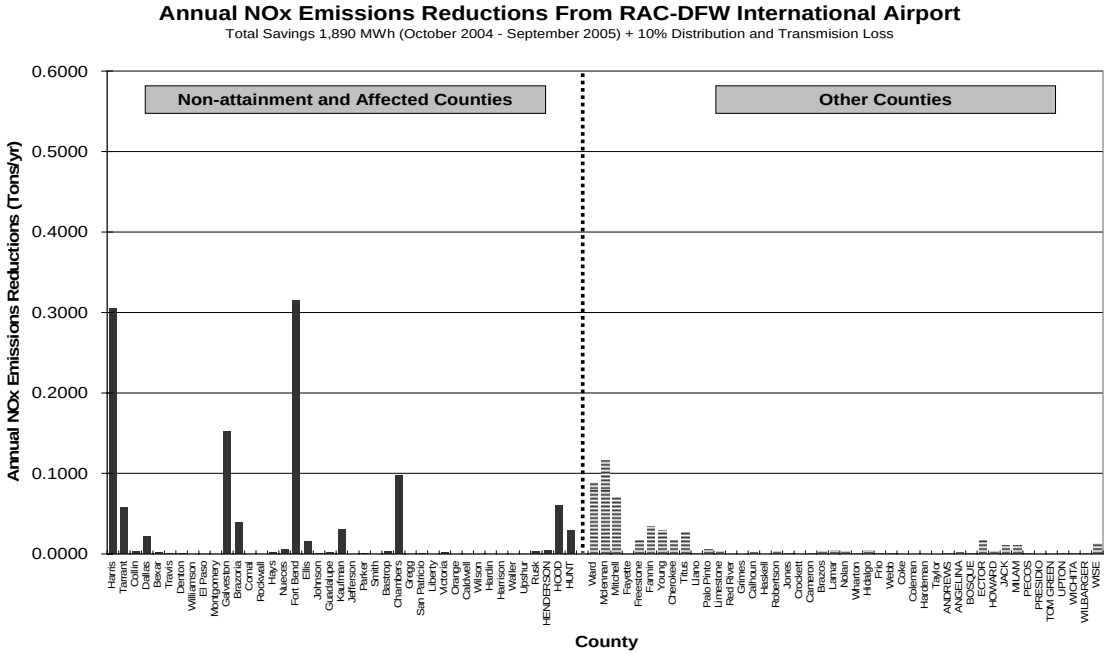


Figure 34: Annual NO_x emissions reduction on the Rent-a-Car facility of the Dallas-Fort Worth International Airport based on 2005 weather data (10/2004–9/2005) from Continuous Commissioning® measures (2007 eGRID).

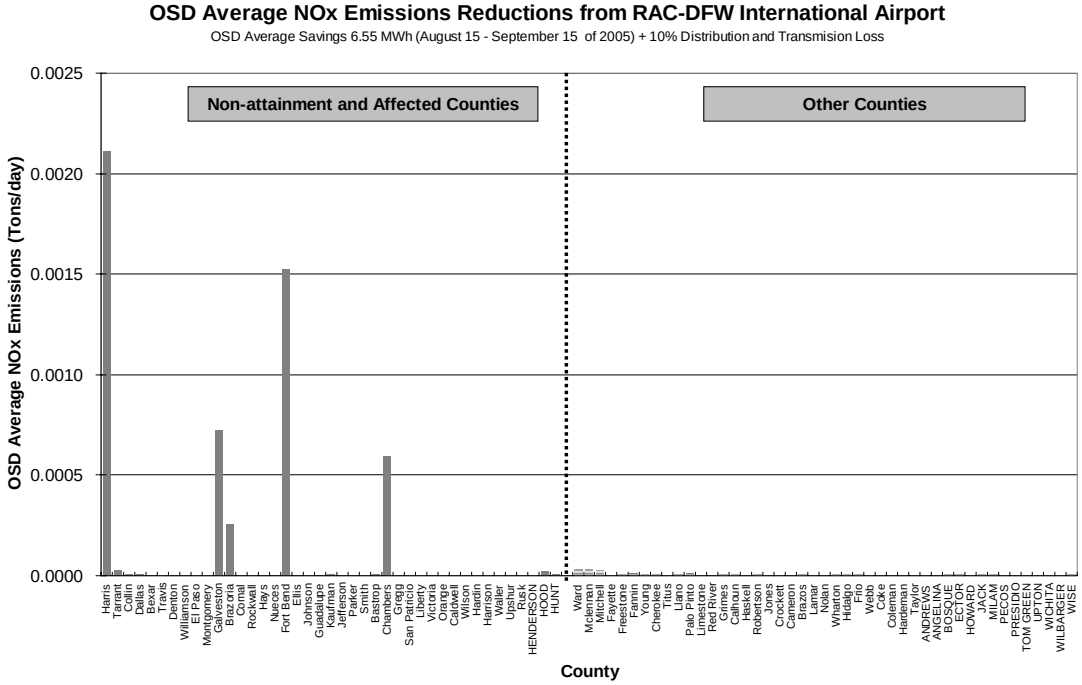


Figure 35: OSD period NO_x emissions reduction on the Rent-a-Car facility of the Dallas-Fort Worth International Airport based on 2005 weather data (10/2004–9/2005) from Continuous Commissioning® measures during the OSD period of July 15 thru September 15, 2005 (2007 eGRID).

5.2.16 Calculated Emissions Reductions from Pilot Light Elimination in Furnace Replacements.

At the request of the TCEQ the Laboratory analyzed the NOx emissions reductions from the elimination of pilot lights in residences where the gas-fired furnaces were replaced with new high-efficiency furnaces that contained electronic ignition. To accomplish this analysis several furnace manufacturers were contacted to ascertain when the pilot lights had been eliminated from residential furnaces (Table 11). From these interviews it was determined that 1995 was the year that all new furnaces that were manufactured were equipped with electronic ignition to meet the new AFUE standards.

Next the number of housing units and the growth rate were determined from U.S. Census data for Texas (Table 15, Figure 36). This information was then combined with information about the Btu consumption of an average pilot light and NOx levels from the combustion of natural gas (Table 14). Calculations for the years 2001 through 2010 were then performed in an Excel spreadsheet that included a panel that contained the variables that the TCEQ could use to vary the input parameters to meet their policy requirements (Table 16).

Using the parameters shown in Table 16, the analysis shows that the NOx emissions reduction to be expected from furnace replacements began in 2001 and increased to 0.4 tons/NOx per Ozone Season Day (OSD) by 2006. From 2006 through 2020 the savings remain flat because it was assumed that most furnaces in the state had been replaced in the 10-year period beginning in 1995 as shown in Figure 37.

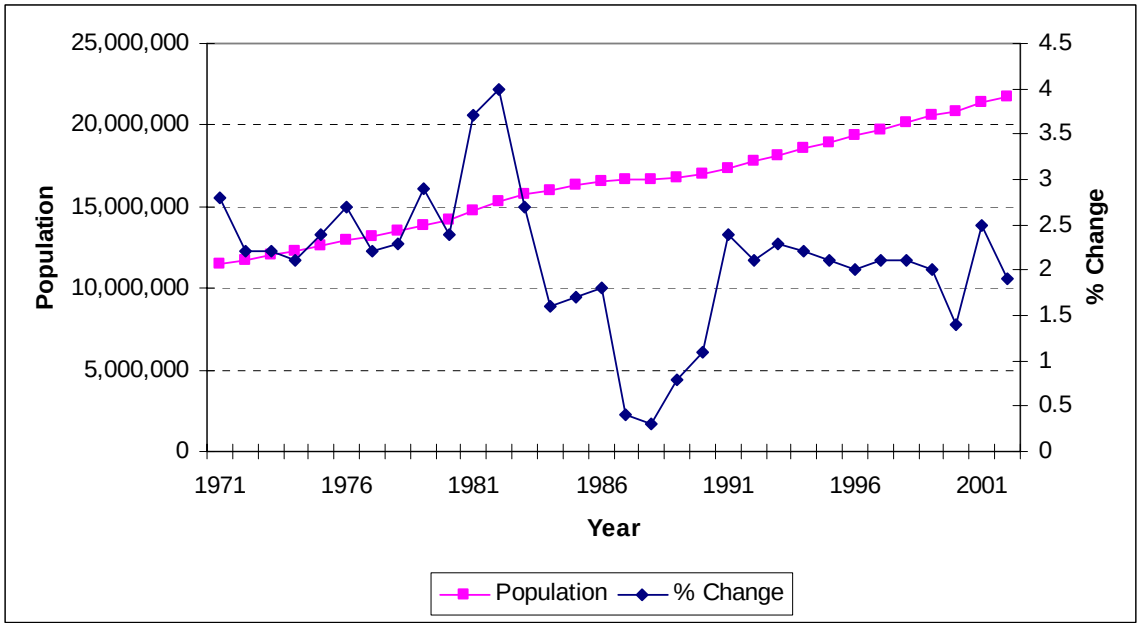


Figure 36: Average Texas Population Growth Rate Used for Furnace Analysis.

Table 13: Reference Information for Residential Furnaces.

References for Calculating NOx Emission for Pilot Lights for Gas Furnace

3.1 Percent of Number of Heating Systems Per House

From NAHB National Association of Home Builder (NAHB) Research Center (2000) The Builder Practices Survey Reports, 400

CENTRAL HEATING SYSTEMS PER HOUSE / ZONING

Dwellings	East Texas	West Texas
One unit, one zone	91.03%	54.43%
One unit, multiple zones	1.99%	4.82%
Two units	3.82%	34.07%
Three or more units	3.16%	6.68%
TOTAL	100.00%	100.00%
The calculated no. of furnace per house is		1.29

3.2 Lifetime of Furnace

18 yrs	1997 Housing Facts, Figures and Trends" published by the National Association of Home Builders (NAHB) http://www.buildithomeplans.com/buildit/lifespans.htm
8-12 yrs	Freddie Mac http://www.freddiemac.com/sell/consumerkit/english/310eng.htm
20 Yrs	The Life Expectancy/Replacement Picture, Appliance Magazine, 2001, 58(9)
10 Yrs	James Mullen, Lennox Industries, personal communication, 9/2005.
20 Yrs' warranty on heat exchanger	Roger Stuksa, Trane, personal communication, 11/2005

3.3 Timeline for change to electronic ignition

1995 - all new furn w/elec.	James Mullen, Lennox Industries, personal communication, 9/2005.
Around 1995 - all new furnace w/elec.	Roger Stuksa, Trane, personal communication, 713-266-3900, 11/2005

Table 14: Reference Information for Pilot Lights for Residential Furnace Calculations.

References for Calculating NOx Emission for Pilot Lights for Domestic Water Heater

(1) Pilot Lights

	Unit	Value	References
NOx Emission	lb NOx/MMBtu NG	0.248	Environmental Costs of Electricity, Richard L. Ottinger, 1991[1]
		0.092	EPA AP42 Project, 2003, for residential furnace (uncontrolled) - heat input < 0.3 MMBtu/hr (All emissions factors were updated based on 482 data points taken from 151 source tests in 1998).[2] *http://www.epa.gov/ttn/chief/ap42/ap42supp.html*
		0.036	TRNCC, Chapter 117 - Control of Air Pollution from Nitrogen Compounds, Rule Log No. 2000-011H-117-AI[3]
Pilot Lights NG Input	Btu/hr	800	LBL (1981) DOE-2 Reference Manual Version 2.1A. LBL-8706 Rev. 1. Berkeley, CA: Lawrence Berkeley Laboratory and Los Alamos Scientific Laboratory, Page IV.86 and IV. 252.
		400	California Energy Comission Appliance Database for Small Gas Instantaneous Water Heater Certified to CEC, 2003, *www.energy.ca.gov/appliances/appliance/excel_based_files*
		200-800	California Energy Comission - Residential Manual for Compliance with the 2001 Energy Efficiency Standards, 2001, *http://www.energy.ca.gov/title24/residential_manual/res_manual_2001.PDF*
		650	IAC Audit Report, Colorado State University, *http://www.engr.colostate.edu/IAC/word/pilotlts.doc*
		1000	Information on Hearth Fuels and Hearth Products, *http://www.hearth.com/what/specific.html*
		1020	Energy Management Opportunities, Manohar Kulkarni, 1998, in the website of Rebuild Carbondale - A Rebuild America Partnership, *http://howard.engr.siu.edu/rebuild/Resources-Links/Energy%20Management%20Opportunities.htm*

Pilot light NG input (But/hr) that is used in the report: ***500***

Note:

1. Environmental Costs of Electricity, Richard L. Ottinger, 1991
   Page 361, 362: Chap VI. EXTERNAL COSTS BY RESOURCE, C. NATURAL GAS PLANT OPERATIONS
   Originally referenced by PLC (1989)
   PLC (1989) Chernick, P. and E. Caverhill, The Valuation of Externalities from Energy Production, Delivery, and Use (for Boston Gas Co., Boston, Mass), December 22, 1989.

Externality	$/lb	Existing Steam Plant (lbs/MMBTU)	Combined Cycle (lbs/MMBTU)	BACT (SCR, SWI) (lbs/MMBTU)
NOx	$0.82	**0.248**	0.42	0.042

2.EPA AP-42 Project, Section 1.4: Natural Gas Combustion Data Files, 2003

Table - Emission Factors for Nitrogen Oxide (NOx) from Natural Gas Combustion

Combustor Type (MMBtu/hr Heat Input) [SCC]	NOx		
	Emission Factor ($lb/10^6$ scf)	Emission Factor (lb/MMBtu)	Emission Factor Rating
Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01]			
Uncontrolled (Pre-NSPS)	280	0.275	A
Uncontrolled (Post-NSPS)	190	0.186	A
Controlled - Low NOx burners	140	0.137	A
Controlled - Flue gas recirculation	100	0.098	D
Small Boilers (<100) [1-01-006-02, 1-02-006-02, 1-03-006-02, 1-03-006-03]			
Uncontrolled	100	0.098	B
Controlled - Low NOx burners	50	0.049	D
Controlled - Low NOx burners/Flue gas recirculation	32	0.031	C
Tangential-Fired Boilers (All Sizes) [1-01-006-04]			
Uncontrolled	170	0.167	A
Controlled - Flue gas recirculation	76	0.075	D
Residential Furnaces (<0.3) [No SCC]			
Uncontrolled	94	**0.092**	B

3. TRNCC, Chapter 117 - Control of Air Pollution from Nitrogen Compounds, Rule Log No. 2000-011H-117-AI

Table - Emission Limits Proposed for Fired Units

Fired Unit	NOx Emission Limit (lbs NOx/MMBtu)	Approximate Emissions Limit, ppmv
Fired Heaters > 100 MMBtu/hr	0.01	8
Fired Heaters 40 to 100 MMBtu/hr	0.015	12
Fired Heaters < 40 MMBtu/hr	**0.036**	30
Gas Turbines	0.015	4 to 6
FCCU CO Boilers	10 ppmv	20
Incinerators	90 % Reduction	-
Dryers	91 % Reduction	-
Flares	No Reduction Required	-
Sulfur Plants	No Reduction Required	-

Table 15: Reference Information for Housing Units and Annual Population Estimates.

References for Calculating NOx Emission for Pilot Lights for Domestic Water Heater

(2) Housing Units in Texas

Housing Type		2000 (US Census Bureau) # of Units[1]	2000 Total Units	2000 Percent	2002 (Estimated by ESL) Popul.Growth Rate (Apr 00 to Dec 02)	2002 # of Units	References
Single-Family (SF)	1-unit, detached	5,171,892	5,171,892	63.4%	5.27%	5,444,342	1. Census 2000 housing information for the State of Texas, US Census Bureau, 2000 http://quickfacts.census.gov/qfd/states/48000lk.html 2. Annual Population Estimates by States, US Census Bureau, 2002, http://eire.census.gov/popest/data/states/tables/ST-EST2002-01.php
MultiFamily (MF)	1-unit, attached	249,018	2,219,718	27.2%		2,336,650	
	2 units	170,679					
	3 or 4 units	272,988					
	5-9 units	356,073					
	10-19 units	351,859					
	20 or more units	819,101					
Mobile Home (MH)		731,652	731,652	9.0%		770,195	
Boat, RV, van, etc		34,313	34,313	0.4%		36,121	
Total			8,157,575	100.0%		8,587,308	
Total (SF, MF, MH)			*8,123,262*	99.6%		*8,551,187*	

No. of Housing Units that is used in the report: *8,830,503*

Annual Population Estimates for Texas

State	1-Dec-02	1-Jul-02	1-Jul-01	1-Jul-00	1-Apr-00	Census 2000
	Estimated by ESL	Values from US Census Bureau				
Texas Population	21,950,272	21,779,893	21,370,983	20,955,248	20,851,812	20,851,820

State	Jul 01 to Apr 00	Jul 02 to Jul 01	Dec 02 to Census 2000
Texas Population Growth Rate	2.49%	1.91%	5.27%

Table 16: Input Paramters for Residential Furnace Pilot Light Replacement Analysis.

Parameters:

1	Btu/h per Pilot Light (I)	500.0
2	Percent Furnace Using NG (J)	59.7%
3	Percent NG Furnace w/ Pilot Light (K)	20.0%
4	lb NOx/MMBtu-NG (L)	0.092
5	Hrs/year Burning (M)	8760
6	Remaining years for P.L. replacement (P)	5.0
7	Percent of Housing Growth Rate (Q)	0.0%
8	Percent of Furnaces Turned Off During OSD	25.0%
9	Include 2001 (Sept. through Dec.) Savings	Yes

Assumptions:

1	No. of Furnace per Housing Unit (MF, SF, or MH) (N) =	1.0
2	% of Furnace Using NG is the same for SF, MF, and MH	
3	All new N.G. Furnaces from new houses have no pilot light	
4	Each unit in Multifamily Residences has its own furnace	

Notes:

1	Life of Furnace can be estimated from "Furnace" tab
2	To view the impact only from the replacement of furnaces, set 7 "Percent of Housing Growth Rate" to 0%
3	To view the impact only from the new houses, set 6 "Life of Furnce" to 1000
4	The percentage of furnaces turned off during OSD can be controlled in 8 "Percent of Furnaces Turned off during OSD"

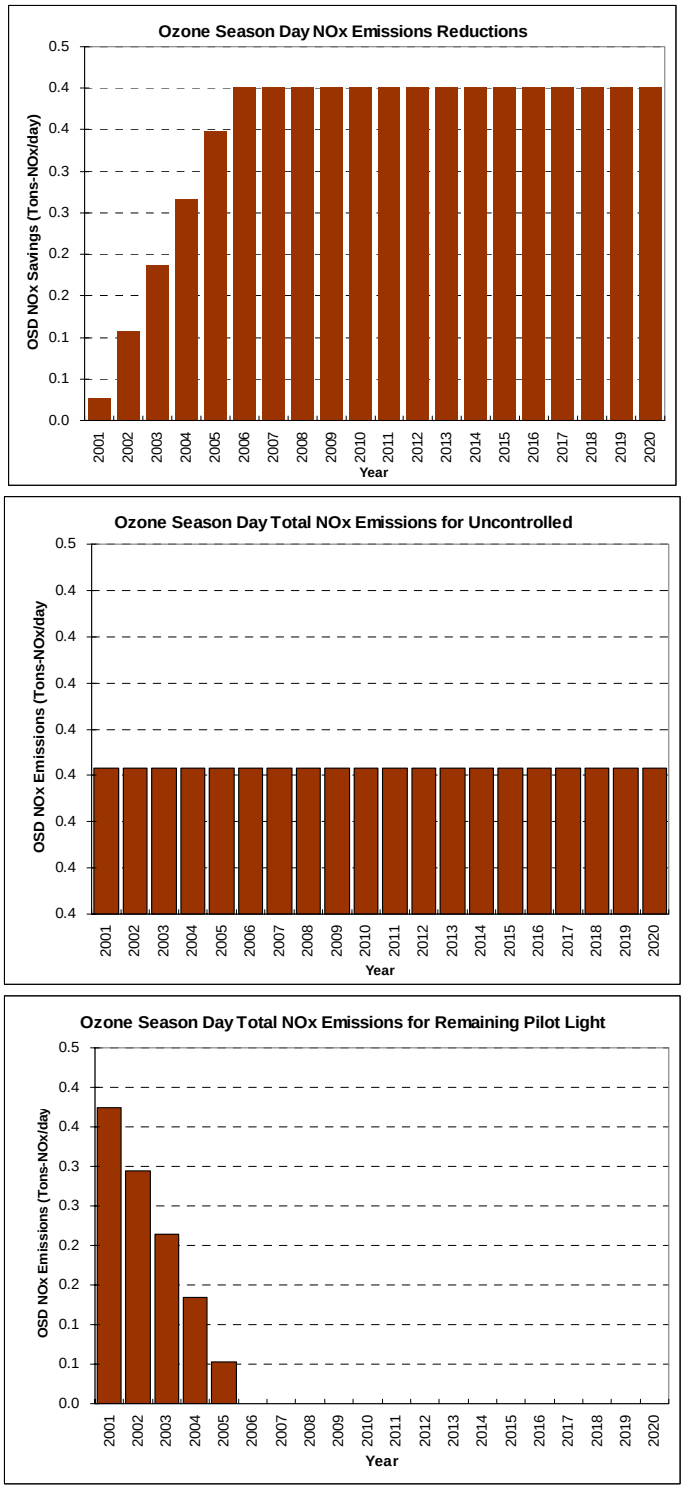


Figure 37: NOx Emissions Reductions from Furnace Replacements (2001 to 2020).

5.2.17 Calculated Emissions Reductions from Pilot Light Elimination in Domestic Water Heaters (DHW).

At the request of the TCEQ, the 2004 DHW Pilot Light analysis was updated and re-evaluated to determine the NOx reductions from the application to new and new/existing construction. In a similar fashion as the calculation of NOx reductions from furnace replacements, the average population growth rate was determined from U.S. Census data (Figure 38, Table 20). This information was then combined with information about the number of households that used natural gas (Table 17), as well as information from a survey of DHW manufacturers to determine how many of the manufacturers had electronic ignition (Table 18), and information regarding the NOx emissions rates from pilot lights (Table 19).

This analysis was then delivered to the TCEQ in the form of a spreadsheet that contained calculations for the years 2005 to 2020, and included the variable input parameters shown in Table 21. Using the parameters shown in Table 21 the results of the analysis showed that if all standing pilot lights could be eliminated in domestic water heaters in new and existing construction, by 2020, the NOx elimination would reach 3.5 tons-NOx/OSD. If standing pilot lights could be eliminated in new domestic water heaters the analysis showed that the NOx elimination would reach about 1.25 tons-NOx/OSD.

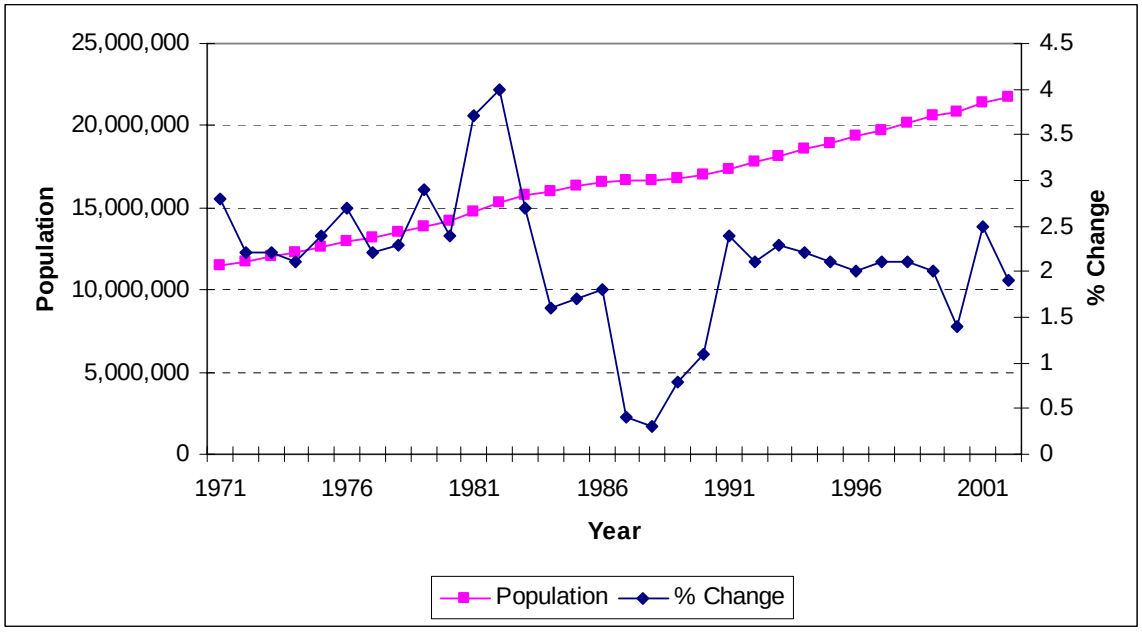


Figure 38: Average Texas Population Growth Rate Used for DHW Analysis.

Table 17: Reference Information Regarding the Households Using Natural Gas for DHW.

References for Calculating NOx Emission for Pilot Lights for Domestic Water Heater

(3) Domestic Water Heater Information in Texas

3.1 Percent of Housing Units Using Gas-Fired Water Heater

From NAHB

Water Heater Fuel		Gas (%)	Electric (%)	Oil (%)	No Answer	References
Single-Family	East Texas	**43.2**	11.4	0	45.4	National Association of Home Builder (NAHB) Research Center (2000) The Builder Practices Survey Reports, 400 Princeton George's Boulevard Upper Marlboro, Maryland 20774
	West Texas	**51.6**	7.6	0	40.8	
MultiFamily	West-South Central	**17.6**	35.5	0	46.9	

From RECS

Water Heater Fuel	Total Households (Million)	Households with Water Heating		No. Of Households with Water Heating, Major Fuels used (Million)				References
		Number (Million)	%	with Ele.	%	with NG	%	
Texas	7.7	7.6	98.7	3	**39.0**	4.6	**59.7**	Residential Energy Consumption Surveys, 2001 Consumption and Expenditures Tables, Water-Heating Consumption Tables, *ftp://ftp.eia.doe.gov/pub/consumption/residential/2001ce_tables/waterheat_consump.pdf*
US Total	107	106.9	99.9	41.6	**38.9**	58.2	**54.4**	
US Single-Family	73.7	73.6	99.9	25.9	**35.1**	42.8	**58.1**	
US Multifamily (2-4 units)	9.5	9.5	100.0	3.4	**35.8**	5.7	**60.0**	
US Multifamily (>5 units)	17	17	100.0	7.4	**43.5**	8.2	**48.2**	
US Multifamily Total	26.5	26.5	100.0	10.8	**40.8**	13.9	**52.5**	

From GAMA

Water Heater Fuel	Total Models	Natural Gas *	Natural or Propane Gas	Propane Gas	Oil	Electric	References
Percentage (%)	2488	**34**	12	23	1	30	Gas Appliance Manufacturers Association (GAMA), 2003, *http://www.gamanet.org/consumer/certification/certdir.htm*

* Of 855 natural gas models, 84 models (**9.8%**) have no pilot lights (i.e., electronic ignition)

Table 18: Reference Information from Survey of Water Heater Manufacturers.

3.2 # of Manufactures Making Hot Surface Ignitor

* Of 855 natural gas models, 84 models (**9.8%**) have no pilot lights (i.e., electronic ignition) — From GAMA, April 03

* Of 14 large water heater manuafactuers, 9 make water heaters with hot surface ignitors (84 models) — From GAMA, April 03

Section	Manufacturer Name	Having Models with Electronic Ignition
1	A. O. SMITH WATER PRODUCTS CO.	Yes
2	AMERICAN WATER HEATER COMPANY	No
3	APOLLO COMFORT PRODUCTS	Yes
4	BRADFORD WHITE CORPORATION	Yes
5	GSW WATER HEATING COMPANY	No
6	LOCHINVAR WATER HEATER CORPORATION	Yes
7	MAYTAG	Yes
8	RELIANCE WATER HEATER COMPANY	Yes
9	RHEEM MFG. CO., WATER HEATER DIVISION	Yes
10	RICHMOND WATER HEATERS	No
11	RUUD WATER HEATER DIVISION	Yes
12	SEARS, ROEBUCK AND COMPANY	No
13	STATE INDUSTRIES, INC.	Yes
14	U.S. CRAFTMASTER WATER HEATERS	No

3.3 Lifetime of Water Heater

6-12 yrs	John, Lowe's, Bryan, Texas, (979) 774-4141
12-15 yrs	Thomas, Lowe's, Houston, Texas, (713) 426-6300
10-16 yrs	George, Home Depot, College Station, Texas, (979) 595-1188
10 yrs	Dan Major, A.O. Smith Water Product Co., 1-800-527-1953 ext 4040
9-12 yrs	American Water Heater Company, 1-800-937-1037
10 yrs	Paul, Bradford White Corporation, 1-800-334-3393
10-12 yrs	http://www.stateind.com/index.htm, State Industries Inc.

3.4 Size of Residential Water Heater (2500 ft2)

40 Gallon	John, Lowe's, Bryan, Texas, (979) 774-4141
50 Gallon	Thomas, Lowe's, Houston, Texas, (713) 426-6300
50 Gallon	George, Home Depot, College Station, Texas, (979) 595-1188
40-50 Gallon	Dan Major, A.O. Smith Water Product Co., 1-800-527-1953 ext 4040

3.5 Additional Cost for Hot Surface Ignitor Gas-Fired Water Heater

$50-$200 depending on other features	Thomas, Lowe's, Houston, Texas, (713) 426-6300
$125 (high end) depending on other features	George, Home Depot, College Station, Texas, (979) 595-1188
10% increase in price, $3 less in yearly operating cost	Dan Major, A.O. Smith Water Product Co., 1-800-527-1953 ext 4040
no significant difference	Bill, Hou-Tra International, Manufacturer Representative of Lochinvar Water Heater Corporation, (713) 644-9296
$60 (obsolete style)	Andy, FERGUSON ENT 434 , Houston, TX 77075, (713) 987-0990, Distributor of State Industries, Inc
no significant difference	http://www.sears.com, 1-800-877-6420

Table 19: Reference Information for NOx Emissions from DHW Pilot Lights.

References for Calculating NOx Emission for Pilot Lights for Domestic Water Heater

(1) Pilot Lights

	Unit	Value	References
NOx Emission	lb NOx/MMBtu NG	0.248	Environmental Costs of Electricity, Richard L. Ottinger, 1991[1]
		0.092	EPA AP42 Project, 2003, for residential furnace (uncontrolled) - heat input < 0.3 MMBtu/hr (All emissions factors were updated based on 482 data points taken from 151 source tests in 1998).[2] *http://www.epa.gov/ttn/chief/ap42/ap42supp.html*
		0.036	TRNCC, Chapter 117 - Control of Air Pollution from Nitrogen Compounds, Rule Log No. 2000-011H-117-AI[3]
Pilot Lights NG Input	Btu/hr	800	LBL (1981) DOE-2 Reference Manual Version 2.1A. LBL-8706 Rev. 1. Berkeley, CA: Lawrence Berkeley Laboratory and Los Alamos Scientific Laboratory, Page IV.86 and IV. 252.
		400	California Energy Comission Appliance Database for Small Gas Instantaneous Water Heater Certified to CEC, 2003, *www.energy.ca.gov/appliances/appliance/excel_based_files*
		200-800	California Energy Comission - Residential Manual for Compliance with the 2001 Energy Efficiency Standards, 2001, *http://www.energy.ca.gov/title24/residential_manual/res_manual_2001.PDF*
		650	IAC Audit Report, Colorado State University, *http://www.engr.colostate.edu/IAC/word/pilotlts.doc*
		1000	Information on Hearth Fuels and Hearth Products, *http://www.hearth.com/what/specific.html*
		1020	Energy Management Opportunities, Manohar Kulkarni, 1998, in the website of Rebuild Carbondale - A Rebuild America Partnership, *http://howard.engr.siu.edu/rebuild/Resources-Links/Energy%20Management%20Opportunities.htm*

Pilot light NG input (But/hr) that is used in the report: ***500***

Note:

1. Environmental Costs of Electricity, Richard L. Ottinger, 1991
   Page 361, 362: Chap VI. EXTERNAL COSTS BY RESOURCE, C. NATURAL GAS PLANT OPERATIONS
   Originally referenced by PLC (1989)
   PLC (1989) Chernick, P. and E. Caverhill, The Valuation of Externalities from Energy Production, Delivery, and Use (for Boston Gas Co., Boston, Mass), December 22, 1989.

Externality	$/lb	Existing Steam Plant (lbs/MMBTU)	Combined Cycle (lbs/MMBTU)	BACT (SCR, SWI) (lbs/MMBTU)
NOx	$0.82	**0.248**	0.42	0.042

2.EPA AP-42 Project, Section 1.4: Natural Gas Combustion Data Files, 2003

Table - Emission Factors for Nitrogen Oxide (NOx) from Natural Gas Combustion

Combustor Type (MMBtu/hr Heat Input) [SCC]	NOx		
	Emission Factor ($lb/10^6$ scf)	Emission Factor (lb/MMBtu)	Emission Factor Rating
Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01]			
Uncontrolled (Pre-NSPS)	280	0.275	A
Uncontrolled (Post-NSPS)	190	0.186	A
Controlled - Low NOx burners	140	0.137	A
Controlled - Flue gas recirculation	100	0.098	D
Small Boilers (<100) [1-01-006-02, 1-02-006-02, 1-03-006-02, 1-03-006-03]			
Uncontrolled	100	0.098	B
Controlled - Low NOx burners	50	0.049	D
Controlled - Low NOx burners/Flue gas recirculation	32	0.031	C
Tangential-Fired Boilers (All Sizes) [1-01-006-04]			
Uncontrolled	170	0.167	A
Controlled - Flue gas recirculation	76	0.075	D
Residential Furnaces (<0.3) [No SCC]			
Uncontrolled	94	**0.092**	B

3. TRNCC, Chapter 117 - Control of Air Pollution from Nitrogen Compounds, Rule Log No. 2000-011H-117-AI

Table - Emission Limits Proposed for Fired Units

Fired Unit	NOx Emission Limit (lbs NOx/MMBtu)	Approximate Emissions Limit, ppmv
Fired Heaters > 100 MMBtu/hr	0.01	8
Fired Heaters 40 to 100 MMBtu/hr	0.015	12
Fired Heaters < 40 MMBtu/hr	**0.036**	30
Gas Turbines	0.015	4 to 6
FCCU CO Boilers	10 ppmv	20
Incinerators	90 % Reduction	-
Dryers	91 % Reduction	-
Flares	No Reduction Required	-
Sulfur Plants	No Reduction Required	-

Table 20: Reference Information for Housing Units in Texas.

References for Calculating NOx Emission for Pilot Lights for Domestic Water Heater

(2) Housing Units in Texas

Housing Type		2000 (US Census Bureau) # of Units[1]	2000 (US Census Bureau) Total Units	2000 (US Census Bureau) Percent	2002 (Estimated by ESL) Popul.Growth Rate (Apr 00 to Dec 02)	2002 (Estimated by ESL) # of Units	References
Single-Family (SF)	1-unit, detached	5,171,892	5,171,892	63.4%		5,444,342	
MultiFamily (MF)	1-unit, attached	249,018	2,219,718	27.2%	5.27%	2,336,650	1. Census 2000 housing information for the State of Texas, US Census Bureau, 2000 http://quickfacts.census.gov/qfd/states/48000lk.html 2. Annual Population Estimates by States, US Census Bureau, 2002, http://eire.census.gov/popest/data/states/tables/ST-EST2002-01.php
	2 units	170,679					
	3 or 4 units	272,988					
	5-9 units	356,073					
	10-19 units	351,859					
	20 or more units	819,101					
Mobile Home (MH)		731,652	731,652	9.0%		770,195	
Boat, RV, van, etc		34,313	34,313	0.4%		36,121	
Total			8,157,575	100.0%		8,587,308	
Total (SF, MF, MH)			*8,123,262*	99.6%		*8,551,187*	

No. of Housing Units that is used in the report: *8,830,503*

Annual Population Estimates for Texas

State	1-Dec-02	1-Jul-02	1-Jul-01	1-Jul-00	1-Apr-00	Census 2000
	Estimated by ESL	Values from US Census Bureau				
Texas Population	21,950,272	21,779,893	21,370,983	20,955,248	20,851,812	20,851,820

State	Jul 01 to Apr 00	Jul 02 to Jul 01	Dec 02 to Census 2000
Texas Population Growth Rate	2.49%	1.91%	5.27%

Table 21: Input Paramters for Pilot Light Elimination in DHW.

Parameters:

1	Btu/h per Pilot Light (I)	500.0
2	Percent DHW Using NG (J)	59.7%
3	Percent NG DHW w/ Pilot Light (K)	100.0%
4	lb NOx/MMBtu-NG (L)	0.092
5	Hrs/year Burning (M)	8760
6	Life of DHW (P)	10.0
7	Percent of Housing Growth Rate (Q)	2.0%

Assumptions:

1	No. of DHW per Housing Unit (MF, SF, or MH) (N) =	1.0
2	% of DHW Using NG is the same for SF, MF, and MH	

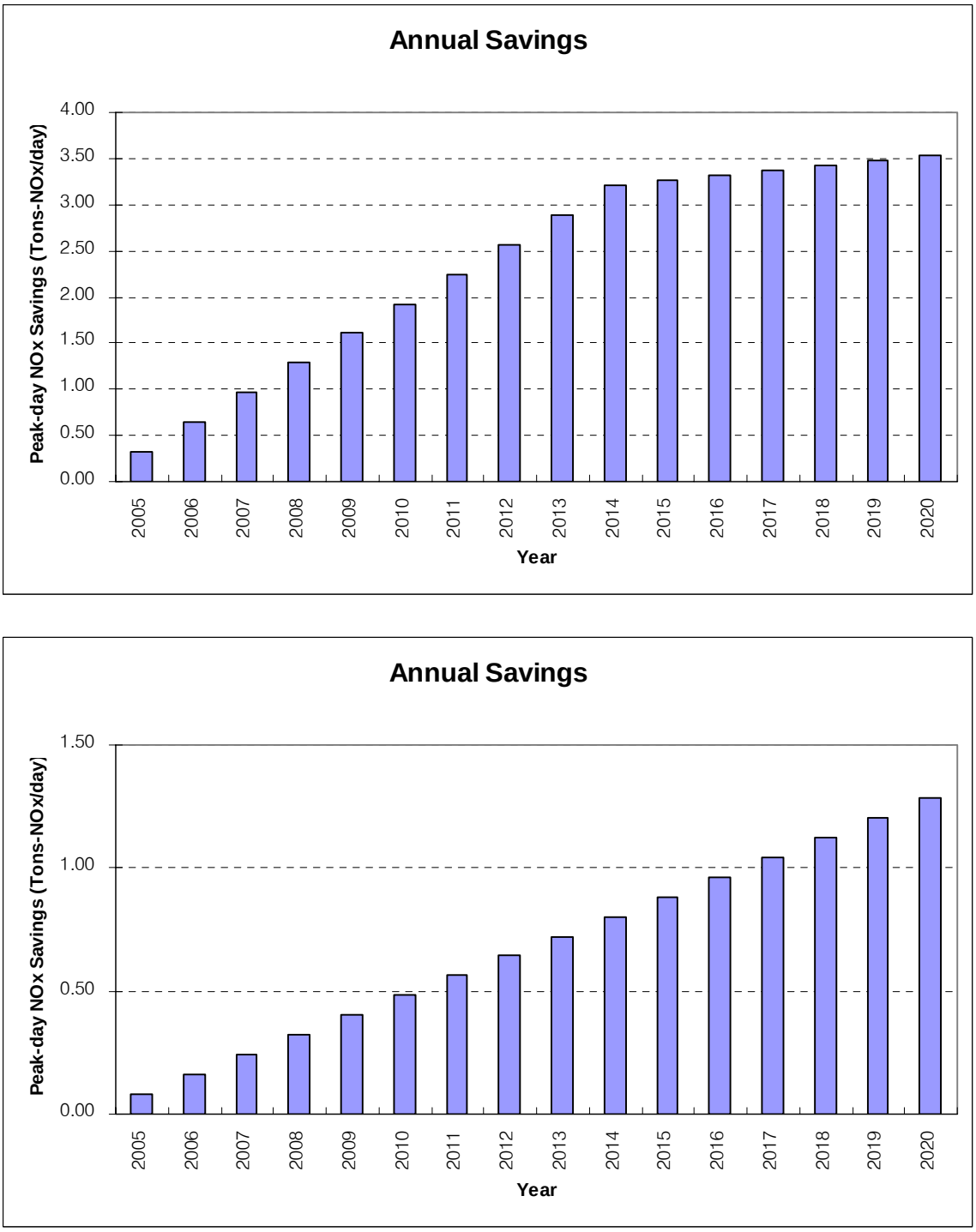


Figure 39: NOx Emissions Reductions from Pilot Light Elimination in DHW (2005 to 2020). Upper graph shows savings for all residences. Lower graph shows savings for new construction only.

5.2.18 Review of Local Amendments

In 2005 the Laboratory received several requests for a review of Local Amendments from the North Central Texas COG. These requests include the analysis of 15% above code and issues related to NOx elimination from pilot lights in residential water heaters and furnaces, which are described in the related sections of this report.

6 CALCULATED NOx REDUCTION POTENTIAL FROM IMPLEMENTATION OF THE IECC / IRC

6.1 Calculated 2005 Electricity and Natural Gas Savings Due to the Implementation of the IECC / IRC to New Residential Construction (Single-family and Multi-family), and Commercial Buildings Using Code-traceable, Fuel-Neutral Simulation.

A complete reporting of the savings from the implementation of the IECC / IRC requires tracking and analyzing savings to new construction and construction activity to existing buildings that undergoes a building permit. Adoption of the IECC / IRC is expected to impact the following types of buildings:

- single-family residential
- multi-family residential
- commercial buildings
- industrial buildings
- renewables

Adoption of the IECC / IRC is also expected to impact construction activity in existing buildings that undergoes a building permit. Such activity would impact the following types of buildings:

- single-family residential
- multi-family residential
- commercial buildings
- industrial buildings
- renewables

The following sections report calculations of the energy savings associated only with new construction activity in new residences (i.e., single-family and multi-family), and commercial construction. Calculation of energy savings adoption of the IECC / IRC in industrial building and renewables is currently under development at the Laboratory, and will be reported in future reports.

In this year's report, savings calculations were substantially enhanced over the 2004 calculations. These enhancements include: (single family) a modification to the second floor space position error for slab-on-grade-house, modification to the floor-weight for the garage, modification to the height of the garage, repositioning of the garage, modification to the width of the interior floor over the crawl space, modification to the DHW part-load curve and standby losses, (multi-family) DHW part-load curve and standby losses, and modifications to the ground and sky form factors.

This year's report is also updated to include more precise NAHB data, as shown in Figure 40, which include: type of foundation, number of stories, fuel option, etc. In addition, in 2004, the percentages for East Texas were used for both East and West Texas. For 2005 annual report, the percentages for both East and West Texas were updated using the new NAHB data. Also, in the 2005 report, the actual number of building permits for 2004 was used to predict the permits for 2005.

2004

East & West Texas

		Fuel Option			Total
		1	2	3	
		Elec. cooling, NG	All electricity	Elec. cooling, Heat	
		77.1%	18.9%	4.0%	
Slab-on-grade (94.6%)	1-Story (59%)	43.00%	10.60%	2.20%	55.80%
	2-Story (41%)	29.90%	7.30%	1.60%	38.80%
Crawl spaces (5.4%)	1-Story (59%)	2.50%	0.60%	0.10%	3.20%
	2-Story (41%)	1.70%	0.40%	0.10%	2.20%
Total		77.10%	18.90%	4.00%	100.00%

2005

East Texas

		Fuel Option			Total
		1	2	3	
		Elec. cooling, NG	All electricity	Elec. cooling, Heat	
		77.1%	18.9%	4.0%	
Slab-on-grade (93.6%)	1-Story (59.8%)	43.16%	10.58%	2.24%	55.97%
	2-Story (40.2%)	29.01%	7.11%	1.51%	37.63%
Crawl spaces (6.4%)	1-Story (59.8%)	2.95%	0.72%	0.15%	3.83%
	2-Story (39.2%)	1.98%	0.49%	0.10%	2.57%
Total		77.10%	18.90%	4.00%	100.00%

West Texas

		Fuel Option			Total
		1	2	3	
		Elec. cooling, NG	All electricity	Elec. cooling, Heat	
		84.1%	13.1%	2.8%	
Slab-on-grade (98.3%)	1-Story (45.5%)	37.61%	5.86%	1.25%	44.73%
	2-Story (54.5%)	45.06%	7.02%	1.50%	53.57%
Crawl spaces (1.7%)	1-Story (45.5%)	0.65%	0.10%	0.02%	0.77%
	2-Story (54.5%)	0.78%	0.12%	0.03%	0.93%
Total		84.10%	13.10%	2.80%	100.00%

Figure 40: Changes in NAHB Percentage Distribution for SF Homes from 2004 to 2005.

In 2004, the fixed peak-day (i.e., Aug 19) was used for all 41 non-attainment and affected counties to estimate the peak-day energy savings and the resultant NOx emissions reductions. In 2005, instead of the peak-day, the average Ozone Season Day (OSD) energy savings were used. The period of the OSD is from July 15 through August 15.

Finally, in 2004, only the 1999 eGRID was used to estimate the NOx emission reductions. Whereas, in 2005, the 2007 eGRID, which was newly obtained from EPA, was used for the NOx emission reduction calculation as well as 1999 eGRID. The results from the 1999 and 2007 eGRID are presented in this report.

In Table 22, using the new enhancements, the results of 2005 code and pre-code new-construction simulations are shown for single-family and multi-family residences (example for Bastrop county), which include 1-story or 2-story slab-on-grade construction and three different HVAC systems[32]. For each simulation, annual energy use and peak electricity use is shown for the Ozone Season Period[33]. On the right-hand side of the table, the savings are shown that represent the difference between the code and pre-code simulations for each housing type.

In Table 23, each of these simulations is distributed into one of nine different fuel-option/construction categories according to the NAHB builder's survey. For example, in Bastrop County, according to the NAHB, 77.1% of the single-family houses have central air conditioning, natural gas heating and water heating; 18.9% have electric resistance heating and water heating; and 4% have heat pump heating and electric water heating. These houses are distributed as 59% one story and 41% two story, 94.6% slab-on-grade, and 5.4% crawl space. The second group in Table 23 shows the number of houses according to the percent distributions, which represents the total number of houses in Bastrop County times the percent distributions in the upper box. The third and fourth groups show the pre-code and code-compliant energy use per house and total use for all new houses in the county. The fifth group shows the total county-wide savings from adoption of the 2001 IECC. The total electricity savings and natural gas savings from this fifth group are then entered into the appropriate cell in Table 28. Table 24 contains similar results for the peak Ozone Season Day (OSD) simulations.

In Table 22, the simulations are distributed into 24 different categories according to the NAHB's builder's survey for purposes of calculating peak-day electricity and natural gas savings. These categories include: precode, and code-compliant, slab-on-grade and crawl-space, fuel options #1, #2, and #3, and 1-story or 2-story.

Table 25 and Table 26 contain the simulation results for the new multi-family units built in Bastrop County, which are calculated in a similar fashion as the single-family residential savings and entered into Table 39.

[32] Fuel option #1 is a house with central air conditioning, and a natural gas-fired furnace and domestic water heater. Fuel option #2 is a house with central air conditioning, and electric resistance heating and domestic water heater. Fuel option #3 is a house with central air conditioning, and heat pump heating and electric resistance domestic water heater.

[33] The Ozone Season Day (OSD) for the 2004 report for the 1999 baseyear was August 19, 1999. For 2007 the OSD is the average daily savings for the period July 15 to September 15.

Table 22: 2005 Code and Pre-code Simulation Results for Individual Residence for Bastrop (Single Family and Multi-Family).

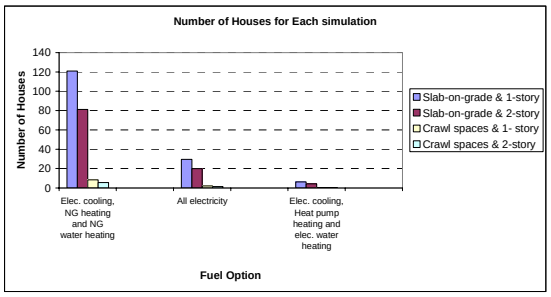
County	SF or MF	Precode or Code-compliant		Options	Simulation #	Annual Elec. (kWh/yr)	Annual NG (Therms/yr)	Avg. OSD Elec. (kWh/day) (Aug. 19)	Avg. OSD NG (Therm/day) (Aug. 19)	Total Annual (Elec. + NG) (MBtu)	Annual Elec.Savings (kWh/yr)	Annual NG Savings (Therms/yr)	Avg. OSD Elec. Savings (kWh/day) (Aug. 19)	Avg. OSD NG Savings (Therm/day) (Aug. 19)	Total Annual Savings (Elec. + NG) (MBtu)
Bastrop	SF	Precode	Slab-on-grade	Fuel Option 1	1-story	1	16122	366	70.1102	0.730761	91.63				
					2-story	2	15195	354	66.264	0.730761	87.31				
				Fuel Option 2	1-story	3	20906	0	78.604	0	71.35				
					2-story	4	19764	0	74.7579	0	67.45				
				Fuel Option 3	1-story	5	20670	0	78.604	0	70.55				
					2-story	6	19596	0	74.7579	0	66.88				
			Crawl Space	Fuel Option 1	1-story	7	16667	356	70.6667	0.730761	92.51				
					2-story	8	15953	345	66.8591	0.730761	88.98				
				Fuel Option 2	1-story	9	21282	0	79.1607	0	72.63				
					2-story	10	20367	0	75.3528	0	69.51				
				Fuel Option 3	1-story	11	21090	0	79.1607	0	71.98				
					2-story	12	20236	0	75.3528	0	69.07				
		Code - Compliant	Slab-on-grade	Fuel Option 1	1-story	13	13657	303	59.3257	0.610761	77.55	2,265	63	10.78	0.12	14.08
					2-story	14	13197	297	56.493	0.610761	74.71	1,998	57	9.77	0.12	12.60
				Fuel Option 2	1-story	15	18264	0	67.8195	0	62.33	2,642	0	10.78	0.00	9.02
					2-story	16	17502	0	64.9869	0	59.73	2,262	0	9.77	0.00	7.72
				Fuel Option 3	1-story	17	18163	0	67.8195	0	61.99	2,507	0	10.78	0.00	8.56
					2-story	18	17429	0	64.9869	0	59.48	2,167	0	9.77	0.00	7.40
			Crawl Space	Fuel Option 1	1-story	19	14475	293	59.9564	0.610761	78.72	2,192	63	10.71	0.12	13.79
					2-story	20	13979	288	57.1644	0.610761	76.51	1,974	57	9.69	0.12	12.47
				Fuel Option 2	1-story	21	18726	0	68.4502	0	63.91	2,556	0	10.71	0.00	8.72
					2-story	22	18140	0	65.6583	0	61.91	2,227	0	9.69	0.00	7.60
				Fuel Option 3	1-story	23	18662	0	68.4502	0	63.69	2,428	0	10.71	0.00	8.29
					2-story	24	18094	0	65.6583	0	61.75	2,142	0	9.69	0.00	7.32
	MF	Precode	Slab-on-grade	Fuel Option 1	1-story	1	6366	208.5	25.77575	0.500135	42.565					
					2-story	2	6220.5	192.75	23.91965	0.46762	40.4975					
					3-story	3	6247.333333	187.66667	23.604	0.456781667	40.085					
				Fuel Option 2	1-story	4	8510.5	0	30.481	0	29.045					
					2-story	5	8086.75	0	28.03675	0	27.6					
					3-story	6	8023.833333	0	27.52516667	0	27.385					
				Fuel Option 3	1-story	7	8509	0	30.481	0	29.04					
					2-story	8	8086.25	0	28.03675	0	27.5975					
					3-story	9	8024.166667	0	27.52516667	0	27.38666667					
		Code - Compliant	Slab-on-grade	Fuel Option 1	1-story	10	5958	168	24.20505	0.3801365	37.115	408	41	1.57	0.12	5.45
					2-story	11	5876	151.5	22.75605	0.34762	35.2	345	41	1.16	0.12	5.30
					3-story	12	5903.166667	146.16667	22.48916667	0.336781667	34.75833333	344	42	1.11	0.12	5.33
				Fuel Option 2	1-story	13	8153.5	0	28.91035	0	27.825	357	0	1.57	0.00	1.22
					2-story	14	7782.75	0	26.87325	0	26.5625	304	0	1.16	0.00	1.04
					3-story	15	7716.333333	0	26.41016667	0	26.335	308	0	1.12	0.00	1.05
				Fuel Option 3	1-story	16	8150.5	0	28.91035	0	27.815	359	0	1.57	0.00	1.23
					2-story	17	7782.5	0	26.87325	0	26.56	304	0	1.16	0.00	1.04
					3-story	18	7715.333333	0	26.41016667	0	26.33166667	309	0	1.12	0.00	1.06

Table 23: 2005 Code and Pre-code Annual Simulation Results for Bastrop (Single Family).

Prototype of the simulation result for one county

County Name	Bastrop
Division (East or West Texas)	East Texas
Number of new building permits for SFD	280

		Fuel Option 1: Elec. cooling, NG heating and NG water heating	Fuel Option 2: All electricity	Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating	Total
		77.1%	18.9%	4.0%	
Slab-on-grade (93.6%)	1-Story (59.8%)	43.16%	10.58%	2.24%	55.97%
	2-Story (40.2%)	29.01%	7.11%	1.51%	37.63%
Crawl spaces (6.4%)	1-Story (59.8%)	2.95%	0.72%	0.15%	3.83%
	2-Story (39.2%)	1.98%	0.49%	0.10%	2.57%
Total		77.10%	18.90%	4.00%	100.00%



Number of Houses for each simulation

		Fuel Option 1: Elec. cooling, NG heating and NG water heating	Fuel Option 2: All electricity	Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating	Total
		77.1%	18.9%	4.0%	
Slab-on-grade (93.6%)	1-Story (59.8%)	121	30	6	157
	2-Story (40.2%)	81	20	4	105
Crawl spaces (6.4%)	1-Story (59.8%)	8	2	0	11
	2-Story (39.2%)	6	1	0	7
Total		216	53	11	280

Precode Energy Use for each option (per house)

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating	
		Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)
Slab-on-grade	1-Story	16,122	366	20,906	0	20,670	0
	2-Story	15,195	354	19,764	0	19,596	0
Crawl spaces	1-Story	16,667	356	21,282	0	21,090	0
	2-Story	15,953	345	20,367	0	20,236	0
Total		63,937	1,421	82,319	0	81,592	0

Code compliant Energy Use for each option (per house)

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating	
		Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)
Slab-on-grade	1-Story	13,857	303	18,264	0	18,163	0
	2-Story	13,197	297	17,502	0	17,429	0
Crawl spaces	1-Story	14,475	293	18,726	0	18,662	0
	2-Story	13,979	288	18,140	0	18,094	0
Total		55,508	1,181	72,632	0	72,348	0

Precode Total Energy Use (For total houses in a County)

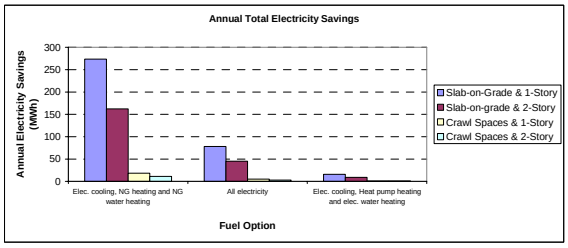
		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating		Total	
		Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)
Slab-on-grade	1-Story	1,948	44,225	619	0	130	0	2,697	44,225
	2-Story	1,234	28,755	394	0	83	0	1,710	28,755
Crawl spaces	1-Story	138	2,941	43	0	9	0	190	2,941
	2-Story	89	1,916	28	0	6	0	122	1,916
Total		3,409	77,838	1,084	0	227	0	4,719	77,838

Code compliant Total Energy Use (For total houses in a County)

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating		Total	
		Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)
Slab-on-grade	1-Story	1,674	36,613	541	0	114	0	2,329	36,613
	2-Story	1,072	24,125	349	0	73	0	1,494	24,125
Crawl spaces	1-Story	120	2,421	38	0	8	0	166	2,421
	2-Story	78	1,600	25	0	5	0	108	1,600
Total		2,944	64,758	952	0	201	0	4,096	64,758

Total Energy Savings Due to the Code Adoption

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating		Total	
		Elec. Savings (MWh)	NG Savings (Therm)	Elec. Savings (MWh)	NG Savings (Therm)	Elec. Savings (MWh)	NG Savings (Therm)	Elec. Savings (MWh)	NG Savings (Therm)
Slab-on-grade	1-Story	274	7,613	78	0	16	0	368	7,613
	2-Story	162	4,630	45	0	9	0	216	4,630
Crawl spaces	1-Story	18	521	5	0	1	0	24	521
	2-Story	11	317	3	0	1	0	15	317
Total		465	13,080	132	0	27	0	623	13,080



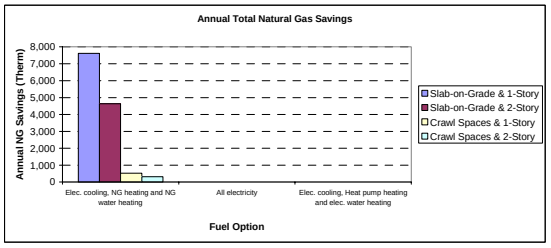


Table 24: 2005 Code and Pre-code Peak-Day Simulation Results for Bastrop (Single Family).

Precode Avg. OSD Energy Use for each option (per house)

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating	
		Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)
Slab-on-grade	1-Story	70.11	0.73	78.60	0.00	78.60	0.00
	2-Story	66.26	0.73	74.76	0.00	74.76	0.00
Crawl spaces	1-Story	70.67	0.73	79.16	0.00	79.16	0.00
	2-Story	66.86	0.73	75.35	0.00	75.35	0.00
Total		273.90	2.92	307.88	0.00	307.88	0.00

Code compliant Avg. OSD Energy Use for each option (per house)

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating	
		Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)
Slab-on-grade	1-Story	59.33	0.61	67.82	0.00	67.82	0.00
	2-Story	56.49	0.61	64.99	0.00	64.99	0.00
Crawl spaces	1-Story	59.98	0.61	68.45	0.00	68.45	0.00
	2-Story	57.16	0.61	65.66	0.00	65.66	0.00
Total		232.94	2.44	266.91	0.00	266.91	0.00

Precode Avg. OSD Total Energy Use (For total houses in a County)

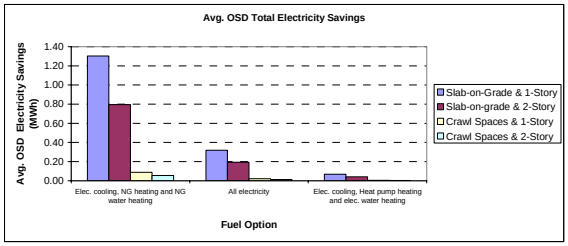
		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating		Total	
		Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)
Slab-on-grade	1-Story	8.47	88.30	2.33	0.00	0.49	0.00	11.29	88.30
	2-Story	5.38	59.36	1.49	0.00	0.32	0.00	7.19	59.36
Crawl spaces	1-Story	0.58	6.04	0.16	0.00	0.03	0.00	0.78	6.04
	2-Story	0.37	4.06	0.10	0.00	0.02	0.00	0.50	4.06
Total		14.81	157.76	4.08	0.00	0.86	0.00	19.75	157.76

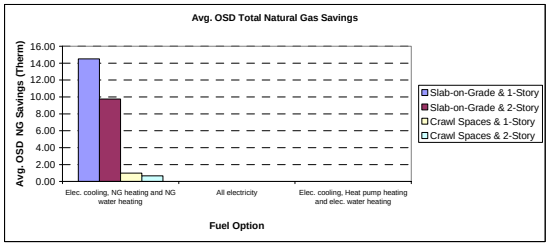
Code compliant Avg. OSD Total Energy Use (For total houses in a County)

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating		Total	
		Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)
Slab-on-grade	1-Story	7.17	73.80	2.01	0.00	0.43	0.00	9.60	73.80
	2-Story	4.55	49.61	1.25	0.00	0.27	0.00	6.16	49.61
Crawl spaces	1-Story	0.50	5.05	0.14	0.00	0.03	0.00	0.66	5.05
	2-Story	0.32	3.39	0.09	0.00	0.02	0.00	0.43	3.39
Total		12.57	131.85	3.53	0.00	0.75	0.00	16.85	131.85

Avg. OSD Total Energy Savings Due to the Code Adoption

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating		Total	
		Elec. Savings (MWh)	NG Savings (Therm)	Elec. Savings (MWh)	NG Savings (Therm)	Elec. Savings (MWh)	NG Savings (Therm)	Elec. Savings (MWh)	NG Savings (Therm)
Slab-on-grade	1-Story	1.30	14.50	0.32	0.00	0.07	0.00	1.69	14.50
	2-Story	0.79	9.75	0.19	0.00	0.04	0.00	1.03	9.75
Crawl spaces	1-Story	0.09	0.99	0.02	0.00	0.00	0.00	0.11	0.99
	2-Story	0.05	0.67	0.01	0.00	0.00	0.00	0.07	0.67
Total		2.24	25.91	0.55	0.00	0.12	0.00	2.90	25.91





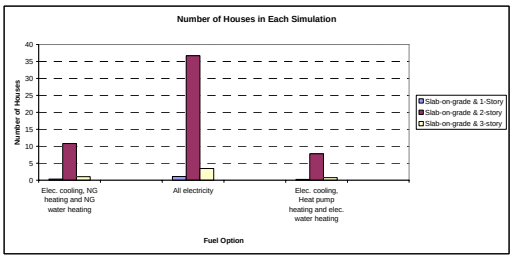
* 2003 Report Result
Harris: Annual Elec. Savings: 33,784 MWh, Peak Elec.: 193.42
Annual NG savings: 949,828 Therms, Peak NG: 2,590.44

Table 25: 2005 Code and Pre-code Annual Simulation Results for Bastrop (Multi-Family).

The simulation result for one county

County Name	Bastrop
NAHB Division	West South Central
Number of new building permits for MF	62

		Fuel Option 1: Elec. cooling, NG heating and NG water heating	Fuel Option 2: All electricity	Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating	Total
		19.5%	66.4%	14.1%	
Slab-on-grade (100%)	1-Story (2.6%)	0.51%	1.73%	0.37%	2.60%
	2-Story (89.1%)	17.37%	59.16%	12.56%	89.10%
	3-Story (8.3%)	1.62%	5.51%	1.17%	8.30%
Total		19.50%	66.40%	14.10%	100.00%



Number of Houses for each simulation

		Fuel Option 1: Elec. cooling, NG heating and NG water heating	Fuel Option 2: All electricity	Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating	Total
		19.5%	66.4%	14.2%	
Slab-on-grade (100%)	1-Story (2.6%)	0	1	0	2
	2-Story (89.1%)	11	37	8	55
	3-Story (8.3%)	1	3	1	5
Total		12	41	9	62

Precode Energy Use for each option (per house)

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating	
		Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)
Slab-on-grade	1-Story	6,368	209	8,511	0	8,509	0
	2-Story	6,221	193	8,087	0	8,088	0
	3-Story	6,247	188	8,024	0	8,024	0
Total		18,834	589	24,621	0	24,619	0

Code compliant Energy Use for each option (per house)

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating	
		Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)
Slab-on-grade	1-Story	5,958	168	8,154	0	8,151	0
	2-Story	5,878	152	7,783	0	7,783	0
	3-Story	5,903	146	7,716	0	7,715	0
Total		17,737	466	23,653	0	23,648	0

Precode Total Energy Use (For total houses in a County)

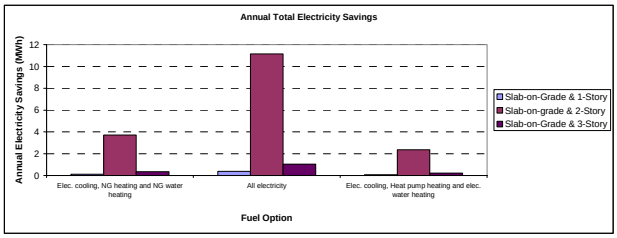
		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating		Total	
		Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)
Slab-on-grade	1-Story	2	66	9	0	2	0	13	66
	2-Story	67	2,076	297	0	63	0	427	2,076
	3-Story	6	188	27	0	6	0	40	188
Total		75	2,330	333	0	71	0	479	2,330

Code compliant Total Energy Use (For total houses in a County)

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating		Total	
		Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)
Slab-on-grade	1-Story	2	53	9	0	2	0	12	53
	2-Story	63	1,632	285	0	61	0	409	1,632
	3-Story	6	147	26	0	6	0	38	147
Total		71	1,831	321	0	68	0	460	1,831

Total Energy Savings Due to the Code Adoption

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating		Total	
		Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)
Slab-on-grade	1-Story	0	13	0	0	0	0	1	13
	2-Story	4	444	11	0	2	0	17	444
	3-Story	0	42	1	0	0	0	2	42
Total		4	499	13	0	3	0	19	499



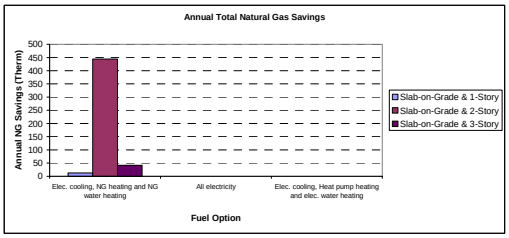


Table 26: 2005 Code and Pre-code Peak OSD Simulation Results for Bastrop (Multi-Family).

Precode OSD Energy Use for each option (per house)

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating	
		Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)
Slab-on-grade	1-Story	25.78	0.50	30.48	0.00	30.48	0.00
	2-Story	23.92	0.47	28.04	0.00	28.04	0.00
	3-Story	23.60	0.46	27.53	0.00	27.53	0.00
Total		73.30	1.42	86.04	0.00	86.04	0.00

Code compliant OSD Energy Use for each option (per house)

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating	
		Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)	Elec. Use (kWh)	NG Use (Therm)
Slab-on-grade	1-Story	24.21	0.38	28.91	0.00	28.91	0.00
	2-Story	22.76	0.35	26.87	0.00	26.87	0.00
	3-Story	22.49	0.34	26.41	0.00	26.41	0.00
Total		69.45	1.06	82.19	0.00	82.19	0.00

Precode OSD Total Energy Use (For total houses in a County)

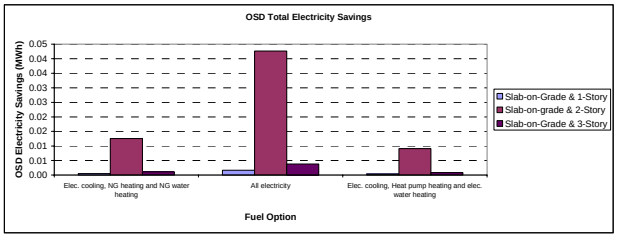
		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating		Total	
		Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)
Slab-on-grade	1-Story	0.01	0.16	0.03	0.00	0.01	0.00	0.05	0.16
	2-Story	0.26	5.04	1.03	0.00	0.22	0.00	1.50	5.04
	3-Story	0.02	0.46	0.09	0.00	0.02	0.00	0.14	0.46
Total		0.29	5.65	1.16	0.00	0.25	0.00	1.69	5.65

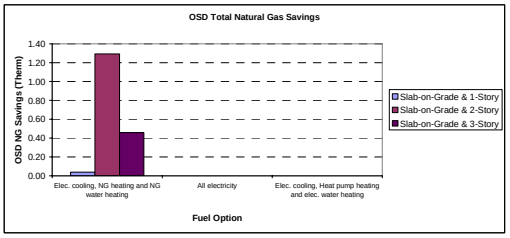
Code compliant OSD Total Energy Use (For total houses in a County)

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating		Total	
		Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)
Slab-on-grade	1-Story	0.01	0.12	0.03	0.00	0.01	0.00	0.05	0.12
	2-Story	0.25	3.74	0.99	0.00	0.21	0.00	1.44	3.74
	3-Story	0.02	0.34	0.09	0.00	0.02	0.00	0.13	0.34
Total		0.28	4.20	1.11	0.00	0.24	0.00	1.62	4.20

Total Energy Savings Due to the Code Adoption

		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating		Total	
		Elec. Savings (kWh)	NG Savings (Therm)	Elec. Savings (kWh)	NG Savings (Therm)	Elec. Savings (kWh)	NG Savings (Therm)	Elec. Use (kWh)	NG Use (Therm)
Slab-on-grade	1-Story	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.04
	2-Story	0.01	1.29	0.04	0.00	0.01	0.00	0.06	1.29
	3-Story	0.00	0.12	0.00	0.00	0.00	0.00	0.01	0.12
Total		0.01	1.45	0.05	0.00	0.01	0.00	0.07	1.45





6.1.1 2005 Results for New Single-family Residential Construction.

In this section of the report, calculations are provided regarding the potential electricity reductions and associated emissions reductions from the implementation of the IECC / IRC to new single-family residences in the 41 non-attainment and affected counties[34]. To calculate the NOx emissions reductions from the implementation of the IECC / IRC, a number of procedures were followed. First, new construction activity by county had to be determined; then energy savings attributable to the IECC / IRC had to be modeled using the code-traceable, DOE-2 simulation that the Laboratory has developed for the TERP; these estimates were then applied to the NAHB Builder's survey data to determine the appropriate number of housing types; then estimates of the NOx reduction potential from the electricity reductions in each county were calculated using the US EPA's 1999 eGRID database[35]. The results of the new calculations are reported in Table 27 through Table 34 for new single-family residences, which were estimated to be constructed during 2004.

In Table 27, the 1999 and IECC / IRC code-compliant building characteristics are shown for each county. The 1999 building characteristics reflect those published by the NAHB, ARI and GAMA for Texas. The IECC / IRC code-compliant characteristics are the minimum building code characteristics required by the IECC / IRC for each county for single-family residences (i.e., Type A.1)[36]. In Table 27, the rows are sorted first by the US EPA's non-attainment and affected designation, then alphabetically. Next, in the third column, the location of the TMY2 weather file is listed, followed by the NAHB survey classification. The fifth column in Table 27 lists the window area for the average house as defined by the NAHB survey[37]. The sixth, seventh, eighth and ninth columns show the NAHB's average glazing U-value, Solar Heat Gain Coefficient (SHGC), roof insulation and wall insulation, respectively. In columns ten through fourteen of Table 27, the corresponding values from the IECC / IRC code-compliant house are listed for each county (i.e., percent area, glazing U-value, SHGC, roof and wall insulation R-value). For each county, the identical window percent area was used for the 1999 and code-compliant calculation (i.e., window-to-wall area).

The IECC / IRC SHGC is 0.4 for all non-attainment and affected counties since they all fall below the 3,500 HDD_{65}, as required by the IECC / IRC. All houses were assumed to have an air-conditioner efficiency[38] equal to a SEER 11, a furnace efficiency (AFUE) of 0.80, and a domestic water heater efficiency of 76%. The values shown in Table 27 represent the only changes that were made to the simulation to obtain the savings calculations. All other variables in the simulation remained the same for the 1999 and IECC / IRC code-compliant simulation. In cases where the 1999 values were more efficient than the IECC / IRC code-compliant simulation, the 1999 values were used in both simulations, since this indicates that the prevailing practice is already above code. For example, in Brazoria County, according to the NAHB, the roof insulation is R-27.08, which is already above the code-required insulation of R-19. Therefore, R-27.08 was used in both simulations.

In Table 27 the code-traceable simulation results are shown for each county. In a similar fashion as Table 27, Table 28 is first divided into US EPA affected and then non-attainment classifications, followed by an alphabetical listing of counties. In the third column, the IECC / IRC climate zone is listed followed by the number of projected new housing units[39] in the fourth column. In the fifth column, the total simulated energy use is listed if all new construction had been built to pre-code specifications, and, in the sixth column, the total county-wide energy use for code-compliant construction is shown.

[34] The three new counties, Henderson, Hood and Hunt were added in the 2003 Legislative session are included in this.
[35] This preliminary analysis does not include actual power transfers on the grid, and assumes transmission and distribution losses of 7%. Counties were assigned to utility service districts as indicated.
[36] As modified by the 2001 Supplement.
[37] This value represents the NAHB's reported number of window units times an average window size of 3 x 5 feet, which was determined by surveying local building suppliers. Additional information about the procedures used to determine these values can be found in the MS Thesis by Im (2003).
[38] The choice of a SEER 11 efficiency for the air conditioner was based on ARI sales numbers for Texas which show an average SEER 11 for houses built in 1999.
[39] The number of projected new housing units uses the published values for the new housing units in 2004. A vacancy rate of 0% was assumed for 2005 calculations, based on information suggested by the Real Estate Center at Texas A&M University.

The values in the fifth and sixth columns come from the associated tables in the 2005 Volume III Appendix to the 2005 Volume II Technical report. As previously explained, in the 2004 report, 24 simulations were run for each county, which were then distributed according to the NAHB's survey data to account for 1 story, 2 story, slab-on-grade, crawlspace, and three different system types. In the seventh and eighth columns, the total pre-code and code-compliant peak OSD energy use is reported for the Ozone Season Day across all counties[40]. In a similar fashion as the annual pre-code and code-compliant energy use, these values are from the associated tables for each county in the Volume III Appendix to this report for the 1999 peak OSD results.

In the ninth and tenth columns, the total annual electricity and peak OSD savings are shown for each county, respectively. A 7% transmission and distribution loss is used in the 2005 report, which represents a fixed 1.07 multiplier for the electricity use. In the eleventh and twelfth columns, the total annual pre-code and code-compliant natural gas use is shown for those residences that had natural gas-fired furnaces and domestic water heaters. Similarly, in columns thirteen and fourteen, the simulated total peak OSD natural gas use on the peak Ozone Season Day (OSD) is shown for each county. Finally, in columns fifteen and sixteen, the total annual and peak OSD natural gas savings are shown for each county.

In Table 29, the 2005 PCA assignments for each county are shown. These assignments are the same as the 2004 report, and include a second PCA provider, according the ratios of the 1998 total power sales reported to the PUCT. In Table 30, the annual electricity savings are assigned to PCA provider(s) according to Table 29. The total electricity savings for each PCA, as shown in the bottom half of Table 30 are then entered into the bottom row of Table 31, which is the 1999 US EPA eGRID database for Texas. eGRID then proportions each MWh of electricity savings according to the 1999 measured data from the power plants assigned to that PCA. For each county in which there is a power plant the lbs-NOx/MWh are calculated and displayed as NOx reductions (lbs) in the column adjacent to the PCA column. Adding across the rows then totals the NOx reductions in each county from multiple PCAs that have power plants in that county. Counties that do not show NOx reductions represent counties that do not have power plants in eGRID's database. In Table 32 the PCA assignments for peak reductions are shown for each county; and in the peak OSD NOx reductions are shown calculated with eGRID.

Table 34 is a summary of the annual and peak-day electricity savings for each county from implementation of the IECC / IRC, and the associated NOx reductions at the power plants that supplied the electricity, as well as the NOx reductions from natural gas savings associated with the code adoption in single-family residences.

Figure 41 and Figure 42 illustrate the electricity savings and NOx reductions previously shown in Table 28 and Table 34, respectively. In Figure 41, the total annual electricity savings (upper graph) and total peak-day savings (lower graph) are shown for the 41 non-attainment and affected counties. Figure 42 shows the annual NOx emissions reductions (upper graph), and peak-day NOx emissions reductions (lower graph) as calculated by the 1999 eGRID database for the 41 non-attainment and affected counties and other counties in the eGRID database that have power plants that supply electricity to the 41 counties.

In a similar fashion as Table 31, the total electricity savings for each PCA, as shown in the bottom half of Table 30 are then entered into the bottom row of Table 35 and Table 36, which are the 2007 US EPA eGRID database for Texas for annual (Table 35) and Ozone Season Day (Table 36)[41] periods. The 2007 version of eGRID then proportions each MWh of electricity savings according to the 1999 measured data from the power plants assigned to that PCA and forecasts the NOx reductions for 2007. For each county, in which there is one or more power plants, the lbs-NOx/MWh are calculated and displayed as NOx reductions (lbs) in the column adjacent to the PCA column. Adding across the rows then totals the NOx

[40] In the 2005 report, the peak Ozone Season Day (OSD) was used to report peak savings. This is different than the peak day for 2004, which was August 19, 1999. This change was made at the request of the TCEQ. In the 2002 and 2003 reports, these dates represent the TMY2 non-coincident dates that were chosen by the DOE-2 simulation program as the peak date for the houses simulated in a specific county. Hence, the 2002 and 2003 dates did not correspond to the same calendar date.

[41] This 2007 version of eGRID was specially created for Texas by Art Diem at the USEPA, and includes specific assumptions about plant closures, new plant additions, and capacity factor for annual and Ozone Season Day (OSD) periods.

reductions in each county from multiple PCAs that have power plants in that county. Counties that do not show NOx reductions represent counties that do not have power plants in eGRID's database.

Table 37 is a summary of the annual and peak-day electricity savings for each county from implementation of the IECC / IRC, and the associated NOx reductions at the power plants that supplied the electricity, as well as the NOx reductions from natural gas savings associated with the code adoption in single-family residences.

Figure 43 illustrates the NOx reductions previously shown in Table 35 and Table 36, for annual and peak-day savings. Figure 43 shows the annual NOx emissions reductions (upper graph), and peak-day NOx emissions reductions (lower graph) as calculated by the 2007 eGRID database for the 41 non-attainment and affected counties and other counties in the eGRID database that have power plants that supply electricity to the 41 counties.

Table 27: 1999 and IECC / IRC Code-compliant Building Characteristics used in the DOE-2 Simulation for Single-family Residential.

	County	Climate Zone	TMY2	Division	1999 Average					2000 IECC				
				(East or West)	Area %	Glazing U-value	SHGC	Roof Insulation	Wall Insulation	Area %	Glazing U-value	SHGC	Roof Insulation	Wall Insulation
Non-attainment	Brazoria	3	Houston	East	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	27.08	14.18
	Chambers	4	Port Arthur	East	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	27.08	13.99
	Collin	6	Fort Worth	West	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	Dallas	5	Fort Worth	West	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	14.18
	Denton	6	Fort Worth	West	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	El Paso	6	El Paso	West	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	Fort Bend	4	Houston	East	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	27.08	13.99
	Galveston	3	Houston	East	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	27.08	14.18
	Hardin	4	Port Arthur	East	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	27.08	13.99
	Harris	4	Houston	East	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	27.08	13.99
	Jefferson	4	Port Arthur	East	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	27.08	13.99
	Liberty	4	Port Arthur	East	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	27.08	13.99
	Montgomery	4	Houston	East	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	27.08	13.99
	Orange	4	Port Arthur	East	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	27.08	13.99
	Tarrant	5	Fort Worth	West	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	14.18
	Waller	4	Houston	East	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	27.08	13.99
Affected	Bastrop	4	Austin	West	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	14.18
	Bexar	4	San Antonio	West	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	14.18
	Caldwell	4	Austin	West	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	14.18
	Comal	4	San Antonio	West	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	14.18
	Ellis	5	Fort Worth	West	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	14.18
	Gregg	6	Lufkin	East	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.99
	Guadalupe	4	San Antonio	West	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	14.18
	Harrison	6	Lufkin	East	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.99
	Hays	5	Austin	West	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	14.18
	Henderson	5	Fort Worth	East	13.8	1.11	0.71	27.08	13.99	13.8	0.65	0.40	30.00	14.18
	Hood	5	Fort Worth	West	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	14.18
	Hunt	6	Fort Worth	West	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	Johnson	5	Fort Worth	West	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	14.18
	Kaufman	6	Fort Worth	West	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	Nueces	3	Corpus Christi	East	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	27.08	14.18
	Parker	6	Fort Worth	West	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	Rockwall	6	Fort Worth	West	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	Rusk	5	Lufkin	East	13.8	1.11	0.71	27.08	13.99	13.8	0.65	0.40	30.00	13.99
	San Patricio	3	Corpus Christi	East	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	27.08	14.18
	Smith	5	Lufkin	East	13.8	1.11	0.71	27.08	13.99	13.8	0.65	0.40	30.00	13.99
	Travis	5	Austin	West	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	14.18
	Upshur	6	Lufkin	East	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.99
	Victoria	3	Victoria	East	20.6	1.11	0.71	27.08	14.18	20.6	0.75	0.40	27.08	14.18
	Williamson	5	Austin	West	13.8	0.87	0.66	26.75	14.18	13.8	0.50	0.40	38.00	14.18
	Wilson	4	San Antonio	West	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	14.18

Table 28: 2005 Annual and Peak-day Electricity Savings from Implementation of the IECC / IRC for Single-family Residences.

2005 Summary															
	County	Climate Zone	No. of Projected Units (2005)	Precode Total Annual Elec. Use (MWh/yr)	Code-compliant Total Annual Elec. Use (MWh/yr)	Precode OSD Elec. Use (MWh/day)	Code-compliant OSD Elec. Use (MWh/day)	Total Annual Elec. Savings (MWh/yr) w/ 7% of T&D Loss	Total OSD Elec. Savings (MWh/day) w/ 7% of T&D Loss	Precode Total NG Use (Therm/yr)	Code-compliant Total NG Use (Therm/yr)	Precode OSD NG Use (Therm/day)	Code-compliant OSD NG Use (Therm/day)	Total Annual NG Savings (Therm/yr)	Total OSD NG Savings (Therm/day)
Affected County	Bastrop	4	280	4,719	4,096	19.75	16.85	667	3.11	77,838	64,758	157.76	131.85	13,080	25.91
	Bexar	4	8,987	138,551	121,535	581.65	499.14	18,208	88.29	2,888,565	2,396,091	5,614.68	4,707.72	492,474	906.97
	Caldwell	4	103	1,682	1,460	7.13	6.08	237	1.12	31,171	25,950	63.30	52.91	5,221	10.39
	Comal	4	1,589	24,518	21,509	102.93	88.38	3,220	15.57	510,730	423,655	992.74	832.38	87,075	160.36
	Ellis	5	1,798	29,130	25,305	129.91	109.64	4,093	21.69	756,337	631,874	1,097.44	915.98	124,463	181.45
	Gregg	6	298	4,184	3,749	16.87	14.63	465	2.40	108,792	93,518	177.56	149.99	15,274	27.57
	Guadalupe	4	1,303	20,091	17,626	84.32	72.38	2,638	12.78	418,805	347,402	814.06	682.56	71,402	131.50
	Harrison	6	44	618	554	2.49	2.16	69	0.35	16,097	13,841	26.22	22.15	2,257	4.07
	Hays	5	1,960	32,088	27,683	136.03	114.77	4,714	22.75	592,255	485,144	1,204.56	1,006.75	107,111	197.80
	Henderson	5	139	1,972	1,772	7.98	6.94	213	1.11	52,360	45,952	82.82	69.96	6,408	12.86
	Hood	5	92	1,491	1,295	6.65	5.61	210	1.11	38,700	32,297	56.15	46.87	6,403	9.28
	Hunt	6	191	3,101	2,697	13.83	11.50	433	2.49	80,345	62,300	116.58	97.30	18,045	19.28
	Johnson	5	913	14,797	12,851	66.00	55.69	2,082	11.03	383,647	320,514	557.26	465.12	63,133	92.14
	Kaufman	6	789	12,780	11,122	56.99	47.41	1,774	10.25	331,897	257,708	481.58	401.95	74,188	79.63
	Nueces	3	1,448	23,097	20,491	89.17	79.11	2,788	10.77	371,027	317,931	819.81	685.84	53,096	133.97
	Parker	6	357	5,793	5,038	25.85	21.49	807	4.66	150,010	116,305	217.90	181.87	33,705	36.03
	Rockwall	6	1,598	25,917	22,545	115.61	96.15	3,608	20.82	672,206	521,229	975.36	814.09	150,977	161.27
	Rusk	5	13	182	164	0.73	0.64	20	0.10	4,746	4,143	7.75	6.54	603	1.20
	San Patricio	3	301	4,807	4,263	18.56	16.46	582	2.25	77,126	66,089	170.42	142.57	11,037	27.85
	Smith	5	608	8,541	7,666	34.47	29.94	935	4.84	221,777	193,468	362.28	306.03	28,309	56.25
	Travis	5	7,757	127,172	109,679	538.91	454.64	18,718	90.17	2,343,938	1,919,970	4,767.22	3,984.38	423,968	782.84
	Upshur	6	9	126	113	0.51	0.44	14	0.07	3,286	2,824	5.36	4.53	461	0.83
	Victoria	3	138	1,997	1,803	8.07	7.14	207	0.99	39,643	34,782	80.27	67.51	4,861	12.77
	Williamson	5	4,209	69,074	59,553	292.57	246.77	10,188	49.01	1,271,836	1,041,788	2,586.73	2,161.95	230,048	424.77
	Wilson	4	41	631	554	2.65	2.28	83	0.40	13,178	10,931	25.62	21.48	2,247	4.14
Nonattain-ment County	Brazoria	3	3,288	49,325	43,918	199.08	175.42	5,785	25.32	906,339	790,519	1,870.99	1,566.79	115,821	304.21
	Chambers	4	571	8,622	7,638	34.63	30.37	1,053	4.56	159,007	139,110	329.80	276.97	19,897	52.83
	Collin	6	11,079	180,406	156,748	805.22	669.07	25,313	145.68	4,655,444	3,609,465	6,762.24	5,644.15	1,045,978	1,118.09
	Dallas	5	10,046	162,859	141,442	726.40	612.96	22,917	121.38	4,225,899	3,531,230	6,131.74	5,117.89	694,668	1,013.84
	Denton	6	6,461	105,031	91,307	468.67	389.59	14,685	84.62	2,714,890	2,104,901	3,943.57	3,291.53	609,989	652.04
	El Paso	6	3,407	54,045	46,214	201.46	169.89	8,379	33.78	1,378,009	1,025,765	2,226.81	1,882.97	352,244	343.83
	Fort Bend	4	3,858	57,950	51,577	233.95	206.07	6,820	29.83	1,062,341	927,561	2,195.35	1,838.40	134,780	356.94
	Galveston	3	2,995	44,940	40,010	181.34	159.79	5,274	23.06	825,574	720,133	1,704.27	1,427.17	105,440	277.10
	Hardin	4	115	1,740	1,541	6.99	6.13	214	0.93	32,077	28,017	66.42	55.78	4,060	10.64
	Harris	4	28,020	420,877	374,577	1,699	1,496	49,541	216.56	7,723,729	6,737,274	15,944.43	13,352.02	986,455	2,592.41
	Jefferson	4	711	10,730	9,508	43	38	1,308	5.67	198,335	173,731	410.66	344.88	24,604	65.78
	Liberty	4	263	3,984	3,525	16	14	491	2.12	73,238	64,068	151.90	127.57	9,170	24.33
	Montgomery	4	6,023	90,676	80,628	366.08	322.24	10,751	46.91	1,658,496	1,445,483	3,427.31	2,870.06	213,014	557.25
	Orange	4	251	3,790	3,358	15	13	463	2.01	70,090	61,339	144.97	121.75	8,751	23.22
	Tarrant	5	14,705	238,517	207,108	1,064	898	33,607	177.90	6,179,104	5,162,157	8,975.43	7,491.40	1,016,947	1,484.03
	Waller	4	46	692	616	2.80	2.46	82	0.36	12,666	11,040	26.18	21.92	1,626	4.26
	TOTAL		126,804					263,656	1,299					7,369,292	12,382

Table 29: 2005 Allocation of PCA for each of 41 Non-attainment and Affected Counties.

NERC Region	County	Elec. Utilities 1	PCA	1998 Annual net Generation (MWh)	Percentage	Elec. Utilities 2	PCA	1998 Annual net Generation (MWh)	Percentage
ERCOT	BASTROP	ONCOR	TXU Electric/PCA	97,581,030	100%	Smithville			
	BEXAR	CPSB	San Antonio Public Service Bd/PCA	14,641,059	100%	Bandera EC			
	BRAZORIA	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	97%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	3%
	CALDWELL	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Luling			
	CHAMBERS	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	70%	ENTERGY	Entergy Electric System/PCA	32,288,113	30%
	COLLIN	ONCOR	TXU Electric/PCA	97,581,030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
	COMAL	CPSB	San Antonio Public Service Bd/PCA	14,641,059	100%	New Braunfels			
	DALLAS	ONCOR	TXU Electric/PCA	97,581,030	100%	Garland			
	DENTON	ONCOR	TXU Electric/PCA	97,581,030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
	ELLIS	ONCOR	TXU Electric/PCA	97,581,030	100%	Navarro County EC			
	FORT BEND	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	100%				
	GALVESTON	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	97%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	3%
	GUADALUPE	CPSB	San Antonio Public Service Bd/PCA	14,641,059	100%	Seguin			
	HARRIS	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	70%	ENTERGY	Entergy Electric System/PCA	32,288,113	30%
	HAYS	San Marcos	*Lower Colorado River Authority/PCA		100%	Pedernales EC			
	HENDERSON	ONCOR	TXU Electric/PCA	97,581,030	100%	Trinity Valley EC			
	HOOD	ONCOR	TXU Electric/PCA	97,581,030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
	HUNT	ONCOR	TXU Electric/PCA	97,581,030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
	JOHNSON	ONCOR	TXU Electric/PCA	97,581,030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
	KAUFMAN	ONCOR	TXU Electric/PCA	97,581,030	100%	Trinity Valley EC			
	NUECES	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Robstown			
	PARKER	ONCOR	TXU Electric/PCA	97,581,030	100%	Weatherford			
	ROCKWALL	ONCOR	TXU Electric/PCA	97,581,030	100%	FEC Electric			
	SAN PATRICIO	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	San Patricio EC			
	SMITH	ONCOR	TXU Electric/PCA	97,581,030	100%	SWEPCO(AEP)			
	TARRANT	ONCOR	TXU Electric/PCA	97,581,030	100%	Tri-County EC			
	TRAVIS	ONCOR	TXU Electric/PCA	97,581,030	97%	Austin Energy	Austin Energy/PCA	3,359,240	3%
	VICTORIA	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Victoria EC			
	WALLER	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	100%	Hempstead			
	WILLIAMSON	ONCOR	TXU Electric/PCA	97,581,030	97%	Austin Energy	Austin Energy/PCA	3,359,240	3%
	WILSON	Floresville	*San Antonio Public Service Bd/PCA	N/A	100%	Guadalupe Valley EC			
SPP	GREGG	SWEPCO(AEP)	Southwestern Public Service Co/PCA			Rusk County EC			
	HARRISON	SWEPCO(AEP)	Southwestern Public Service Co/PCA			Panola-Harrison EC			
	RUSK	SWEPCO(AEP)	Southwestern Public Service Co/PCA			ONCOR			
	UPSHUR	SWEPCO(AEP)	Southwestern Public Service Co/PCA			Upshur-Rural EC			
SERC	HARDIN	ENTERGY	Entergy Electric System/PCA	32,288,113	30%	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	70%
	JEFFERSON	ENTERGY	Entergy Electric System/PCA	32,288,113	100%				
	LIBERTY	ENTERGY	Entergy Electric System/PCA	32,288,113	100%	Sam Houston EC			
	MONTGOMERY	ENTERGY	Entergy Electric System/PCA	32,288,113	30%	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	70%
	ORANGE	ENTERGY	Entergy Electric System/PCA	32,288,113	100%	Jasper-Newton EC			
WSCC	EL PASO	EPEC	El Paso Electric Co/PCA	3,066,882	100%	Rio Grande EC			

* The electricity providers for Hays and Wilson county were identified by personal communication with the proper representatives. Below is the contact information
* Hays County: SAN MARCOS ELECTRIC UTILITY (SAN MARCOS, CITY OF) 630 E. Hopkins St. San Marcos TX 78666-6397 512/396-2451 Robert L. Higgs Dir., Electric Utility Mun
* Wilson County: FLORESVILLE ELECTRIC LIGHT & POWER SYSTEM 1400 Fourth St. P.O. Box 218 Floresville TX 78114-2372 830/216-7000 David K. McMillan General Manager Muni

Table 30: 2005 Totalized Annual Electricity Savings from IECC / IRC by PCA for Single-family Residences.

NERC	County	Total Energy Savings by County (MWh)	PCA 1	Percentage	Energy Savings by County for PCA 1 (MWh)	PCA 2	Percentage	Energy Savings by County for PCA 2 (MWh)
ERCOT	CALDWELL	237.08	American Electric Power - West (ERCOT)/PCA	100%	237.08			0.00
	NUECES	2787.69	American Electric Power - West (ERCOT)/PCA	100%	2,787.69			0.00
	SAN PATRICIO	582.06	American Electric Power - West (ERCOT)/PCA	100%	582.06			0.00
	VICTORIA	207.36	American Electric Power - West (ERCOT)/PCA	100%	207.36			0.00
	HAYS	4713.70	Lower Colorado River Authority/PCA	100%	4,713.70			0.00
	BRAZORIA	5785.00	Reliant Energy HL&P/PCA	97%	5,628.54	Texas-New Mexico Power Co/PCA	3%	156.46
	CHAMBERS	1053.38	Reliant Energy HL&P/PCA	70%	734.54	Entergy Electric System/PCA	30%	318.84
	FORT BEND	6819.56	Reliant Energy HL&P/PCA	100%	6,819.56			0.00
	GALVESTON	5274.22	Reliant Energy HL&P/PCA	97%	5,131.58	Texas-New Mexico Power Co/PCA	3%	142.64
	HARRIS	49541.43	Reliant Energy HL&P/PCA	70%	34,546.26	Entergy Electric System/PCA	30%	14,995.17
	WALLER	82.08	Reliant Energy HL&P/PCA	100%	82.08			0.00
	BEXAR	18207.73	San Antonio Public Service Bd/PCA	100%	18,207.73			0.00
	WILSON	82.69	San Antonio Public Service Bd/PCA	100%	82.69			0.00
	COMAL	3220.05	San Antonio Public Service Bd/PCA	100%	3,220.05			0.00
	GUADALUPE	2638.20	San Antonio Public Service Bd/PCA	100%	2,638.20			0.00
	BASTROP	666.69	TXU Electric/PCA	100%	666.69			0.00
	COLLIN	25313.19	TXU Electric/PCA	98%	24,787.95	Texas-New Mexico Power Co/PCA	2%	525.25
	DALLAS	22916.90	TXU Electric/PCA	100%	22,916.90			0.00
	DENTON	14684.76	TXU Electric/PCA	98%	14,380.05	Texas-New Mexico Power Co/PCA	2%	304.71
	ELLIS	4092.90	TXU Electric/PCA	100%	4,092.90			0.00
	HENDERSON	213.31	TXU Electric/PCA	100%	213.31			0.00
	HOOD	210.05	TXU Electric/PCA	98%	205.69	Texas-New Mexico Power Co/PCA	2%	4.36
	HUNT	432.64	TXU Electric/PCA	98%	423.66	Texas-New Mexico Power Co/PCA	2%	8.98
	JOHNSON	2081.99	TXU Electric/PCA	98%	2,038.79	Texas-New Mexico Power Co/PCA	2%	43.20
	KAUFMAN	1774.18	TXU Electric/PCA	100%	1,774.18			0.00
	PARKER	807.34	TXU Electric/PCA	100%	807.34			0.00
	ROCKWALL	3608.00	TXU Electric/PCA	100%	3,608.00			0.00
	SMITH	935.46	TXU Electric/PCA	100%	935.46			0.00
	TARRANT	33606.87	TXU Electric/PCA	100%	33,606.87			0.00
	TRAVIS	18717.70	TXU Electric/PCA	97%	18,094.79	Austin Energy/PCA	3%	622.92
	WILLIAMSON	10187.52	TXU Electric/PCA	97%	9,848.49	Austin Energy/PCA	3%	339.04
WSCC	EL PASO	8379.49	El Paso Electric Co/PCA	100%	8,379.49			0.00
SERC	HARDIN	213.85	Entergy Electric System/PCA	30%	64.73	Reliant Energy HL&P/PCA	70%	149.12
	JEFFERSON	1308.30	Entergy Electric System/PCA	100%	1,308.30			0.00
	LIBERTY	490.83	Entergy Electric System/PCA	100%	490.83			0.00
	MONTGOMERY	10751.30	Entergy Electric System/PCA	30%	3,254.20	Reliant Energy HL&P/PCA	70%	7,497.10
	ORANGE	462.74	Entergy Electric System/PCA	100%	462.74			0.00
SPP	GREGG	464.89	Southwestern Public Service Co/PCA	100%	464.89			0.00
	HARRISON	68.60	Southwestern Public Service Co/PCA	100%	68.60			0.00
	RUSK	19.82	Southwestern Public Service Co/PCA	100%	19.82			0.00
	UPSHUR	14.10	Southwestern Public Service Co/PCA	100%	14.10			0.00

PCA	Total Electricity Savings by PCA (MWh)
American Electric Power - West (ERCOT)/PCA	3,814.19
Austin Energy/PCA	961.95
Brownsville Public Utils Board/PCA	0.00
Lower Colorado River Authority/PCA	4,713.70
Reliant Energy HL&P/PCA	60,588.78
San Antonio Public Service Bd /PCA	24,148.66
South Texas Electric Coop Inc/PCA	0.00
Texas Municipal Power Pool/PCA	0.00
Texas-New Mexico Power Co/PCA	1,185.60
TXU Electric/PCA	138,401.07
Total	233,813.95

Table 31: 2005 Annual NOx Reductions from IECC / IRC by PCA for Single-family Residences by County Using 1999 eGRID.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Austin-San Antonio Area	BASTROP	0.012215415	46.5919	0.4663901	448.64	0.00902163	0.00	0.817318	3852.59	0.00755428	457.70	0.02170659	524.18	0.00648344	0.00	0.01133142	0.00	0.00245301	2.91	0.01120603	1550.93	6,883.55	3.44
	BEXAR	0.055151593	210.3585	0.08545943	82.21	0.04073191	0.00	0.14964594	705.39	0.00188468	114.19	1.88754037	45581.57	0.07736836	0.00	0.00770739	0.00	0.0008576	1.02	0.00413279	571.98	47,266.71	23.63
	HAYS	9.07402E-06	0.0346	0.00034645	0.33	6.7016E-06	0.00	0.00060713	2.86	5.6116E-06	0.34	1.6124E-05	0.39	4.8161E-06	0.00	8.4174E-06	0.00	1.8222E-06	0.00	8.3242E-06	1.15	5.11	0.00
	TRAVIS	0.000828265	3.1592	0.48656288	468.05	0.00061171	0.00	0.05511859	259.81	0.00054358	32.93	0.00147156	35.54	0.00044033	0.00	0.00076612	0.00	0.00016781	0.20	0.00075897	105.04	904.73	0.45
	FAYETTE	0.001485019	5.6641	0.05669872	54.54	0.00109675	0.00	0.09936078	468.36	0.00091837	55.64	0.00263885	63.72	0.00078819	0.00	0.00137755	0.00	0.00029821	0.35	0.00136231	188.55	836.83	0.42
	LLANO	0.007176248	27.3716	0.27399242	263.57	0.00529998	0.00	0.48015371	2263.30	0.00443795	268.89	0.01275207	307.95	0.00380886	0.00	0.00665692	0.00	0.00144108	1.71	0.00658326	911.13	4,043.91	2.02
	CALDWELL		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	COMAL		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	GUADALUPE		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WILLIAMSON		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WILSON		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Dallas-Fort Worth Area	ANGELINA	0.000494588	1.8865	0.00049881	0.48	0.00036528	0.00	0.00082585	3.89	0.0002162	13.10	7.1266E-05	1.72	0.00070458	0.00	0.00244871	0.00	0.00083784	0.99	0.00449947	622.73	644.80	0.32
	COLLIN	0.007169953	27.3475	0.01253841	12.06	0.00529533	0.00	0.02011327	94.81	0.00821861	497.96	0.00238641	57.63	0.06221009	0.00	0.24840578	0.00	0.00386471	4.58	0.01870204	2588.38	3,282.76	1.64
	DALLAS	0.049181758	187.5884	0.05006993	48.16	0.03632292	0.00	0.08284103	390.49	0.02194718	1329.75	0.00720608	174.02	0.07465196	0.00	0.26228915	0.00	0.08258381	97.91	0.4433209	61356.09	63,584.01	31.79
	DENTON	0.004478418	17.0815	0.00824843	7.93	0.00330751	0.00	0.01320233	62.23	0.00553275	335.22	0.00159686	38.56	0.04294073	0.00	0.17187819	0.00	0.00176352	2.09	0.00802733	1110.99	1,574.11	0.79
	JOHNSON	4.90169E-05	0.1870	9.028E-05	0.09	3.6201E-05	0.00	0.0001445	0.68	6.0557E-05	3.67	1.7478E-05	0.42	0.00046999	0.00	0.00188123	0.00	1.9302E-05	0.02	8.786E-05	12.16	17.23	0.01
	PARKER	0.000692972	2.6431	0.00127633	1.23	0.00051179	0.00	0.00204287	9.63	0.00085611	51.87	0.00024709	5.97	0.00664447	0.00	0.02659573	0.00	0.00027288	0.32	0.00124212	171.91	243.57	0.12
	CHEROKEE	0.010981286	41.8847	0.01107502	10.65	0.00811017	0.00	0.0183363	86.43	0.00480017	290.84	0.00158823	38.21	0.01564371	0.00	0.05436859	0.00	0.01860246	22.05	0.09990132	13826.45	14,316.52	7.16
	COKE	0.021538872	82.1533	0.0004313	0.41	0.01590742	0.00	0.00072053	3.40	0.00015909	9.64	0.00015397	3.72	0.00442876	0.00	0.00068585	0.00	0.00015233	0.18	0.000784	108.51	208.01	0.10
	COLEMAN	0.007243808	27.6292	0.00014505	0.14	0.00534988	0.00	0.00024232	1.14	5.3505E-05	3.24	5.1783E-05	1.25	0.00148945	0.00	0.00023066	0.00	5.123E-05	0.06	0.00026367	36.49	69.96	0.03
	FANNIN	0.020337335	77.5704	0.02051093	19.73	0.01502003	0.00	0.03395882	160.07	0.00888992	538.63	0.00293043	70.77	0.02897213	0.00	0.10069058	0.00	0.03445175	40.85	0.18501717	25606.57	26,514.19	13.26
	FRIO	0.047394602	180.7719	0.00480871	4.63	0.03500303	0.00	0.00784102	36.96	0.00260367	157.75	0.00120542	29.11	1.14045437	0.00	0.07034879	0.00	0.00103497	1.23	0.00489394	677.33	1,087.77	0.54
	HARDEMAN	0.007011794	26.7443	0.0001404	0.14	0.00517852	0.00	0.00023456	1.11	5.1791E-05	3.14	5.0124E-05	1.21	0.00144175	0.00	0.00022327	0.00	4.9589E-05	0.06	0.00025523	35.32	67.72	0.03
	HASKELL	0.195882927	747.1342	0.00392237	3.77	0.14466827	0.00	0.00655279	30.89	0.00144685	87.66	0.00140029	33.82	0.04027689	0.00	0.00623741	0.00	0.00138534	1.64	0.00713005	986.81	1,891.72	0.95
	HENDERSON	0.003151289	12.0196	0.00317819	3.06	0.00232737	0.00	0.00526195	24.80	0.0013775	83.46	0.00045407	10.97	0.00448926	0.00	0.0156021	0.00	0.00533833	6.33	0.02866858	3967.76	4,108.40	2.05
	HOWARD	0.001294958	4.9392	0.00130601	1.26	0.00095638	0.00	0.00216229	10.19	0.00056606	34.30	0.00018659	4.51	0.00184477	0.00	0.00641136	0.00	0.00219368	2.60	0.01178077	1630.47	1,688.26	0.84
	HOOD	0.029930315	114.1598	0.0301858	29.04	0.02210487	0.00	0.04997696	235.58	0.01308323	792.70	0.00431269	104.15	0.04263809	0.00	0.14818564	0.00	0.0507024	60.11	0.27228849	37685.02	39,020.75	19.51
	JONES	0.093145673	355.2750	0.00186516	1.79	0.06879223	0.00	0.00311597	14.69	0.000688	41.69	0.00066586	16.08	0.01915235	0.00	0.00296599	0.00	0.00065875	0.78	0.00339046	469.24	899.55	0.45
	LAMAR	0.001155059	4.4056	0.00116492	1.12	0.00085306	0.00	0.00192869	9.09	0.0005049	30.59	0.00016643	4.02	0.00164547	0.00	0.00571872	0.00	0.00195669	2.32	0.01050805	1454.33	1,505.87	0.75
	LIMESTONE	0.012894146	49.1807	0.01597135	15.36	0.0095229	0.00	0.00537766	25.35	0.09772731	5921.18	0.02220238	536.16	0.00892048	0.00	0.00566029	0.00	0.00682478	8.09	0.00937254	1297.17	7,852.49	3.93
	MCLENNAN	0.05325577	203.1275	0.05371035	51.67	0.03933176	0.00	0.08892527	419.17	0.02327932	1410.47	0.00767368	185.31	0.07586704	0.00	0.26367046	0.00	0.09021607	106.96	0.48448983	67053.91	69,430.61	34.72
	MITCHELL	0.04519919	172.3982	0.045585	43.85	0.03338162	0.00	0.07547258	355.76	0.0197576	1197.09	0.0065128	157.28	0.0643898	0.00	0.22378216	0.00	0.07656811	90.78	0.41119578	56909.94	58,927.08	29.46
	NOLAN	0.001025023	3.9096	0.00103377	0.99	0.00075703	0.00	0.00171156	8.07	0.00044806	27.15	0.0001477	3.57	0.00146023	0.00	0.00507491	0.00	0.0017364	2.06	0.00932506	1290.60	1,336.34	0.67
	PALO PINTO	0.010167179	38.7795	0.0187261	18.01	0.00750891	0.00	0.02997273	141.28	0.01256078	761.04	0.00362529	87.55	0.09748668	0.00	0.39020837	0.00	0.00400365	4.75	0.01822413	2522.24	3,573.65	1.79
	RED RIVER	0.00311042	11.8637	0.00313697	3.02	0.00229718	0.00	0.00519371	24.48	0.00135964	82.38	0.00044818	10.82	0.00443104	0.00	0.01539976	0.00	0.0052691	6.25	0.02829678	3916.31	4,055.12	2.03
	TAYLOR	0.001885023	7.1898	3.7746E-05	0.04	0.00139217	0.00	6.3059E-05	0.30	1.3923E-05	0.84	1.3475E-05	0.33	0.00038759	0.00	6.0024E-05	0.00	1.3331E-05	0.02	6.8614E-05	9.50	18.20	0.01
	TITUS	0.007854045	29.9568	0.00792109	7.62	0.00580056	0.00	0.0131145	61.82	0.00343318	208.01	0.0011317	27.33	0.01118871	0.00	0.03888555	0.00	0.01330487	15.77	0.0714515	9888.96	10,239.47	5.12
	TOM GREEN	0.00089529	3.4148	1.7927E-05	0.02	0.00066121	0.00	2.995E-05	0.14	6.6129E-06	0.40	6.4001E-06	0.15	0.00018409	0.00	2.8508E-05	0.00	6.3317E-06	0.01	3.2588E-05	4.51	8.65	0.00
	YOUNG	0.019487528	74.3291	0.01965387	18.91	0.01439241	0.00	0.03253983	153.38	0.00851845	516.12	0.00280798	67.81	0.02776152	0.00	0.09648317	0.00	0.03301216	39.14	0.17728613	24536.59	25,406.28	12.70
	TARRANT	0.029723615	113.3714	0.02997733	28.84	0.02195221	0.00	0.04963181	233.95	0.01299287	787.22	0.00428291	103.43	0.04234363	0.00	0.14716226	0.00	0.05035225	59.70	0.27040805	37424.76	38,751.27	19.38
	WICHITA	0.000471631	1.7989	0.00047566	0.46	0.00034832	0.00	0.00078752	3.71	0.00020616	12.49	6.7958E-05	1.64	0.00067188	0.00	0.00233505	0.00	0.00079895	0.95	0.00429062	593.83	614.87	0.31
	WILBARGER	0.074052599	282.4505	0.00148283	1.43	0.05469115	0.00	0.00247725	11.68	0.00054697	33.14	0.00052937	12.78	0.01522649	0.00	0.00235802	0.00	0.00052372	0.62	0.00269548	373.06	715.16	0.36
	WISE	1.54736E-05	0.0590	2.85E-05	0.03	1.1428E-05	0.00	4.5616E-05	0.22	1.9117E-05	1.16	5.5174E-06	0.13	0.00014837	0.00	0.00059387	0.00	6.0932E-06	0.01	2.7736E-05	3.84	5.44	0.00
	ELLIS		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	HUNT		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	KAUFMAN		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	ROCKWALL		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	RUSK		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Houston - Galveston Area	BRAZORIA	0.011584147	44.1841	0.01434872	13.80	0.00855541	0.00	0.00483131	22.77	0.08779856	5319.61	0.0199467	481.69	0.00801419	0.00	0.00508523	0.00	0.00613141	7.27	0.00842032	1165.38	7,054.70	3.53
	BRAZOS	0.002939669	11.2124	0.00541434	5.21	0.00217108	0.00	0.00866611	40.85	0.00363174	220.04	0.00104819	25.31	0.02818664	0.00	0.11282221	0.00	0.00115759	1.37	0.0052692	729.26	1,033.26	0.52
	GRIMES	0.000352817	1.3457	0.00064982	0.63	0.00026057	0.00	0.0010401	4.90	0.00043588	26.41	0.0001258	3.04	0.00338294	0.00	0.01354083	0.00	0.00013893	0.16	0.00063241	87.53	124.01	0.06
	WHARTON	0.000859628	3.2788	0.00106478	1.02	0.00063487	0.00	0.00035852	1.69	0.0065153	394.75	0.00148019	35.74	0.00059471	0.00	0.00037736	0.00	0.000455	0.54	0.00062485	86.48	523.51	0.26
	CHAMBERS	0.026549037	101.2630	0.03288499	31.63	0.01960765	0.00	0.01107259	52.19	0.20122045	12191.70	0.04571469	1103.95	0.01836725	0.00	0.01165454	0.00	0.01405221	16.66	0.01929805	2670.87	16,168.27	8.08
	FORT BEND	0.101391373	386.7257	0.12558854	120.81	0.07488205	0.00	0.04228648	199.33	0.76846545	46560.38	0.17458545	4216.00	0.07014496	0.00	0.04450894	0.00	0.05366573	63.63	0.07369968	10200.11	61,746.99	30.87
	GALVESTON	0.045304684	172.8006	0.05591643	53.79	0.03345953	0.00	0.01998506	94.20	0.33715771	20427.97	0.07663686	1850.68	0.03198055	0.00	0.02381461	0.00	0.51082916	605.64	0.04021583	5565.91	28,770.99	14.39
	ROBERTSON	0.003269549	12.4707	0.00370118	3.56	0.00241471	0.00	0.00326161	15.37	0.01395949	845.79	0.00323927	78.22	0.00337216	0.00	0.00827153	0.00	0.84932265	1006.95	0.0150589	2084.17	4,046.54	2.02
	HARRIS	0.069468248	264.9649	0.08604692	82.77	0.0513054	0.00	0.02897256	136.57	0.52651372	31900.82	0.11961713	2888.59	0.04805979	0.00	0.03049528	0.00	0.03676905	43.59	0.0504953	6988.60	42,305.92	21.15
	HARDIN		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	JEFFERSON		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	LIBERTY		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	MONTGOMERY		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	ORANGE		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WALLER		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
El Paso Area	EL PASO		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Etc.	ANDREWS	6.67623E-05	0.2546	6.7332E-05	0.06	4.9307E-05	0.00	0.00011148	0.53	2.9183E-05	1.77	9.6198E-06	0.23	9.5108E-05	0.00	0.00033054	0.00	0.0001131	0.13	0.00060736	84.06	87.04	0.04
	CROCKETT	0.075441526	287.7481	0.00151065	1.45	0.05571693	0.00	0.00252372	11.90	0.00055723	33.76	0.0005393	13.02	0.01551207	0.00	0.00240225	0.00	0.00053354	0.63	0.00274604	380.05	728.57	0.36
	FREESTONE	0.025200214	96.1183	0.02541532	24.45	0.01861148	0.00	0.04207874	198.35	0.01101559	667.42	0.00363112	87.69	0.03589969	0.00	0.1247668	0.00	0.04268954	50.61	0.2292568	31729.39	32,854.02	16.43
	CALHOUN	0.169651094	647.0811	0.0033971	3.27	0.1252949	0.00	0.00567527	26.75	0.00125309	75.92	0.00121277	29.29	0.03488318	0.00	0.00540212	0.00	0.00119982	1.42	0.00617522	854.66	1,638.39	0.82
	HIDALGO	0.125605549	479.0831	0.00251513	2.42	0.0927653	0.00	0.00420183	19.81	0.00092776	56.21	0.0008979	21.68	0.02582666	0.00	0.0039996	0.00	0.00088832	1.05	0.00457198	632.77	1,213.02	0.61
	CAMERON	0.125578894	478.9814	0.0025146	2.42	0.39341934	0.00	0.00420094	19.80	0.00092756	56.20	0.00089771	21.68	0.02582118	0.00	0.00399875	0.00	0.00088813	1.05	0.00457101	632.63	1,212.77	0.61
	PECOS	0.000135659	0.5174	4.984E-05	0.05	0.00010019	0.00	8.2544E-05	0.39	2.1488E-05	1.30	7.498E-06	0.18	8.6003E-05	0.00	0.00023882	0.00	8.1378E-05	0.10	0.00043689	60.47	63.00	0.03
	PRESIDIO	0.000237673	0.9065	4.7592E-06	0.00	0.00017553	0.00	7.9508E-06	0.04	1.7555E-06	0.11	1.699E-06	0.04	4.887E-05	0.00	7.5681E-06	0.00	1.6809E-06	0.00	8.6512E-06	1.20	2.30	0.00
	SAN PATRICIO	0.038088543	145.2768	0.00076269	0.73	0.02813009	0.00	0.00127416	6.01	0.00028133	17.05	0.00027228	6.58	0.00783166	0.00	0.00121284	0.00	0.00026937	0.32	0.00138641	191.88	367.84	0.18
	WARD	0.057516808	219.3799	0.05800776	55.80	0.04247873	0.00	0.09604025	452.70	0.02514192	1523.32	0.00828766	200.14	0.08193722	0.00	0.28476696	0.00	0.09743434	115.52	0.52325426	72418.95	74,985.81	37.49
	WEBB	0.051854261	197.7819	0.00103833	1.00	0.03829668	0.00	0.00173466	8.18	0.00038301	23.21	0.00037068	8.95	0.01066213	0.00	0.00165117	0.00	0.00036673	0.43	0.00188747	261.23	500.78	0.25
	NUECES	0.556471643	2122.4871	0.01114282	10.72	0.41097912	0.00	0.01861543	87.75	0.00411026	249.04	0.00397799	96.06	0.11442012	0.00	0.01771947	0.00	0.00393551	4.67	0.02025531	2803.36	5,374.07	2.69
	UPTON	3.45456E-05	0.1318	3.4841E-05	0.03	2.5513E-05	0.00	5.7684E-05	0.27	1.5101E-05	0.91	4.9777E-06	0.12	4.9213E-05	0.00	0.00017104	0.00	5.8521E-05	0.07	0.00031428	43.50	45.04	0.02
	VICTORIA	0.26869859	1024.8668	0.00810515	7.80	0.19844589	0.00	0.01340471	63.19	0.00357559	216.64	0.0025326	61.16	0.85346281	0.00	0.05715275	0.00	0.00239431	2.84	0.01201749	1663.23	3,039.72	1.52
	GREGG		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	HARRISON		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	SMITH		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	UPSHUR		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	TOTAL	**2.59433808**		**2.15884660**		**2.21670807**		**2.46753295**		**2.26120971**		**2.46530416**		**3.34809944**		**3.09910920**		**2.11715092**		**3.63318167**		725,487.26	**362.74**
Energy Savings by PCA from ESL (MWh)		3814.19		961.95		0.00		4713.70		60588.78		24148.66		0.00		0.00		1185.60		138401.07			

Table 32: 2005 Totalized OSD Electricity Savings from IECC / IRC by PCA for Single-family Residences.

NERC	County	Total Energy Savings by County (MWh)	PCA 1	Percentage	Energy Savings by County for PCA 1 (MWh)	PCA 2	Percentage	Energy Savings by County for PCA 2 (MWh)
ERCOT	CALDWELL	1.12	American Electric Power - West (ERCOT)/PCA	100%	1.12			0.00
	NUECES	10.77	American Electric Power - West (ERCOT)/PCA	100%	10.77			0.00
	SAN PATRICIO	2.25	American Electric Power - West (ERCOT)/PCA	100%	2.25			0.00
	VICTORIA	0.99	American Electric Power - West (ERCOT)/PCA	100%	0.99			0.00
	HAYS	22.75	Lower Colorado River Authority/PCA	100%	22.75			0.00
	BRAZORIA	25.32	Reliant Energy HL&P/PCA	97%	24.63	Texas-New Mexico Power Co/PCA	3%	0.68
	CHAMBERS	4.56	Reliant Energy HL&P/PCA	70%	3.18	Entergy Electric System/PCA	30%	1.38
	FORT BEND	29.83	Reliant Energy HL&P/PCA	100%	29.83			0.00
	GALVESTON	23.06	Reliant Energy HL&P/PCA	97%	22.44	Texas-New Mexico Power Co/PCA	3%	0.62
	HARRIS	216.56	Reliant Energy HL&P/PCA	70%	151.01	Entergy Electric System/PCA	30%	65.55
	WALLER	0.36	Reliant Energy HL&P/PCA	100%	0.36			0.00
	BEXAR	88.29	San Antonio Public Service Bd/PCA	100%	88.29			0.00
	WILSON	0.40	San Antonio Public Service Bd/PCA	100%	0.40			0.00
	COMAL	15.57	San Antonio Public Service Bd/PCA	100%	15.57			0.00
	GUADALUPE	12.78	San Antonio Public Service Bd/PCA	100%	12.78			0.00
	BASTROP	3.11	TXU Electric/PCA	100%	3.11			0.00
	COLLIN	145.68	TXU Electric/PCA	98%	142.65	Texas-New Mexico Power Co/PCA	2%	3.02
	DALLAS	121.38	TXU Electric/PCA	100%	121.38			0.00
	DENTON	84.62	TXU Electric/PCA	98%	82.86	Texas-New Mexico Power Co/PCA	2%	1.76
	ELLIS	21.69	TXU Electric/PCA	100%	21.69			0.00
	HENDERSON	1.11	TXU Electric/PCA	100%	1.11			0.00
	HOOD	1.11	TXU Electric/PCA	98%	1.09	Texas-New Mexico Power Co/PCA	2%	0.02
	HUNT	2.49	TXU Electric/PCA	98%	2.44	Texas-New Mexico Power Co/PCA	2%	0.05
	JOHNSON	11.03	TXU Electric/PCA	98%	10.80	Texas-New Mexico Power Co/PCA	2%	0.23
	KAUFMAN	10.25	TXU Electric/PCA	100%	10.25			0.00
	PARKER	4.66	TXU Electric/PCA	100%	4.66			0.00
	ROCKWALL	20.82	TXU Electric/PCA	100%	20.82			0.00
	SMITH	4.84	TXU Electric/PCA	100%	4.84			0.00
	TARRANT	177.90	TXU Electric/PCA	100%	177.90			0.00
	TRAVIS	90.17	TXU Electric/PCA	97%	87.17	Austin Energy/PCA	3%	3.00
	WILLIAMSON	49.01	TXU Electric/PCA	97%	47.37	Austin Energy/PCA	3%	1.63
WSCC	EL PASO	33.78	El Paso Electric Co/PCA	100%	33.78			0.00
SERC	HARDIN	0.93	Entergy Electric System/PCA	30%	0.28	Reliant Energy HL&P/PCA	70%	0.65
	JEFFERSON	5.67	Entergy Electric System/PCA	100%	5.67			0.00
	LIBERTY	2.12	Entergy Electric System/PCA	100%	2.12			0.00
	MONTGOMERY	46.91	Entergy Electric System/PCA	30%	14.20	Reliant Energy HL&P/PCA	70%	32.71
	ORANGE	2.01	Entergy Electric System/PCA	100%	2.01			0.00
SPP	GREGG	2.40	Southwestern Public Service Co/PCA	100%	2.40			0.00
	HARRISON	0.35	Southwestern Public Service Co/PCA	100%	0.35			0.00
	RUSK	0.10	Southwestern Public Service Co/PCA	100%	0.10			0.00
	UPSHUR	0.07	Southwestern Public Service Co/PCA	100%	0.07			0.00

PCA	Total Electricity Savings by PCA (MWh)
American Electric Power - West(ERCOT)/PCA	15.13
Austin Energy/PCA	4.63
Brownsville Public Utils Board/PCA	0.00
Lower Colorado River Authority/PCA	22.75
Reliant Energy HL&P/PCA	264.80
San Antonio Public Service Bd /PCA	117.04
South Texas Electric Coop Inc/PCA	0.00
Texas Municipal Power Pool/PCA	0.00
Texas-New Mexico Power Co/PCA	6.39
TXU Electric/PCA	740.15
Total	1,170.90

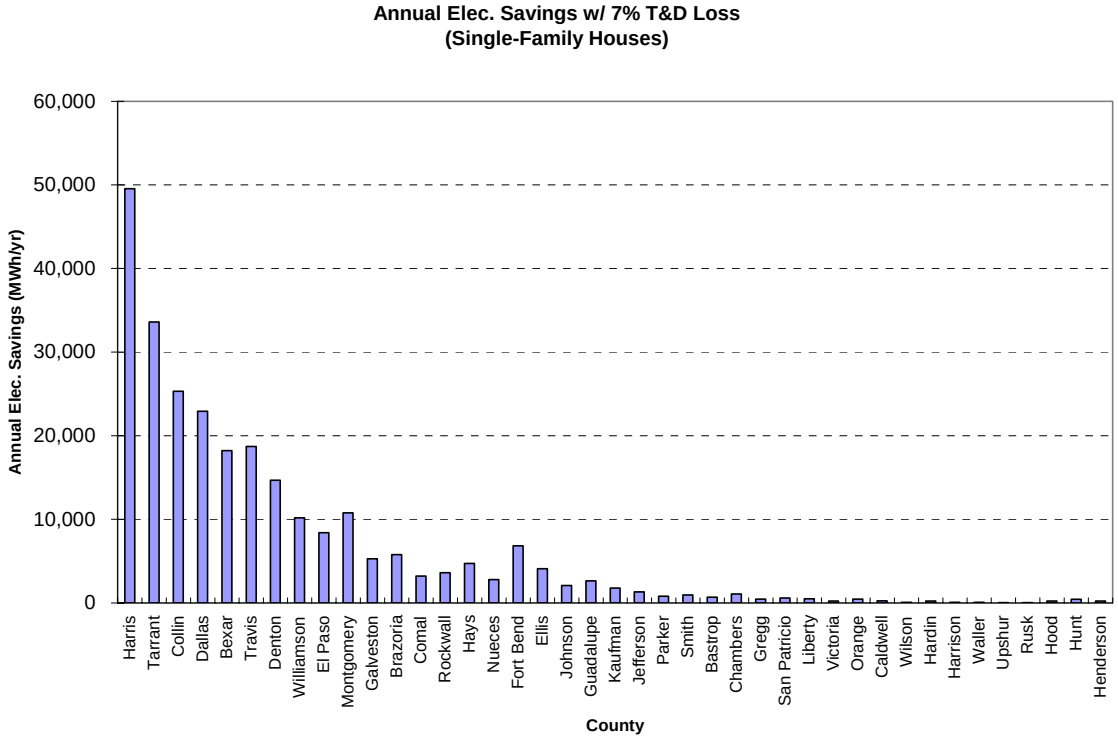
Table 33: 2005 OSD NOx Reductions from IECC / IRC by PCA for Single-family Residences by County Using 1999 eGRID.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Austin-San Antonio Area	BASTROP	0.012215415	0.18	0.4663901	2.16	0.00902163	0.00	0.817318	18.59	0.00755428	2.00	0.02170659	2.54	0.00648344	0.00	0.01133142	0.00	0.00245301	0.02	0.01120603	8.29	33.79	0.02
	BEXAR	0.055151593	0.83	0.08545943	0.40	0.04073191	0.00	0.14964594	3.40	0.00188468	0.50	1.88754037	220.93	0.07736836	0.00	0.00770739	0.00	0.0008576	0.01	0.00413279	3.06	229.12	0.11
	HAYS	9.07402E-06	0.00	0.00034645	0.00	6.7016E-06	0.00	0.00060713	0.01	5.6116E-06	0.00	1.6124E-05	0.00	4.8161E-06	0.00	8.4174E-06	0.00	1.8222E-06	0.00	8.3242E-06	0.01	0.03	0.00
	TRAVIS	0.000828265	0.01	0.48656288	2.25	0.00061171	0.00	0.05511859	1.25	0.00054358	0.14	0.00147156	0.17	0.00044033	0.00	0.00076612	0.00	0.00016781	0.00	0.00075897	0.56	4.40	0.00
	FAYETTE	0.001485019	0.02	0.05669872	0.26	0.00109675	0.00	0.09936078	2.26	0.00091837	0.24	0.00263885	0.31	0.00078819	0.00	0.00137755	0.00	0.00029821	0.00	0.00136231	1.01	4.11	0.00
	LLANO	0.007176248	0.11	0.27399242	1.27	0.00529998	0.00	0.48015371	10.92	0.00443795	1.18	0.01275207	1.49	0.00380886	0.00	0.00665692	0.00	0.00144108	0.01	0.00658326	4.87	19.85	0.01
	CALDWELL		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	COMAL		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	GUADALUPE		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WILLIAMSON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WILSON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Dallas-Fort Worth Area	ANGELINA	0.000494588	0.01	0.00049881	0.00	0.00036528	0.00	0.00082585	0.02	0.0002162	0.06	7.1266E-05	0.01	0.00070458	0.00	0.00244871	0.00	0.00083784	0.01	0.00449947	3.33	3.43	0.00
	COLLIN	0.007169953	0.11	0.01253841	0.06	0.00529533	0.00	0.02011327	0.46	0.00821861	2.18	0.00238641	0.28	0.06221009	0.00	0.24840578	0.00	0.00386471	0.02	0.01870204	13.84	16.95	0.01
	DALLAS	0.049181758	0.74	0.05006993	0.23	0.03632292	0.00	0.08284103	1.88	0.02194718	5.81	0.00720608	0.84	0.07465196	0.00	0.26228915	0.00	0.08258381	0.53	0.4433209	328.13	338.17	0.17
	DENTON	0.004478418	0.07	0.00824843	0.04	0.00330751	0.00	0.01320233	0.30	0.00553275	1.47	0.00159686	0.19	0.04294073	0.00	0.17187819	0.00	0.00176352	0.01	0.00802733	5.94	8.01	0.00
	JOHNSON	4.90169E-05	0.00	9.028E-05	0.00	3.6201E-05	0.00	0.0001445	0.00	6.0557E-05	0.02	1.7478E-05	0.00	0.00046999	0.00	0.00188123	0.00	1.9302E-05	0.00	8.786E-05	0.07	0.09	0.00
	PARKER	0.000692972	0.01	0.00127633	0.01	0.00051179	0.00	0.00204287	0.05	0.00085611	0.23	0.00024709	0.03	0.00664447	0.00	0.02659573	0.00	0.00027288	0.00	0.00124212	0.92	1.24	0.00
	CHEROKEE	0.010981286	0.17	0.01107502	0.05	0.00811017	0.00	0.0183363	0.42	0.00480017	1.27	0.0015823	0.19	0.01564371	0.00	0.05436859	0.00	0.01860246	0.12	0.09990132	73.94	76.15	0.04
	COKE	0.021538872	0.33	0.0004313	0.00	0.01590742	0.00	0.00072053	0.02	0.00015909	0.04	0.00015397	0.02	0.00442876	0.00	0.00068585	0.00	0.00015233	0.00	0.000784	0.58	0.99	0.00
	COLEMAN	0.007243808	0.11	0.00014505	0.00	0.00534988	0.00	0.00024232	0.01	5.3505E-05	0.01	5.1783E-05	0.01	0.00148945	0.00	0.00023066	0.00	5.123E-05	0.00	0.00026367	0.20	0.33	0.00
	FANNIN	0.020337335	0.31	0.02051093	0.10	0.01502003	0.00	0.03395882	0.77	0.00888992	2.35	0.00293043	0.34	0.02897213	0.00	0.10069058	0.00	0.03445175	0.22	0.18501717	136.94	141.03	0.07
	FRIO	0.047394602	0.72	0.00480871	0.02	0.03500303	0.00	0.00784102	0.18	0.00260367	0.69	0.00120542	0.14	1.14045437	0.00	0.07034879	0.00	0.00103497	0.01	0.00489394	3.62	5.38	0.00
	HARDEMAN	0.007011794	0.11	0.0001404	0.00	0.00517852	0.00	0.00023456	0.01	5.1791E-05	0.01	5.0124E-05	0.01	0.00144175	0.00	0.00022327	0.00	4.9589E-05	0.00	0.00025523	0.19	0.32	0.00
	HASKELL	0.195882927	2.96	0.00392237	0.02	0.14466827	0.00	0.00655279	0.15	0.00144685	0.38	0.00140029	0.16	0.04027689	0.00	0.00623741	0.00	0.00138534	0.01	0.00713005	5.28	8.96	0.00
	HENDERSON	0.003151289	0.05	0.00317819	0.01	0.00232737	0.00	0.00526195	0.12	0.0013775	0.36	0.00045407	0.05	0.00448926	0.00	0.0156021	0.00	0.00533833	0.03	0.02866858	21.22	21.85	0.01
	HOWARD	0.001294958	0.02	0.00130601	0.01	0.00095638	0.00	0.00216229	0.05	0.00056606	0.15	0.00018659	0.02	0.00184477	0.00	0.00641136	0.00	0.00219368	0.01	0.01178077	8.72	8.98	0.00
	HOOD	0.029930315	0.45	0.0301858	0.14	0.02210487	0.00	0.04997696	1.14	0.01308323	3.46	0.00431269	0.50	0.04263809	0.00	0.14818564	0.00	0.0507024	0.32	0.27228849	201.54	207.56	0.10
	JONES	0.093145673	1.41	0.00186516	0.01	0.06879223	0.00	0.00311597	0.07	0.000688	0.18	0.00066586	0.08	0.01915235	0.00	0.00296599	0.00	0.00065875	0.00	0.00339046	2.51	4.26	0.00
	LAMAR	0.001155059	0.02	0.00116492	0.01	0.00085306	0.00	0.00192869	0.04	0.0005049	0.13	0.00016643	0.02	0.00164547	0.00	0.00571872	0.00	0.00195669	0.01	0.01050805	7.78	8.01	0.00
	LIMESTONE	0.012894146	0.20	0.01597135	0.07	0.0095229	0.00	0.00537766	0.12	0.09772731	25.88	0.02220238	2.60	0.00892048	0.00	0.00566029	0.00	0.00682478	0.04	0.00937254	6.94	35.85	0.02
	MCLENNAN	0.05325577	0.81	0.05371035	0.25	0.03933176	0.00	0.08892527	2.02	0.02327932	6.16	0.00767368	0.90	0.07586704	0.00	0.26367046	0.00	0.09021607	0.58	0.48448983	358.60	369.31	0.18
	MITCHELL	0.04519919	0.68	0.045585	0.21	0.03338162	0.00	0.07547258	1.72	0.0197576	5.23	0.0065128	0.76	0.0643898	0.00	0.22378216	0.00	0.07656811	0.49	0.41119578	304.35	313.44	0.16
	NOLAN	0.001025023	0.02	0.00103377	0.00	0.00075703	0.00	0.00171156	0.04	0.00044806	0.12	0.0001477	0.02	0.00146023	0.00	0.00507491	0.00	0.0017364	0.01	0.00932506	6.90	7.11	0.00
	PALO PINTO	0.010167179	0.15	0.0187261	0.09	0.00750891	0.00	0.02997273	0.68	0.01256078	3.33	0.00362529	0.42	0.09748668	0.00	0.39020837	0.00	0.00400365	0.03	0.01822413	13.49	18.19	0.01
	RED RIVER	0.00311042	0.05	0.00313697	0.01	0.00229718	0.00	0.00519371	0.12	0.00135964	0.36	0.00044818	0.05	0.00443104	0.00	0.01539976	0.00	0.0052691	0.03	0.02829678	20.94	21.57	0.01
	TAYLOR	0.001885023	0.03	3.7746E-05	0.00	0.00139217	0.00	6.3059E-05	0.00	1.3923E-05	0.00	1.3475E-05	0.00	0.00038759	0.00	6.0024E-05	0.00	1.3331E-05	0.00	6.8614E-05	0.05	0.09	0.00
	TITUS	0.007854045	0.12	0.00792109	0.04	0.00580056	0.00	0.0131145	0.30	0.00343318	0.91	0.0011317	0.13	0.01118871	0.00	0.03888555	0.00	0.01330487	0.09	0.0714515	52.89	54.47	0.03
	TOM GREEN	0.00089529	0.01	1.7927E-05	0.00	0.00066121	0.00	2.995E-05	0.00	6.6129E-06	0.00	6.4001E-06	0.00	0.00018409	0.00	2.8508E-05	0.00	6.3317E-06	0.00	3.2588E-05	0.02	0.04	0.00
	YOUNG	0.019487528	0.29	0.01965387	0.09	0.01439241	0.00	0.03253983	0.74	0.00851845	2.26	0.00280798	0.33	0.02776152	0.00	0.09648317	0.00	0.03301216	0.21	0.17728613	131.22	135.14	0.07
	TARRANT	0.029723615	0.45	0.02997733	0.14	0.02195221	0.00	0.04963181	1.13	0.01299287	3.44	0.00428291	0.50	0.04234363	0.00	0.14716226	0.00	0.05035225	0.32	0.27040805	200.14	206.12	0.10
	WICHITA	0.000471631	0.01	0.00047566	0.00	0.00034832	0.00	0.00078752	0.02	0.00020616	0.05	6.7958E-05	0.01	0.00067188	0.00	0.00233505	0.00	0.00079895	0.01	0.00429062	3.18	3.27	0.00
	WILBARGER	0.074052599	1.12	0.00148283	0.01	0.05469115	0.00	0.00247725	0.06	0.00054697	0.14	0.00052937	0.06	0.01522649	0.00	0.00235802	0.00	0.00052372	0.00	0.00269548	2.00	3.39	0.00
	WISE	1.54736E-05	0.00	2.85E-05	0.00	1.1428E-05	0.00	4.5616E-05	0.00	1.9117E-05	0.01	5.5174E-06	0.00	0.00014837	0.00	0.00059387	0.00	6.0932E-06	0.00	2.7736E-05	0.02	0.03	0.00
	ELLIS		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	HUNT		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	KAUFMAN		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	ROCKWALL		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	RUSK		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Houston - Galveston Area	BRAZORIA	0.011584147	0.18	0.01434872	0.07	0.00855541	0.00	0.00483131	0.11	0.08779856	23.25	0.0199467	2.33	0.00801419	0.00	0.00508523	0.00	0.00613141	0.04	0.00842032	6.23	32.21	0.02
	BRAZOS	0.002939669	0.04	0.00541434	0.03	0.00217108	0.00	0.00866611	0.20	0.00363174	0.96	0.00104819	0.12	0.02818664	0.00	0.11282221	0.00	0.00115759	0.01	0.0052692	3.90	5.26	0.00
	GRIMES	0.000352817	0.01	0.00064982	0.00	0.00026057	0.00	0.0010401	0.02	0.00043588	0.12	0.0001258	0.01	0.00338294	0.00	0.01354083	0.00	0.00013893	0.00	0.00063241	0.47	0.63	0.00
	WHARTON	0.000859628	0.01	0.00106478	0.00	0.00063487	0.00	0.00035852	0.01	0.0065153	1.73	0.00148019	0.17	0.00059471	0.00	0.00037736	0.00	0.000455	0.00	0.00062485	0.46	2.39	0.00
	CHAMBERS	0.026549037	0.40	0.03288499	0.15	0.01960765	0.00	0.01107259	0.25	0.20122045	53.28	0.04571469	5.35	0.01836725	0.00	0.01165454	0.00	0.01405221	0.09	0.01929805	14.28	73.81	0.04
	FORT BEND	0.101391373	1.53	0.12558854	0.58	0.07488205	0.00	0.04228648	0.96	0.76846545	203.49	0.17458545	20.43	0.07014496	0.00	0.04450894	0.00	0.05366573	0.34	0.07369968	54.55	281.90	0.14
	GALVESTON	0.045304684	0.69	0.05591643	0.26	0.03345953	0.00	0.01998506	0.45	0.33715771	89.28	0.07663686	8.97	0.03198055	0.00	0.02381461	0.00	0.51082916	3.26	0.04021583	29.77	132.68	0.07
	ROBERTSON	0.003269549	0.05	0.00370118	0.02	0.00241471	0.00	0.00326161	0.07	0.01395949	3.70	0.00323927	0.38	0.00337216	0.00	0.00827153	0.00	0.84932265	5.43	0.0150589	11.15	20.79	0.01
	HARRIS	0.069468248	1.05	0.08604692	0.40	0.0513054	0.00	0.02897256	0.66	0.52651372	139.42	0.11961713	14.00	0.04805979	0.00	0.03049528	0.00	0.03676905	0.23	0.0504953	37.37	193.14	0.10
	HARDIN		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	JEFFERSON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	LIBERTY		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	MONTGOMERY		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	ORANGE		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WALLER		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
El Paso Area	EL PASO		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Etc.	ANDREWS	6.67623E-05	0.00	6.7332E-05	0.00	4.9307E-05	0.00	0.00011148	0.00	2.9183E-05	0.01	9.6198E-06	0.00	9.5108E-05	0.00	0.00033054	0.00	0.0001131	0.00	0.00060736	0.45	0.46	0.00
	CROCKETT	0.075441526	1.14	0.00151065	0.01	0.05571693	0.00	0.00252372	0.06	0.00055723	0.15	0.0005393	0.06	0.01551207	0.00	0.00240225	0.00	0.00053354	0.00	0.00274604	2.03	3.45	0.00
	FREESTONE	0.025200214	0.38	0.02541532	0.12	0.01861148	0.00	0.04207874	0.96	0.01101559	2.92	0.00363112	0.43	0.03589969	0.00	0.1247668	0.00	0.04268954	0.27	0.2292568	169.69	174.76	0.09
	CALHOUN	0.169651094	2.57	0.0033971	0.02	0.1252949	0.00	0.00567527	0.13	0.00125309	0.33	0.00121277	0.14	0.03488318	0.00	0.00540212	0.00	0.00119982	0.01	0.00617522	4.57	7.76	0.00
	HIDALGO	0.125605549	1.90	0.00251513	0.01	0.0927653	0.00	0.00420183	0.10	0.00092776	0.25	0.0008979	0.11	0.02582666	0.00	0.0039996	0.00	0.00088832	0.01	0.00457198	3.38	5.75	0.00
	CAMERON	0.125578894	1.90	0.0025146	0.01	0.39341934	0.00	0.00420094	0.10	0.00092756	0.25	0.00089771	0.11	0.02582118	0.00	0.00399875	0.00	0.00088813	0.01	0.00457101	3.38	5.75	0.00
	PECOS	0.000135659	0.00	4.984E-05	0.00	0.00010019	0.00	8.2544E-05	0.00	2.1488E-05	0.01	7.498E-06	0.00	8.6003E-05	0.00	0.00023882	0.00	8.1378E-05	0.00	0.00043689	0.32	0.33	0.00
	PRESIDIO	0.000237673	0.00	4.7592E-06	0.00	0.00017553	0.00	7.9508E-06	0.00	1.7555E-06	0.00	1.699E-06	0.00	4.887E-05	0.00	7.5681E-06	0.00	1.6809E-06	0.00	8.6512E-06	0.01	0.01	0.00
	SAN PATRICIO	0.038088543	0.58	0.00076269	0.00	0.02813009	0.00	0.00127416	0.03	0.00028133	0.07	0.00027228	0.03	0.00783166	0.00	0.00121284	0.00	0.00026937	0.00	0.00138641	1.03	1.74	0.00
	WARD	0.057516808	0.87	0.05800776	0.27	0.04247873	0.00	0.09604025	2.18	0.02514192	6.66	0.00828766	0.97	0.08193722	0.00	0.28476696	0.00	0.09743434	0.62	0.52325426	387.29	398.86	0.20
	WEBB	0.051854261	0.78	0.00103833	0.00	0.03829668	0.00	0.00173466	0.04	0.00038301	0.10	0.00037068	0.04	0.01066213	0.00	0.00165117	0.00	0.00036673	0.00	0.00188747	1.40	2.37	0.00
	NUECES	0.556471643	8.42	0.01114282	0.05	0.41097912	0.00	0.01861543	0.42	0.00411026	1.09	0.00397799	0.47	0.11442012	0.00	0.01771947	0.00	0.00393551	0.03	0.02025531	14.99	25.47	0.01
	UPTON	3.45456E-05	0.00	3.4841E-05	0.00	2.5513E-05	0.00	5.7684E-05	0.00	1.5101E-05	0.00	4.9777E-06	0.00	4.9213E-05	0.00	0.00017104	0.00	5.8521E-05	0.00	0.00031428	0.23	0.24	0.00
	VICTORIA	0.26869859	4.07	0.00810515	0.04	0.19844589	0.00	0.01340471	0.30	0.00357559	0.95	0.0025326	0.30	0.85346281	0.00	0.05715275	0.00	0.00239431	0.02	0.01201749	8.89	14.56	0.01
	GREGG		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	HARRISON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	SMITH		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	UPSHUR		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	TOTAL	**2.59433808**		**2.15884660**		**2.21670807**		**2.46753295**		**2.26120971**		**2.46530416**		**3.34809944**		**3.09910920**		**2.11715092**		**3.63318167**		3,695.35	**1.85**

Energy Savings by PCA from ESL (MWh)	American Electric Power - West (ERCOT) /PCA	NOx	Austin Energy/PCA	NOx	Brownsville Public Utils Board/PCA	NOx	Lower Colorado River Auhotrity /PCA	NOx	Reliant Energy HL&P/PCA	NOx	San Antonio Public Service Bd/PCA	NOx	South Texas Electric Coop INC/PCA	NOx	Texas Municipal Power Pool/PCA	NOx	Texas-New Mexico Power Co/PCA	NOx	TXU Electric/PCA	NOx
	15.13		4.63		0.00		22.75		264.80		117.04		0.00		0.00		6.39		740.15	

Table 34: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Single-family Residences by County using 1999 eGRID.

	Electricity Savings and Resultant NOx Reductions (Single Family Houses)			
County	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)
Harris	49,541.43	21.15	216.56	0.10
Tarrant	33,606.87	19.38	177.90	0.10
Collin	25,313.19	1.64	145.68	0.01
Dallas	22,916.90	31.79	121.38	0.17
Bexar	18,207.73	23.63	88.29	0.11
Travis	18,717.70	0.45	90.17	0.00
Denton	14,684.76	0.79	84.62	0.00
Williamson	10,187.52	0.00	49.01	0.00
El Paso	8,379.49	0.00	33.78	0.00
Montgomery	10,751.30	0.00	46.91	0.00
Galveston	5,274.22	14.39	23.06	0.07
Brazoria	5,785.00	3.53	25.32	0.02
Comal	3,220.05	0.00	15.57	0.00
Rockwall	3,608.00	0.00	20.82	0.00
Hays	4,713.70	0.00	22.75	0.00
Nueces	2,787.69	2.69	10.77	0.01
Fort Bend	6,819.56	30.87	29.83	0.14
Ellis	4,092.90	0.00	21.69	0.00
Johnson	2,081.99	0.01	11.03	0.00
Guadalupe	2,638.20	0.00	12.78	0.00
Kaufman	1,774.18	0.00	10.25	0.00
Jefferson	1,308.30	0.00	5.67	0.00
Parker	807.34	0.12	4.66	0.00
Smith	935.46	0.00	4.84	0.00
Bastrop	666.69	3.44	3.11	0.02
Chambers	1,053.38	8.08	4.56	0.04
Gregg	464.89	0.00	2.40	0.00
San Patricio	582.06	0.18	2.25	0.00
Liberty	490.83	0.00	2.12	0.00
Victoria	207.36	1.52	0.99	0.01
Orange	462.74	0.00	2.01	0.00
Caldwell	237.08	0.00	1.12	0.00
Wilson	82.69	0.00	0.40	0.00
Hardin	213.85	0.00	0.93	0.00
Harrison	68.60	0.00	0.35	0.00
Waller	82.08	0.00	0.36	0.00
Upshur	14.10	0.00	0.07	0.00
Rusk	19.82	0.00	0.10	0.00
Hood	210.05	19.51	1.11	0.10
Hunt	432.64	0.00	2.49	0.00
Henderson	213.31	2.05	1.11	0.01
Ward		37.49		0.20
McLennan		34.72		0.18
Mitchell		29.46		0.16
Freestone		16.43		0.09
Fannin		13.26		0.07
Young		12.70		0.07
Cherokee		7.16		0.04
Titus		5.12		0.03
Limestone		3.93		0.02
Red River		2.03		0.01
Robertson		2.02		0.01
Palo Pinto		1.79		0.01
Llano		2.02		0.01
Haskell		0.95		0.00
Howard		0.84		0.00
Calhoun		0.82		0.00
Lamar		0.75		0.00
Nolan		0.67		0.00
Hidalgo		0.61		0.00
Cameron		0.61		0.00
Frio		0.54		0.00
Brazos		0.52		0.00
Jones		0.45		0.00
Crockett		0.36		0.00
Wilbarger		0.36		0.00
Fayette		0.42		0.00
Angelina		0.32		0.00
Whichita		0.31		0.00
Wharton		0.26		0.00
Webb		0.25		0.00
Coke		0.10		0.00
Grimes		0.06		0.00
Andrews		0.04		0.00
Coleman		0.03		0.00
Hardeman		0.03		0.00
Pecos		0.03		0.00
Upton		0.02		0.00
Taylor		0.01		0.00
Tom Green		0.00		0.00
Wise		0.00		0.00
Presidio		0.00		0.00
Total	**263,655.66**	**362.74**	**1,298.81**	**1.85**



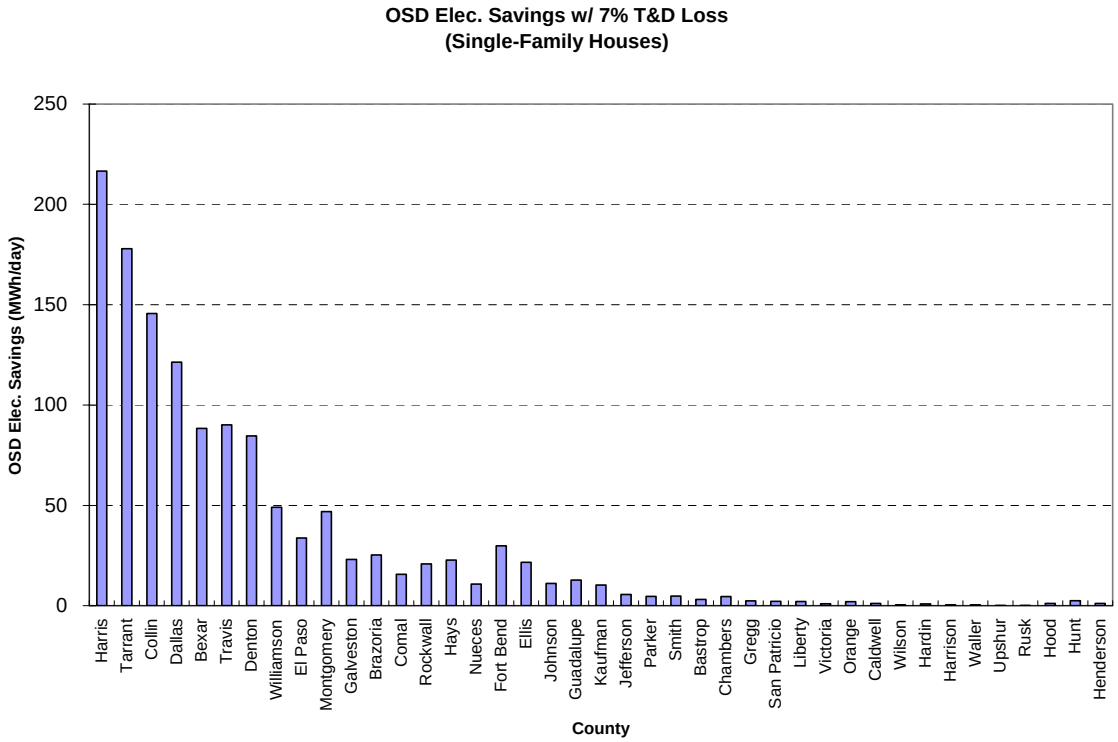


Figure 41: 2005 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Single-family.

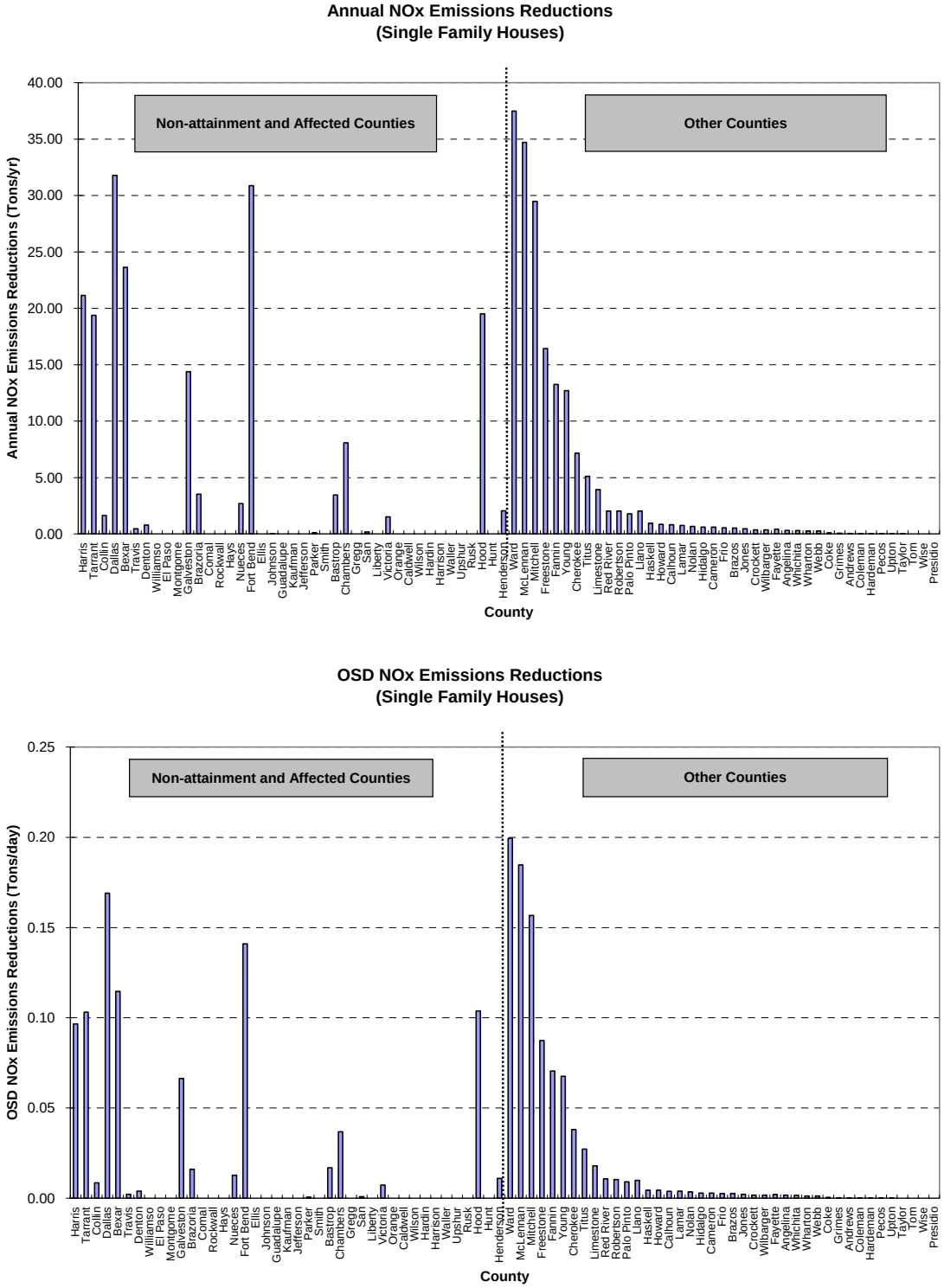


Figure 42: 2005 Annual and OSD NOx Reductions From IECC / IRC by PCA for Single-family Residences by County Using 1999 eGRID.

Table 35: 2005 Annual NOx Reductions from IECC / IRC by PCA for Single-family Residences by County using 2007 eGRID.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.00883113	33.6835929	0.010890729	10.47634723	0.006522185	0	0.003944232	18.5919257	0.0654443	3965.189652	0.014877	359.2700835	0.006262	0	0.0048171	0	0.121275	143.7829945	0.00816387	1129.888403	5660.882998	2.830441499
	Chambers	0.02176222	83.0051924	0.026955801	25.93015865	0.016072371	0	0.009076193	42.78245136	0.1649402	9993.526674	0.037472	904.9056682	0.015056	0	0.0095532	0	0.011519	13.65638173	0.01581859	2189.310189	13253.11672	6.626558358
	Fort Bend	0.07043123	268.63792	0.087239726	83.92033893	0.052016606	0	0.029374182	138.4610818	0.5338124	32343.03951	0.121275	2928.635779	0.048726	0	0.030918	0	0.037279	44.19749986	0.05119528	7085.481256	42892.37338	21.44618669
	Galveston	0.03385674	129.135946	0.041710519	40.12347361	0.025004711	0	0.015351589	72.36278383	0.2495874	15122.19427	0.056747	1370.365214	0.024143	0	0.0192972	0	0.567751	673.1230646	0.03283689	4544.660419	21951.96517	10.97598258
	Harris	0.06826733	260.384395	0.084559408	81.34200371	0.050418468	0	0.028471701	134.2070584	0.5174117	31349.34478	0.117549	2838.657534	0.047229	0	0.0299681	0	0.036133	42.8395934	0.04962237	6867.789739	41574.56511	20.78728255
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.00203914	7.77764346	0.003716345	3.574941313	0.001505992	0	0.005950953	28.0510058	0.0024815	150.3497308	0.000717	17.31581401	0.019166	0	0.0766809	0	0.000864	1.024840435	0.0040002	553.6318854	761.7258613	0.380862931
	Dallas	0.00453947	17.3143934	0.004683963	4.505742356	0.003352602	0	0.00774211	36.49398374	0.0020856	126.3646338	0.000681	16.44669386	0.007503	0	0.026717	0	0.007525	8.921523799	0.04037045	5587.314226	5797.361196	2.898680598
	Denton	0.00047388	1.80746821	0.000872802	0.839592265	0.000349982	0	0.001396994	6.585009889	0.0005854	35.4712977	0.000169	4.080411422	0.004544	0	0.0181872	0	0.000187	0.221238559	0.00084941	117.5586185	166.5636366	0.083281818
	Tarrant	0.01216249	46.3900242	0.012266309	11.79958815	0.008982543	0	0.020308652	95.72889396	0.0053165	322.1205107	0.001753	42.32067237	0.017326	0	0.0602168	0	0.020603	24.42734274	0.11064724	15313.69655	15856.48358	7.92824179
	Ellis	0.00327981	12.5098232	0.003307809	3.18195053	0.002422289	0	0.005476558	25.81485056	0.0014337	86.86502582	0.000473	11.41245645	0.004672	0	0.0162384	0	0.005556	6.587229584	0.02983782	4129.586916	4275.958252	2.137979126
	Johnson	0.00028606	1.09108063	0.000526868	0.506821008	0.000211267	0	0.000843297	3.975050136	0.0003534	21.41229689	0.000102	2.46314588	0.002743	0	0.0109787	0	0.000113	0.133550956	0.00051274	70.96441926	100.5463648	0.050273182
	Kaufman	0.00632545	24.1264609	0.006379446	6.136713813	0.004671629	0	0.010562096	49.78655341	0.002765	167.5279985	0.000911	22.01007792	0.009011	0	0.0313175	0	0.010715	12.7041393	0.05754527	7964.326543	8246.618486	4.123309243
	Parker	0.00021749	0.82954563	0.000400576	0.385334628	0.000160626	0	0.000641157	3.022219764	0.0002687	16.27971086	7.75E-05	1.872723087	0.002085	0	0.0083471	0	8.56E-05	0.101538427	0.00038984	53.95405418	76.44512657	0.038222563
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.00081989	3.12723286	0.000826893	0.795430925	0.000605529	0	0.001369042	6.453252576	0.0003584	21.71470837	0.000118	2.852910723	0.001168	0	0.0040593	0	0.001389	1.646690001	0.00745892	1032.323133	1068.913358	0.534456679
	Hood	0.01252711	47.780744	0.012634039	12.1533263	0.009251829	0	0.020917482	98.59873658	0.0054759	331.7773147	0.001805	43.58939767	0.017846	0	0.062022	0	0.021221	25.1596465	0.11396431	15772.78363	16331.8428	8.1659214
	Hunt	0.00618756	23.6005068	0.006240374	6.002934138	0.004569788	0	0.010331844	48.70121211	0.0027047	163.8759069	0.000892	21.53026068	0.008815	0	0.0306347	0	0.010482	12.42719048	0.05629078	7790.705114	8066.843125	4.033421563
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.03341375	127.446306	0.051775843	49.80582245	0.024677545	0	0.090663423	427.3601802	0.0011418	69.18276632	1.143572	27615.72475	0.046874	0	0.0046695	0	0.00052	0.61601426	0.00250387	346.537632	28636.67347	14.31833674
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.00200047	7.63015655	0.076378745	73.47260702	0.001477434	0	0.133848731	630.9227639	0.0012371	74.95636251	0.003555	85.84356426	0.001062	0	0.0018557	0	0.000402	0.476275283	0.00183516	253.9887832	1127.290513	0.563645256
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.00450233	17.1727446	0.171901148	165.3604754	0.003325174	0	0.301245466	1419.980758	0.0027843	168.6998766	0.008001	193.2030613	0.00239	0	0.0041765	0	0.000904	1.071924768	0.0041303	571.6376164	2537.126457	1.268563229
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.0024586	9.37755774	0.093870431	90.29875203	0.001815785	0	0.164501762	775.4119599	0.0015205	92.12230606	0.004369	105.502813	0.001305	0	0.0022807	0	0.000494	0.585348273	0.00225544	312.1553881	1385.454125	0.692727063
	Travis	0.00051001	1.94526229	0.299602906	288.203304	0.000376663	0	0.033939476	159.9805096	0.0003347	20.27959624	0.000906	21.88160761	0.000271	0	0.0004717	0	0.000103	0.122503828	0.00046734	64.67977279	557.0925564	0.278546278
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0.00068596	2.61639841	0.00069182	0.665497038	0.000506616	0	0.001145408	5.399111774	0.0002999	18.16760405	9.88E-05	2.386886875	0.000977	0	0.0033962	0	0.001162	1.37770268	0.00624051	863.6928301	894.3060309	0.447153015
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22756873	867.989769	0.004556851	4.383467505	0.168069652	0	0.007612767	35.88430046	0.0016809	101.8429412	0.001627	39.28494204	0.046792	0	0.0072464	0	0.001609	1.908127538	0.00828339	1146.430731	2197.724278	1.098862139
	San Patricio	0.05031335	191.904547	0.001007478	0.969144313	0.037158653	0	0.001683113	7.933688492	0.0003716	22.51653677	0.00036	8.685539041	0.010345	0	0.0016021	0	0.000356	0.421869433	0.00183138	253.4652809	485.8966064	0.242948303
Victoria Area	Victoria	0.02183674	83.2894008	0.002215582	2.131281402	0.016127403	0	0.003612695	17.02916173	0.0011996	72.68357763	0.000555	13.41189481	0.525456	0	0.0324127	0	0.000477	0.565357352	0.00225485	312.0735477	501.1842214	0.250592111
Other ERCOT counties	Andrews	2.4742E-05	0.09437094	2.49533E-05	0.024003829	1.82731E-05	0	4.13138E-05	0.194740695	1.082E-05	0.655287755	3.57E-06	0.086092681	3.52E-05	0	0.0001225	0	4.19E-05	0.049692392	0.00022509	31.1525578	32.25674608	0.016128373
	Angelina	0.00031082	1.1855254	0.000313473	0.301545682	0.000229554	0	0.000519	2.446410353	0.0001359	8.23198639	4.48E-05	1.08153063	0.000443	0	0.0015389	0	0.000527	0.624255663	0.00282766	391.3508684	405.2221225	0.202611061
	Bosque	0.00059539	2.27093576	0.001096604	1.054878909	0.000439723	0	0.001755208	8.273525541	0.0007356	44.56678007	0.000212	5.126702721	0.005709	0	0.0228507	0	0.000234	0.277968128	0.00106721	147.7027748	209.2735659	0.104636783
	Brazos	0.00193973	7.39847531	0.003572622	3.436687079	0.001432574	0	0.005718288	26.95429596	0.0023964	145.1939895	0.000692	16.70227061	0.018599	0	0.0744451	0	0.000764	0.905591594	0.00347685	481.2004613	681.7917714	0.340895886
	Calhoun	0.08269981	315.432563	0.001655986	1.592977752	0.061077496	0	0.002766524	13.04056485	0.0006108	37.01032102	0.000591	14.27637791	0.017004	0	0.0026334	0	0.000585	0.693424717	0.00301023	416.6196387	798.6658681	0.399332934
	Cameron	0.04837175	184.498905	0.000968599	0.931744801	0.297964476	0	0.001618161	7.627525548	0.0003573	21.64761821	0.000346	8.350362004	0.009946	0	0.0015403	0	0.000342	0.40558939	0.00176071	243.6839949	467.1457397	0.23357287
	Cherokee	0.0035039	13.3645268	0.003533808	3.399349646	0.002587786	0	0.00585073	27.57858813	0.0015316	92.79986976	0.000505	12.19218508	0.004992	0	0.0173479	0	0.005936	7.0372862	0.03187642	4411.731008	4568.102814	2.284051407
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.00129879	4.95381647	2.6007E-05	0.025017453	0.000959212	0	4.34478E-05	0.204799924	9.593E-06	0.581240998	9.28E-06	0.224208165	0.000267	0	4.136E-05	0	9.19E-06	0.010890121	4.7275E-05	6.542942837	12.54291597	0.006271458
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.00353575	13.4860039	0.003565928	3.430248079	0.002611307	0	0.005903911	27.82926406	0.0015456	93.64337537	0.000509	12.3030061	0.005037	0	0.0175056	0	0.00599	7.101251704	0.03216616	4451.831494	4609.624643	2.304812322
	Fannin	0.00705631	26.9141062	0.007116546	6.845768545	0.005211403	0	0.011782473	55.53904446	0.0030845	186.8846972	0.001017	24.55318982	0.010052	0	0.034936	0	0.011954	14.17201451	0.06419422	8884.549255	9199.458075	4.599729038
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.00367718	14.025444	0.003708565	3.567458002	0.00271576	0	0.006140067	28.94243462	0.0016074	97.38911039	0.00053	12.79512635	0.005238	0	0.0182058	0	0.006229	7.385301772	0.03345281	4629.904754	4794.009629	2.397004814
	Frio	0.00858833	32.7575173	0.000871383	0.838227755	0.006342868	0	0.001420864	6.697527596	0.0004718	28.58627305	0.000218	5.274865376	0.206661	0	0.0127478	0	0.000188	0.222353662	0.00088683	122.7377619	197.1145267	0.098557263
	Grimes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.18852746	719.079035	0.003775086	3.631447857	0.139235931	0	0.006306735	29.72805566	0.0013925	84.37095294	0.001348	32.54528941	0.038764	0	0.0060032	0	0.001333	1.580772676	0.00686231	949.7511766	1820.686731	0.910343365
	Howard	0.00055511	2.11730516	0.000559851	0.538549597	0.000409976	0	0.000926915	4.369199721	0.0002427	14.70202764	8E-05	1.931574285	0.000791	0	0.0027484	0	0.00094	1.11489786	0.00505009	698.9383864	723.7119407	0.36185597
	Jack	0.00212145	8.09160232	0.002139557	2.058148847	0.001566784	0	0.003542346	16.69755844	0.0009273	56.18602522	0.000306	7.381803663	0.003022	0	0.0105033	0	0.003594	4.260751022	0.0192997	2671.098896	2765.774786	1.382887393
	Jones	0.04071872	155.308835	0.000815354	0.784330938	0.030072592	0	0.001362147	6.420754121	0.0003008	18.22269004	0.000291	7.029228668	0.008372	0	0.0012966	0	0.000288	0.341419997	0.00148214	205.1300916	393.2373499	0.196618675
	Lamar	0.00095084	3.62667367	0.000958954	0.922466767	0.000702236	0	0.001587687	7.483881827	0.0004156	25.1826981	0.000137	3.308540377	0.001355	0	0.0047076	0	0.001611	1.909677829	0.00865017	1197.192306	1239.626245	0.619813122
	Limestone	0.00071976	2.74528721	0.000891528	0.857605781	0.000531572	0	0.000300183	1.414973125	0.0054552	330.5227077	0.001239	29.9285609	0.000498	0	0.000316	0	0.000381	0.451666805	0.00052318	72.40854558	438.3293471	0.219164674
	Llano	0.00123817	4.72262742	0.047274044	45.47531179	0.000914447	0	0.082844655	390.5048503	0.0007657	46.39367098	0.0022	53.13222177	0.000657	0	0.0011486	0	0.000249	0.294786967	0.00113586	157.2044273	697.7278966	0.348863948
	McLennan	0.02453432	93.5784822	0.024743738	23.80226286	0.018119687	0	0.040966843	193.105409	0.0107245	649.7851422	0.003535	85.3697396	0.034951	0	0.1214699	0	0.041562	49.27511241	0.22319886	30890.96211	31985.87826	15.99293913
	Milam	0.0022454	8.564395	0.002264571	2.178406575	0.001658332	0	0.003749326	17.67319751	0.0009815	59.46897715	0.000324	7.813122776	0.003199	0	0.011117	0	0.003804	4.509706892	0.02042738	2827.171323	2927.379129	1.463689564
	Mitchell	0.01494317	56.996045	0.015070721	14.4972948	0.011036196	0	0.024951762	117.6151217	0.006532	395.7660169	0.002153	51.99632865	0.021288	0	0.073984	0	0.025314	30.01209739	0.1359442	18814.82391	19481.70682	9.740853408
	Nolan	0.00056465	2.153695	0.000569473	0.547805579	0.000417022	0	0.000942846	4.444292587	0.0002468	14.95470948	8.14E-05	1.964772001	0.000804	0	0.0027956	0	0.000957	1.134059465	0.00513689	710.9509495	736.1502836	0.368075142
	Palo Pinto	0.003207	12.2320925	0.005906709	5.681964508	0.002368511	0	0.009454195	44.56424151	0.003962	240.053015	0.001144	27.61430023	0.03075	0	0.1230821	0	0.001263	1.497238235	0.00574838	795.5812908	1127.224143	0.563612071
	Pecos	4.0968E-05	0.1562584	4.13174E-05	0.039745286	3.02565E-05	0	6.84069E-05	0.322449584	1.791E-05	1.085018539	5.9E-06	0.142551351	5.84E-05	0	0.0002028	0	6.94E-05	0.082280137	0.0003727	51.58207598	53.41037928	0.02670519
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.00073771	2.81375549	0.000835096	0.803321782	0.00054483	0	0.000735917	3.468892251	0.0031497	190.8351297	0.000731	17.64965856	0.000761	0	0.0018663	0	0.191633	227.1985749	0.00339774	470.2505086	913.0198413	0.456509921
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.00569644	21.7272793	0.005745061	5.526467205	0.004207073	0	0.009511781	44.83568292	0.00249	150.8686926	0.000821	19.8213535	0.008115	0	0.0282032	0	0.00965	11.44081529	0.05182285	7172.338615	7426.558906	3.713279453
	Tom Green	0.00148245	5.65433459	2.96846E-05	0.028555166	0.001094854	0	4.95918E-05	0.233760637	1.095E-05	0.663434162	1.06E-05	0.255913393	0.000305	0	4.72E-05	0	1.05E-05	0.012430091	5.396E-05	7.46817897	14.31660701	0.007158304
	Upton	3.1166E-05	0.11887345	3.14322E-05	0.030236193	2.30176E-05	0	5.20405E-05	0.245303247	1.362E-05	0.825426931	4.49E-06	0.108445819	4.44E-05	0	0.0001543	0	5.28E-05	0.062594544	0.00028353	39.24102046	40.63190064	0.02031595
	Ward	0.01855953	70.789519	0.01871795	18.00574982	0.013707039	0	0.030990277	146.0788709	0.0081128	491.5443871	0.002674	64.57983355	0.02644	0	0.0918886	0	0.03144	37.27525201	0.16884373	23368.15364	24196.42725	12.09821363
	Webb	0.02001433	76.3383935	0.000400768	0.385519369	0.014781473	0	0.000669531	3.155970208	0.0001478	8.956933372	0.000143	3.455051516	0.004115	0	0.0006373	0	0.000142	0.167816945	0.00072851	100.826857	193.286542	0.096643271
	Wharton	0.00014434	0.55053865	0.000178787	0.171983872	0.000106601	0	6.01986E-05	0.283758065	0.001094	66.28287314	0.000249	6.00185996	9.99E-05	0	6.336E-05	0	7.64E-05	0.090577055	0.00010492	14.52077672	87.90236747	0.043951184
	Wichita	0.00020763	0.79195196	0.000209406	0.201437855	0.000153346	0	0.000346701	1.634245434	9.076E-05	5.49911267	2.99E-05	0.722481612	0.000296	0	0.001028	0	0.000352	0.417013836	0.00188893	261.4293096	270.695553	0.135347777
	Wilbarger	0.02861682	109.149905	0.000573025	0.551222008	0.021134796	0	0.000957307	4.512458713	0.0002114	12.80677236	0.000205	4.940090144	0.005884	0	0.0009112	0	0.000202	0.23994746	0.00104164	144.1639178	276.3643137	0.138182157
	Wise	0.00284449	10.8494084	0.002882008	2.77235041	0.002100781	0	0.00476997	22.48420991	0.0012561	76.1040706	0.000413	9.979223113	0.004182	0	0.0146143	0	0.004798	5.688419602	0.02576141	3565.406994	3693.284676	1.846642338
	Young	0.00623586	23.7847242	0.006289085	6.049790982	0.004605458	0	0.010412491	49.08135706	0.0027258	165.155066	0.000899	21.69831851	0.008883	0	0.0308739	0	0.010564	12.52419287	0.05673017	7851.516685	8129.810135	4.064905067
	Total	**1.12183722**	**4278.89732**	**1.172570094**	**1127.954932**	**1.090766584**	**0**	**1.189130767**	**5605.20572**	**1.62936**	**98720.93169**	**1.542363**	**37245.99008**	**1.359386**	**0**	**1.2316428**	**0**	**1.221806**	**1448.56731**	**1.52878695**	**211585.7562**	**360013.3032**	**180.0066516**

Energy Savings by PCA (MWh)		American Electric Power - West (ERCOT)		Austin Energy		Brownsville Public Utils Board		Lower Colorado River Auhotrity		Reliant Energy HL&P		San Antonio Public Service Bd		South Texas Electric Coop INC		Texas Municipal Power Pool		Texas-New Mexico Power Co		TXU Electric	
		3,814.19		961.95		0.00		4,713.70		60,588.78		24,148.66		0.00		0.00		1,185.60		138,401.07	

Table 36: 2005 OSD NOx Reductions from IECC / IRC by PCA for Single-family Residences by County using 2007 eGRID.

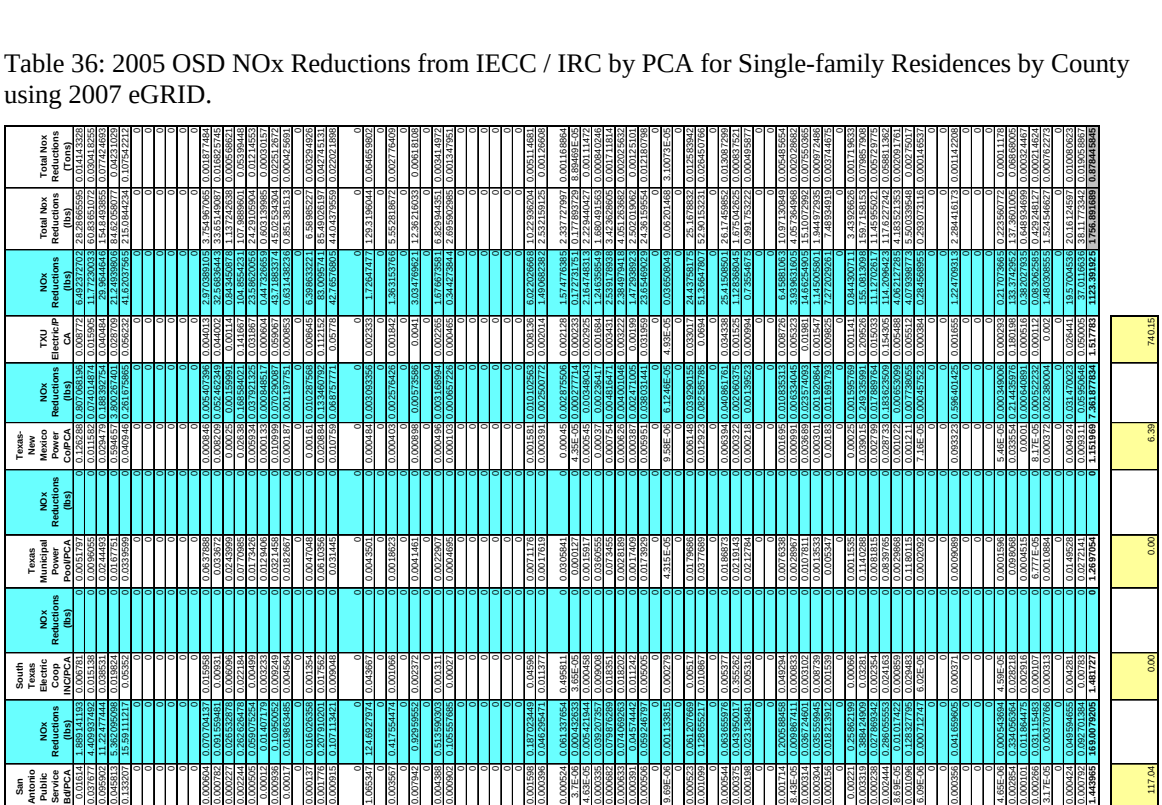


Table 37: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Single-family Residences by County using 2007 eGRID.

		Electricity Savings and Resultant NOx Reductions (Single Family Houses)			
County		Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)
Harris		49,541.43	20.79	216.56	0.11
Tarrant		33,606.87	7.93	177.90	0.05
Collin		25,313.19	0.38	145.68	0.00
Dallas		22,916.90	2.90	121.38	0.02
Bexar		18,207.73	14.32	88.29	0.06
Travis		18,717.70	0.28	90.17	0.00
Denton		14,684.76	0.08	84.62	0.00
Williamson		10,187.52	0.00	49.01	0.00
El Paso		8,379.49	0.00	33.78	0.00
Montgomery		10,751.30	0.00	46.91	0.00
Galveston		5,274.22	10.98	23.06	0.04
Brazoria		5,785.00	2.83	25.32	0.01
Comal		3,220.05	0.00	15.57	0.00
Rockwall		3,608.00	0.00	20.82	0.00
Hays		4,713.70	0.69	22.75	0.00
Nueces		2,787.69	1.10	10.77	0.01
Fort Bend		6,819.56	21.45	29.83	0.08
Ellis		4,092.90	2.14	21.69	0.01
Johnson		2,081.99	0.05	11.03	0.00
Guadalupe		2,638.20	0.56	12.78	0.00
Kaufman		1,774.18	4.12	10.25	0.02
Jefferson		1,308.30	0.00	5.67	0.00
Parker		807.34	0.04	4.66	0.00
Smith		935.46	0.00	4.84	0.00
Bastrop		666.69	1.27	3.11	0.01
Chambers		1,053.38	6.63	4.56	0.03
Gregg		464.89	0.00	2.40	0.00
San Patricio		582.06	0.24	2.25	0.00
Liberty		490.83	0.00	2.12	0.00
Victoria		207.36	0.25	0.99	0.00
Orange		462.74	0.00	2.01	0.00
Caldwell		237.08	0.00	1.12	0.00
Wilson		82.69	0.00	0.40	0.00
Hardin		213.85	0.00	0.93	0.00
Harrison		68.60	0.00	0.35	0.00
Waller		82.08	0.00	0.36	0.00
Upshur		14.10	0.00	0.07	0.00
Rusk		19.82	0.45	0.10	0.00
Hood		210.05	8.17	1.11	0.04
Hunt		432.64	4.03	2.49	0.02
Henderson		213.31	0.53	1.11	0.00
Ward			12.10		0.07
McLennan			15.99		0.08
Mitchell			9.74		0.06
Freestone			2.40		0.01
Fannin			4.60		0.03
Young			4.06		0.02
Cherokee			2.28		0.01
Titus			3.71		0.00
Limestone			0.22		0.00
Red River			0.00		0.00
Robertson			0.46		0.00
Palo Pinto			0.56		0.00
Llano			0.35		0.00
Haskell			0.00		0.00
Howard			0.36		0.00
Calhoun			0.40		0.00
Lamar			0.62		0.00
Nolan			0.37		0.00
Hidalgo			0.91		0.01
Cameron			0.23		0.00
Frio			0.10		0.00
Brazos			0.34		0.00
Jones			0.20		0.00
Wilbarger			0.14		0.00
Fayette			0.00		0.00
Angelina			0.20		0.00
Whichita			0.14		0.00
Wharton			0.04		0.00
Webb			0.10		0.00
Coke			0.00		0.00
Grimes			0.00		0.00
Andrews			0.02		0.00
Coleman			0.01		0.00
Hardeman			0.00		0.00
Pecos			0.03		0.00
Upton			0.02		0.00
Taylor			0.00		0.00
Tom Green			0.01		0.00
Wise			1.85		0.01
Presidio			0.00		0.00
Bosque	*		0.10		0.00
Crockett	*		0.00		0.00
Ector	*		2.30		0.01
Jack	*		1.38		0.01
Milam	*		1.46		0.01
Total		**263,655.66**	**180.01**	**1,298.81**	**0.88**

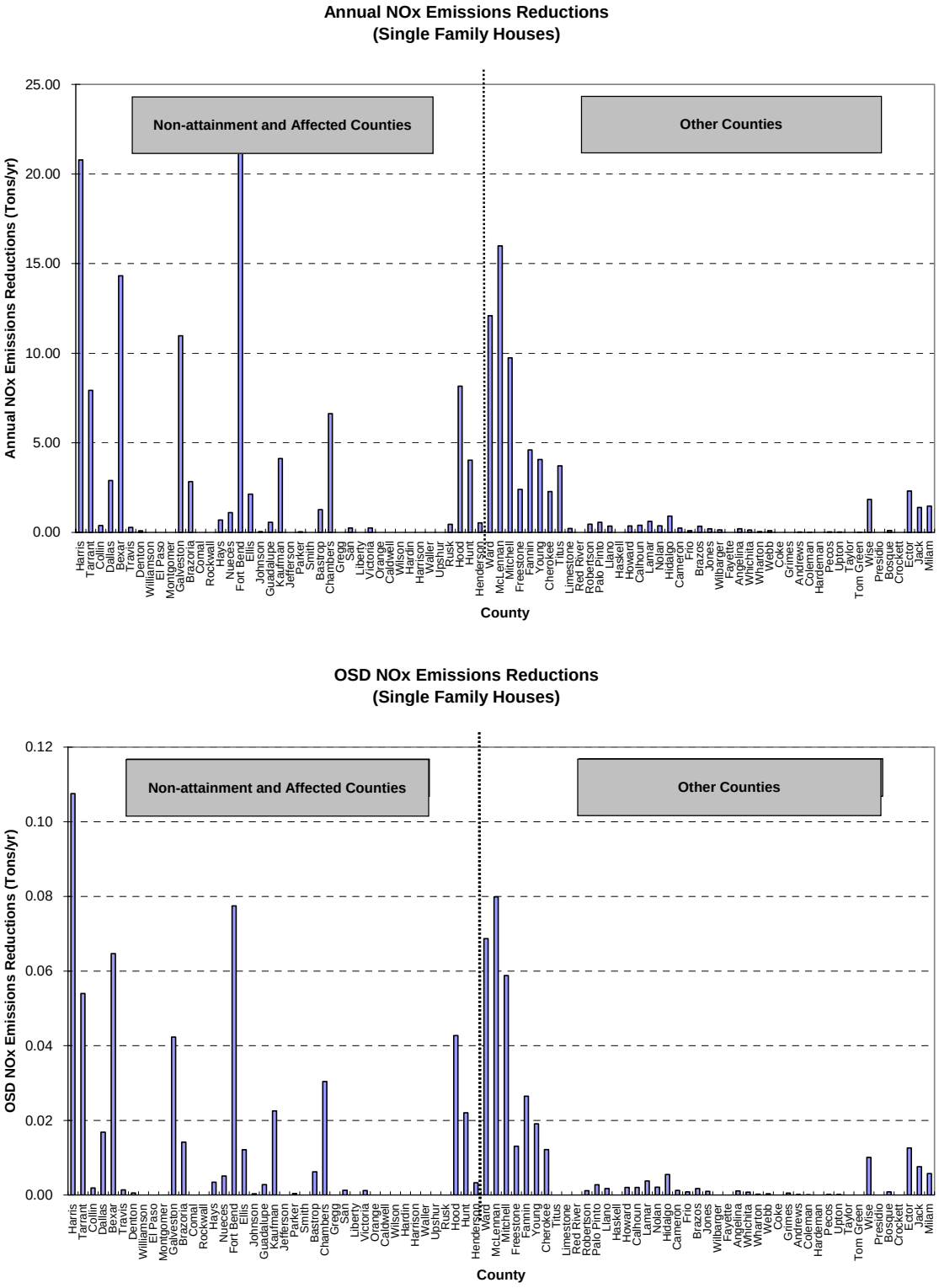


Figure 43: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Single-family Residences by County using 2007 eGRID.

6.1.2 2005 Results for New Multi-family Residential Construction.

In this section of the report, calculations are provided regarding the potential electricity reductions and associated emissions reductions from the implementation of the IECC / IRC to new multi-family residences in the 41 non-attainment and affected counties. To calculate the NOx emissions reductions from the implementation of the IECC /IRC in multi-family residences, new construction activity by county had to be determined. Then, energy savings attributable to the IECC / IRC had to be modeled using the code-traceable, DOE-2 simulation that the Laboratory has developed for the TERP. Next, these estimates were applied to the NAHB's survey data to determine the appropriate number of housing types. In addition, estimates of the NOx reduction potential from the electricity reductions in each county were calculated using the US EPA's 1999 and 2007 eGRID database[42]. The results of the new calculations are reported in Table 38 through Table 44 for new multi-family residences, which were estimated to be constructed during 2004.

In Table 38, the 1999 and IECC / IRC code-compliant building characteristics for multi-family are shown for each county. The IECC / IRC code-compliant characteristics are the minimum building code characteristics required by the IECC / IRC for each county for multi-family residences (i.e., Type A.2). In Table 38, the rows are sorted first by the US EPA's non-attainment and affected designation, then alphabetically. Next, in the third column, the location of the TMY2 weather file is listed, followed by the NAHB survey classification. The fifth column in Table 38 lists the window area for the average house as defined by the NAHB survey[43]. The sixth, seventh, eighth and ninth columns show the NAHB's average glazing U-value, Solar Heat Gain Coefficient (SHGC), roof insulation and wall insulation, respectively. In columns ten through fourteen of Table 38 ,the corresponding values from the IECC / IRC code-compliant house are listed for each county (i.e., percent area, glazing U-value, SHGC, roof and wall insulation R-value). For each county the identical window percent area was used for the 1999 and code-compliant calculation (i.e., window-to-wall area).

The IECC / IRC SHGC is 0.4 for all non-attainment and affected counties since they all fall below the 3,500 HDD_{65}, as required by the IECC / IRC. All houses were assumed to have an air conditioner efficiency[44] equal to a SEER 11, and a furnace efficiency (AFUE) or 0.80. The values shown in Table 38 represent the only changes that were made to the simulation to obtain the savings calculations. All other variables in the simulation remained the same for the 1999 and IECC / IRC code-compliant simulation. In cases where the 1999 values were more efficient than the IECC / IRC code-compliant simulation, the 1999 values were used in both simulations, since this indicates that the prevailing practice is already above code.

In Table 39, the code-traceable simulation results for multi-family are shown for each county. In a similar fashion as Table 38, this table is first divided into US EPA affected and then non-attainment classifications, followed by an alphabetical listing of counties. In the third column, the IECC / IRC climate zone is listed followed by the number of projected new housing units[45] in the fourth column. In the fifth column, the total simulated energy use is listed if all new construction had been built to pre-code specifications, and, in the sixth column, the total county-wide energy use for code-compliant construction is shown. In a similar fashion as the 2004 report, the values in the fifth and sixth columns come from the associated tables in the 2005 Volume III Appendix to the 2005 Volume II Technical report. As previously explained, in the 2004 report, 18 simulations were run for each county, which were then distributed according to the NAHB's survey data to account for 1, 2 or 3 story, and 3 fuel options (i.e., central air conditioning with electric resistance heating, heat pump heating, or a natural gas-fired furnace).

[42] This analysis assumes transmission and distribution losses of 7%. Counties were assigned to utility service districts as indicated in a fashion similar to the 2004 report.

[43] In a similar fashion as single-family, this value represents the NAHB's reported number of window units times an average window size of 3 x 5 feet, which was determined by surveying local building suppliers. Additional information about the procedures used to determine these values can be found in Im (2003).

[44] In a similar fashion as single-family, the choice of a SEER 11 efficiency for the air conditioner was based on ARI sales numbers for Texas which show an average SEER 11 for houses built in 1999.

[45] The number of projected new housing units uses the published values for the new housing units in 2004. A vacancy rate of 0% was assumed for 2005 calculations, based on information suggested by the Real Estate Center at Texas A&M University.

In the seventh and eighth columns, the total pre-code and code-compliant peak-day energy use is reported for peak OSD, Episode Day for the 2004 annual report across all counties. In a similar fashion as the annual pre-code and code-compliant energy use, these values are from the associated tables for each county in the Volume III Appendix to this report.

In the ninth and tenth columns, the total annual electricity and Ozone Season Day savings are shown for each county, respectively. In similar fashion as the 2004 report, a 7% transmission and distribution loss is used in the 2005 report, which represents a fixed 1.07 multiplier for the electricity use. In the eleventh and twelfth columns, the total annual pre-code and code-compliant natural gas use is shown for those residences that had natural gas-fired furnaces and domestic water heaters. Similarly, in columns thirteen and fourteen, the simulated total peak OSD natural gas use on the OSD, is shown for each county. Finally, in columns fifteen and sixteen, the total annual and peak-day natural gas savings are shown for each county.

In Table 40, the annual electricity savings from Table 39 are assigned to PCA provider(s) in a similar fashion as the single-family residential assignments. The total electricity savings for each PCA, as shown in the bottom half of Table 40, are then entered into the bottom row of Table 41, the 1999 US EPA eGRID database for Texas. eGRID then proportions each MWh of electricity savings according to the 1999 measured data from the power plants assigned to that PCA. For each county in which there is a power plant, the lbs-NOx/MWh are calculated and displayed as NOx reductions (lbs) in the column adjacent to the PCA column. In a similar fashion as the single-family residences, adding across the rows then totals the NOx reductions in each county from multiple PCAs that have power plants in that county. Counties that do not show NOx reductions represent counties that do not have power plants in eGRID's database. In Table 42, the PCA assignments for peak OSD reductions are shown for each county, and, in Table 43, the peak OSD NOx reductions are shown calculated with the 1999 eGRID.

Table 44 is a summary of the annual and peak-day electricity savings for each county from implementation of the IECC / IRC and the associated NOx reductions at the power plants that supplied the electricity, as well as the NOx reductions from natural gas savings associated with the code adoption.

Figure 44 and Figure 45 illustrate the electricity savings and NOx reductions. In Figure 44, the total annual electricity savings (upper graph) and total peak-day savings (lower graph) are shown for the 41 non-attainment and affected counties. Figure 45 shows the annual NOx emissions reductions (upper graph) and peak-day NOx emissions reductions (lower graph) as calculated by the 1999 eGRID database for the 41 non-attainment and affected counties and other counties in the eGRID database that have power plants that supply electricity to the 41 counties.

In a similar fashion as single-family residential, the total electricity savings for each PCA, as shown in the bottom half of Table 42 are then entered into the bottom row of Table 45 and Table 46, which are the 2007 US EPA eGRID database for Texas for annual (Table 45) and Ozone Season Day (Table 46) periods. The 2007 version of eGRID then proportions each MWh of electricity savings according to the 1999 measured data from the power plants assigned to that PCA and forecasts the NOx reductions for 2007. For each county in which there is one or more power plants, the lbs-NOx/MWh are calculated and displayed as NOx reductions (lbs) in the column adjacent to the PCA column. Adding across the rows then totals the NOx reductions in each county from multiple PCAs that have power plants in that county. Counties that do not show NOx reductions represent counties that do not have power plants in eGRID's database.

Table 47 is a summary of the annual and peak-day electricity savings for each county from implementation of the IECC / IRC, and the associated NOx reductions at the power plants that supplied the electricity, as well as the NOx reductions from natural gas savings associated with the code adoption in single-family residences.

Figure 46 illustrates the NOx reductions previously shown in Table 45 and Table 46 for annual and peak-day savings. Figure 43 shows the annual NOx emissions reductions (upper graph) and peak-day NOx emissions reductions (lower graph) as calculated by the 2007 eGRID database for the 41 non-attainment

and affected counties and other counties in the eGRID database that have power plants that supply electricity to the 41 counties.

Table 38: 1999 and IECC / IRC Code-compliant Building Characteristics used in the DOE-2 Simulation for Multi-family Residential.

	County	Climate Zone	TMY2	1999 Average					2000 IECC				
				Area %	Glazing U-value	SHGC	Roof Insulation	Wall Insulation	Area %	Glazing U-value	SHGC	Roof Insulation	Wall Insulation
Non-attainment	Brazoria	3	Houston	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Chambers	4	Port Arthur	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Collin	6	Fort Worth	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	36.08	21.41
	Dallas	5	Fort Worth	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	36.08	21.41
	Denton	6	Fort Worth	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	36.08	21.41
	El Paso	6	El Paso	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	36.08	21.41
	Fort Bend	4	Houston	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Galveston	3	Houston	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Hardin	4	Port Arthur	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Harris	4	Houston	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Jefferson	4	Port Arthur	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Liberty	4	Port Arthur	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Montgomery	4	Houston	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Orange	4	Port Arthur	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Tarrant	5	Fort Worth	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	36.08	21.41
	Waller	4	Houston	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
Affected	Bastrop	4	Austin	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Bexar	4	San Antonio	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Caldwell	4	Austin	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Comal	4	San Antonio	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Ellis	5	Fort Worth	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	36.08	21.41
	Gregg	6	Lufkin	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	36.08	21.41
	Guadalupe	4	San Antonio	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Harrison	6	Lufkin	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	36.08	21.41
	Hays	5	Austin	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	36.08	21.41
	Henderson	5	Fort Worth	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	36.08	21.41
	Hood	5	Fort Worth	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	36.08	21.41
	Hunt	6	Fort Worth	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	36.08	21.41
	Johnson	5	Fort Worth	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	36.08	21.41
	Kaufman	6	Fort Worth	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	36.08	21.41
	Nueces	3	Corpus Christi	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Parker	6	Fort Worth	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	36.08	21.41
	Rockwall	6	Fort Worth	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	36.08	21.41
	Rusk	5	Lufkin	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	36.08	21.41
	San Patricio	3	Corpus Christi	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Smith	5	Lufkin	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	36.08	21.41
	Travis	5	Austin	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	36.08	21.41
	Upshur	6	Lufkin	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	36.08	21.41
	Victoria	3	Victoria	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41
	Williamson	5	Austin	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	36.08	21.41
	Wilson	4	San Antonio	7.5%	0.75	0.61	36.08	21.41	7.5%	0.75	0.40	36.08	21.41

Table 39: 2005 Annual and OSD Electricity and Natural Gas Savings from Implementation of the IECC / IRC for Multi-family Residences.

2005 Summary															
	County	Climate Zone	No. of Projected Units (2005)	Precode Total Annual Elec. Use (MWh/yr)	Code-compliant Total Annual Elec. Use (MWh/yr)	Precode OSD Elec. Use (MWh/day)	Code-compliant OSD Elec. Use (MWh/day)	Total Annual Elec. Savings (MWh/yr) w/ 7% of T&D Loss	Total OSD Elec. Savings (MWh/day) w/ 7% of T&D Loss	Precode Total NG Use (Therm/yr)	Code-compliant Total NG Use (Therm/yr)	Precode OSD NG Use (Therm/day)	Code-compliant OSD NG Use (Therm/day)	Total Annual NG Savings (Therm/yr)	Total OSD NG Savings (Therm/day)
Affected County	Bastrop	4	62	479	460	1.69	1.61	20.95	0.08	2,330	1,817	5.65	4.20	513.67	1.45
	Bexar	4	4,333	32,680	31,553	114.14	109.14	1,206.34	5.35	165,185	130,096	399.81	298.42	35,088.88	101.39
	Caldwell	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	Comal	4	251	1,893	1,828	6.61	6.32	69.88	0.31	9,569	7,536	23.16	17.29	2,032.61	5.87
	Ellis	5	102	808	785	2.86	2.73	24.43	0.14	4,396	3,610	9.25	6.87	785.96	2.39
	Gregg	6	92	691	666	2.37	2.25	26.26	0.12	3,826	3,018	8.74	6.59	807.55	2.15
	Guadalupe	4	249	1,878	1,813	6.56	6.27	69.32	0.31	9,493	7,476	22.98	17.15	2,016.42	5.83
	Harrison	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	Hays	5	618	4,776	4,581	16.84	16.05	209.00	0.85	23,227	18,046	56.35	17.29	5,180.36	39.06
	Henderson	5	6	45	44	0.16	0.15	1.41	0.01	255	208	0.57	0.43	46.82	0.14
	Hood	5	12	95	92	0.34	0.32	2.86	0.02	518	425	1.09	0.81	92.99	0.28
	Hunt	6	256	2,028	1,953	7.19	6.81	79.32	0.40	11,044	8,810	23.23	17.23	2,234.63	5.99
	Johnson	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	Kaufman	6	10	79	76	0.28	0.27	3.10	0.02	431	344	0.91	0.67	87.26	0.23
	Nueces	3	908	7,304	6,993	24.73	23.70	333.64	1.10	33,374	25,800	83.08	61.83	7,574.14	21.25
	Parker	6	69	546	526	1.94	1.84	21.36	0.11	2,974	2,371	6.26	4.65	602.13	1.61
	Rockwall	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	Rusk	5	76	568	551	1.94	1.85	17.81	0.09	3,168	2,564	7.22	5.44	603.95	1.78
	San Patricio	3	178	1,432	1,371	4.85	4.65	65.40	0.22	6,543	5,058	16.29	12.12	1,484.80	4.17
	Smith	5	116	867	842	2.96	2.83	27.18	0.14	4,835	3,913	11.02	8.30	921.81	2.71
	Travis	5	2,901	22,421	21,504	79.07	75.33	981.06	4.00	109,031	84,713	264.50	196.62	24,317.53	67.88
	Upshur	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	Victoria	3	260	1,982	1,913	6.87	6.58	73.99	0.31	0.00	0.00	0.00	0.00	0.00	0.00
	Williamson	5	125	966	927	3.41	3.25	42.27	0.17	4,698	3,650	11.40	8.47	1,047.81	2.92
	Wilson	4	4	30	29	0.11	0.10	1.11	0.00	152	120	0.37	0.28	32.39	0.09
Nonattainment County	Brazoria	3	1,079	8,349	8,005	28.79	27.51	368.33	1.37	40,553	31,611	99.09	73.84	8,942.21	25.25
	Chambers	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	Collin	6	1,011	8,006	7,780	28.38	27.09	242.17	1.38	43,570	35,779	91.72	68.06	7,790.28	23.66
	Dallas	5	3,251	25,744	25,016	91.26	87.10	778.74	4.45	140,104	115,053	294.94	218.87	25,050.65	76.07
	Denton	6	985	7,800	7,515	27.65	26.20	304.98	1.55	42,449	33,854	89.36	66.31	8,595.60	23.05
	El Paso	6	535	4,066	3,892	13.09	12.41	185.83	0.73	22,379	17,734	51.02	38.50	4,645.35	12.52
	Fort Bend	4	294	2,275	2,181	7.84	7.50	100.36	0.37	11,050	8,613	27.00	20.12	2,436.53	6.88
	Galveston	3	64	23,174	22,218	79.91	76.36	1,022.39	3.80	112,563	87,742	275.04	204.96	24,821.06	70.08
	Hardin	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	Harris	4	8,375	64,801	62,130	223.45	213.53	2,858.94	10.62	314,763	245,355	769.11	573.14	69,407.81	195.97
	Jefferson	4	48	373	357	1.29	1.23	17.44	0.07	1,818	1,425	4.46	3.33	393.13	1.12
	Liberty	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	Montgomery	4	954	7,382	7,077	25.45	24.32	325.66	1.21	35,855	27,949	87.61	65.29	7,906.27	22.32
	Orange	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	Tarrant	5	2,583	20,454	19,876	72.50	69.20	618.73	3.54	111,316	91,413	234.34	173.90	19,903.36	60.44
	Waller	4	167	1,292	1,239	4.46	4.26	57.01	0.21	6,276	4,892	15.34	11.43	1,384.01	3.91
	TOTAL		29,974					**10,157**	**43**					**266,748**	**788**

Table 40: 2005 Totalized Annual Electricity Savings from IECC / IRC by PCA for Multi-family Residences.

NERC	County	Total Energy Savings by County (MWh)	PCA 1	Percentage	Energy Savings by County for PCA 1 (MWh)	PCA 2	Percentage	Energy Savings by County for PCA 2 (MWh)
ERCOT	CALDWELL	0.00	American Electric Power - West (ERCOT)/PCA	100%	0.00			0.00
	NUECES	333.64	American Electric Power - West (ERCOT)/PCA	100%	333.64			0.00
	SAN PATRICIO	65.40	American Electric Power - West (ERCOT)/PCA	100%	65.40			0.00
	VICTORIA	73.99	American Electric Power - West (ERCOT)/PCA	100%	73.99			0.00
	HAYS	209.00	Lower Colorado River Authority/PCA	100%	209.00			0.00
	BRAZORIA	368.33	Reliant Energy HL&P/PCA	97%	358.37	Texas-New Mexico Power Co/PCA	3%	9.96
	CHAMBERS	0.00	Reliant Energy HL&P/PCA	70%	0.00	Entergy Electric System/PCA	30%	0.00
	FORT BEND	100.36	Reliant Energy HL&P/PCA	100%	100.36			0.00
	GALVESTON	1022.39	Reliant Energy HL&P/PCA	97%	994.74	Texas-New Mexico Power Co/PCA	3%	27.65
	HARRIS	2858.94	Reliant Energy HL&P/PCA	70%	1,993.60	Entergy Electric System/PCA	30%	865.34
	WALLER	57.01	Reliant Energy HL&P/PCA	100%	57.01			0.00
	BEXAR	1206.34	San Antonio Public Service Bd/PCA	100%	1,206.34			0.00
	WILSON	1.11	San Antonio Public Service Bd/PCA	100%	1.11			0.00
	COMAL	69.88	San Antonio Public Service Bd/PCA	100%	69.88			0.00
	GUADALUPE	69.32	San Antonio Public Service Bd/PCA	100%	69.32			0.00
	BASTROP	20.95	TXU Electric/PCA	100%	20.95			0.00
	COLLIN	242.17	TXU Electric/PCA	98%	237.15	Texas-New Mexico Power Co/PCA	2%	5.03
	DALLAS	778.74	TXU Electric/PCA	100%	778.74			0.00
	DENTON	304.98	TXU Electric/PCA	98%	298.65	Texas-New Mexico Power Co/PCA	2%	6.33
	ELLIS	24.43	TXU Electric/PCA	100%	24.43			0.00
	HENDERSON	1.41	TXU Electric/PCA	100%	1.41			0.00
	HOOD	2.86	TXU Electric/PCA	98%	2.80	Texas-New Mexico Power Co/PCA	2%	0.06
	HUNT	79.32	TXU Electric/PCA	98%	77.67	Texas-New Mexico Power Co/PCA	2%	1.65
	JOHNSON	0.00	TXU Electric/PCA	98%	0.00	Texas-New Mexico Power Co/PCA	2%	0.00
	KAUFMAN	3.10	TXU Electric/PCA	100%	3.10			0.00
	PARKER	21.36	TXU Electric/PCA	100%	21.36			0.00
	ROCKWALL	0.00	TXU Electric/PCA	100%	0.00			0.00
	SMITH	27.18	TXU Electric/PCA	100%	27.18			0.00
	TARRANT	618.73	TXU Electric/PCA	100%	618.73			0.00
	TRAVIS	981.06	TXU Electric/PCA	97%	948.41	Austin Energy/PCA	3%	32.65
	WILLIAMSON	42.27	TXU Electric/PCA	97%	40.87	Austin Energy/PCA	3%	1.41
WSCC	EL PASO	185.83	El Paso Electric Co/PCA	100%	185.83			0.00
SERC	HARDIN	0.00	Entergy Electric System/PCA	30%	0.00	Reliant Energy HL&P/PCA	70%	0.00
	JEFFERSON	17.44	Entergy Electric System/PCA	100%	17.44			0.00
	LIBERTY	0.00	Entergy Electric System/PCA	100%	0.00			0.00
	MONTGOMERY	325.66	Entergy Electric System/PCA	30%	98.57	Reliant Energy HL&P/PCA	70%	227.09
	ORANGE	0.00	Entergy Electric System/PCA	100%	0.00			0.00
SPP	GREGG	26.26	Southwestern Public Service Co/PCA	100%	26.26			0.00
	HARRISON	0.00	Southwestern Public Service Co/PCA	100%	0.00			0.00
	RUSK	17.81	Southwestern Public Service Co/PCA	100%	17.81			0.00
	UPSHUR	0.00	Southwestern Public Service Co/PCA	100%	0.00			0.00

PCA	Total Electricity Savings by PCA (MWh)
American Electric Power - West(ERCOT)/PCA	473.03
Austin Energy/PCA	34.06
Brownsville Public Utils Board/PCA	0.00
Lower Colorado River Authority/PCA	209.00
Reliant Energy HL&P/PCA	3,731.17
San Antonio Public Service Bd /PCA	1,346.65
South Texas Electric Coop Inc/PCA	0.00
Texas Municipal Power Pool/PCA	0.00
Texas-New Mexico Power Co/PCA	50.67
TXU Electric/PCA	3,101.46
Total	8,946.03

Table 41: 2005 Annual NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 1999 eGRID.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Austin-San Antonio Area	BASTROP	0.012215415	5.78	0.4663901	15.88	0.00902163	0.00	0.817318	170.82	0.00755428	28.19	0.02170659	29.23	0.00648344	0.00	0.01133142	0.00	0.00245301	0.12	0.01120603	34.76	284.77	0.14
	BEXAR	0.055151593	26.09	0.08545943	2.91	0.04073191	0.00	0.14964594	31.28	0.00188468	7.03	1.88754037	2541.86	0.07736836	0.00	0.00770739	0.00	0.0008576	0.04	0.00413279	12.82	2,622.03	1.31
	HAYS	9.07402E-06	0.00	0.00034645	0.01	6.7016E-06	0.00	0.00060713	0.13	5.6116E-06	0.02	1.6124E-05	0.02	4.8161E-06	0.00	8.4174E-06	0.00	1.8222E-06	0.00	8.3242E-06	0.03	0.21	0.00
	TRAVIS	0.000828265	0.39	0.48656288	16.57	0.00061171	0.00	0.05511859	11.52	0.00054358	2.03	0.00147156	1.98	0.00044033	0.00	0.00076612	0.00	0.00016781	0.01	0.00075897	2.35	34.85	0.02
	FAYETTE	0.001485019	0.70	0.05669872	1.93	0.00109675	0.00	0.09936078	20.77	0.00091837	3.43	0.00263885	3.55	0.00078819	0.00	0.00137755	0.00	0.00029821	0.02	0.00136231	4.23	34.62	0.02
	LLANO	0.007176248	3.39	0.27399242	9.33	0.00529998	0.00	0.48015371	100.35	0.00443795	16.56	0.01275207	17.17	0.00380886	0.00	0.00665692	0.00	0.00144108	0.07	0.00658326	20.42	167.30	0.08
	CALDWELL		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	COMAL		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	GUADALUPE		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WILLIAMSON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WILSON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Dallas-Fort Worth Area	ANGELINA	0.000494588	0.23	0.00049881	0.02	0.00036528	0.00	0.00082585	0.17	0.0002162	0.81	7.1266E-05	0.10	0.00070458	0.00	0.00244871	0.00	0.00083784	0.04	0.00449947	13.95	15.32	0.01
	COLLIN	0.007169953	3.39	0.01253841	0.43	0.00529533	0.00	0.02011327	4.20	0.00821861	30.67	0.00238641	3.21	0.06221009	0.00	0.24840578	0.00	0.00386471	0.20	0.01870204	58.00	100.10	0.05
	DALLAS	0.049181758	23.26	0.05006993	1.71	0.03632292	0.00	0.08284103	17.31	0.02194718	81.89	0.00720608	9.70	0.07465196	0.00	0.26228915	0.00	0.08258381	4.18	0.4433209	1374.94	1,513.00	0.76
	DENTON	0.004478418	2.12	0.00824843	0.28	0.00330751	0.00	0.01320233	2.76	0.00553275	20.64	0.00159686	2.15	0.04294073	0.00	0.17187819	0.00	0.00176352	0.09	0.00802733	24.90	52.94	0.03
	JOHNSON	4.90169E-05	0.02	9.028E-05	0.00	3.6201E-05	0.00	0.0001445	0.03	6.0557E-05	0.23	1.7478E-05	0.02	0.00046999	0.00	0.00188123	0.00	1.9302E-05	0.00	8.786E-05	0.27	0.58	0.00
	PARKER	0.000692972	0.33	0.00127633	0.04	0.00051179	0.00	0.00204287	0.43	0.00085611	3.19	0.00024709	0.33	0.00664447	0.00	0.02659573	0.00	0.00027288	0.01	0.00124212	3.85	8.19	0.00
	CHEROKEE	0.010981286	5.19	0.01107502	0.38	0.00811017	0.00	0.0183363	3.83	0.00480017	17.91	0.0015823	2.13	0.01564371	0.00	0.05436859	0.00	0.01860246	0.94	0.09990132	309.84	340.23	0.17
	COKE	0.021538872	10.19	0.0004313	0.01	0.01590742	0.00	0.00072053	0.15	0.00015909	0.59	0.00015397	0.21	0.00442876	0.00	0.00068585	0.00	0.00015233	0.01	0.000784	2.43	13.59	0.01
	COLEMAN	0.007243808	3.43	0.00014505	0.00	0.00534988	0.00	0.00024232	0.05	5.3505E-05	0.20	5.1783E-05	0.07	0.00148945	0.00	0.00023066	0.00	5.123E-05	0.00	0.00026367	0.82	4.57	0.00
	FANNIN	0.020337335	9.62	0.02051093	0.70	0.01502003	0.00	0.03395882	7.10	0.00888992	33.17	0.00293043	3.95	0.02897213	0.00	0.10069058	0.00	0.03445175	1.75	0.18501717	573.82	630.10	0.32
	FRIO	0.047394602	22.42	0.00480871	0.16	0.03500303	0.00	0.00784102	1.64	0.00260367	9.71	0.00120542	1.62	1.14045437	0.00	0.07034879	0.00	0.00103497	0.05	0.00489394	15.18	50.79	0.03
	HARDEMAN	0.007011794	3.32	0.0001404	0.00	0.00517852	0.00	0.00023456	0.05	5.1791E-05	0.19	5.0124E-05	0.07	0.00144175	0.00	0.00022327	0.00	4.9589E-05	0.00	0.00025523	0.79	4.43	0.00
	HASKELL	0.195882927	92.66	0.00392237	0.13	0.14466827	0.00	0.00655279	1.37	0.00144685	5.40	0.00140029	1.89	0.04027689	0.00	0.00623741	0.00	0.00138534	0.07	0.00713005	22.11	123.63	0.06
	HENDERSON	0.003151289	1.49	0.00317819	0.11	0.00232737	0.00	0.00526195	1.10	0.0013775	5.14	0.00045407	0.61	0.00448926	0.00	0.0156021	0.00	0.00533833	0.27	0.02866858	88.91	97.63	0.05
	HOWARD	0.001294958	0.61	0.00130601	0.04	0.00095638	0.00	0.00216229	0.45	0.00056606	2.11	0.00018659	0.25	0.00184477	0.00	0.00641136	0.00	0.00219368	0.11	0.01178077	36.54	40.12	0.02
	HOOD	0.029930315	14.16	0.0301858	1.03	0.02210487	0.00	0.04997696	10.44	0.01308323	48.82	0.00431269	5.81	0.04263809	0.00	0.14818564	0.00	0.0507024	2.57	0.27228849	844.49	927.32	0.46
	JONES	0.093145673	44.06	0.00186516	0.06	0.06879223	0.00	0.00311597	0.65	0.000688	2.57	0.00066586	0.90	0.01915235	0.00	0.00296599	0.00	0.00065875	0.03	0.00339046	10.52	58.79	0.03
	LAMAR	0.001155059	0.55	0.00116492	0.04	0.00085306	0.00	0.00192869	0.40	0.0005049	1.88	0.00016643	0.22	0.00164547	0.00	0.00571872	0.00	0.00195669	0.10	0.01050805	32.59	35.79	0.02
	LIMESTONE	0.012894146	6.10	0.01597135	0.54	0.0095229	0.00	0.00537766	1.12	0.09772731	364.64	0.02220238	29.90	0.00892048	0.00	0.00566029	0.00	0.00682478	0.35	0.00937254	29.07	431.72	0.22
	MCLENNAN	0.05325577	25.19	0.05371035	1.83	0.03933176	0.00	0.08892527	18.59	0.02327932	86.86	0.00767368	10.33	0.07586704	0.00	0.26367046	0.00	0.09021607	4.57	0.48448983	1502.63	1,650.00	0.82
	MITCHELL	0.04519919	21.38	0.045585	1.55	0.03338162	0.00	0.07547258	15.77	0.0197576	73.72	0.0065128	8.77	0.0643898	0.00	0.22378216	0.00	0.07656811	3.88	0.41119578	1275.31	1,400.38	0.70
	NOLAN	0.001025023	0.48	0.00103377	0.04	0.00075703	0.00	0.00171156	0.36	0.00044806	1.67	0.0001477	0.20	0.00146023	0.00	0.00507491	0.00	0.0017364	0.09	0.00932506	28.92	31.76	0.02
	PALO PINTO	0.010167179	4.81	0.0187261	0.64	0.00750891	0.00	0.02997273	6.26	0.01256078	46.87	0.00362529	4.88	0.09748668	0.00	0.39020837	0.00	0.00400365	0.20	0.01822413	56.52	120.18	0.06
	RED RIVER	0.00311042	1.47	0.00313697	0.11	0.00229718	0.00	0.00519371	1.09	0.00135964	5.07	0.00044818	0.60	0.00443104	0.00	0.01539976	0.00	0.0052691	0.27	0.02829678	87.76	96.37	0.05
	TAYLOR	0.001885023	0.89	3.7746E-05	0.00	0.00139217	0.00	6.3059E-05	0.01	1.3923E-05	0.05	1.3475E-05	0.02	0.00038759	0.00	6.0024E-05	0.00	1.3331E-05	0.00	6.8614E-05	0.21	1.19	0.00
	TITUS	0.007854045	3.72	0.00792109	0.27	0.00580056	0.00	0.0131145	2.74	0.00343318	12.81	0.0011317	1.52	0.01118871	0.00	0.03888555	0.00	0.01330487	0.67	0.0714515	221.60	243.34	0.12
	TOM GREEN	0.00089529	0.42	1.7927E-05	0.00	0.00066121	0.00	2.995E-05	0.01	6.6129E-06	0.02	6.4001E-06	0.01	0.00018409	0.00	2.8508E-05	0.00	6.3317E-06	0.00	3.2588E-05	0.10	0.57	0.00
	YOUNG	0.019487528	9.22	0.01965387	0.67	0.01439241	0.00	0.03253983	6.80	0.00851845	31.78	0.00280798	3.78	0.02776152	0.00	0.09648317	0.00	0.03301216	1.67	0.17728613	549.85	603.77	0.30
	TARRANT	0.029723615	14.06	0.02997733	1.02	0.02195221	0.00	0.04963181	10.37	0.01299287	48.48	0.00428291	5.77	0.04234363	0.00	0.14716226	0.00	0.05035225	2.55	0.27040805	838.66	920.91	0.46
	WICHITA	0.000471631	0.22	0.00047566	0.02	0.00034832	0.00	0.00078752	0.16	0.00020616	0.77	6.7958E-05	0.09	0.00067188	0.00	0.00233505	0.00	0.00079895	0.04	0.00429062	13.31	14.61	0.01
	WILBARGER	0.074052599	35.03	0.00148283	0.05	0.05469115	0.00	0.00247725	0.52	0.00054697	2.04	0.00052937	0.71	0.01522649	0.00	0.00235802	0.00	0.00052372	0.03	0.00269548	8.36	46.74	0.02
	WISE	1.54736E-05	0.01	2.85E-05	0.00	1.1428E-05	0.00	4.5616E-05	0.01	1.9117E-05	0.07	5.5174E-06	0.01	0.00014837	0.00	0.00059387	0.00	6.0932E-06	0.00	2.7736E-05	0.09	0.18	0.00
	ELLIS		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	HUNT		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	KAUFMAN		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	ROCKWALL		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	RUSK		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Houston - Galveston Area	BRAZORIA	0.011584147	5.48	0.01434872	0.49	0.00855541	0.00	0.00483131	1.01	0.08779856	327.59	0.0199467	26.86	0.00801419	0.00	0.00508523	0.00	0.00613141	0.31	0.00842032	26.12	387.86	0.19
	BRAZOS	0.002939669	1.39	0.00541434	0.18	0.00217108	0.00	0.00866611	1.81	0.00363174	13.55	0.00104819	1.41	0.02818664	0.00	0.11282221	0.00	0.00115759	0.06	0.0052692	16.34	34.75	0.02
	GRIMES	0.000352817	0.17	0.00064982	0.02	0.00026057	0.00	0.0010401	0.22	0.00043588	1.63	0.0001258	0.17	0.00338294	0.00	0.01354083	0.00	0.00013893	0.01	0.00063241	1.96	4.17	0.00
	WHARTON	0.000859628	0.41	0.00106478	0.04	0.00063487	0.00	0.00035852	0.07	0.0065153	24.31	0.00148019	1.99	0.00059471	0.00	0.00037736	0.00	0.000455	0.02	0.00062485	1.94	28.78	0.01
	CHAMBERS	0.026549037	12.56	0.03288499	1.12	0.01960765	0.00	0.01107259	2.31	0.20122045	750.79	0.04571469	61.56	0.01836725	0.00	0.01165454	0.00	0.01405221	0.71	0.01929805	59.85	888.91	0.44
	FORT BEND	0.101391373	47.96	0.12558854	4.28	0.07488205	0.00	0.04228648	8.84	0.76846545	2867.28	0.17458545	235.11	0.07014496	0.00	0.04450894	0.00	0.05366573	2.72	0.07369968	228.58	3,394.75	1.70
	GALVESTON	0.045304684	21.43	0.05591643	1.90	0.03345953	0.00	0.01998506	4.18	0.33715771	1257.99	0.07663686	103.20	0.03198055	0.00	0.02381461	0.00	0.51082916	25.88	0.04021583	124.73	1,539.32	0.77
	ROBERTSON	0.003269549	1.55	0.00370118	0.13	0.00241471	0.00	0.00326161	0.68	0.01395949	52.09	0.00323927	4.36	0.00337216	0.00	0.00827153	0.00	0.84932265	43.04	0.0150589	46.70	148.54	0.07
	HARRIS	0.069468248	32.86	0.08604692	2.93	0.0513054	0.00	0.02897256	6.06	0.52651372	1964.51	0.11961713	161.08	0.04805979	0.00	0.03049528	0.00	0.03676905	1.86	0.0504953	156.61	2,325.91	1.16
	HARDIN		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	JEFFERSON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	LIBERTY		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	MONTGOMERY		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	ORANGE		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WALLER		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
El Paso Area	EL PASO		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Etc.	ANDREWS	6.67623E-05	0.03	6.7332E-05	0.00	4.9307E-05	0.00	0.00011148	0.02	2.9183E-05	0.11	9.6198E-06	0.01	9.5108E-05	0.00	0.00033054	0.00	0.0001131	0.01	0.00060736	1.88	2.07	0.00
	CROCKETT	0.075441526	35.69	0.00151065	0.05	0.05571693	0.00	0.00252372	0.53	0.00055723	2.08	0.0005393	0.73	0.01551207	0.00	0.00240225	0.00	0.00053354	0.03	0.00274604	8.52	47.61	0.02
	FREESTONE	0.025200214	11.92	0.02541532	0.87	0.01861148	0.00	0.04207874	8.79	0.01101559	41.10	0.00363112	4.89	0.03589969	0.00	0.1247668	0.00	0.04268954	2.16	0.2292568	711.03	780.77	0.39
	CALHOUN	0.169651094	80.25	0.0033971	0.12	0.1252949	0.00	0.00567527	1.19	0.00125309	4.68	0.00121277	1.63	0.03488318	0.00	0.00540212	0.00	0.00119982	0.06	0.00617522	19.15	107.07	0.05
	HIDALGO	0.125605549	59.41	0.00251513	0.09	0.0927653	0.00	0.00420183	0.88	0.00092776	3.46	0.0008979	1.21	0.02582666	0.00	0.0039996	0.00	0.00088832	0.05	0.00457198	14.18	79.27	0.04
	CAMERON	0.125578894	59.40	0.0025146	0.09	0.39341934	0.00	0.00420094	0.88	0.00092756	3.46	0.00089771	1.21	0.02582118	0.00	0.00399875	0.00	0.00088813	0.05	0.00457101	14.18	79.26	0.04
	PECOS	0.000135659	0.06	4.984E-05	0.00	0.00010019	0.00	8.2544E-05	0.02	2.1488E-05	0.08	7.498E-06	0.01	8.6003E-05	0.00	0.00023882	0.00	8.1378E-05	0.00	0.00043689	1.35	1.53	0.00
	PRESIDIO	0.000237673	0.11	4.7592E-06	0.00	0.00017553	0.00	7.9508E-06	0.00	1.7555E-06	0.01	1.699E-06	0.00	4.887E-05	0.00	7.5681E-06	0.00	1.6809E-06	0.00	8.6512E-06	0.03	0.15	0.00
	SAN PATRICIO	0.038088543	18.02	0.00076269	0.03	0.02813009	0.00	0.00127416	0.27	0.00028133	1.05	0.00027228	0.37	0.00783166	0.00	0.00121284	0.00	0.00026937	0.01	0.00138641	4.30	24.04	0.01
	WARD	0.057516808	27.21	0.05800776	1.98	0.04247873	0.00	0.09604025	20.07	0.02514192	93.81	0.00828766	11.16	0.08193722	0.00	0.28476696	0.00	0.09743434	4.94	0.52325426	1622.85	1,782.01	0.89
	WEBB	0.051854261	24.53	0.00103833	0.04	0.03829668	0.00	0.00173466	0.36	0.00038301	1.43	0.00037068	0.50	0.01066213	0.00	0.00165117	0.00	0.00036673	0.02	0.00188747	5.85	32.73	0.02
	NUECES	0.556471643	263.23	0.01114282	0.38	0.41097912	0.00	0.01861543	3.89	0.00411026	15.34	0.00397799	5.36	0.11442012	0.00	0.01771947	0.00	0.00393551	0.20	0.02025531	62.82	351.21	0.18
	UPTON	3.45456E-05	0.02	3.4841E-05	0.00	2.5513E-05	0.00	5.7684E-05	0.01	1.5101E-05	0.06	4.9777E-06	0.01	4.9213E-05	0.00	0.00017104	0.00	5.8521E-05	0.00	0.00031428	0.97	1.07	0.00
	VICTORIA	0.26869859	127.10	0.00810515	0.28	0.19844589	0.00	0.01340471	2.80	0.00357559	13.34	0.0025326	3.41	0.85346281	0.00	0.05715275	0.00	0.00239431	0.12	0.01201749	37.27	184.32	0.09
	GREGG		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	HARRISON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	SMITH		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	UPSHUR		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	TOTAL	**2.59433808**		**2.15884660**		**2.21670807**		**2.46753295**		**2.26120971**		**2.46530416**		**3.34809944**		**3.09910920**		**2.11715092**		**3.63318167**		24,948.74	**12.47**

Energy Savings by PCA from ESL (MWh)	American Electric Power - West (ERCOT) /PCA		Austin Energy/PCA		Brownsville Public Utils Board/PCA		Lower Colorado River Auhotrity /PCA		Reliant Energy HL&P/PCA		San Antonio Public Service Bd/PCA		South Texas Electric Coop INC/PCA		Texas Municipal Power Pool/PCA		Texas-New Mexico Power Co/PCA		TXU Electric/PCA	
	473.03		34.06		0.00		209.00		3731.17		1346.65		0.00		0.00		50.67		3101.46	

Table 42: 2005 Totalized OSD Electricity Savings from IECC / IRC by PCA for Multi-family Residences.

NERC	County	Total Energy Savings by County (MWh)	PCA 1	Percentage	Energy Savings by County for PCA 1 (MWh)	PCA 2	Percentage	Energy Savings by County for PCA 2 (MWh)
ERCOT	CALDWELL	0.00	American Electric Power - West (ERCOT)/PCA	100%	0.00			0.00
	NUECES	1.10	American Electric Power - West (ERCOT)/PCA	100%	1.10			0.00
	SAN PATRICIO	0.22	American Electric Power - West (ERCOT)/PCA	100%	0.22			0.00
	VICTORIA	0.31	American Electric Power - West (ERCOT)/PCA	100%	0.31			0.00
	HAYS	0.85	Lower Colorado River Authority/PCA	100%	0.85			0.00
	BRAZORIA	1.37	Reliant Energy HL&P/PCA	97%	1.33	Texas-New Mexico Power Co/PCA	3%	0.04
	CHAMBERS	0.00	Reliant Energy HL&P/PCA	70%	0.00	Entergy Electric System/PCA	30%	0.00
	FORT BEND	0.37	Reliant Energy HL&P/PCA	100%	0.37			0.00
	GALVESTON	3.80	Reliant Energy HL&P/PCA	97%	3.70	Texas-New Mexico Power Co/PCA	3%	0.10
	HARRIS	10.62	Reliant Energy HL&P/PCA	70%	7.41	Entergy Electric System/PCA	30%	3.21
	WALLER	0.21	Reliant Energy HL&P/PCA	100%	0.21			0.00
	BEXAR	5.35	San Antonio Public Service Bd/PCA	100%	5.35			0.00
	WILSON	0.00	San Antonio Public Service Bd/PCA	100%	0.00			0.00
	COMAL	0.31	San Antonio Public Service Bd/PCA	100%	0.31			0.00
	GUADALUPE	0.31	San Antonio Public Service Bd/PCA	100%	0.31			0.00
	BASTROP	0.08	TXU Electric/PCA	100%	0.08			0.00
	COLLIN	1.38	TXU Electric/PCA	98%	1.36	Texas-New Mexico Power Co/PCA	2%	0.03
	DALLAS	4.45	TXU Electric/PCA	100%	4.45			0.00
	DENTON	1.55	TXU Electric/PCA	98%	1.51	Texas-New Mexico Power Co/PCA	2%	0.03
	ELLIS	0.14	TXU Electric/PCA	100%	0.14			0.00
	HENDERSON	0.01	TXU Electric/PCA	100%	0.01			0.00
	HOOD	0.02	TXU Electric/PCA	98%	0.02	Texas-New Mexico Power Co/PCA	2%	0.00
	HUNT	0.40	TXU Electric/PCA	98%	0.39	Texas-New Mexico Power Co/PCA	2%	0.01
	JOHNSON	0.00	TXU Electric/PCA	98%	0.00	Texas-New Mexico Power Co/PCA	2%	0.00
	KAUFMAN	0.02	TXU Electric/PCA	100%	0.02			0.00
	PARKER	0.11	TXU Electric/PCA	100%	0.11			0.00
	ROCKWALL	0.00	TXU Electric/PCA	100%	0.00			0.00
	SMITH	0.14	TXU Electric/PCA	100%	0.14			0.00
	TARRANT	3.54	TXU Electric/PCA	100%	3.54			0.00
	TRAVIS	4.00	TXU Electric/PCA	97%	3.86	Austin Energy/PCA	3%	0.13
	WILLIAMSON	0.17	TXU Electric/PCA	97%	0.17	Austin Energy/PCA	3%	0.01
WSCC	EL PASO	0.73	El Paso Electric Co/PCA	100%	0.73			0.00
SERC	HARDIN	0.00	Entergy Electric System/PCA	30%	0.00	Reliant Energy HL&P/PCA	70%	0.00
	JEFFERSON	0.07	Entergy Electric System/PCA	100%	0.07			0.00
	LIBERTY	0.00	Entergy Electric System/PCA	100%	0.00			0.00
	MONTGOMERY	1.21	Entergy Electric System/PCA	30%	0.37	Reliant Energy HL&P/PCA	70%	0.84
	ORANGE	0.00	Entergy Electric System/PCA	100%	0.00			0.00
SPP	GREGG	0.12	Southwestern Public Service Co/PCA	100%	0.12			0.00
	HARRISON	0.00	Southwestern Public Service Co/PCA	100%	0.00			0.00
	RUSK	0.09	Southwestern Public Service Co/PCA	100%	0.09			0.00
	UPSHUR	0.00	Southwestern Public Service Co/PCA	100%	0.00			0.00

PCA	Total Electricity Savings by PCA (MWh)
American Electric Power - West (ERCOT)/PCA	1.63
Austin Energy/PCA	0.14
Brownsville Public Utils Board/PCA	0.00
Lower Colorado River Authority/PCA	0.85
Reliant Energy HL&P/PCA	13.86
San Antonio Public Service Bd /PCA	5.98
South Texas Electric Coop Inc/PCA	0.00
Texas Municipal Power Pool/PCA	0.00
Texas-New Mexico Power Co/PCA	0.21
TXU Electric/PCA	15.79
Total	38.46

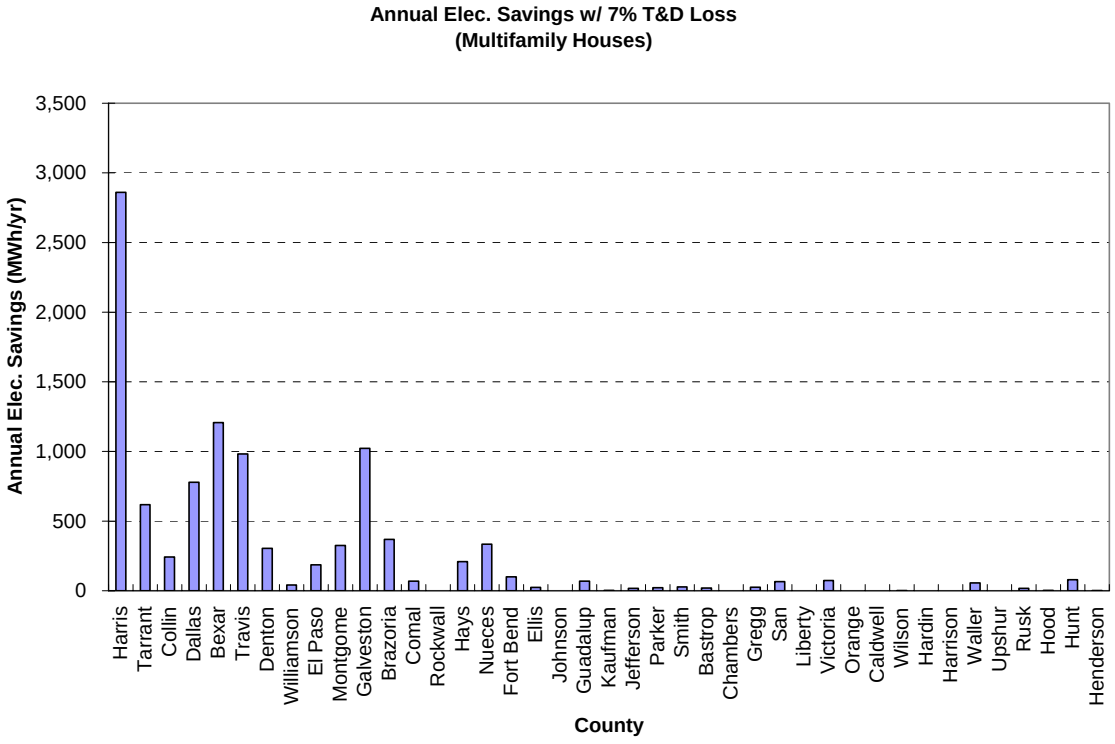
Table 43: 2005 OSD NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 1999 eGRID.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Austin-San Antonio Area	BASTROP	0.012215415	0.02	0.4663901	0.06	0.00902163	0.00	0.817318	0.70	0.00755428	0.10	0.02170659	0.13	0.00648344	0.00	0.01133142	0.00	0.00245301	0.00	0.01120603	0.18	1.19	0.00
	BEXAR	0.055151593	0.09	0.08545943	0.01	0.04073191	0.00	0.14964594	0.13	0.00188468	0.03	1.88754037	11.28	0.07736836	0.00	0.00770739	0.00	0.0008576	0.00	0.00413279	0.07	11.60	0.01
	HAYS	9.07402E-06	0.00	0.00034645	0.00	6.7016E-06	0.00	0.00060713	0.00	5.6116E-06	0.00	1.6124E-05	0.00	4.8161E-06	0.00	8.4174E-06	0.00	1.8222E-06	0.00	8.3242E-06	0.00	0.00	0.00
	TRAVIS	0.000828265	0.00	0.48656288	0.07	0.00061171	0.00	0.05511859	0.05	0.00054358	0.01	0.00147156	0.01	0.00044033	0.00	0.00076612	0.00	0.00016781	0.00	0.00075897	0.01	0.14	0.00
	FAYETTE	0.001485019	0.00	0.05669872	0.01	0.00109675	0.00	0.09936078	0.08	0.00091837	0.01	0.00263885	0.02	0.00078819	0.00	0.00137755	0.00	0.00029821	0.00	0.00136231	0.02	0.14	0.00
	LLANO	0.007176248	0.01	0.27399242	0.04	0.00529998	0.00	0.48015371	0.41	0.00443795	0.06	0.01275207	0.08	0.00380886	0.00	0.00665692	0.00	0.00144108	0.00	0.00658326	0.10	0.70	0.00
	CALDWELL		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	COMAL		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	GUADALUPE		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WILLIAMSON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WILSON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Dallas-Fort Worth Area	ANGELINA	0.000494588	0.00	0.00049881	0.00	0.00036528	0.00	0.00082585	0.00	0.0002162	0.00	7.1266E-05	0.00	0.00070458	0.00	0.00244871	0.00	0.00083784	0.00	0.00449947	0.07	0.08	0.00
	COLLIN	0.007169953	0.01	0.01253841	0.00	0.00529533	0.00	0.02011327	0.02	0.00821861	0.11	0.00238641	0.01	0.06221009	0.00	0.24840578	0.00	0.00386471	0.00	0.01870204	0.30	0.45	0.00
	DALLAS	0.049181758	0.08	0.05006993	0.01	0.03632292	0.00	0.08284103	0.07	0.02194718	0.30	0.00720608	0.04	0.07465196	0.00	0.26228915	0.00	0.08258381	0.02	0.4433209	7.00	7.52	0.00
	DENTON	0.004478418	0.01	0.00824843	0.00	0.00330751	0.00	0.01320233	0.01	0.00553275	0.08	0.00159686	0.01	0.04294073	0.00	0.17187819	0.00	0.00176352	0.00	0.00802733	0.13	0.23	0.00
	JOHNSON	4.90169E-05	0.00	9.028E-05	0.00	3.6201E-05	0.00	0.0001445	0.00	6.0557E-05	0.00	1.7478E-05	0.00	0.00046999	0.00	0.00188123	0.00	1.9302E-05	0.00	8.786E-05	0.00	0.00	0.00
	PARKER	0.000692972	0.00	0.00127633	0.00	0.00051179	0.00	0.00204287	0.00	0.00085611	0.01	0.00024709	0.00	0.00664447	0.00	0.02659573	0.00	0.00027288	0.00	0.00124212	0.02	0.04	0.00
	CHEROKEE	0.010981286	0.02	0.01107502	0.00	0.00811017	0.00	0.0183363	0.02	0.00480017	0.07	0.0015823	0.01	0.01564371	0.00	0.05436859	0.00	0.01860246	0.00	0.09990132	1.58	1.69	0.00
	COKE	0.021538872	0.04	0.0004313	0.00	0.01590742	0.00	0.00072053	0.00	0.00015909	0.00	0.00015397	0.00	0.00442876	0.00	0.00068585	0.00	0.00015233	0.00	0.000784	0.01	0.05	0.00
	COLEMAN	0.007243808	0.01	0.00014505	0.00	0.00534988	0.00	0.00024232	0.00	5.3505E-05	0.00	5.1783E-05	0.00	0.00148945	0.00	0.00023066	0.00	5.123E-05	0.00	0.00026367	0.00	0.02	0.00
	FANNIN	0.020337335	0.03	0.02051093	0.00	0.01502003	0.00	0.03395882	0.03	0.00888992	0.12	0.00293043	0.02	0.02897213	0.00	0.10069058	0.00	0.03445175	0.01	0.18501717	2.92	3.13	0.00
	FRIO	0.047394602	0.08	0.00480871	0.00	0.03500303	0.00	0.00784102	0.01	0.00260367	0.04	0.00120542	0.01	1.14045437	0.00	0.07034879	0.00	0.00103497	0.00	0.00489394	0.08	0.21	0.00
	HARDEMAN	0.007011794	0.01	0.0001404	0.00	0.00517852	0.00	0.00023456	0.00	5.1791E-05	0.00	5.0124E-05	0.00	0.00144175	0.00	0.00022327	0.00	4.9589E-05	0.00	0.00025523	0.00	0.02	0.00
	HASKELL	0.195882927	0.32	0.00392237	0.00	0.14466827	0.00	0.00655279	0.01	0.00144685	0.02	0.00140029	0.01	0.04027689	0.00	0.00623741	0.00	0.00138534	0.00	0.00713005	0.11	0.47	0.00
	HENDERSON	0.003151289	0.01	0.00317819	0.00	0.00232737	0.00	0.00526195	0.00	0.0013775	0.02	0.00045407	0.00	0.00448926	0.00	0.0156021	0.00	0.00533833	0.00	0.02866858	0.45	0.49	0.00
	HOWARD	0.001294958	0.00	0.00130601	0.00	0.00095638	0.00	0.00216229	0.00	0.00056606	0.01	0.00018659	0.00	0.00184477	0.00	0.00641136	0.00	0.00219368	0.00	0.01178077	0.19	0.20	0.00
	HOOD	0.029930315	0.05	0.0301858	0.00	0.02210487	0.00	0.04997696	0.04	0.01308323	0.18	0.00431269	0.03	0.04263809	0.00	0.14818564	0.00	0.0507024	0.01	0.27228849	4.30	4.61	0.00
	JONES	0.093145673	0.15	0.00186516	0.00	0.06879223	0.00	0.00311597	0.00	0.000688	0.01	0.00066586	0.00	0.01915235	0.00	0.00296599	0.00	0.00065875	0.00	0.00339046	0.05	0.22	0.00
	LAMAR	0.001155059	0.00	0.00116492	0.00	0.00085306	0.00	0.00192869	0.00	0.0005049	0.01	0.00016643	0.00	0.00164547	0.00	0.00571872	0.00	0.00195669	0.00	0.01050805	0.17	0.18	0.00
	LIMESTONE	0.012894146	0.02	0.01597135	0.00	0.0095229	0.00	0.00537766	0.00	0.09772731	1.35	0.02220238	0.13	0.00892048	0.00	0.00566029	0.00	0.00682478	0.00	0.00937254	0.15	1.66	0.00
	MCLENNAN	0.05325577	0.09	0.05371035	0.01	0.03933176	0.00	0.08892527	0.08	0.02327932	0.32	0.00767368	0.05	0.07586704	0.00	0.26367046	0.00	0.09021607	0.02	0.48448983	7.65	8.21	0.00
	MITCHELL	0.04519919	0.07	0.045585	0.01	0.03338162	0.00	0.07547258	0.06	0.0197576	0.27	0.0065128	0.04	0.0643898	0.00	0.22378216	0.00	0.07656811	0.02	0.41119578	6.49	6.97	0.00
	NOLAN	0.001025023	0.00	0.00103377	0.00	0.00075703	0.00	0.00171156	0.00	0.00044806	0.01	0.0001477	0.00	0.00146023	0.00	0.00507491	0.00	0.0017364	0.00	0.00932506	0.15	0.16	0.00
	PALO PINTO	0.010167179	0.02	0.0187261	0.00	0.00750891	0.00	0.02997273	0.03	0.01256078	0.17	0.00362529	0.02	0.09748668	0.00	0.39020837	0.00	0.00400365	0.00	0.01822413	0.29	0.53	0.00
	RED RIVER	0.00311042	0.01	0.00313697	0.00	0.00229718	0.00	0.00519371	0.00	0.00135964	0.02	0.00044818	0.00	0.00443104	0.00	0.01539976	0.00	0.0052691	0.00	0.02829678	0.45	0.48	0.00
	TAYLOR	0.001885023	0.00	3.7746E-05	0.00	0.00139217	0.00	6.3059E-05	0.00	1.3923E-05	0.00	1.3475E-05	0.00	0.00038759	0.00	6.0024E-05	0.00	1.3331E-05	0.00	6.8614E-05	0.00	0.00	0.00
	TITUS	0.007854045	0.01	0.00792109	0.00	0.00580056	0.00	0.0131145	0.01	0.00343318	0.05	0.0011317	0.01	0.01118871	0.00	0.03888555	0.00	0.01330487	0.00	0.0714515	1.13	1.21	0.00
	TOM GREEN	0.00089529	0.00	1.7927E-05	0.00	0.00066121	0.00	2.995E-05	0.00	6.6129E-06	0.00	6.4001E-06	0.00	0.00018409	0.00	2.8508E-05	0.00	6.3317E-06	0.00	3.2588E-05	0.00	0.00	0.00
	YOUNG	0.019487528	0.03	0.01965387	0.00	0.01439241	0.00	0.03253983	0.03	0.00851845	0.12	0.00280798	0.02	0.02776152	0.00	0.09648317	0.00	0.03301216	0.01	0.17728613	2.80	3.00	0.00
	TARRANT	0.029723615	0.05	0.02997733	0.00	0.02195221	0.00	0.04963181	0.04	0.01299287	0.18	0.00428291	0.03	0.04234363	0.00	0.14716226	0.00	0.05035225	0.01	0.27040805	4.27	4.58	0.00
	WICHITA	0.000471631	0.00	0.00047566	0.00	0.00034832	0.00	0.00078752	0.00	0.00020616	0.00	6.7958E-05	0.00	0.00067188	0.00	0.00233505	0.00	0.00079895	0.00	0.00429062	0.07	0.07	0.00
	WILBARGER	0.074052599	0.12	0.00148283	0.00	0.05469115	0.00	0.00247725	0.00	0.00054697	0.01	0.00052937	0.00	0.01522649	0.00	0.00235802	0.00	0.00052372	0.00	0.00269548	0.04	0.18	0.00
	WISE	1.54736E-05	0.00	2.85E-05	0.00	1.1428E-05	0.00	4.5616E-05	0.00	1.9117E-05	0.00	5.5174E-06	0.00	0.00014837	0.00	0.00059387	0.00	6.0932E-06	0.00	2.7736E-05	0.00	0.00	0.00
	ELLIS		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	HUNT		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	KAUFMAN		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	ROCKWALL		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	RUSK		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Houston - Galveston Area	BRAZORIA	0.011584147	0.02	0.01434872	0.00	0.00855541	0.00	0.00483131	0.00	0.08779856	1.22	0.0199467	0.12	0.00801419	0.00	0.00508523	0.00	0.00613141	0.00	0.00842032	0.13	1.50	0.00
	BRAZOS	0.002939669	0.00	0.00541434	0.00	0.00217108	0.00	0.00866611	0.01	0.00363174	0.05	0.00104819	0.01	0.02818664	0.00	0.11282221	0.00	0.00115759	0.00	0.0052692	0.08	0.15	0.00
	GRIMES	0.000352817	0.00	0.00064982	0.00	0.00026057	0.00	0.0010401	0.00	0.00043588	0.01	0.0001258	0.00	0.00338294	0.00	0.01354083	0.00	0.00013893	0.00	0.00063241	0.01	0.02	0.00
	WHARTON	0.000859628	0.00	0.00106478	0.00	0.00063487	0.00	0.00035852	0.00	0.0065153	0.09	0.00148019	0.01	0.00059471	0.00	0.00037736	0.00	0.000455	0.00	0.00062485	0.01	0.11	0.00
	CHAMBERS	0.026549037	0.04	0.03288499	0.00	0.01960765	0.00	0.01107259	0.01	0.20122045	2.79	0.04571469	0.27	0.01836725	0.00	0.01165454	0.00	0.01405221	0.00	0.01929805	0.30	3.43	0.00
	FORT BEND	0.101391373	0.17	0.12558854	0.02	0.07488205	0.00	0.04228648	0.04	0.76846545	10.65	0.17458545	1.04	0.07014496	0.00	0.04450894	0.00	0.05366573	0.01	0.07369968	1.16	13.09	0.01
	GALVESTON	0.045304684	0.07	0.05591643	0.01	0.03345953	0.00	0.01998506	0.02	0.33715771	4.67	0.07663686	0.46	0.03198055	0.00	0.02381461	0.00	0.51082916	0.11	0.04021583	0.63	5.97	0.00
	ROBERTSON	0.003269549	0.01	0.00370118	0.00	0.00241471	0.00	0.00326161	0.00	0.01395949	0.19	0.00323927	0.02	0.00337216	0.00	0.00827153	0.00	0.84932265	0.18	0.0150589	0.24	0.64	0.00
	HARRIS	0.069468248	0.11	0.08604692	0.01	0.0513054	0.00	0.02897256	0.02	0.52651372	7.30	0.11961713	0.71	0.04805979	0.00	0.03049528	0.00	0.03676905	0.01	0.0504953	0.80	8.97	0.00
	HARDIN		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	JEFFERSON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	LIBERTY		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	MONTGOMERY		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	ORANGE		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WALLER		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
El Paso Area	EL PASO		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Etc.	ANDREWS	6.67623E-05	0.00	6.7332E-05	0.00	4.9307E-05	0.00	0.00011148	0.00	2.9183E-05	0.00	9.6198E-06	0.00	9.5108E-05	0.00	0.00033054	0.00	0.0001131	0.00	0.00060736	0.01	0.01	0.00
	CROCKETT	0.075441526	0.12	0.00151065	0.00	0.05571693	0.00	0.00252372	0.00	0.00055723	0.01	0.0005393	0.00	0.01551207	0.00	0.00240225	0.00	0.00053354	0.00	0.00274604	0.04	0.18	0.00
	FREESTONE	0.025200214	0.04	0.02541532	0.00	0.01861148	0.00	0.04207874	0.04	0.01101559	0.15	0.00363112	0.02	0.03589969	0.00	0.1247668	0.00	0.04268954	0.01	0.2292568	3.62	3.88	0.00
	CALHOUN	0.169651094	0.28	0.0033971	0.00	0.1252949	0.00	0.00567527	0.00	0.00125309	0.02	0.00121277	0.01	0.03488318	0.00	0.00540212	0.00	0.00119982	0.00	0.00617522	0.10	0.40	0.00
	HIDALGO	0.125605549	0.20	0.00251513	0.00	0.0927653	0.00	0.00420183	0.00	0.00092776	0.01	0.0008979	0.01	0.02582666	0.00	0.0039996	0.00	0.00088832	0.00	0.00457198	0.07	0.30	0.00
	CAMERON	0.125578894	0.20	0.0025146	0.00	0.39341934	0.00	0.00420094	0.00	0.00092756	0.01	0.00089771	0.01	0.02582118	0.00	0.00399875	0.00	0.00088813	0.00	0.00457101	0.07	0.30	0.00
	PECOS	0.000135659	0.00	4.984E-05	0.00	0.00010019	0.00	8.2544E-05	0.00	2.1488E-05	0.00	7.498E-06	0.00	8.6003E-05	0.00	0.00023882	0.00	8.1378E-05	0.00	0.00043689	0.01	0.01	0.00
	PRESIDIO	0.000237673	0.00	4.7592E-06	0.00	0.00017553	0.00	7.9508E-06	0.00	1.7555E-06	0.00	1.699E-06	0.00	4.887E-05	0.00	7.5681E-06	0.00	1.6809E-06	0.00	8.6512E-06	0.00	0.00	0.00
	SAN PATRICIO	0.038088543	0.06	0.00076269	0.00	0.02813009	0.00	0.00127416	0.00	0.00028133	0.00	0.00027228	0.00	0.00783166	0.00	0.00121284	0.00	0.00026937	0.00	0.00138641	0.02	0.09	0.00
	WARD	0.057516808	0.09	0.05800776	0.01	0.04247873	0.00	0.09604025	0.08	0.02514192	0.35	0.00828766	0.05	0.08193722	0.00	0.28476696	0.00	0.09743434	0.02	0.52325426	8.26	8.86	0.00
	WEBB	0.051854261	0.08	0.00103833	0.00	0.03829668	0.00	0.00173466	0.00	0.00038301	0.01	0.00037068	0.00	0.01066213	0.00	0.00165117	0.00	0.00036673	0.00	0.00188747	0.03	0.12	0.00
	NUECES	0.556471643	0.91	0.01114282	0.00	0.41097912	0.00	0.01861543	0.02	0.00411026	0.06	0.00397799	0.02	0.11442012	0.00	0.01771947	0.00	0.00393551	0.00	0.02025531	0.32	1.33	0.00
	UPTON	3.45456E-05	0.00	3.4841E-05	0.00	2.5513E-05	0.00	5.7684E-05	0.00	1.5101E-05	0.00	4.9777E-06	0.00	4.9213E-05	0.00	0.00017104	0.00	5.8521E-05	0.00	0.00031428	0.00	0.01	0.00
	VICTORIA	0.26869859	0.44	0.00810515	0.00	0.19844589	0.00	0.01340471	0.01	0.00357559	0.05	0.0025326	0.02	0.85346281	0.00	0.05715275	0.00	0.00239431	0.00	0.01201749	0.19	0.71	0.00
	GREGG		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	HARRISON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	SMITH		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	UPSHUR		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	TOTAL	**2.59433808**		**2.15884660**		**2.21670807**		**2.46753295**		**2.26120971**		**2.46530416**		**3.34809944**		**3.09910920**		**2.11715092**		**3.63318167**		110.52	**0.06**

Energy Savings by PCA from ESL (MWh)	1.63		0.14		0.00		0.85		13.86		5.98		0.00		0.00		0.21		15.79	

Table 44: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 1999 eGRID.

	Electricity Savings and Resultant NOx Reductions (Multifamily Houses)			
County	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)
Harris	2,858.94	1.16	10.62	0.00
Tarrant	618.73	0.46	3.54	0.00
Collin	242.17	0.05	1.38	0.00
Dallas	778.74	0.76	4.45	0.00
Bexar	1,206.34	1.31	5.35	0.01
Travis	981.06	0.02	4.00	0.00
Denton	304.98	0.03	1.55	0.00
Williamson	42.27	0.00	0.17	0.00
El Paso	185.83	0.00	0.73	0.00
Montgomery	325.66	0.00	1.21	0.00
Galveston	1,022.39	0.77	3.80	0.00
Brazoria	368.33	0.19	1.37	0.00
Comal	69.88	0.00	0.31	0.00
Rockwall	0.00	0.00	0.00	0.00
Hays	209.00	0.00	0.85	0.00
Nueces	333.64	0.18	1.10	0.00
Fort Bend	100.36	1.70	0.37	0.01
Ellis	24.43	0.00	0.14	0.00
Johnson	0.00	0.00	0.00	0.00
Guadalupe	69.32	0.00	0.31	0.00
Kaufman	3.10	0.00	0.02	0.00
Jefferson	17.44	0.00	0.07	0.00
Parker	21.36	0.00	0.11	0.00
Smith	27.18	0.00	0.14	0.00
Bastrop	20.95	0.14	0.08	0.00
Chambers	0.00	0.44	0.00	0.00
Gregg	26.26	0.00	0.12	0.00
San Patricio	65.40	0.01	0.22	0.00
Liberty	0.00	0.00	0.00	0.00
Victoria	73.99	0.09	0.31	0.00
Orange	0.00	0.00	0.00	0.00
Caldwell	0.00	0.00	0.00	0.00
Wilson	1.11	0.00	0.00	0.00
Hardin	0.00	0.00	0.00	0.00
Harrison	0.00	0.00	0.00	0.00
Waller	57.01	0.00	0.21	0.00
Upshur	0.00	0.00	0.00	0.00
Rusk	17.81	0.00	0.09	0.00
Hood	2.86	0.46	0.02	0.00
Hunt	79.32	0.00	0.40	0.00
Henderson	1.41	0.05	0.01	0.00
Ward		0.89		0.00
McLennan		0.82		0.00
Mitchell		0.70		0.00
Freestone		0.39		0.00
Fannin		0.32		0.00
Young		0.30		0.00
Cherokee		0.17		0.00
Titus		0.12		0.00
Limestone		0.22		0.00
Red River		0.05		0.00
Robertson		0.07		0.00
Palo Pinto		0.06		0.00
Llano		0.08		0.00
Haskell		0.06		0.00
Howard		0.02		0.00
Calhoun		0.05		0.00
Lamar		0.02		0.00
Nolan		0.02		0.00
Hidalgo		0.04		0.00
Cameron		0.04		0.00
Frio		0.03		0.00
Brazos		0.02		0.00
Jones		0.03		0.00
Crockett		0.02		0.00
Wilbarger		0.02		0.00
Fayette		0.02		0.00
Angelina		0.01		0.00
Whichita		0.01		0.00
Wharton		0.01		0.00
Webb		0.02		0.00
Coke		0.01		0.00
Grimes		0.00		0.00
Andrews		0.00		0.00
Coleman		0.00		0.00
Hardeman		0.00		0.00
Pecos		0.00		0.00
Upton		0.00		0.00
Taylor		0.00		0.00
Tom Green		0.00		0.00
Wise		0.00		0.00
Presidio		0.00		0.00
Total	**10,157.29**	**12.47**	**43.05**	**0.06**



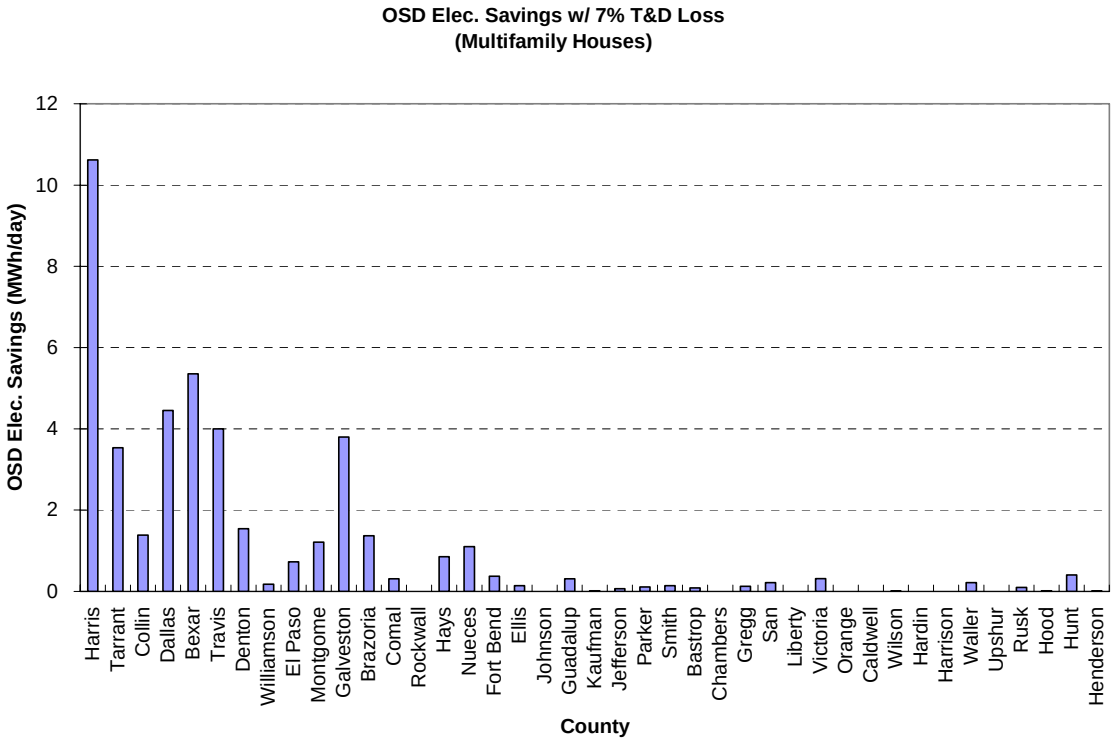


Figure 44: 2005 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Multi-family Residences by County using 1999 eGRID.

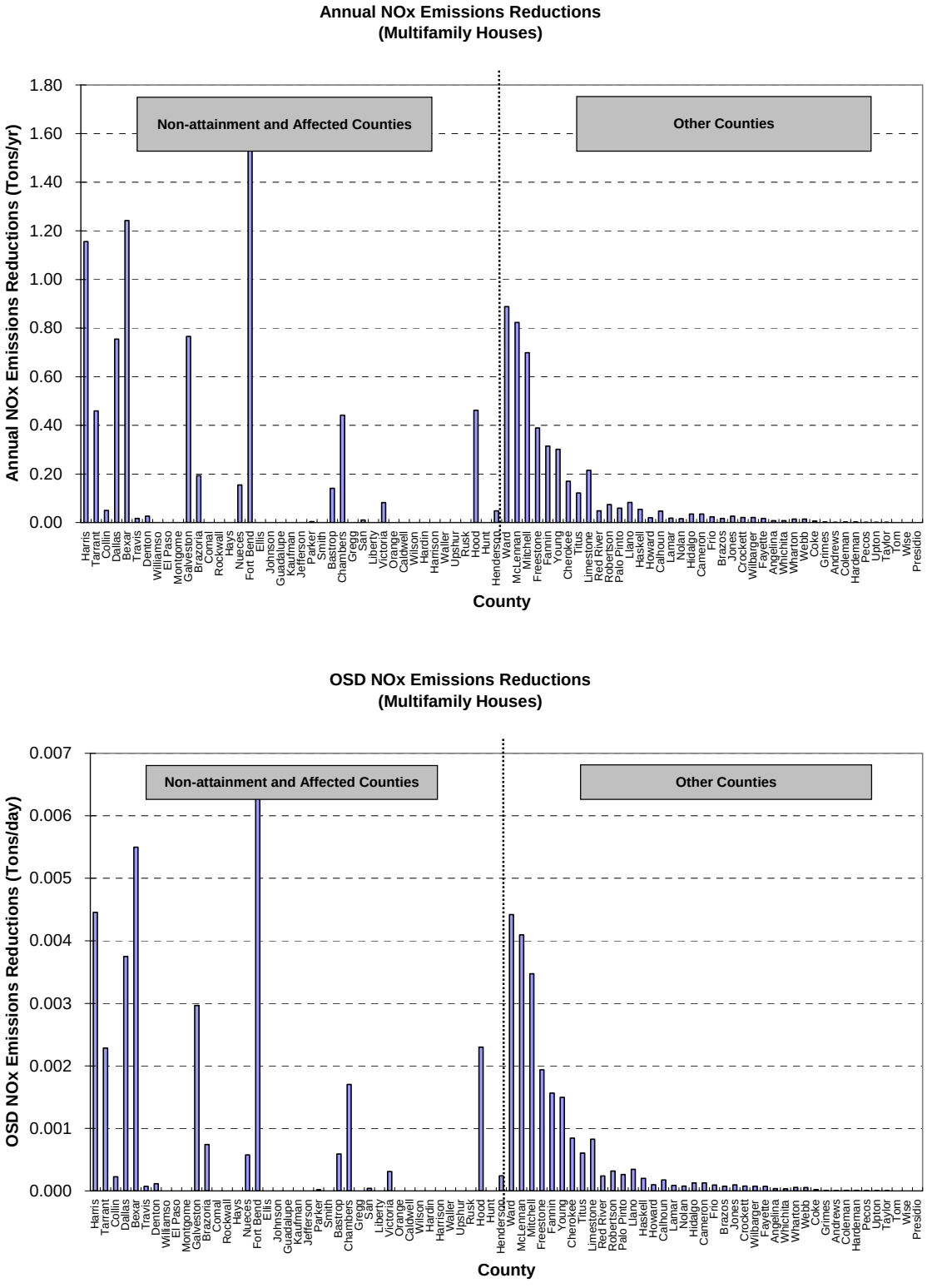


Figure 45: 2004 Annual and OSD NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 1999 eGRID.

Table 45: 2005 Annual NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 2007 eGRID.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.00883113	4.17735523	0.010890729	0.370895422	0.006522185	0	0.003944232	0.824327784	0.0654443	244.1838548	0.014877	20.0347365	0.006262	0	0.0048171	0	0.121275	6.145120253	0.00816387	25.31992861	301.0562186	0.150528109
	Chambers	0.02176222	10.2940971	0.026955801	0.918008627	0.016072371	0	0.009076193	1.896885986	0.1649402	615.4202145	0.037472	50.46216608	0.015056	0	0.0095532	0	0.011519	0.58365809	0.01581859	49.06075464	728.635785	0.364317892
	Fort Bend	0.07043123	33.3158052	0.087239726	2.971042181	0.052016606	0	0.029374182	6.139079863	0.5338124	1991.745353	0.121275	163.3157027	0.048726	0	0.030918	0	0.037279	1.888950446	0.05119528	158.7801761	2358.156109	1.179078055
	Galveston	0.03385674	16.0151182	0.041710519	1.420496319	0.025004711	0	0.015351589	3.208417147	0.2495874	931.2532345	0.056747	76.41856984	0.024143	0	0.0192972	0	0.567751	28.76850765	0.03283689	101.8423387	1158.926682	0.579463341
	Harris	0.06826733	32.2922236	0.084559408	2.879761059	0.050418468	0	0.028471701	5.950465207	0.5174117	1930.551758	0.117549	158.2980558	0.047229	0	0.0299681	0	0.036133	1.830915081	0.04962237	153.9018769	2285.705056	1.142852528
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.00203914	0.96456396	0.003716345	0.126564091	0.001505992	0	0.005950953	1.243723959	0.0024815	9.258819896	0.000717	0.965618311	0.019166	0	0.0766809	0	0.000864	0.043800505	0.0040002	12.40646402	25.00955474	0.012504777
	Dallas	0.00453947	2.14728791	0.004683963	0.159517356	0.003352602	0	0.00774211	1.618068253	0.0020856	7.781772401	0.000681	0.917151728	0.007503	0	0.026717	0	0.007525	0.381295693	0.04037045	125.2074072	138.2125005	0.06910625
	Denton	0.00047388	0.2241577	0.000872802	0.029724189	0.000349982	0	0.001396994	0.291965808	0.0005854	2.18438939	0.000169	0.227544601	0.004544	0	0.0181872	0	0.000187	0.009455482	0.00084941	2.634398071	5.601635244	0.002800818
	Tarrant	0.01216249	5.75317518	0.012266309	0.417742285	0.008982543	0	0.020308652	4.244422458	0.0053165	19.83678837	0.001753	2.360017042	0.017326	0	0.0602168	0	0.020603	1.043996608	0.11064724	343.1681416	376.8242836	0.188412142
	Ellis	0.00327981	1.5514371	0.003307809	0.11265099	0.002422289	0	0.005476558	1.144577431	0.0014337	5.349312066	0.000473	0.636416914	0.004672	0	0.0162384	0	0.005556	0.281530636	0.02983782	92.54086125	101.6167864	0.050808393
	Johnson	0.00028606	0.1353131	0.000526868	0.017943047	0.000211267	0	0.000843297	0.176245555	0.0003534	1.318609613	0.000102	0.137357606	0.002743	0	0.0109787	0	0.000113	0.005707815	0.00051274	1.590257963	3.3814347	0.001690717
	Kaufman	0.00632545	2.99210355	0.006379446	0.217258841	0.004671629	0	0.010562096	2.207433479	0.002765	10.31669001	0.000911	1.227394464	0.009011	0	0.0313175	0	0.010715	0.542960341	0.05754527	178.4744219	195.9782626	0.097989131
	Parker	0.00021749	0.10287818	0.000400576	0.01364205	0.000160626	0	0.000641157	0.133999014	0.0002687	1.002535288	7.75E-05	0.104432613	0.002085	0	0.0083471	0	8.56E-05	0.004339636	0.00038984	1.209068787	2.570895569	0.001285448
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.00081989	0.38783163	0.000826893	0.02816074	0.000605529	0	0.001369042	0.286123959	0.0003584	1.337232683	0.000118	0.159092886	0.001168	0	0.0040593	0	0.001389	0.070377642	0.00745892	23.13356608	25.40238562	0.012701193
	Hood	0.01252711	5.92564878	0.012634039	0.43026572	0.009251829	0	0.020917482	4.371665383	0.0054759	20.43147258	0.001805	2.43076765	0.017846	0	0.062022	0	0.021221	1.075294431	0.11396431	353.4559295	388.1210441	0.194060522
	Hunt	0.00618756	2.92687603	0.006240374	0.212522623	0.004569788	0	0.010331844	2.159311675	0.0027047	10.09178732	0.000892	1.200637402	0.008815	0	0.0306347	0	0.010482	0.531123866	0.05629078	174.5836995	191.7059584	0.095852979
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.03341375	15.8055732	0.051775843	1.763281717	0.024677545	0	0.090663423	18.94827227	0.0011418	4.260405188	1.143572	1539.993988	0.046874	0	0.0046695	0	0.00052	0.026327743	0.00250387	7.765641353	1588.56349	0.794281745
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.00200047	0.946273	0.076378745	2.601159831	0.001477434	0	0.133848731	27.97381896	0.0012371	4.615954127	0.003555	4.787075989	0.001062	0	0.0018557	0	0.000402	0.020355459	0.00183516	5.691692954	46.63633032	0.023318165
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.00450233	2.12972098	0.171901148	5.854277447	0.003325174	0	0.301245466	62.95902908	0.0027843	10.38885647	0.008001	10.77399038	0.00239	0	0.0041765	0	0.000904	0.045812835	0.0041303	12.80995858	104.9616458	0.052480823
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.0024586	1.16298134	0.093870431	3.196857932	0.001815785	0	0.164501762	34.38017302	0.0015205	5.673065295	0.004369	5.883376203	0.001305	0	0.0022807	0	0.000494	0.025017114	0.00225544	6.995161755	57.31663265	0.028658316
	Travis	0.00051001	0.24124658	0.299602906	10.20329736	0.000376663	0	0.033939476	7.093207073	0.0003347	1.248855772	0.000906	1.220230303	0.000271	0	0.0004717	0	0.000103	0.005235673	0.00046734	1.449423878	21.46149664	0.010730748
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0.00068596	0.32447921	0.00069182	0.023560674	0.000506616	0	0.001145408	0.239385522	0.0002999	1.118795311	9.88E-05	0.133105014	0.000977	0	0.0033962	0	0.001162	0.058881432	0.00624051	19.35469091	21.25289808	0.010626449
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22756873	107.645928	0.004556851	0.155188444	0.168069652	0	0.007612767	1.591036149	0.0016809	6.271680335	0.001627	2.190729199	0.046792	0	0.0072464	0	0.001609	0.081551182	0.00828339	25.69062944	143.6267424	0.071813371
	San Patricio	0.05031335	23.7995237	0.001007478	0.034310736	0.037158653	0	0.001683113	0.351763446	0.0003716	1.386610787	0.00036	0.484350059	0.010345	0	0.0016021	0	0.000356	0.018030216	0.00183138	5.67996167	31.75455057	0.015877275
Victoria Area	Victoria	0.02183674	10.3293439	0.002215582	0.07545402	0.016127403	0	0.003612695	0.75503804	0.0011996	4.475991749	0.000555	0.747915818	0.525456	0	0.0324127	0	0.000477	0.024162725	0.00225485	6.993327777	23.40123402	0.011700617
Other ERCOT counties	Andrews	2.4742E-05	0.01170365	2.49533E-05	0.000849811	1.82731E-05	0	4.13138E-05	0.008634402	1.082E-05	0.040353855	3.57E-06	0.004800968	3.52E-05	0	0.0001225	0	4.19E-05	0.002123796	0.00022509	0.69810482	0.7665713	0.000383286
	Angelina	0.00031082	0.14702591	0.000313473	0.010675659	0.000229554	0	0.000519	0.108468808	0.0001359	0.506941243	4.48E-05	0.060311677	0.000443	0	0.0015389	0	0.000527	0.026679971	0.00282766	8.769871454	9.629974718	0.004814987
	Bosque	0.00059539	0.28163579	0.001096604	0.037346009	0.000439723	0	0.001755208	0.366831122	0.0007356	2.744506343	0.000212	0.285891152	0.005709	0	0.0228507	0	0.000234	0.011880039	0.00106721	3.30990539	7.037995849	0.003518998
	Brazos	0.00193973	0.91754047	0.003572622	0.121669459	0.001432574	0	0.005718288	1.195098098	0.0023964	8.941319621	0.000692	0.931403994	0.018599	0	0.0744451	0	0.000764	0.038703946	0.00347685	10.78333161	22.9290672	0.011464534
	Calhoun	0.08269981	39.1191603	0.001655986	0.056396389	0.061077496	0	0.002766524	0.57819185	0.0006108	2.279165348	0.000591	0.796123815	0.017004	0	0.0026334	0	0.000585	0.029636177	0.00301023	9.336125131	52.19479899	0.026097399
	Cameron	0.04837175	22.8810943	0.000968599	0.032986677	0.297964476	0	0.001618161	0.33818881	0.0003573	1.333101144	0.000346	0.465658874	0.009946	0	0.0015403	0	0.000342	0.017334425	0.00176071	5.460770585	30.52913484	0.015264567
	Cherokee	0.0035039	1.65743531	0.003533808	0.120347598	0.002587786	0	0.00585073	1.22277793	0.0015316	5.714790945	0.000505	0.679898569	0.004992	0	0.0173479	0	0.005936	0.30076554	0.03187642	98.86349299	108.5595089	0.054279754
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.00129879	0.61435997	2.6007E-05	0.000885696	0.000959212	0	4.34478E-05	0.009080408	9.593E-06	0.035793917	9.28E-06	0.012502993	0.000267	0	4.136E-05	0	9.19E-06	0.000465431	4.7275E-05	0.146622308	0.819710725	0.000409855
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.00353575	1.67250059	0.003565928	0.121441499	0.002611307	0	0.005903911	1.233892386	0.0015456	5.766735611	0.000509	0.686078515	0.005037	0	0.0175056	0	0.00599	0.303499352	0.03216616	99.76211399	109.5462619	0.054773131
	Fannin	0.00705631	3.33782037	0.007116546	0.242361594	0.005211403	0	0.011782473	2.462487112	0.0030845	11.50871201	0.001017	1.369211384	0.010052	0	0.034936	0	0.011954	0.605695644	0.06419422	199.0959039	218.622192	0.109311096
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.00367718	1.73940061	0.003708565	0.126299159	0.00271576	0	0.006140067	1.283248081	0.0016074	5.997405036	0.00053	0.713521656	0.005238	0	0.0182058	0	0.006229	0.315639326	0.03345281	103.7525985	113.9281124	0.056964056
	Frio	0.00858833	4.06250565	0.000871383	0.029675881	0.006342868	0	0.001420864	0.296954612	0.0004718	1.760396591	0.000218	0.294153459	0.206661	0	0.0127478	0	0.000188	0.00950314	0.00088683	2.750458685	9.203648018	0.004601824
	Grimes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.18852746	89.1783897	0.003775086	0.128564599	0.139235931	0	0.006306735	1.318080904	0.0013925	5.195722356	0.001348	1.814891715	0.038764	0	0.0060032	0	0.001333	0.067560411	0.00686231	21.28319216	118.9864018	0.059493201
	Howard	0.00055511	0.26258291	0.000559851	0.019066338	0.000409976	0	0.000926915	0.193721338	0.0002427	0.905378582	8E-05	0.107714457	0.000791	0	0.0027484	0	0.00094	0.047649456	0.00505009	15.66267076	17.19878384	0.008599392
	Jack	0.00212145	1.00350035	0.002139557	0.072864899	0.001566784	0	0.003542346	0.740335432	0.0009273	3.460041367	0.000306	0.411647109	0.003022	0	0.0105033	0	0.003594	0.182099611	0.0192997	59.85726839	65.72775716	0.032863879
	Jones	0.04071872	19.2610146	0.000815354	0.027767766	0.030072592	0	0.001362147	0.284683045	0.0003008	1.12218761	0.000291	0.391985725	0.008372	0	0.0012966	0	0.000288	0.014591899	0.00148214	4.596807316	25.69903793	0.012849519
	Lamar	0.00095084	0.44977103	0.000958954	0.032658206	0.000702236	0	0.001587687	0.331819943	0.0004156	1.550798029	0.000137	0.184501125	0.001355	0	0.0047076	0	0.001611	0.08161744	0.00865017	26.82815723	29.459323	0.014729662
	Limestone	0.00071976	0.34046368	0.000891528	0.030361924	0.000531572	0	0.000300183	0.062737001	0.0054552	20.35421151	0.001239	1.668969555	0.000498	0	0.000316	0	0.000381	0.019303721	0.00052318	1.622619721	24.09866711	0.012049334
	Llano	0.00123817	0.58568848	0.047274044	1.609968111	0.000914447	0	0.082844655	17.31418267	0.0007657	2.85700973	0.0022	2.962924306	0.000657	0	0.0011486	0	0.000249	0.012598857	0.00113586	3.522830102	28.86520226	0.014432601
	McLennan	0.02453432	11.6053701	0.024743738	0.842674468	0.018119687	0	0.040966843	8.561897052	0.0107245	40.01499417	0.003535	4.760653104	0.034951	0	0.1214699	0	0.041562	2.105961781	0.22319886	692.2426618	760.1342125	0.380067106
	Milam	0.0022454	1.06213492	0.002264571	0.077122399	0.001658332	0	0.003749326	0.783593264	0.0009815	3.662211736	0.000324	0.435699668	0.003199	0	0.011117	0	0.003804	0.1927397	0.02042738	63.35473122	69.56823291	0.034784116
	Mitchell	0.01494317	7.06850744	0.015070721	0.513249528	0.011036196	0	0.024951762	5.214812825	0.006532	24.3720175	0.002153	2.899581099	0.021288	0	0.073984	0	0.025314	1.282682616	0.1359442	421.6257085	462.9765595	0.23148828
	Nolan	0.00056465	0.26709589	0.000569473	0.019394029	0.000417022	0	0.000942846	0.197050801	0.0002468	0.920939205	8.14E-05	0.109565731	0.000804	0	0.0027956	0	0.000957	0.048468401	0.00513689	15.93186305	17.4943771	0.008747189
	Palo Pinto	0.003207	1.51699362	0.005906709	0.201159295	0.002368511	0	0.009454195	1.9758869	0.003962	14.78291726	0.001144	1.53991455	0.03075	0	0.1230821	0	0.001263	0.063990245	0.00574838	17.82836379	37.90922567	0.018954613
	Pecos	4.0968E-05	0.01937878	4.13174E-05	0.001407107	3.02565E-05	0	6.84069E-05	0.014296752	1.791E-05	0.066817487	5.9E-06	0.007949392	5.84E-05	0	0.0002028	0	6.94E-05	0.003516559	0.0003727	1.155914583	1.269280658	0.00063464
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.00073771	0.34895494	0.000835096	0.028440101	0.00054483	0	0.000735917	0.153803555	0.0031497	11.75198709	0.000731	0.984235189	0.000761	0	0.0018663	0	0.191633	9.710206474	0.00339774	10.53795161	33.51557896	0.016757789
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.00569644	2.69456302	0.005745061	0.195654205	0.004207073	0	0.009511781	1.987922054	0.00249	9.29077854	0.000821	1.105340001	0.008115	0	0.0282032	0	0.00965	0.488967322	0.05182285	160.7265826	176.4898078	0.088244904
	Tom Green	0.00148245	0.70123648	2.96846E-05	0.001010942	0.001094854	0	4.95918E-05	0.010364466	1.095E-05	0.040855527	1.06E-05	0.014271039	0.000305	0	4.72E-05	0	1.05E-05	0.000531248	5.396E-05	0.167356137	0.935625842	0.000467813
	Upton	3.1166E-05	0.01474239	3.14322E-05	0.001070456	2.30176E-05	0	5.20405E-05	0.010876242	1.362E-05	0.050831347	4.49E-06	0.006047493	4.44E-05	0	0.0001543	0	5.28E-05	0.002675219	0.00028353	0.879361036	0.965604181	0.000482802
	Ward	0.01855953	8.77913971	0.01871795	0.637459797	0.013707039	0	0.030990277	6.476836981	0.0081128	30.27023012	0.002674	3.601301662	0.02644	0	0.0918886	0	0.03144	1.593101513	0.16884373	523.6623197	575.0203895	0.287510195
	Webb	0.02001433	9.4672973	0.000400768	0.01364859	0.014781473	0	0.000669531	0.139929234	0.0001478	0.551584845	0.000143	0.192671335	0.004115	0	0.0006373	0	0.000142	0.007172304	0.00072851	2.259452187	12.63175579	0.006315878
	Wharton	0.00014434	0.06827643	0.000178787	0.006088766	0.000106601	0	6.01986E-05	0.01258125	0.001094	4.081824298	0.000249	0.334694394	9.99E-05	0	6.336E-05	0	7.64E-05	0.003871159	0.00010492	0.325399419	4.832735718	0.002416368
	Wichita	0.00020763	0.09821591	0.000209406	0.007131529	0.000153346	0	0.000346701	0.072459085	9.076E-05	0.338645726	2.99E-05	0.040289268	0.000296	0	0.001028	0	0.000352	0.017822693	0.00188893	5.858429418	6.432993628	0.003216497
	Wilbarger	0.02861682	13.5364992	0.000573025	0.019514981	0.021134796	0	0.000957307	0.200073147	0.0002114	0.788665188	0.000205	0.275484681	0.005884	0	0.0009112	0	0.000202	0.010255079	0.00104164	3.23060233	18.0610946	0.009030547
	Wise	0.00284449	1.34551659	0.002882008	0.098149866	0.002100781	0	0.00476997	0.996903668	0.0012561	4.686632155	0.000413	0.556492496	0.004182	0	0.0146143	0	0.004798	0.243116529	0.02576141	79.89802387	87.82483517	0.043912418
	Young	0.00623586	2.94972222	0.006289085	0.214181501	0.004605458	0	0.010412491	2.176166522	0.0027258	10.17056035	0.000899	1.210009166	0.008883	0	0.0308739	0	0.010564	0.535269637	0.05673017	175.9464399	193.2023493	0.096601175
	Total	**1.12183722**	**530.658181**	**1.172570094**	**39.93312854**	**1.090766584**	**0**	**1.189130767**	**248.5233043**	**1.62936**	**6079.421103**	**1.542363**	**2077.026815**	**1.359386**	**0**	**1.2316428**	**0**	**1.221806**	**61.91010521**	**1.52878695**	**4741.473786**	**13778.94642**	**6.889473211**
Energy Savings by PCA (MWh)		473.03		34.06		0.00		209.00		3,731.17		1,346.65		0.00		0.00		50.67		3,101.46			

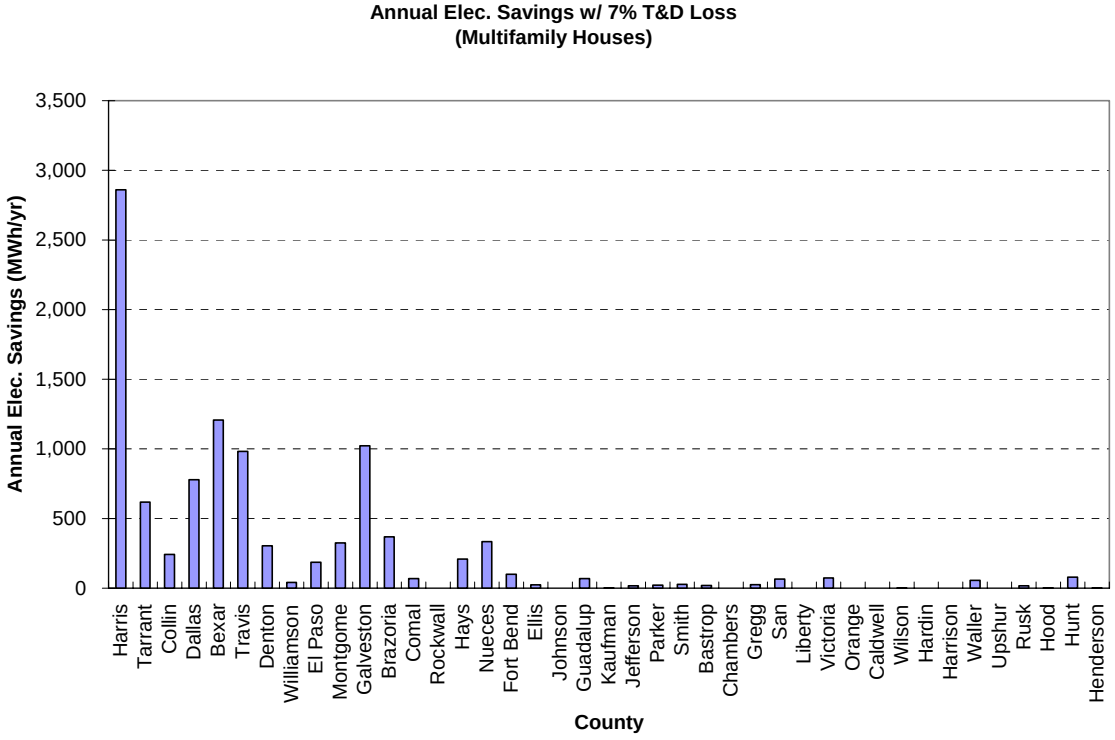
Table 46: 2005 OSD NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 2007 eGRID.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.00957217	0.01561516	0.011806715	0.001638005	0.007069474	0	0.004263638	0.003630023	0.0710018	0.984151829	0.01614	0.096475401	0.006781	0	0.0051797	0	0.126288	0.02641651	0.008772	0.138494073	1.266421003	0.000633211
	Chambers	0.0218814	0.03569531	0.027103415	0.003760193	0.016160386	0	0.009125896	0.007769707	0.1658435	2.298747679	0.037677	0.225208412	0.015138	0	0.0096055	0	0.011582	0.002422614	0.015905	0.251124496	2.824728407	0.001412364
	Fort Bend	0.05569551	0.09085656	0.068987309	0.009570956	0.041133619	0	0.023228475	0.019776517	0.4221274	5.851086152	0.095902	0.57323117	0.038531	0	0.0244493	0	0.029479	0.006166367	0.040484	0.639196321	7.189884047	0.003594942
	Galveston	0.02755599	0.04495231	0.033893644	0.004702236	0.020351324	0	0.012791501	0.010890571	0.2014466	2.792241399	0.045813	0.273833569	0.019824	0	0.0167751	0	0.594657	0.124388252	0.028709	0.453288161	3.7042965	0.001852148
	Harris	0.07736057	0.12619896	0.09582276	0.013293974	0.057134232	0	0.032264145	0.027469407	0.5863312	8.127106786	0.133207	0.796213012	0.05352	0	0.0339599	0	0.040946	0.00856503	0.056232	0.887838023	9.986685191	0.004993343
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.00176365	0.00287706	0.003151138	0.000437173	0.001302533	0	0.005050143	0.004299647	0.0020858	0.028910491	0.000604	0.003610747	0.015958	0	0.0637888	0	0.000846	0.000176992	0.004013	0.063363782	0.103675886	5.18379E-05
	Dallas	0.00504555	0.00823085	0.005305276	0.000736028	0.003726366	0	0.008757286	0.007455876	0.0024131	0.033447671	0.000782	0.004675795	0.00931	0	0.033672	0	0.008209	0.001717169	0.044002	0.694742222	0.751005614	0.000375503
	Denton	0.00063576	0.00103712	0.001170951	0.000162452	0.000469535	0	0.001874207	0.001595683	0.0007854	0.010886816	0.000227	0.001354991	0.006096	0	0.0243999	0	0.00025	5.23674E-05	0.00114	0.017992335	0.033081763	1.65409E-05
	Tarrant	0.01557224	0.02540313	0.015705165	0.002178857	0.011500796	0	0.026002176	0.022138022	0.006807	0.094351266	0.002244	0.013411912	0.022184	0	0.0770985	0	0.02638	0.005517999	0.141667	2.236756157	2.399757345	0.001199879
	Ellis	0.00350282	0.00571419	0.003532723	0.000490112	0.002586991	0	0.005848935	0.004979731	0.0015312	0.021223393	0.000505	0.003016878	0.00499	0	0.0173426	0	0.005934	0.00124122	0.031867	0.503136393	0.539801914	0.000269901
	Johnson	0.00033718	0.00055004	0.000621017	8.61568E-05	0.00024902	0	0.000993991	0.000846275	0.0004166	0.005773855	0.00012	0.000718624	0.003233	0	0.0129406	0	0.000133	2.77732E-05	0.000604	0.009542288	0.017554501	8.77251E-06
	Kaufman	0.00649275	0.01059168	0.006548174	0.000908461	0.004795187	0	0.01084145	0.009230314	0.0028381	0.039339189	0.000936	0.005592015	0.009249	0	0.0321458	0	0.010999	0.002300696	0.059067	0.932601936	1.000564294	0.000500282
	Parker	0.00047595	0.00077642	0.000876616	0.000121617	0.000351511	0	0.0014031	0.001194587	0.000588	0.00815027	0.00017	0.001014396	0.004564	0	0.0182667	0	0.000187	3.92041E-05	0.000853	0.013469722	0.02476622	1.23831E-05
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.00095027	0.00155019	0.000958382	0.000132961	0.000701818	0	0.001586741	0.001350937	0.0004154	0.005757634	0.000137	0.00081844	0.001354	0	0.0047048	0	0.00161	0.000336727	0.008645	0.13649444	0.146441325	7.32207E-05
	Hood	0.01232788	0.02011058	0.012433111	0.001724908	0.00910469	0	0.020584816	0.01752573	0.0053888	0.07469388	0.001776	0.010617639	0.017562	0	0.0610356	0	0.020884	0.004368365	0.112152	1.770744617	1.899785718	0.000949893
	Hunt	0.00635121	0.01036078	0.006405424	0.000888657	0.004690653	0	0.010605108	0.009029094	0.0027763	0.038481599	0.000915	0.00547011	0.009048	0	0.031445	0	0.010759	0.002250541	0.05778	0.912271318	0.978752105	0.000489376
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.03112811	0.05077956	0.048234164	0.006691768	0.0229895	0	0.084461674	0.071909919	0.0010637	0.014744371	1.065347	6.367860533	0.043667	0	0.0043501	0	0.000484	0.00010125	0.002333	0.036828835	6.548916233	0.003274458
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.00200761	0.00327503	0.076651484	0.010634246	0.00148271	0	0.134326688	0.114364549	0.0012416	0.017209066	0.003567	0.021323835	0.001066	0	0.0018623	0	0.000403	8.43302E-05	0.001842	0.02907854	0.195969599	9.79848E-05
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.00446951	0.00729116	0.170648096	0.023674869	0.003300936	0	0.299049574	0.254608151	0.002764	0.038312297	0.007942	0.047472947	0.002372	0	0.0041461	0	0.000898	0.000187743	0.0041	0.064737135	0.436284299	0.000218142
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.00246935	0.00402828	0.094281013	0.013080079	0.001823727	0	0.165221279	0.14066793	0.0015271	0.021167081	0.004388	0.02622823	0.001311	0	0.0022907	0	0.000496	0.000103726	0.002265	0.035766485	0.241041808	0.000120521
	Travis	0.00050761	0.00082807	0.298194277	0.041369992	0.000374892	0	0.033779905	0.028759911	0.0003331	0.004617568	0.000902	0.005390661	0.00027	0	0.0004695	0	0.000103	2.15119E-05	0.000465	0.007343985	0.088331697	4.41658E-05
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22352453	0.36463746	0.00447587	0.00062096	0.165082827	0	0.007477478	0.006366258	0.001651	0.02288465	0.001598	0.009550987	0.04596	0	0.0071176	0	0.001581	0.000330672	0.008136	0.12846074	0.532851726	0.000266426
	San Patricio	0.05533089	0.09026175	0.001107949	0.000153711	0.040864326	0	0.001850962	0.001575893	0.0004087	0.005664828	0.000396	0.002364235	0.011377	0	0.0017619	0	0.000391	8.18539E-05	0.002014	0.031798956	0.131901222	6.59506E-05
Victoria Area	Victoria	0.02060475	0.03361271	0.002090584	0.000290037	0.015217528	0	0.003408874	0.002902285	0.0011319	0.015689775	0.000524	0.003132415	0.495811	0	0.0305841	0	0.00045	9.41195E-05	0.002128	0.033592834	0.089314174	4.46571E-05
Other ERCOT counties	Andrews	2.5653E-05	4.1847E-05	2.58716E-05	3.5893E-06	1.89456E-05	0	4.28342E-05	3.64687E-05	1.121E-05	0.000155428	3.7E-06	2.20939E-05	3.65E-05	0	0.000127	0	4.35E-05	9.08998E-06	0.000233	0.003684681	0.003953198	1.9766E-06
	Angelina	0.00032149	0.00052445	0.000324234	4.49827E-05	0.000237435	0	0.000536817	0.000457041	0.0001405	0.001947889	4.63E-05	0.00027689	0.000458	0	0.0015917	0	0.000545	0.00011392	0.002925	0.046178004	0.049543176	2.47716E-05
	Bosque	0.00093945	0.00153254	0.001730301	0.000240053	0.000693828	0	0.002769496	0.002357924	0.0011606	0.016087335	0.000335	0.002002257	0.009008	0	0.0360555	0	0.00037	7.73827E-05	0.001684	0.026587086	0.048884575	2.44423E-05
	Brazos	0.00191393	0.0031222	0.003525105	0.000489056	0.00141352	0	0.005642234	0.004803748	0.0023645	0.032774374	0.000682	0.004079154	0.018351	0	0.073455	0	0.000754	0.00015765	0.003431	0.054165287	0.099591472	4.97957E-05
	Calhoun	0.08852525	0.14441199	0.001772635	0.000245927	0.065379841	0	0.0029614	0.00252131	0.0006539	0.009063298	0.000633	0.003782598	0.018202	0	0.0028189	0	0.000626	0.00013096	0.003222	0.050875932	0.211032011	0.000105516
	Cameron	0.05467229	0.08918737	0.001094762	0.000151882	0.285623104	0	0.001828931	0.001557135	0.0004038	0.0055974	0.000391	0.002336094	0.011242	0	0.0017409	0	0.000387	8.08796E-05	0.00199	0.031420456	0.130331214	6.51656E-05
	Cherokee	0.003513	0.00573078	0.003542982	0.000491536	0.002594504	0	0.005865919	0.004994191	0.0015356	0.021285022	0.000506	0.003025639	0.005005	0	0.0173929	0	0.005951	0.001244824	0.031959	0.504597403	0.541369393	0.000270685
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.0013551	0.00221059	2.71346E-05	3.76452E-06	0.001000801	0	4.53316E-05	3.85949E-05	1.001E-05	0.000138736	9.69E-06	5.79021E-05	0.000279	0	4.315E-05	0	9.58E-06	2.00467E-06	4.93E-05	0.000778783	0.00323037	1.61519E-06
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.00362926	0.00592045	0.003660242	0.000507804	0.002680373	0	0.006060061	0.005159483	0.0015864	0.021989485	0.000523	0.003125777	0.00517	0	0.0179686	0	0.006148	0.001286024	0.033017	0.521297896	0.559286917	0.000279643
	Fannin	0.00762852	0.01244446	0.007693632	0.001067376	0.005633999	0	0.012737922	0.010844954	0.0033346	0.046220711	0.001099	0.006570215	0.010867	0	0.0377689	0	0.012923	0.002703152	0.0694	1.095740046	1.175590918	0.000587795
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.00377443	0.00615727	0.003806652	0.000528116	0.002787588	0	0.006302464	0.005365862	0.0016499	0.022869065	0.000544	0.003250808	0.005377	0	0.0186873	0	0.006394	0.001337465	0.034338	0.542149812	0.581658394	0.000290829
	Frio	0.01476384	0.02408437	0.001497957	0.000207819	0.010903753	0	0.002442547	0.002079563	0.0008111	0.01124213	0.000375	0.002244457	0.355262	0	0.0219143	0	0.000322	6.7439E-05	0.001525	0.024070135	0.063995917	3.1998E-05
	Grimes	0.00055442	0.00090444	0.001021149	0.000141669	0.000409467	0	0.001634436	0.001391545	0.0006849	0.009494047	0.000198	0.001181645	0.005316	0	0.0212784	0	0.000218	4.56679E-05	0.000994	0.015690545	0.028849556	1.44248E-05
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.239737	0.391085	0.004800509	0.000665999	0.177056459	0	0.008019827	0.00682801	0.0017708	0.024544498	0.001714	0.01024373	0.049294	0	0.0076338	0	0.001695	0.000354655	0.008726	0.137778133	0.571500025	0.00028575
	Howard	0.00058508	0.00095445	0.000590075	8.18641E-05	0.000432108	0	0.000976955	0.000831771	0.0002558	0.003544969	8.43E-05	0.000503913	0.000833	0	0.0028967	0	0.000991	0.000207322	0.005323	0.08403948	0.090163766	4.50819E-05
	Jack	0.00217756	0.00355227	0.002196145	0.000304682	0.001608224	0	0.003636037	0.00309569	0.0009519	0.013193691	0.000314	0.001875466	0.003102	0	0.0107811	0	0.003689	0.000771614	0.01981	0.312778738	0.33557215	0.000167786
	Jones	0.04250012	0.06933081	0.000851025	0.000118067	0.031388236	0	0.00142174	0.001210457	0.0003139	0.004351202	0.000304	0.001815989	0.008739	0	0.0013533	0	0.000301	6.28727E-05	0.001547	0.024425048	0.10131445	5.06572E-05
	Lamar	0.00107998	0.00176178	0.001089199	0.00015111	0.000797614	0	0.001803327	0.001535336	0.0004721	0.006543535	0.000156	0.000930155	0.001539	0	0.005347	0	0.00183	0.000382689	0.009825	0.15512556	0.166430168	8.32151E-05
	Limestone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Llano	0.00124346	0.00202847	0.047475864	0.006586565	0.000918351	0	0.083198331	0.07083432	0.000769	0.010658832	0.00221	0.013207409	0.00066	0	0.0011535	0	0.00025	5.22318E-05	0.001141	0.018010464	0.121378289	6.06891E-05
	McLennan	0.02303137	0.03757127	0.023227961	0.003222532	0.017009692	0	0.038457253	0.032742164	0.0100675	0.139545647	0.003319	0.019836235	0.03281	0	0.1140288	0	0.039015	0.008161128	0.209526	3.308165324	3.549244297	0.001774622
	Milam	0.00165249	0.00269572	0.001666598	0.000231215	0.001220439	0	0.002759294	0.002349238	0.0007223	0.010012348	0.000238	0.001423242	0.002354	0	0.0081815	0	0.002799	0.000585558	0.015033	0.237359629	0.254656955	0.000127328
	Mitchell	0.01696145	0.02766936	0.017106233	0.002373234	0.012526789	0	0.028321847	0.024112969	0.0074142	0.102768403	0.002444	0.014608397	0.024163	0	0.0839765	0	0.028733	0.006010263	0.154305	2.436298601	2.613841229	0.001306921
	Nolan	0.00060327	0.00098412	0.000608422	8.44095E-05	0.000445544	0	0.001007331	0.000857633	0.0002637	0.003655193	8.69E-05	0.000519581	0.000859	0	0.0029868	0	0.001022	0.000213769	0.005488	0.086652535	0.092967245	4.64836E-05
	Palo Pinto	0.00307488	0.00501608	0.00566337	0.000785708	0.002270935	0	0.00906471	0.007717614	0.0037988	0.052654714	0.001096	0.006553494	0.029483	0	0.1180115	0	0.001211	0.000253278	0.005512	0.087020967	0.160001851	8.00009E-05
	Pecos	4.2262E-05	6.8942E-05	4.26225E-05	5.91324E-06	3.12122E-05	0	7.05678E-05	6.00808E-05	1.847E-05	0.000256062	6.09E-06	3.63988E-05	6.02E-05	0	0.0002092	0	7.16E-05	1.49754E-05	0.000384	0.006070371	0.006512743	3.25637E-06
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.00035926	0.00058606	0.000406685	5.64214E-05	0.000265328	0	0.000358385	0.000305126	0.0015339	0.021260847	0.000356	0.002127489	0.000371	0	0.0009089	0	0.093323	0.019521082	0.001655	0.026125269	0.069982294	3.49911E-05
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tom Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upton	3.2238E-05	5.259E-05	3.25131E-05	4.51071E-06	2.38092E-05	0	5.38302E-05	4.58305E-05	1.409E-05	0.000195328	4.65E-06	2.77656E-05	4.59E-05	0	0.0001596	0	5.46E-05	1.14235E-05	0.000293	0.004630575	0.004968023	2.48401E-06
	Ward	0.01980763	0.03231235	0.0199767	0.002771468	0.014628815	0	0.033074321	0.028159183	0.0086584	0.120013188	0.002854	0.017059721	0.028218	0	0.098068	0	0.033554	0.0070188	0.180198	2.845115373	3.052450081	0.001526225
	Webb	0.01418005	0.02313203	0.000283942	3.93927E-05	0.010472596	0	0.000474359	0.000403865	0.0001047	0.001451766	0.000101	0.0006059	0.002916	0	0.0004515	0	0.0001	2.09773E-05	0.000516	0.008149348	0.033803278	1.69016E-05
	Wharton	0.00015439	0.00025186	0.000191235	2.6531E-05	0.000114024	0	6.43902E-05	5.48212E-05	0.0011702	0.016219424	0.000266	0.001589018	0.000107	0	6.777E-05	0	8.17E-05	1.70934E-05	0.000112	0.001771875	0.01993062	9.96531E-06
	Wichita	0.00021984	0.00035863	0.000221719	3.07603E-05	0.000162364	0	0.000367089	0.000312536	9.61E-05	0.001332015	3.17E-05	0.000189344	0.000313	0	0.0010884	0	0.000372	7.7901E-05	0.002	0.031577664	0.033878852	1.69394E-05
	Wilbarger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Wise	0.00291847	0.00476093	0.002955932	0.000410091	0.002155421	0	0.004892446	0.004165385	0.0012878	0.017849479	0.000424	0.002532719	0.004281	0	0.0149528	0	0.004924	0.001030059	0.026441	0.417464526	0.448213186	0.000224107
	Young	0.00549666	0.00896675	0.005543579	0.000769089	0.004059529	0	0.009178198	0.007814236	0.0024027	0.033303927	0.000792	0.004734111	0.00783	0	0.0272141	0	0.009311	0.001947733	0.050005	0.789525844	0.847061687	0.000423531
	Total	**1.14303735**	**1.86464656**	**1.154658244**	**0.160191547**	**1.089429227**	**0**	**1.180868675**	**1.005381103**	**1.5393506**	**21.33685953**	**1.443965**	**8.630962563**	**1.481727**	**0**	**1.2697054**	**0**	**1.151969**	**0.240964916**	**1.517783**	**23.96398518**	**57.2029914**	**0.028601496**

Energy Savings by PCA (MWh)		AEP-West (ERCOT)		Austin Energy		Brownsville		LCRA		Reliant		San Antonio		South Texas		Texas Municipal		Texas-New Mexico		TXU
		1.63		0.14		0.00		0.85		13.86		5.98		0.00		0.00		0.21		15.79

Table 47: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 2007 eGRID.

	Electricity Savings and Resultant NOx Reductions (Multifamily Houses)			
County	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)
Harris	2,858.94	1.14	10.62	0.00
Tarrant	618.73	0.19	3.54	0.00
Collin	242.17	0.01	1.38	0.00
Dallas	778.74	0.07	4.45	0.00
Bexar	1,206.34	0.79	5.35	0.00
Travis	981.06	0.01	4.00	0.00
Denton	304.98	0.00	1.55	0.00
Williamson	42.27	0.00	0.17	0.00
El Paso	185.83	0.00	0.73	0.00
Montgomery	325.66	0.00	1.21	0.00
Galveston	1,022.39	0.58	3.80	0.00
Brazoria	368.33	0.15	1.37	0.00
Comal	69.88	0.00	0.31	0.00
Rockwall	0.00	0.00	0.00	0.00
Hays	209.00	0.03	0.85	0.00
Nueces	333.64	0.07	1.10	0.00
Fort Bend	100.36	1.18	0.37	0.00
Ellis	24.43	0.05	0.14	0.00
Johnson	0.00	0.00	0.00	0.00
Guadalupe	69.32	0.02	0.31	0.00
Kaufman	3.10	0.10	0.02	0.00
Jefferson	17.44	0.00	0.07	0.00
Parker	21.36	0.00	0.11	0.00
Smith	27.18	0.00	0.14	0.00
Bastrop	20.95	0.05	0.08	0.00
Chambers	0.00	0.36	0.00	0.00
Gregg	26.26	0.00	0.12	0.00
San Patricio	65.40	0.02	0.22	0.00
Liberty	0.00	0.00	0.00	0.00
Victoria	73.99	0.01	0.31	0.00
Orange	0.00	0.00	0.00	0.00
Caldwell	0.00	0.00	0.00	0.00
Wilson	1.11	0.00	0.00	0.00
Hardin	0.00	0.00	0.00	0.00
Harrison	0.00	0.00	0.00	0.00
Waller	57.01	0.00	0.21	0.00
Upshur	0.00	0.00	0.00	0.00
Rusk	17.81	0.01	0.09	0.00
Hood	2.86	0.19	0.02	0.00
Hunt	79.32	0.10	0.40	0.00
Henderson	1.41	0.01	0.01	0.00
Ward		0.29		0.00
McLennan		0.38		0.00
Mitchell		0.23		0.00
Freestone		0.06		0.00
Fannin		0.11		0.00
Young		0.10		0.00
Cherokee		0.05		0.00
Titus		0.09		0.00
Limestone		0.01		0.00
Red River		0.00		0.00
Robertson		0.02		0.00
Palo Pinto		0.02		0.00
Llano		0.01		0.00
Haskell		0.00		0.00
Howard		0.01		0.00
Calhoun		0.03		0.00
Lamar		0.01		0.00
Nolan		0.01		0.00
Hidalgo		0.06		0.00
Cameron		0.02		0.00
Frio		0.00		0.00
Brazos		0.01		0.00
Jones		0.01		0.00
Wilbarger		0.01		0.00
Fayette		0.00		0.00
Angelina		0.00		0.00
Whichita		0.00		0.00
Wharton		0.00		0.00
Webb		0.01		0.00
Coke		0.00		0.00
Grimes		0.00		0.00
Andrews		0.00		0.00
Coleman		0.00		0.00
Hardeman		0.00		0.00
Pecos		0.00		0.00
Upton		0.00		0.00
Taylor		0.00		0.00
Tom Green		0.00		0.00
Wise		0.04		0.00
Presidio		0.00		0.00
Bosque		0.00		0.00
Crockett		0.00		0.00
Ector		0.05		0.00
Jack		0.03		0.00
Milam		0.03		0.00
Total	**10,157.29**	**6.89**	**43.05**	**0.03**



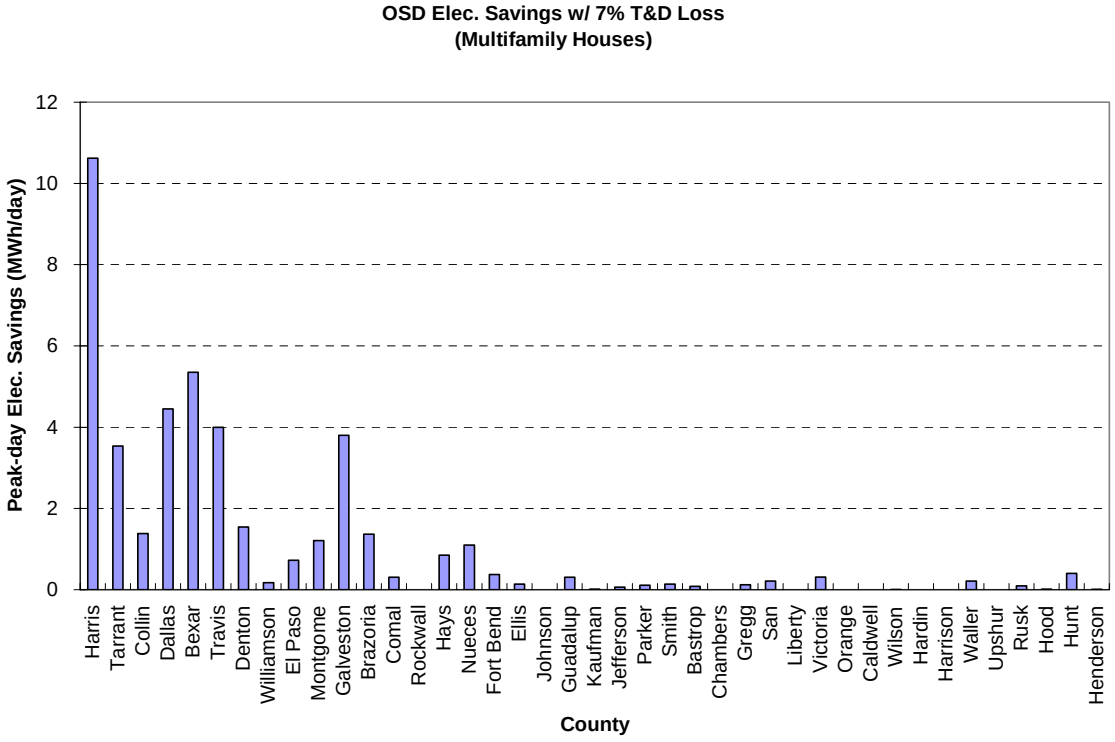


Figure 46: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 2007 eGRID.

6.1.3 2005 Results for New Residential Construction (Single-family and Multi-family), using 1999 eGRID.

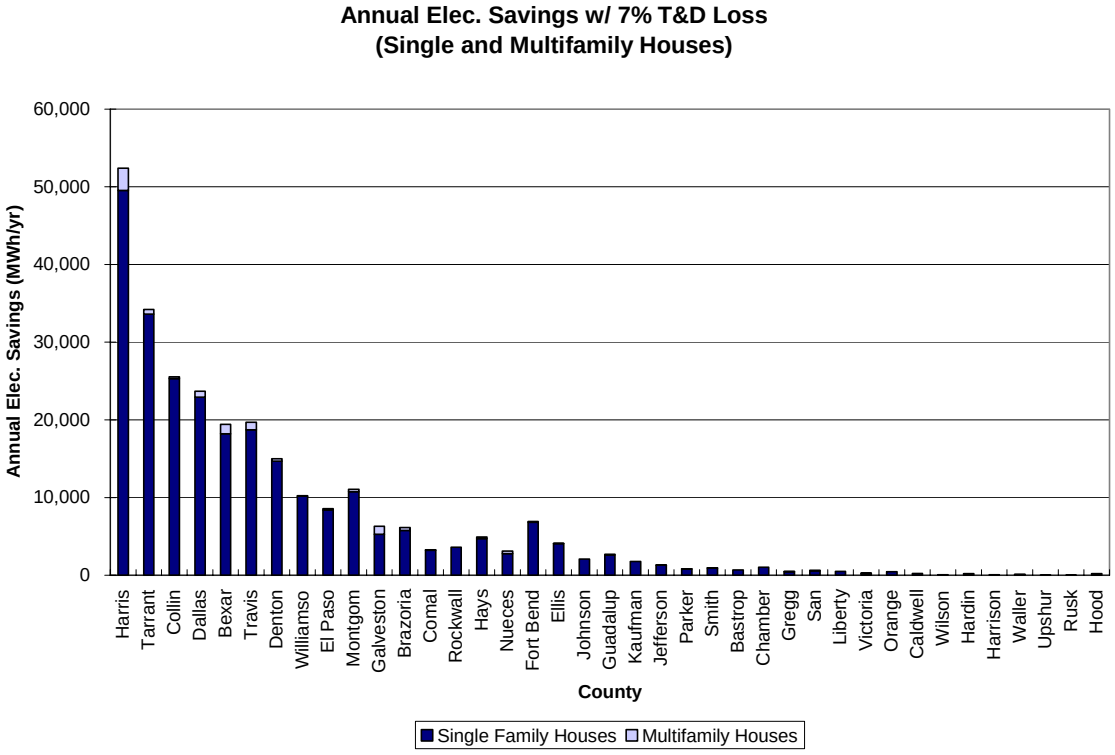
In Table 48, the combined NOx emissions reductions are listed from single-family electricity savings, multi-family electricity savings, and natural gas savings (single-family and multi-family). In Figure 47 and Figure 48, the 2005 annual and peak-day electricity savings are shown for the combined single-family and multi-family savings. Figure 49 and Figure 50 present the combined total NOx reductions from electricity and natural gas savings in single-family and multi-family households in the 41 non-attainment and affected counties, and in those counties calculated by the 1999 eGRID to for electric power production facilities.

Using the 1999 eGRID the total NOx reductions from electricity and natural gas savings from new construction in 2005 are calculated to be 410.34 tons NOx/year, which represents 362.74 tons NOx/year (88.4%) from single-family residential electricity savings, 12.47 tons NOx/year (3.0%) from multi-family residential electricity savings, and 35.13 tons NOx/year (8.6%) from natural gas savings from single-family and multi-family residential. On a peak Ozone Season Day (OSD), the NOx reductions in 2005 are calculated to be 1.96 tons of NOx/day, which represents 1.85 tons NOx/day (94.4%) from single-family residential electricity savings, 0.06 tons NOx/day (3.1%) from multi-family residential electricity savings, and 0.06 tons NOx/day (3.1%) from natural gas savings from single-family and multi-family residential.

In Figure 49 and Figure 50, it is worth pointing out that the comparative magnitude of the annual and peak-OSD NOx emissions reduction from natural gas compared to savings from electricity vary significantly, as is expected since the annual savings include heating period NOx emissions reduction, and the peak-OSD (cooling) savings include only those savings associated with the elimination of pilot lights in the furnaces. This can be identified by comparing the size of the natural gas portion of the stacked-bar figure for each county. In the annual NOx reduction graph (Figure 49), this portion is more significant than Figure 50, since the peak-day NOx reductions from natural gas are mostly related to pilot light elimination in new construction. Furthermore, the savings from the natural gas reductions remain in the counties where the houses are built, i.e., they are not distributed to other counties using eGRID as were the electricity savings.

Table 48: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (Using 1999 eGRID).

	Electricity Savings and Resultant NOx Reductions (Single Family Houses)				Electricity Savings and Resultant NOx Reductions (Multifamily Houses)				Total Electricity Savings and Resultant NOx Reductions (Single and Multi-Family Houses)				Total Natural Gas Savings and Resultant NOx Reductions (Single and Multi-Family Houses)				Total Nox Reductions	
County	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual N.G. Savings (Therm/County)	Annual Nox Reductions (Tons)	Total OSD N.G. Savings (Therm/County)	OSD Nox Reductions (Tons)	Annual Nox Reductions (Tons)	OSD Nox Reductions (Tons)
Harris	49,541.43	21.15	216.58	0.10	2,858.94	1.16	10.62	0.00	52,400.37	22.32	227.1758	0.1011	1,055,883.18	4.86	2,788.3854	0.0128	27.17	0.1139
Tarrant	33,608.87	19.38	177.06	0.10	618.73	0.46	3.54	0.00	34,225.60	19.84	181.4369	0.1054	1,036,850.35	4.77	1,544.4708	0.0071	24.61	0.1125
Collin	25,313.19	1.64	145.66	0.01	242.17	0.05	1.38	0.00	25,555.37	1.69	147.0600	0.0087	1,053,768.45	4.85	1,141.7501	0.0053	6.54	0.0140
Dallas	22,916.90	31.79	121.38	0.17	778.74	0.76	4.45	0.00	23,695.64	32.55	125.8325	0.1728	719,719.02	3.31	1,089.9157	0.0050	35.86	0.1779
Bexar	18,207.73	23.63	88.39	0.11	1,206.34	1.31	5.35	0.01	19,414.06	24.94	93.6470	0.1204	527,562.97	2.43	1,008.3602	0.0046	27.37	0.1250
Travis	18,717.70	0.46	90.17	0.00	981.06	0.03	4.00	0.00	19,698.77	0.47	94.1696	0.0023	448,285.63	2.06	850.7198	0.0039	2.53	0.0062
Denton	14,684.76	0.79	84.62	0.00	354.98	0.03	1.55	0.00	14,989.74	0.81	86.1625	0.0041	618,584.31	2.85	675.0931	0.0031	3.66	0.0072
Williamson	10,187.52	0.00	49.01	0.00	42.27	0.00	0.17	0.00	10,229.80	0.00	49.1774	0.0000	231,095.73	1.06	427.6973	0.0020	1.06	0.0020
El Paso	8,379.49	0.00	33.78	0.00	185.83	0.00	0.73	0.00	8,565.32	0.00	34.5032	0.0000	356,889.41	1.64	356.3534	0.0016	1.64	0.0016
Montgomery	10,751.30	0.00	46.91	0.00	325.66	0.00	1.21	0.00	11,076.96	0.00	48.1218	0.0000	220,919.81	1.02	579.5716	0.0027	1.02	0.0027
Galveston	5,274.22	14.39	23.06	0.07	1,022.39	0.77	3.80	0.00	6,266.61	15.16	26.8583	0.0903	130,261.24	0.60	347.1804	0.0016	15.75	0.0709
Brazoria	5,785.00	3.53	25.32	0.02	368.33	0.19	1.37	0.00	6,153.33	3.72	26.6849	0.0169	124,762.80	0.57	329.4544	0.0015	4.30	0.0184
Comal	3,220.05	0.00	15.57	0.00	69.88	0.00	0.31	0.00	3,289.93	0.00	15.8908	0.0000	89,107.42	0.41	166.2353	0.0008	0.41	0.0008
Rockwall	3,608.00	0.00	20.62	0.00	0.00	0.00	0.00	0.00	3,608.00	0.00	20.8181	0.0000	150,977.09	0.69	161.2702	0.0007	0.69	0.0007
Hays	4,713.70	0.00	22.75	0.00	209.00	0.00	0.85	0.00	4,922.70	0.00	23.5971	0.0000	112,291.23	0.52	236.8631	0.0011	0.52	0.0011
Nueces	2,787.69	2.69	10.77	0.01	333.64	0.18	1.33	0.00	3,121.32	2.86	11.8677	0.0134	60,670.20	0.28	155.2162	0.0007	3.14	0.0141
Fort Bend	6,819.56	30.87	29.83	0.14	100.36	1.70	0.37	0.01	6,919.92	32.57	30.2025	0.1475	137,216.27	0.63	363.8218	0.0017	33.20	0.1492
Ellis	4,092.90	0.00	21.69	0.00	24.43	0.00	0.14	0.00	4,117.33	0.00	21.8308	0.0000	125,249.20	0.58	183.8410	0.0008	0.58	0.0008
Johnson	2,081.99	0.01	11.03	0.00	0.00	0.00	0.00	0.00	2,081.99	0.01	11.0305	0.0000	63,132.81	0.29	92.1400	0.0004	0.30	0.0005
Guadalupe	2,638.20	0.00	12.78	0.00	69.32	0.00	0.31	0.00	2,707.52	0.00	13.0878	0.0000	73,418.86	0.34	137.3254	0.0006	0.34	0.0006
Kaufman	1,774.18	0.00	10.25	0.00	3.10	0.00	0.02	0.00	1,777.28	0.00	10.2617	0.0000	74,275.54	0.34	79.8599	0.0004	0.34	0.0004
Jefferson	1,308.30	0.00	5.87	0.00	17.44	0.00	0.07	0.00	1,325.75	0.00	5.7379	0.0000	24,997.53	0.11	66.9049	0.0003	0.11	0.0003
Parker	807.34	0.12	4.66	0.00	21.36	0.00	0.11	0.00	828.71	0.13	4.7680	0.0006	34,306.81	0.16	37.6430	0.0002	0.28	0.0008
Smith	935.46	0.00	4.84	0.00	27.18	0.00	0.14	0.00	962.64	0.00	4.9818	0.0000	29,230.58	0.13	58.9666	0.0003	0.13	0.0003
Bastrop	666.69	3.44	3.11	0.02	20.95	0.14	0.08	0.00	687.65	3.58	3.1903	0.0175	13,593.41	0.06	27.3564	0.0001	3.65	0.0176
Chambers	1,053.38	8.08	4.58	0.04	0.00	0.44	0.00	0.00	1,053.38	8.53	4.5628	0.0388	19,897.13	0.09	52.8289	0.0002	8.62	0.0389
Gregg	464.89	0.00	2.40	0.00	26.26	0.00	0.12	0.00	491.15	0.00	2.5229	0.0000	16,081.74	0.07	29.7238	0.0001	0.07	0.0001
San Patricio	582.06	0.18	2.25	0.00	65.40	0.01	0.22	0.00	647.46	0.20	2.4627	0.0009	12,522.03	0.06	32.0137	0.0001	0.25	0.0011
Liberty	460.83	0.00	2.12	0.00	0.00	0.00	0.00	0.00	460.83	0.00	2.1214	0.0000	9,169.75	0.04	24.3328	0.0001	0.04	0.0001
Victoria	207.36	1.52	0.96	0.01	73.99	0.09	0.31	0.00	281.35	1.61	1.3085	0.0078	4,861.08	0.02	12.7678	0.0005	1.63	0.0077
Orange	462.74	0.00	2.01	0.00	0.00	0.00	0.00	0.00	462.74	0.00	2.0059	0.0000	8,751.35	0.04	23.2225	0.0001	0.04	0.0001
Caldwell	237.08	0.00	1.12	0.00	0.00	0.00	0.00	0.00	237.08	0.00	1.1237	0.0000	5,221.20	0.02	10.3948	0.0000	0.02	0.0000
Wilson	82.60	0.00	0.40	0.00	1.11	0.00	0.00	0.00	83.80	0.00	0.4060	0.0000	2,279.45	0.01	4.2313	0.0000	0.01	0.0000
Hardin	213.85	0.00	0.93	0.00	0.00	0.00	0.00	0.00	213.85	0.00	0.9250	0.0000	4,060.33	0.02	10.6398	0.0000	0.02	0.0000
Harrison	68.60	0.00	0.35	0.00	0.00	0.00	0.00	0.00	68.60	0.00	0.3540	0.0000	2,256.55	0.01	4.0709	0.0000	0.01	0.0000
Waller	82.08	0.00	0.36	0.00	57.01	0.00	0.21	0.00	139.09	0.00	0.5701	0.0000	3,009.97	0.01	8.1637	0.0000	0.01	0.0000
Upshur	14.10	0.00	0.07	0.00	0.00	0.00	0.00	0.00	14.10	0.00	0.0728	0.0000	461.30	0.00	0.8327	0.0000	0.00	0.0000
Rusk	19.82	0.00	0.10	0.00	17.81	0.00	0.09	0.00	37.63	0.00	0.1949	0.0000	1,207.36	0.01	2.9812	0.0000	0.01	0.0000
Hood	210.05	19.51	1.11	0.10	2.86	0.46	0.02	0.00	212.91	19.97	1.1291	0.1061	6,496.12	0.03	9.5854	0.0000	20.00	0.1061
Hunt	432.64	0.00	2.49	0.00	79.32	0.00	0.40	0.00	511.96	0.00	2.8961	0.0000	20,280.08	0.09	25.2661	0.0001	0.09	0.0001
Henderson	213.31	2.05	1.11	0.01	1.41	0.05	0.01	0.00	214.72	2.10	1.1192	0.0112	6,454.64	0.03	13.0007	0.0001	2.13	0.0112
Ward		37.49		0.20		0.89		0.00	0.00	38.38	0.0000	0.2039					38.38	0.2039
McLennan		34.72		0.18		0.82		0.00	0.00	35.54	0.0000	0.1888					35.54	0.1888
Mitchell		29.46		0.16		0.70		0.00	0.00	30.16	0.0000	0.1602					30.16	0.1602
Freestone		16.43		0.09		0.39		0.00	0.00	16.82	0.0000	0.0893					16.82	0.0893
Fannin		13.26		0.07		0.32		0.00	0.00	13.57	0.0000	0.0721					13.57	0.0721
Young		12.70		0.07		0.30		0.00	0.00	13.01	0.0000	0.0691					13.01	0.0691
Cherokee		7.18		0.04		0.17		0.00	0.00	7.33	0.0000	0.0389					7.33	0.0389
Titus		5.12		0.03		0.12		0.00	0.00	5.24	0.0000	0.0278					5.24	0.0278
Limestone		3.93		0.02		0.22		0.00	0.00	4.14	0.0000	0.0188					4.14	0.0188
Red River		2.03		0.01		0.05		0.00	0.00	2.08	0.0000	0.0110					2.08	0.0110
Robertson		2.02		0.01		0.07		0.00	0.00	2.10	0.0000	0.0107					2.10	0.0107
Palo Pinto		1.79		0.01		0.06		0.00	0.00	1.85	0.0000	0.0094					1.85	0.0094
Llano		2.02		0.01		0.08		0.00	0.00	2.11	0.0000	0.0103					2.11	0.0103
Haskell		0.95		0.00		0.06		0.00	0.00	1.01	0.0000	0.0047					1.01	0.0047
Howard		0.84		0.00		0.03		0.00	0.00	0.86	0.0000	0.0046					0.86	0.0046
Calhoun		0.82		0.00		0.05		0.00	0.00	0.87	0.0000	0.0041					0.87	0.0041
Lamar		0.75		0.00		0.02		0.00	0.00	0.77	0.0000	0.0041					0.77	0.0041
Nolan		0.67		0.00		0.02		0.00	0.00	0.68	0.0000	0.0036					0.68	0.0036
Hidalgo		0.61		0.00		0.04		0.00	0.00	0.65	0.0000	0.0030					0.65	0.0030
Cameron		0.61		0.00		0.04		0.00	0.00	0.65	0.0000	0.0030					0.65	0.0030
Frio		0.54		0.00		0.03		0.00	0.00	0.57	0.0000	0.0028					0.57	0.0028
Brazos		0.52		0.00		0.02		0.00	0.00	0.53	0.0000	0.0027					0.53	0.0027
Jones		0.45		0.00		0.03		0.00	0.00	0.48	0.0000	0.0022					0.48	0.0022
Crockett		0.36		0.00		0.03		0.00	0.00	0.39	0.0000	0.0018					0.39	0.0018
Wilbarger		0.38		0.00		0.03		0.00	0.00	0.38	0.0000	0.0018					0.38	0.0018
Fayette		0.42		0.00		0.02		0.00	0.00	0.44	0.0000	0.0021					0.44	0.0021
Angelina		0.32		0.00		0.01		0.00	0.00	0.33	0.0000	0.0018					0.33	0.0018
Wichita		0.31		0.00		0.01		0.00	0.00	0.31	0.0000	0.0017					0.31	0.0017
Wharton		0.26		0.00		0.01		0.00	0.00	0.28	0.0000	0.0013					0.28	0.0013
Webb		0.25		0.00		0.02		0.00	0.00	0.27	0.0000	0.0012					0.27	0.0012
Coke		0.10		0.00		0.01		0.00	0.00	0.11	0.0000	0.0005					0.11	0.0005
Grimes		0.06		0.00		0.00		0.00	0.00	0.06	0.0000	0.0003					0.06	0.0003
Andrews		0.04		0.00		0.00		0.00	0.00	0.04	0.0000	0.0002					0.04	0.0002
Coleman		0.03		0.00		0.00		0.00	0.00	0.04	0.0000	0.0002					0.04	0.0002
Hardeman		0.03		0.00		0.00		0.00	0.00	0.04	0.0000	0.0002					0.04	0.0002
Pecos		0.03		0.00		0.00		0.00	0.00	0.03	0.0000	0.0002					0.03	0.0002
Upton		0.02		0.00		0.00		0.00	0.00	0.02	0.0000	0.0001					0.02	0.0001
Taylor		0.01		0.00		0.00		0.00	0.00	0.01	0.0000	0.0000					0.01	0.0000
Tom Green		0.00		0.00		0.00		0.00	0.00	0.00	0.0000	0.0000					0.00	0.0000
Wise		0.00		0.00		0.00		0.00	0.00	0.00	0.0000	0.0000					0.00	0.0000
Presidio		0.00		0.00		0.00		0.00	0.00	0.00	0.0000	0.0000					0.00	0.0000
Total	**263,655.60**	**362.74**	**1,298.81**	**1.85**	**10,157.29**	**12.47**	**43.05**	**0.08**	**273,812.94**	**375.22**	**1,341.86**	**1.90**	**7,636,039.90**	**35.13**	**13,170.43**	**0.06**	**410.34**	**1.96**



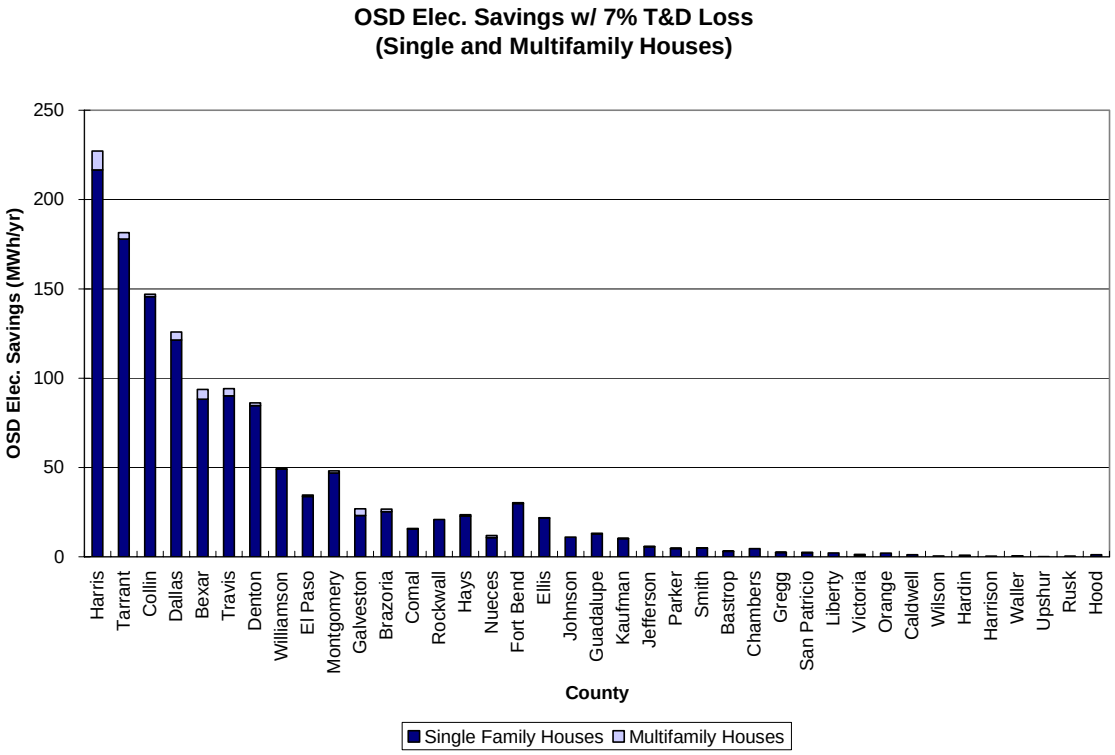


Figure 47: 2005 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Single-family and Multi-family Residences by County.

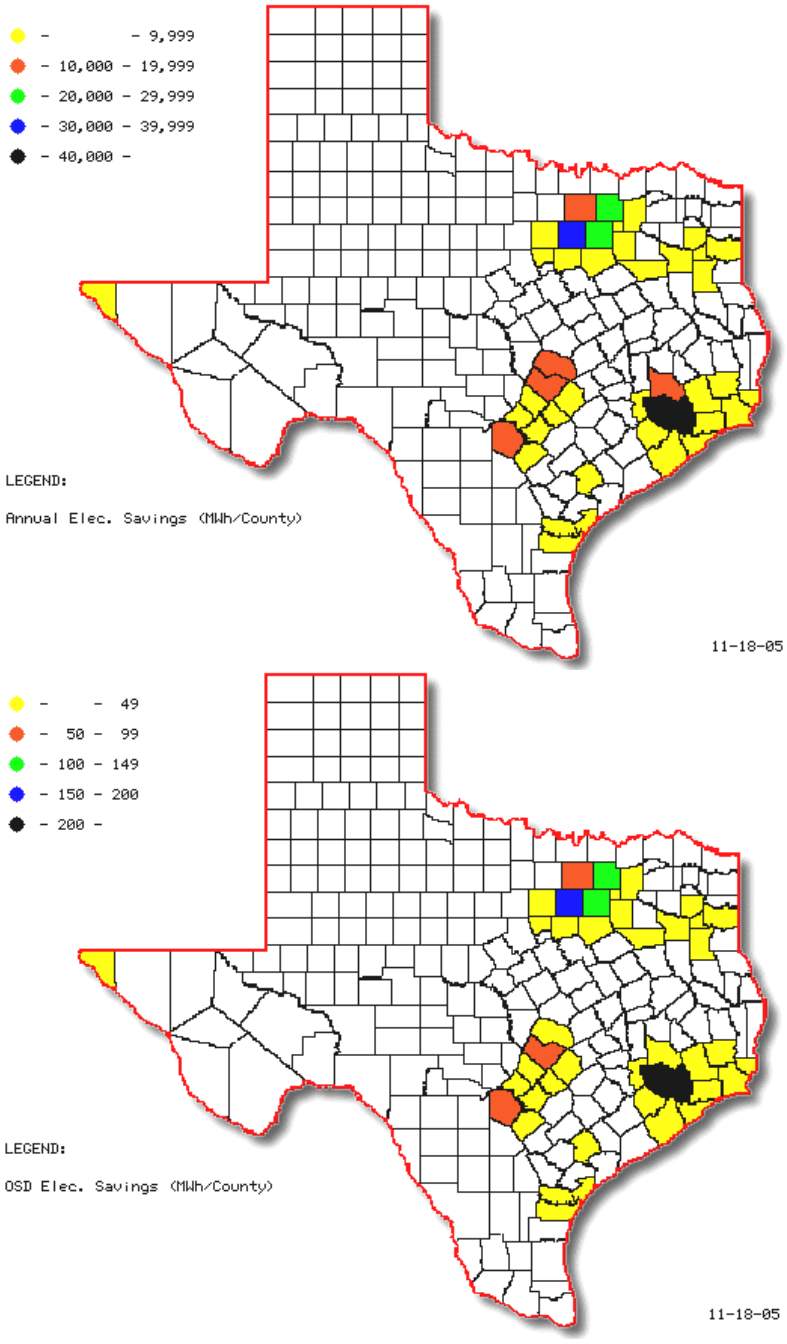
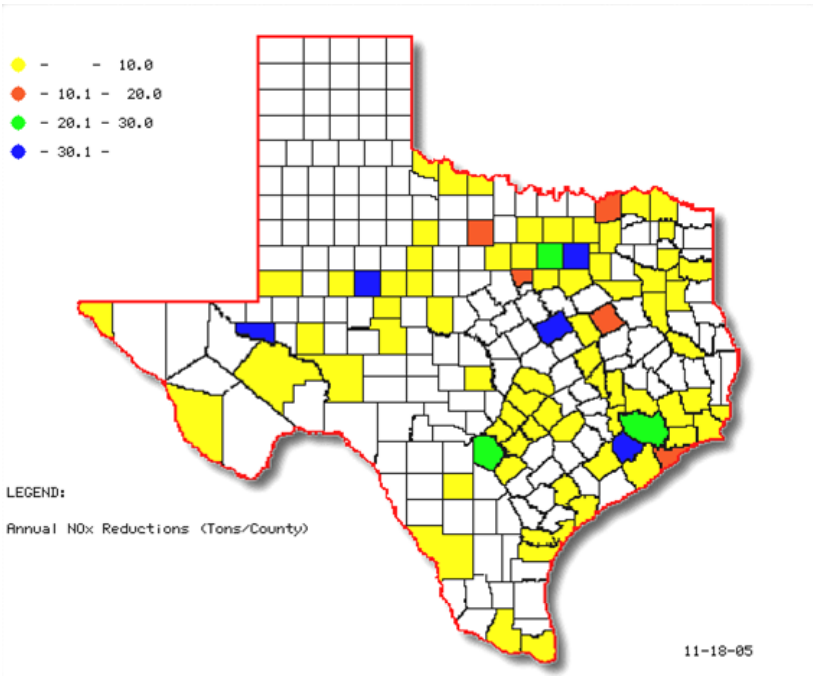


Figure 48: 2005 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Single-family and Multi-family Residences by County.



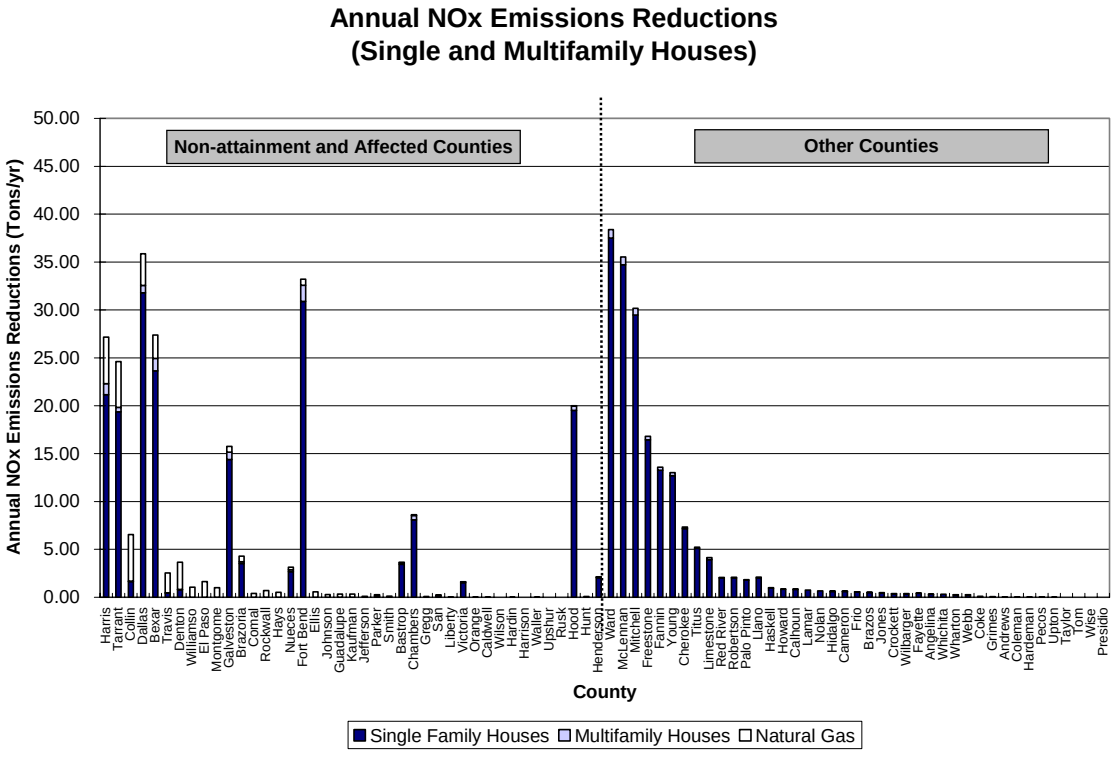
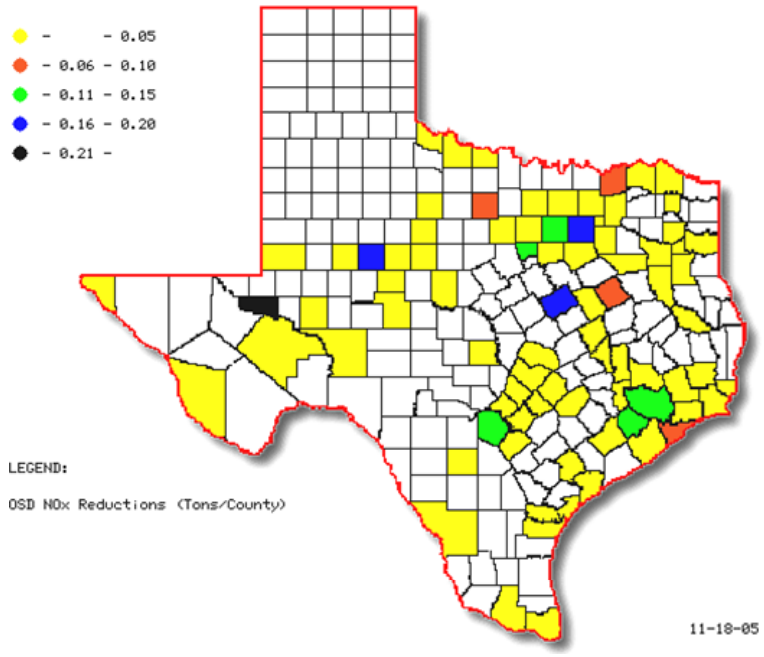


Figure 49: 2005 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 1999 eGRID).



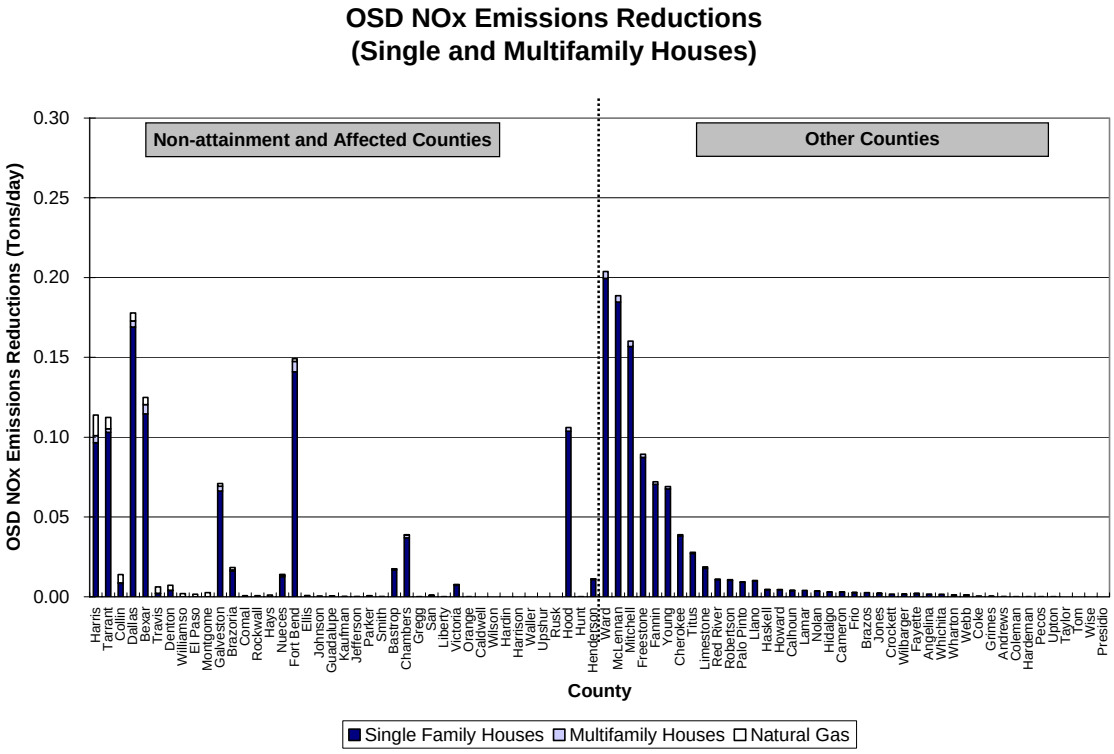


Figure 50: 2005 OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 1999 eGRID).

6.1.4 Estimated 2007 Savings for 2005 New Residential Construction (Single-family and Multi-family), using 2007 eGRID.

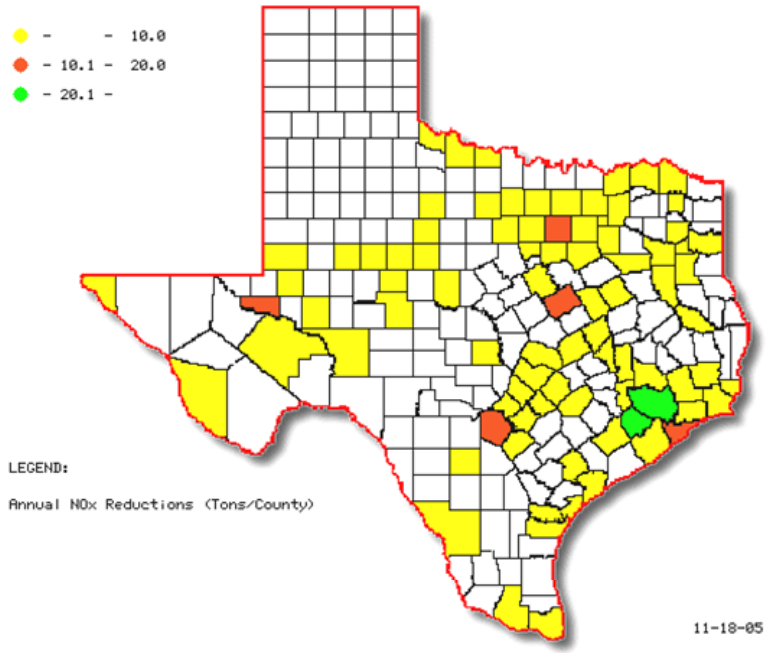
In Table 49, the combined NOx emissions reductions are listed from single-family electricity savings, multi-family electricity savings, and natural gas savings (single-family and multi-family). Figure 51 and Figure 52 present the combined total NOx reductions from electricity and natural gas savings in single-family and multi-family households in the 41 non-attainment and affected counties, and in those counties calculated by the 2007 eGRID to for electric power production facilities.

Using the 2007 eGRID, the total NOx reductions from electricity and natural gas savings from new construction in 2007 are calculated to be 222.02 tons NOx/year, which represents 180.0 tons NOx/year (81.1%) from single-family residential electricity savings, 6.89 tons NOx/year (3.1%) from multi-family residential electricity savings, and 35.13 tons NOx/year (15.8%) from natural gas savings from single-family and multi-family residential. On a peak Ozone Season Day (OSD), the NOx reductions in 2007 are calculated to be 0.97 tons of NOx/day, which represents 0.88 tons NOx/day (90.7%) from single-family residential electricity savings, 0.03 tons NOx/day (3.1%) from multi-family residential electricity savings, and 0.06 tons NOx/day (6.2%) from natural gas savings from single-family and multi-family residential.

In Figure 51 and Figure 52 it is worth pointing out that the comparative magnitude of the annual and peak-OSD NOx emissions reduction from natural gas compared to savings from electricity vary significantly, as is expected since the annual savings include heating period NOx emissions reduction, and the peak-OSD (cooling) savings include only those savings associated with the elimination of pilot lights in the furnaces. This can be identified by comparing the size of the natural gas portion of the stacked-bar figure for each county. In the annual NOx reduction graph (Figure 51), this portion is more significant than Figure 52, since the peak-day NOx reductions from natural gas are mostly related to pilot light elimination in new construction. Furthermore, the savings from the natural gas reductions remain in the counties where the houses are built, i.e., they are not distributed to other counties using eGRID as were the electricity savings.

Table 49: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 2007 eGRID).

		Electricity Savings and Resultant NOx Reductions (Single Family Houses)				Electricity Savings and Resultant NOx Reductions (Multifamily Houses)				Total Electricity Savings and Resultant NOx Reductions (Single and Multi-Family Houses)				Total Natural Gas Savings and Resultant NOx Reductions (Single and Multi-Family Houses)				Total Nox Reductions	
County		Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual N.G. Savings (Therm/County)	Annual Nox Reductions (Tons)	Total OSD N.G. Savings (Therm/County)	OSD Nox Reductions (Tons)	Annual Nox Reductions (Tons)	OSD Nox Reductions (Tons)
Harris		49,541.43	20.79	216.56	0.11	2,858.94	1.14	10.62	0.00	52,400.37	21.93	227.1758	0.1125	1,055,863.18	4.86	2,788.3854	0.0128	26.79	0.1254
Tarrant		33,608.87	7.93	177.90	0.05	618.73	0.19	3.54	0.00	34,225.60	8.12	181.4368	0.0552	1,036,850.35	4.77	1,544.4708	0.0071	12.89	0.0623
Collin		25,313.19	0.38	145.68	0.00	242.17	0.01	1.38	0.00	25,555.37	0.39	147.0600	0.0019	1,053,768.45	4.85	1,141.7501	0.0053	5.24	0.0072
Dallas		22,916.90	2.90	121.38	0.02	778.74	0.07	4.45	0.00	23,695.64	2.97	125.8325	0.0172	719,719.02	3.31	1,089.9157	0.0050	6.28	0.0222
Bexar		18,207.73	14.32	88.29	0.06	1,206.34	0.79	5.35	0.00	19,414.06	15.11	93.6470	0.0679	527,562.97	2.43	1,008.3602	0.0046	17.54	0.0726
Travis		18,717.70	0.28	90.17	0.00	981.06	0.01	4.00	0.00	19,698.77	0.29	94.1696	0.0014	448,285.63	2.06	850.7198	0.0039	2.35	0.0053
Denton		14,684.76	0.08	84.62	0.00	304.98	0.00	1.55	0.00	14,989.74	0.09	86.1625	0.0008	618,584.31	2.85	675.0931	0.0031	2.93	0.0037
Williamson		10,187.52	0.00	49.01	0.00	42.27	0.00	0.17	0.00	10,229.80	0.00	49.1774	0.0090	231,095.71	1.08	427.6973	0.0020	1.08	0.0020
El Paso		8,379.49	0.00	33.78	0.00	185.83	0.00	0.73	0.00	8,565.32	0.00	34.5032	0.0000	356,889.41	1.64	356.3634	0.0016	1.64	0.0016
Montgomery		10,751.30	0.00	46.91	0.02	325.66	0.00	1.21	0.00	11,076.96	0.00	48.1218	0.0000	220,919.81	1.02	579.5716	0.0027	1.02	0.0027
Galveston		5,274.22	10.98	23.06	0.04	1,022.39	0.58	3.80	0.00	6,296.61	11.58	26.8583	0.0442	130,261.24	0.60	347.1804	0.0016	12.15	0.0458
Brazoria		5,785.00	2.83	25.32	0.01	368.33	0.15	1.37	0.00	6,153.33	2.98	26.6949	0.0148	124,762.80	0.57	329.4544	0.0015	3.55	0.0163
Comal		3,220.05	0.00	15.57	0.00	69.88	0.00	0.31	0.00	3,289.93	0.00	15.8808	0.0000	89,107.42	0.41	166.2353	0.0008	0.41	0.0008
Rockwall		3,608.00	0.00	20.82	0.00	0.00	0.00	0.00	0.00	3,608.00	0.00	20.8181	0.0000	150,977.09	0.69	161.2702	0.0007	0.69	0.0007
Hays		4,713.70	0.69	22.75	0.00	209.00	0.03	0.85	0.00	4,922.70	0.72	23.5971	0.0035	112,291.23	0.52	236.8631	0.0011	1.24	0.0046
Nueces		2,787.69	1.10	10.77	0.01	333.64	0.07	1.10	0.00	3,121.32	1.17	11.8677	0.0054	60,670.26	0.28	155.2162	0.0007	1.45	0.0061
Fort Bend		6,819.56	21.45	29.83	0.08	100.36	1.18	0.37	0.00	6,919.92	22.63	30.2025	0.0810	137,216.27	0.63	363.8218	0.0017	23.26	0.0827
Ellis		4,092.90	2.14	21.69	0.01	24.43	0.05	0.14	0.00	4,117.33	2.19	21.8308	0.0124	125,249.28	0.58	183.8410	0.0008	2.76	0.0133
Johnson		2,081.99	0.05	11.03	0.00	0.00	0.00	0.00	0.00	2,081.99	0.05	11.0305	0.0003	63,132.81	0.29	92.1400	0.0004	0.34	0.0007
Guadalupe		2,638.20	0.58	12.78	0.00	69.32	0.02	0.31	0.00	2,707.52	0.59	13.0878	0.0029	73,418.88	0.34	137.3254	0.0006	0.92	0.0035
Kaufman		1,774.18	4.12	10.25	0.02	3.10	0.10	0.02	0.00	1,777.28	4.22	10.2617	0.0230	74,275.54	0.34	79.8599	0.0004	4.56	0.0234
Jefferson		1,308.30	0.00	5.67	0.00	17.44	0.00	0.07	0.00	1,325.75	0.00	5.7379	0.0000	24,997.53	0.11	66.9049	0.0003	0.11	0.0003
Parker		807.34	0.04	4.66	0.00	21.36	0.00	0.11	0.00	828.71	0.04	4.7680	0.0004	34,306.81	0.16	37.6430	0.0002	0.20	0.0006
Smith		935.46	0.00	4.84	0.00	27.18	0.00	0.14	0.00	962.64	0.00	4.9818	0.0000	29,230.58	0.13	58.9666	0.0003	0.13	0.0003
Bastrop		666.69	1.27	3.11	0.01	20.95	0.05	0.08	0.00	687.65	1.32	3.1903	0.0084	13,593.41	0.06	27.3564	0.0001	1.38	0.0085
Chambers		1,053.38	6.63	4.56	0.03	0.00	0.36	0.00	0.00	1,053.38	6.99	4.5628	0.0318	19,897.13	0.09	52.8289	0.0002	7.08	0.0321
Gregg		464.89	0.00	2.40	0.00	26.26	0.00	0.12	0.00	491.15	0.00	2.5229	0.0000	16,081.74	0.07	29.7238	0.0001	0.07	0.0001
San Patricio		582.06	0.24	2.25	0.00	65.40	0.02	0.22	0.00	647.46	0.26	2.4827	0.0013	12,522.03	0.06	32.0137	0.0001	0.32	0.0015
Liberty		490.83	0.00	2.12	0.00	0.00	0.00	0.00	0.00	490.83	0.00	2.1214	0.0000	9,169.75	0.04	24.3328	0.0001	0.04	0.0001
Victoria		207.36	0.25	0.99	0.00	73.99	0.01	0.31	0.00	281.35	0.26	1.3085	0.0012	4,861.08	0.02	12.7678	0.0001	0.28	0.0013
Orange		462.74	0.00	2.01	0.00	0.00	0.00	0.00	0.00	462.74	0.00	2.0059	0.0000	8,751.35	0.04	23.2225	0.0001	0.04	0.0001
Caldwell		237.08	0.00	1.12	0.00	0.00	0.00	0.00	0.00	237.08	0.00	1.1237	0.0000	5,221.90	0.02	10.3948	0.0000	0.02	0.0000
Wilson		82.69	0.00	0.40	0.00	1.11	0.00	0.00	0.00	83.80	0.00	0.4060	0.0000	2,279.45	0.01	4.2313	0.0000	0.01	0.0000
Hardin		213.85	0.00	0.93	0.00	0.00	0.00	0.00	0.00	213.85	0.00	0.9250	0.0000	4,060.33	0.02	10.6398	0.0000	0.02	0.0000
Harrison		68.60	0.00	0.35	0.00	0.00	0.00	0.00	0.00	68.60	0.00	0.3540	0.0000	2,256.55	0.01	4.0709	0.0000	0.01	0.0000
Waller		82.08	0.00	0.36	0.00	57.01	0.00	0.21	0.00	139.09	0.00	0.5701	0.0000	3,009.97	0.01	8.1637	0.0000	0.01	0.0000
Jasper		14.10	0.00	0.07	0.00	0.00	0.00	0.00	0.00	14.10	0.00	0.0728	0.0000	461.30	0.00	0.8327	0.0000	0.00	0.0000
Rusk		19.82	0.45	0.10	0.00	17.81	0.01	0.09	0.00	37.63	0.46	0.1949	0.0008	1,207.39	0.01	2.9812	0.0000	0.46	0.0000
Hood		210.05	8.17	1.11	0.04	2.86	0.19	0.02	0.00	212.91	8.36	1.1291	0.0437	6,496.12	0.03	9.5654	0.0000	8.39	0.0437
Hunt		432.64	4.03	2.49	0.02	79.32	0.10	0.40	0.00	511.96	4.13	2.8961	0.0225	20,280.08	0.09	25.2661	0.0001	4.22	0.0226
Henderson		213.31	0.53	1.11	0.00	1.41	0.01	0.01	0.00	214.72	0.55	1.1192	0.0034	6,454.64	0.03	13.0007	0.0001	0.58	0.0034
Ward			12.10		0.07		0.29		0.00		12.39		0.0702					12.39	0.0702
McLennan			15.99		0.08		0.38		0.00		16.37		0.0816					16.37	0.0816
Mitchell			9.74		0.06		0.23		0.00		9.97		0.0601					9.97	0.0601
Freestone			2.40		0.01		0.06		0.00		2.45		0.0134					2.45	0.0134
Fannin			4.60		0.03		0.11		0.00		4.71		0.0270					4.71	0.0270
Young			4.06		0.02		0.10		0.00		4.16		0.0195					4.16	0.0195
Cherokee			2.28		0.01		0.05		0.00		2.34		0.0125					2.34	0.0125
Titus			3.71		0.00		0.09		0.00		3.80		0.0000					3.80	0.0000
Limestone			0.22		0.00		0.01		0.00		0.23		0.0000					0.23	0.0000
Red River			0.00		0.00		0.00		0.00		0.00		0.0000					0.00	0.0000
Robertson			0.46		0.00		0.02		0.00		0.47		0.0012					0.47	0.0012
Palo Pinto			0.56		0.00		0.02		0.00		0.58		0.0028					0.58	0.0028
Jano			0.35		0.00		0.01		0.00		0.36		0.0018					0.36	0.0018
Haskell			0.00		0.00		0.00		0.00		0.00		0.0000					0.00	0.0000
Howard			0.36		0.00		0.01		0.00		0.37		0.0021					0.37	0.0021
Calhoun			0.40		0.00		0.03		0.00		0.43		0.0021					0.43	0.0021
Lamar			0.62		0.00		0.01		0.00		0.63		0.0038					0.63	0.0038
Nolan			0.37		0.00		0.01		0.00		0.38		0.0021					0.38	0.0021
Hidalgo			0.91		0.01		0.06		0.00		0.97		0.0058					0.97	0.0058
Cameron			0.23		0.00		0.02		0.00		0.25		0.0013					0.25	0.0013
Kiso			0.10		0.00		0.00		0.00		0.10		0.0009					0.10	0.0009
Brazos			0.34		0.00		0.01		0.00		0.35		0.0018					0.35	0.0018
Jones			0.20		0.00		0.01		0.00		0.21		0.0010					0.21	0.0010
Wilbarger			0.14		0.00		0.01		0.00		0.15		0.0000					0.15	0.0000
Fayette			0.00		0.00		0.00		0.00		0.00		0.0000					0.00	0.0000
Angelina			0.20		0.00		0.00		0.00		0.21		0.0011					0.21	0.0011
Wichita			0.14		0.00		0.00		0.00		0.14		0.0008					0.14	0.0008
Wharton			0.04		0.00		0.00		0.00		0.05		0.0002					0.05	0.0002
Webb			0.10		0.00		0.01		0.00		0.10		0.0003					0.10	0.0003
Coke			0.00		0.00		0.00		0.00		0.00		0.0000					0.00	0.0000
Grimes			0.00		0.00		0.00		0.00		0.00		0.0005					0.00	0.0005
Andrews			0.02		0.00		0.00		0.00		0.02		0.0001					0.02	0.0001
Coleman			0.01		0.00		0.00		0.00		0.01		0.0000					0.01	0.0000
Sanderman			0.00		0.00		0.00		0.00		0.00		0.0000					0.00	0.0000
Nacos			0.03		0.00		0.00		0.00		0.03		0.0001					0.03	0.0001
Upton			0.02		0.00		0.00		0.00		0.02		0.0001					0.02	0.0001
Taylor			0.00		0.00		0.00		0.00		0.00		0.0000					0.00	0.0000
Tom Green			0.01		0.00		0.00		0.00		0.01		0.0000					0.01	0.0000
Wise			1.85		0.01		0.04		0.00		1.89		0.0103					1.89	0.0103
Presidio			0.00		0.00		0.00		0.00		0.00		0.0000					0.00	0.0000
Bosque	*		0.10		0.00		0.00		0.00		0.11		0.0009					0.11	0.0009
Crockett	*		0.00		0.00		0.00		0.00		0.00		0.0000					0.00	0.0000
Ector	*		2.30		0.01		0.05		0.00		2.36		0.0129					2.36	0.0129
Jack	*		1.38		0.01		0.03		0.00		1.42		0.0077					1.42	0.0077
Milam	*		1.46		0.01		0.03		0.00		1.50		0.0059					1.50	0.0059
Total		**263,655.66**	**180.01**	**1,298.81**	**0.88**	**10,157.29**	**6.89**	**43.05**	**0.03**	**273,812.94**	**186.90**	**1,341.86**	**0.91**	**7,636,039.96**	**35.13**	**13,170.43**	**0.06**	**222.02**	**0.97**



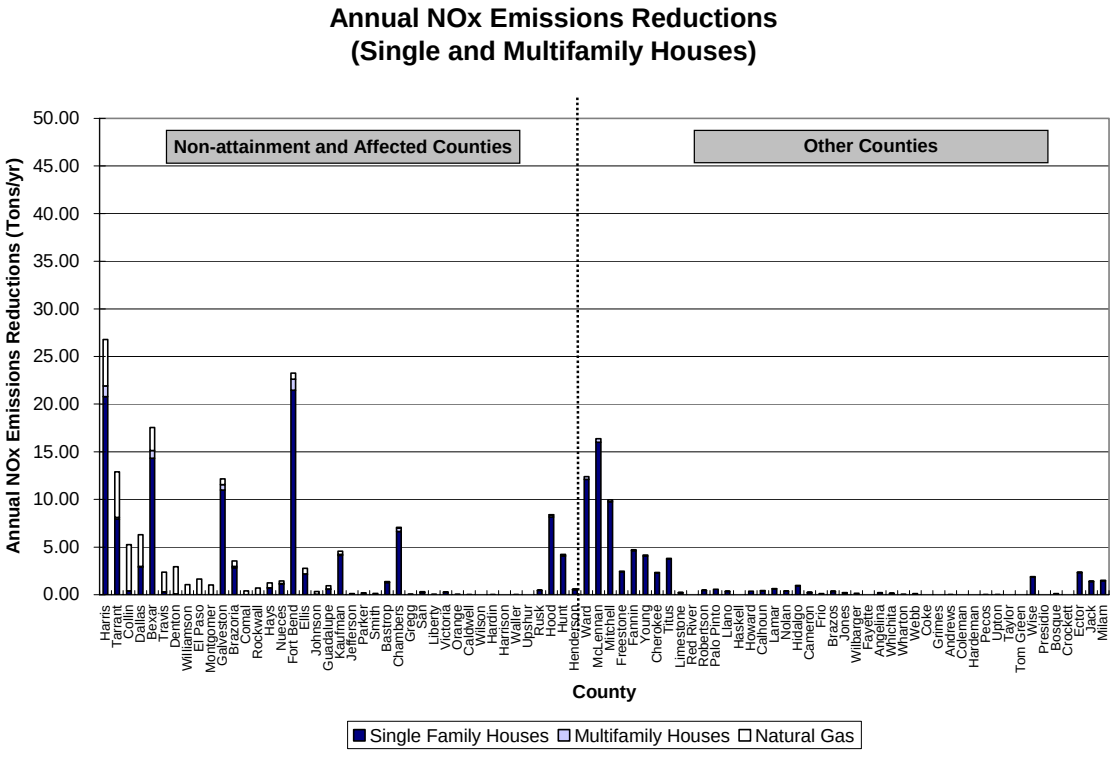
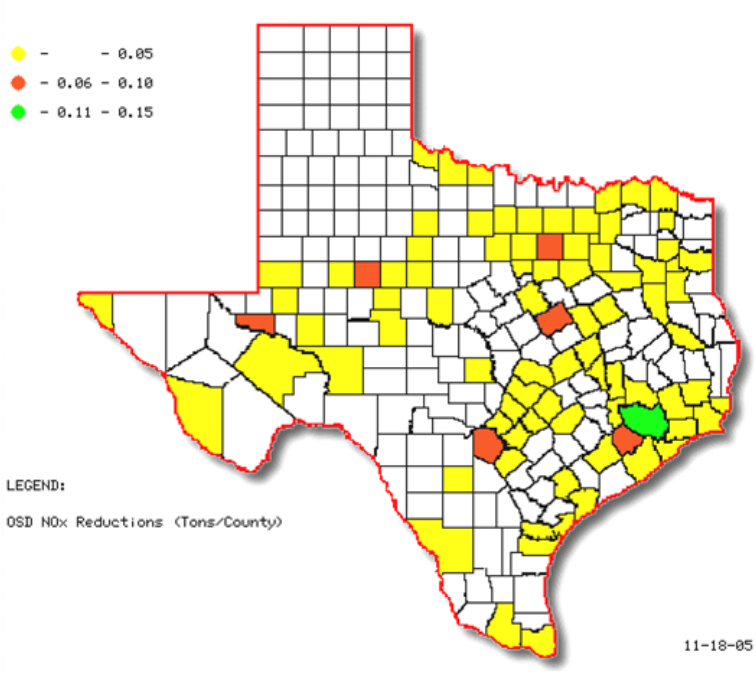


Figure 51: 2005 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 2007 eGRID).



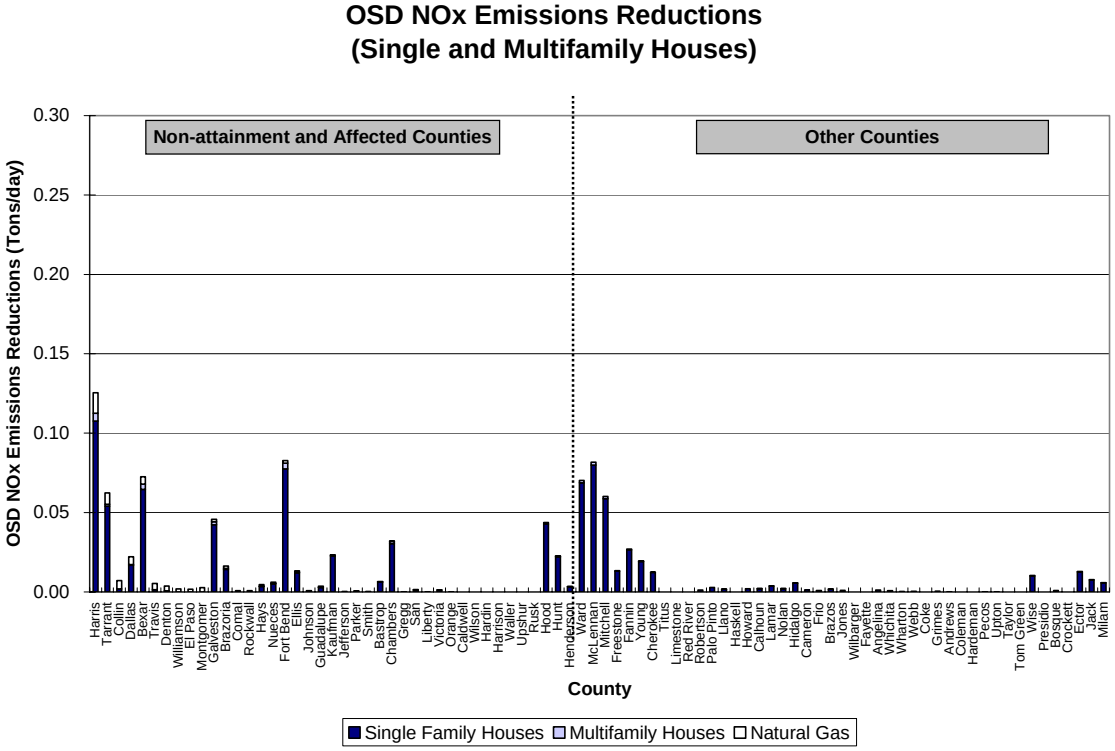


Figure 52: 2005 Peak OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 2007 eGRID).

6.1.5 2005 Results for Commercial Construction.

This section reports on the calculated energy and emissions savings from new commercial construction in 2005 that was built to meet the new ASHRAE Standard 90.1-1999 energy code. Construction prior to September 2001 was assumed to comply to ASHRAE Standard 90.1-1989, which was determined from a survey of engineers and architects reported in the Laboratory's 2004 Annual report to the TCEQ. To determine the energy and emissions savings from new commercial construction in the 41 non-attainment and affected counties, data from two sources were merged into one analysis as shown in Figure 53. In this figure, the analysis is described that covers results shown in Figure 54 to Figure 60 and in Table 50 to Table 64.

Beginning in the upper left of Figure 53, the Dodge database of the square footage of new commercial construction in Texas (Dodge 2005) was merged with the energy savings calculations published by the Pacific Northwest National Laboratory (PNNL) in a report prepared for the U.S.D.O.E. (USDOE 2004). This allowed for the new construction to be tracked by county, and energy savings to be calculated by building type. In the next block in Figure 53 and Table 50, the merged categories from the Dodge and PNNL database can be seen. This resulted in 12 Dodge categories being merged into 7 PNNL energy use categories. In the 4th and 5th PNNL category, the the Dodge "stores and restaurant" category had to be split into two categories to match the two PNNL categories for "retail" and "food." To accomplish this, information published in the 1999 and 2003 CBEC database (Table 51) by the U.S.D.O.E's Energy Information Agency (EIA) was used to determine the percentages used to split the Dodge conditioned area for each county as shown (i.e., 21.06% for food and 78.94% for retail). Table 52 shows the Dodge data for 1999 to 2003 prior to merging into the PNNL categories, which are shown by category in Figure 54 and Figure 55. Table 55 shows the Dodge data for 1999 to 2003 after merging into the required PNNL categories for the energy savings calculations. Table 56 and Figure 56 show the Dodge data from Table 55 for 2003 which were used for the 2005 calculations. In the upper graph of Figure 56, the square footage of all PNNL building types are shown for each county, followed by individual graphs of each building type in the lower seven graphs.

In the next step the PNNL energy savings, which represent buildings built to ASHRAE Standard 90.1-1989 versus Standard 90.1-1999, which are expressed per square foot, were then multiplied by the published square feet of new construction. For the 2005 results, the values for 2003 were assumed[46] for 2005. Table 57, Table 58, Table 59, and Table 60 show the annual and OSD energy use calculated for new construction, by building type, for Standard 90.1-1989, and 90.1-1999. Figure 57 and Figure 58 show the annual savings by building type for electricity (Figure 57) and gas (Figure 58). Figure 59 and Figure 60 show the OSD savings by building type for electricity (Figure 59) and natural gas (Figure 60). Table 61 and Table 62 show the county-wide annual electricity and natural gas savings by building type[47]. Table 63 and Table 64 show the county-wide OSD electricity and natural gas savings by building type[48].

In order to calculate the Ozone Season Day electricity and natural gas savings, simulations were performed on a typical office building that simulated a 6-story, 90,000-sq. ft. office building in Central Texas. Figure 61 provides an image of the office building (3-story shown). Table 65 (building LOADS) and Table 66 (building SYSTEM and PLANT information) provide the input characteristics used to simulate the office building. The results of these simulations show about a 13% annual energy use reduction as shown in Table 33 (Haberl et al. 2005). The simulations were also used to simulate the electricity and natural gas used during the Ozone Season Day (July 15 to Sept. 15) as shown in Figure 63, Figure 64, and Table 67. In the bottom row of Table 67, a ratio was calculated to allow for the conversion of annual savings to OSD savings. This ratio was then used in the remaining building types to accomplish this conversion.

[46] This assumption is based on conversations with Texas State demographer's office.
[47] In this table (-) values are savings, (+) values are increased energy use.
[48] In a similar fashion as the preceeding table, in this table (-) values are savings, (+) values are increased energy use.

In the next calculation step, electric utility providers were assigned to each county according to the published 1998 sales data from the Texas Public Utilities Commission as shown in Table 68 and Table 69. In the case where more than one utility was shown selling electricity in a county, a percentage of electricity use was allocated according to the PUCT's 1998 sales data. In the lower half of Table 69, the total electricity savings by utility provider is shown for 2005 for all estimated new commercial construction. Table 70 shows the calculated annual NOx emissions reductions from electricity using the 1999 eGRID table for Texas.

In a similar fashion as the annual calculations, electric utility providers were assigned to each county to calculate the OSD electricity savings by utility, as shown in Table 71. Table 72 shows the calculated NOx emissions reductions from electricity savings using the 1999 eGRID table for Texas. Table 73 shows the data transformation required to present the data in the bar charts that follow Figure 65 and Figure 66.

Table 74 shows the transformation of the annual and OSD county-wide electricity and natural gas savings, along with the associated 1999 NOx emissions reductions with 7% T&D losses. Figure 67 shows the data transformed in Table 74 which uses the 1999 eGRID and 7% T&D losses.

In Table 75 and Table 76, the NOx emissions reductions from the electricity use savings are shown using the 2007 eGRID for Texas. In a similar fashion as Table 73, Table 77 shows the data transformation required to present the data from Table 75 and Table 76 in the bar charts that follow Figure 68.

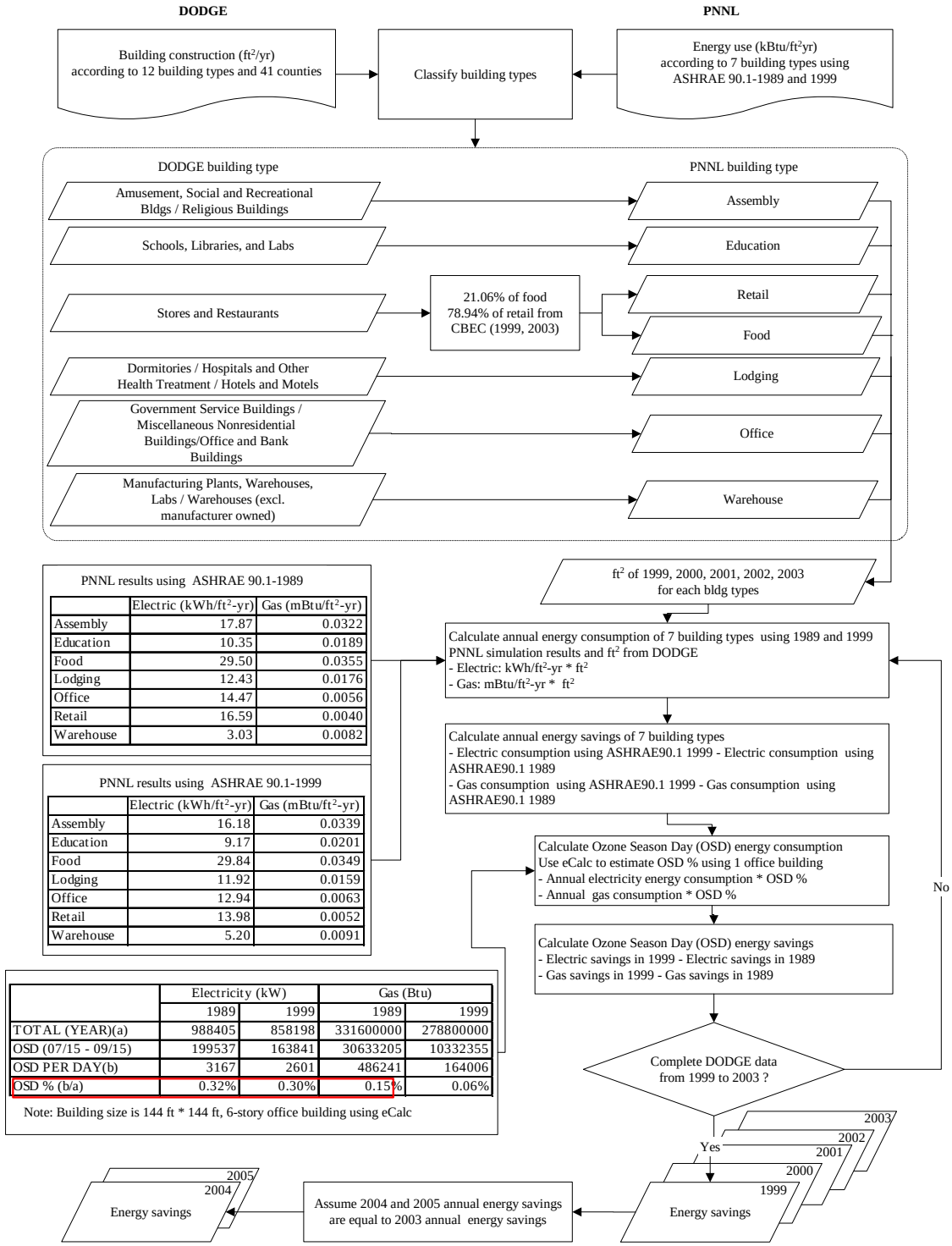
Finally Table 78 shows the transformation of the annual and OSD county-wide electricity and natural gas savings, along with the associated 2007 NOx emissions reductions with 7% T&D losses. Figure 69 shows the data transformed in Table 74 which uses the 2007 eGRID and 7% T&D losses.

6.1.6 2005 Results for New Commercial Construction using 1999 eGRID.

Using the 1999 eGRID, the total NOx reductions from electricity and natural gas savings from new commercial construction in 2005 are calculated to be 94.2 tons NOx/year which represents 97.5 tons NOx/year from electricity savings and -3.4 tons NOx/year (i.e., an increase) from natural gas savings. On a peak Ozone Season Day (OSD), the NOx reductions in 2005 are calculated to be 0.59 tons of NOx/day which represents 0.59 tons NOx/day from electricity savings and -0.005 tons NOx/day (i.e., an increase) from natural gas savings.

6.1.7 Estimated 2007 Savings for 2005 New Commericial Construction using 2007 eGRID.

Using the 2007 eGRID, the total NOx reductions from electricity and natural gas savings from new commercial construction in 2005 are calculated to be 46.2 tons NOx/year which represents 49.5 tons NOx/year from electricity savings and -3.4 tons NOx/year (i.e., an increase) from natural gas savings. On a peak Ozone Season Day (OSD), the NOx reductions in 2005 are calculated to be 0.29 tons of NOx/day which represents 0.29 tons NOx/day from electricity savings and -0.005 tons NOx/day (i.e., an increase) from natural gas savings.



PNNL results using ASHRAE 90.1-1989

	Electric (kWh/ft²-yr)	Gas (mBtu/ft²-yr)
Assembly	17.87	0.0322
Education	10.35	0.0189
Food	29.50	0.0355
Lodging	12.43	0.0176
Office	14.47	0.0056
Retail	16.59	0.0040
Warehouse	3.03	0.0082

PNNL results using ASHRAE 90.1-1999

	Electric (kWh/ft²-yr)	Gas (mBtu/ft²-yr)
Assembly	16.18	0.0339
Education	9.17	0.0201
Food	29.84	0.0349
Lodging	11.92	0.0159
Office	12.94	0.0063
Retail	13.98	0.0052
Warehouse	5.20	0.0091

	Electricity (kW)		Gas (Btu)	
	1989	1999	1989	1999
TOTAL (YEAR)(a)	988405	858198	331600000	278800000
OSD (07/15 - 09/15)	199537	163841	30633205	10332355
OSD PER DAY(b)	3167	2601	486241	164006
OSD % (b/a)	0.32%	0.30%	0.15%	0.06%

Note: Building size is 144 ft * 144 ft, 6-story office building using eCalc

Figure 53: Analysis Method for Calculating the 2005 Energy and Emissions Savings from Commercial Buildings.

Table 50: Commercial Building Descriptions from USDOE (2004) Report and Dodge (2005).

No	PNNL Bldg Types	Dodge Bldg Types
1	Assembly	Amusement, Social and Recreational Bldgs
2		Religious Buildings
3	Education	Schools, Libraries, and Labs (nonmfg)
4	Retail	Stores and Restaurants
5	Food	Stores and Restaurants
6	Lodging	Dormitories
7		Hospitals and Other Health Treatment
8		Hotels and Motels
9	Office	Government Service Buildings
10		Miscellaneous Nonresidential Buildings
11		Office and Bank Buildings
12	Warehouse	Manufacturing Plants, Warehouses, Labs
13		Warehouses (excl. manufacturer owned)

Table 51: Floor Area from CBEC (1999, 2003) Database for Retail and Food Type Commercial Buildings.

		CBEC (1999)		CBEC (2003)	
		All (million square feet)	South (million square feet)	All (million square feet)	South (million square feet)
Food	Food Sales	994	392	1,255	487
	Food Service	1851	676	1,654	764
Retail	Retail (Other Than Mall)	4766	1566	4,317	1,844
	Enclosed and Strip Malls	5631	2513	6,875	3,251

	South		All	
	Food %	Retail %	Food %	Retail %
CBEC (1999)[1]	20.75	79.25	21.48	78.52
CBEC (2003)[2]	19.71	80.29	20.63	79.37
Average	20.23	79.77	21.06	78.94

Note1: http://www.eia.doe.gov/emeu/cbecs/pdf/alltables.pdf, page 4.
Note2: http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/pdf2003/seta.pdf, Page 1.

Table 52: 1999 to 2003 New Commercial Building Construction (sq. ft. x 1000) (Source: Dodge/McGraw-Hill 2005). Table shows Dodge data before merging into PNNL building types (sq. ft. x 1000) (Part 1).

	Amusement, Social and Recreational Bldgs					Dormitories					Government Service Buildings					Hospitals and Other Health Treatment				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
BASTROP, TX	20	2.9	4.7	45.6	0	0	0	7.6	0	0	0	9.6	1.5	0	45	0	31.3	0	0	0
BEXAR, TX	591.1	923	1092.7	222.1	157.1	128.1	63.4	61.2	66.2	705.3	57.9	164.9	14.8	39.8	34.7	420	432.7	511.2	570.4	224.1
BRAZORIA, TX	23.4	17.9	20.9	78.7	42.5	0	0	0	0	0	9.8	0	4.2	0	29.2	10.4	97.4	10.7	10.7	2
CALDWELL, TX	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39.7	0
CHAMBERS, TX	5.1	0	0	13.7	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COLLIN, TX	645.1	305.3	159	682.7	218.3	0	0	0	0	0	44.1	0	207.9	37	75.3	366.2	374.5	92.9	118.9	1429.7
COMAL, TX	2.8	2.6	32.7	5	4.8	2.5	0	0	9.7	0	0	0.9	0	0	10.9	31	14.6	26.8	5.2	42.5
DALLAS, TX	1597	1458.9	422.6	456.4	840.1	0	154	359.2	27.2	115.3	91.3	105.6	765.6	83.1	528.2	507.1	780.1	228.6	933	441.7
DENTON, TX	78.6	96.7	103.6	342.9	167.5	0	0	0	0	297	22.6	148	3.4	127.6	9.9	112.3	68.6	303.6	317.1	512.2
EL PASO, TX	127.4	399.1	187.3	102.8	225.1	0	167	15	0	0	14.3	51.9	18.6	20	59.7	145.4	134.8	210.9	400.4	286.4
ELLIS, TX	30.3	118.4	35.6	74.6	5.6	0	0	0	0	0	58	48.9	0	16.9	16	0	31.3	17.6	36	0
FORT BEND, TX	123	28.1	33.9	236.4	252.7	0	29.6	0	1.8	0	0	11	47.3	67	195.2	343.1	8.3	7	24.2	174.8
GALVESTON, TX	15.6	34.6	20.4	165.5	31.7	0	16.6	0	0	0	7.1	56.6	6.3	0	69.1	0	0	5.8	28.8	42.9
GREGG	0	0	0	0	0	0	23	118.4	0	0	0	0	5.4	0	12	52.2	177.7	3.1	187.3	131.1
GUADALUPE, TX	0	24.2	13.3	3.6	40	0	0	0	0	0	120	3.4	0	19.8	43.3	5.8	26.4	3.9	38.1	0
HARDIN, TX	10.5	0	12.2	0	1.6	0	0	0	0	0	10.2	0	0	0	0	0	0	0	0	0
HARRIS, TX	1245.6	4122.5	2542.3	534.8	543.5	75	301.3	108.3	109	185.6	201.7	574.8	118.6	903	813.4	2378.6	661.8	1665.4	553	1578.1
HARRISON, TX	0	0	10	0	0	0	0	11.6	0	0	3.6	0	0	0	0	0	0	0	6	0
HAYS, TX	7.1	40.7	15.8	57.8	10	53.5	0	0	0	0	0	43	7.5	3.4	8	54.4	0	12.8	31.5	11.2
HENDERSON, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.5	48.1	7	0	0
HOOD, TX	8.2	0	3.8	0	48.3	0	0	0	0	0	0	35	27.5	0	0	0	17.7	36	0	0
HUNT, TX	0	0	21	62.2	58.5	0	80.3	0	0	0	119.3	8.6	0	0	0	4.7	0	0	25	0
JEFFERSON, TX	20.2	13.4	297	100	6.9	0	0	0	0	233.3	6.7	91.3	0	0	0	19.2	12	181.4	482.4	386.3
JOHNSON, TX	11.8	0	12	3	0.9	0	41.3	0	0	0	25.5	4	0	22.5	1.2	0	0	0	0	0
KAUFMAN, TX	3.5	57	0	56	24	0	0	0	0	0	10.3	12.5	0	114.2	0	0	17	0	39.3	0
LIBERTY, TX	5.9	0	3.3	0	0.9	0	0	0	0	0	26.8	10.5	11	17.5	0	0	0	0	0	30.3
MONTGOMERY, TX	155	83.2	334	122.4	142.4	0	0	0	0	0	124.4	186.5	22.9	13.1	68	20	295.2	674.8	30.3	38.3
NUECES, TX	28.5	0.9	27.3	58	313.9	0	50	0	18	9.5	10	12	26.6	28.8	0	34	25.1	5	0	670
ORANGE, TX	0	0	3	0	16	0	0	87	0	0	41.6	0	11.7	0	0	0	0	0	0	0
PARKER, TX	0	46.6	0	0	0	0	0	0	0	83.3	0.4	13.2	0	0	0	0	80	0	0	0
ROCKWALL, TX	0	1.1	0	0	0	0	0	0	0	0	42.2	10	22.7	0	10	0	0	0	0	0
RUSK, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SAN PATRICIO, TX	0	12	3.5	0	0	80.2	0	0	0	0	0	0.9	0	0	0	0	19	0	0	0
SMITH, TX	63.4	27.2	42.4	92.6	38.2	0	0	46.8	0	75	8.6	10.6	0	84.4	0	117.3	86.3	28.3	284.1	40.2
TARRANT, TX	866.5	619.1	1362.7	341.6	382.7	241.6	89.9	52.8	30	180.4	188.6	173.3	110.4	74.9	370.5	556.2	251.5	909.4	662.6	454.9
TRAVIS, TX	233.8	601	482.9	176.2	103.1	527.7	88.6	5.4	127.2	27.9	176.9	118.3	89.8	0	144.3	311.2	48.8	373.7	388	579.7
UPSHUR, TX	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VICTORIA, TX	7.2	46	12.3	0	0	0	0	0	0	0	0	0	0	0	0	82.5	4.5	4.7	0	2.4
WALLER, TX	0	23	0	0	106.7	0	0	0	0	0	12.5	1.1	0	0	0	0	0	0	0	0
WILLIAMSON, TX	97.3	61.3	19.2	99.9	137.6	0	36	0	0	0	11.1	9.4	129.6	347.8	92.8	106.3	68.7	10.5	41	105
WILSON, TX	0	0	0	0	0	0	0	0	0	0	2.5	0	0	0	0.5	0	0	0	0	0

Table 53: 1999 to 2003 New Commercial Building Construction (sq. ft. x 1000) (Source: Dodge/McGraw-Hill 2005). Table shows Dodge data before merging into PNNL building types (sq. ft. x 1000) (Part 2).

	Hotels and Motels					Manufacturing Plants, Warehouses, Labs					Miscellaneous Nonresidential Buildings					Office and Bank Buildings				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
BASTROP, TX	0	0	0	0	0	0	0	20.4	0	0	0	0	0	0	0	0	27.7	0	13.9	0
BEXAR, TX	332.7	500.7	389.5	389.6	603.4	247.2	316.3	162.5	25.8	85	75.8	340	42.9	41.3	52	2440.8	1755.7	1344.5	1609.9	753.1
BRAZORIA, TX	40.5	0	48.7	24.5	0	10.9	15.3	32.1	27.2	9.9	4	4.6	0	2.2	54.5	59.3	25.4	113.2	100.3	59.8
CALDWELL, TX	0	0	0	0	0	0	0	0	20	0	0	8.9	0	0	0	0	0	0	0	0
CHAMBERS, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	14.4	22.6	0	90	5
COLLIN, TX	457.5	77.1	238.5	112.5	322	353.3	408.4	219.9	2.6	145	55.9	35.3	50.1	66.2	99.5	1949.8	3083.7	1710.5	1062.9	566.3
COMAL, TX	21.7	0	43.7	39	0	0	0	21.7	0	0	0	6.9	0	0	0	20.3	50.9	126.5	51.4	4.9
DALLAS, TX	2056.4	514.1	722.2	2.7	47.7	921.2	608	460.3	623.4	695.1	508.8	2377.8	597.6	71.8	473.8	4910	5670.2	3440.5	1235.4	1340.8
DENTON, TX	333.7	50.9	91.7	47.1	0	34.7	13.3	7.7	36.9	6.4	49.7	42.5	0	56.7	28.8	618.1	616.7	343.5	472.7	838.8
EL PASO, TX	66.3	13	129.2	104.1	0	111.3	733.7	290.4	33.5	123.6	73.5	63.9	62.3	65.6	87.4	356.4	205.5	321.1	289.5	289.9
ELLIS, TX	18.3	33.2	0	0	40	967.2	29.9	27.5	29.9	55.4	0	22.9	0	23.6	0	77.3	21.8	19.4	9.8	33.6
FORT BEND, TX	0	0	0	190	6.5	15.1	261.5	488	9.7	38.5	0	50.4	1.6	0	45.1	368	182.7	389.4	264.8	193.5
GALVESTON, TX	32.6	0	105.9	243.3	225.7	27.1	0	6.9	6.2	5.4	8.9	0	1.5	96.2	1.9	54.3	31.2	31.1	209.8	66.7
GREGG	97.3	64.1	0	0	0	18.8	0	250.2	6.3	0	0	0	0	0	0	48.6	37.8	40.7	40.6	27.7
GUADALUPE, TX	34	16.4	0	0	0	17.7	0.7	2.3	0	17.5	4	30	2.7	0	0	61.5	69	38.4	181	43.3
HARDIN, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.5	0	0	0	0
HARRIS, TX	1212	1031.8	1749.9	486.1	501.6	958.7	639.9	763.1	459.2	323.5	541.1	648.2	1240.2	403.6	1010.3	4199.5	3862	5225.1	3058.8	2459.9
HARRISON, TX	37	0	0	5.6	0	0	0	0	0	0	0	0	0	0	0	23.2	3.4	12.1	0	0
HAYS, TX	0	0	48.7	0	0	0	3.3	0	0	0	35.5	6.6	9.3	0	0	28.9	4	13.4	28.8	7.8
HENDERSON, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21.9	6.8	0	2.4	5
HOOD, TX	0	0	0	0	0	0	0	0	0	0	0	3.6	0	0	0	0	0	0	4.7	10.3
HUNT, TX	0	0	0	0	0	0	0	70	13.5	0	0	0	2.8	0	29.7	0	0.4	0	0	0
JEFFERSON, TX	19.6	35.6	0	55.9	16.6	19	15.1	12.2	4.3	9.5	0	4.6	113.1	0	0	15.4	54.4	28.2	20.4	83.3
JOHNSON, TX	33.2	0	0	0	0	0	55	0	0	0	7	0	0	0	0	1	0	0	0	0
KAUFMAN, TX	0	0	0	0	0	250	15	0	0	0	0	0	0	0	0	4.6	4.7	7.3	4.5	11.3
LIBERTY, TX	0	0	0	0	0	0	0	5.3	0	0	0	0	0	0	14.7	1.4	0	21.6	0	0
MONTGOMERY, TX	166	41.4	331.6	54.3	153.9	0	25.2	21.4	18.5	38.9	3	24	8	9.8	30.7	1107.9	461.2	503.3	562.3	278.1
NUECES, TX	0	100	0	0	93.8	8.6	0	0	0	0	257.3	160.3	31.6	9.3	57	36	31.2	27.4	38.5	17
ORANGE, TX	0	0	0	0	0	0	62.9	0	0	2.3	0	0	0	0	0	0	8.8	0	0	12.5
PARKER, TX	0	0	0	57	22.9	0	0	2.4	0	0	16.7	8.1	0	0	0	22.5	16.2	5	15.1	0
ROCKWALL, TX	0	0	0	0	0	10.3	132.9	0	0	200	0	0	10.6	0	0	35	25.2	150.4	27.4	27.6
RUSK, TX	0	0	0	0	0	0	0	43	0	0	0	0	0	0	0	7.1	0	1.5	0	0
SAN PATRICIO, TX	36.1	0	0	0	0	0	0	0	85	0	5	0	0	0	8.4	15.8	0	10.4	0	0
SMITH, TX	139.8	0	0	78.7	0	4.8	17	10.9	2.8	3.2	18	1.4	54.5	0	0	64	77.2	47.4	94.4	31.9
TARRANT, TX	1000.6	465.2	1211	380.9	344.5	1565.3	1129.2	171.9	107.9	336.6	85.9	135.5	6.1	9.6	79.1	1576.1	1486.7	886.3	739.7	2773.9
TRAVIS, TX	427.1	533.7	1145.4	0	60.9	49.1	94.2	0	47.7	51.5	106.3	3.3	3.1	187.5	15	3098	3761.3	1679.6	888.5	652.6
UPSHUR, TX	0	0	0	0	0	0	0	0	0	0	0	0	40.2	0	0	0	0	0	0	0
VICTORIA, TX	0	0	0	0	0	17.3	5.1	1.8	0	0	10	0	0	0	6	14	80.3	16.7	32.7	14.2
WALLER, TX	0	0	0	0	0	0	0	0	0	914.2	0	0	12	0	0	2.4	0	0	3.5	0
WILLIAMSON, TX	161.5	51.5	106.9	80.4	14	0	0	105.1	0	0	95.4	51.5	0	0	24	298.6	489.6	581.2	139.6	65.7
WILSON, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 54: 1999 to 2003 New Commercial Building Construction (sq. ft. x 1000) (Source: Dodge/McGraw-Hill 2005). Table shows Dodge data before merging into PNNL building types (sq. ft. x 1000) (Part 3).

	Religious Buildings					Schools, Libraries, and Labs					Stores and Restaurants					Warehouses (excl. manufacturer owned)				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
BASTROP, TX	0	0	0	18.8	0	68	0	0	309.7	271.5	0	16.5	55.3	233	16.9	0	0	0	0	0
BEXAR, TX	257.2	204.1	331.3	346.4	236.6	3413.3	3059.9	3064.1	1629.9	3229.8	2219.8	2955.6	2683.4	1713.8	2717.4	1001.6	947.3	1202.1	251.3	1007.3
BRAZORIA, TX	17.5	95.3	64.9	18.3	106.5	114.1	599.2	434.8	385	461.9	187.3	449.5	946.7	803.2	260.4	1.6	132	128.8	97.7	128.5
CALDWELL, TX	13.4	0	0	0	0	156.7	5.2	0	0	46	53	0	0	0	1.9	0	0	0	0	0
CHAMBERS, TX	0	12	0	0	0	269.4	0	13	0	0	0	7.6	0	0	3	0	0	0	0	0
COLLIN, TX	280.4	641.1	308.7	566.9	290.6	1089.1	808.2	2462.5	1797.6	1003.4	7923.9	4810.2	1395.4	1998.2	1469.7	905.9	790.4	1086	365.4	474.2
COMAL, TX	47.5	6.6	29.7	3.9	0	42.3	308.3	264.5	410.7	30.8	84.2	86.1	20	320.6	35.8	107	0	0	6	57.2
DALLAS, TX	759.8	611.5	1188.5	895.9	558.1	2562.2	2360.3	2101.4	2985	2362.8	3621.5	4066.1	2521.6	2528.5	2774.8	4504.1	7988.1	7432	3953.3	3241.1
DENTON, TX	222.4	160	160	176.5	150.5	758.5	1270.3	1718.4	408.8	1729.3	659.2	539.6	832.8	1624.1	692.5	1461.4	1588.4	497.3	1335	2184
EL PASO, TX	62.4	113.4	39.5	121.9	127.6	782.9	517.3	551	992.1	816	815.2	1014.7	680.9	860.1	477.3	745.8	1178.2	1065.5	868.6	630.7
ELLIS, TX	51.7	97.3	136.2	70.4	33.4	332.7	255.4	340.6	14.5	60	50.3	59.8	333.1	73.1	15.6	55.8	677.3	925.1	1692	420.8
FORT BEND, TX	95	137.2	158.7	163.3	45.8	1760.4	906.3	350.3	168.7	96	211	1507.9	571.9	454.5	786.5	404.6	303	127	139.7	323.1
GALVESTON, TX	23.8	31.9	10	71.3	104.4	47.3	1093.7	43.8	277.3	336.5	276.8	753.5	473.1	611.7	304.4	9	32.8	59.1	133.3	19.2
GREGG	25.1	81.6	20.4	105.9	14.2	71.5	10.3	2.4	15.8	0	133.1	92.7	41.4	225.2	247.5	34	0	8.1	31.3	44
GUADALUPE, TX	1.6	0	47.2	21.8	1.8	124.1	12	197.5	94.5	469.2	62.5	57.4	24.1	18.5	112.9	132	371.1	0	18.1	12.5
HARDIN, TX	0	15.1	0	0	19.3	312.6	4.3	0	113.3	0	5.4	8.1	0	0	171.1	0	0	0	0	0
HARRIS, TX	1400.4	1389.4	1181.3	1560.9	908	3962.4	4310.7	5026.2	4721.7	4316.3	3667.5	6313.9	7950.2	5936.7	4248	4302.1	5229.3	8481.5	4075.2	5247.6
HARRISON, TX	0	0	30.7	0	23.5	0	46.6	0	17	0	7	5.7	0	0	153.4	0	15.6	0	0	19
HAYS, TX	47	22.3	17.8	0	84	3	208	172	356.7	140	95	150.3	23.5	27.9	51.6	1.8	270	1.7	0	40
HENDERSON, TX	13.5	23	10	15	0	127.9	118	0	19.5	0	21.6	30.6	16.4	0	159.8	0	0	70	0	0
HOOD, TX	0	30.5	26.8	0	0	396	0	27	0	0	2.6	7.7	193.7	0	20.5	0	0	0	0	0
HUNT, TX	0	0	13.6	0	0	27.2	78.7	236	33.2	148	12.6	150.7	145.5	12	0	0	0	0	0	50
JEFFERSON, TX	105.6	44.5	22.7	19.6	42.5	228.5	220.7	48.9	2.2	121.1	104.3	201.9	585.7	357.5	585.9	5.3	22.6	97	27.3	33.5
JOHNSON, TX	31.4	19.4	21.2	0	0	328.1	188.9	226.5	79.9	93	180.5	114	46.5	51.9	136.1	0	17.4	840	0	0
KAUFMAN, TX	0	33	7.6	37.3	17.9	50	204.1	185.5	538.6	350.6	0	7.2	0	142.7	0	350	0	0	0	590
LIBERTY, TX	15.7	0	11.2	0	0	29.7	2.7	177	113	161.1	164.6	0	8.3	0	8	0	0	15.7	0	0
MONTGOMERY, TX	166.6	282.6	160.5	54.8	105.4	507.8	717.5	355.7	330.4	1442.8	1021.3	544.4	810	877.9	1490.6	0	135.6	1011	213.6	193.6
NUECES, TX	0	14.6	7.5	16.7	0	235.5	236.1	263.1	112.8	59.2	25.8	269	47	79.3	443	206.1	117	25	53	600
ORANGE, TX	0	0	0	0	1.2	0	243	0	0	257.4	0	22.9	0	5.4	1.4	0	8.5	0	0	0
PARKER, TX	7.3	0	13	18.5	17	571.9	146.3	545	109.9	96.7	146.9	86	24.7	0	6.5	11.6	0	31.6	0	0
ROCKWALL, TX	107.6	3.8	61.5	76.5	0	70.7	0	416.3	5.5	425.2	231.7	86.8	44.9	44.9	4.2	0	12.7	42	24	0
RUSK, TX	0	7.7	1.5	0	0	0	14.7	22.1	40.5	0	10	7	0	0	0	0	0	0	5.9	0
SAN PATRICIO, TX	0	19.6	10.6	0	9.6	1.9	63.7	322.5	148.7	3.9	179.4	174.1	0	0	0	0	0	5.2	0	0
SMITH, TX	141.6	8.3	52.4	26.1	61.2	221.2	82.6	290.9	207.5	113.2	137.4	254.8	82.7	3.3	312.5	0	0	0	0	0
TARRANT, TX	625.3	560.8	405.6	685.8	571	2261.8	3890.1	1233.9	2718.5	1964.4	4137	3644.6	2539.1	2195.8	2254.8	3195.2	3729.6	4410.7	2512	1491.8
TRAVIS, TX	530	231.2	359.2	168	126.3	1446.3	602.9	795	646.9	244.2	669.4	410.3	1660.5	1725	2017.4	667.2	633.3	1064.8	215.4	253.7
UPSHUR, TX	0	0	0	38.4	0	0	0	8	0	0	6.4	0	5.3	0	0	0	0	0	0	0
VICTORIA, TX	22.7	16.8	19.8	42.9	4.3	96.1	62.3	42.6	0	17.3	57.5	44.8	88.2	15.4	167.1	0	0	0	15	0
WALLER, TX	0	0	0	4	0	201.1	0	353.8	24	51.5	2.6	0	0	5.1	0	0	0	0	0	0
WILLIAMSON, TX	69.1	22.1	148.2	231.9	53.2	456.6	803.9	693.1	107.2	758.4	291.3	723.4	611	635.4	817.7	349.7	34.5	56.6	245.9	29.8
WILSON, TX	0	7.6	0	0	0	67	18.5	0	179	26	0	0	0	0	0	0	0	0	0	0

Table 55: 1999 to 2003 New Commercial Building Construction (sq. ft. x 1000) (Source: Dodge/McGraw-Hill 2005). Table shows Dodge data merged into PNNL building types (sq. ft. x 1000).

	Assembly					Education					Retail					Food					Lodging					Office					Warehouse				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
BASTROP, TX	20	3	5	64	0	68	0	0	310	272	0	13	44	194	13	0	3	12	49	4	0	31	8	0	0	0	37	2	14	45	0	0	0	20	0	0
BEXAR, TX	848	1127	1424	569	394	3413	3060	3064	1630	3230	1752	2333	2118	1353	2145	467	622	565	361	572	881	997	962	678	1533	2575	2261	1402	1691	840	1249	1264	1365	277	1092
BRAZORIA, TX	41	113	86	97	149	114	599	435	385	462	148	356	747	634	206	39	95	199	169	55	51	97	59	13	2	73	30	117	103	144	13	147	161	125	138
CALDWELL, TX	13	1	0	0	0	157	5	0	0	46	42	0	0	0	1	11	0	0	0	0	0	0	0	40	0	0	9	0	0	0	0	0	0	20	0
CHAMBERS, TX	5	12	0	14	4	269	0	13	0	0	0	6	0	0	2	0	2	0	0	1	1	0	0	0	0	14	23	0	90	15	0	0	0	0	0
COLLIN, TX	926	946	468	1250	509	1089	808	2463	1798	1003	6255	3797	1102	1577	1160	1669	1013	294	421	309	824	452	331	185	1752	2050	3119	1969	1166	741	1259	1199	1306	368	619
COMAL, TX	50	9	62	9	5	42	308	265	411	31	66	68	16	253	28	18	18	4	68	8	55	15	71	15	43	20	59	127	51	16	107	0	22	6	57
DALLAS, TX	2357	2070	1611	1353	1398	2562	2369	2101	2985	2363	2859	3210	1991	1990	2191	763	856	531	532	584	2564	1449	1310	1032	605	5510	8154	4804	1390	2343	5425	8598	7892	4577	3936
DENTON, TX	301	257	264	519	318	759	1270	1718	409	1729	520	426	657	1282	547	139	114	175	342	146	446	120	395	374	809	690	807	347	657	878	1496	1602	505	1372	2190
EL PASO, TX	190	513	227	225	353	783	517	551	992	816	644	801	538	679	377	172	214	143	181	101	212	315	355	466	286	444	321	402	375	437	857	1912	1356	902	754
ELLIS, TX	82	216	172	145	39	333	255	341	19	60	40	47	263	58	12	11	13	70	15	3	18	65	18	60	40	135	94	19	50	50	1023	707	953	1722	476
FORT BEND, TX	218	165	193	400	299	1760	906	350	169	96	167	1190	451	359	621	44	318	120	96	166	343	38	7	26	181	368	244	438	332	434	420	565	615	149	362
GALVESTON, TX	39	67	30	237	136	47	1094	44	277	337	219	595	373	483	240	58	159	100	129	64	33	17	112	125	269	70	88	39	306	138	36	33	66	140	25
GREGG	25	82	20	106	14	72	10	2	16	0	105	73	33	178	195	28	20	9	47	52	150	265	122	187	131	49	38	46	41	40	53	0	258	38	44
GUADALUPE, TX	2	24	61	25	42	124	12	198	95	469	49	45	19	15	89	13	12	5	4	24	40	43	4	38	0	186	102	41	201	87	150	372	2	18	30
HARDIN, TX	11	15	12	0	21	313	4	0	113	0	4	6	0	0	135	1	2	0	0	38	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0
HARRIS, TX	2646	5512	3724	2096	1452	3962	4311	5026	4722	4316	2895	4984	6276	4687	3353	772	1330	1674	1250	895	3666	1995	3524	1066	2265	4942	5085	6584	4365	4284	5261	5869	9245	4534	5571
HARRISON, TX	0	0	41	0	24	0	47	0	17	0	6	4	0	0	121	1	1	0	0	32	37	0	12	6	0	27	3	12	0	0	0	16	0	0	19
HAYS, TX	54	63	34	58	94	3	209	172	357	140	75	119	19	22	41	20	32	5	6	11	108	0	62	32	11	64	54	30	32	16	2	273	2	0	40
HENDERSON, TX	14	23	10	15	0	128	118	0	20	0	17	24	13	0	126	5	6	3	0	34	6	48	7	0	0	22	7	0	2	5	0	0	70	0	0
HOOD, TX	8	31	31	0	48	396	0	27	0	0	2	6	153	0	16	1	2	41	0	4	0	18	36	0	0	0	39	28	5	10	0	0	0	0	0
HUNT, TX	0	0	35	62	59	27	79	236	33	148	10	119	115	9	0	3	32	31	3	0	5	80	0	25	0	119	9	3	0	30	0	0	70	14	50
JEFFERSON, TX	126	58	320	120	49	229	221	49	2	121	82	159	462	282	463	22	43	123	75	123	39	48	181	482	636	22	150	141	20	83	24	38	109	32	43
JOHNSON, TX	43	19	33	3	1	328	189	227	80	93	142	90	37	41	107	38	24	10	11	29	33	41	0	0	0	34	4	0	23	1	0	72	840	0	0
KAUFMAN, TX	4	90	8	93	42	50	204	186	539	351	0	6	0	113	0	0	2	0	30	0	0	17	0	39	0	15	17	7	119	11	600	15	0	0	590
LIBERTY, TX	22	0	15	0	1	30	3	177	113	161	130	0	1	0	6	35	0	2	0	2	0	0	0	0	30	28	11	33	18	15	0	0	21	0	0
MONTGOMERY, TX	322	368	495	177	248	508	719	356	330	1443	806	430	639	693	1177	215	115	171	185	314	188	337	1006	40	192	1235	672	534	585	377	0	181	1032	232	233
NUECES, TX	29	16	35	75	314	236	236	263	113	59	20	212	37	63	350	5	57	10	17	93	34	175	5	27	773	303	204	86	77	74	215	117	25	53	600
ORANGE, TX	0	0	3	0	17	0	243	0	0	257	0	18	0	4	1	0	5	0	1	0	0	0	87	0	0	42	9	12	0	13	0	71	0	0	2
PARKER, TX	7	47	13	19	17	572	149	545	110	97	116	68	19	0	5	31	18	5	0	1	0	80	0	0	106	40	39	5	15	0	12	0	34	0	0
ROCKWALL, TX	108	9	62	77	0	71	0	416	6	425	183	69	35	35	3	49	18	9	9	1	0	0	0	0	0	77	35	184	27	38	10	146	42	24	200
RUSK, TX	0	8	2	0	0	0	15	22	41	0	8	6	0	0	0	2	1	0	0	0	0	0	0	0	0	7	0	2	0	0	0	0	43	6	0
SAN PATRICIO, TX	0	32	14	0	10	2	64	323	149	4	142	137	0	0	0	38	37	0	0	0	116	19	0	0	0	21	1	10	0	8	0	0	5	85	0
SMITH, TX	205	36	95	119	99	221	83	291	208	113	108	201	65	3	247	29	54	17	1	66	257	86	75	284	115	91	89	102	179	32	5	17	11	3	3
TARRANT, TX	1492	1180	1768	1027	954	2262	3890	1234	2719	1964	3266	2877	2004	1733	1780	871	767	535	462	475	1798	807	2173	702	980	1851	1796	1003	824	3224	4761	4898	4583	2620	1828
TRAVIS, TX	764	832	842	344	229	1446	603	795	647	244	528	324	1311	1362	1593	141	86	350	363	425	1266	671	1525	703	669	3381	3883	1773	1076	812	716	728	1065	263	305
UPSHUR, TX	0	0	0	38	30	0	0	8	0	0	5	0	4	0	0	1	0	1	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0
VICTORIA, TX	30	63	32	43	4	96	62	43	0	17	45	36	70	12	132	12	8	19	3	35	83	5	5	0	2	24	80	17	33	20	17	5	2	15	0
WALLER, TX	0	23	0	4	107	201	0	354	24	52	2	0	0	4	0	1	0	0	1	0	0	0	0	0	0	15	1	12	4	0	0	0	0	0	914
WILLIAMSON, TX	166	83	167	332	191	457	804	693	107	758	230	571	482	502	646	61	152	129	134	172	268	156	117	41	119	405	551	711	487	183	350	35	162	246	30
WILSON, TX	9	8	0	0	0	67	19	0	179	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	1	0	0	0	0	0

Table 56: 2003 New Commercial Building Construction (sq. ft. x 1000) Used to Project 2005 Construction (Source: Dodge/McGraw-Hill 2005).

	Assembly	Education	Retail	Food	Lodging	Office	Warehouse	Stores and Restaurants
BASTROP, TX	0	272	13	4	0	45	0	17
BEXAR, TX	394	3230	2145	572	1533	840	1092	2717
BRAZORIA, TX	149	462	206	55	2	144	138	260
CALDWELL, TX	0	46	1	0	0	0	0	2
CHAMBERS, TX	4	0	2	1	0	15	0	3
COLLIN, TX	509	1003	1160	309	1752	741	619	1470
COMAL, TX	5	31	28	8	43	16	57	36
DALLAS, TX	1398	2363	2191	584	605	2343	3936	2775
DENTON, TX	318	1729	547	146	809	878	2190	693
EL PASO, TX	353	816	377	101	286	437	754	477
ELLIS, TX	39	60	12	3	40	50	476	16
FORT BEND, TX	299	96	621	166	181	434	362	787
GALVESTON, TX	136	337	240	64	269	138	25	304
GREGG, TX	14	0	195	52	131	40	44	248
GUADALUPE, TX	42	469	89	24	0	87	30	113
HARDIN, TX	21	0	135	36	0	0	0	171
HARRIS, TX	1452	4316	3353	895	2265	4284	5571	4248
HARRISON, TX	24	0	121	32	0	0	19	153
HAYS, TX	94	140	41	11	11	16	40	52
HENDERSON, TX	0	0	126	34	0	5	0	160
HOOD, TX	48	0	16	4	0	10	0	21
HUNT, TX	59	148	0	0	0	30	50	0
JEFFERSON, TX	49	121	463	123	636	83	43	586
JOHNSON, TX	1	93	107	29	0	1	0	136
KAUFMAN, TX	42	351	0	0	0	11	590	0
LIBERTY, TX	1	161	6	2	30	15	0	8
MONTGOMERY, TX	248	1443	1177	314	192	377	233	1491
NUECES, TX	314	59	350	93	773	74	600	443
ORANGE, TX	17	257	1	0	0	13	2	1
PARKER, TX	17	97	5	1	106	0	0	7
ROCKWALL, TX	0	425	3	1	0	38	200	4
RUSK, TX	0	0	0	0	0	0	0	0
SAN PATRICIO, TX	10	4	0	0	0	8	0	0
SMITH, TX	99	113	247	66	115	32	3	313
TARRANT, TX	954	1964	1780	475	980	3224	1828	2255
TRAVIS, TX	229	244	1593	425	669	812	305	2017
UPSHUR, TX	30	0	0	0	0	0	0	0
VICTORIA, TX	4	17	132	35	2	20	0	167
WALLER, TX	107	52	0	0	0	0	914	0
WILLIAMSON, TX	191	758	646	172	119	183	30	818
WILSON, TX	0	26	0	0	0	1	0	0

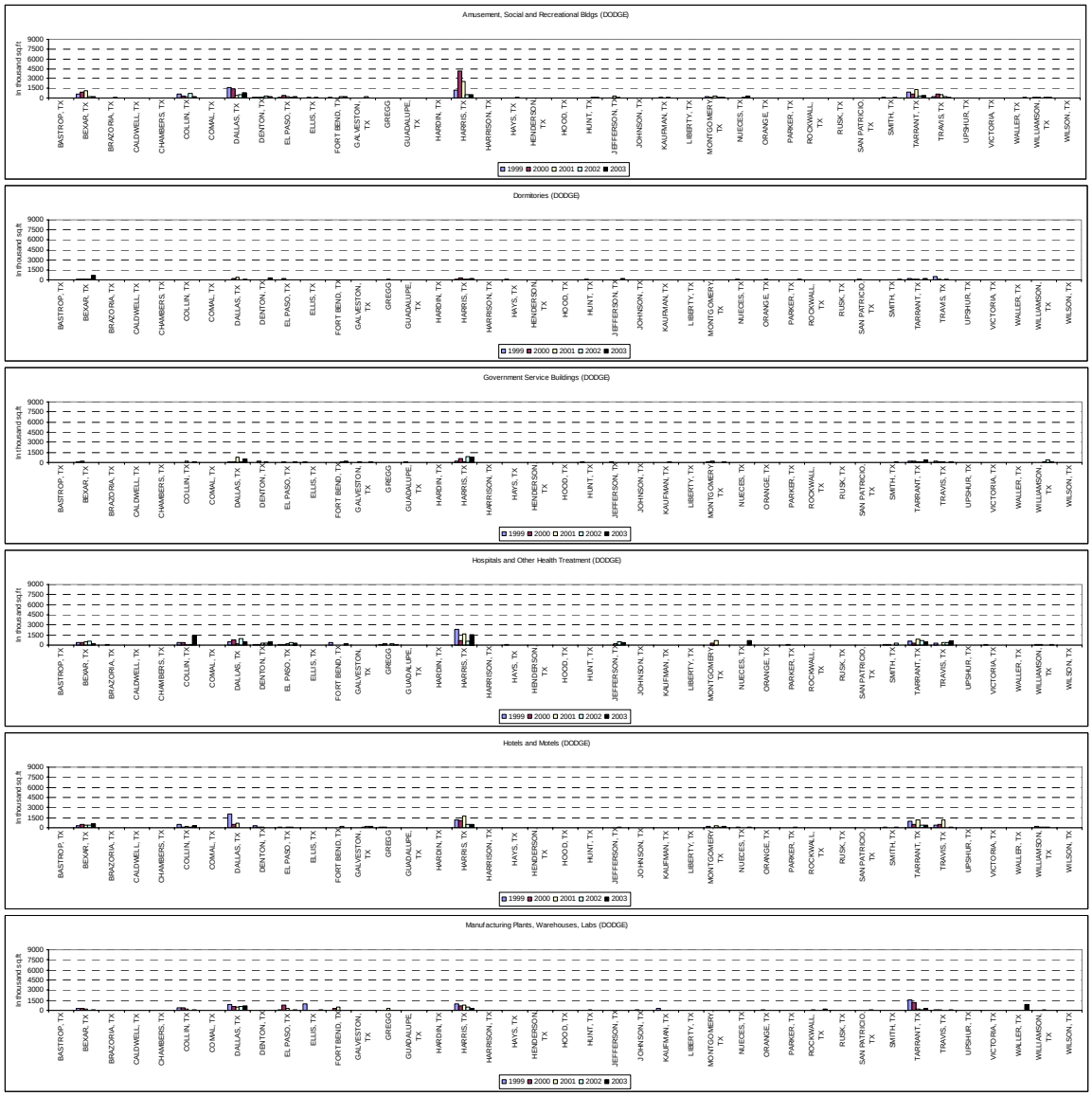


Figure 54: 1999 to 2003 New Commercial Building Construction (sq. ft. x 1000), Part 1 (Dodge 2005).

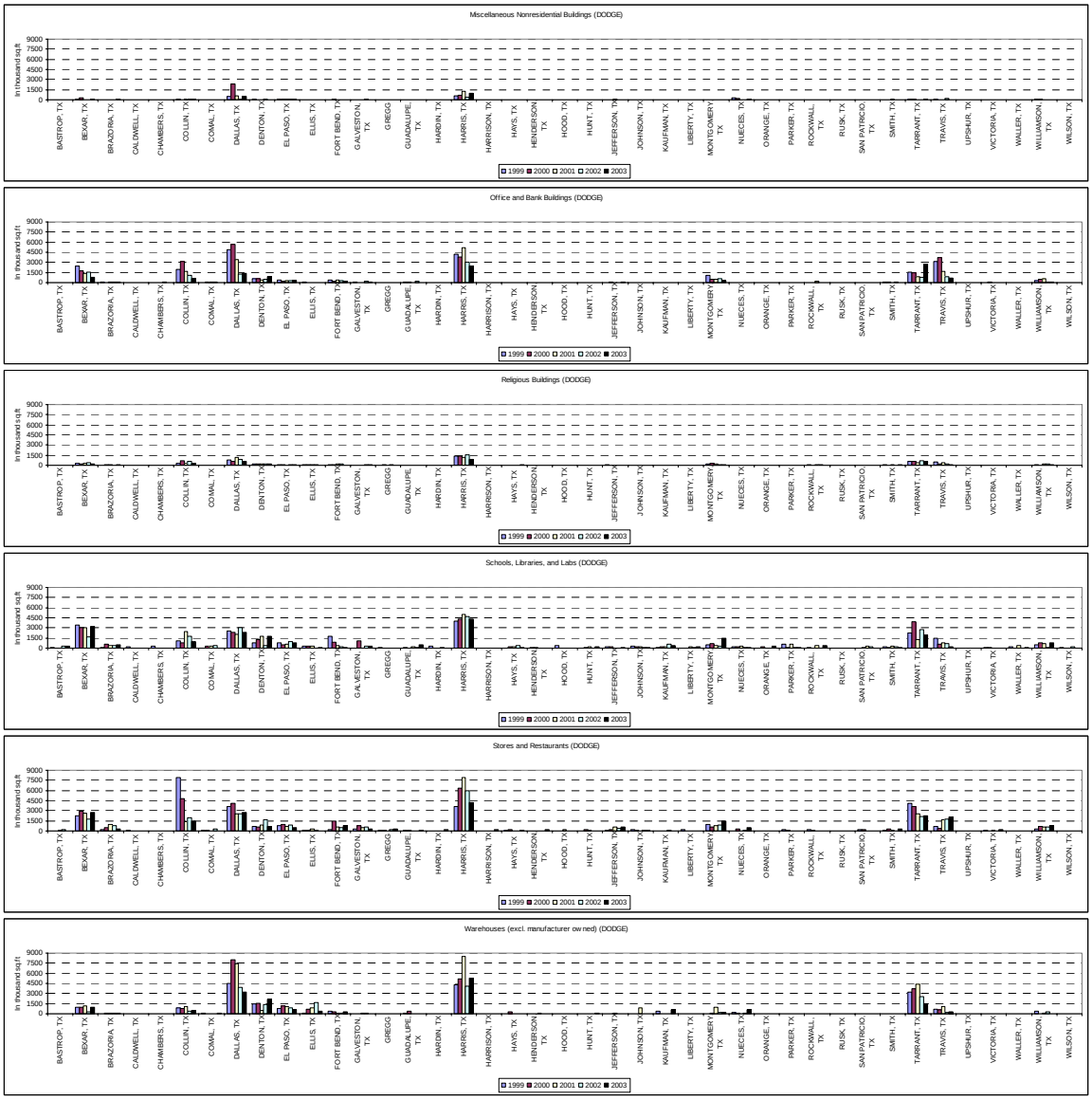


Figure 55: 1999 to 2003 New Commercial Building Construction (sq. ft. x 1000), Part 2 (Dodge 2005).

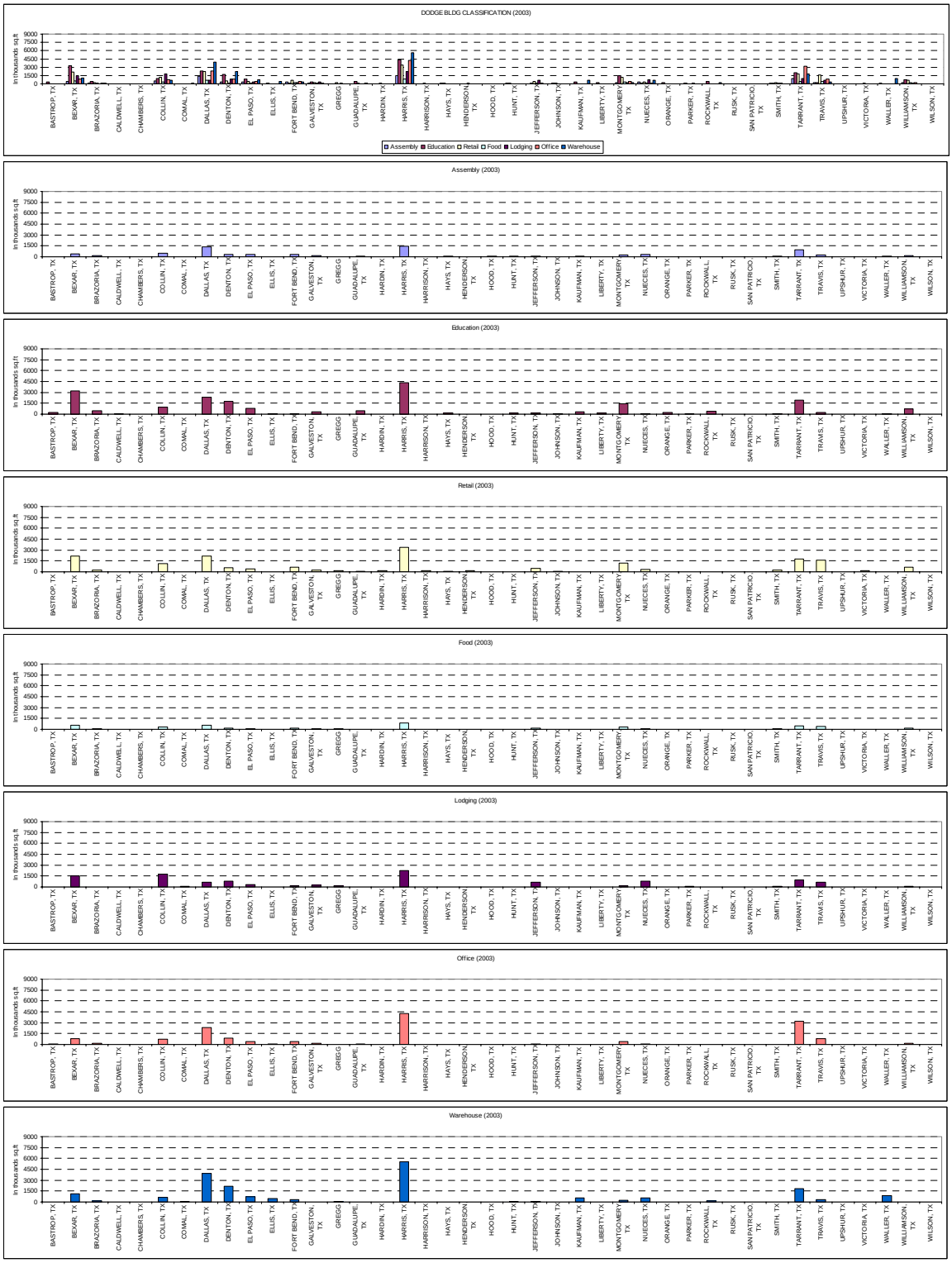


Figure 56: 2003 New Commercial Building Construction (sq. ft. x 1000) Used to Project 2005 Construction (Source: Dodge/McGraw-Hill 2005).

Table 57: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Assembly and Education Building Types (USDOE 2004).

2003	Assembly									Education								
	In thousand sq.ft (DODGE)	Electricity (kWh), PNNL				Gas (mBtu), PNNL				In thousand sq.ft (DODGE)	Electricity (kWh), PNNL				Gas (mBtu), PNNL			
		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
BASTROP, TX	0	0	0	0	0	0	0	0	0	272	2810494	9006	2490421	7547	5120	8	5444	8
BEXAR, TX	394	7036338	22547	6368715	19300	12669	19	13339	20	3230	33434005	107136	29626374	89779	60914	89	64757	95
BRAZORIA, TX	149	2662978	8533	2410309	7304	4795	7	5048	7	462	4781462	15322	4236926	12839	8711	13	9261	14
CALDWELL, TX	0	0	0	0	0	0	0	0	0	46	476179	1526	421950	1279	868	1	922	1
CHAMBERS, TX	4	71489	229	64706	196	129	0	136	0	0	0	0	0	0	0	0	0	0
COLLIN, TX	509	9095231	29145	8232256	24947	16376	24	17242	25	1003	10386922	33284	9204007	27891	18924	28	20118	30
COMAL, TX	5	85787	275	77648	235	154	0	163	0	31	318833	1022	282523	856	581	1	618	1
DALLAS, TX	1398	24989099	80075	22618078	68541	44994	66	47371	69	2363	24459059	78377	21673539	65679	44562	65	47374	69
DENTON, TX	318	5683403	18212	5144149	15589	10233	15	10774	16	1729	17901240	57363	15862557	48069	32615	48	34672	51
EL PASO, TX	353	6303573	20199	5705476	17290	11350	17	11949	18	816	8447009	27068	7485021	22682	15390	23	16361	24
ELLIS, TX	39	697021	2234	630886	1912	1255	2	1321	2	60	621104	1990	550369	1668	1132	2	1203	2
FORT BEND, TX	299	5334892	17095	4828706	14633	9606	14	10113	15	96	993766	3184	880591	2669	1811	3	1925	3
GALVESTON, TX	136	2432425	7794	2201631	6672	4380	6	4611	7	337	3483356	11162	3086654	9354	6346	9	6747	10
GREGG	14	253787	813	229707	696	457	1	481	1	0	0	0	0	0	0	0	0	0
GUADALUPE, TX	42	747064	2394	676181	2049	1345	2	1416	2	469	4857030	15564	4303887	13042	8849	13	9407	14
HARDIN, TX	21	373532	1197	338090	1025	673	1	708	1	0	0	0	0	0	0	0	0	0
HARRIS, TX	1452	25941694	83128	23480289	71154	46709	68	49177	72	4316	44681156	143177	39592642	119980	81405	119	86542	127
HARRISON, TX	24	420000	1346	380149	1152	756	1	796	1	0	0	0	0	0	0	0	0	0
HAYS, TX	94	1679999	5383	1520597	4608	3025	4	3185	5	140	1449242	4644	1284195	3892	2640	4	2807	4
HENDERSON, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HOOD, TX	48	863234	2766	781328	2368	1554	2	1636	2	0	0	0	0	0	0	0	0	0
HUNT, TX	59	1045532	3350	946329	2868	1883	3	1982	3	148	1532055	4909	1357577	4114	2791	4	2967	4
JEFFERSON, TX	49	882893	2829	799122	2422	1590	2	1674	2	121	1253594	4017	1110828	3366	2284	3	2428	4
JOHNSON, TX	1	16085	52	14559	44	29	0	30	0	93	962711	3085	853072	2585	1754	3	1865	3
KAUFMAN, TX	42	748851	2400	677798	2054	1348	2	1420	2	351	3629315	11630	3215991	9746	6612	10	7030	10
LIBERTY, TX	1	16085	52	14559	44	29	0	30	0	161	1667663	5344	1477741	4478	3038	4	3230	5
MONTGOMERY, TX	248	4428765	14192	4008554	12147	7974	12	8395	12	1443	14935470	47859	13234545	40105	27211	40	28928	42
NUECES, TX	314	5610126	17977	5077825	15388	10101	15	10635	16	59	612822	1964	543031	1646	1117	2	1187	2
ORANGE, TX	17	307404	985	278237	843	553	1	583	1	257	2664534	8538	2361084	7155	4855	7	5161	8
PARKER, TX	17	303830	974	275002	833	547	1	576	1	97	1001012	3208	887012	2688	1824	3	1939	3
ROCKWALL, TX	0	0	0	0	0	0	0	0	0	425	4401554	14104	3900283	11819	8019	12	8525	13
RUSK, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SAN PATRICIO, TX	10	171574	550	155295	471	309	0	325	0	4	40372	129	35774	108	74	0	78	0
SMITH, TX	99	1776510	5693	1607951	4873	3199	5	3368	5	113	1171815	3755	1038363	3147	2135	3	2270	3
TARRANT, TX	954	17044846	54619	15427593	46751	30690	45	32311	47	1964	20334931	65161	18019087	54604	37049	54	39386	58
TRAVIS, TX	229	4099914	13138	3710905	11245	7382	11	7772	11	244	2527892	8100	2240003	6788	4606	7	4896	7
UPSHUR, TX	30	536170	1718	485297	1471	965	1	1016	1	0	0	0	0	0	0	0	0	0
VICTORIA, TX	4	76851	246	69559	211	138	0	146	0	17	179085	574	158690	481	326	0	347	1
WALLER, TX	107	1906978	6111	1726040	5231	3434	5	3615	5	52	533114	1708	472400	1432	971	1	1033	2
WILLIAMSON, TX	191	3410042	10927	3086489	9353	6140	9	6464	9	758	7850749	25157	6956667	21081	14303	21	15206	22
WILSON, TX	0	0	0	0	0	0	0	0	0	26	269145	862	238493	723	490	1	521	1
Total	7669	137054001	439177	124050015	375916	246772	362	259809	381	21704	224668688	719930	199082296	603291	409328	600	435155	638

Table 58: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Retail and Food Building Types (USDOE 2004).

2003	Retail									Food								
	In thousand sq.ft (DODGE)	Electricity (kWh), PNNL				Gas (mBtu), PNNL				In thousand sq.ft (DODGE)	Electricity (kWh), PNNL				Gas (mBtu), PNNL			
		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
BASTROP, TX	13	221357	709	186491	565	53	0	69	0	4	104987	336	106206	322	126	0	124	0
BEXAR, TX	2145	35592586	114053	29986473	90870	8474	12	11091	16	572	16881121	54094	17077181	51750	20325	30	19976	29
BRAZORIA, TX	206	3410727	10929	2873511	8708	812	1	1063	2	55	1617665	5184	1636453	4959	1948	3	1914	3
CALDWELL, TX	1	24886	80	20966	64	6	0	8	0	0	11803	38	11940	36	14	0	14	0
CHAMBERS, TX	2	39294	126	33105	100	9	0	12	0	1	18637	60	18853	57	22	0	22	0
COLLIN, TX	1160	19250174	61685	16218120	49147	4583	7	5998	9	309	9130118	29257	9236157	27989	10993	16	10804	16
COMAL, TX	28	468909	1503	395053	1197	112	0	146	0	8	222398	713	224981	682	268	0	263	0
DALLAS, TX	2191	36344413	116462	30619881	92789	8652	13	11325	17	584	17237703	55237	17437904	52843	20754	30	20398	30
DENTON, TX	547	9070386	29065	7641728	23157	2159	3	2826	4	146	4301971	13785	4351935	13188	5180	8	5091	7
EL PASO, TX	377	6251690	20033	5266999	15961	1488	2	1948	3	101	2965099	9501	2999536	9090	3570	5	3509	5
ELLIS, TX	12	204329	655	172146	522	49	0	64	0	3	96911	311	98036	297	117	0	115	0
FORT BEND, TX	621	10301600	33011	8679017	26301	2452	4	3210	5	166	4885921	15656	4942667	14978	5883	9	5782	8
GALVESTON, TX	240	3987040	12776	3359050	10179	949	1	1242	2	64	1891004	6060	1912966	5797	2277	3	2238	3
GREGG	195	3241762	10388	2731159	8276	772	1	1010	1	52	1537528	4927	1555385	4713	1851	3	1819	3
GUADALUPE, TX	89	1478768	4739	1245850	3775	352	1	461	1	24	701361	2247	709507	2150	844	1	830	1
HARDIN, TX	135	2241073	7181	1888086	5722	534	1	698	1	36	1062913	3406	1075258	3258	1280	2	1258	2
HARRIS, TX	3353	55640430	178295	46876624	142053	13246	19	17338	25	895	26389564	84563	26696057	80899	31773	47	31227	46
HARRISON, TX	121	2009238	6438	1692767	5130	478	1	626	1	32	952956	3054	964024	2921	1147	2	1128	2
HAYS, TX	41	675858	2166	569405	1726	161	0	211	0	11	320551	1027	324274	983	386	1	379	1
HENDERSON, TX	126	2093065	6707	1763391	5344	498	1	652	1	34	992715	3181	1004244	3043	1195	2	1175	2
HOOD, TX	16	268510	860	226217	686	64	0	84	0	4	127351	408	128830	390	153	0	151	0
HUNT, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JEFFERSON, TX	463	7674136	24591	6465399	19593	1827	3	2391	4	123	3639747	11663	3682020	11158	4382	6	4307	6
JOHNSON, TX	107	1782642	5712	1501862	4551	424	1	555	1	29	845485	2709	855304	2592	1018	1	1000	1
KAUFMAN, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LIBERTY, TX	6	104784	336	88280	268	25	0	33	0	2	49698	159	50275	152	60	0	59	0
MONTGOMERY, TX	1177	19523923	62563	16448751	49846	4648	7	6084	9	314	9259954	29673	9367500	28387	11149	16	10958	16
NUECES, TX	350	5802427	18593	4888499	14814	1381	2	1808	3	93	2752019	8819	2783981	8436	3313	5	3257	5
ORANGE, TX	1	18337	59	15449	47	4	0	6	0	0	8697	28	8798	27	10	0	10	0
PARKER, TX	5	85137	273	71727	217	20	0	27	0	1	40380	129	40848	124	49	0	48	0
ROCKWALL, TX	3	55012	176	46347	140	13	0	17	0	1	26091	84	26394	80	31	0	31	0
RUSK, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SAN PATRICIO, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SMITH, TX	247	4093134	13116	3448433	10450	974	1	1275	2	66	1941323	6221	1963870	5951	2337	3	2297	3
TARRANT, TX	1780	29533437	94637	24881688	75401	7031	10	9203	13	475	14007342	44885	14170025	42940	16865	25	16575	24
TRAVIS, TX	1593	26423965	84673	22261982	67462	6291	9	8234	12	425	12532558	40159	12678113	38419	15089	22	14830	22
UPSHUR, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VICTORIA, TX	132	2188681	7013	1843946	5588	521	1	682	1	35	1038064	3326	1050120	3182	1250	2	1228	2
WALLER, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WILLIAMSON, TX	646	10710259	34320	9023309	27344	2550	4	3337	5	172	5079742	16278	5138740	15572	6116	9	6011	9
WILSON, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	18130	300811968	963925	253431714	767990	71614	105	93733	137	4836	142671374	457177	144328384	437367	171776	252	168826	248

Table 59: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Loding and Office Building Types (USDOE 2004).

2003	Lodging									Office								
	In thousand sq.ft (DODGE)	Electricity (kWh), PNNL				Gas (mBtu), PNNL				In thousand sq.ft (DODGE)	Electricity (kWh), PNNL				Gas (mBtu), PNNL			
		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
BASTROP, TX	0	0	0	0	0	0	0	0	0	45	651375	2087	582252	1764	252	0	284	0
BEXAR, TX	1533	19049453	61042	18266111	55353	26993	40	24433	36	840	12156100	38953	10866115	32928	4711	7	5308	8
BRAZORIA, TX	2	24856	80	23834	72	35	0	32	0	144	2077162	6656	1856737	5627	805	1	907	1
CALDWELL, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHAMBERS, TX	0	0	0	0	0	0	0	0	0	15	217125	696	194084	588	84	0	95	0
COLLIN, TX	1752	21769915	69760	20874704	63258	30847	45	27922	41	741	10727418	34375	9589042	29058	4158	6	4684	7
COMAL, TX	43	528185	1693	506465	1535	748	1	677	1	16	228705	733	204435	620	89	0	100	0
DALLAS, TX	605	7515138	24082	7206105	21837	10649	16	9639	14	2343	33912017	108668	30313329	91860	13143	19	14806	22
DENTON, TX	809	10056640	32226	9643095	29222	14250	21	12899	19	878	12701808	40702	11353913	34406	4923	7	5546	8
EL PASO, TX	286	3559344	11406	3412979	10343	5044	7	4565	7	437	6325573	20270	5654313	17135	2452	4	2762	4
ELLIS, TX	40	497115	1593	476673	1444	704	1	638	1	50	717960	2301	641771	1945	278	0	313	0
FORT BEND, TX	181	2253174	7220	2160521	6547	3193	5	2890	4	434	6279253	20121	5612909	17009	2434	4	2742	4
GALVESTON, TX	269	3338128	10697	3200859	9700	4730	7	4281	6	138	1993207	6387	1781691	5399	772	1	870	1
GREGG	131	1629295	5221	1562296	4734	2309	3	2090	3	40	574657	1841	513676	1557	223	0	251	0
GUADALUPE, TX	0	0	0	0	0	0	0	0	0	87	1253535	4017	1120511	3396	486	1	547	1
HARDIN, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HARRIS, TX	2265	28152874	90213	26995186	81805	39892	58	36109	53	4284	62005086	198690	55425208	167958	24031	35	27072	40
HARRISON, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HAYS, TX	11	139192	446	133468	404	197	0	179	0	16	228705	733	204435	620	89	0	100	0
HENDERSON, TX	0	0	0	0	0	0	0	0	0	5	72375	232	64695	196	28	0	32	0
HOOD, TX	0	0	0	0	0	0	0	0	0	10	149092	478	133271	404	58	0	65	0
HUNT, TX	0	0	0	0	0	0	0	0	0	30	429907	1378	384286	1165	167	0	188	0
JEFFERSON, TX	636	7906616	25336	7581485	22975	11203	16	10141	15	83	1205767	3864	1077813	3266	467	1	526	1
JOHNSON, TX	0	0	0	0	0	0	0	0	0	1	17370	56	15527	47	7	0	8	0
KAUFMAN, TX	0	0	0	0	0	0	0	0	0	11	163567	524	146210	443	63	0	71	0
LIBERTY, TX	30	376565	1207	361080	1094	534	1	483	1	15	212782	682	190202	576	82	0	93	0
MONTGOMERY, TX	192	2388638	7654	2290414	6941	3385	5	3064	4	377	5454178	17477	4875389	14774	2114	3	2381	3
NUECES, TX	773	9610479	30796	9215281	27926	13618	20	12326	18	74	1071150	3432	957481	2902	415	1	468	1
ORANGE, TX	0	0	0	0	0	0	0	0	0	13	180937	580	161737	490	70	0	79	0
PARKER, TX	106	1319841	4229	1265567	3835	1870	3	1693	2	0	0	0	0	0	0	0	0	0
ROCKWALL, TX	0	0	0	0	0	0	0	0	0	38	544260	1744	486504	1474	211	0	238	0
RUSK, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SAN PATRICIO, TX	0	0	0	0	0	0	0	0	0	8	121590	390	108687	329	47	0	53	0
SMITH, TX	115	1431692	4588	1372818	4160	2029	3	1836	3	32	461752	1480	412752	1251	179	0	202	0
TARRANT, TX	980	12176836	39020	11676106	35383	17254	25	15618	23	3224	46660144	149518	41708647	126392	18084	27	20373	30
TRAVIS, TX	669	8308037	26622	7966398	24141	11772	17	10656	16	812	11752248	37659	10505119	31834	4555	7	5131	8
UPSHUR, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VICTORIA, TX	2	29827	96	28600	87	42	0	38	0	20	292395	937	261366	792	113	0	128	0
WALLER, TX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WILLIAMSON, TX	119	1478918	4739	1418102	4297	2096	3	1897	3	183	2641686	8465	2361355	7156	1024	2	1153	2
WILSON, TX	0	0	0	0	0	0	0	0	0	1	7237	23	6469	20	3	0	3	0
Total	11550	143540757	459963	137638147	417093	203394	298	184105	270	15440	223488123	716147	199771931	605381	86616	127	97578	143

Table 60: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Warehouse Building Type (USDOE 2004).

2003	Warehouse								
	In thousand sq.ft (DODGE)	Electricity (kWh), PNNL				Gas (mBtu), PNNL			
		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
BASTROP, TX	0	0	0	0	0	0	0	0	0
BEXAR, TX	1092	3308106	10601	5680555	17214	8946	13	9951	15
BRAZORIA, TX	138	419154	1343	719755	2181	1133	2	1261	2
CALDWELL, TX	0	0	0	0	0	0	0	0	0
CHAMBERS, TX	0	0	0	0	0	0	0	0	0
COLLIN, TX	619	1875290	6009	3220177	9758	5071	7	5641	8
COMAL, TX	57	173234	555	297471	901	468	1	521	1
DALLAS, TX	3936	11921055	38200	20470384	62033	32237	47	35859	53
DENTON, TX	2190	6633779	21257	11391273	34520	17939	26	19955	29
EL PASO, TX	754	2284450	7320	3922771	11887	6178	9	6872	10
ELLIS, TX	476	1442205	4621	2476499	7505	3900	6	4338	6
FORT BEND, TX	362	1095131	3509	1880517	5699	2962	4	3294	5
GALVESTON, TX	25	74503	239	127933	388	201	0	224	0
GREGG	44	133257	427	228824	693	360	1	401	1
GUADALUPE, TX	30	90857	291	156016	473	246	0	273	0
HARDIN, TX	0	0	0	0	0	0	0	0	0
HARRIS, TX	5571	16872464	54066	28972754	87798	45627	67	50753	74
HARRISON, TX	19	57543	184	98810	299	156	0	173	0
HAYS, TX	40	121143	388	208022	630	328	0	364	1
HENDERSON, TX	0	0	0	0	0	0	0	0	0
HOOD, TX	0	0	0	0	0	0	0	0	0
HUNT, TX	50	151428	485	260027	788	410	1	456	1
JEFFERSON, TX	43	130228	417	223623	678	352	1	392	1
JOHNSON, TX	0	0	0	0	0	0	0	0	0
KAUFMAN, TX	590	1786856	5726	3068321	9298	4832	7	5375	8
LIBERTY, TX	0	0	0	0	0	0	0	0	0
MONTGOMERY, TX	233	704142	2256	1209127	3664	1904	3	2118	3
NUECES, TX	600	1817142	5823	3120327	9456	4914	7	5466	8
ORANGE, TX	2	6966	22	11961	36	19	0	21	0
PARKER, TX	0	0	0	0	0	0	0	0	0
ROCKWALL, TX	200	605714	1941	1040109	3152	1638	2	1822	3
RUSK, TX	0	0	0	0	0	0	0	0	0
SAN PATRICIO, TX	0	0	0	0	0	0	0	0	0
SMITH, TX	3	9691	31	16642	50	26	0	29	0
TARRANT, TX	1828	5537437	17744	9508676	28815	14975	22	16657	24
TRAVIS, TX	305	924319	2962	1587206	4810	2500	4	2780	4
UPSHUR, TX	0	0	0	0	0	0	0	0	0
VICTORIA, TX	0	0	0	0	0	0	0	0	0
WALLER, TX	914	2768718	8872	4754338	14407	7487	11	8328	12
WILLIAMSON, TX	30	90251	289	154976	470	244	0	271	0
WILSON, TX	0	0	0	0	0	0	0	0	0
Total	20153	61035065	195581	104807096	333484	165054	242	183595	269

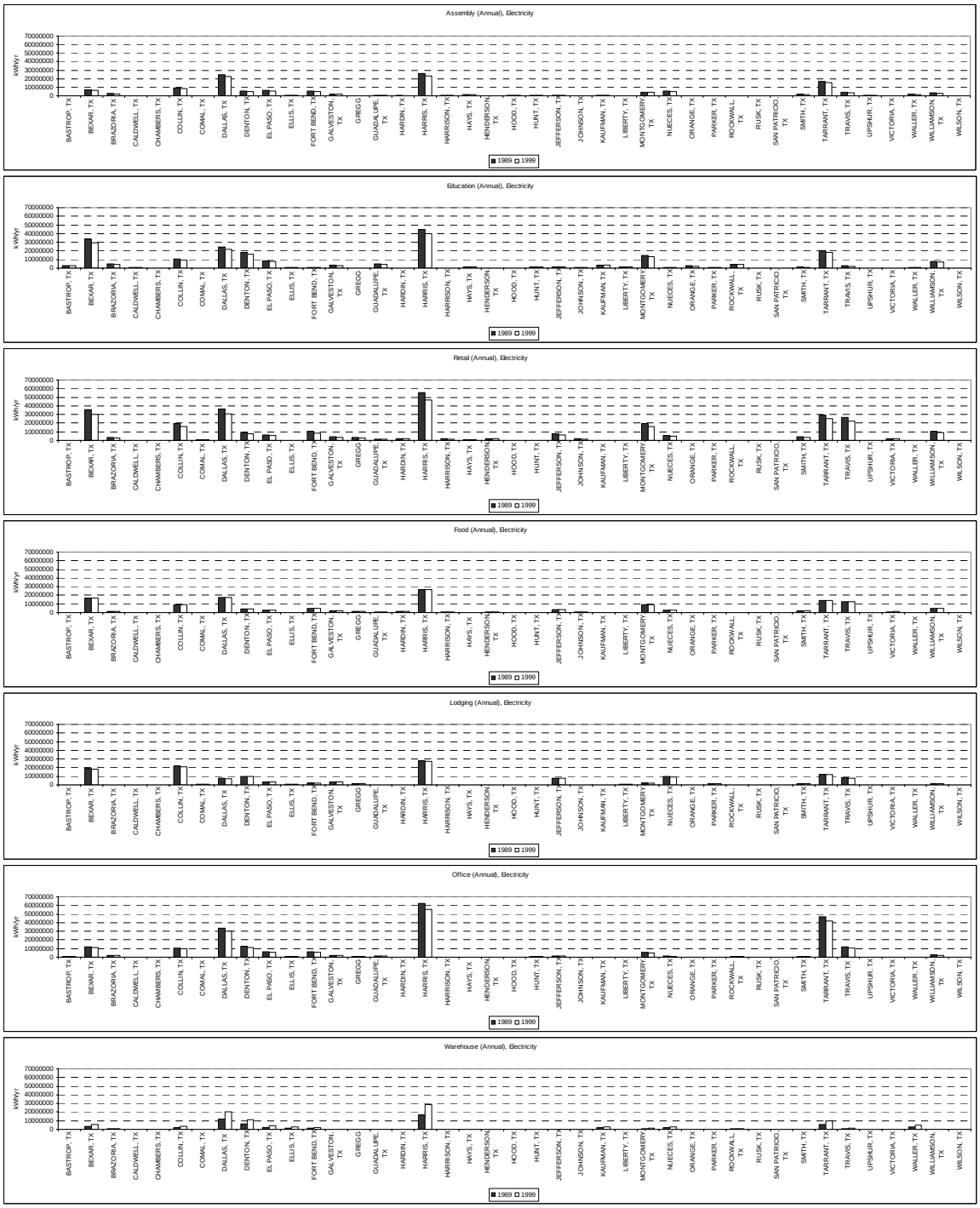


Figure 57: Calculated ASHRAE Standard 90.1-1989 and 1999 Annual Electricity Use for Assembly, Education, Retail, Food, Lodging, Office, and Warehouse Building Types (USDOE 2004).

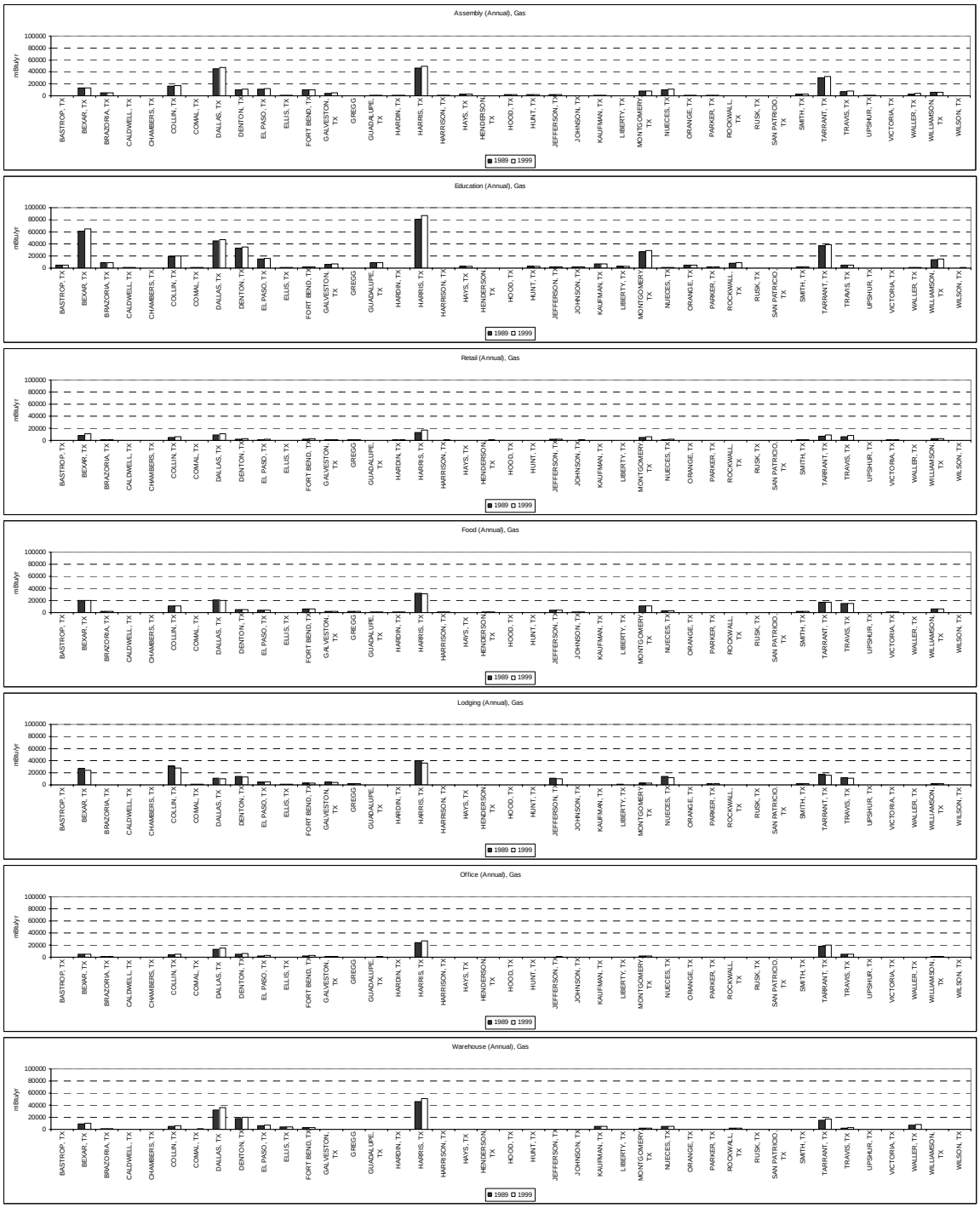


Figure 58: Calculated ASHRAE Standard 90.1-1989 and 1999 Annual Natural Gas Use for Assembly, Education, Retail, Food, Lodging, Office, and Warehouse Building Types (USDOE 2004).

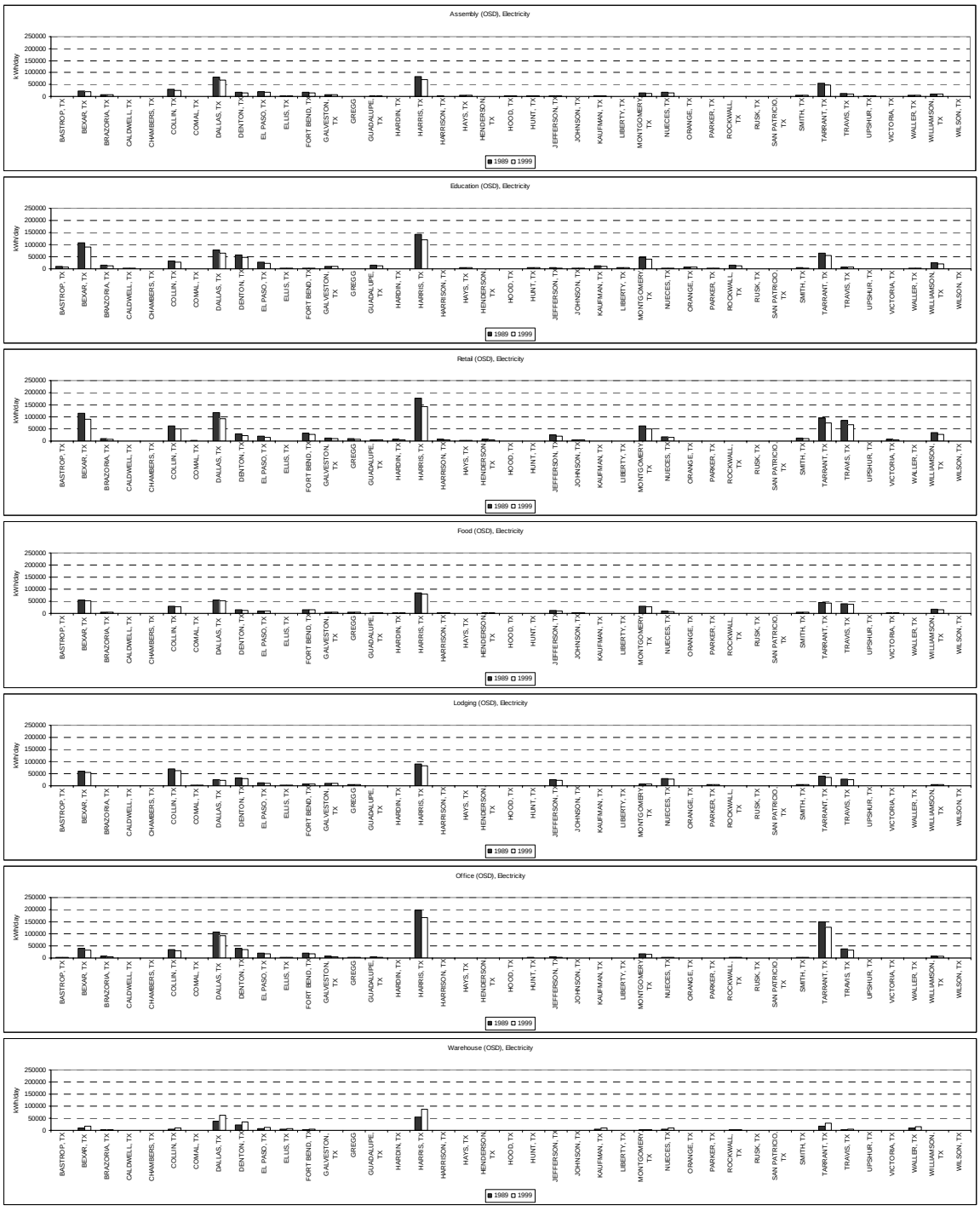


Figure 59: Calculated ASHRAE Standard 90.1-1989 and 1999 OSD Electricity Use for Assembly, Education, Retail, Food, Lodging, Office, and Warehouse Building Types (USDOE 2004).

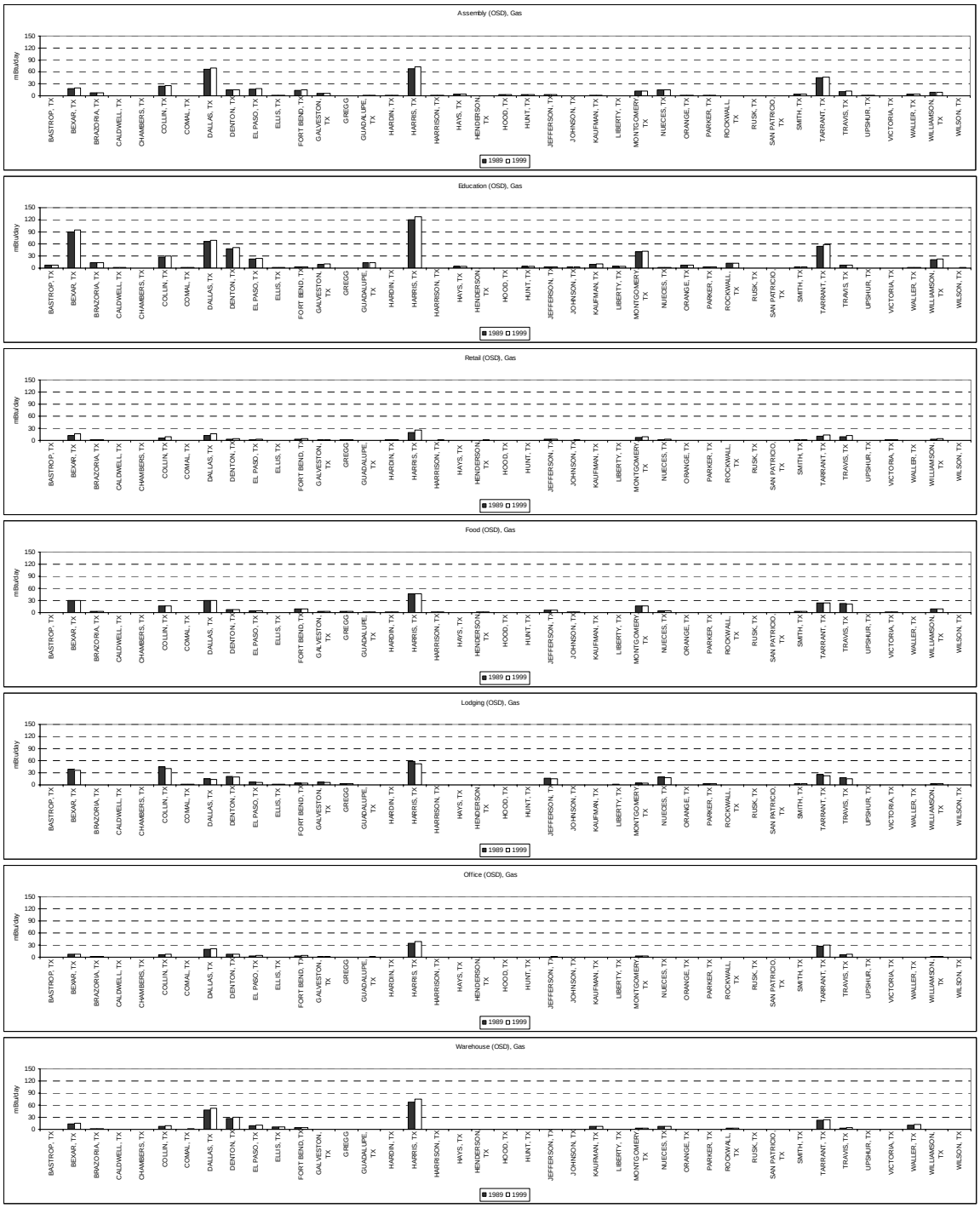


Figure 60: Calculated ASHRAE Standard 90.1-1989 and 1999 OSD Natural Gas Use for Assembly, Education, Retail, Food, Lodging, Office, and Warehouse Building Types (USDOE 2004).

Table 61: Calculated ASHRAE Standard 90.1-1989 and 1999 Annual Electricity and Natural Gas Savings for Assembly, Education, Retail, and Food Types (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represents an energy use increase (+).

Counties	Assembly		Education		Retail		Food		Lodging	
	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr
BASTROP, TX	0	0	-320073	323	-34865	16	1219	-2	0	0
BEXAR, TX	-667623	669	-3807631	3843	-5606113	2617	196060	-349	-783342	-2560
BRAZORIA, TX	-252669	253	-544537	550	-537216	251	18788	-33	-1022	-3
CALDWELL, TX	0	0	-54230	55	-3920	2	137	0	0	0
CHAMBERS, TX	-6783	7	0	0	-6189	3	216	0	0	0
COLLIN, TX	-862976	865	-1182915	1194	-3032054	1415	106039	-189	-895211	-2925
COMAL, TX	-8140	8	-36310	37	-73857	34	2583	-5	-21720	-71
DALLAS, TX	-2371021	2377	-2785520	2812	-5724531	2672	200202	-356	-309034	-1010
DENTON, TX	-539254	541	-2038683	2058	-1428657	667	49964	-89	-413544	-1351
EL PASO, TX	-598097	600	-961988	971	-984690	460	34437	-61	-146366	-478
ELLIS, TX	-66135	66	-70734	71	-32183	15	1126	-2	-20442	-67
FORT BEND, TX	-506186	507	-113175	114	-1622583	757	56746	-101	-92654	-303
GALVESTON, TX	-230794	231	-396702	400	-627990	293	21962	-39	-137269	-449
GREGG	-24080	24	0	0	-510603	238	17857	-32	-66999	-219
GUADALUPE, TX	-70883	71	-553143	558	-232918	109	8146	-15	0	0
HARDIN, TX	-35442	36	0	0	-352987	165	12345	-22	0	0
HARRIS, TX	-2461405	2468	-5088513	5136	-8763806	4091	306493	-546	-1157688	-3783
HARRISON, TX	-39851	40	0	0	-316471	148	11068	-20	0	0
HAYS, TX	-159402	160	-165047	167	-106453	50	3723	-7	-5724	-19
HENDERSON, TX	0	0	0	0	-329674	154	11530	-21	0	0
HOOD, TX	-81906	82	0	0	-42292	20	1479	-3	0	0
HUNT, TX	-99202	99	-174478	176	0	0	0	0	0	0
JEFFERSON, TX	-83771	84	-142766	144	-1208737	564	42273	-75	-325132	-1062
JOHNSON, TX	-1526	2	-109638	111	-280780	131	9820	-17	0	0
KAUFMAN, TX	-71053	71	-413325	417	0	0	0	0	0	0
LIBERTY, TX	-1526	2	-189922	192	-16504	8	577	-1	-15485	-51
MONTGOMERY, TX	-420211	421	-1700926	1717	-3075172	1436	107547	-191	-98224	-321
NUECES, TX	-532301	534	-69791	70	-913928	427	31962	-57	-395197	-1291
ORANGE, TX	-29167	29	-303450	306	-2888	1	101	0	0	0
PARKER, TX	-28828	29	-114000	115	-13410	6	469	-1	-54274	-177
ROCKWALL, TX	0	0	-501271	506	-8665	4	303	-1	0	0
RUSK, TX	0	0	0	0	0	0	0	0	0	0
SAN PATRICIO, TX	-16279	16	-4598	5	0	0	0	0	0	0
SMITH, TX	-168559	169	-133452	135	-644701	301	22547	-40	-58873	-192
TARRANT, TX	-1617253	1621	-2315843	2338	-4651749	2172	162684	-290	-500730	-1636
TRAVIS, TX	-389009	390	-287889	291	-4161983	1943	145555	-259	-341639	-1116
UPSHUR, TX	-50873	51	0	0	0	0	0	0	0	0
VICTORIA, TX	-7292	7	-20395	21	-344734	161	12056	-21	-1227	-4
WALLER, TX	-180938	181	-60714	61	0	0	0	0	0	0
WILLIAMSON, TX	-323552	324	-894083	902	-1686950	788	58997	-105	-60815	-199
WILSON, TX	0	0	-30652	31	0	0	0	0	0	0
TOTAL	-13003986	13036	-25586392	25827	-47380254	22119	1657010	-2950	-5902611	-19288

Table 62: Calculated ASHRAE Standard 90.1-1989 and 1999 Annual Electricity and Natural Gas Savings for Lodging, Office, and Warehouse Building Types (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represents an energy use increase (+).

Counties	Office		Warehouse		Total		Total*1.07 (T&D loss) for eGrid	
	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	MWh/yr	Therm/yr
BASTROP, TX	-69123	32	0	0	-422842	369	452	-3950
BEXAR, TX	-1289985	596	2372448	1005	-9586186	5822	10257	-62298
BRAZORIA, TX	-220425	102	300601	127	-1236480	1246	1323	-13334
CALDWELL, TX	0	0	0	0	-58012	56	62	-603
CHAMBERS, TX	-23041	11	0	0	-35797	20	38	-214
COLLIN, TX	-1138376	526	1344887	570	-5660606	1456	6057	-15583
COMAL, TX	-24270	11	124237	53	-37477	68	40	-723
DALLAS, TX	-3598687	1663	8549328	3621	-6039263	11780	6462	-126041
DENTON, TX	-1347895	623	4757494	2015	-960574	4463	1028	-47757
EL PASO, TX	-671259	310	1638321	694	-1689642	2495	1808	-26696
ELLIS, TX	-76189	35	1034295	438	769737	557	-824	-5962
FORT BEND, TX	-666344	308	785386	333	-2158810	1616	2310	-17292
GALVESTON, TX	-211516	98	53431	23	-1528878	558	1636	-5968
GREGG	-60982	28	95567	40	-549240	80	588	-861
GUADALUPE, TX	-133023	61	65159	28	-916661	813	981	-8696
HARDIN, TX	0	0	0	0	-376083	178	402	-1908
HARRIS, TX	-6579878	3041	12100290	5125	-11644507	15533	12460	-166206
HARRISON, TX	0	0	41268	17	-303986	185	325	-1984
HAYS, TX	-24270	11	86879	37	-370294	399	396	-4267
HENDERSON, TX	-7680	4	0	0	-325825	137	349	-1465
HOOD, TX	-15821	7	0	0	-138540	107	148	-1140
HUNT, TX	-45621	21	108599	46	-210703	343	225	-3666
JEFFERSON, TX	-127954	59	93395	40	-1752692	-247	1875	2639
JOHNSON, TX	-1843	1	0	0	-383968	227	411	-2425
KAUFMAN, TX	-17358	8	1281465	543	779731	1039	-834	-11120
LIBERTY, TX	-22580	10	0	0	-245440	160	263	-1709
MONTGOMERY, TX	-578788	268	504984	214	-5260790	3543	5629	-37908
NUECES, TX	-113669	53	1303185	552	-689739	287	738	-3070
ORANGE, TX	-19201	9	4996	2	-349610	348	374	-3720
PARKER, TX	0	0	0	0	-210043	-28	225	299
ROCKWALL, TX	-57756	27	434395	184	-132994	720	142	-7706
RUSK, TX	0	0	0	0	0	0	0	0
SAN PATRICIO, TX	-12903	6	0	0	-33780	27	36	-288
SMITH, TX	-49000	23	6950	3	-1025089	398	1097	-4256
TARRANT, TX	-4951498	2289	3971239	1682	-9903150	8175	10596	-87477
TRAVIS, TX	-1247129	576	662887	281	-5619206	2105	6013	-22526
UPSHUR, TX	0	0	0	0	-50873	51	54	-546
VICTORIA, TX	-31028	14	0	0	-392620	178	420	-1901
WALLER, TX	0	0	1985620	841	1743968	1084	-1866	-11596
WILLIAMSON, TX	-280331	130	64725	27	-3122010	1868	3341	-19983
WILSON, TX	-768	0	0	0	-31420	31	34	-335
TOTAL	-23716192	10962	43772031	18541	-70160394	68247	75072	-730244

Table 63: Calculated ASHRAE Standard 90.1-1989 and 1999 OSD Electricity and Natural Gas Savings for Assembly, Education, Retail, and Food Types (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represents an energy use increase (+).

Counties	Assembly		Education		Retail		Food		Lodging	
	kWh/day	mBtu/day	kWh/day	mBtu/day	kWh/day	mBtu/day	kWh/day	mBtu/day	kWh/day	mBtu/day
BASTROP, TX	0	0	-1459	0	-144	0	-15	0	0	0
BEXAR, TX	-3248	1	-17358	6	-23183	4	-2344	-1	-5689	-4
BRAZORIA, TX	-1229	0	-2482	1	-2222	0	-225	0	-7	0
CALDWELL, TX	0	0	-247	0	-16	0	-2	0	0	0
CHAMBERS, TX	-33	0	0	0	-26	0	-3	0	0	0
COLLIN, TX	-4198	1	-5392	2	-12539	2	-1268	0	-6502	-4
COMAL, TX	-40	0	-166	0	-305	0	-31	0	-158	0
DALLAS, TX	-11534	3	-12698	4	-23673	4	-2393	-1	-2244	-1
DENTON, TX	-2623	1	-9294	3	-5908	1	-597	0	-3004	-2
EL PASO, TX	-2910	1	-4385	1	-4072	1	-412	0	-1063	-1
ELLIS, TX	-322	0	-322	0	-133	0	-13	0	-148	0
FORT BEND, TX	-2462	1	-516	0	-6710	1	-678	0	-673	0
GALVESTON, TX	-1123	0	-1808	1	-2597	0	-263	0	-997	-1
GREGG	-117	0	0	0	-2112	0	-213	0	-487	0
GUADALUPE, TX	-345	0	-2522	1	-963	0	-97	0	0	0
HARDIN, TX	-172	0	0	0	-1460	0	-148	0	0	0
HARRIS, TX	-11974	4	-23197	8	-36242	6	-3664	-1	-8408	-6
HARRISON, TX	-194	0	0	0	-1309	0	-132	0	0	0
HAYS, TX	-775	0	-752	0	-440	0	-45	0	-42	0
HENDERSON, TX	0	0	0	0	-1363	0	-138	0	0	0
HOOD, TX	-398	0	0	0	-175	0	-18	0	0	0
HUNT, TX	-483	0	-795	0	0	0	0	0	0	0
JEFFERSON, TX	-408	0	-651	0	-4999	1	-505	0	-2361	-2
JOHNSON, TX	-7	0	-500	0	-1161	0	-117	0	0	0
KAUFMAN, TX	-346	0	-1884	1	0	0	0	0	0	0
LIBERTY, TX	-7	0	-866	0	-68	0	-7	0	-112	0
MONTGOMERY, TX	-2044	1	-7754	3	-12717	2	-1286	0	-713	0
NUECES, TX	-2589	1	-318	0	-3779	1	-382	0	-2870	-2
ORANGE, TX	-142	0	-1383	0	-12	0	-1	0	0	0
PARKER, TX	-140	0	-520	0	-55	0	-6	0	-394	0
ROCKWALL, TX	0	0	-2285	1	-36	0	-4	0	0	0
RUSK, TX	0	0	0	0	0	0	0	0	0	0
SAN PATRICIO, TX	-79	0	-21	0	0	0	0	0	0	0
SMITH, TX	-820	0	-608	0	-2666	0	-270	0	-428	0
TARRANT, TX	-7867	2	-10557	3	-19237	3	-1945	0	-3637	-2
TRAVIS, TX	-1892	1	-1312	0	-17211	3	-1740	0	-2481	-2
UPSHUR, TX	-247	0	0	0	0	0	0	0	0	0
VICTORIA, TX	-35	0	-93	0	-1426	0	-144	0	-9	0
WALLER, TX	-880	0	-277	0	0	0	0	0	0	0
WILLIAMSON, TX	-1574	0	-4076	1	-6976	1	-705	0	-442	0
WILSON, TX	0	0	-140	0	0	0	0	0	0	0
TOTAL	-63261	19	-116639	38	-195935	32	-19810	-4	-42870	-28

Table 64 Calculated ASHRAE Standard 90.1-1989 and 1999 OSD Electricity and Natural Gas Savings for Lodging, Office, and Warehouse Building Types (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represets an energy use increase (+).

Counties	Office		Warehouse		Total		Total*1.07 (T&D loss) for eGrid	
	kWh/day	mBtu/day	kWh/day	mBtu/day	kWh/day	mBtu/day	MWh/day	Therm/day
BASTROP, TX	-323	0	0	0	-1941	1	2	-6
BEXAR, TX	-6025	1	6614	1	-51233	9	55	-91
BRAZORIA, TX	-1029	0	838	0	-6357	2	7	-20
CALDWELL, TX	0	0	0	0	-265	0	0	-1
CHAMBERS, TX	-108	0	0	0	-169	0	0	0
COLLIN, TX	-5317	1	3749	1	-31466	2	34	-23
COMAL, TX	-113	0	346	0	-466	0	0	-1
DALLAS, TX	-16808	2	23833	5	-45518	17	49	-185
DENTON, TX	-6295	1	13262	3	-14459	7	15	-70
EL PASO, TX	-3135	0	4567	1	-11410	4	12	-39
ELLIS, TX	-356	0	2883	1	1588	1	-2	-9
FORT BEND, TX	-3112	0	2189	0	-11962	2	13	-25
GALVESTON, TX	-988	0	149	0	-7627	1	8	-9
GREGG	-285	0	266	0	-2947	0	3	-1
GUADALUPE, TX	-621	0	182	0	-4367	1	5	-13
HARDIN, TX	0	0	0	0	-1780	0	2	-3
HARRIS, TX	-30731	4	33732	8	-80484	23	86	-244
HARRISON, TX	0	0	115	0	-1520	0	2	-3
HAYS, TX	-113	0	242	0	-1925	1	2	-6
HENDERSON, TX	-36	0	0	0	-1537	0	2	-2
HOOD, TX	-74	0	0	0	-665	0	1	-2
HUNT, TX	-213	0	303	0	-1188	1	1	-5
JEFFERSON, TX	-598	0	260	0	-9261	0	10	4
JOHNSON, TX	-9	0	0	0	-1794	0	2	-4
KAUFMAN, TX	-81	0	3572	1	1261	2	-1	-16
LIBERTY, TX	-105	0	0	0	-1166	0	1	-3
MONTGOMERY, TX	-2703	0	1408	0	-25810	5	28	-56
NUECES, TX	-531	0	3633	1	-6837	0	7	-5
ORANGE, TX	-90	0	14	0	-1614	1	2	-5
PARKER, TX	0	0	0	0	-1115	0	1	0
ROCKWALL, TX	-270	0	1211	0	-1383	1	1	-11
RUSK, TX	0	0	0	0	0	0	0	0
SAN PATRICIO, TX	-60	0	0	0	-160	0	0	0
SMITH, TX	-229	0	19	0	-5001	1	5	-6
TARRANT, TX	-23126	3	11071	2	-55298	12	59	-128
TRAVIS, TX	-5825	1	1848	0	-28614	3	31	-33
UPSHUR, TX	0	0	0	0	-247	0	0	-1
VICTORIA, TX	-145	0	0	0	-1852	0	2	-3
WALLER, TX	0	0	5535	1	4378	2	-5	-17
WILLIAMSON, TX	-1309	0	180	0	-14902	3	16	-29
WILSON, TX	-4	0	0	0	-143	0	0	0
TOTAL	-110766	16	122022	27	-427258	100	457	-1071

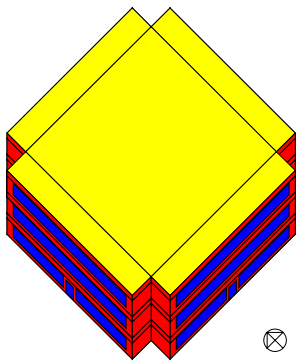


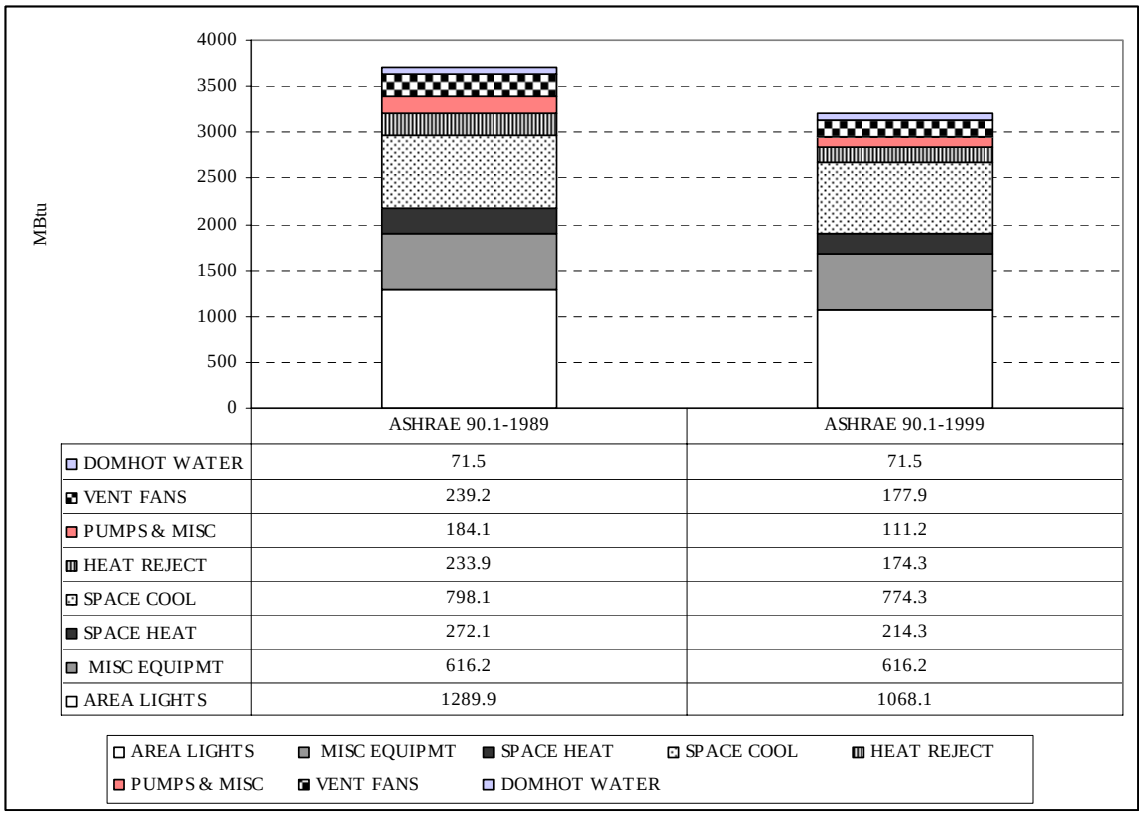
Figure 61: Typical Office Building Used for Annual to OSD calculation (3-story shown).

Table 65: Office/Retail Simulation Input Parameters (LOADS).

NAME	DESCRIPTION	DEFAULT	STATUS	COMMENT
LOADS				
b01	Quick or thermal mode (Q or T)	Quick (Q)	Fixed	Q simulates the building as massless, T will include thermal mass
b02	Location	Bastrop (BAS)	User Defined	41 counties linked to 9 TRY packed weather files according to climate zone
b03	Azimuth of building (degree)	0	User Defined	Orientation of the building
b04	Length of building (ft)	122	User Defined	
b05	Width of building (ft)	122	User Defined	
b06	Floor to ceiling height (ft)	9	User Defined	
b07	Door height (ft)	7	Fixed	
b08	Door width (ft)	6	Fixed	
b09	Run year	2000	User Defined	
b10	Floor to floor height (ft)	13	User Defined	This defines the plenum height in conjunction with b06
b11	Number of floor	6	User Defined	
b12	Perimeter depth (ft)	15	Fixed	Used for thermal zoning
b13	Void			
b14	Underground floor mode	No (N)	User Defined	This allows the user to activate/deactivate underground floors
b15	Front wall: Attached to another building?	No (N)	User Defined	These 4 parameters are used to attach buildings to the different orientations of the model for the retail scenario
b16	Right wall: Attached to another building?	No (N)	User Defined	
b17	Back wall: Attached to another building?	No (N)	User Defined	
b18	Left wall: Attached to another building?	No (N)	User Defined	
b19	Building type	Office (O)	User Defined	Allows the user to switch between Office and Retail
b20	Code compliance	Code (C)	User Defined	Allows user to run user defined model or either of ASHRAE 90.1 1989 or 1999
c01	Roof absorptance	0.45	User Defined	c01 and c03 are used to determine "roof color"
c02	Roof roughness	1	Fixed	This is used to calculate the outside film coefficient for heat transfer calculations, DOE-2 allows values from 1 to 6 increasing in smoothness
c03	Roof outside emissivity	0.89	User Defined	c01 and c03 are used to determine "roof color"
c04	Roof insulation R-value (hr-sq.ft-F/Btu)	R-15	User Defined	
c05	Wall absorptance	0.57	User Defined	c05 and c07 are used to define "wall color"
c06	Wall roughness	2	Fixed	This is used to calculate the outside film coefficient for heat transfer calculations, DOE-2 allows values from 1 to 6 increasing in smoothness
c07	Wall outside emissivity	0.9	User Defined	c05 and c07 are used to define "wall color"
c08	Wall insulation R-value (hr-sq.ft-F/Btu)	R-13	User Defined	
c09	Ground reflectance	0.24	Fixed	This defines the fraction of sunlight reflected from the ground
c10	Void			
c11	U-Factor of glazing (Btu/hr-sq.ft-F)	1.22	User Defined	
c12	Solar Heat Gain Coefficient(SHGC)	0.17	User Defined	
c13	Number of pane of glazing	1	Fixed	
c14	Frame absorptance of glazing	0.7	Fixed	
c15	Frame type - A,B,C,D,E	Aluminum w/o thermal break (A)	User Defined	Allows user to select from 5 different frame types
c16	Void			
c17	Floor weight (lb/sq-ft)	70	User Defined	This corresponds to medium construction, user has a choice of light, medium or heavy construction
c18	Slab-on-grade floor insulation R-value (Exterior insulation, horizontal) (hr-sq.ft-F/Btu)	R-0 (A)	User Defined	User can choose from 9 insulation R-values and insulation depths
c19	Slab-on-grade floor R-value (hr-sq.ft-F/Btu)	0.88	Fixed	
c20	Below-grade wall insulation R-value (hr-sq.ft-F/Btu) (Exterior insulation, vertical, basement wall = 8 ft)	R-0 (A)	User Defined	User can choose from 9 insulation R-values
c21	Below-grade wall R-value (concrete wall) (hr-sq.ft-F/Btu)	0.88	Fixed	
c22	Void			
c23	Floor R-value	1.67	Fixed	
c24	Void			
c25	Ceiling R-value (hr-sq.ft-F/Btu)	1.89	Fixed	
c26	Interior wall R-value (hr-sq.ft-F/Btu)	2.01	Fixed	
c27	Percent window-front (%)	50	User Defined	
c28	Percent window-right (%)	50	User Defined	
c29	Percent window-back (%)	50	User Defined	
c30	Percent window-left (%)	50	User Defined	
sp01	void			
sp02	void			
sp03	Area per person (ft^2/person) for office	275	User Defined	
sp04	Lighting load (W/ft2) for office	1.3	User Defined	
sp05	Equipment load (W/ft2) for office	0.75	User Defined	
sp06	Area per person (ft^2/person) for retail	300	User Defined	
sp07	Lighting load (W/ft2) for retail	1.9	User Defined	
sp08	Equipment load (W/ft2) for retail	0.25	User Defined	
s01	Front Shade (S)	0	User Defined	
s02	Back Shade (N)	0	User Defined	
s03	Left Shade (W)	0	User Defined	
s04	Right Shade (E)	0	User Defined	

Table 66: Office/Retail Simulation Input Parameters (SYSTEMS and PLANT).

NAME	DESCRIPTION	DEFAULT	STATUS	COMMENT
SYSTEM				
sy01	Mode of system	Variable air volume (2)	User Defined	User can choose from Packaged single zone, variable air volume or packaged variable volume system
sy02	Cooling Capacity of cooling system (Btu/hr)	0	Fixed	DOE-2 is autosizing the system
sy03	Heating Capacity of heating system (Btu/hr)	0	Fixed	DOE-2 is autosizing the system
sy04	Seasonal Energy Efficiency Ratio (SEER) for PVAVS and PSZ	10	User Defined	
sy05	ANNUAL FUEL UTILIZATION EFFICIENCY (AFUE) for PSZ	0.8	User Defined	
sy06	**Spare parameter for systems other than VAVS**HEATING SEASONAL PERFORMANCE FACTOR (HSPF)	6.8	User Defined	Unused, since heatpump systems are not included in the office/retail scenario
sy07	**Spare parameter for Pilot light	0	Fixed	Unused
sy08	**Spare parameter for Pilot light	0	Fixed	Unused
sy09	**Spare parameter for Pilot light	0	Fixed	Unused
sy10	Void			
sy11	Exterior lighting (kW)	0	Fixed	
sy12	Void			
sy13	Fan control type	Variable frequency drives (1)	User Defined	User can choose from 4 different type of fan control
sy14	Economizer type	None (1)	User Defined	
sy15	Economizer drybulb limit (F) (use when economizer type(sy14) = dry bulb(2))	65	Fixed	This corresponds to the temperature above which the outside air dampers return to the minimum position
sy16	User input for numbers of fans	Autosized (A)	Fixed	Autosized by DOE-2
sy17	Number of Fans	6	Fixed	equal to the number of floors
sy18	Supply fan total pressure (in W.G)	5.5	Fixed	
sy19	Supply fan efficiency	0.54	Fixed	
sy20	Return fan total pressure (in W.G)	2	Fixed	
sy21	Return fan efficiency	0.51	Fixed	
sy22	Supply motor efficiency	0.5	Fixed	
sy23	Return motor efficiency	0.5	Fixed	
sy24	User input for DHW gallon/hr-person	Autosized (A)	Fixed	The size of DHW depends on the gallons per hour per person requirements of ASHRAE 90.1
sy25	Maximum DHW gallon/h-person (maximum hourly, to be used with occupancy schedule)	0.4	Fixed	
PLANT				
p01	Chiller type	Electric Centrifugal (1)	Fixed	
p02	Number of chillers	1	Fixed	
p03	Chillers size (MBtu/h)	-999	Fixed	Chiller is being autosized by DOE-2
p04	Condenser type	water-cooled (W)	Fixed	
p05	COP	5	User Defined	
p06	Switch for a chiller sizing	Autosized (A)	Fixed	Chiller is being autosized by DOE-2
p07	Cooling tower type	Open tower (O)		
p08	Void			
p09	Gpm/hp	38.2	Fixed	Value from ASHRAE 90.1 1999 for axial fan cooling towers
p10	Cooling tower capacity control	Two-speed fan (1)	Fixed	
p11	Boiler type	Gas fired-hotwater boiler (1)	User Defined	User can choose from gas fired or electric boilers
p12	Number of boilers	1	Fixed	
p13	Boiler size (MBtu/h)	-999	Fixed	Boiler is being autosized by DOE-2
p14	Boiler fuel type	Gas (G)	Fixed	Depends on the value of p10
p15	Boilers efficiency (Et,Ec,AFUE) (%)	80	User Defined	
p16	Switch for a boiler sizing	Autosized (A)	Fixed	Boiler is being autosized by DOE-2
p17	Void			
p18	DHW heater type	Gas water heater (1)	User Defined	User can choose from gas fired or electric water heaters
p19	Number of DHW heater	1	Fixed	
p20	DHW size (MBtu/h)	-999	Fixed	Water heater is being autosized by DOE-2
p21	DHW fuel type	Gas (G)	Fixed	Depends on the value of p18
p22	DHW heater Efficiency (Et,Ec,Energy factor) (%)	54	User Defined	
p23	Switch for a DHW heater sizing	Autosized (A)	Fixed	Water heater is being autosized by DOE-2
p24	DHW Storage Capacity (gal)	75	Fixed	



	ASHRAE 90.1-1989	ASHRAE 90.1-1999
DOMHOT WATER	71.5	71.5
VENT FANS	239.2	177.9
PUMPS & MISC	184.1	111.2
HEAT REJECT	233.9	174.3
SPACE COOL	798.1	774.3
SPACE HEAT	272.1	214.3
MISC EQUIPMT	616.2	616.2
AREA LIGHTS	1289.9	1068.1

Figure 62: Comparison of Annual Energy Use ASHRAE Standard 90.1-1989 vs 90.1-1999.

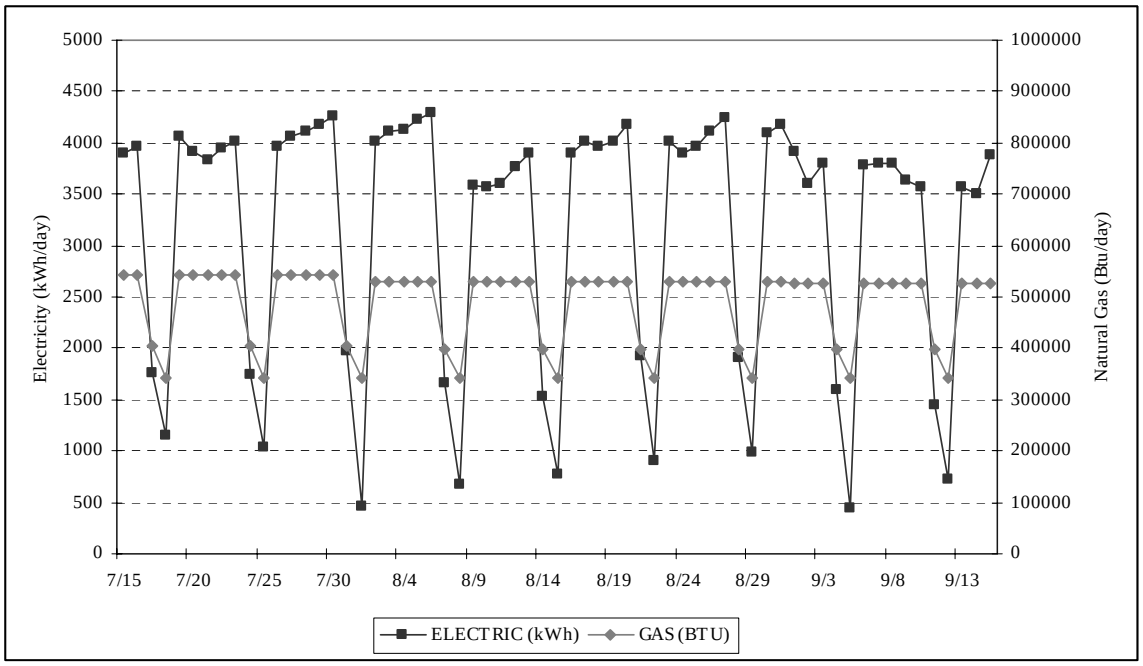


Figure 63: Simulated Electricity and Natural Gas for Building Built to 90.1-1989 Standard for OSD (07/15 – 09/15).

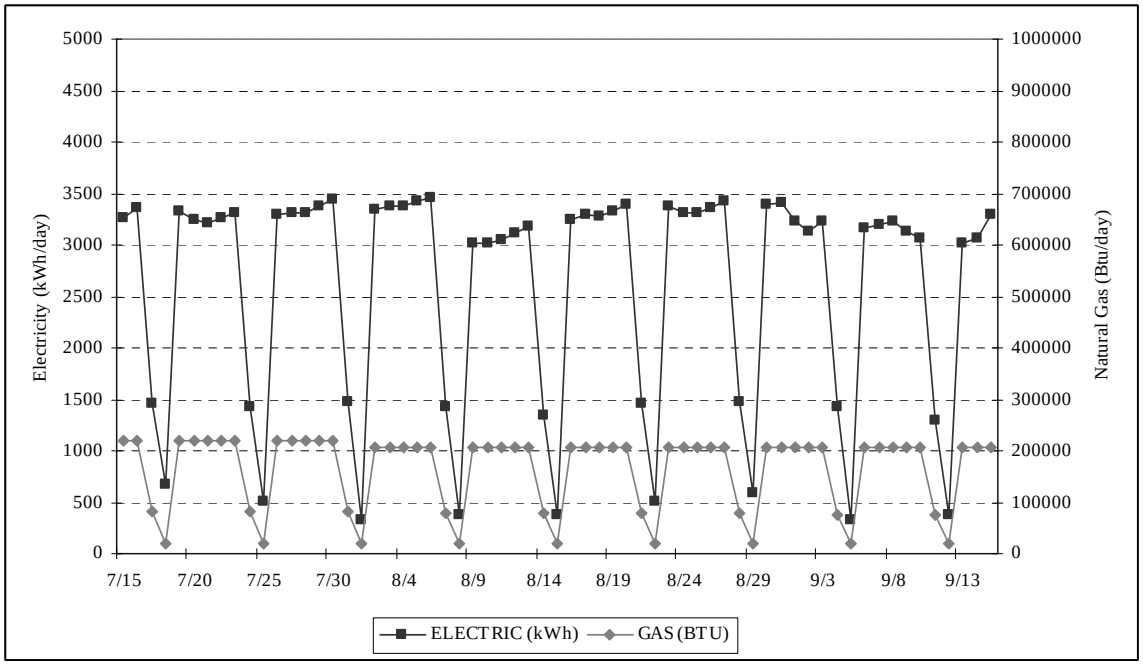


Figure 64: Simulated Electricity and Natural Gas for Building Built to 90.1-1989 Standard for OSD (07/15 – 09/15).

Table 67: Simulated Electricity and Natural Gas for Building Built to 90.1-1989 Standard for Annual and OSD (07/15 – 09/15).

	Electricity (kW)		Gas (Btu)	
	1989	1999	1989	1999
TOTAL (YEAR) (a)	988,405	858,198	331,600,000	278,800,000
OSD (07/15 - 09/15)	199,537	163,841	30,633,205	10,332,355
OSD PER DAY (b)	3167	2601	486241	164006
OSD % (b/a)	0.32%	0.30%	0.15%	0.06%

Table 68: 2005 Allocation of PCA for each of 41 Non-attainment and Affected Counties.

NERC Region	County	Elec. Utilities 1	PCA	1998 Annual net Generation (MWh)	Percentage	Elec. Utilities 2	PCA	1998 Annual net Generation (MWh)	Percentage
ERCOT	BASTROP	ONCOR	TXU Electric/PCA	97,581,030	100%	Smithville			
	BEXAR	CPSB	San Antonio Public Service Bd/PCA	14,641,059	100%	Bandera EC			
	BRAZORIA	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	97%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	3%
	CALDWELL	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Luling			
	CHAMBERS	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	70%	ENTERGY	Entergy Electric System/PCA	32,288,113	30%
	COLLIN	ONCOR	TXU Electric/PCA	97,581,030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
	COMAL	CPSB	San Antonio Public Service Bd/PCA	14,641,059	100%	New Braunfels			
	DALLAS	ONCOR	TXU Electric/PCA	97,581,030	100%	Garland			
	DENTON	ONCOR	TXU Electric/PCA	97,581,030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
	ELLIS	ONCOR	TXU Electric/PCA	97,581,030	100%	Navarro County EC			
	FORT BEND	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	100%				
	GALVESTON	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	97%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	3%
	GUADALUPE	CPSB	San Antonio Public Service Bd/PCA	14,641,059	100%	Seguin			
	HARRIS	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	70%	ENTERGY	Entergy Electric System/PCA	32,288,113	30%
	HAYS	San Marcos	*Lower Colorado River Authority/PCA		100%	Pedernales EC			
	HENDERSON	ONCOR	TXU Electric/PCA	97,581,030	100%	Trinity Valley EC			
	HOOD	ONCOR	TXU Electric/PCA	97,581,030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
	HUNT	ONCOR	TXU Electric/PCA	97,581,030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
	JOHNSON	ONCOR	TXU Electric/PCA	97,581,030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
	KAUFMAN	ONCOR	TXU Electric/PCA	97,581,030	100%	Trinity Valley EC			
	NUECES	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Robstown			
	PARKER	ONCOR	TXU Electric/PCA	97,581,030	100%	Weatherford			
	ROCKWALL	ONCOR	TXU Electric/PCA	97,581,030	100%	FEC Electric			
	SAN PATRICIO	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	San Patricio EC			
	SMITH	ONCOR	TXU Electric/PCA	97,581,030	100%	SWEPCO(AEP)			
	TARRANT	ONCOR	TXU Electric/PCA	97,581,030	100%	Tri-County EC			
	TRAVIS	ONCOR	TXU Electric/PCA	97,581,030	97%	Austin Energy	Austin Energy/PCA	3,359,240	3%
	VICTORIA	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Victoria EC			
	WALLER	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	100%	Hempstead			
	WILLIAMSON	ONCOR	TXU Electric/PCA	97,581,030	97%	Austin Energy	Austin Energy/PCA	3,359,240	3%
	WILSON	Floresville	*San Antonio Public Service Bd/PCA	N/A	100%	Guadalupe Valley EC			
SPP	GREGG	SWEPCO(AEP)	Southwestern Public Service Co/PCA			Rusk County EC			
	HARRISON	SWEPCO(AEP)	Southwestern Public Service Co/PCA			Panola-Harrison EC			
	RUSK	SWEPCO(AEP)	Southwestern Public Service Co/PCA			ONCOR			
	UPSHUR	SWEPCO(AEP)	Southwestern Public Service Co/PCA			Upshur-Rural EC			
SERC	HARDIN	ENTERGY	Entergy Electric System/PCA	32,288,113	30%	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	70%
	JEFFERSON	ENTERGY	Entergy Electric System/PCA	32,288,113	100%				
	LIBERTY	ENTERGY	Entergy Electric System/PCA	32,288,113	100%	Sam Houston EC			
	MONTGOMERY	ENTERGY	Entergy Electric System/PCA	32,288,113	30%	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	70%
	ORANGE	ENTERGY	Entergy Electric System/PCA	32,288,113	100%	Jasper-Newton EC			
WSCC	EL PASO	EPEC	El Paso Electric Co/PCA	3,066,882	100%	Rio Grande EC			
* The electricity providers for Hays and Wilson county were identified by personal communication with the proper representatives. Below is the contact information									
	* Hays County: SAN MARCOS ELECTRIC UTILITY (SAN MARCOS, CITY OF) 630 E. Hopkins St. San Marcos TX 78666-6397 512/396-2451 Robert L. Higgs Dir., Electric Utility Mun								
	* Wilson County: FLORESVILLE ELECTRIC LIGHT & POWER SYSTEM 1400 Fourth St. P.O. Box 218 Floresville TX 78114-2372 830/216-7000 David K. McMillan General Manager Muni								

Table 69: Totalized Annual Electricity Savings from 90.1-1999 by PCA for Commercial Buildings.

NERC	County	Total Energy Savings by County (MWh)	PCA 1	Percentage	Energy Savings by County for PCA 1 (MWh)	PCA 2	Percentage	Energy Savings by County for PCA 2 (MWh)
ERCOT	CALDWELL	62.07	American Electric Power - West (ERCOT)/PCA	100%	62.07			0.00
	NUECES	738.02	American Electric Power - West (ERCOT)/PCA	100%	738.02			0.00
	SAN PATRICIO	36.14	American Electric Power - West (ERCOT)/PCA	100%	36.14			0.00
	VICTORIA	420.10	American Electric Power - West (ERCOT)/PCA	100%	420.10			0.00
	HAYS	396.21	Lower Colorado River Authority/PCA	100%	396.21			0.00
	BRAZORIA	1323.03	Reliant Energy HL&P/PCA	97%	1,287.25	Texas-New Mexico Power Co/PCA	3%	35.78
	CHAMBERS	38.30	Reliant Energy HL&P/PCA	70%	26.71	Entergy Electric System/PCA	30%	11.59
	FORT BEND	2309.93	Reliant Energy HL&P/PCA	100%	2,309.93			0.00
	GALVESTON	1635.90	Reliant Energy HL&P/PCA	97%	1,591.66	Texas-New Mexico Power Co/PCA	3%	44.24
	HARRIS	12459.62	Reliant Energy HL&P/PCA	70%	8,688.35	Entergy Electric System/PCA	30%	3,771.27
	WALLER	-1866.05	Reliant Energy HL&P/PCA	100%	-1,866.05			0.00
	BEXAR	10257.22	San Antonio Public Service Bd/PCA	100%	10,257.22			0.00
	WILSON	33.62	San Antonio Public Service Bd/PCA	100%	33.62			0.00
	COMAL	40.10	San Antonio Public Service Bd/PCA	100%	40.10			0.00
	GUADALUPE	980.83	San Antonio Public Service Bd/PCA	100%	980.83			0.00
	BASTROP	452.44	TXU Electric/PCA	100%	452.44			0.00
	COLLIN	6056.85	TXU Electric/PCA	98%	5,931.17	Texas-New Mexico Power Co/PCA	2%	125.68
	DALLAS	6462.01	TXU Electric/PCA	100%	6,462.01			0.00
	DENTON	1027.81	TXU Electric/PCA	98%	1,006.49	Texas-New Mexico Power Co/PCA	2%	21.33
	ELLIS	-823.62	TXU Electric/PCA	100%	-823.62			0.00
	HENDERSON	348.63	TXU Electric/PCA	100%	348.63			0.00
	HOOD	148.24	TXU Electric/PCA	98%	145.16	Texas-New Mexico Power Co/PCA	2%	3.08
	HUNT	225.45	TXU Electric/PCA	98%	220.77	Texas-New Mexico Power Co/PCA	2%	4.68
	JOHNSON	410.85	TXU Electric/PCA	98%	402.32	Texas-New Mexico Power Co/PCA	2%	8.53
	KAUFMAN	-834.31	TXU Electric/PCA	100%	-834.31			0.00
	PARKER	224.75	TXU Electric/PCA	100%	224.75			0.00
	ROCKWALL	142.30	TXU Electric/PCA	100%	142.30			0.00
	SMITH	1096.85	TXU Electric/PCA	100%	1,096.85			0.00
	TARRANT	10596.37	TXU Electric/PCA	100%	10,596.37			0.00
	TRAVIS	6012.55	TXU Electric/PCA	97%	5,812.46	Austin Energy/PCA	3%	200.09
	WILLIAMSON	3340.55	TXU Electric/PCA	97%	3,229.38	Austin Energy/PCA	3%	111.17
WSCC	EL PASO	1807.92	El Paso Electric Co/PCA	100%	1,807.92			0.00
SERC	HARDIN	402.41	Entergy Electric System/PCA	30%	121.80	Reliant Energy HL&P/PCA	70%	280.61
	JEFFERSON	1875.38	Entergy Electric System/PCA	100%	1,875.38			0.00
	LIBERTY	262.62	Entergy Electric System/PCA	100%	262.62			0.00
	MONTGOMERY	5629.05	Entergy Electric System/PCA	30%	1,703.80	Reliant Energy HL&P/PCA	70%	3,925.25
	ORANGE	374.08	Entergy Electric System/PCA	100%	374.08			0.00
SPP	GREGG	587.69	Southwestern Public Service Co/PCA	100%	587.69			0.00
	HARRISON	325.26	Southwestern Public Service Co/PCA	100%	325.26			0.00
	RUSK	0.00	Southwestern Public Service Co/PCA	100%	0.00			0.00
	UPSHUR	54.43	Southwestern Public Service Co/PCA	100%	54.43			0.00

PCA	Total Electricity Savings by PCA (MWh)
American Electric Power - West (ERCOT)/PCA	1,256.34
Austin Energy/PCA	311.27
Brownsville Public Utils Board/PCA	0.00
Lower Colorado River Authority/PCA	396.21
Reliant Energy HL&P/PCA	16,243.71
San Antonio Public Service Bd /PCA	11,311.77
South Texas Electric Coop Inc/PCA	0.00
Texas Municipal Power Pool/PCA	0.00
Texas-New Mexico Power Co/PCA	243.31
TXU Electric/PCA	34,413.17
Total	64,175.77

Table 70: 2005 Annual NOx Reductions from IECC / IRC by PCA for Commercial Buildings by County using 1999 eGRID.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Authority /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total NOx Reductions (lbs)	Total NOx Reductions (Tons)
Austin-San Antonio Area	BASTROP	0.012215415	15.3467	0.4663901	145.17	0.00902163	0.00	0.817318	323.83	0.00755428	122.71	0.02170659	245.54	0.00648344	0.00	0.01133142	0.00	0.00245301	0.60	0.01120603	385.64	1,238.83	0.62
	BEXAR	0.055151593	69.2893	0.08545943	26.60	0.04073191	0.00	0.14964594	59.29	0.00188468	30.61	1.88754037	21351.41	0.07736836	0.00	0.00770739	0.00	0.0008576	0.21	0.00413279	142.22	21,679.64	10.84
	HAYS	9.07402E-06	0.0114	0.00034645	0.11	6.7016E-06	0.00	0.00060713	0.24	5.6116E-06	0.09	1.6124E-05	0.18	4.8161E-06	0.00	8.4174E-06	0.00	1.8222E-06	0.00	8.3242E-06	0.29	0.92	0.00
	TRAVIS	0.000828265	1.0406	0.48656288	151.45	0.00061171	0.00	0.05511859	21.84	0.00054358	8.83	0.00147156	16.65	0.00044033	0.00	0.00076612	0.00	0.00016781	0.04	0.00075897	26.12	225.96	0.11
	FAYETTE	0.001485019	1.8657	0.05669872	17.65	0.00109675	0.00	0.09936078	39.37	0.00091837	14.92	0.00263885	29.85	0.00078819	0.00	0.00137755	0.00	0.00029821	0.07	0.00136231	46.88	150.60	0.08
	LLANO	0.007176248	9.0158	0.27399242	85.28	0.00529998	0.00	0.48015371	190.24	0.00443795	72.09	0.01275207	144.25	0.00380886	0.00	0.00665692	0.00	0.00144108	0.35	0.00658326	226.55	727.78	0.36
	CALDWELL		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	COMAL		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	GUADALUPE		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WILLIAMSON		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WILSON		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Dallas-Fort Worth Area	ANGELINA	0.000494588	0.6214	0.00049881	0.16	0.00036528	0.00	0.00082585	0.33	0.0002162	3.51	7.1266E-05	0.81	0.00070458	0.00	0.00244871	0.00	0.00083784	0.20	0.00449947	154.84	160.47	0.08
	COLLIN	0.007169953	9.0079	0.01253841	3.90	0.00529533	0.00	0.02011327	7.97	0.00821861	133.50	0.00238641	26.99	0.06221009	0.00	0.24840578	0.00	0.00386471	0.94	0.01870204	643.60	825.91	0.41
	DALLAS	0.049181758	61.7891	0.05006993	15.59	0.03632292	0.00	0.08284103	32.82	0.02194718	356.50	0.00720608	81.51	0.07465196	0.00	0.26228915	0.00	0.08258381	20.09	0.4433209	15256.08	15,824.38	7.91
	DENTON	0.004478418	5.6264	0.00824843	2.57	0.00330751	0.00	0.01320233	5.23	0.00553275	89.87	0.00159686	18.06	0.04294073	0.00	0.17187819	0.00	0.00176352	0.43	0.00802733	276.25	398.04	0.20
	JOHNSON	4.90169E-05	0.0616	9.028E-05	0.03	3.6201E-05	0.00	0.0001445	0.06	6.0557E-05	0.98	1.7478E-05	0.20	0.00046999	0.00	0.00188123	0.00	1.9302E-05	0.00	8.786E-05	3.02	4.36	0.00
	PARKER	0.000692972	0.8706	0.00127633	0.40	0.00051179	0.00	0.00204287	0.81	0.00085611	13.91	0.00024709	2.80	0.00664447	0.00	0.02659573	0.00	0.00027288	0.07	0.00124212	42.75	61.59	0.03
	CHEROKEE	0.010981286	13.7962	0.01107502	3.45	0.00811017	0.00	0.0183363	7.27	0.00480017	77.97	0.0015823	17.90	0.01564371	0.00	0.05436859	0.00	0.01860246	4.53	0.09990132	3437.92	3,562.83	1.78
	COKE	0.021538872	27.0602	0.0004313	0.13	0.01590742	0.00	0.00072053	0.29	0.00015909	2.58	0.00015397	1.74	0.00442876	0.00	0.00068585	0.00	0.00015233	0.04	0.000784	26.98	58.82	0.03
	COLEMAN	0.007243808	9.1007	0.00014505	0.05	0.00534988	0.00	0.00024232	0.10	5.3505E-05	0.87	5.1783E-05	0.59	0.00148945	0.00	0.00023066	0.00	5.123E-05	0.01	0.00026367	9.07	19.78	0.01
	FANNIN	0.020337335	25.5506	0.02051093	6.38	0.01502003	0.00	0.03395882	13.45	0.00888932	144.41	0.00293043	33.15	0.02897213	0.00	0.10069058	0.00	0.03445175	8.38	0.18501717	6367.03	6,598.35	3.30
	FRIO	0.047394602	59.5430	0.00480871	1.50	0.03500303	0.00	0.00784102	3.11	0.00260367	42.29	0.00120542	13.64	1.14045437	0.00	0.00704879	0.00	0.00103497	0.25	0.00489394	168.42	288.74	0.14
	HARDEMAN	0.007011794	8.8092	0.0001404	0.04	0.00517852	0.00	0.00023456	0.09	5.1791E-05	0.84	5.0124E-05	0.57	0.00144175	0.00	0.00022327	0.00	4.9589E-05	0.01	0.00025523	8.78	19.15	0.01
	HASKELL	0.195882927	246.0959	0.00392237	1.22	0.14466827	0.00	0.00655279	2.60	0.00144685	23.50	0.00140029	15.84	0.04027689	0.00	0.00623741	0.00	0.00138534	0.34	0.00713005	245.37	534.96	0.27
	HENDERSON	0.003151289	3.9591	0.00317819	0.99	0.00232737	0.00	0.00526195	2.08	0.0013775	22.38	0.00045407	5.14	0.00448926	0.00	0.0156021	0.00	0.00533833	1.30	0.02866858	986.58	1,022.42	0.51
	HOWARD	0.001294958	1.6269	0.00130601	0.41	0.00095638	0.00	0.00216229	0.86	0.00056606	9.19	0.00018659	2.11	0.00184477	0.00	0.00641136	0.00	0.00219368	0.53	0.01178077	405.41	420.14	0.21
	HOOD	0.029930315	37.6027	0.0301858	9.40	0.02210487	0.00	0.04997696	19.80	0.01308323	212.52	0.00431269	48.78	0.04263809	0.00	0.14818564	0.00	0.0507024	12.34	0.27228849	9370.31	9,710.75	4.86
	JONES	0.093145673	117.0228	0.00186516	0.58	0.06879223	0.00	0.00311597	1.23	0.000688	11.18	0.00066586	7.53	0.01915235	0.00	0.00296599	0.00	0.00065875	0.16	0.00339046	116.68	254.38	0.13
	LAMAR	0.00115509	1.4511	0.00116492	0.36	0.00085306	0.00	0.00192869	0.76	0.0005049	8.20	0.00016643	1.88	0.00164547	0.00	0.00571872	0.00	0.00195669	0.48	0.01050805	361.62	374.75	0.19
	LIMESTONE	0.012894146	16.1995	0.01597135	4.97	0.0095229	0.00	0.00537766	2.13	0.0077231	1587.45	0.02220238	251.15	0.0089248	0.00	0.00566029	0.00	0.00682478	1.66	0.00937252	322.54	2,186.10	1.09
	MCLENNAN	0.05325577	66.9075	0.05371035	16.72	0.03933176	0.00	0.08892527	35.23	0.02327932	378.14	0.00767368	86.80	0.07586704	0.00	0.26367046	0.00	0.09021607	21.95	0.48448983	16672.83	17,278.58	8.64
	MITCHELL	0.04519919	56.7856	0.045585	14.19	0.03338162	0.00	0.07547258	29.90	0.0197576	320.94	0.0065128	73.67	0.0643898	0.00	0.22378216	0.00	0.07656811	18.63	0.41119578	14150.55	14,664.66	7.33
	NOLAN	0.001025023	1.2878	0.00103377	0.32	0.00075703	0.00	0.00171156	0.68	0.00044806	7.28	0.0001477	1.67	0.00146023	0.00	0.00507491	0.00	0.0017364	0.42	0.00932506	320.90	332.56	0.17
	PALO PINTO	0.010167179	12.7735	0.0187261	5.83	0.00750891	0.00	0.02997273	11.88	0.01256078	204.03	0.00362529	41.01	0.09748668	0.00	0.39020837	0.00	0.00400365	0.97	0.01822413	627.15	903.64	0.45
	RED RIVER	0.00311042	3.9078	0.00313697	0.98	0.00229718	0.00	0.00519371	2.06	0.00135964	22.09	0.00044818	5.07	0.00443104	0.00	0.01539976	0.00	0.0052691	1.28	0.02829678	973.78	1,009.16	0.50
	TAYLOR	0.001885023	2.3682	3.7746E-05	0.01	0.00139217	0.00	6.3059E-05	0.02	1.3923E-05	0.23	1.3475E-05	0.15	0.00038759	0.00	6.0024E-05	0.00	1.3331E-05	0.00	6.8614E-05	2.36	5.15	0.00
	TITUS	0.007854045	9.8674	0.00792109	2.47	0.00580906	0.00	0.0131145	5.20	0.00343318	55.77	0.0011317	12.80	0.01118871	0.00	0.03888555	0.00	0.01330487	3.24	0.0714515	2458.87	2,548.21	1.27
	TOM GREEN	0.00089529	1.1248	1.7927E-05	0.01	0.00066121	0.00	2.995E-05	0.01	6.6129E-06	0.11	6.4001E-06	0.07	0.00018409	0.00	2.8508E-05	0.00	6.3317E-06	0.00	3.2588E-05	1.12	2.45	0.00
	YOUNG	0.019487528	24.4830	0.01965387	6.12	0.0143924	0.00	0.03253983	12.89	0.00851845	138.37	0.00280798	31.76	0.02776152	0.00	0.09648317	0.00	0.03301216	8.03	0.17728613	6100.98	6,322.64	3.16
	TARRANT	0.029723615	37.3430	0.02997733	9.33	0.02195221	0.00	0.04963181	19.66	0.01299287	211.05	0.00428291	48.45	0.04234363	0.00	0.14716226	0.00	0.05035225	12.25	0.27040805	9305.60	9,643.69	4.82
	WICHITA	0.000471631	0.5925	0.00047566	0.15	0.00034832	0.00	0.00078752	0.31	0.00020616	3.35	6.7958E-05	0.77	0.00067188	0.00	0.00233505	0.00	0.00079895	0.19	0.00429062	147.65	153.02	0.08
	WILBARGER	0.074052599	93.0354	0.00148283	0.46	0.05469115	0.00	0.00247725	0.98	0.00054697	8.88	0.00052937	5.99	0.01522649	0.00	0.00235802	0.00	0.00052372	0.13	0.00269548	92.76	202.24	0.10
	WISE	1.54736E-05	0.0194	2.85E-05	0.01	1.1428E-05	0.00	4.5616E-05	0.02	1.9117E-05	0.31	5.5174E-06	0.06	0.00014837	0.00	0.00059387	0.00	6.0932E-06	0.00	2.7736E-05	0.95	1.38	0.00
	ELLIS		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	HUNT		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	KAUFMAN		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	ROCKWALL		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	RUSK		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Houston - Galveston Area	BRAZORIA	0.011584147	14.5536	0.01434872	4.47	0.00855541	0.00	0.00483131	1.91	0.08779856	1426.17	0.0199467	225.63	0.00801419	0.00	0.00508523	0.00	0.00613141	1.49	0.00842032	289.77	1,964.00	0.98
	BRAZOS	0.002939669	3.6932	0.00541434	1.69	0.00217108	0.00	0.00866611	3.43	0.0036374	58.99	0.00104819	11.86	0.02818664	0.00	0.11282221	0.00	0.00115759	0.28	0.0052692	181.33	261.27	0.13
	GRIMES	0.000352817	0.4433	0.00064982	0.20	0.00026057	0.00	0.0010401	0.41	0.00043588	7.08	0.0001258	1.42	0.00338294	0.00	0.01354083	0.00	0.00013893	0.03	0.00063241	21.76	31.36	0.02
	WHARTON	0.000859628	1.0800	0.00106478	0.33	0.00063487	0.00	0.00035852	0.14	0.0065153	105.83	0.00148019	16.74	0.00059471	0.00	0.00037736	0.00	0.000455	0.11	0.00062485	21.50	145.74	0.07
	CHAMBERS	0.026594037	33.3547	0.03288499	10.24	0.01960765	0.00	0.01107259	4.39	0.20122045	3268.57	0.04571469	517.11	0.01836725	0.00	0.01165454	0.00	0.01405221	3.42	0.01929805	664.11	4,501.18	2.25
	FORT BEND	0.101391373	127.3822	0.12558854	39.09	0.07488205	0.00	0.04228648	16.75	0.76846545	12482.73	0.17458545	1974.87	0.07014496	0.00	0.04450894	0.00	0.05366573	13.06	0.07369968	2536.24	17,190.12	8.60
	GALVESTON	0.045304684	56.9182	0.05591643	17.40	0.03345953	0.00	0.01998506	7.92	0.33715771	5476.69	0.07663686	866.90	0.03198055	0.00	0.02381461	0.00	0.51082916	124.29	0.04021583	1383.95	7,934.08	3.97
	ROBERTSON	0.003269549	4.1077	0.00370118	1.15	0.00241471	0.00	0.00326161	1.29	0.01395949	226.75	0.00323927	36.64	0.00337216	0.00	0.00827153	0.00	0.84932265	206.65	0.0150589	518.22	994.82	0.50
	HARRIS	0.069468248	87.2759	0.08604692	26.78	0.0513054	0.00	0.02897256	11.48	0.52651372	8552.53	0.11961713	1353.08	0.04805979	0.00	0.03049528	0.00	0.03676905	8.95	0.0504953	1737.70	11,777.80	5.89
	HARDIN		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	JEFFERSON		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	LIBERTY		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	MONTGOMERY		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	ORANGE		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WALLER		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
El Paso Area	EL PASO		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Etc.	ANDREWS	6.67623E-05	0.0839	6.7332E-05	0.02	4.9307E-05	0.00	0.00011148	0.04	2.9183E-05	0.47	9.6198E-06	0.11	9.5108E-05	0.00	0.00033054	0.00	0.0001131	0.03	0.00060736	20.90	21.66	0.01
	CROCKETT	0.075441526	94.7803	0.00151065	0.47	0.05571693	0.00	0.00252372	1.00	0.00055723	9.05	0.0005393	6.10	0.01551207	0.00	0.00240225	0.00	0.00053354	0.13	0.00274604	94.50	206.03	0.10
	FREESTONE	0.025200214	31.6601	0.02541532	7.91	0.01861148	0.00	0.04207874	16.67	0.01101559	178.93	0.00363112	41.07	0.03589969	0.00	0.1247668	0.00	0.04268954	10.39	0.2292568	7889.45	8,176.09	4.09
	CALHOUN	0.169651094	213.1398	0.0033971	1.06	0.1252949	0.00	0.00567527	2.25	0.00125309	20.35	0.00121277	13.72	0.03488318	0.00	0.00540212	0.00	0.00119982	0.29	0.00617522	212.51	463.32	0.23
	HIDALGO	0.125605549	157.8035	0.00251513	0.78	0.0927653	0.00	0.00420183	1.66	0.00092776	15.07	0.0008979	10.16	0.02582666	0.00	0.0039996	0.00	0.00088832	0.22	0.00457198	157.34	343.03	0.17
	CAMERON	0.125578894	157.7700	0.0025146	0.78	0.39341934	0.00	0.00420094	1.66	0.00092756	15.07	0.00089771	10.15	0.02582118	0.00	0.00399875	0.00	0.00088813	0.22	0.00457101	157.30	342.96	0.17
	PECOS	0.000135659	0.1704	4.984E-05	0.02	0.00010019	0.00	8.2544E-05	0.03	2.1488E-05	0.35	7.498E-06	0.08	8.6003E-05	0.00	0.00023882	0.00	8.1378E-05	0.02	0.00043689	15.03	15.71	0.01
	PRESIDIO	0.000237673	0.2986	4.7592E-06	0.00	0.00017553	0.00	7.9508E-06	0.00	1.7555E-06	0.03	1.699E-06	0.02	4.887E-05	0.00	7.5681E-06	0.00	1.6809E-06	0.00	8.6512E-06	0.30	0.65	0.00
	SAN PATRICIO	0.038088543	47.8522	0.00076269	0.24	0.02813009	0.00	0.00127416	0.50	0.00028133	4.57	0.00027228	3.08	0.00783166	0.00	0.00121284	0.00	0.00026937	0.07	0.00138641	47.71	104.02	0.05
	WARD	0.057516808	72.2608	0.05800776	18.06	0.04247673	0.00	0.09604025	38.05	0.02514192	408.40	0.00828766	93.75	0.08193722	0.00	0.28476696	0.00	0.09743434	23.71	0.5235426	18006.84	18,661.06	9.33
	WEBB	0.051854261	65.1467	0.00103833	0.32	0.03829668	0.00	0.00173466	0.69	0.00038301	6.22	0.00037068	4.19	0.01066213	0.00	0.00165117	0.00	0.00036673	0.09	0.00188747	64.95	141.61	0.07
	NUECES	0.556471643	699.1186	0.01114282	3.47	0.41097912	0.00	0.01861543	7.38	0.00411026	66.77	0.00397799	45.00	0.11442012	0.00	0.01771947	0.00	0.00393551	0.96	0.02025531	697.05	1,519.73	0.76
	UPTON	3.45456E-05	0.0434	3.4841E-05	0.01	2.5513E-05	0.00	5.7684E-05	0.02	1.5101E-05	0.25	4.9777E-06	0.06	4.9213E-05	0.00	0.00017104	0.00	5.8521E-05	0.01	0.00031428	10.82	11.21	0.01
	VICTORIA	0.26869859	337.5773	0.00810515	2.52	0.19844589	0.00	0.01340471	5.31	0.00357559	58.08	0.0025326	28.65	0.85346281	0.00	0.05715275	0.00	0.00239431	0.58	0.01201749	413.56	846.28	0.42
	GREGG		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	HARRISON		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	SMITH		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	UPSHUR		0.0000		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	TOTAL	**2.59433808**		**2.15884660**		**2.21670807**		**2.46753295**		**2.26120971**		**2.46530416**		**3.34809944**		**3.09910920**		**2.11715092**		**3.63318167**		195,070.81	**97.54**

Energy Savings by PCA from ESL (MWh)	1256.34	311.27	0.00	396.21	16243.71	11311.77	0.00	0.00	243.31	34413.17

Table 71: 2005 Totalized OSD Electricity Savings from IECC / IRC by PCA for Commercial Buildings (w/7% T&D).

NERC	County	Total Energy Savings by County (MWh)	PCA 1	Percentage	Energy Savings by County for PCA 1 (MWh)	PCA 2	Percentage	Energy Savings by County for PCA 2 (MWh)
ERCOT	CALDWELL	0.28	American Electric Power - West (ERCOT)/PCA	100%	0.28			0.00
	NUECES	7.32	American Electric Power - West (ERCOT)/PCA	100%	7.32			0.00
	SAN PATRICIO	0.17	American Electric Power - West (ERCOT)/PCA	100%	0.17			0.00
	VICTORIA	1.98	American Electric Power - West (ERCOT)/PCA	100%	1.98			0.00
	HAYS	2.06	Lower Colorado River Authority/PCA	100%	2.06			0.00
	BRAZORIA	6.80	Reliant Energy HL&P/PCA	97%	6.62	Texas-New Mexico Power Co/PCA	3%	0.18
	CHAMBERS	0.18	Reliant Energy HL&P/PCA	70%	0.13	Entergy Electric System/PCA	30%	0.05
	FORT BEND	12.80	Reliant Energy HL&P/PCA	100%	12.80			0.00
	GALVESTON	8.16	Reliant Energy HL&P/PCA	97%	7.94	Texas-New Mexico Power Co/PCA	3%	0.22
	HARRIS	86.12	Reliant Energy HL&P/PCA	70%	60.05	Entergy Electric System/PCA	30%	26.07
	WALLER	-4.68	Reliant Energy HL&P/PCA	100%	-4.68			0.00
	BEXAR	54.82	San Antonio Public Service Bd/PCA	100%	54.82			0.00
	WILSON	0.15	San Antonio Public Service Bd/PCA	100%	0.15			0.00
	COMAL	0.50	San Antonio Public Service Bd/PCA	100%	0.50			0.00
	GUADALUPE	4.67	San Antonio Public Service Bd/PCA	100%	4.67			0.00
	BASTROP	2.08	TXU Electric/PCA	100%	2.08			0.00
	COLLIN	33.67	TXU Electric/PCA	98%	32.97	Texas-New Mexico Power Co/PCA	2%	0.70
	DALLAS	48.70	TXU Electric/PCA	100%	48.70			0.00
	DENTON	15.47	TXU Electric/PCA	98%	15.15	Texas-New Mexico Power Co/PCA	2%	0.32
	ELLIS	-1.70	TXU Electric/PCA	100%	-1.70			0.00
	HENDERSON	1.64	TXU Electric/PCA	100%	1.64			0.00
	HOOD	0.71	TXU Electric/PCA	98%	0.70	Texas-New Mexico Power Co/PCA	2%	0.01
	HUNT	1.27	TXU Electric/PCA	98%	1.25	Texas-New Mexico Power Co/PCA	2%	0.03
	JOHNSON	1.92	TXU Electric/PCA	98%	1.88	Texas-New Mexico Power Co/PCA	2%	0.04
	KAUFMAN	-1.35	TXU Electric/PCA	100%	-1.35			0.00
	PARKER	1.19	TXU Electric/PCA	100%	1.19			0.00
	ROCKWALL	1.48	TXU Electric/PCA	100%	1.48			0.00
	SMITH	5.35	TXU Electric/PCA	100%	5.35			0.00
	TARRANT	59.17	TXU Electric/PCA	100%	59.17			0.00
	TRAVIS	30.62	TXU Electric/PCA	97%	29.60	Austin Energy/PCA	3%	1.02
	WILLIAMSON	15.94	TXU Electric/PCA	97%	15.41	Austin Energy/PCA	3%	0.53
WSCC	EL PASO	12.21	El Paso Electric Co/PCA	100%	12.21			0.00
SERC	HARDIN	1.90	Entergy Electric System/PCA	30%	0.58	Reliant Energy HL&P/PCA	70%	1.33
	JEFFERSON	9.91	Entergy Electric System/PCA	100%	9.91			0.00
	LIBERTY	1.25	Entergy Electric System/PCA	100%	1.25			0.00
	MONTGOMERY	27.62	Entergy Electric System/PCA	30%	8.36	Reliant Energy HL&P/PCA	70%	19.26
	ORANGE	1.73	Entergy Electric System/PCA	100%	1.73			0.00
SPP	GREGG	3.15	Southwestern Public Service Co/PCA	100%	3.15			0.00
	HARRISON	1.63	Southwestern Public Service Co/PCA	100%	1.63			0.00
	RUSK	0.00	Southwestern Public Service Co/PCA	100%	0.00			0.00
	UPSHUR	0.26	Southwestern Public Service Co/PCA	100%	0.26			0.00

PCA	Total Electricity Savings by PCA (MWh)
American Electric Power - West (ERCOT)/PCA	9.75
Austin Energy /PCA	1.55
Brownsville Public Utils Board/PCA	0.00
Lower Colorado River Authority /PCA	2.06
Reliant Energy HL&P/PCA	103.44
San Antonio Public Service Bd /PCA	60.14
South Texas Electric Coop Inc/PCA	0.00
Texas Municipal Power Pool/PCA	0.00
Texas-New Mexico Power Co/PCA	1.51
TXU Electric /PCA	213.53
Total	391.97

Table 72: 2005 OSD NOx Reductions from Electricity Savings from the IECC / IRC by PCA for Commercial Buildings by County using 1999 eGRID (w/7% T&D).

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Authority /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total NOx Reductions (lbs)	Total NOx Reductions (Tons)
Austin-San Antonio Area	BASTROP	0.012215415	0.12	0.4663901	0.72	0.00902163	0.00	0.817318002	1.68	0.00755428	0.78	0.02170659	1.31	0.006483441	0.00	0.01133142	0.00	0.00245301	0.00	0.01120603	2.39	7.01	0.00
	BEXAR	0.055151593	0.54	0.08545943	0.13	0.04073191	0.00	0.149645941	0.31	0.00188468	0.19	1.88754037	113.52	0.077368362	0.00	0.00770739	0.00	0.0008576	0.00	0.00413279	0.88	115.58	0.06
	HAYS	9.07402E-06	0.00	0.00034645	0.00	6.7016E-06	0.00	0.000607132	0.00	5.6116E-06	0.00	1.6124E-05	0.00	4.81612E-06	0.00	8.4174E-06	0.00	1.8222E-06	0.00	8.3242E-06	0.00	0.01	0.00
	TRAVIS	0.000828265	0.01	0.48656288	0.75	0.00061171	0.00	0.055118588	0.11	0.00054358	0.06	0.00147156	0.09	0.000440334	0.00	0.00076612	0.00	0.00016781	0.00	0.00075897	0.16	1.18	0.00
	FAYETTE	0.001485019	0.01	0.05669872	0.09	0.00109675	0.00	0.099360775	0.20	0.00091837	0.09	0.00263885	0.16	0.000788187	0.00	0.00137755	0.00	0.00029821	0.00	0.00136231	0.29	0.85	0.00
	LLANO	0.007176248	0.07	0.27399242	0.42	0.00529998	0.00	0.480153706	0.99	0.00443795	0.46	0.01275207	0.77	0.003808858	0.00	0.00665692	0.00	0.00144108	0.00	0.00658326	1.41	4.12	0.00
	CALDWELL		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	COMAL		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	GUADALUPE		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WILLIAMSON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WILSON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Dallas-Fort Worth Area	ANGELINA	0.000494588	0.00	0.00049881	0.00	0.00036528	0.00	0.000825851	0.00	0.0002162	0.02	7.1266E-05	0.00	0.000704579	0.00	0.00244871	0.00	0.00083784	0.00	0.00449947	0.96	1.00	0.00
	COLLIN	0.007169953	0.07	0.01253841	0.02	0.00529533	0.00	0.020113269	0.04	0.00821861	0.85	0.00238641	0.14	0.062210088	0.00	0.24840578	0.00	0.00386471	0.01	0.01870204	3.99	5.12	0.00
	DALLAS	0.049181758	0.48	0.05006993	0.08	0.03632292	0.00	0.08284103	0.17	0.02194718	2.27	0.00720608	0.43	0.074651961	0.00	0.26228915	0.00	0.08258381	0.12	0.4433209	94.66	98.22	0.05
	DENTON	0.004478418	0.04	0.00824843	0.01	0.00330751	0.00	0.013202327	0.03	0.00553275	0.57	0.00159686	0.10	0.042940735	0.00	0.17187819	0.00	0.00176352	0.00	0.00802733	1.71	2.47	0.00
	JOHNSON	4.90169E-05	0.00	9.028E-05	0.00	3.6201E-05	0.00	0.000144501	0.00	6.0557E-05	0.01	1.7478E-05	0.00	0.000469992	0.00	0.00188123	0.00	1.9302E-05	0.00	8.786E-05	0.02	0.03	0.00
	PARKER	0.000692972	0.01	0.00127633	0.00	0.00051179	0.00	0.00204287	0.00	0.00085611	0.09	0.00024709	0.01	0.006644473	0.00	0.02659573	0.00	0.00027288	0.00	0.00124212	0.27	0.38	0.00
	CHEROKEE	0.010981286	0.11	0.01107502	0.02	0.00811017	0.00	0.018336302	0.04	0.00480017	0.50	0.0015823	0.10	0.015643707	0.00	0.05436859	0.00	0.01860246	0.03	0.09990132	21.33	22.11	0.01
	COKE	0.021538872	0.21	0.0004313	0.00	0.01590742	0.00	0.000720531	0.00	0.00015909	0.02	0.00015397	0.01	0.004428762	0.00	0.00068585	0.00	0.00015233	0.00	0.000784	0.17	0.41	0.00
	COLEMAN	0.00724308	0.07	0.00014505	0.00	0.00534988	0.00	0.000242324	0.00	5.3505E-05	0.01	5.1783E-05	0.00	0.001489451	0.00	0.00023066	0.00	5.123E-05	0.00	0.00026367	0.06	0.14	0.00
	FANNIN	0.020337335	0.20	0.02051093	0.03	0.01502003	0.00	0.033958817	0.07	0.00888992	0.92	0.00293043	0.18	0.028972134	0.00	0.10069058	0.00	0.03445175	0.05	0.18501717	39.51	40.95	0.02
	FRIO	0.047394602	0.46	0.00480871	0.01	0.03500303	0.00	0.007841019	0.02	0.00260367	0.27	0.00120542	0.07	1.140454367	0.00	0.07034879	0.00	0.00103497	0.00	0.00489394	1.04	1.87	0.00
	HARDEMAN	0.007011794	0.07	0.0001404	0.00	0.00517852	0.00	0.00023563	0.00	5.1791E-05	0.01	5.0124E-05	0.00	0.001441745	0.00	0.00022327	0.00	4.9589E-05	0.00	0.00025523	0.05	0.13	0.00
	HASKELL	0.195882927	1.91	0.00392237	0.01	0.14466827	0.00	0.006552794	0.01	0.00144685	0.15	0.00140029	0.08	0.040276892	0.00	0.00623741	0.00	0.00138534	0.00	0.00713005	1.52	3.69	0.00
	HENDERSON	0.003151289	0.03	0.00317819	0.00	0.00232737	0.00	0.00526195	0.01	0.0013775	0.14	0.00045407	0.03	0.004489259	0.00	0.0156021	0.00	0.00533833	0.01	0.02866858	6.12	6.35	0.00
	HOWARD	0.001294958	0.01	0.00130601	0.00	0.00095638	0.00	0.002162291	0.00	0.00056606	0.06	0.00018659	0.01	0.001844769	0.00	0.00641136	0.00	0.00219368	0.00	0.01178077	2.52	2.61	0.00
	HOOD	0.029930315	0.29	0.0301858	0.05	0.02210487	0.00	0.049976957	0.10	0.01308323	1.35	0.00431269	0.26	0.04263809	0.00	0.14818564	0.00	0.0507024	0.08	0.27228849	58.14	60.27	0.03
	JONES	0.093145673	0.91	0.00186516	0.00	0.06879223	0.00	0.003115966	0.01	0.000688	0.07	0.00066586	0.04	0.019152349	0.00	0.00296599	0.00	0.00065875	0.00	0.00039046	0.72	1.75	0.00
	LAMAR	0.001155059	0.01	0.00116492	0.00	0.00085306	0.00	0.001928691	0.00	0.0005049	0.05	0.00016643	0.01	0.001645472	0.00	0.00571872	0.00	0.00195669	0.00	0.01050805	2.24	2.33	0.00
	LIMESTONE	0.012894146	0.13	0.01597135	0.02	0.0095229	0.00	0.005377657	0.01	0.09772731	10.11	0.02220238	1.34	0.008920477	0.00	0.00566029	0.00	0.00682478	0.01	0.00937254	2.00	13.62	0.01
	MCLENNAN	0.05325577	0.52	0.05371035	0.08	0.03933176	0.00	0.08892527	0.18	0.02327932	2.41	0.00767368	0.46	0.075867036	0.00	0.26367046	0.00	0.09021607	0.14	0.48448983	103.45	107.24	0.05
	MITCHELL	0.0451991	0.44	0.045585	0.07	0.03338162	0.00	0.075472576	0.16	0.0197576	2.04	0.0065128	0.39	0.064389803	0.00	0.22378216	0.00	0.07656811	0.12	0.41119578	87.80	91.02	0.05
	NOLAN	0.001025023	0.01	0.00103377	0.00	0.00075703	0.00	0.00171156	0.00	0.00044806	0.05	0.0001477	0.01	0.001460226	0.00	0.00507491	0.00	0.0017364	0.00	0.00932506	1.99	2.06	0.00
	PALO PINTO	0.010167179	0.10	0.0187261	0.03	0.00750891	0.00	0.029972731	0.06	0.01256078	1.30	0.00362529	0.22	0.097486682	0.00	0.39020837	0.00	0.00400365	0.01	0.01822413	3.89	5.60	0.00
	RED RIVER	0.00311042	0.03	0.00313697	0.00	0.00229718	0.00	0.005193709	0.01	0.00135964	0.14	0.00044818	0.03	0.004431038	0.00	0.01539976	0.00	0.0052691	0.01	0.02829678	6.04	6.26	0.00
	TAYLOR	0.001885023	0.02	3.7746E-05	0.00	0.00139217	0.00	6.30589E-05	0.00	1.3923E-05	0.00	1.3475E-05	0.00	0.000387593	0.00	6.0024E-05	0.00	1.3331E-05	0.00	6.8614E-05	0.01	0.04	0.00
	TITUS	0.007854045	0.08	0.00792109	0.01	0.00580056	0.00	0.013114505	0.03	0.00343318	0.36	0.0011317	0.07	0.011188705	0.00	0.03888555	0.00	0.01330487	0.02	0.0714515	15.26	15.82	0.01
	TOM GREEN	0.00089529	0.01	1.7927E-05	0.00	0.00066121	0.00	2.99498E-05	0.00	6.6129E-06	0.00	6.4001E-06	0.00	0.000184087	0.00	2.8508E-05	0.00	6.3317E-06	0.00	3.2588E-05	0.01	0.02	0.00
	YOUNG	0.019487528	0.19	0.01965387	0.03	0.01439241	0.00	0.03253983	0.07	0.00851845	0.88	0.00280798	0.17	0.027761517	0.00	0.09648317	0.00	0.03301216	0.05	0.17728613	37.86	39.24	0.02
	TARRANT	0.029723615	0.29	0.0299773	0.05	0.02195221	0.00	0.049631813	0.10	0.01299287	1.34	0.00428291	0.26	0.042343628	0.00	0.14716226	0.00	0.05035225	0.08	0.27040805	57.74	59.85	0.03
	WICHITA	0.000471631	0.00	0.00047566	0.00	0.00034832	0.00	0.000787519	0.00	0.00020616	0.02	6.7958E-05	0.00	0.000671875	0.00	0.00233505	0.00	0.00079895	0.00	0.00429062	0.92	0.95	0.00
	WILBARGER	0.074052599	0.72	0.00148283	0.00	0.05469115	0.00	0.002477252	0.01	0.00054697	0.06	0.00052937	0.03	0.015226485	0.00	0.00235802	0.00	0.00052372	0.00	0.00269548	0.58	1.39	0.00
	WISE	1.54736E-05	0.00	2.85E-05	0.00	1.1428E-05	0.00	4.56161E-05	0.00	1.9117E-05	0.00	5.5174E-06	0.00	0.000148367	0.00	0.00059387	0.00	6.0932E-06	0.00	2.7736E-05	0.01	0.01	0.00
	ELLIS		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	HUNT		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	KAUFMAN		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	ROCKWALL		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	RUSK		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Houston - Galveston Area	BRAZORIA	0.011584147	0.11	0.01434872	0.02	0.00855541	0.00	0.004831306	0.01	0.08779856	9.08	0.0199467	1.20	0.008014188	0.00	0.00508523	0.00	0.00613141	0.01	0.00842032	1.80	12.23	0.01
	BRAZOS	0.002939669	0.03	0.00541434	0.01	0.00217108	0.00	0.008666113	0.02	0.00363174	0.38	0.00104819	0.06	0.02818664	0.00	0.11282221	0.00	0.00115759	0.00	0.0052692	1.13	1.62	0.00
	GRIMES	0.000352817	0.00	0.00064982	0.01	0.00026057	0.00	0.0010401	0.00	0.00043588	0.05	0.0001258	0.01	0.003382938	0.00	0.01354083	0.00	0.00013893	0.00	0.00063241	0.14	0.19	0.00
	WHARTON	0.000859628	0.01	0.00106478	0.00	0.00063487	0.00	0.000358518	0.00	0.0065153	0.67	0.00148019	0.09	0.000594711	0.00	0.00037736	0.00	0.000455	0.00	0.00062485	0.13	0.91	0.00
	CHAMBERS	0.026549037	0.26	0.03288499	0.05	0.01960765	0.00	0.011072591	0.02	0.20122045	20.81	0.04571469	2.75	0.018367255	0.00	0.01165454	0.00	0.01405221	0.02	0.01929805	4.12	28.04	0.01
	FORT BEND	0.101391373	0.99	0.12558854	0.19	0.07488205	0.00	0.042286475	0.09	0.76846545	79.49	0.17458545	10.50	0.070144962	0.00	0.04450894	0.00	0.05366573	0.08	0.07369968	15.74	107.08	0.05
	GALVESTON	0.045304684	0.44	0.05591643	0.09	0.03345953	0.00	0.019985056	0.04	0.33715771	34.87	0.07663686	4.61	0.031980551	0.00	0.02381461	0.00	0.51082916	0.77	0.04021583	8.59	49.41	0.02
	ROBERTSON	0.003269549	0.03	0.00370118	0.01	0.00241471	0.00	0.00326161	0.01	0.01395949	1.44	0.0323927	0.19	0.00337216	0.00	0.00827153	0.00	0.84932265	1.28	0.0150589	3.22	6.18	0.00
	HARRIS	0.069468248	0.68	0.08604692	0.13	0.0513054	0.00	0.028972557	0.06	0.52651372	54.46	0.11961713	7.19	0.048059785	0.00	0.03049528	0.00	0.03676905	0.06	0.0504953	10.78	73.36	0.04
	HARDIN		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	JEFFERSON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	LIBERTY		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	MONTGOMERY		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	ORANGE		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	WALLER		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
El Paso Area	EL PASO		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
Etc.	ANDREWS	6.67623E-05	0.00	6.7332E-05	0.00	4.9307E-05	0.00	0.000111478	0.00	2.9183E-05	0.00	9.6198E-06	0.00	9.51081E-05	0.00	0.00033054	0.00	0.0001131	0.00	0.00060736	0.13	0.13	0.00
	CROCKETT	0.075441526	0.74	0.00151065	0.00	0.05571693	0.00	0.002523716	0.01	0.00055723	0.06	0.0005393	0.03	0.015512072	0.00	0.00240225	0.00	0.00053354	0.00	0.00274604	0.59	1.42	0.00
	FREESTONE	0.025200214	0.25	0.02541532	0.04	0.01861148	0.00	0.042078742	0.09	0.01101559	1.14	0.00363112	0.22	0.035899688	0.00	0.1247668	0.00	0.04268954	0.06	0.2292568	48.95	50.75	0.03
	CALHOUN	0.169651094	1.65	0.0033971	0.01	0.1252949	0.00	0.005675271	0.01	0.00125309	0.13	0.00121277	0.07	0.034883177	0.00	0.00540212	0.00	0.00119982	0.00	0.00617522	1.32	3.19	0.00
	HIDALGO	0.125605549	1.23	0.00251513	0.00	0.0927653	0.00	0.004201833	0.01	0.00092776	0.10	0.0008979	0.05	0.025826656	0.00	0.0039996	0.00	0.00088832	0.00	0.00457198	0.98	2.37	0.00
	CAMERON	0.125578894	1.22	0.0025146	0.00	0.39341934	0.00	0.004200941	0.01	0.00092756	0.10	0.00089771	0.05	0.025821176	0.00	0.00399875	0.00	0.00088813	0.00	0.00457101	0.98	2.36	0.00
	PECOS	0.000135659	0.00	4.984E-05	0.00	0.00010019	0.00	8.25436E-05	0.00	2.1488E-05	0.00	7.498E-06	0.00	8.60031E-05	0.00	0.00023882	0.00	8.1378E-05	0.00	0.00043689	0.09	0.10	0.00
	PRESIDIO	0.000237673	0.00	4.7592E-06	0.00	0.00017553	0.00	7.95078E-06	0.00	1.7555E-06	0.00	1.699E-06	0.00	4.88697E-05	0.00	7.5681E-06	0.00	1.6809E-06	0.00	8.6512E-06	0.00	0.00	0.00
	SAN PATRICIO	0.038088543	0.37	0.00076269	0.00	0.02813009	0.00	0.001274161	0.00	0.00028133	0.03	0.00027228	0.02	0.007831658	0.00	0.00121284	0.00	0.00026937	0.00	0.00138641	0.30	0.72	0.00
	WARD	0.057516808	0.56	0.05800776	0.09	0.04247873	0.00	0.096040254	0.20	0.02514192	2.60	0.00828766	0.50	0.08193722	0.00	0.28476696	0.00	0.09743434	0.15	0.52325426	111.73	115.82	0.06
	WEBB	0.05185426	0.51	0.00103833	0.00	0.03829668	0.00	0.00173466	0.00	0.00038301	0.04	0.00037068	0.02	0.010662126	0.00	0.00165117	0.00	0.00036673	0.00	0.00188747	0.40	0.98	0.00
	NUECES	0.556471643	5.43	0.01114282	0.02	0.41097912	0.00	0.018615427	0.04	0.00411026	0.43	0.00397799	0.24	0.11442012	0.00	0.01771947	0.00	0.00393551	0.01	0.02025531	4.33	10.48	0.01
	UPTON	3.45456E-05	0.00	3.4841E-05	0.00	2.5513E-05	0.00	5.76835E-05	0.00	1.5101E-05	0.00	4.9773E-06	0.00	4.9213E-05	0.00	0.00017104	0.00	5.8521E-05	0.00	0.00031428	0.07	0.07	0.00
	VICTORIA	0.26869859	2.62	0.00810515	0.01	0.19844589	0.00	0.013404713	0.03	0.00357559	0.37	0.0025326	0.15	0.853462815	0.00	0.05715275	0.00	0.00239431	0.00	0.01201749	2.57	5.75	0.00
	GREGG		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	HARRISON		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	SMITH		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	UPSHUR		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00
	TOTAL	**2.59433808**		**2.15884660**		**2.21670807**		**2.46753295**		**2.26120971**		**2.46530416**		**3.34809944**		**3.09910920**		**2.11715092**		**3.63318167**		1,194.86	**0.60**

Energy Savings by PCA from ESL (MWh)	9.75		1.55		0.00		2.06		103.44		60.14		0.00		0.00		1.51		213.53			

Table 73: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Commercial Buildings by County using 1999 eGRID (w/7% T&D).

	Electricity Savings and Resultant NOx Reductions (Commercial)			
County	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual NOx Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD NOx Reductions (Tons)
Harris	12459.62	5.89	86.12	0.04
Tarrant	10596.37	4.82	59.17	0.03
Collin	6056.85	0.41	33.67	0.00
Dallas	6462.01	7.91	48.70	0.05
Bexar	10257.22	10.84	54.82	0.06
Travis	6012.55	0.11	30.62	0.00
Denton	1027.81	0.20	15.47	0.00
Williamson	3340.55	0.00	15.94	0.00
El Paso	1807.92	0.00	12.21	0.00
Montgomery	5629.05	0.00	27.62	0.00
Galveston	1635.90	3.97	8.16	0.02
Brazoria	1323.03	0.98	6.80	0.01
Comal	40.10	0.00	0.50	0.00
Rockwall	142.30	0.00	1.48	0.00
Hays	396.21	0.00	2.06	0.00
Nueces	738.02	0.76	7.32	0.01
Fort Bend	2309.93	8.60	12.80	0.05
Ellis	-823.62	0.00	-1.70	0.00
Johnson	410.85	0.00	1.92	0.00
Guadalupe	980.83	0.00	4.67	0.00
Kaufman	-834.31	0.00	-1.35	0.00
Jefferson	1875.38	0.00	9.91	0.00
Parker	224.75	0.03	1.19	0.00
Smith	1096.85	0.00	5.35	0.00
Bastrop	452.44	0.62	2.08	0.00
Chambers	38.30	2.25	0.18	0.01
Gregg	587.69	0.00	3.15	0.00
San Patricio	36.14	0.05	0.17	0.00
Liberty	262.62	0.00	1.25	0.00
Victoria	420.10	0.42	1.98	0.00
Orange	374.08	0.00	1.73	0.00
Caldwell	62.07	0.00	0.28	0.00
Wilson	33.62	0.00	0.15	0.00
Hardin	402.41	0.00	1.90	0.00
Harrison	325.26	0.00	1.63	0.00
Waller	-1866.05	0.00	-4.68	0.00
Upshur	54.43	0.00	0.26	0.00
Rusk	0.00	0.00	0.00	0.00
Hood	148.24	4.86	0.71	0.03
Hunt	225.45	0.00	1.27	0.00
Henderson	348.63	0.51	1.64	0.00
Ward		9.33		0.06
McLennan		8.64		0.05
Mitchell		7.33		0.05
Freestone		4.09		0.03
Fannin		3.30		0.02
Young		3.16		0.02
Cherokee		1.78		0.01
Titus		1.27		0.01
Limestone		1.09		0.01
Red River		0.50		0.00
Robertson		0.50		0.00
Palo Pinto		0.45		0.00
Llano		0.36		0.00
Haskell		0.27		0.00
Howard		0.21		0.00
Calhoun		0.23		0.00
Lamar		0.19		0.00
Nolan		0.17		0.00
Hidalgo		0.17		0.00
Cameron		0.17		0.00
Frio		0.14		0.00
Brazos		0.13		0.00
Jones		0.13		0.00
Crockett		0.10		0.00
Wilbarger		0.10		0.00
Fayette		0.08		0.00
Angelina		0.08		0.00
Whichita		0.08		0.00
Wharton		0.07		0.00
Webb		0.07		0.00
Coke		0.03		0.00
Grimes		0.02		0.00
Andrews		0.01		0.00
Coleman		0.01		0.00
Hardeman		0.01		0.00
Pecos		0.01		0.00
Upton		0.01		0.00
Taylor		0.00		0.00
Tom Green		0.00		0.00
Wise		0.00		0.00
Presidio		0.00		0.00
Total	**75071.62**	**97.54**	**457.17**	**0.60**

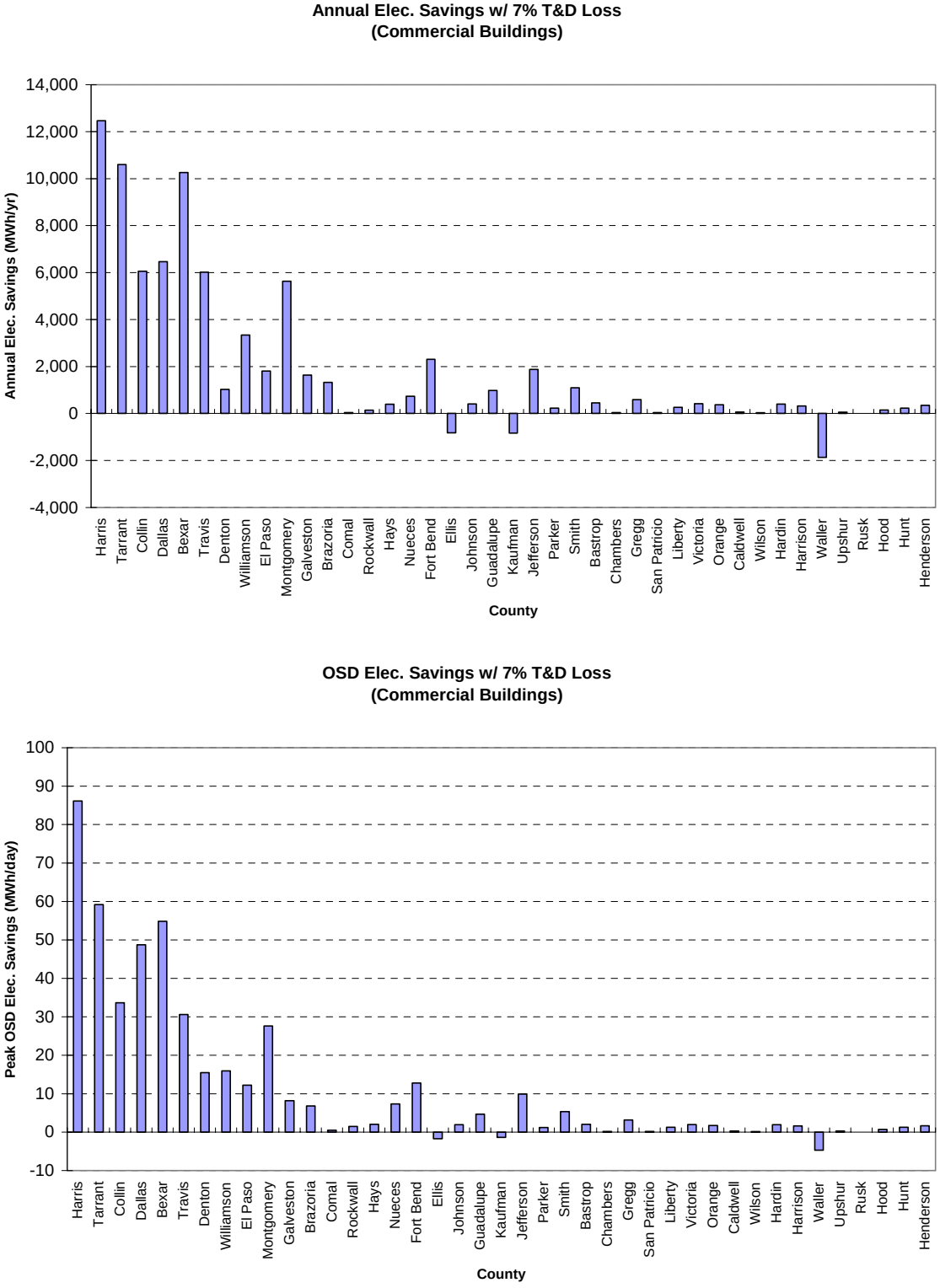


Figure 65: 2005 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Commercial Buildings with 7% T&D losses.

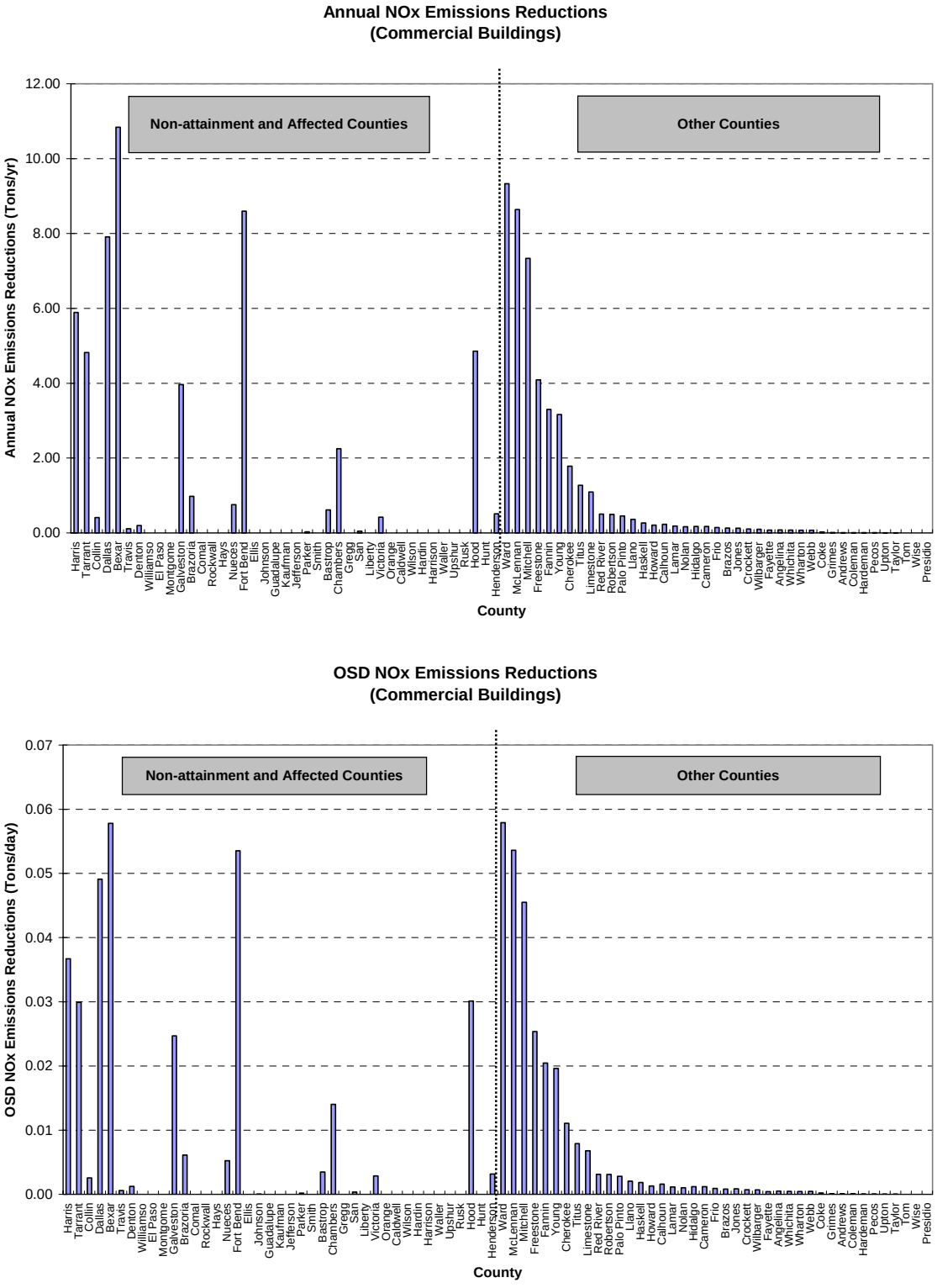
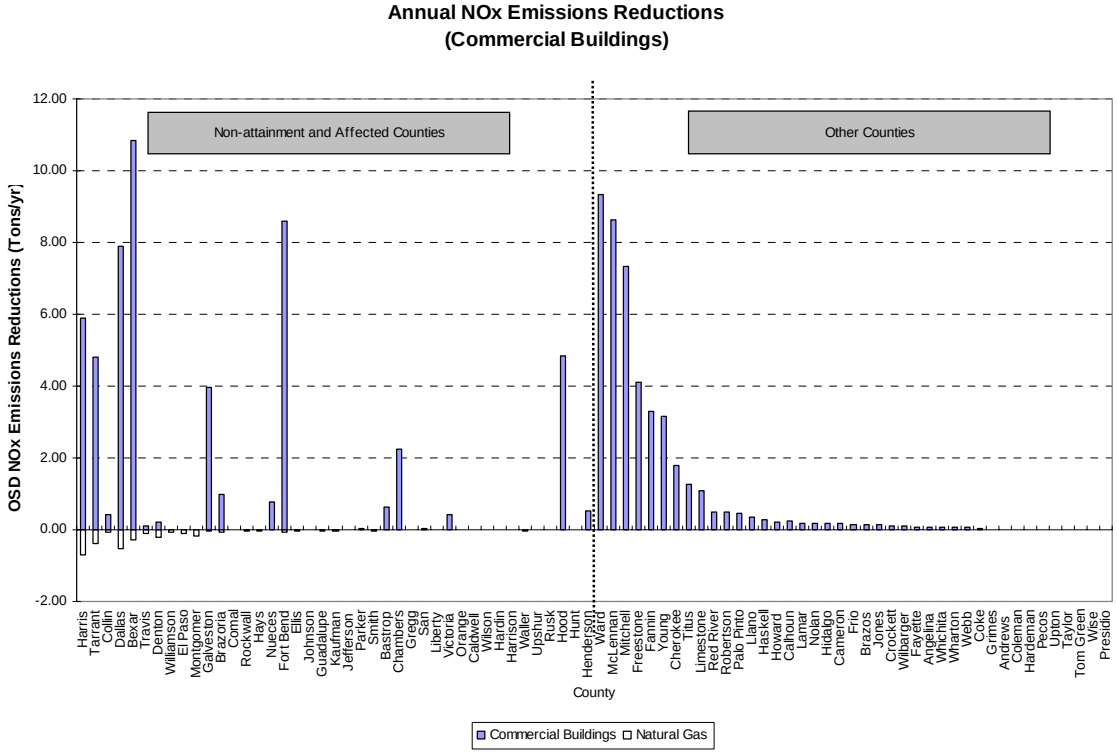


Figure 66: 2005 Annual and OSD NOx Reductions from Electricity Savings from the IECC / IRC by PCA for Commercial Buildings by County using 1999 eGRID with 7% T&D losses.

Table 74: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Commercial Buildings by County using 1999 eGRID.

	Electricity Savings and Resultant NOx Reductions (Commercial)				Natural Gas (Commercial)				Total NOx Reductions	
County	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual NOx Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD NOx Reductions (Tons)	Total Annual N.G. Savings (Therm/County)	Annual NOx Reductions (Tons)	OSD N.G. Savings (Therm/County)	OSD NOx Reductions (Tons)	Annual NOx Reductions (Tons)	OSD NOx Reductions (Tons)
Harris	12459.62	5.89	86.12	0.04	-166205.99	-0.76	-243.72	-0.0011	5.12	0.04
Tarrant	10596.37	4.82	59.17	0.03	-87477.30	-0.40	-128.27	-0.0006	4.42	0.03
Collin	6056.85	0.41	33.67	0.00	-15583.18	-0.07	-22.85	-0.0001	0.34	0.00
Dallas	6462.01	7.91	48.70	0.05	-126040.76	-0.58	-184.82	-0.0009	7.33	0.05
Bexar	10257.22	10.84	54.82	0.06	-62297.93	-0.29	-91.35	-0.0004	10.55	0.06
Travis	6012.55	0.11	30.62	0.00	-22526.12	-0.10	-33.03	-0.0002	0.01	0.00
Denton	1027.81	0.20	15.47	0.00	-47757.24	-0.22	-70.03	-0.0003	-0.02	0.00
Williamson	3340.55	0.00	15.94	0.00	-19983.46	-0.09	-29.30	-0.0001	-0.09	0.00
El Paso	1807.92	0.00	12.21	0.00	-26695.94	-0.12	-39.15	-0.0002	-0.12	0.00
Montgomery	5629.05	0.00	27.62	0.00	-37907.75	-0.17	-55.59	-0.0003	-0.17	0.00
Galveston	1635.90	3.97	8.16	0.02	-5967.50	-0.03	-8.75	0.0000	3.94	0.02
Brazoria	1323.03	0.98	6.80	0.01	-13334.10	-0.06	-19.55	-0.0001	0.92	0.01
Comal	40.10	0.00	0.50	0.00	-722.89	0.00	-1.06	0.0000	0.00	0.00
Rockwall	142.30	0.00	1.48	0.00	-7706.03	-0.04	-11.30	-0.0001	-0.04	0.00
Hays	396.21	0.00	2.06	0.00	-4266.97	-0.02	-6.26	0.0000	-0.02	0.00
Nueces	738.02	0.76	7.32	0.01	-3070.45	-0.01	-4.50	0.0000	0.75	0.01
Fort Bend	2309.93	8.60	12.80	0.05	-17291.67	-0.08	-25.36	-0.0001	8.52	0.05
Ellis	-823.62	0.00	-1.70	0.00	-5962.47	-0.03	-8.74	0.0000	-0.03	0.00
Johnson	410.85	0.00	1.92	0.00	-2425.14	-0.01	-3.56	0.0000	-0.01	0.00
Guadalupe	980.83	0.00	4.67	0.00	-8696.17	-0.04	-12.75	-0.0001	-0.04	0.00
Kaufman	-834.31	0.00	-1.35	0.00	-11120.16	-0.05	-16.31	-0.0001	-0.05	0.00
Jefferson	1875.38	0.00	9.91	0.00	2639.03	0.01	3.87	0.0000	0.01	0.00
Parker	224.75	0.03	1.19	0.00	299.13	0.00	0.44	0.0000	0.03	0.00
Smith	1096.85	0.00	5.35	0.00	-4255.67	-0.02	-6.24	0.0000	-0.02	0.00
Bastrop	452.44	0.62	2.08	0.00	-3949.80	-0.02	-5.79	0.0000	0.60	0.00
Chambers	38.30	2.25	0.18	0.01	-213.51	0.00	-0.31	0.0000	2.25	0.01
Gregg	587.69	0.00	3.15	0.00	-860.78	0.00	-1.26	0.0000	0.00	0.00
San Patricio	36.14	0.05	0.17	0.00	-288.10	0.00	-0.42	0.0000	0.05	0.00
Liberty	262.62	0.00	1.25	0.00	-1709.35	-0.01	-2.51	0.0000	-0.01	0.00
Victoria	420.10	0.42	1.98	0.00	-1901.41	-0.01	-2.79	0.0000	0.41	0.00
Orange	374.08	0.00	1.73	0.00	-3720.45	-0.02	-5.46	0.0000	-0.02	0.00
Caldwell	62.07	0.00	0.28	0.00	-602.69	0.00	-0.88	0.0000	0.00	0.00
Wilson	33.62	0.00	0.15	0.00	-334.86	0.00	-0.49	0.0000	0.00	0.00
Hardin	402.41	0.00	1.90	0.00	-1908.23	-0.01	-2.80	0.0000	-0.01	0.00
Harrison	325.26	0.00	1.63	0.00	-1984.48	-0.01	-2.91	0.0000	-0.01	0.00
Waller	-1866.05	0.00	-4.68	0.00	-11596.01	-0.05	-17.00	-0.0001	-0.05	0.00
Upshur	54.43	0.00	0.26	0.00	-545.70	0.00	-0.80	0.0000	0.00	0.00
Rusk	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00	0.00
Hood	148.24	4.86	0.71	0.03	-1139.91	-0.01	-1.67	0.0000	4.85	0.03
Hunt	225.45	0.00	1.27	0.00	-3666.43	-0.02	-5.38	0.0000	-0.02	0.00
Henderson	348.63	0.51	1.64	0.00	-1465.12	-0.01	-2.15	0.0000	0.50	0.00
Ward		9.33		0.06					9.33	0.06
McLennan		8.64		0.05					8.64	0.05
Mitchell		7.33		0.05					7.33	0.05
Freestone		4.09		0.03					4.09	0.03
Fannin		3.30		0.02					3.30	0.02
Young		3.16		0.02					3.16	0.02
Cherokee		1.78		0.01					1.78	0.01
Titus		1.27		0.01					1.27	0.01
Limestone		1.09		0.01					1.09	0.01
Red River		0.50		0.00					0.50	0.00
Robertson		0.50		0.00					0.50	0.00
Palo Pinto		0.45		0.00					0.45	0.00
Llano		0.36		0.00					0.36	0.00
Haskell		0.27		0.00					0.27	0.00
Howard		0.21		0.00					0.21	0.00
Calhoun		0.23		0.00					0.23	0.00
Lamar		0.19		0.00					0.19	0.00
Nolan		0.17		0.00					0.17	0.00
Hidalgo		0.17		0.00					0.17	0.00
Cameron		0.17		0.00					0.17	0.00
Frio		0.14		0.00					0.14	0.00
Brazos		0.13		0.00					0.13	0.00
Jones		0.13		0.00					0.13	0.00
Crockett		0.10		0.00					0.10	0.00
Wilbarger		0.10		0.00					0.10	0.00
Fayette		0.08		0.00					0.08	0.00
Angelina		0.08		0.00					0.08	0.00
Whichita		0.08		0.00					0.08	0.00
Wharton		0.07		0.00					0.07	0.00
Webb		0.07		0.00					0.07	0.00
Coke		0.03		0.00					0.03	0.00
Grimes		0.02		0.00					0.02	0.00
Andrews		0.01		0.00					0.01	0.00
Coleman		0.01		0.00					0.01	0.00
Hardeman		0.01		0.00					0.01	0.00
Pecos		0.01		0.00					0.01	0.00
Upton		0.01		0.00					0.01	0.00
Taylor		0.00		0.00					0.00	0.00
Tom Green		0.00		0.00					0.00	0.00
Wise		0.00		0.00					0.00	0.00
Presidio		0.00		0.00					0.00	0.00
Total	**75071.62**	**97.54**	**457.17**	**0.60**	**-730243.55**	**-3.36**	**-1070.79**	**-0.0049**	**94.18**	**0.59**



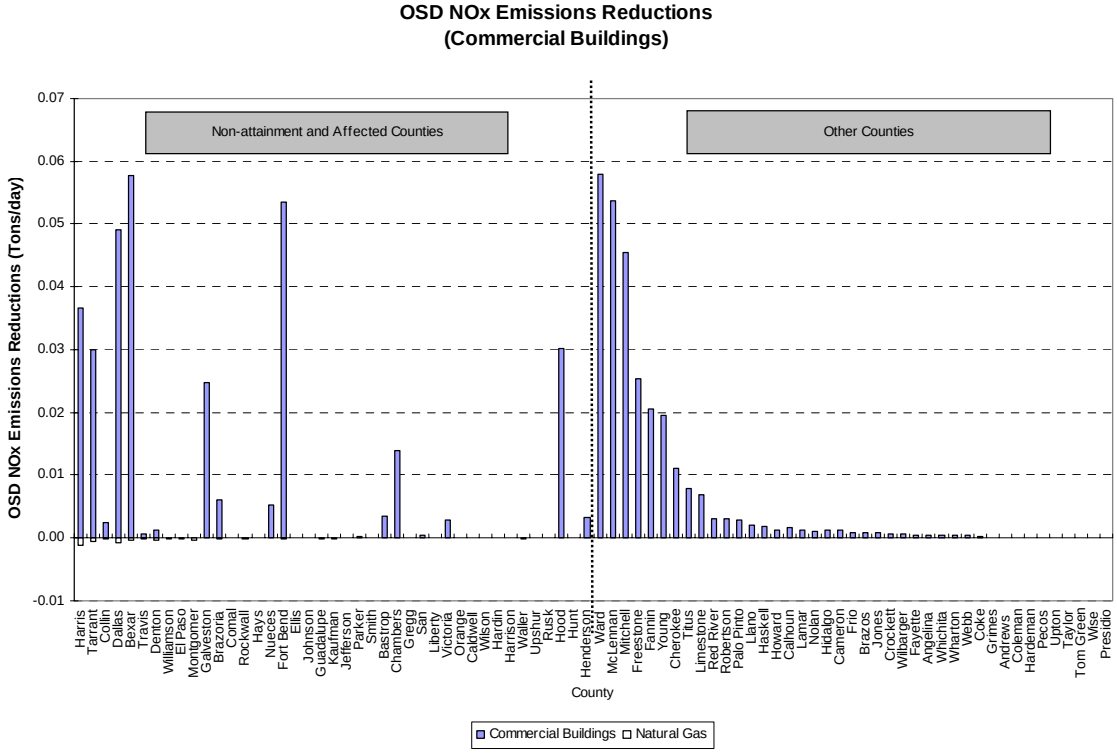


Figure 67: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Commercial Buildings by County using 1999 eGRID and 7% T&D losses.

Table 75: 2005 Annual NOx Reductions from Electricity From the IECC / IRC by PCA for Commercial Buildings by County using 2007 eGRID and 7% T&D losses.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total NOx Reductions (lbs)	Total NOx Reductions (Tons)
Houston-Galveston Area	Brazoria	0.00883113	11.0949209	0.010890729	3.389917719	0.006522185	0	0.003944232	1.562760438	0.0654443	1063.057904	0.014877434	168.2900453	0.006262315	0	0.0048171	0	0.121274957	29.50754843	0.00816387	280.9446296	1557.847727	0.778923863
	Chambers	0.02176222	27.3407902	0.026955801	8.390434412	0.016072371	0	0.009076193	3.59611605	0.1649402	2679.240706	0.037472294	423.8778091	0.015055623	0	0.0095532	0	0.011518588	2.802600868	0.01581859	544.3678674	3689.616324	1.844808162
	Fort Bend	0.07043123	88.4857054	0.087239726	27.15479335	0.052016606	0	0.029374182	11.63846631	0.5338124	8671.09188	0.121275295	1371.837708	0.048726002	0	0.030918	0	0.037278747	9.070334583	0.05119528	1761.791609	11941.0705	5.970535248
	Galveston	0.03385674	42.5356379	0.041710519	12.98308191	0.025004711	0	0.015351589	6.082516549	0.2495874	4054.224276	0.056747051	641.9093446	0.024143087	0	0.0192972	0	0.567751219	138.1401987	0.03283689	1130.021279	6025.896335	3.012948167
	Harris	0.06826733	85.7671056	0.084559408	26.32050024	0.050418468	0	0.028471701	11.28089068	0.5174117	8404.684691	0.117549281	1329.68991	0.047228963	0	0.0299681	0	0.03613341	8.79166122	0.04962237	1707.663022	11574.19778	5.78709889
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.00203914	2.56185079	0.003716345	1.156773123	0.001505992	0	0.005950953	2.357851619	0.0024815	40.30840484	0.000717051	8.111109881	0.019166247	0	0.0766809	0	0.00086441	0.210320621	0.0040002	137.6595287	192.3658396	0.09618292
	Dallas	0.00453947	5.70312751	0.004683963	1.457960062	0.003352602	0	0.00774211	3.067533451	0.0020856	33.87805745	0.00068106	7.703994797	0.007502816	0	0.026717	0	0.007524933	1.830900076	0.04037045	1389.27519	1442.916764	0.721458382
	Denton	0.00047388	0.59535564	0.000872802	0.271673765	0.000349982	0	0.001396994	0.553508717	0.0005854	9.509770453	0.000168971	1.911354868	0.00454374	0	0.0181872	0	0.000186605	0.045403196	0.00084941	29.23072974	42.11779638	0.021058898
	Tarrant	0.01216249	15.2802479	0.012266309	3.818089655	0.008982543	0	0.020308652	8.046575199	0.0053165	86.35974191	0.001752506	19.82393802	0.017326428	0	0.0602168	0	0.020603444	5.013047622	0.11064724	3807.721891	3946.063531	1.973031766
	Ellis	0.00327981	4.12056695	0.003307809	1.029609868	0.002422289	0	0.005476558	2.169889651	0.0014337	23.28830659	0.000472592	5.34584676	0.004672353	0	0.0162384	0	0.005556053	1.351849686	0.02983782	1026.814032	1064.120102	0.532060051
	Johnson	0.00028606	0.35938724	0.000526868	0.163996236	0.000211267	0	0.000843297	0.334126286	0.0003534	5.740585812	0.000101999	1.153791954	0.002742835	0	0.0109787	0	0.000112645	0.027407701	0.00051274	17.64516959	25.42446482	0.012712232
	Kaufman	0.00632545	7.94693063	0.006379446	1.985706892	0.004671629	0	0.010562096	4.184851922	0.002765	44.91385751	0.000911441	10.31000682	0.009011105	0	0.0313175	0	0.010715411	2.607179012	0.05754527	1980.31484	2052.263372	1.026131686
	Parker	0.00021749	0.27324113	0.000400576	0.124685891	0.000160626	0	0.000641157	0.254035303	0.0002687	4.364551717	7.75498E-05	0.877224872	0.00208537	0	0.0083471	0	8.56434E-05	0.020838	0.00038984	13.41557426	19.33015118	0.009665076
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.00081989	1.0300683	0.000826893	0.257384118	0.000605529	0	0.001369042	0.542433742	0.0003584	5.82166161	0.00011814	1.336366418	0.001168005	0	0.0040593	0	0.001388914	0.337938329	0.00745892	256.6852085	266.011061	0.13300553
	Hood	0.01252711	15.7383323	0.012634039	3.932551611	0.009251829	0	0.020917482	8.287802309	0.0054759	88.94870808	0.001805044	20.41823699	0.017845854	0	0.062022	0	0.021221112	5.163333049	0.11396431	3921.873033	4064.361997	2.032180999
	Hunt	0.00618756	7.77368843	0.006240374	1.942418704	0.004569788	0	0.010331844	4.093622618	0.0027047	43.93474044	0.000891572	10.08524982	0.008814664	0	0.0306347	0	0.010481817	2.550342801	0.05629078	1937.144197	2007.52426	1.00376213
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.03341375	41.9790933	0.051775843	16.11607905	0.024677545	0	0.090663423	35.92213056	0.0011418	18.54773492	1.143571754	12935.81565	0.046873844	0	0.0046695	0	0.000519582	0.12642017	0.00250387	86.16593148	13134.67304	6.567336519
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.00200047	2.5132706	0.076378745	23.77413492	0.001477434	0	0.133848731	53.03276006	0.0012371	20.09562231	0.003554796	40.21102223	0.001061766	0	0.0018557	0	0.000401718	0.097742546	0.00183516	63.15383402	202.8783867	0.101439193
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.00450233	5.65647032	0.171901148	53.50704722	0.003325174	0	0.301245466	119.357714	0.0027843	45.22803523	0.008000571	90.50058278	0.002389654	0	0.0041765	0	0.000904124	0.2199834	0.0041303	142.1366199	456.6064529	0.228303226
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.0024586	3.08884097	0.093870431	29.21870886	0.001815785	0	0.164501762	65.17792473	0.0015205	24.6977709	0.004368889	49.41984874	0.001304924	0	0.0022807	0	0.000493717	0.12012681	0.00225544	77.61685108	249.3400721	0.124670036
	Travis	0.00051001	0.64074315	0.299602906	93.25631024	0.000376663	0	0.033939476	13.44730047	0.0003347	5.436911465	0.000906121	10.24982848	0.000271138	0	0.0004717	0	0.000103327	0.025140578	0.00046734	16.08250405	139.1387384	0.069569369
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0.00068596	0.86180633	0.00069182	0.215340343	0.000506616	0	0.001145408	0.453827022	0.0002999	4.870691388	9.88414E-05	1.118070551	0.000977211	0	0.0033962	0	0.001162035	0.282735999	0.00624051	214.7556004	222.558072	0.111279036
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22756873	285.904116	0.004556851	1.418394584	0.168069652	0	0.007612767	3.016285994	0.0016809	27.30385004	0.001626796	18.40193486	0.046792036	0	0.0072464	0	0.001609426	0.391591272	0.00828339	285.0578485	621.4940211	0.310747011
	San Patricio	0.05031335	63.2107681	0.001007478	0.313593985	0.037158653	0	0.001683113	0.666873066	0.0003716	6.036629893	0.00035967	4.068498396	0.010345288	0	0.0016021	0	0.000355829	0.086577225	0.00183138	63.02366615	137.4066068	0.068703303
Victoria Area	Victoria	0.02183674	27.4344046	0.002215582	0.689636229	0.016127403	0	0.003612695	1.431400957	0.0011996	19.4862941	0.000555389	6.282427867	0.52545648	0	0.0324127	0	0.000476855	0.116024218	0.00225485	77.59650164	133.0366896	0.066518345
Other ERCOT counties	Andrews	2.4742E-05	0.03108451	2.49533E-05	0.007767116	1.82731E-05	0	4.13138E-05	0.016369098	1.082E-05	0.175681087	3.56511E-06	0.040327714	3.5247E-05	0	0.0001225	0	4.19135E-05	0.010198012	0.00022509	7.746024998	8.027452538	0.004013726
	Angelina	0.00031082	0.39049607	0.000313473	0.097573613	0.000229554	0	0.000519	0.205635144	0.0001359	2.20697595	4.47864E-05	0.506612844	0.000442787	0	0.0015389	0	0.000526534	0.128111494	0.00282766	97.30865855	100.8440637	0.050422032
	Bosque	0.00059539	0.74801559	0.001096604	0.341335833	0.000439723	0	0.001755208	0.695438364	0.0007356	11.94824762	0.000212298	2.40146083	0.005708837	0	0.0228507	0	0.000234455	0.057045397	0.00106721	36.72601761	52.91756124	0.026458781
	Brazos	0.00193973	2.43695792	0.003572622	1.112037065	0.001432574	0	0.005718288	2.265666722	0.0023964	38.92616286	0.000691644	7.823712593	0.018598805	0	0.0744451	0	0.000763829	0.185848041	0.00347685	119.6495911	172.3999763	0.086199988
	Calhoun	0.08269981	103.899229	0.001655986	0.515452895	0.061077496	0	0.002766524	1.096135987	0.0006108	9.92237894	0.000591187	6.687370853	0.0170045	0	0.0026334	0	0.000584875	0.142306561	0.00301023	103.5916909	225.8545655	0.112927283
	Cameron	0.04837175	60.7714494	0.000968599	0.301492318	0.297964476	0	0.001618161	0.641138275	0.0003573	5.803674896	0.00034579	3.911494066	0.009946061	0	0.0015403	0	0.000342098	0.083236189	0.00176071	60.59156774	132.1040528	0.066052026
	Cherokee	0.0035039	4.40209478	0.003533808	1.099955486	0.002587786	0	0.00585073	2.318142142	0.0015316	24.87942412	0.00050488	5.711088881	0.00499158	0	0.0173479	0	0.005935657	1.444211564	0.03187642	1096.968631	1136.823548	0.568411774
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.00129879	1.63172029	2.6007E-05	0.008095103	0.000959212	0	4.34478E-05	0.017214635	9.593E-06	0.155829328	9.2845E-06	0.105024058	0.000267053	0	4.136E-05	0	9.18536E-06	0.002234901	4.7275E-05	1.62689045	3.547008767	0.001773504
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.00353575	4.44210767	0.003565928	1.109953545	0.002611307	0	0.005903911	2.339212924	0.0015456	25.10556596	0.00050947	5.762999897	0.005036951	0	0.0175056	0	0.00598961	1.457338743	0.03216616	1106.939541	1147.15672	0.57357836
	Fannin	0.00705631	8.86514336	0.007116546	2.215141556	0.005211403	0	0.011782473	4.668382546	0.0030845	50.10334234	0.001016752	11.50125662	0.010052276	0	0.034936	0	0.011953503	2.90842047	0.06419422	2209.126489	2289.388176	1.144694088
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.00367718	4.61979198	0.003708565	1.154351687	0.00271576	0	0.006140067	2.432781441	0.0016074	26.1097886	0.000529848	5.993519893	0.005238429	0	0.0182058	0	0.006229194	1.515632293	0.03345281	1151.217123	1193.042989	0.596521494
	Frio	0.00858833	10.7898841	0.000871383	0.271232239	0.006342868	0	0.001420864	0.56296649	0.0004718	7.663911737	0.000218433	2.470863491	0.206660746	0	0.0127478	0	0.000187546	0.045632041	0.00088683	30.51851402	52.32300415	0.026161502
	Grimes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.18852746	236.85493	0.003775086	1.17505741	0.139235931	0	0.006306735	2.498817499	0.0013925	22.61965159	0.001347706	15.24493266	0.03876448	0	0.0060032	0	0.001333316	0.324410591	0.00686231	236.1538466	514.8716464	0.257435823
	Howard	0.00055511	0.69741174	0.000559851	0.174262917	0.000409976	0	0.000926915	0.367256872	0.0002427	3.941578604	7.99868E-05	0.904792074	0.000790802	0	0.0027484	0	0.00094037	0.228802458	0.00505009	173.7897173	180.103822	0.090051911
	Jack	0.00212145	2.6652646	0.002139557	0.665972127	0.001566784	0	0.003542346	1.403527755	0.0009273	15.06333958	0.000305682	3.457799938	0.00302217	0	0.0105033	0	0.003593766	0.874403246	0.0192997	664.1637248	688.2940321	0.344147016
	Jones	0.04071872	51.1566342	0.000815354	0.253792404	0.030072592	0	0.001362147	0.539702056	0.0003008	4.885459809	0.000291082	3.292646021	0.008372468	0	0.0012966	0	0.000287974	0.070067167	0.00148214	51.00521209	111.2035137	0.055601757
	Lamar	0.00095084	1.19457736	0.000958954	0.298490149	0.000702236	0	0.001587687	0.629064177	0.0004156	6.751421398	0.000137007	1.549793415	0.001354543	0	0.0047076	0	0.001610734	0.391909427	0.00865017	297.6796188	308.4948747	0.154247437
	Limestone	0.00071976	0.90426056	0.000891528	0.277502547	0.000531572	0	0.000300183	0.118936793	0.0054552	88.61235094	0.001239347	14.0191992	0.000497945	0	0.000316	0	0.000380962	0.092692326	0.00052318	18.00424889	122.0291913	0.061014596
	Llano	0.00123817	1.55556974	0.047274044	14.71482015	0.000914447	0	0.082844655	32.82422384	0.0007657	12.43803272	0.002200214	24.88830664	0.000657172	0	0.0011486	0	0.000248641	0.060497006	0.00113586	39.08858566	125.5700358	0.062785018
	McLennan	0.02453432	30.8234892	0.024743738	7.701893693	0.018119687	0	0.040966843	16.23164262	0.0107245	174.2058494	0.003535175	39.98907229	0.034951066	0	0.1214699	0	0.041561501	10.11237644	0.22319886	7680.979722	7960.044045	3.980022023
	Milam	0.0022454	2.82099613	0.002264571	0.704884908	0.001658332	0	0.003749326	1.485535943	0.0009815	15.94349117	0.000323543	3.659839341	0.003198756	0	0.011117	0	0.00380375	0.925494666	0.02042738	702.9708406	728.5110827	0.364255541
	Mitchell	0.01494317	18.773728	0.015070721	4.691008753	0.011036196	0	0.024951762	9.886241051	0.006532	106.1039268	0.002153177	24.35622921	0.02128772	0	0.073984	0	0.025313952	6.159166598	0.1359442	4678.270636	4848.240936	2.424120468
	Nolan	0.00056465	0.70939807	0.000569473	0.177257951	0.000417022	0	0.000942846	0.373568868	0.0002468	4.009322002	8.13615E-05	0.920342617	0.000804394	0	0.0027956	0	0.000956532	0.232734856	0.00513689	176.7766186	183.1992429	0.091599621
	Palo Pinto	0.003207	4.02908618	0.005906709	1.838559925	0.002368511	0	0.009454195	3.745885967	0.003962	64.35764173	0.001143513	12.93514837	0.030749889	0	0.1230821	0	0.001262858	0.30726742	0.00574838	197.819794	285.0333836	0.142516692
	Pecos	4.0968E-05	0.05146941	4.13174E-05	0.012860709	3.02565E-05	0	6.84069E-05	0.027103779	1.791E-05	0.290890887	5.90308E-06	0.066774203	5.83617E-05	0	0.0002028	0	6.93999E-05	0.01688576	0.0003727	12.82578633	13.29177108	0.006645886
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.00073771	0.92681309	0.000835096	0.259937427	0.00054483	0	0.000735917	0.291580746	0.0031497	51.16244388	0.000730875	8.267490043	0.00076086	0	0.0018663	0	0.191632518	46.62632723	0.00339774	116.9269059	224.4614984	0.112230749
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.00569644	7.15667258	0.005745061	1.788244385	0.004207073	0	0.009511781	3.768702209	0.00249	40.44753726	0.000820806	9.284759937	0.008115023	0	0.0282032	0	0.00964985	2.347916124	0.05182285	1783.388529	1848.182361	0.924091181
	Tom Green	0.00148245	1.86246151	2.96846E-05	0.00923983	0.001094854	0	4.95918E-05	0.019648953	1.095E-05	0.177865119	1.05974E-05	0.119875488	0.000304817	0	4.72E-05	0	1.04843E-05	0.002550938	5.396E-05	1.856948677	4.048590511	0.002024295
	Upton	3.1166E-05	0.03915531	3.14322E-05	0.009783773	2.30176E-05	0	5.20405E-05	0.020619177	1.362E-05	0.221294995	4.49076E-06	0.050798418	4.43986E-05	0	0.0001543	0	5.27959E-05	0.012845828	0.00028353	9.75720605	10.11170355	0.005055852
	Ward	0.01855953	23.3171122	0.01871795	5.82626836	0.013707039	0	0.030990277	12.27878618	0.0081128	131.7818798	0.002674262	30.25062094	0.026439509	0	0.0918886	0	0.03144012	7.649731511	0.16884373	5810.447522	6021.551921	3.010775961
	Webb	0.02001433	25.1448366	0.000400768	0.124745669	0.014781473	0	0.000669531	0.265277813	0.0001478	2.40133251	0.000143074	1.61842247	0.004115289	0	0.0006373	0	0.000141547	0.034439863	0.00072851	25.07040867	54.6594636	0.027329732
	Wharton	0.00014434	0.18134	0.000178787	0.055650234	0.000106601	0	6.01986E-05	0.02385153	0.001094	17.77028046	0.000248538	2.811403818	9.98576E-05	0	6.336E-05	0	7.6398E-05	0.018588477	0.00010492	3.610563865	24.47167839	0.012235839
	Wichita	0.00020763	0.26085829	0.000209406	0.065180901	0.000153346	0	0.000346701	0.137367917	9.076E-05	1.474299013	2.99181E-05	0.33842635	0.00029579	0	0.001028	0	0.000351734	0.085580746	0.00188893	65.00390693	67.36562015	0.03368281
	Wilbarger	0.02861682	35.9525058	0.000573025	0.178363432	0.021134796	0	0.000957307	0.37929863	0.0002114	3.433465177	0.00020457	2.314047376	0.005884109	0	0.0009112	0	0.000202386	0.049242689	0.00104164	35.84608744	78.1530105	0.039076505
	Wise	0.00284449	3.57364871	0.002882008	0.897072193	0.002100781	0	0.00476997	1.889929763	0.0012561	20.40332012	0.000413241	4.674488599	0.004181914	0	0.0146143	0	0.004797945	1.167393387	0.02576141	886.5317541	919.1376068	0.459568803
	Young	0.00623586	7.83436717	0.006289085	1.957580558	0.004605458	0	0.010412491	4.125576031	0.0027258	44.27767994	0.000898531	10.16397182	0.008883468	0	0.0308739	0	0.010563634	2.570249902	0.05673017	1952.26488	2023.194306	1.011597153
	Total	**1.12183722**	**1409.41103**	**1.172570094**	**364.9816419**	**1.090766584**	**0**	**1.189130767**	**471.1504277**	**1.62936**	**26466.84672**	**1.542362643**	**17446.84471**	**1.359385821**	**0**	**1.2316428**	**0**	**1.221806085**	**297.2790364**	**1.52878695**	**52610.40096**	**99066.91454**	**49.53345727**

Energy Savings by PCA (MWh)		1,256.34		311.27		0.00		396.21		16,243.71		11,311.77		0.00		0.00		243.31		34,413.17

Table 76: 2005 OSD NOx Reductions from Electricity from the IECC / IRC by PCA for Commercial Buildings by County using 2007 eGRID and 7% T&D losses.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total NOx Reductions (lbs)	Total NOx Reductions (Tons)
Houston-Galveston Area	Brazoria	0.00957217	0.09335765	0.011806715	0.018295318	0.007069474	0	0.004263638	0.008783379	0.0710018	7.344115711	0.016140391	0.970748012	0.006781035	0	0.0051797	0	0.126288	0.190100651	0.008772	1.872971374	10.49837209	0.005249186
	Chambers	0.0218814	0.21340988	0.027103415	0.041998609	0.016160386	0	0.009125896	0.018799956	0.1658435	17.15413053	0.037677498	2.266076285	0.01513807	0	0.0096055	0	0.011582	0.017433813	0.015905	3.396166938	23.10801601	0.011554008
	Fort Bend	0.05569551	0.54319994	0.068987309	0.106900588	0.041133619	0	0.023228475	0.047852212	0.4221274	43.66303293	0.095901908	5.767926463	0.038531479	0	0.0244493	0	0.029479	0.044374918	0.040484	8.644387344	58.81767439	0.029408837
	Galveston	0.02755599	0.26875432	0.033893644	0.052520536	0.020351324	0	0.012791501	0.026351349	0.2014466	20.83676859	0.045812515	2.755348927	0.019823685	0	0.0167751	0	0.594657	0.895132915	0.028709	6.130195553	30.96507219	0.015482536
	Harris	0.07736057	0.7544999	0.09582276	0.148483969	0.057134232	0	0.032264145	0.066466298	0.5863312	60.64756559	0.1332069	8.011598715	0.053519883	0	0.0339599	0	0.040946	0.061636368	0.056232	12.00697738	81.69722822	0.040848614
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.00176365	0.01720092	0.003151138	0.004882905	0.001302533	0	0.005050143	0.010403632	0.0020858	0.21574109	0.00060408	0.0363318	0.015958397	0	0.0637888	0	0.000846	0.001273683	0.004013	0.856921501	1.14275553	0.000571378
	Dallas	0.00504555	0.04920942	0.005305276	0.00822089	0.003726366	0	0.008757286	0.018040596	0.0024131	0.249599256	0.000782263	0.04704846	0.009310387	0	0.033672	0	0.008209	0.012357229	0.044002	9.395581102	9.780056956	0.004890028
	Denton	0.00063576	0.00620056	0.001170951	0.001814469	0.000469535	0	0.001874207	0.003860992	0.0007854	0.081241568	0.000226691	0.013634099	0.006095882	0	0.0243999	0	0.00025	0.00037685	0.00114	0.243325426	0.350453968	0.000175227
	Tarrant	0.01557224	0.15187654	0.015705165	0.024336236	0.011500796	0	0.026002176	0.053566224	0.006807	0.704085075	0.002243821	0.134952396	0.022183886	0	0.0770985	0	0.02638	0.039709076	0.141667	30.24952737	31.35805292	0.015679026
	Ellis	0.00350282	0.03416314	0.003532723	0.005474198	0.002586991	0	0.005848935	0.012049197	0.0015312	0.158377042	0.000504725	0.03035622	0.004990048	0	0.0173426	0	0.005934	0.008932168	0.031867	6.804334948	7.053686913	0.003526843
	Johnson	0.00033718	0.00328849	0.000621017	0.000962309	0.00024902	0	0.000993991	0.002047688	0.0004166	0.043086705	0.000120226	0.007230885	0.003232969	0	0.0129406	0	0.000133	0.000199864	0.000604	0.129048357	0.185864295	9.29321E-05
	Kaufman	0.00649275	0.063324	0.006548174	0.010146846	0.004795187	0	0.01084145	0.022334113	0.0028381	0.293564009	0.000935547	0.056267585	0.009249437	0	0.0321458	0	0.010999	0.016556459	0.059067	12.61235728	13.07455029	0.006537275
	Parker	0.00047595	0.00464197	0.000876616	0.001358378	0.000351511	0	0.0014031	0.00289048	0.000588	0.060820415	0.000169709	0.010206986	0.0045636	0	0.0182667	0	0.000187	0.000282124	0.000853	0.18216233	0.262362683	0.000131181
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.00095027	0.00926802	0.000958382	0.00148508	0.000701818	0	0.001586741	0.003268792	0.0004154	0.042965657	0.000136926	0.008235253	0.001353736	0	0.0047048	0	0.00161	0.002423182	0.008645	1.845928662	1.913574647	0.000956787
	Hood	0.01232788	0.12023419	0.012433111	0.019265962	0.00910469	0	0.020584816	0.042406099	0.0053888	0.557394176	0.001776337	0.106836067	0.017562038	0	0.0610356	0	0.020884	0.031435985	0.112152	23.94726291	24.82483539	0.012412418
	Hunt	0.00635121	0.06194355	0.006405424	0.009925646	0.004690653	0	0.010605108	0.021847231	0.0027763	0.287164346	0.000915153	0.055040958	0.0090478	0	0.031445	0	0.010759	0.01619553	0.05778	12.3374093	12.78952656	0.006394763
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.03112811	0.30359339	0.048234164	0.07474216	0.0229895	0	0.084461674	0.173996702	0.0010637	0.110028111	1.065346769	64.07423952	0.043667482	0	0.0043501	0	0.000484	0.000728624	0.002333	0.498067189	65.23539569	0.032617698
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.00200761	0.01958028	0.076651484	0.118776755	0.00148271	0	0.134326688	0.276721967	0.0012416	0.128420605	0.00356749	0.214563198	0.001065557	0	0.0018623	0	0.000403	0.000606864	0.001842	0.393253453	1.151923127	0.000575962
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.00446951	0.0435913	0.170648096	0.264430982	0.003300936	0	0.299049574	0.616062135	0.002764	0.285900946	0.007942252	0.477678962	0.002372235	0	0.0041461	0	0.000898	0.001351052	0.0041	0.875494505	2.564509886	0.001282255
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.00246935	0.02408367	0.094281013	0.146094925	0.001823727	0	0.165221279	0.340366893	0.0015271	0.157956821	0.004387998	0.26391186	0.001310631	0	0.0022907	0	0.000496	0.00074644	0.002265	0.483700145	1.416860754	0.00070843
	Travis	0.00050761	0.00495073	0.298194277	0.462072578	0.000374892	0	0.033779905	0.069588864	0.0003331	0.034458054	0.000901861	0.054241532	0.000269863	0	0.0004695	0	0.000103	0.000154806	0.000465	0.09931886	0.724785421	0.000362393
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22352453	2.18004115	0.00447587	0.006935669	0.165082827	0	0.007477478	0.015404105	0.001651	0.170773975	0.001597886	0.096103268	0.045960479	0	0.0071176	0	0.001581	0.002379605	0.008136	1.737282204	4.208919978	0.00210446
	San Patricio	0.05533089	0.53964373	0.001107949	0.001716844	0.040864326	0	0.001850962	0.003813106	0.0004087	0.042273103	0.000395538	0.023789242	0.01137698	0	0.0017619	0	0.000391	0.000589044	0.002014	0.430043923	1.041868993	0.000520934
Victoria Area	Victoria	0.02060475	0.20095874	0.002090584	0.003239503	0.015217528	0	0.003408874	0.007022509	0.0011319	0.117083078	0.000524055	0.03151877	0.495811308	0	0.0305841	0	0.00045	0.00067731	0.002128	0.454304031	0.814803943	0.000407402
Other ERCOT counties	Andrews	2.5653E-05	0.00025019	2.58716E-05	4.00899E-05	1.89456E-05	0	4.28342E-05	8.82414E-05	1.121E-05	0.001159862	3.69632E-06	0.000222311	3.65442E-05	0	0.000127	0	4.35E-05	6.54141E-05	0.000233	0.049831031	0.051657141	2.58286E-05
	Angelina	0.00032149	0.0031355	0.000324234	0.000502423	0.000237435	0	0.000536817	0.001105879	0.0001405	0.014535891	4.63239E-05	0.002786103	0.000457988	0	0.0015917	0	0.000545	0.000819797	0.002925	0.62450383	0.647389426	0.000323695
	Bosque	0.00093945	0.00916251	0.001730301	0.002681221	0.000693828	0	0.002769496	0.005705347	0.0011606	0.120049816	0.000334979	0.020146966	0.009007821	0	0.0360555	0	0.00037	0.000556868	0.001684	0.359559439	0.517862167	0.000258931
	Brazos	0.00191393	0.01866658	0.003525105	0.005462393	0.00141352	0	0.005642234	0.011623379	0.0023645	0.244574858	0.000682445	0.041044973	0.018351436	0	0.073455	0	0.000754	0.001134494	0.003431	0.732522559	1.055029234	0.000527515
	Calhoun	0.08852525	0.86338928	0.001772635	0.002746821	0.065379841	0	0.0029614	0.006100683	0.0006539	0.067633778	0.000632831	0.038060993	0.01820231	0	0.0028189	0	0.000626	0.000942425	0.003222	0.688037853	1.666911834	0.000833456
	Cameron	0.05467229	0.5332204	0.001094762	0.001696408	0.285623104	0	0.001828931	0.003767719	0.0004038	0.04176993	0.00039083	0.02350608	0.011241561	0	0.0017409	0	0.000387	0.000582032	0.00199	0.424925149	1.029467719	0.000514734
	Cherokee	0.003513	0.03426234	0.003542982	0.005490094	0.002594504	0	0.005865919	0.012084186	0.0015356	0.158836939	0.000506191	0.030444369	0.005004538	0	0.0173929	0	0.005951	0.008958105	0.031959	6.82409341	7.074169445	0.003537085
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.0013551	0.01321632	2.71346E-05	4.20469E-05	0.001000801	0	4.53316E-05	9.33861E-05	1.001E-05	0.001035303	9.68705E-06	0.000582618	0.000278632	0	4.315E-05	0	9.58E-06	1.44262E-05	4.93E-05	0.010532133	0.025516237	1.27581E-05
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.00362926	0.03539631	0.003660242	0.005671798	0.002680373	0	0.006060061	0.012484132	0.0015864	0.164093912	0.000522944	0.031451976	0.005170172	0	0.0179686	0	0.006148	0.009254588	0.033017	7.04994817	7.308300889	0.00365415
	Fannin	0.00762852	0.07440114	0.007693632	0.011921813	0.005633999	0	0.012737922	0.026240972	0.0033346	0.344916548	0.001099201	0.066110356	0.010867422	0	0.0377689	0	0.012923	0.019452645	0.0694	14.81861061	15.36165408	0.007680827
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.00377443	0.03681216	0.003806652	0.00589867	0.002787588	0	0.006302464	0.012983498	0.0016499	0.170657669	0.000543862	0.032710055	0.005376978	0	0.0186873	0	0.006394	0.009624772	0.034338	7.331946097	7.600632924	0.003800316
	Frio	0.01476384	0.14399214	0.001497957	0.002321188	0.010903753	0	0.002442547	0.00503181	0.0008111	0.083893056	0.000375499	0.022584014	0.355261637	0	0.0219143	0	0.000322	0.00048531	0.001525	0.325520598	0.583828118	0.000291914
	Grimes	0.00055442	0.00540732	0.001021149	0.00158234	0.000409467	0	0.001634436	0.003367048	0.0006849	0.070848194	0.00019769	0.011889866	0.005316025	0	0.0212784	0	0.000218	0.000328639	0.000994	0.212196383	0.305619786	0.00015281
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.239737	2.33816184	0.004800509	0.00743872	0.177056459	0	0.008019827	0.016521381	0.0017708	0.183160392	0.001713782	0.103073739	0.049294041	0	0.0076338	0	0.001695	0.002552201	0.008726	1.86328912	4.514197395	0.002257099
	Howard	0.00058508	0.00570631	0.000590075	0.000914362	0.000432108	0	0.000976955	0.002012592	0.0002558	0.026453909	8.43049E-05	0.005070436	0.000833494	0	0.0028967	0	0.000991	0.001491951	0.005323	1.136536295	1.178185856	0.000589093
	Jack	0.00217756	0.02123779	0.002196145	0.003403079	0.001608224	0	0.003636037	0.007490479	0.0009519	0.098456347	0.000313767	0.018871185	0.003102103	0	0.0107811	0	0.003689	0.005552753	0.01981	4.229968902	4.384980533	0.00219249
	Jones	0.04250012	0.41450493	0.000851025	0.001318722	0.031388236	0	0.00142174	0.002928879	0.0003139	0.03247033	0.000303816	0.018272719	0.008738755	0	0.0013533	0	0.000301	0.000452449	0.001547	0.330320391	0.800268424	0.000400134
	Lamar	0.00107998	0.01053308	0.001089199	0.001687789	0.000797614	0	0.001803327	0.003714974	0.0004721	0.048830352	0.000155616	0.009359342	0.001538517	0	0.005347	0	0.00183	0.00275394	0.009825	2.097892906	2.174772384	0.001087386
	Limestone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Llano	0.00124346	0.0121275	0.047475864	0.073567122	0.000918351	0	0.083198331	0.17139413	0.000769	0.079540263	0.002209607	0.132894663	0.000659977	0	0.0011535	0	0.00025	0.000375875	0.001141	0.243570592	0.713470145	0.000356735
	McLennan	0.02303137	0.2246256	0.023227961	0.035993325	0.017009692	0	0.038457253	0.079224516	0.0100675	1.04134276	0.003318614	0.199594773	0.032809997	0	0.1140288	0	0.039015	0.058729776	0.209526	44.73909112	46.37860187	0.023189301
	Milam	0.00165249	0.0161168	0.001666598	0.002582508	0.001220439	0	0.002759294	0.005684329	0.0007223	0.074715955	0.000238109	0.014320851	0.002354105	0	0.0081815	0	0.002799	0.00421384	0.015033	3.21001311	3.327647395	0.001663824
	Mitchell	0.01696145	0.16542554	0.017106233	0.026507287	0.012526789	0	0.028321847	0.058344901	0.0074142	0.766896954	0.002443993	0.146991586	0.024162925	0	0.0839765	0	0.028733	0.043251548	0.154305	32.94810702	34.15552483	0.017077762
	Nolan	0.00060327	0.00588374	0.000608422	0.000942792	0.000445544	0	0.001007331	0.00207517	0.0002637	0.027276445	8.69262E-05	0.005228092	0.00085941	0	0.0029868	0	0.001022	0.00153834	0.005488	1.171874825	1.214819402	0.00060741
	Palo Pinto	0.00307488	0.02998939	0.00566337	0.008775782	0.002270935	0	0.00906471	0.018673909	0.0037988	0.392929526	0.001096403	0.065942108	0.029483083	0	0.1180115	0	0.001211	0.001822658	0.005512	1.176857441	1.69499081	0.000847495
	Pecos	4.2262E-05	0.00041218	4.26225E-05	6.60465E-05	3.12122E-05	0	7.05678E-05	0.000145374	1.847E-05	0.001910829	6.08954E-06	0.00036625	6.02052E-05	0	0.0002092	0	7.16E-05	0.000107767	0.000384	0.082094718	0.085103165	4.25516E-05
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.00035926	0.00350385	0.000406685	0.000630186	0.000265328	0	0.000358385	0.000738298	0.0015339	0.158656537	0.00035593	0.02140707	0.000370532	0	0.0009089	0	0.093323	0.140479206	0.001655	0.353313895	0.67872904	0.000339365
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tom Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upton	3.2238E-05	0.00031442	3.25131E-05	5.03813E-05	2.38092E-05	0	5.38302E-05	0.000110894	1.409E-05	0.00145761	4.6452E-06	0.000279381	4.59255E-05	0	0.0001596	0	5.46E-05	8.22065E-05	0.000293	0.062623139	0.06491803	3.2459E-05
	Ward	0.01980763	0.19318435	0.0199767	0.030955274	0.014628815	0	0.033074321	0.068135315	0.0086584	0.895584109	0.002854101	0.171657128	0.028217522	0	0.098068	0	0.033554	0.050509262	0.180198	38.47687871	39.88690414	0.019943452
	Webb	0.01418005	0.13829839	0.000283942	0.000439988	0.010472596	0	0.000474359	0.000977212	0.0001047	0.010833633	0.000101367	0.006096641	0.002915661	0	0.0004515	0	0.0001	0.000150958	0.000516	0.110210461	0.267007288	0.000133504
	Wharton	0.00015439	0.00150577	0.000191235	0.000296332	0.000114024	0	6.43902E-05	0.000132648	0.0011702	0.121035515	0.000265844	0.015988902	0.000106811	0	6.777E-05	0	8.17E-05	0.000123009	0.000112	0.023962556	0.163044732	8.15224E-05
	Wichita	0.00021984	0.00214413	0.000221719	0.00034357	0.000162364	0	0.000367089	0.000756227	9.61E-05	0.009940002	3.16774E-05	0.001905206	0.000313184	0	0.0010884	0	0.000372	0.000560597	0.002	0.427051199	0.442700937	0.00022135
	Wilbarger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Wise	0.00291847	0.02846393	0.002955932	0.00458042	0.002155421	0	0.004892446	0.010078766	0.0012878	0.133199609	0.000423725	0.02548455	0.004280539	0	0.0149528	0	0.004924	0.007412598	0.026441	5.645722515	5.85494239	0.002927471
	Young	0.00549666	0.05360909	0.005543579	0.008590157	0.004059529	0	0.009178198	0.018907702	0.0024027	0.248526582	0.000792019	0.047635235	0.007830425	0	0.0272141	0	0.009311	0.014016432	0.050005	10.67741943	11.06870462	0.005534352
	Total	**1.14303735**	**11.1480763**	**1.154658244**	**1.789222504**	**1.089429227**	**0**	**1.180868675**	**2.432668497**	**1.5393506**	**159.2237708**	**1.443965054**	**86.84586599**	**1.48172714**	**0**	**1.2697054**	**0**	**1.151969**	**1.734051442**	**1.517783**	**324.0850477**	**587.2587032**	**0.293629352**

Energy Savings by PCA (MWh)		9.75		1.55		0.00		2.06		103.44		60.14		0.00		0.00		1.51		213.53

Table 77: 2005 Annual and OSD NOx Reductions from IECC / IRC by PCA for Commercial Buildings by County using 2007 eGRID and 7% T&D losses.

		Electricity Savings and Resultant NOx Reductions (Commercial)			
County		Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual NOx Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD NOx Reductions (Tons)
Harris		12459.62	5.79	86.12	0.04
Tarrant		10596.37	1.97	59.17	0.02
Collin		6056.85	0.10	33.67	0.00
Dallas		6462.01	0.72	48.70	0.00
Bexar		10257.22	6.57	54.82	0.03
Travis		6012.55	0.07	30.62	0.00
Denton		1027.81	0.02	15.47	0.00
Williamson		3340.55	0.00	15.94	0.00
El Paso		1807.92	0.00	12.21	0.00
Montgomery		5629.05	0.00	27.62	0.00
Galveston		1635.90	3.01	8.16	0.02
Brazoria		1323.03	0.78	6.80	0.01
Comal		40.10	0.00	0.50	0.00
Rockwall		142.30	0.00	1.48	0.00
Hays		396.21	0.12	2.06	0.00
Nueces		738.02	0.31	7.32	0.00
Fort Bend		2309.93	5.97	12.80	0.03
Ellis		-823.62	0.53	-1.70	0.00
Johnson		410.85	0.01	1.92	0.00
Guadalupe		980.83	0.10	4.67	0.00
Kaufman		-834.31	1.03	-1.35	0.01
Jefferson		1875.38	0.00	9.91	0.00
Parker		224.75	0.01	1.19	0.00
Smith		1096.85	0.00	5.35	0.00
Bastrop		452.44	0.23	2.08	0.00
Chambers		38.30	1.84	0.18	0.01
Gregg		587.69	0.00	3.15	0.00
San Patricio		36.14	0.07	0.17	0.00
Liberty		262.62	0.00	1.25	0.00
Victoria		420.10	0.07	1.98	0.00
Orange		374.08	0.00	1.73	0.00
Caldwell		62.07	0.00	0.28	0.00
Wilson		33.62	0.00	0.15	0.00
Hardin		402.41	0.00	1.90	0.00
Harrison		325.26	0.00	1.63	0.00
Waller		-1866.05	0.00	-4.68	0.00
Upshur		54.43	0.00	0.26	0.00
Rusk		0.00	0.11	0.00	0.00
Hood		148.24	2.03	0.71	0.01
Hunt		225.45	1.00	1.27	0.01
Henderson		348.63	0.13	1.64	0.00
Ward			3.01		0.02
McLennan			3.98		0.02
Mitchell			2.42		0.02
Freestone			0.60		0.00
Fannin			1.14		0.01
Young			1.01		0.01
Cherokee			0.57		0.00
Titus			0.92		0.00
Limestone			0.06		0.00
Red River			0.00		0.00
Robertson			0.11		0.00
Palo Pinto			0.14		0.00
Llano			0.06		0.00
Haskell			0.00		0.00
Howard			0.09		0.00
Calhoun			0.11		0.00
Lamar			0.15		0.00
Nolan			0.09		0.00
Hidalgo			0.26		0.00
Cameron			0.07		0.00
Frio			0.03		0.00
Brazos			0.09		0.00
Jones			0.06		0.00
Wilbarger			0.04		0.00
Fayette			0.00		0.00
Angelina			0.05		0.00
Whichita			0.03		0.00
Wharton			0.01		0.00
Webb			0.03		0.00
Coke			0.00		0.00
Grimes			0.00		0.00
Andrews			0.00		0.00
Coleman			0.00		0.00
Hardeman			0.00		0.00
Pecos			0.01		0.00
Upton			0.01		0.00
Taylor			0.00		0.00
Tom Green			0.00		0.00
Wise			0.46		0.00
Presidio			0.00		0.00
Bosque	*		0.03		0.00
Crockett	*		0.00		0.00
Ector	*		0.57		0.00
Jack	*		0.34		0.00
Milam	*		0.36		0.00
Total		**75071.62**	**49.53**	**457.17**	**0.29**

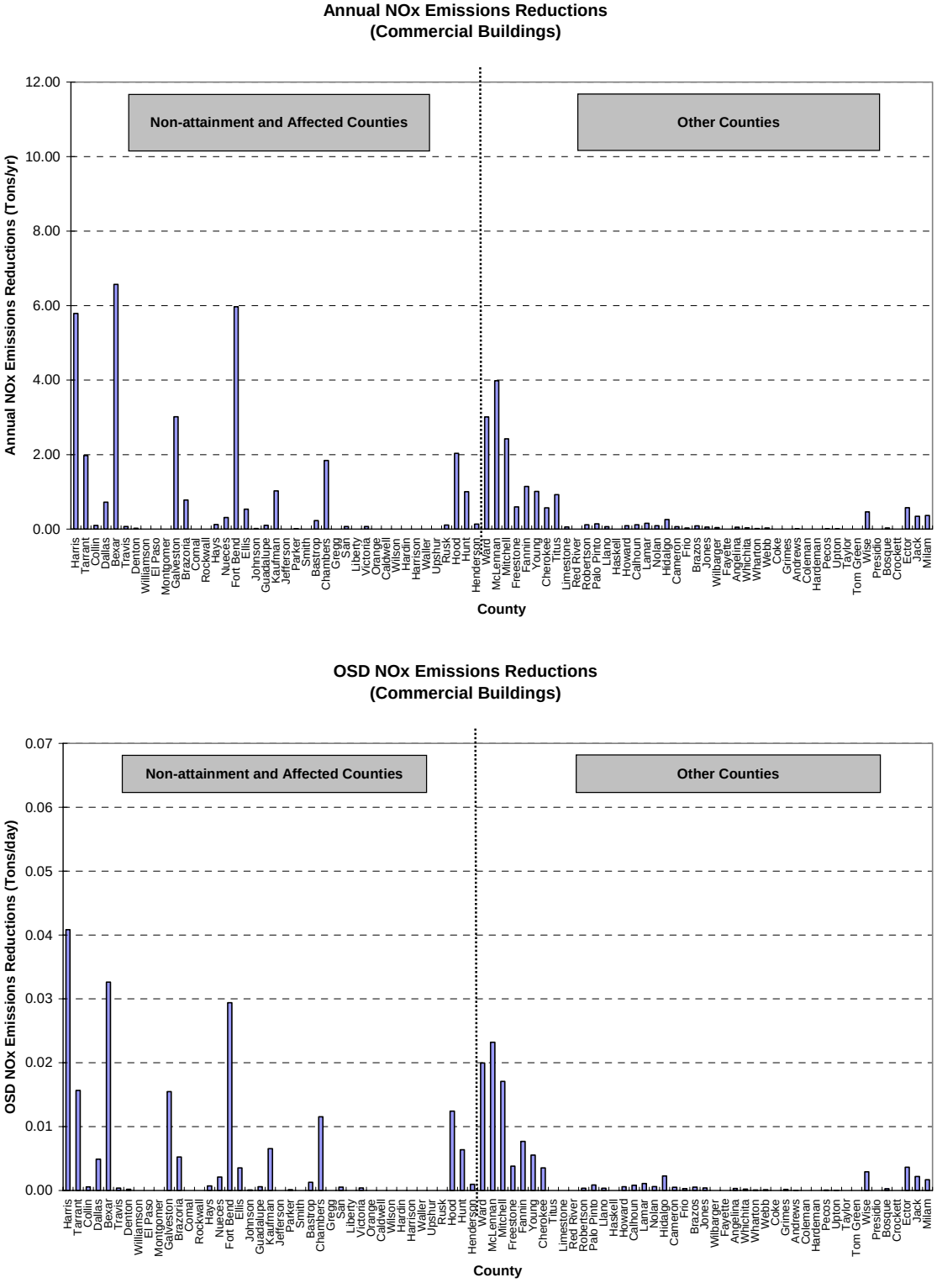
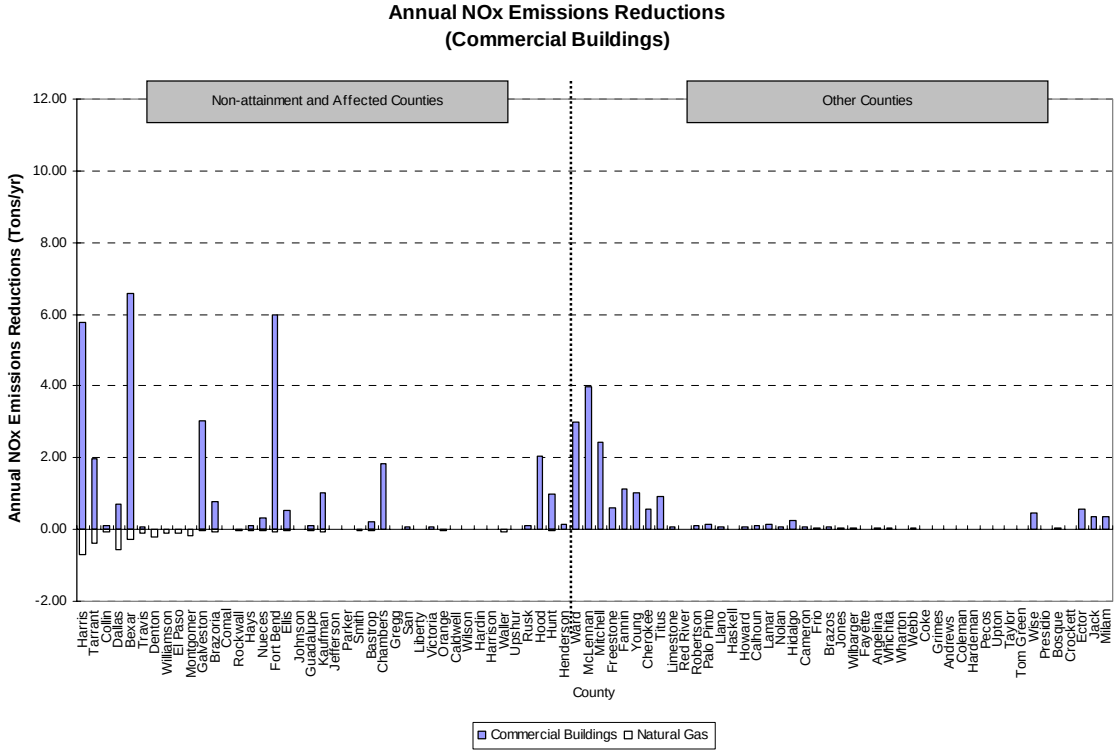


Figure 68: 2005 Annual and OSD NOx Reductions from Electricity from the IECC / IRC by PCA for Commercial Buildings by County using 2007 eGRID and 7% T&D losses.

Table 78: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Commercial Buildings by County using 2007 eGRID and 7% T&D losses.

		Electricity Savings and Resultant NOx Reductions (Commercial)				Natural Gas (Commercial)				Total NOx Reductions	
County		Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual NOx Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD NOx Reductions (Tons)	Total Annual N.G. Savings (Therm/County)	Annual NOx Reductions (Tons)	OSD N.G. Savings (Therm/County)	OSD NOx Reductions (Tons)	Annual NOx Reductions (Tons)	OSD NOx Reductions (Tons)
Harris		12459.62	5.79	86.12	0.04	-166205.99	-0.76	-243.72	-0.0011	5.02	0.04
Tarrant		10596.37	1.97	59.17	0.02	-87477.30	-0.40	-128.27	-0.0006	1.57	0.02
Collin		6056.85	0.10	33.67	0.00	-15583.18	-0.07	-22.85	-0.0001	0.02	0.00
Dallas		6462.01	0.72	48.70	0.00	-126040.76	-0.58	-184.82	-0.0009	0.14	0.00
Bexar		10257.22	6.57	54.82	0.03	-62297.93	-0.29	-91.35	-0.0004	6.28	0.03
Travis		6012.55	0.07	30.62	0.00	-22526.12	-0.10	-33.03	-0.0002	-0.03	0.00
Denton		1027.81	0.02	15.47	0.00	-47757.24	-0.22	-70.03	-0.0003	-0.20	0.00
Williamson		3340.55	0.00	15.94	0.00	-19983.46	-0.09	-29.30	-0.0001	-0.09	0.00
El Paso		1807.92	0.00	12.21	0.00	-26695.94	-0.12	-39.15	-0.0002	-0.12	0.00
Montgomery		5629.05	0.00	27.62	0.00	-37907.75	-0.17	-55.59	-0.0003	-0.17	0.00
Galveston		1635.90	3.01	8.16	0.02	-5967.50	-0.03	-8.75	0.0000	2.99	0.02
Brazoria		1323.03	0.78	6.80	0.01	-13334.10	-0.06	-19.55	-0.0001	0.72	0.01
Comal		40.10	0.00	0.50	0.00	-722.89	0.00	-1.06	0.0000	0.00	0.00
Rockwall		142.30	0.00	1.48	0.00	-7706.03	-0.04	-11.30	-0.0001	-0.04	0.00
Hays		396.21	0.12	2.06	0.00	-4266.97	-0.02	-6.26	0.0000	0.11	0.00
Nueces		738.02	0.31	7.32	0.00	-3070.45	-0.01	-4.50	0.0000	0.30	0.00
Fort Bend		2309.93	5.97	12.80	0.03	-17291.67	-0.08	-25.36	-0.0001	5.89	0.03
Ellis		-823.62	0.53	-1.70	0.00	-5962.47	-0.03	-8.74	0.0000	0.50	0.00
Johnson		410.85	0.01	1.92	0.00	-2425.14	-0.01	-3.56	0.0000	0.00	0.00
Guadalupe		980.83	0.10	4.67	0.00	-8696.17	-0.04	-12.75	-0.0001	0.06	0.00
Kaufman		-834.31	1.03	-1.35	0.01	-11120.16	-0.05	-16.31	-0.0001	0.97	0.01
Jefferson		1875.38	0.00	9.91	0.00	2639.03	0.01	3.87	0.0000	0.01	0.00
Parker		224.75	0.01	1.19	0.00	299.13	0.00	0.44	0.0000	0.01	0.00
Smith		1096.85	0.00	5.35	0.00	-4255.67	-0.02	-6.24	0.0000	-0.02	0.00
Bastrop		452.44	0.23	2.08	0.00	-3949.80	-0.02	-5.79	0.0000	0.21	0.00
Chambers		38.30	1.84	0.18	0.01	-213.51	0.00	-0.31	0.0000	1.84	0.01
Gregg		587.69	0.00	3.15	0.00	-860.78	0.00	-1.26	0.0000	0.00	0.00
San Patricio		36.14	0.07	0.17	0.00	-288.10	0.00	-0.42	0.0000	0.07	0.00
Liberty		262.62	0.00	1.25	0.00	-1709.35	-0.01	-2.51	0.0000	-0.01	0.00
Victoria		420.10	0.07	1.98	0.00	-1901.41	-0.01	-2.79	0.0000	0.06	0.00
Orange		374.08	0.00	1.73	0.00	-3720.45	-0.02	-5.46	0.0000	-0.02	0.00
Caldwell		62.07	0.00	0.28	0.00	-602.69	0.00	-0.88	0.0000	0.00	0.00
Wilson		33.62	0.00	0.15	0.00	-334.86	0.00	-0.49	0.0000	0.00	0.00
Hardin		402.41	0.00	1.90	0.00	-1908.23	-0.01	-2.80	0.0000	-0.01	0.00
Harrison		325.26	0.00	1.63	0.00	-1984.48	-0.01	-2.91	0.0000	-0.01	0.00
Waller		-1866.05	0.00	-4.68	0.00	-11596.01	-0.05	-17.00	-0.0001	-0.05	0.00
Upshur		54.43	0.00	0.26	0.00	-545.70	0.00	-0.80	0.0000	0.00	0.00
Rusk		0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.0000	0.11	0.00
Hood		148.24	2.03	0.71	0.01	-1139.91	-0.01	-1.67	0.0000	2.03	0.01
Hunt		225.45	1.00	1.27	0.01	-3666.43	-0.02	-5.38	0.0000	0.99	0.01
Henderson		348.63	0.13	1.64	0.00	-1465.12	-0.01	-2.15	0.0000	0.13	0.00
Ward			3.01		0.02				0.0000	3.01	0.02
McLennan			3.98		0.02				0.0000	3.98	0.02
Mitchell			2.42		0.02				0.0000	2.42	0.02
Freestone			0.60		0.00				0.0000	0.60	0.00
Fannin			1.14		0.01				0.0000	1.14	0.01
Young			1.01		0.01				0.0000	1.01	0.01
Cherokee			0.57		0.00				0.0000	0.57	0.00
Titus			0.92		0.00				0.0000	0.92	0.00
Limestone			0.06		0.00				0.0000	0.06	0.00
Red River			0.00		0.00				0.0000	0.00	0.00
Robertson			0.11		0.00				0.0000	0.11	0.00
Palo Pinto			0.14		0.00				0.0000	0.14	0.00
Llano			0.06		0.00				0.0000	0.06	0.00
Haskell			0.00		0.00				0.0000	0.00	0.00
Howard			0.09		0.00				0.0000	0.09	0.00
Calhoun			0.11		0.00				0.0000	0.11	0.00
Lamar			0.15		0.00				0.0000	0.15	0.00
Nolan			0.09		0.00				0.0000	0.09	0.00
Hidalgo			0.26		0.00				0.0000	0.26	0.00
Cameron			0.07		0.00				0.0000	0.07	0.00
Frio			0.03		0.00				0.0000	0.03	0.00
Brazos			0.09		0.00				0.0000	0.09	0.00
Jones			0.06		0.00				0.0000	0.06	0.00
Wilbarger			0.04		0.00				0.0000	0.04	0.00
Fayette			0.00		0.00				0.0000	0.00	0.00
Angelina			0.05		0.00				0.0000	0.05	0.00
Whichita			0.03		0.00				0.0000	0.03	0.00
Wharton			0.01		0.00				0.0000	0.01	0.00
Webb			0.03		0.00				0.0000	0.03	0.00
Coke			0.00		0.00				0.0000	0.00	0.00
Grimes			0.00		0.00				0.0000	0.00	0.00
Andrews			0.00		0.00				0.0000	0.00	0.00
Coleman			0.00		0.00				0.0000	0.00	0.00
Hardeman			0.00		0.00				0.0000	0.00	0.00
Pecos			0.01		0.00				0.0000	0.01	0.00
Upton			0.01		0.00				0.0000	0.01	0.00
Taylor			0.00		0.00				0.0000	0.00	0.00
Tom Green			0.00		0.00				0.0000	0.00	0.00
Wise			0.46		0.00				0.0000	0.46	0.00
Presidio			0.00		0.00				0.0000	0.00	0.00
Bosque	*		0.03		0.00				0.0000	0.03	0.00
Crockett	*		0.00		0.00				0.0000	0.00	0.00
Ector	*		0.57		0.00				0.0000	0.57	0.00
Jack	*		0.34		0.00				0.0000	0.34	0.00
Milam	*		0.36		0.00				0.0000	0.36	0.00
Total		**75071.62**	**49.53**	**457.17**	**0.29**	**-730243.55**	**-3.36**	**-1070.79**	**-0.0049**	**46.17**	**0.29**



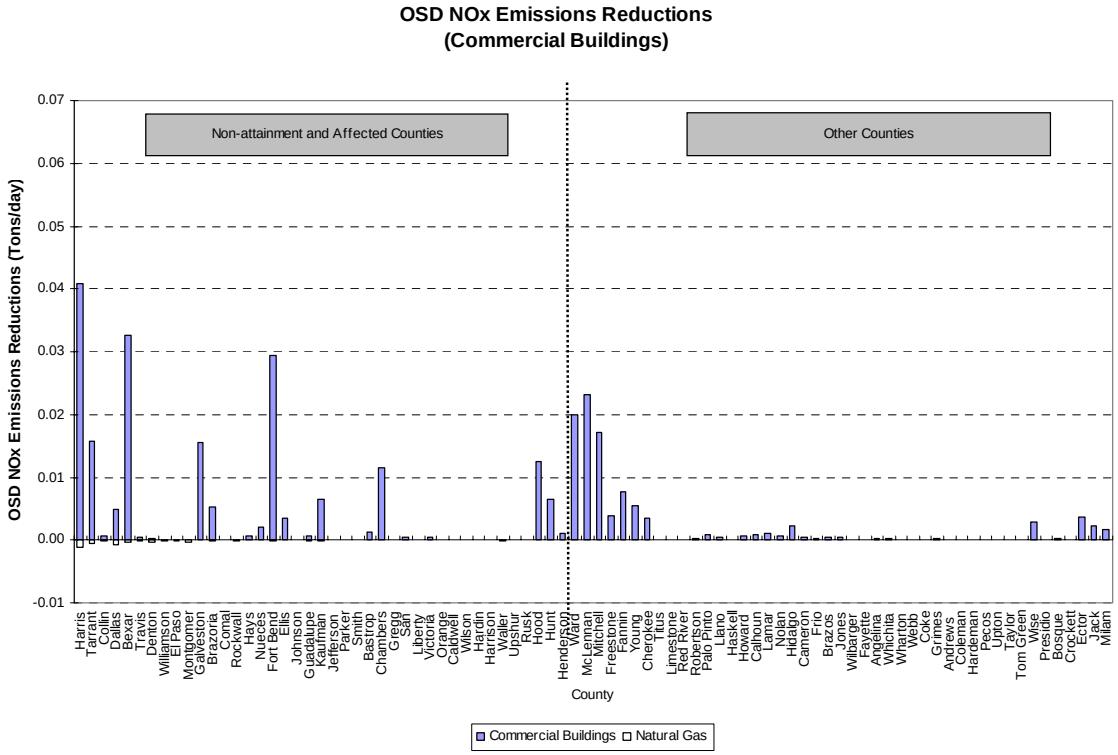


Figure 69: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Commercial Buildings by County using 2007 eGRID and 7% T&D losses.

6.1.8 2005 Results for New Residential Construction (Single-family and Multi-family), and Commercial Construction.

6.1.9 2005 Results for New Residential (Single-family and Multi-family), and Commercial Construction using 1999 eGRID.

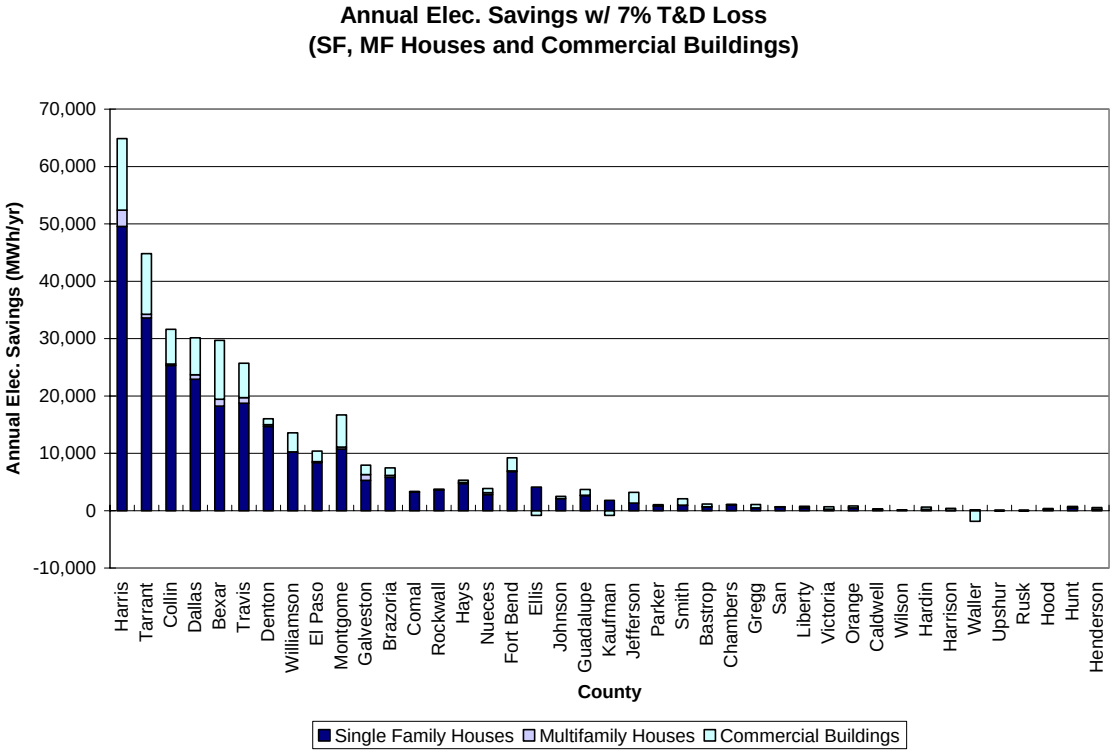
As shown in Table 79, the total annual electricity savings in 2005 were calculated to be 348,884 MWh/yr [49] which includes 263,656 MWh/yr (75.6%) for single-family residential, 10,157 MWh/yr (2.9%) for multi-family residential, and 75,072 MWh/yr (21.5%) for new commercial buildings. Natural gas savings were calculated to be 690,579 MBtu (6,905,796 therms) for new residential and commercial construction.

Using the 1999 eGRID, the total NOx reductions from electricity and natural gas savings from new residential (single-family and multi-family) and commercial construction in 2005 were calculated to be 504.52 tons NOx/year which represents 472.75 tons NOx/year from electricity savings and 31.77 tons NOx/year from natural gas savings. On a peak Ozone Season Day (OSD), the NOx reductions in 2005 are calculated to be 2.56 tons of NOx/day which represents 2.50 tons NOx/day from electricity savings and 0.06 tons NOx/day from natural gas savings.

[49] In 2005, it is estimated that there were 128,804 single family residences and 29,972 multi-family residences, which totaled about 350 million sq. ft., and 122 million sq. ft. of commercial building construction.

	Electricity Savings and Resultant NOx Reductions (Single Family Houses)				Electricity Savings and Resultant NOx Reductions (Multifamily Houses)				Electricity Savings and Resultant NOx Reductions (Commercial Buildings)				Total Electricity Savings and Resultant NOx Reductions (SF, MF Houses and Commerical Buildings)				Total Natural Gas Savings and Resultant NOx Reductions (Single, Multi-Family Houses and Commercial Buildings)				Total Nox Reductions	
County	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual N.G. Savings (Therm/County)	Annual Nox Reductions (Tons)	Total OSD N.G. Savings (Therm/County)	OSD Nox Reductions (Tons)	Annual Nox Reductions (Tons)	OSD Nox Reductions (Tons)
Harris	49,541.43	21.15	216.56	0.10	2,858.94	1.16	10.62	0.00	12459.62	5.89	86.12	0.04	64,859.99	28.20	313.2938	0.14	889,657.18	4.09	2,544.6694	0.0117	32.30	0.15
Tarrant	33,606.87	19.38	177.90	0.10	618.73	0.46	3.54	0.00	10596.37	4.82	59.17	0.03	44,821.97	24.66	240.6060	0.14	949,373.05	4.37	1,416.1985	0.0065	29.03	0.14
Collin	25,313.19	1.64	145.68	0.01	242.17	0.05	1.38	0.00	6056.85	0.41	33.67	0.00	31,612.22	2.10	180.7291	0.01	1,038,185.28	4.78	1,118.8997	0.0051	6.88	0.02
Dallas	22,916.90	31.79	121.38	0.17	778.74	0.76	4.45	0.00	6462.01	7.91	48.70	0.05	30,157.65	40.46	174.5371	0.22	593,678.26	2.73	905.0960	0.0042	43.19	0.23
Bexar	18,207.73	23.63	88.29	0.11	1,206.34	1.31	5.35	0.01	10257.22	10.84	54.82	0.06	29,671.28	35.78	148.4666	0.18	465,265.04	2.14	917.0097	0.0042	37.92	0.18
Travis	18,717.70	0.45	90.17	0.00	981.06	0.02	4.00	0.00	6012.55	0.11	30.62	0.00	25,711.32	0.58	124.7870	0.00	425,759.51	1.96	817.6887	0.0038	2.54	0.01
Denton	14,684.76	0.79	84.62	0.00	304.98	0.03	1.55	0.00	1027.81	0.20	15.47	0.00	16,017.55	1.01	101.6334	0.01	570,827.07	2.63	605.0643	0.0028	3.64	0.01
Williamson	10,187.52	0.00	49.01	0.00	42.27	0.00	0.17	0.00	3340.55	0.00	15.94	0.00	13,570.35	0.00	65.1223	0.00	211,112.27	0.97	398.3946	0.0018	0.97	0.00
El Paso	8,379.49	0.00	33.78	0.00	185.83	0.00	0.73	0.00	1807.92	0.00	12.21	0.00	10,373.24	0.00	46.7115	0.00	330,193.46	1.52	317.2079	0.0015	1.52	0.00
Montgomery	10,751.30	0.00	46.91	0.00	325.66	0.00	1.21	0.00	5629.05	0.00	27.62	0.00	16,706.01	0.00	75.7382	0.00	183,012.06	0.84	523.9856	0.0024	0.84	0.00
Galveston	5,274.22	14.39	23.06	0.07	1,022.39	0.77	3.80	0.00	1635.90	3.97	8.16	0.02	7,932.51	19.12	35.0188	0.09	124,293.74	0.57	338.4299	0.0016	19.69	0.10
Brazoria	5,785.00	3.53	25.32	0.02	368.33	0.19	1.37	0.00	1323.03	0.98	6.80	0.01	7,476.37	4.70	33.4865	0.02	111,428.69	0.51	309.9019	0.0014	5.22	0.02
Comal	3,220.05	0.00	15.57	0.00	69.88	0.00	0.31	0.00	40.10	0.00	0.50	0.00	3,330.03	0.00	16.3796	0.00	88,384.54	0.41	165.1753	0.0008	0.41	0.00
Rockwall	3,608.00	0.00	20.82	0.00	0.00	0.00	0.00	0.00	142.30	0.00	1.48	0.00	3,750.31	0.00	22.2983	0.00	143,271.06	0.66	149.9704	0.0007	0.66	0.00
Hays	4,713.70	0.00	22.75	0.00	209.00	0.00	0.85	0.00	396.21	0.00	2.06	0.00	5,318.91	0.00	25.6572	0.00	108,024.26	0.50	230.6062	0.0011	0.50	0.00
Nueces	2,787.69	2.69	10.77	0.01	333.64	0.18	1.10	0.00	738.02	0.76	7.32	0.01	3,859.34	3.62	19.1838	0.02	57,599.75	0.26	150.7138	0.0007	3.89	0.02
Fort Bend	6,819.56	30.87	29.83	0.14	100.36	1.70	0.37	0.01	2309.93	8.80	12.80	0.05	9,229.84	41.17	43.0023	0.20	110,924.60	0.55	338.4661	0.0016	41.72	0.20
Ellis	4,092.90	0.00	21.69	0.00	24.43	0.00	0.14	0.00	-823.62	0.00	-1.70	0.00	3,293.71	0.00	20.1314	0.00	119,286.72	0.55	175.0979	0.0008	0.55	0.00
Johnson	2,081.99	0.01	11.03	0.00	0.00	0.00	0.00	0.00	410.85	0.00	1.92	0.00	2,492.83	0.01	12.9505	0.00	60,707.67	0.28	88.5839	0.0004	0.29	0.00
Guadalupe	2,638.20	0.00	12.78	0.00	69.32	0.00	0.31	0.00	980.83	0.00	4.67	0.00	3,688.35	0.00	17.7601	0.00	64,722.68	0.30	124.5737	0.0006	0.30	0.00
Kaufman	1,774.18	0.00	10.25	0.00	3.10	0.00	0.02	0.00	-834.31	0.00	-1.35	0.00	942.97	0.00	8.9121	0.00	63,155.38	0.29	63.5539	0.0003	0.29	0.00
Jefferson	1,308.30	0.00	5.67	0.00	17.44	0.00	0.07	0.00	1875.38	0.00	9.91	0.00	3,201.13	0.00	15.6471	0.00	27,636.57	0.13	70.7747	0.0003	0.13	0.00
Parker	807.34	0.12	4.66	0.00	21.36	0.00	0.11	0.00	224.75	0.03	1.19	0.00	1,053.45	0.16	5.9612	0.00	34,605.94	0.16	38.0817	0.0002	0.32	0.00
Smith	935.46	0.00	4.84	0.00	27.18	0.00	0.14	0.00	1096.85	0.00	5.35	0.00	2,059.48	0.00	10.3329	0.00	24,974.91	0.11	52.7263	0.0002	0.11	0.00
Bastrop	666.69	3.44	3.11	0.02	20.95	0.14	0.08	0.00	452.44	0.62	2.08	0.00	1,140.09	4.20	5.2668	0.02	9,643.60	0.04	21.5646	0.0001	4.25	0.02
Chambers	1,053.38	8.08	4.56	0.04	0.00	0.44	0.00	0.00	38.30	2.25	0.18	0.01	1,091.68	10.78	4.7434	0.05	19,663.62	0.09	52.5158	0.0002	10.87	0.05
Gregg	464.99	0.00	2.40	0.00	26.26	0.00	0.12	0.00	587.69	0.00	3.15	0.00	1,078.83	0.00	5.6764	0.00	15,220.96	0.07	28.4616	0.0001	0.07	0.00
San Patricio	582.06	0.18	2.25	0.00	65.40	0.01	0.22	0.00	36.14	0.05	0.17	0.00	683.61	0.25	2.6343	0.00	12,233.93	0.06	31.5913	0.0001	0.30	0.00
Liberty	490.83	0.00	2.12	0.00	0.00	0.00	0.00	0.00	262.62	0.00	1.25	0.00	753.45	0.00	3.3693	0.00	7,460.40	0.03	21.8263	0.0001	0.03	0.00
Victoria	207.36	1.52	0.99	0.01	73.99	0.09	0.31	0.00	420.10	0.42	1.98	0.00	701.45	2.04	3.2902	0.01	2,959.68	0.01	9.9796	0.0000	2.05	0.01
Orange	462.74	0.00	2.01	0.00	0.00	0.00	0.00	0.00	374.08	0.00	1.73	0.00	836.83	0.00	3.7330	0.00	5,030.91	0.02	17.7670	0.0001	0.02	0.00
Caldwell	237.06	0.00	1.12	0.00	0.00	0.00	0.00	0.00	62.07	0.00	0.28	0.00	299.15	0.00	1.4073	0.00	4,618.51	0.02	9.5110	0.0000	0.02	0.00
Wilson	82.69	0.00	0.40	0.00	1.11	0.00	0.00	0.00	33.62	0.00	0.15	0.00	117.42	0.00	0.5593	0.00	1,944.59	0.01	3.7403	0.0000	0.01	0.00
Hardin	213.85	0.00	0.93	0.00	0.00	0.00	0.00	0.00	402.41	0.00	1.90	0.00	616.26	0.00	2.8293	0.00	2,152.10	0.01	7.8417	0.0000	0.01	0.00
Harrison	68.60	0.00	0.35	0.00	0.00	0.00	0.00	0.00	325.26	0.00	1.63	0.00	393.87	0.00	1.9803	0.00	272.06	0.00	1.1609	0.0000	0.00	0.00
Waller	82.08	0.00	0.36	0.00	57.01	0.00	0.21	0.00	-1866.05	0.00	-4.68	0.00	-1,726.95	0.00	-4.1146	0.00	-8,586.04	-0.04	-8.8401	0.0000	-0.04	0.00
Upshur	14.10	0.00	0.07	0.00	0.00	0.00	0.00	0.00	54.43	0.00	0.26	0.00	68.53	0.00	0.3376	0.00	-84.40	0.00	0.0325	0.0000	0.00	0.00
Rusk	19.82	0.00	0.10	0.00	17.81	0.00	0.09	0.00	0.00	0.00	0.00	0.00	37.63	0.00	0.1949	0.00	1,207.39	0.01	2.9812	0.0000	0.01	0.00
Hood	210.05	19.51	1.11	0.10	2.86	0.46	0.02	0.00	148.24	4.86	0.71	0.03	361.15	24.83	1.8406	0.14	5,356.22	0.02	7.8939	0.0000	24.85	0.14
Hunt	432.64	0.00	2.49	0.00	79.32	0.00	0.40	0.00	225.45	0.00	1.27	0.00	737.41	0.00	4.1676	0.00	16,613.65	0.08	19.8899	0.0001	0.08	0.00
Henderson	213.31	2.05	1.11	0.01	1.41	0.05	0.01	0.00	348.63	0.51	1.64	0.00	563.35	2.61	2.7638	0.01	4,989.51	0.02	10.8523	0.0000	2.64	0.01
Ward		37.49		0.20		0.89		0.00		9.33		0.06		47.71		0.26					47.71	0.26
McLennan		34.72		0.18		0.82		0.00		8.84		0.05		44.18		0.24					44.18	0.24
Mitchell		29.46		0.16		0.70		0.00		7.33		0.05		37.50		0.21					37.50	0.21
Freestone		16.43		0.09		0.39		0.00		4.09		0.03		20.91		0.11					20.91	0.11
Fannin		13.26		0.07		0.32		0.00		3.30		0.02		16.87		0.09					16.87	0.09
Young		12.70		0.07		0.30		0.00		3.16		0.02		16.17		0.09					16.17	0.09
Cherokee		7.16		0.04		0.17		0.00		1.78		0.01		9.11		0.05					9.11	0.05
Titus		5.12		0.03		0.12		0.00		1.27		0.01		6.52		0.04					6.52	0.04
Limestone		3.93		0.02		0.22		0.00		1.09		0.01		5.24		0.03					5.24	0.03
Red River		2.03		0.01		0.05		0.00		0.50		0.00		2.58		0.01					2.58	0.01
Robertson		2.02		0.01		0.07		0.00		0.50		0.00		2.59		0.01					2.59	0.01
Palo Pinto		1.79		0.01		0.06		0.00		0.45		0.00		2.30		0.01					2.30	0.01
Llano		2.02		0.01		0.08		0.00		0.36		0.00		2.47		0.01					2.47	0.01
Haskell		0.95		0.00		0.06		0.00		0.27		0.00		1.28		0.01					1.28	0.01
Howard		0.84		0.00		0.02		0.00		0.21		0.00		1.07		0.01					1.07	0.01
Calhoun		0.82		0.00		0.05		0.00		0.23		0.00		1.10		0.01					1.10	0.01
Lamar		0.75		0.00		0.02		0.00		0.19		0.00		0.96		0.01					0.96	0.01
Nolan		0.67		0.00		0.02		0.00		0.17		0.00		0.85		0.00					0.85	0.00
Hidalgo		0.61		0.00		0.04		0.00		0.17		0.00		0.82		0.00					0.82	0.00
Cameron		0.61		0.00		0.04		0.00		0.17		0.00		0.82		0.00					0.82	0.00
Frio		0.54		0.00		0.03		0.00		0.14		0.00		0.71		0.00					0.71	0.00
Brazos		0.52		0.00		0.02		0.00		0.13		0.00		0.66		0.00					0.66	0.00
Jones		0.45		0.00		0.03		0.00		0.13		0.00		0.61		0.00					0.61	0.00
Wilbarger		0.36		0.00		0.02		0.00		0.10		0.00		0.49		0.00					0.49	0.00
Fayette		0.36		0.00		0.02		0.00		0.10		0.00		0.48		0.00					0.48	0.00
Angelina		0.42		0.00		0.02		0.00		0.08		0.00		0.51		0.00					0.51	0.00
Whichita		0.32		0.00		0.01		0.00		0.08		0.00		0.41		0.00					0.41	0.00
Wharton		0.31		0.00		0.01		0.00		0.08		0.00		0.39		0.00					0.39	0.00
Webb		0.26		0.00		0.01		0.00		0.07		0.00		0.35		0.00					0.35	0.00
Coke		0.25		0.00		0.02		0.00		0.07		0.00		0.34		0.00					0.34	0.00
Grimes		0.10		0.00		0.01		0.00		0.03		0.00		0.14		0.00					0.14	0.00
Andrews		0.06		0.00		0.00		0.00		0.02		0.00		0.08		0.00					0.08	0.00
Coleman		0.04		0.00		0.00		0.00		0.01		0.00		0.06		0.00					0.06	0.00
Hardeman		0.03		0.00		0.00		0.00		0.01		0.00		0.05		0.00					0.05	0.00
Pecos		0.03		0.00		0.00		0.00		0.01		0.00		0.05		0.00					0.05	0.00
Upton		0.03		0.00		0.00		0.00		0.01		0.00		0.04		0.00					0.04	0.00
Taylor		0.02		0.00		0.00		0.00		0.01		0.00		0.03		0.00					0.03	0.00
Tom Green		0.01		0.00		0.00		0.00		0.00		0.00		0.01		0.00					0.01	0.00
Wise		0.00		0.00		0.00		0.00		0.00		0.00		0.01		0.00					0.01	0.00
Presidio		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00					0.00	0.00
Total	**263,655.66**	**362.74**	**1,298.81**	**1.85**	**10,157.29**	**12.47**	**43.05**	**0.06**	**75,071.62**	**97.54**	**457.17**	**0.60**	**348,884.56**	**472.75**	**1,799.03**	**2.50**	**6,905,796.41**	**31.77**	**12,099.64**	**0.06**	**504.52**	**2.56**

Table 79: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 1999 eGRID).



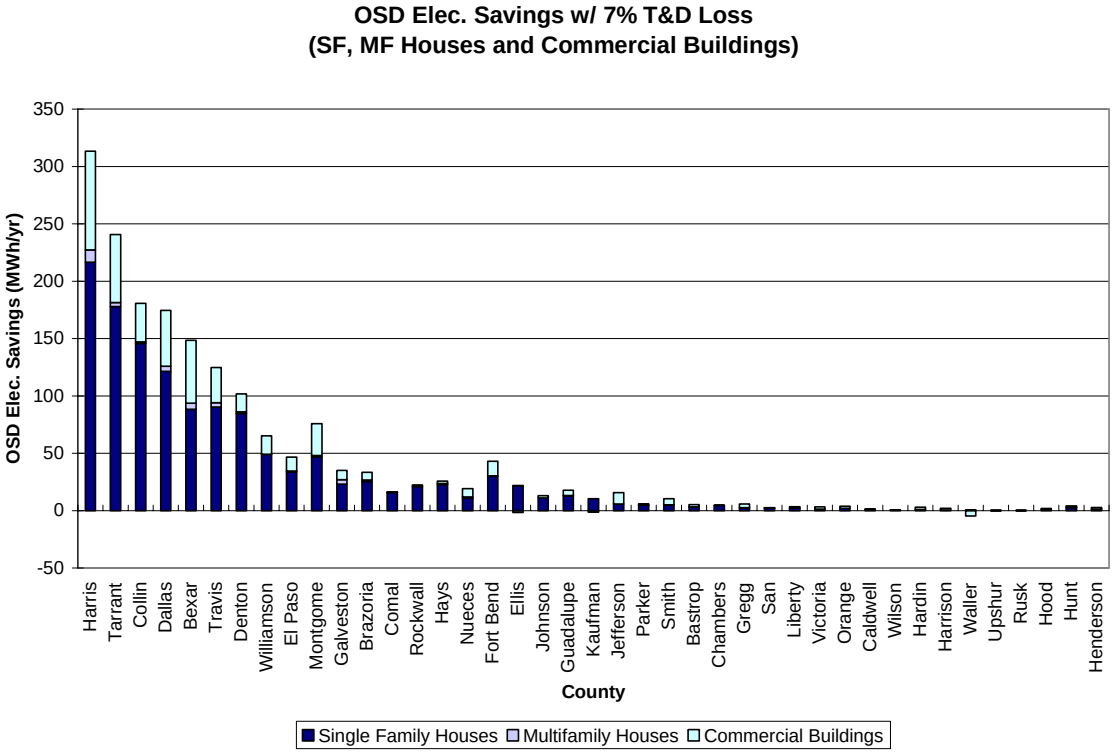
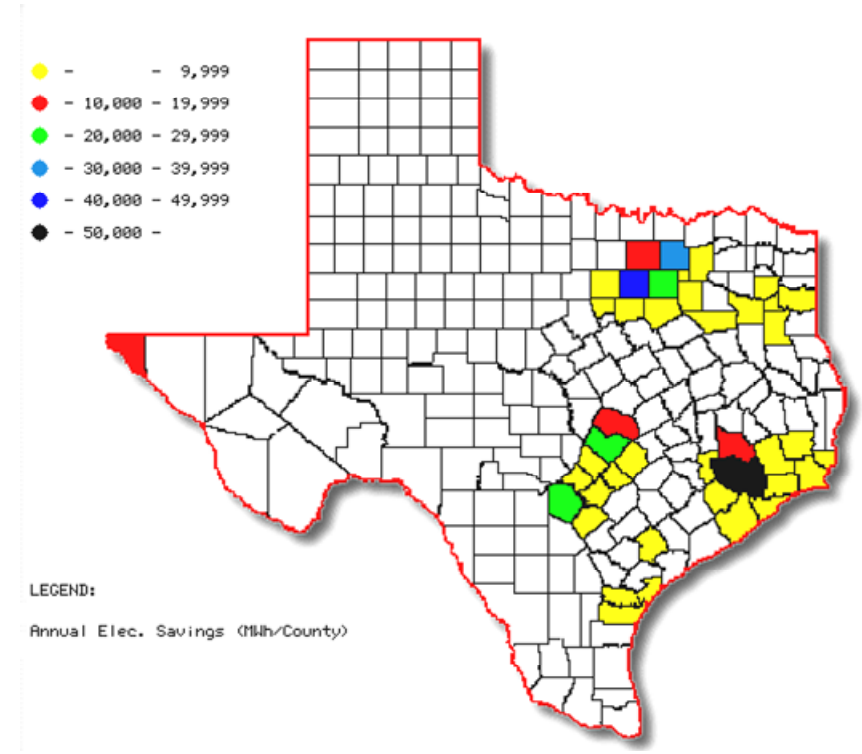


Figure 70: 2005 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Single-family and Multi-family Residences and for Commercial Buildings by County.



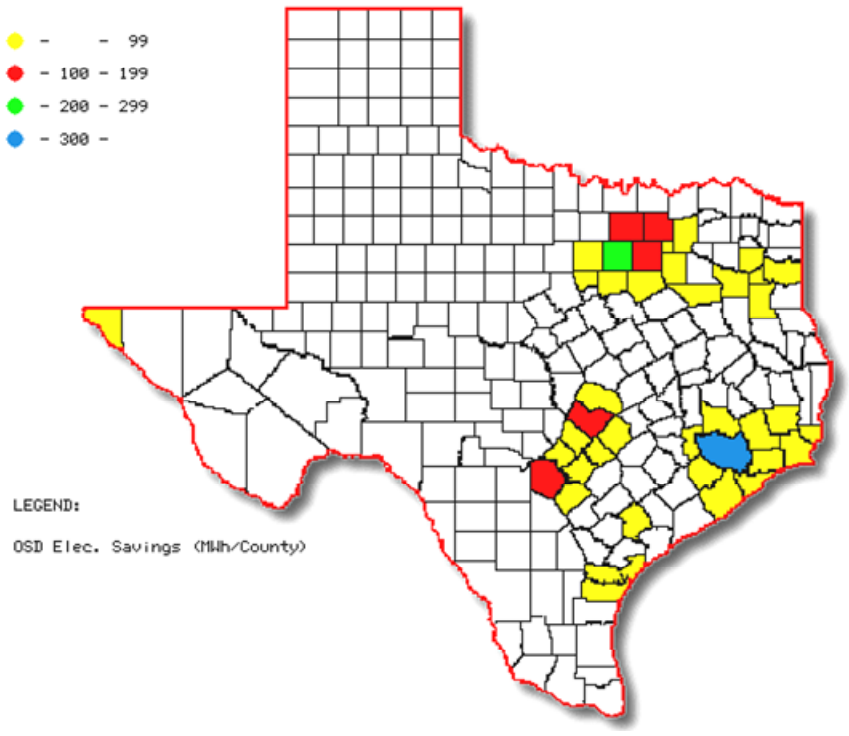
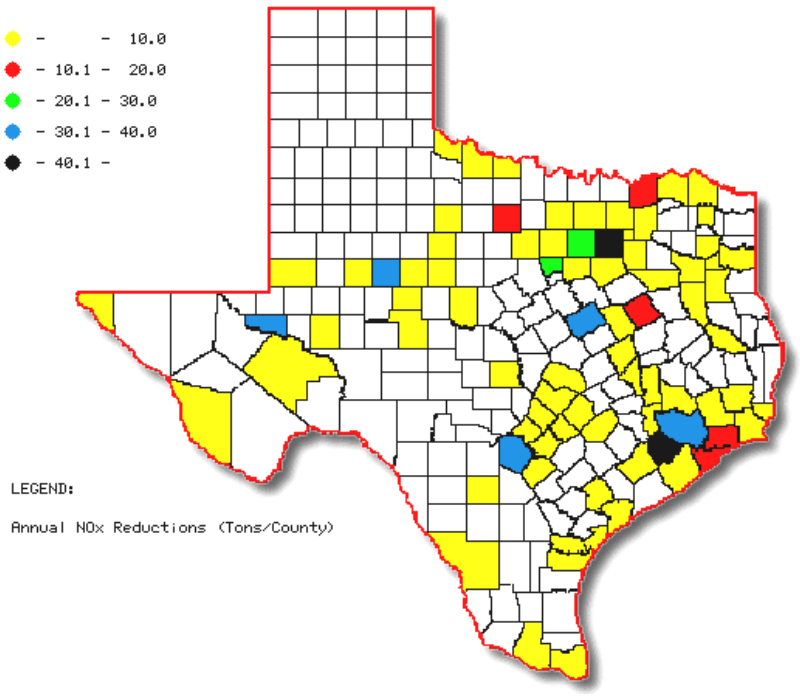


Figure 71: 2005 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Single-family and Multi-family Residences and for Commercial Buildings by County.



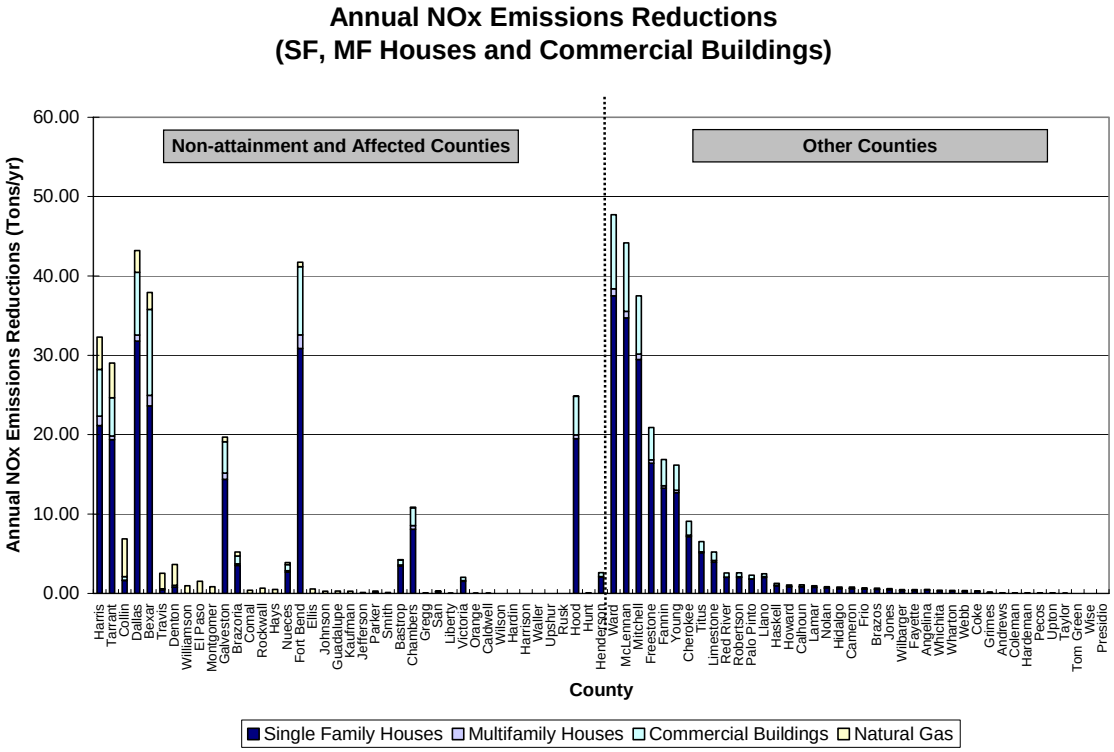
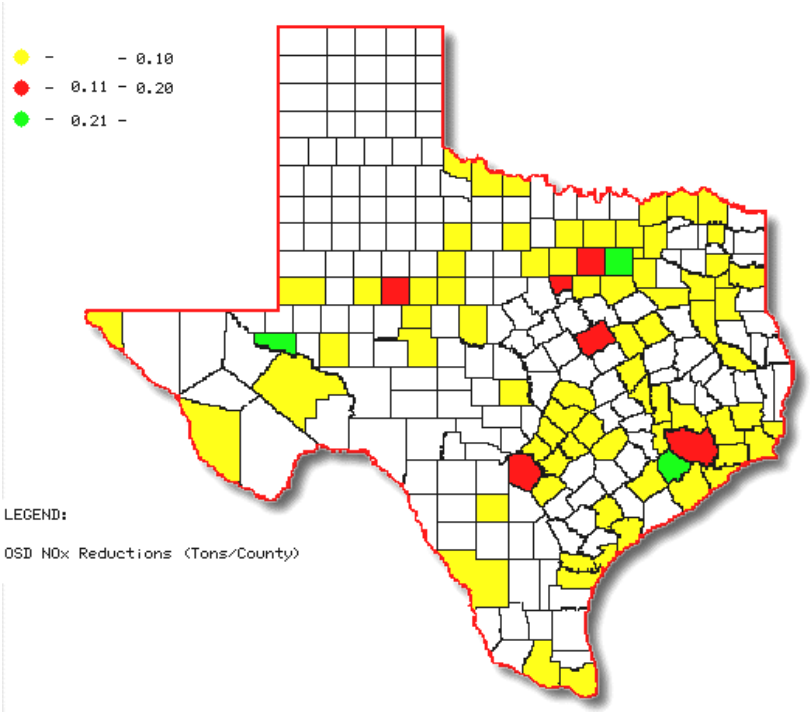


Figure 72: 2005 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 1999 eGRID).



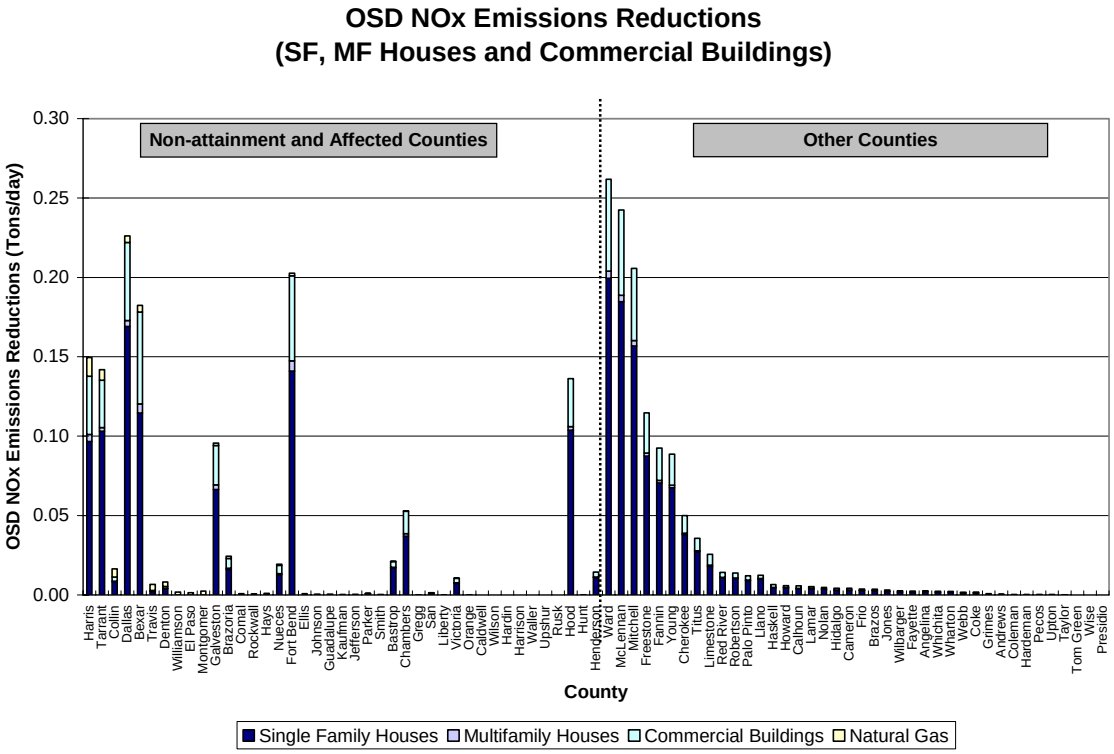


Figure 73: 2005 OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 1999 eGRID).

6.1.10 2005 Results for New Residential (Single-family and Multi-family) and Commercial Construction using 2007 eGRID.

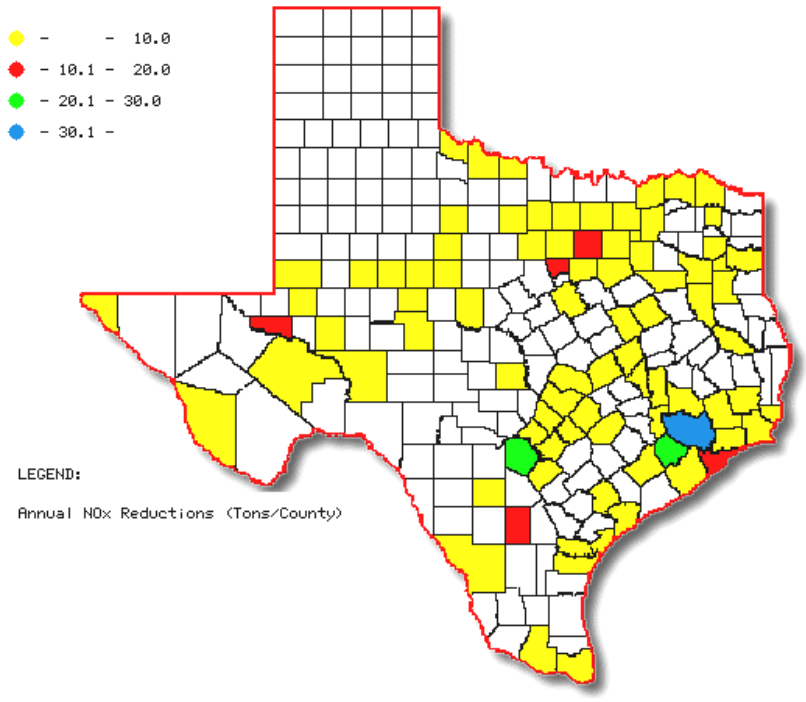
As shown in Table 80, the total annual electricity savings in 2005 were calculated to be 348,884 MWh/yr [50] which includes 263,656 MWh/yr (75.6%) for single-family residential, 10,157 MWh/yr (2.9%) for multi-family residential, and 75,072 MWh/yr (21.5%) for new commercial buildings. Natural gas savings were calculated to be 690,579 MBtu (6,905,796 therms) for new residential and commercial construction.

Using the 2007 eGRID, the total NOx reductions from electricity and natural gas savings from new residential (single family and multifamily) and commercial construction in 2005 are calculated to be 268.20 tons NOx/year which represents 236.43 tons NOx/year from electricity savings and 31.77 tons NOx/year from natural gas savings. On a peak Ozone Season Day (OSD), the NOx reductions in 2005 are calculated to be 1.26 tons of NOx/day which represents 1.20 tons NOx/day from electricity savings and 0.06 tons NOx/day from natural gas savings.

[50] In 2005 it is estimated that there were 128,804 single family residences and 29,972 multi-family residences, which totaled about 350 million sq. ft., and 122 million sq. ft. of commercial building construction.

Table 80: 2005 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 2007 eGRID).

	Electricity Savings and Resultant NOx Reductions (Single Family Houses)				Electricity Savings and Resultant NOx Reductions (Multifamily Houses)				Electricity Savings and Resultant NOx Reductions (Commercial Buildings)				Total Electricity Savings and Resultant NOx Reductions (SF, MF Houses and Commerical Buildings)				Total Natural Gas Savings and Resultant NOx Reductions (Single, Multi-Family Houses, and Commercial Buildings)				Total Nox Reductions	
County	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual N.G. Savings (Therm/County)	Annual Nox Reductions (Tons)	Total OSD N.G. Savings (Therm/County)	OSD Nox Reductions (Tons)	Annual Nox Reductions (Tons)	OSD Nox Reductions (Tons)
Harris	49,541.43	20.79	216.56	0.11	2,858.94	1.14	10.62	0.00	12459.60	5.79	88.12	0.04	64,859.99	27.72	313.2938	0.1534	889,657.18	4.09	2,544.6694	0.0117	31.81	0.17
Tarrant	33,606.87	7.93	177.96	0.05	618.73	0.19	3.54	0.00	10596.37	1.97	59.17	0.02	44,821.97	10.09	240.6060	0.0709	949,371.05	4.37	1,416.1985	0.0065	14.46	0.08
Collin	25,313.19	6.38	145.68	0.00	242.17	0.01	1.38	0.00	6056.85	0.10	33.67	0.00	31,612.22	0.49	180.7261	0.0025	1,038,185.28	4.78	1,118.8997	0.0051	5.27	0.01
Dallas	22,916.96	2.96	121.38	0.02	778.74	0.07	4.45	0.00	6462.81	0.72	46.70	0.00	30,157.65	3.69	174.5371	0.0221	593,678.26	2.73	905.0960	0.0042	6.42	0.03
Bexar	18,207.73	14.32	88.29	0.06	1,206.34	0.79	5.35	0.00	10257.22	6.57	54.82	0.03	29,671.28	21.68	148.4666	0.1006	465,265.04	2.14	917.0097	0.0042	23.82	0.10
Travis	18,717.76	0.28	90.17	0.00	981.06	0.01	4.00	0.00	6012.55	0.07	30.62	0.00	25,711.32	0.36	124.7870	0.0018	425,759.51	1.96	817.6887	0.0038	2.32	0.01
Denton	14,694.76	0.08	84.62	0.00	304.98	0.00	1.55	0.00	1027.81	0.02	15.47	0.00	16,017.55	0.11	101.6334	0.0008	570,827.07	2.63	605.0643	0.0028	2.73	0.00
Williamson	10,187.52	0.06	49.01	0.00	42.27	0.00	0.17	0.00	3340.55	0.00	15.94	0.00	13,570.35	0.00	65.1223	0.0000	211,112.27	0.97	398.3946	0.0018	0.97	0.00
El Paso	8,379.49	0.00	33.78	0.00	185.83	0.00	0.73	0.00	1807.92	0.00	12.21	0.00	10,373.24	0.00	46.7115	0.0000	330,193.46	1.52	317.2079	0.0015	1.52	0.00
Montgomery	10,751.38	0.00	46.91	0.00	325.68	0.00	1.21	0.00	5629.05	0.00	27.62	0.00	16,706.01	0.00	75.7382	0.0000	183,012.06	0.84	523.9856	0.0024	0.84	0.00
Galveston	5,274.22	10.98	23.06	0.04	1,022.39	0.58	3.80	0.00	1635.90	3.01	8.16	0.02	7,932.51	14.57	35.0188	0.0596	124,293.74	0.57	338.4299	0.0016	15.14	0.06
Brazoria	5,785.00	2.85	25.32	0.01	368.33	0.15	1.37	0.00	1323.03	0.78	6.86	0.01	7,476.37	3.76	33.4865	0.0200	111,428.69	0.51	309.9019	0.0014	4.27	0.02
Comal	3,220.05	0.00	15.57	0.00	69.88	0.00	0.31	0.00	40.10	0.00	0.50	0.00	3,330.03	0.00	16.3798	0.0000	88,384.54	0.41	165.1753	0.0008	0.41	0.00
Rockwall	3,608.00	0.00	20.82	0.00	0.00	0.00	0.00	0.00	142.30	0.00	1.48	0.00	3,750.31	0.00	22.2983	0.0000	143,271.06	0.66	149.9704	0.0007	0.66	0.00
Hays	4,713.70	0.69	22.75	0.00	209.00	0.03	0.65	0.00	396.21	0.12	2.06	0.00	5,318.91	0.85	25.4572	0.0042	108,024.26	0.50	230.6052	0.0011	1.38	0.01
Nueces	2,787.69	1.10	10.77	0.01	333.64	0.07	1.10	0.00	738.02	0.31	7.32	0.00	3,859.34	1.48	19.1838	0.0075	57,569.75	0.26	150.7138	0.0007	1.75	0.01
Fort Bend	6,819.58	21.45	29.83	0.08	100.36	1.18	0.37	0.00	2309.93	5.97	12.80	0.03	9,229.84	28.60	43.0020	0.1104	119,924.60	0.55	338.4681	0.0016	29.15	0.11
Ellis	4,092.90	2.14	21.69	0.01	24.43	0.05	0.14	0.00	-823.62	0.53	-1.70	0.00	3,293.71	2.72	20.1314	0.0158	119,286.72	0.55	175.0979	0.0008	3.27	0.02
Johnson	2,081.99	0.65	11.03	0.00	0.00	0.00	0.00	0.00	410.85	0.01	1.92	0.00	2,492.83	0.66	12.9935	0.0004	60,707.67	0.28	88.5838	0.0004	0.34	0.00
Guadalupe	2,838.20	0.56	12.78	0.00	69.32	0.02	0.31	0.00	980.81	0.16	4.67	0.00	3,888.35	0.69	17.7831	0.0035	64,722.68	0.30	124.5737	0.0006	0.96	0.00
Kaufman	1,774.18	4.13	10.25	0.02	3.10	0.10	0.02	0.00	-834.31	1.03	-1.35	0.01	942.97	5.25	8.9121	0.0296	63,155.38	0.29	63.5538	0.0003	5.54	0.03
Jefferson	1,308.30	0.00	5.67	0.00	17.44	0.00	0.07	0.00	1875.38	0.00	9.91	0.00	3,201.13	0.00	15.6471	0.0000	27,636.57	0.13	70.7747	0.0003	0.13	0.00
Parker	807.34	0.04	4.66	0.00	21.36	0.00	0.11	0.00	224.75	0.01	1.19	0.00	1,053.45	0.05	5.9612	0.0006	34,605.94	0.16	38.0817	0.0002	0.21	0.00
Smith	935.46	0.00	4.84	0.00	27.18	0.00	0.14	0.00	1096.81	0.00	5.35	0.00	2,059.48	0.00	10.3329	0.0000	24,974.91	0.11	52.7263	0.0002	0.11	0.00
Bastrop	686.68	1.27	3.11	0.01	20.95	0.05	0.08	0.00	452.44	0.23	2.08	0.00	1,140.09	1.55	5.2688	0.0077	9,643.60	0.04	21.5646	0.0001	1.59	0.01
Chambers	1,053.38	6.63	4.56	0.03	0.00	0.36	0.00	0.00	38.35	1.84	0.18	0.01	1,091.68	8.84	4.7434	0.0434	19,683.62	0.09	52.5158	0.0002	8.93	0.04
Gregg	464.89	0.00	2.40	0.00	26.26	0.00	0.12	0.00	587.69	0.00	3.15	0.00	1,078.83	0.00	5.6764	0.0000	15,220.96	0.07	28.4616	0.0001	0.07	0.00
San Patricio	582.06	0.24	2.25	0.00	65.40	0.02	0.22	0.00	36.14	0.07	0.17	0.00	683.61	0.33	2.6043	0.0010	12,233.93	0.06	31.5913	0.0001	0.38	0.00
Liberty	490.83	0.00	2.12	0.00	0.00	0.00	0.00	0.00	262.62	0.00	1.25	0.00	753.45	0.00	3.3693	0.0000	7,460.40	0.03	21.8263	0.0001	0.03	0.00
Victoria	207.36	0.25	0.99	0.00	73.96	0.01	0.31	0.00	420.16	0.07	1.98	0.00	701.45	0.33	3.2903	0.0016	2,959.68	0.01	9.9796	0.0000	0.34	0.00
Orange	462.74	0.00	2.01	0.00	0.00	0.00	0.00	0.00	374.08	0.00	1.73	0.00	836.83	0.00	3.7330	0.0000	5,030.91	0.02	17.7670	0.0001	0.02	0.00
Caldwell	237.08	0.00	1.12	0.00	0.00	0.00	0.00	0.00	62.07	0.00	0.28	0.00	299.15	0.00	1.4075	0.0000	4,618.51	0.02	9.5110	0.0000	0.02	0.00
Wilson	82.68	0.00	0.40	0.00	1.11	0.00	0.00	0.00	33.82	0.00	0.15	0.00	117.42	0.00	0.5593	0.0000	1,944.59	0.01	3.7465	0.0000	0.01	0.00
Hardin	213.85	0.00	0.93	0.00	0.00	0.00	0.00	0.00	402.43	0.00	1.90	0.00	616.28	0.00	2.8293	0.0000	2,152.10	0.01	7.8417	0.0000	0.01	0.00
Harrison	68.68	0.00	0.35	0.00	0.00	0.00	0.00	0.00	325.26	0.00	1.63	0.00	393.87	0.00	1.9803	0.0000	272.06	0.00	1.1609	0.0000	0.00	0.00
Walker	82.08	0.00	0.36	0.00	57.01	0.00	0.21	0.00	-1866.05	0.00	-4.88	0.00	-1,726.96	0.00	-4.1140	0.0000	-8,586.04	-0.04	-8.8401	0.0000	-0.04	0.00
Upshur	14.16	0.06	0.07	0.00	0.00	0.00	0.00	0.00	54.43	0.00	0.26	0.00	68.53	0.00	0.3376	0.0000	-84.40	0.00	0.0325	0.0000	0.00	0.00
Rusk	19.82	0.45	0.10	0.00	17.91	0.01	0.09	0.00	0.00	0.11	0.00	0.00	37.63	0.57	0.1949	0.0000	1,207.39	0.01	2.9812	0.0000	0.57	0.00
Hood	210.05	8.17	1.11	0.04	2.86	0.19	0.02	0.00	148.24	2.03	0.71	0.01	361.15	10.39	1.8406	0.0561	5,356.22	0.02	7.8939	0.0000	10.42	0.06
Hunt	432.64	4.03	2.48	0.02	79.29	0.10	0.40	0.00	225.45	1.00	1.27	0.01	737.41	5.13	4.1678	0.0280	16,613.65	0.08	19.8859	0.0001	5.21	0.03
Henderson	213.31	0.53	1.11	0.00	1.41	0.01	0.01	0.00	348.63	0.13	1.64	0.00	563.35	0.68	2.7639	0.0043	4,989.51	0.02	10.8523	0.0000	0.70	0.00
Ward		12.10		0.07		0.29		0.00		3.01		0.02		15.40		0.0901						15.40	0.09
McLennan		15.99		0.08		0.38		0.00		3.98		0.02		20.35		0.1048						20.35	0.10
Mitchell		9.74		0.06		0.23		0.00		2.42		0.02		12.40		0.0772						12.40	0.08
Freestone		2.40		0.01		0.06		0.00		0.60		0.00		3.05		0.0172						3.05	0.02
Fannin		4.60		0.03		0.11		0.00		1.14		0.01		5.85		0.0347						5.88	0.03
Young		4.06		0.02		0.10		0.00		1.01		0.01		5.17		0.0250						5.17	0.03
Cherokee		2.28		0.01		0.05		0.00		0.57		0.00		2.91		0.0166						2.91	0.02
Titus		3.71		0.00		0.09		0.00		0.92		0.00		4.73		0.0000						4.73	0.00
Limestone		0.22		0.00		0.01		0.00		0.06		0.00		0.29		0.0000						0.29	0.00
Red River		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.0000						0.00	0.00
Robertson		0.46		0.00		0.02		0.00		0.11		0.00		0.59		0.0015						0.59	0.00
Palo Pinto		0.56		0.00		0.02		0.00		0.14		0.00		0.73		0.0037						0.73	0.00
Llano		0.35		0.00		0.01		0.00		0.08		0.00		0.43		0.0021						0.43	0.00
Haskell		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.0000						0.00	0.00
Howard		0.38		0.00		0.01		0.00		0.09		0.00		0.46		0.0027						0.46	0.00
Calhoun		0.40		0.00		0.03		0.00		0.11		0.00		0.54		0.0035						0.54	0.00
Lamar		0.62		0.00		0.01		0.00		0.15		0.00		0.79		0.0049						0.79	0.00
Nolan		0.37		0.00		0.01		0.00		0.09		0.00		0.47		0.0027						0.47	0.00
Hidalgo		0.91		0.01		0.06		0.00		0.26		0.00		1.23		0.0080						1.23	0.01
Cameron		0.23		0.00		0.02		0.00		0.07		0.00		0.31		0.0018						0.31	0.00
Fisi		0.10		0.00		0.00		0.00		0.03		0.00		0.13		0.0012						0.13	0.00
Brazos		0.34		0.00		0.01		0.00		0.09		0.00		0.44		0.0023						0.44	0.00
Jones		0.20		0.00		0.01		0.00		0.06		0.00		0.27		0.0014						0.27	0.00
Wilbarger		0.14		0.00		0.01		0.00		0.04		0.00		0.19		0.0009						0.18	0.00
Fayette		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.0000						0.00	0.00
Angelina		0.20		0.00		0.00		0.00		0.05		0.00		0.26		0.0015						0.26	0.00
Whichita		0.14		0.00		0.00		0.00		0.03		0.00		0.17		0.0010						0.17	0.00
Wharton		0.04		0.00		0.00		0.00		0.01		0.00		0.06		0.0003						0.06	0.00
Webb		0.10		0.00		0.00		0.00		0.03		0.00		0.13		0.0006						0.13	0.00
Coke		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.0000						0.00	0.00
Grimes		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.0007						0.00	0.00
Andrews		0.02		0.00		0.00		0.00		0.00		0.00		0.02		0.0001						0.02	0.00
Coleman		0.01		0.00		0.00		0.00		0.00		0.00		0.01		0.0000						0.01	0.00
Hardeman		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.0000						0.00	0.00
Pecos		0.03		0.00		0.00		0.00		0.01		0.00		0.03		0.0002						0.03	0.00
Upton		0.02		0.00		0.00		0.00		0.01		0.00		0.03		0.0001						0.02	0.00
Taylor		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.0000						0.00	0.00
Tom Green		0.01		0.00		0.00		0.00		0.00		0.00		0.01		0.0000						0.01	0.00
Wise		1.85		0.01		0.04		0.00		0.48		0.00		2.35		0.0132						2.35	0.01
Presidio		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.0000						0.00	0.00
Bosque		0.10		0.00		0.00		0.00		0.03		0.00		0.13		0.0011						0.13	0.00
Crockett		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.0000						0.00	0.00
Ector		2.30		0.01		0.05		0.00		0.57		0.00		2.93		0.0165						2.93	0.02
Jack		1.38		0.01		0.03		0.00		0.34		0.00		1.76		0.0099						1.78	0.01
Milam		1.46		0.01		0.03		0.00		0.36		0.00		1.86		0.0075						1.89	0.01
Total	263,655.66	180.01	1,298.81	0.88	10,157.29	6.89	43.05	0.03	75,071.62	49.53	457.17	0.29	348,884.56	236.43	1,799.03	1.2007	6,905,796.41	31.77	12,099.64	0.06	268.20	1.20



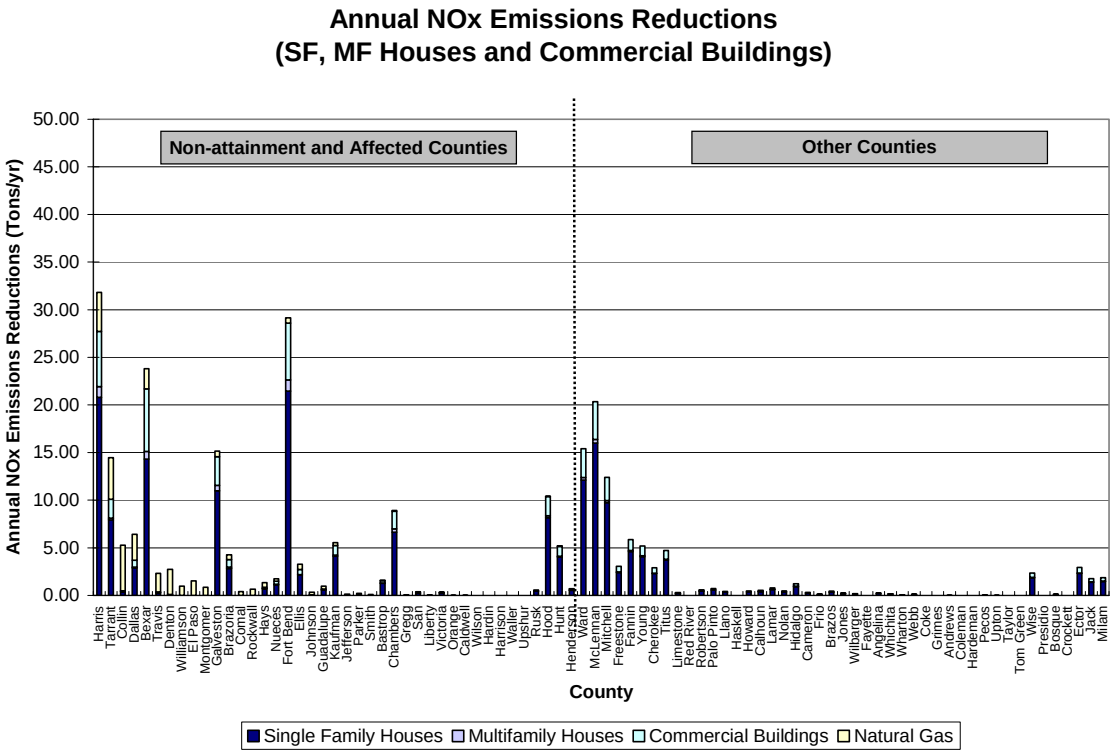
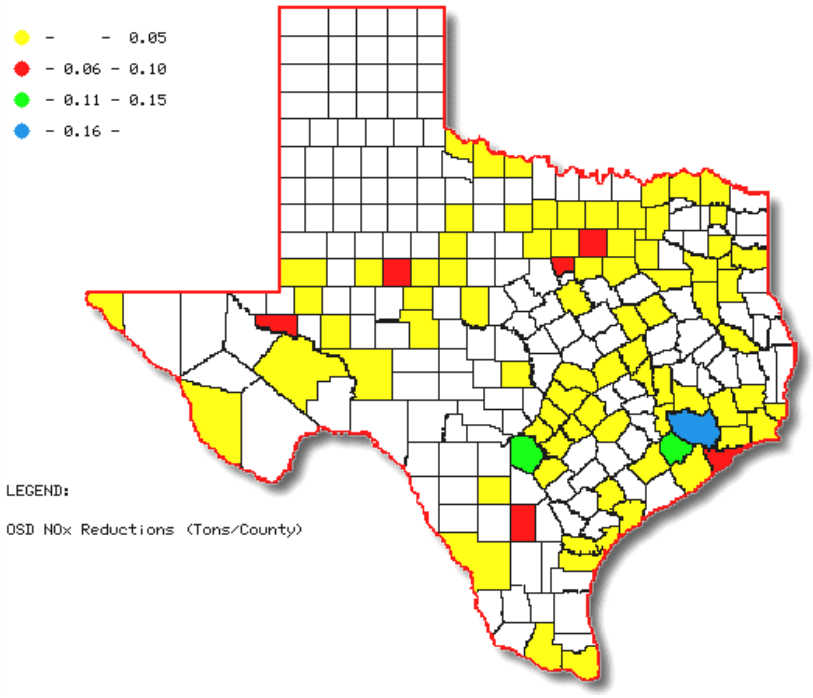


Figure 74: 2005 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 2007 eGRID).



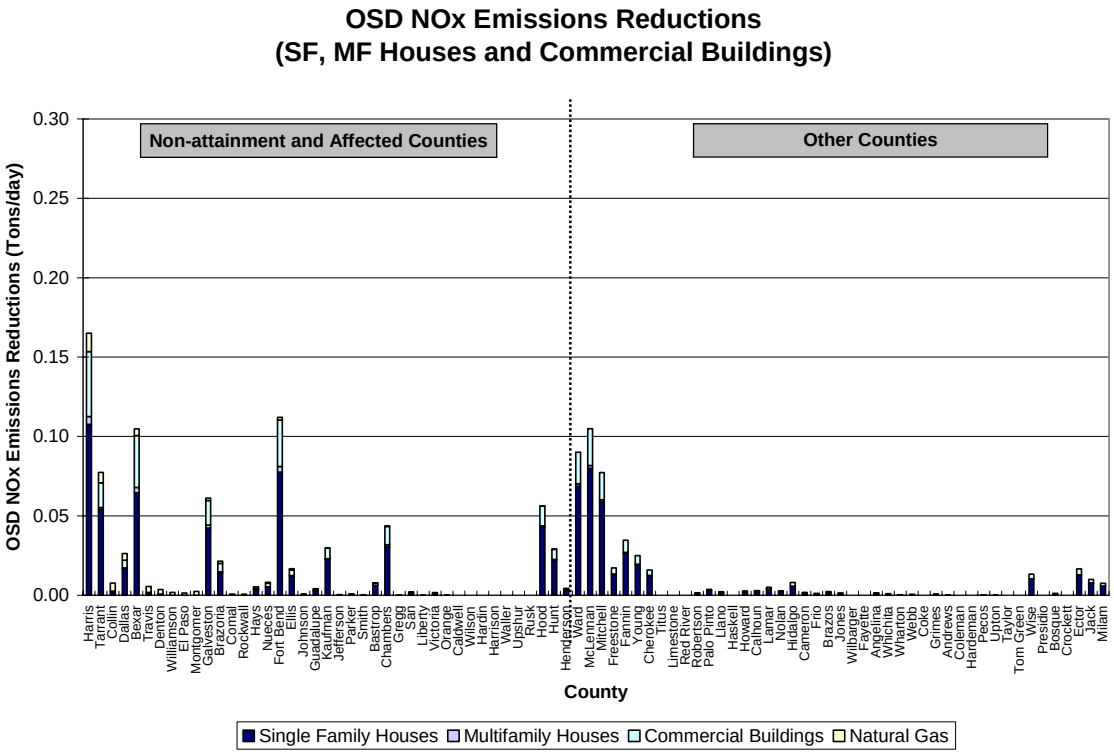


Figure 75: 2005 OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 2007 eGRID).

6.2 Comparison of 2005 Emissions Reductions Vs. 2004 Emissions Reductions Calculations

The 2005 emissions reductions calculations were performed using the 1999 eGRID as well as the 25% 2007 annual eGRID and the 25% 2007 Ozone Season Day (OSD) eGRID. If the NOx emissions are considered from the 25% 2007 eGRID for both annual and OSD, there is a significant decrease in the emissions reduction from the implementation of the IECC / IRC to new single-family and multi-family residential construction. An increase in the NOx emissions reduction is noted if the 1999 eGRID is used for these two programs. The variations in NOx emissions reduction from 2004 to 2005 are depicted in Figure 76 to Figure 81 and Table 81. This significant variation in the emissions from 2004 to 2005 is not only because of the different eGRID tools that were employed but also due to several other changes incorporated in the analysis methodology, including:

- Changes to the code-compliant simulations for both single and multifamily;
- Use of the Ozone Season Day (Average daily for the period between July 15 and September 15) instead of the peak OSD (August 19);
- Change to the number of building permits for the 41 counties for 2005; and
- Changes in the percentages of the number of stories and the type of foundation.

If the 25% 2007 annual eGRID is used then these changes resulted in a 35.9% decrease in the total 2005 NOx reductions from new single-family and multi-family construction when compared to 2004, which includes a 40.3% decrease from single-family residential electricity savings, a 51.1% decrease from multi-family residential electricity savings, and a 14.3% increase in natural gas savings from single-family and multi-family residential. For the OSD using the 25% 2007 OSD eGRID, the decrease in total NOx reductions was 48.7% from new single-family and multi-family construction, which includes a 50.3% decrease from single-family residential electricity savings, a 57.1% decrease from multi-family residential electricity savings, and a 20.0% increase in natural gas savings from single-family and multi-family residential. The emissions factor for natural gas savings used with the 2007 version of the eGRID is the same as the factor used for calculating emissions from natural gas in 2004.

If the 1999 eGRID is used, then the above-mentioned changes resulted in a 18.4% increase in the total 2005 NOx reductions from new single-family and multi-family construction when compared to 2004, which includes a 20.2% increase from single-family residential electricity savings, a 11.5% decrease from multi-family residential electricity savings, and a 14.3% increase in natural gas savings from single-family and multi-family residential. For the OSD using the 1999 eGRID, the increase in total NOx reductions was 3.7% from new single-family and multi-family construction, which includes a 4.5% increase from single-family residential electricity savings, a 14.3% decrease from multi-family residential electricity savings, and a 20.0% increase in natural gas savings from single-family and multi-family residential.

Selected features can be seen in Figure 76 to Figure 81. It can be seen that, if the 1999 eGRID is used, there is no change in the NOx emissions reduction pattern for 2005 compared to 2004. However, with the 25% 2007 annual and OSD eGRID, the trend of NOx emissions reduction for all the counties is entirely different as shown in Figure 78 and Figure 81. The largest change can be seen in Dallas County where the NOx emissions reductions are almost one-fifth the values calculated by the 1999 eGRID. This shows that the emission factor in this county has been reduced suggesting more efficient power production. Hood County shows a similar trend. The emissions reduction in Hunt County from the 2007 eGRIDs show increased NOx emissions reduction suggesting additional pollution from new power production facilities. Additional details about the differences are included in the following sections.

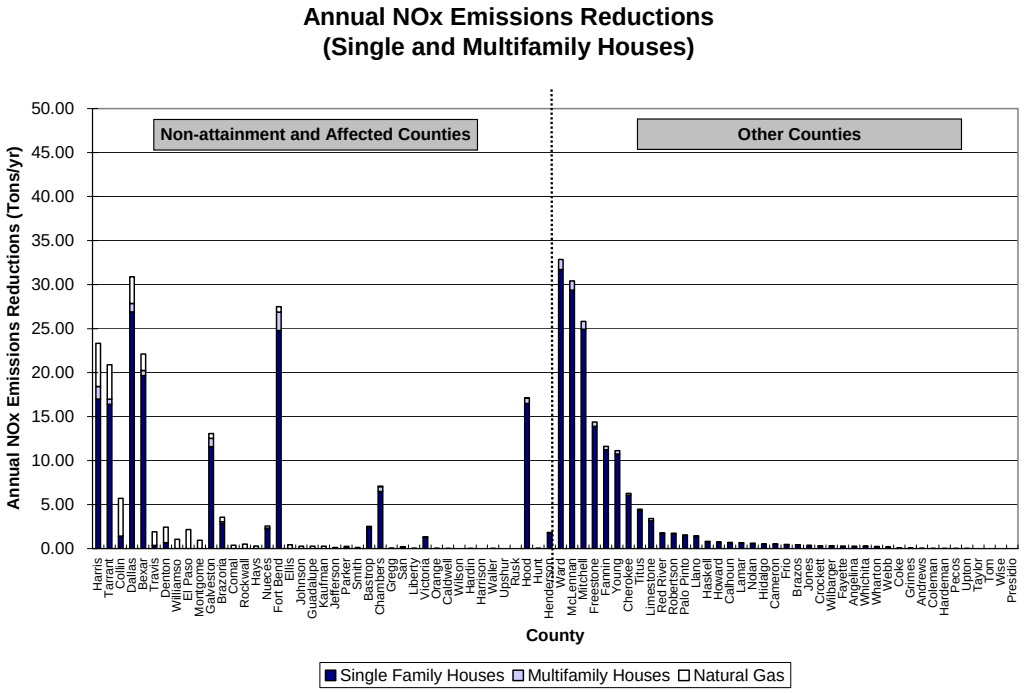


Figure 76: 2004 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County.

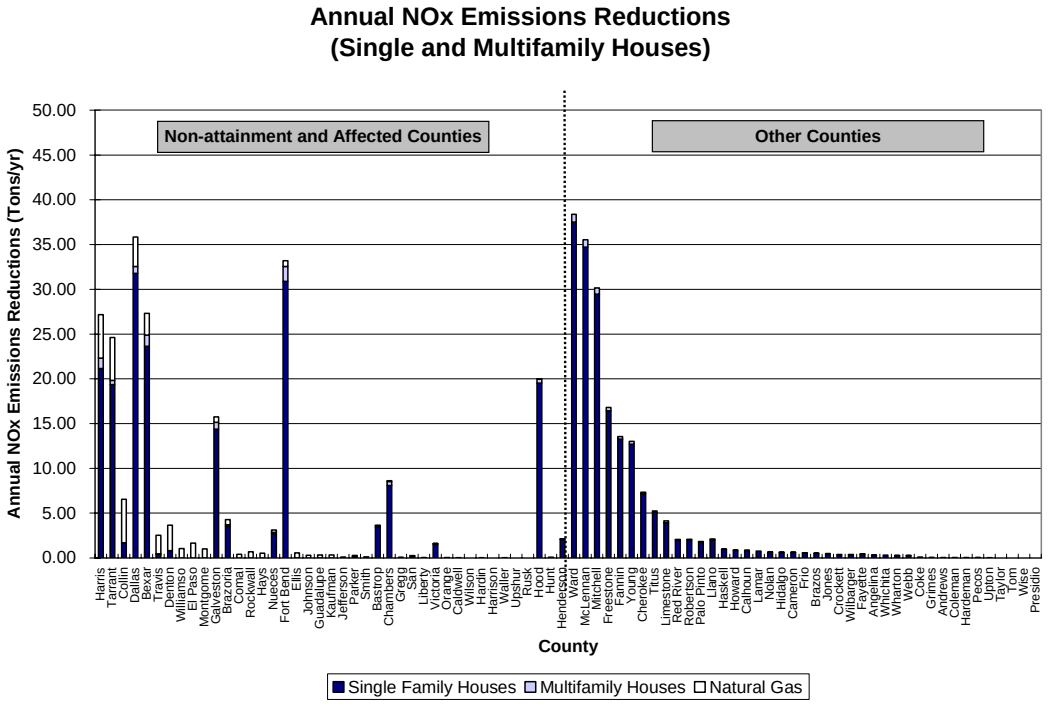


Figure 77: 2005 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 1999 eGRID).

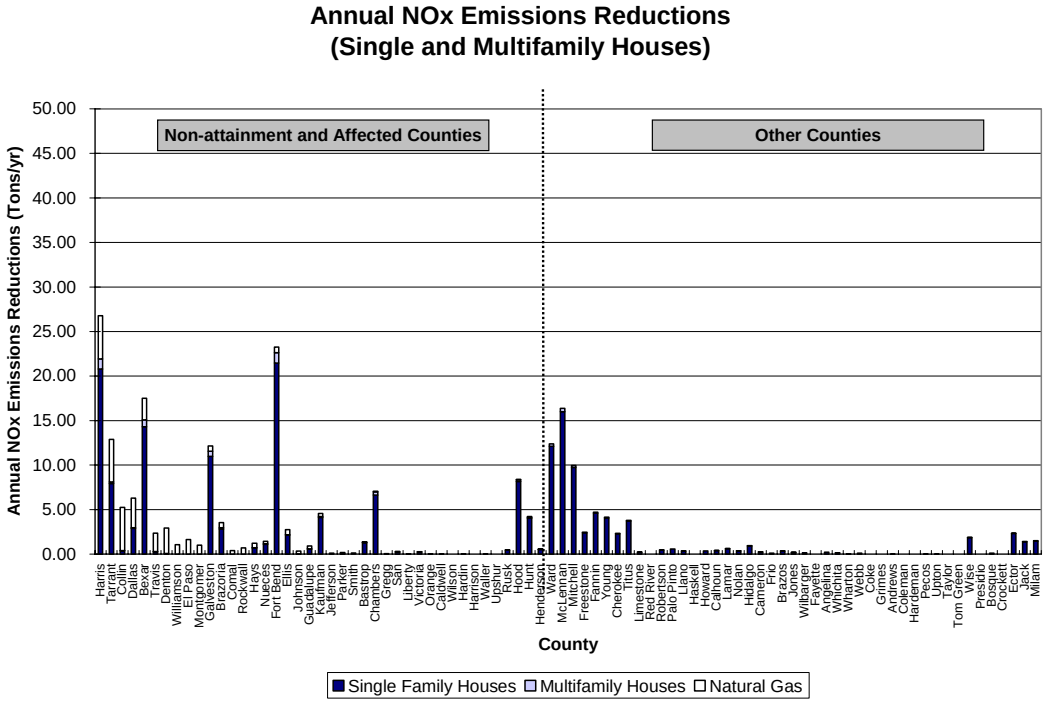


Figure 78: 2005 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 2007 eGRID).

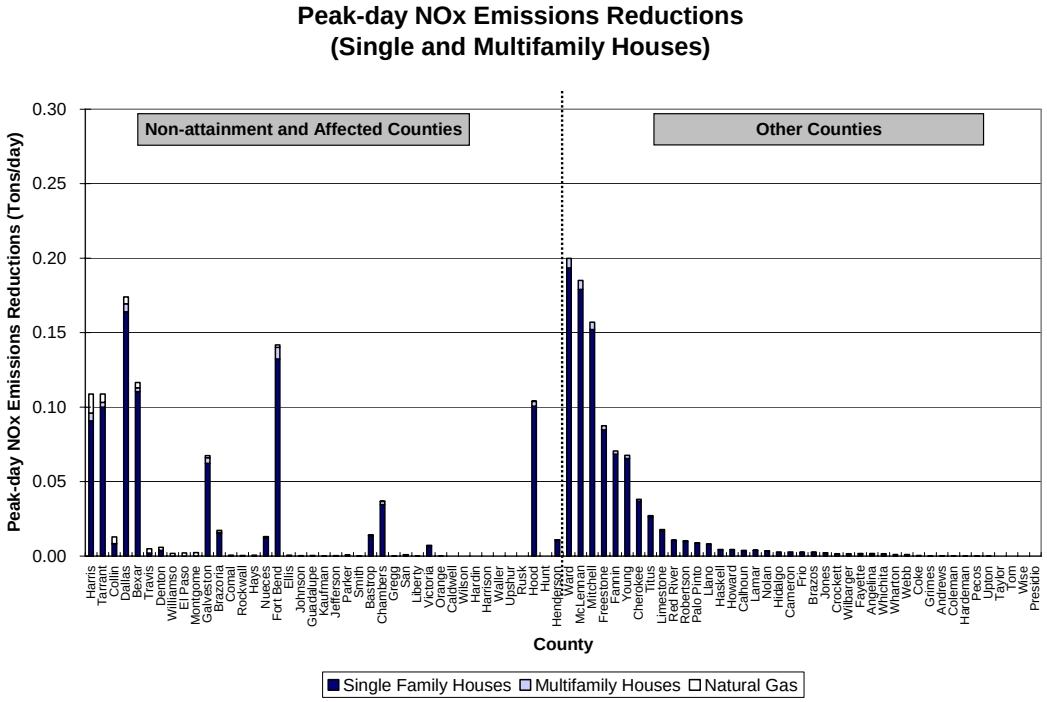


Figure 79: 2004 Peak OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County.

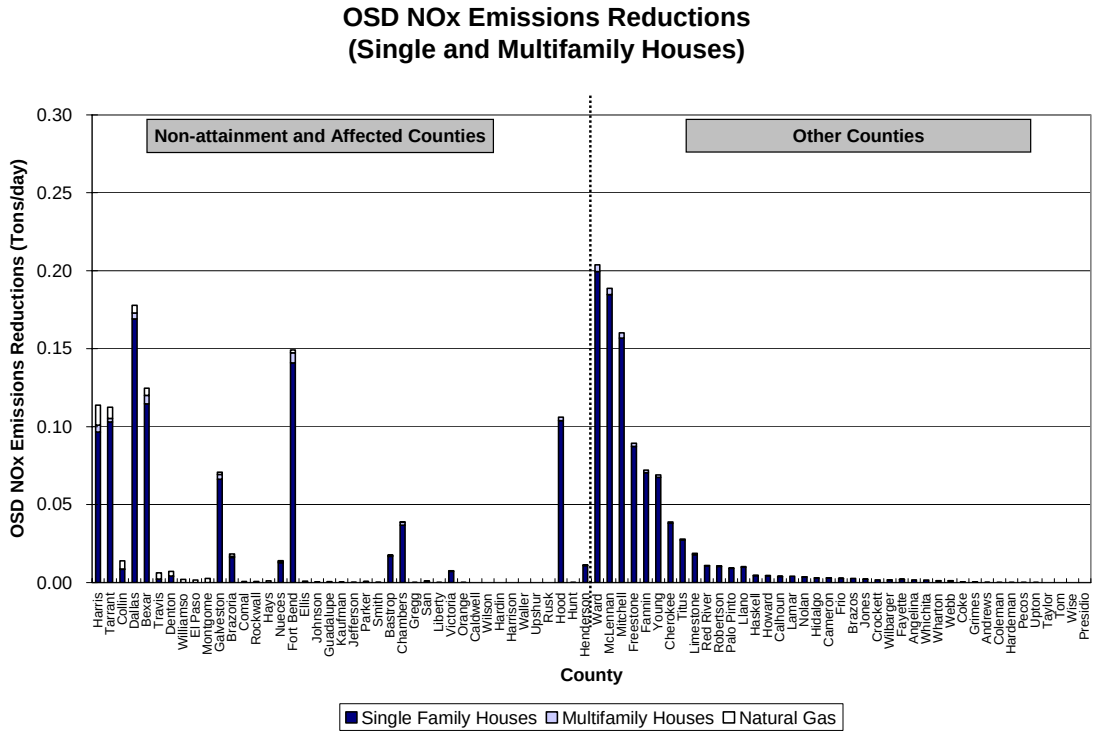


Figure 80: 2005 OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 1999 eGRID).

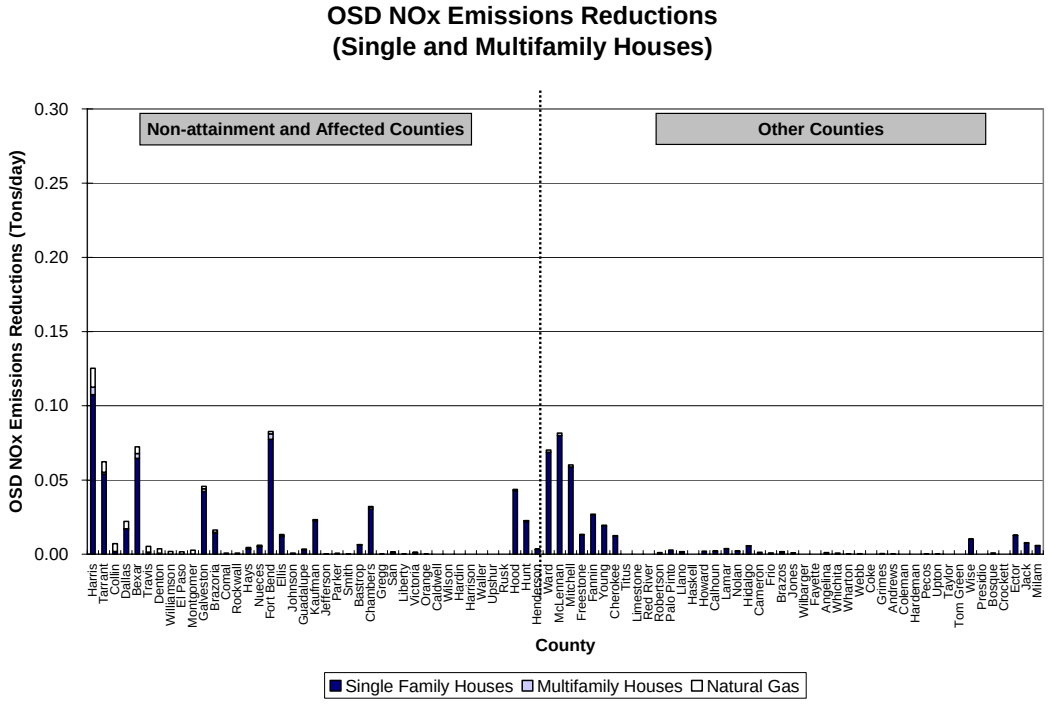


Figure 81: 2005 OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (Using 2007 eGRID).

Table 81: Comparison of 2005 Emissions Reductions vs. 2004 Emissions Reductions from Implementation of the IECC / IRC to Single-family and Multi-family Residential Construction.

ITEM	2005 (2007 eGRID)	2005 (1999 eGRID)	2004 (1999 eGRID)	% Change	
	1	2	3	2 vs. 3	1 vs. 3
Annual (tons-NOx/yr)				(2-3)/3	(1-3)/3
Total – Electricity and N.Gas	222.02	410.34	346.49	18.43%	-35.92%
Single-family Electricity	180.01	362.74	301.67	20.24%	-40.33%
Multi-family Electricity	6.89	12.47	14.09	-11.50%	-51.10%
Natural Gas (SF and MF)	35.13	35.13	30.73	14.32%	14.32%
Peak-day or OSD (tons-NOx/day)					
Total – Electricity and N.Gas	0.97	1.96	1.89	3.70%	-48.68%
Single-family Electricity	0.88	1.85	1.77	4.52%	-50.28%
Multi-family Electricity	0.03	0.06	0.07	-14.29%	-57.14%
Natural Gas (SF and MF)	0.06	0.06	0.05	20.00%	20.00%

6.2.1 Changes to the Code-compliant Simulations.

In both the single-family and multi-family code-compliant simulations, new features were added and corrections were made to the DOE-2 input file to improve the accuracy of the simulations. As shown in Table 82, for the single-family simulations, these changes include:

- Addition of one pilot light to the pre-code run (total change still equals the elimination of one pilot light in the furnace);
- Addition of three bedrooms according to NAHB data;
- Correction of the coordinates of the second floor for the slab-on-grade house;
- Change in the position of the garage and the correct definition of the garage total volume and floor weight;
- Correction in specifying the floor above the crawlspace; and
- Change in the domestic hot water heater characteristics.

Table 83 and Table 84 show the actual impact of these changes on a house located in Harris and Tarrant counties as well as the total impact on the previously mentioned counties. For Harris County (Table 83, Step 2), the above changes resulted in a 17.5% increase in the annual MWh savings for the entire county from 39,745 MWh/year to 46,721 MWh/year. Annual natural gas savings went down by 2.1% from 950,772 to 930,828 therms/year. The peak kWh savings went up by 13% but the definition of the peak OSD changed from August 19 to the average consumption from July 15 to September 15, the savings were adjusted again as shown in Step 3 of Table 83. By the changes in the simulation input, the total annual NOx emissions savings increased by 15.16% from 35.7 to 41.1 tons/year, while the peak emissions savings increased by 12.86% from 0.171 to 0.193 tons/OSD.

For Tarrant County (Table 84, Step 2), the above changes resulted in a 7.2% increase in the annual MWh savings for the entire county from 27,984 MWh/year to 29,997 MWh/year. Annual natural gas savings went down by 0.8% from 825,408 to 818,479 therms /year. The peak kWh savings went up by 4.8%. However, as mentioned earlier about the definition of the peak OSD, the savings were adjusted later as shown in Step 3 of Table 84. The total annual NOx emissions savings increased by 6.6% from 54.6 to 58.3 tons/year, while the peak emissions savings increased by 4.7% from 0.311 to 0.326 tons/OSD.

The “Per House” columns show the differences for one configuration of the single family house as an example. Note 1 of Table 83 and Table 84 provide the house configuration used. Figure 82 and Figure 83 show the percentage change in savings for each of the above mentioned steps.

Table 85 shows the changes made to the Multi-family model, they are:

- Corrected U-factor requirement for Harris County code run;
- Addition of one pilot light for the pre-code run (total change still equals the elimination of one pilot light in the furnace);
- Addition of one bedroom according to NAHB data;
- Change in the Domestic hot water characteristics; and
- Automatic calculations of Ground form factor and Sky form factor.

Table 86 and Table 87 show the impact of these changes on house configuration in Harris and Tarrant counties as well as the total impact on the previously mentioned counties. For Harris County (Table 86, Step 2), the above changes resulted in a 6.8% increase in the annual MWh savings for the entire county from 4,646 MWh/year to 4,961 MWh/year. Annual natural gas savings also increased by 2.4% from 117,613 to 120,442 therms/year. The peak kWh savings went up by 18.3%, however, the definition of the peak OSD changed from August 19 to the average consumption from July 15 to September 15, the savings were adjusted again as shown in Step 3 of Table 86. By the changes in the simulation input, the total annual NOx emissions savings increased by 5.8% from 4.22 to 4.47 tons/year, while the peak emissions savings increased by 46.8% from 0.012 to 0.017 tons/OSD.

For Tarrant County (Table 87, Step 2), the above changes resulted in a 6.9% increase in the annual MWh savings for the entire county from 736 MWh/year to 787 MWh/year. Annual natural gas savings went down by 0.6% from 25,456 to 25,305 therms/year. There was no effect on the peak kWh and therm savings. The total annual NOx emissions savings increased by 6.3% from 1.45 to 1.55, while the peak savings increased by 29.4% from 0.012 to 0.013.

The “Per House” columns show the differences for one configuration of the multifamily house as an example. Note 1 of Table 86 and Table 87 provide the house configuration used. Figure 84 and Figure 85 show the percentage change in savings for each of the above previously mentioned steps.

6.2.2 Change in the Assumption for Peak Day Calculations:

For 2005, the peak day calculations were based on the average energy consumption during the period between July 15 and September 15, known as the average Ozone Season Day (OSD) instead of the assumption of using August 19 as the peak day.

For single-family houses in Harris County (Table 83, Step 3), the peak MWh savings increased to 230.88 due to the modification of the input file that was adjusted again to 204.35 MWh/OSD as compared to 204.25 MWh/peak day in 2004. The OSD NOx emissions increased by 0.65%, from 0.171 to 0.172 tons/OSD.

For single-family houses in Tarrant County (Table 84, Step 3), the peak MWh savings increased to 176.57 due to the modification of the input file that was adjusted again to 153.95 MWh/OSD as compared to 168.54 MWh/peak day in 2004, a decrease of 8.65%. The OSD NOx emissions decreased by 8.51%, from 0.311 to 0.285.

For multi-family houses Harris County (Table 86, Step 3), the peak MWh savings increased to 19.55 due to the modification of the input file that was adjusted again to 18.43 MWh/OSD as compared to 16.52 MWh/peak day in 2004, an increase of 11.6%. The OSD NOx emissions increased by 39.2%, from 0.012 to 0.016 tons/OSD.

For multi-family houses in Tarrant County (Table 87, Step 3), the decrease in the peak MWh savings was negligible and hence has no effect on the peak day NOx emissions reduction.

6.2.3 Change to the Number of Building Permits for the 41 Counties for 2005:

The number of building permits issued for Single- and Multi-family housing in 2004 from actual construction data was used to update the calculations for 2005.

For single-family housing in Harris County (Table 83, Step 4), the annual MWh savings increased by 24.5%, from 39,745 to 49,494 MWh/year. The annual natural gas savings went up by 3.7%, from 950,772 to 986,080 therms. The peak MWh savings increased by 6%, from 204.25 to 216.48 MWh/OSD. The peak gas savings went up by 5.9%, from 2,447 to 2,592 therms/OSD. The annual NOx emissions reduction increased by 22%, from 35.7 to 43.6 tons/year, while the peak day NOx emissions reduction increased by 6.6%, from 0.171 to 0.183 tons/OSD.

For single-family housing in Tarrant County (Table 84, Step 4), the annual MWh savings increased by 30% from 27,984 to 35,396 MWh/year. The annual natural gas savings went up by 17% from 825,408 to 965,795. The peak MWh savings increased by 7.8%, from 168.54 to 181.66 MWh/OSD. The peak gas savings went up by 18%, from 1,153 to 1,361 therms/OSD. The annual NOx emissions reduction increased by 25.8%, from 54.6 to 68.7 tons/year, while the peak OSD NOx emissions reduction increased by 8%, from 0.311 to 0.336 tons/OSD.

For multi-family housing in Harris County (Table 86, Step 4), the annual MWh savings decreased by 38.5%, from 4,646 to 2,859 MWh/year. The annual natural gas savings decreased by 41%, from 117,613 to 69,408 therms. The peak MWh savings decreased by 36%, from 16.52 to 10.62 MWh/OSD. The peak gas savings went down by 42.3%, from 340 to 196 therms/OSD. The annual NOx emissions reduction decreased by 39%, from 4.22 to 2.57 tons/year, while the peak OSD NOx emissions reduction decreased by 19.80%, from 0.012 to 0.009 tons/OSD.

For multi-family housing in Tarrant County (Table 87, Step 4), the annual MWh savings decreased by 15.9%, from 736 to 619 MWh/year. The annual natural gas savings decreased by 21.8%, from 25,456 to 19,903. The peak MWh savings decreased by 21.5%, from 4.51 to 3.54 MWh/OSD. The peak gas savings went down by 22.1%, from 77 to 60 therms/OSD. The annual NOx emissions reduction decreased by 16.4%, from 1.45 to 1.22 tons/year, while the peak OSD NOx emissions reduction decreased by 15%, from 0.012 to 0.011 tons/OSD.

6.2.4 Use of New Updated Data on the Percentage of Housing Types:

For the 2004 analysis, the division of housing types for single family was based on the NAHB data for only east Texas from 1999. This information has been updated by using data from both east and west Texas for a better description of the house types in the 41 counties.

For Single family Harris County (Table 83), the annual MWh savings increased by 24.6%, from 39,745 to 49,541 MWh/year. The annual natural gas savings went up by 3.7%, from 950,772 to 986,455. The peak MWh savings increased by 6%, from 204.25 to 216.56 MWh/OSD. The annual NOx emissions reduction increased by 22.1%, from 35.7 to 43.6 tons/year, while the peak OSD NOx emissions reduction increased by 6.7%, from 0.171 to 0.183 tons/OSD.

For single family housing in Tarrant County (Table 84, Step 5), the annual MWh savings increased by 20.1%, from 27,984 to 33,607. The savings reduced due to the adjustment of the housing types compared with just the adjustment in the housing permits. The annual natural gas savings increased by 23.2%, from 825,408 to 1,016,947 therms/year. The peak MWh savings increased by 5.5%, from 168.54 to 177.9 MWh/OSD. The peak gas savings went up by 28.7%, from 1,153 to 1,484 therms/OSD. The annual NOx emissions reduction increased by 20.3%, from 54.6 to 65.7 tons/year, while the peak OSD NOx emissions reduction increased by 5.9%, from 0.31 to 0.33 tons/OSD.

6.2.5 Use of 2007 25% Annual and Ozone Season Day eGRID:

As required by the TCEQ, the new 2007 25% plant capacity eGRID for both annual and Ozone Season Day were used to calculate the NOx emissions reduction from the new single- and multi-family code-compliant construction. This version of eGRID provides a more conservative estimate of the NOx emission reduction by the implementation of IECC 2000/2001 Supplement.

For single-family housing in Harris County (Table 83, Step 6), the annual NOx emissions reduction savings reduced by 8.46%, from 35.7 to 32.7 tons/year. The OSD NOx emissions reduction savings reduced by 25.2%, from 0.171 to 0.128 tons/OSD.

For single-family housing in Tarrant County (Table 84, Step 6), the annual NOx emissions reduction savings reduced by 44.4%, from 54.6 to 30.4 tons/year. The OSD NOx emissions reduction savings reduced by 54.5%, from 0.311 to 0.142 tons/OSD.

For multi-family housing in Harris County (Table 86, Step 5), the annual NOx emissions reduction savings reduced by 54%, from 4.22 to 1.94 tons/year. The OSD NOx emissions reduction savings reduced by 42.9%, from 0.012 to 0.007 tons/OSD.

For multi-family housing in Tarrant County (Table 87, Step 5), the annual NOx emissions reduction savings reduced by 61.2%, from 1.45 to 0.56 tons/year. The OSD NOx emissions reduction savings reduced by 76%, from 0.012 to 0.003 tons/OSD.

Table 82: Description of Steps for Comparison of 2004 vs. 2005 Energy and NOx Reductions for Single-Family Residence.

Comparison between 2004 and 2005 simulation and eGRID results for SF

1. 2004 Original					
Simulations	2004 input file	August 19th Peak Date	2004 building permit #	2004 Percentage of # story, fuel option, and type of foundation	1999 eGRID for Annual and OSD
2. 2004 vs. 2005 w/2005 input file					
Simulations	2005 input file*	August 19th Peak Date	2004 building permit #	2004 Percentage of # story, fuel option, and type of foundation	1999 eGRID for Annual and OSD
3. 2004 vs. 2005 w/Average OSD					
Simulations	2005 input file*	Average Ozone Season Day (From July 15 ~ September 15)	2004 building permit #	2004 Percentage of # story, fuel option, and type of foundation	1999 eGRID for Annual and OSD
4. 2004 vs. 2005 w/ 2005 Building permit#					
Simulations	2005 input file*	Average Ozone Season Day (From July 15 ~ September 15)	2005 building permit #	2004 Percentage of # story, fuel option, and type of foundation	1999 eGRID for Annual and OSD
5. 2004 vs. 2005 w/ 2005 Percentage of House Type					
Simulations	2005 input file*	Average Ozone Season Day (From July 15 ~ September 15)	2005 building permit #	2005 Percentage[1] of # story, fuel option, and type of foundation	1999 eGRID for Annual and OSD
6. 2004 vs. 2005 w/ 1999 eGRID and 2007 eGRID (Annual & OSD)					
Simulations	2005 input file*	Average Ozone Season Day (From July 15 ~ September 15)	2005 building permit #	2005 Percentage[1] of # story, fuel option, and type of foundation	1999 eGRID for Annual and OSD + 2007 eGRID for Annual and OSD

1. For 2004 report, the percentage of # story, fuel option and type of foundation for east Texas was used for all counties. (i.e., both east and west Texas)
For 2005 report, the percentage for east and west Texas has been updated separately using new NAHB data set for 1999.

*** The changes from 2004 to 2005 input files**

Changes	2004	2005
Attic	No attic	Attic added
Floor-weight of the garage	11.3 lb/sqft	11.5 lb/sqft
Height of the garage	12 ft	8 ft
Position of the garage	Attached	Detached
Second floor and crawlspace	Cannot be removed for one story house	Can be removed for one story house
Second floor space position	Wrong coordinates	Corrected
DHW keywords	1) The DHW-EIR is based on the DHW efficiency specified in the include file (specified as 72%, for the 2004 annual report).. 2) The DHW-GAL/MIN is calculated from the equation from IECC 2000/2001 Supplement, Section 402.1.3.7. 3) DHW-SIZE is calculated from the equation from IECC 2000/2001 Supplement (Section 402.1.3.7)	1) The DHW-EIR is fixed to 1.316 based on DHW efficiency of 76%. 2) The DHW-GAL/MIN is fixed to 0.0278, based on 1 living unit and 1 bedroom. 3) The DHW-SIZE is commented and assumes the default.
# of Pilot Lights	1 for Precode, 0 for Code-compliant	2 for Precode, 1 for Code-compliant
# of Bedrooms	1	4

Table 83: Comparison of 2004 vs. 2005 Energy and NOx Emissions Reductions for Single-family House (Harris County).

Single Family Houses
Harris County

Energy Savings

			Per House[1]					County Total[2]			
Step	County	No. of Building Permits (Single Family Residences)	Annual Elec.Savings per House (kWh/yr)	Annual NG Savings per House (Therms/yr)	Peak date	Peak-day Elec. Savings per House (kWh/day)	Peak-day NG Savings per House (Therm/day)	Total Annual Elec.Savings per County (MWh/yr) w/ 7% T&D Loss	Total Annual NG Savings per County (Therms/yr)	Total Peak-day Elec. Savings per County (MWh/day) w/ 7% T&D Loss	Total Peak-day NG Savings per County (Therm/day)
1 (Original_2004)	Harris	26,450	1,721	47	8/19	8.35	0.12	39,745	950,772	204.25	2,447
2 (2005 Input)	Harris	26,450	1,717	46	8/19	8.35	0.12	46,721	930,828	230.88	2,447
3 (Average OSD)	Harris	26,450	1,717	46	7/15 - 9/15	7.38	0.12	46,721	930,828	204.35	2,447
4 (2005 Permit#)	Harris	28,020	1,717	46	7/15 - 9/15	7.38	0.12	49,494	986,080	216.48	2,592
5 (Updated % of House Type)	Harris	28,020	1,717	46	7/15 - 9/15	7.38	0.12	49,541	986,455	216.56	2,592
6 (2007 eGRID)	Harris	28,020	1,717	46	7/15 - 9/15	7.38	0.12	49,541	986,455	216.56	2,592

NOx Emissions Reductions

Step	County	Total Annual NOx Reductions from Elec. (Tons/yr) *(Total Value)*	2004 vs. % Diff	Total Annual NOx Reductions from NG (Tons/yr) *(For the County Only)*	2004 vs. % Diff	Total Annual NOx Reductions (Tons/yr)	2004 vs. % Diff	Total Peak-day NOx Reductions from Elec. (Tons/day) *(Total Value)*	2004 vs. % Diff	Total Peak-day NOx Reductions from NG (Tons/day) *(For the County Only)*	2004 vs. % Diff	Total Peak-day NOx Reductions (Tons/day)	2004 vs. % Diff
1 (Original_2004)	Harris	31.33	-	4.37	-	35.70	-	0.160	-	0.011	-	0.171	-
2 (2005 Input)	Harris	36.83	17.57%	4.28	-2.10%	41.12	15.16%	0.182	13.77%	0.011	0.00%	0.193	12.86%
3 (Average OSD)	Harris	36.83	17.57%	4.28	-2.10%	41.12	15.16%	0.161	0.69%	0.011	0.00%	0.172	0.65%
4 (2005 Permit#)	Harris	39.02	24.55%	4.54	3.71%	43.56	22.00%	0.171	6.67%	0.012	5.94%	0.183	6.62%
5 (Updated % of House Type)	Harris	39.06	24.67%	4.54	3.75%	43.60	22.11%	0.171	6.71%	0.012	5.94%	0.183	6.66%
6 (2007 eGRID)	Harris	28.14	-10.17%	4.54	3.75%	32.68	-8.46%	0.116	-27.36%	0.012	5.94%	0.128	-25.17%

1. "Per House" shows the simulation results only from one house type (i.e., Slab-on-grade, 1-story, and fuel option 1)
2. "County Total" shows the combined simulation results from all house type considering no. of building permit, percentage of house type, etc.

Table 84: Comparison of 2004 vs. 2005 Energy and NOx Emissions Reductions for Single-family House (Tarrant County).

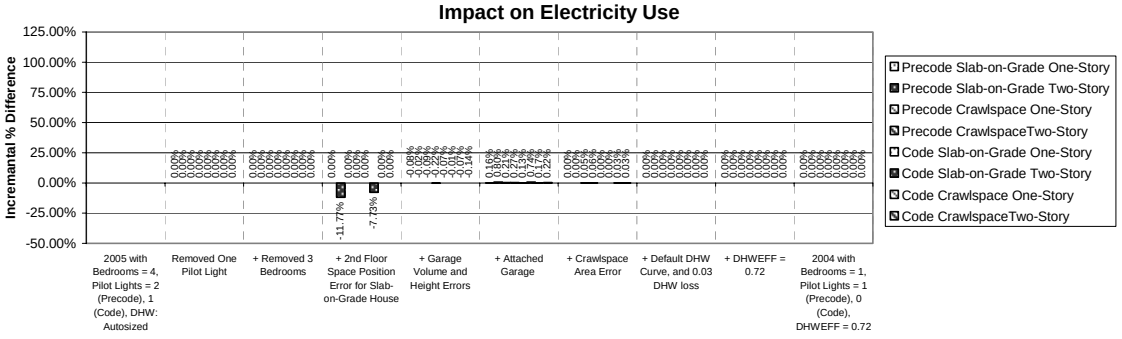
Single Family Houses
Tarrant County

Energy Savings

			Per House[1]					County Total[2]			
Step	County	No. of Building Permits (Single Family Residences)	Annual Elec.Savings per House (kWh/yr)	Annual NG Savings per House (Therms/yr)	Peak date	Peak-day Elec. Savings per House (kWh/day)	Peak-day NG Savings per House (Therm/day)	Total Annual Elec.Savings per County (MWh/yr) w/ 7% T&D Loss	Total Annual NG Savings per County (Therms/yr)	Total Peak-day Elec. Savings per County (MWh/day) w/ 7% T&D Loss	Total Peak-day NG Savings per County (Therm/day)
1 (Original_2004)	Tarrant	12,462	2,219	93	8/19	14.14	0.12	27,984	825,408	168.54	1,153
2 (2005 Input)	Tarrant	12,462	2,226	93	8/19	14.15	0.12	29,997	818,479	176.57	1,153
3 (Average OSD)	Tarrant	12,462	2,226	93	7/15 - 9/15	12.27	0.12	29,997	818,479	153.95	1,153
4 (2005 Permit#)	Tarrant	14,705	2,226	93	7/15 - 9/15	12.27	0.12	35,396	965,795	181.66	1,361
5 (Updated % of House Type)	Tarrant	14,705	2,226	93	7/15 - 9/15	12.27	0.12	33,607	1,016,947	177.90	1,484
6 (2007 eGRID)	Tarrant	14,705	2,226	93	7/15 - 9/15	12.27	0.12	33,607	1,016,947	177.90	1,484

NOx Emissions Reductions

Step	County	Total Annual NOx Reductions from Elec. (Tons/yr) *(Total Value)*	2004 vs. % Diff	Total Annual NOx Reductions from NG (Tons/yr) *(For the County Only)*	2004 vs. % Diff	Total Annual NOx Reductions (Tons/yr)	2004 vs. % Diff	Total Peak-day NOx Reductions from Elec. (Tons/day) *(Total Value)*	2004 vs. % Diff	Total Peak-day NOx Reductions from NG (Tons/day) *(For the County Only)*	2004 vs. % Diff	Total Peak-day NOx Reductions (Tons/day)	2004 vs. % Diff
1 (Original_2004)	Tarrant	50.84	-	3.80	-	**54.64**	-	0.31	-	0.01	-	**0.311**	-
2 (2005 Input)	Tarrant	54.49	7.18%	3.77	-0.84%	**58.26**	6.63%	0.32	4.76%	0.01	0.00%	**0.326**	4.68%
3 (Average OSD)	Tarrant	54.49	7.18%	3.77	-0.84%	**58.26**	6.63%	0.28	-8.65%	0.01	0.00%	**0.285**	-8.51%
4 (2005 Permit#)	Tarrant	64.30	26.47%	4.44	17.01%	**68.74**	25.82%	0.33	7.79%	0.01	18.00%	**0.336**	7.96%
5 (Updated % of House Type)	Tarrant	61.05	20.08%	4.68	23.21%	**65.73**	20.30%	0.32	5.56%	0.01	28.71%	**0.330**	5.95%
6 (2007 eGRID)	Tarrant	25.69	-49.47%	4.68	23.21%	**30.37**	-44.42%	0.14	-55.90%	0.01	28.71%	**0.142**	-54.46%



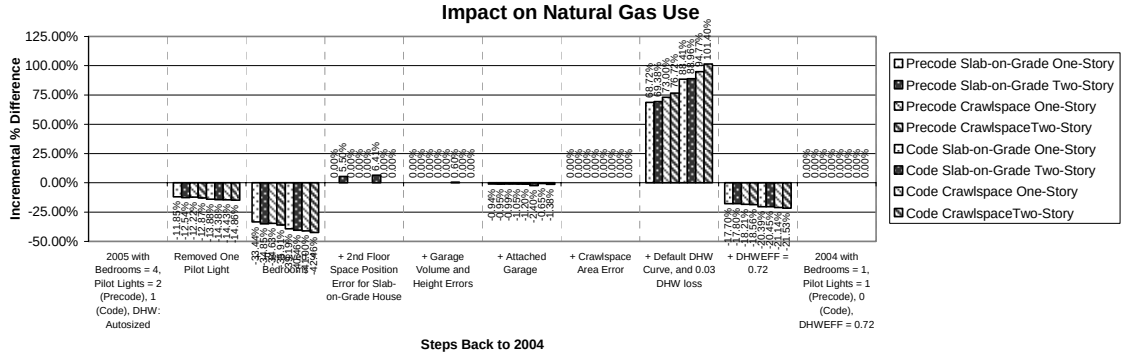


Figure 82: Impact of Changes in the Simulation Input for Single-family Residences on the Annual Electricity and Natural Gas Consumption (Harris County).

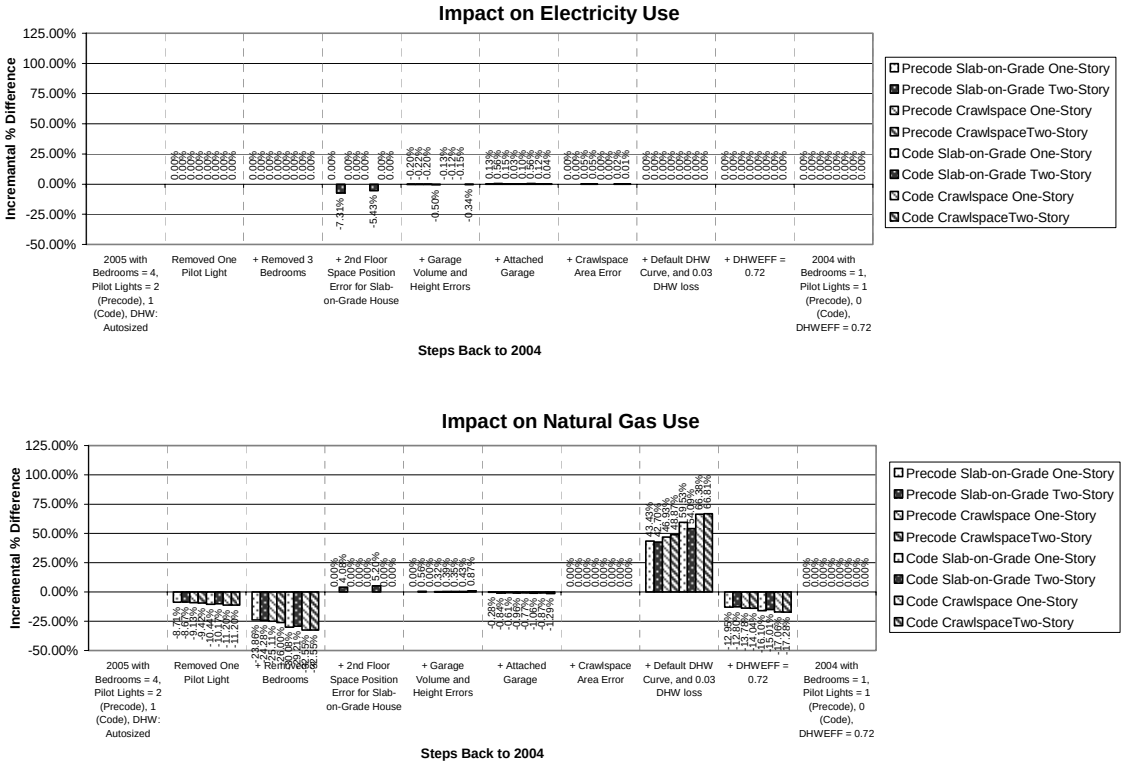


Figure 83: Impact of Changes in the Simulation Input for Single-family Residences on the Annual Electricity and Natural Gas Consumption (Tarrant County).

Table 85: Description of Steps for Comparison of 2004 vs 2005 Energy and NOx Reductions for Multi-Family.

Comparison between 2004 and 2005 simulation and eGRID results for MF

1. 2004 Original Simulations	2004 input file	August 19th Peak Date	2004 building permit #	1999 eGRID for Annual and OSD
2. 2004 vs. 2005 w/2005 input file Simulations	2005 input file*	August 19th Peak Date	2004 building permit #	1999 eGRID for Annual and OSD
3. 2004 vs. 2005 w/Average OSD Simulations	2005 input file*	Average Ozone Season Day (From July 15 ~ September 15)	2004 building permit #	1999 eGRID for Annual and OSD
4. 2004 vs. 2005 w/ 2005 Building permit# Simulations	2005 input file*	Average Ozone Season Day (From July 15 ~ September 15)	2005 building permit #	1999 eGRID for Annual and OSD
6. 2004 vs. 2005 w/ 1999 eGRID and 2007 eGRID (Annual & OSD) Simulations	2005 input file*	Average Ozone Season Day (From July 15 ~ September 15)	2005 building permit #	1999 eGRID for Annual and OSD + 2007 eGRID for Annual and OSD

*** The changes from 2004 to 2005 input files**

Changes	2004	2005
DHW keywords	1) The DHW-EIR is based on the DHW efficiency specified in the include file (specified as 72%, for the 2004 annual report). 2) The DHW-GAL/MIN is calculated from the equation from IECC 2000/2001 Supplement, Section 402.1.3.7. 3) DHW-SIZE is calculated from the equation from IECC 2000/2001 Supplement (Section 402.1.3.7)	1) The DHW-EIR is fixed to 1.316 based on DHW efficiency of 76%. 2) The DHW-GAL/MIN is fixed to 0.0278, based on 1 living unit and 1 bedroom. 3) The DHW-SIZE is commented and assumes the default.
Ground and sky form factors	Specified as 0 and 1	DOE-2 Calculate
# of Pilot Lights	1 for Precode, 0 for Code-compliant	2 for Precode, 1 for Code-compliant
# of Bedrooms	1	2

Table 86: Comparison of 2004 vs 2005 Energy and NOx Emissions Reductions for Multi-family House (Harris County).

Multi Family Houses
Harris County

Energy Savings

		Per House[1]						County Total[2]			
Step	County	No. of Building Permits (Single Family Residences)	Annual Elec.Savings per House (kWh/yr)	Annual NG Savings per House (Therms/yr)	Peak date	Peak-day Elec. Savings per House (kWh/day)	Peak-day NG Savings per House (Therm/day)	Total Annual Elec.Savings per County (MWh/yr) w/ 7% T&D Loss	Total Annual NG Savings per County (Therms/yr)	Total Peak-day Elec. Savings per County (MWh/day) w/ 7% T&D Loss	Total Peak-day NG Savings per County (Therm/day)
1 (Original_2004)	Harris	14,533	417	41	8/19	1.48	0.12	4,646	117,613	16.52	340
2 (2005 Input)	Harris	14,533	408	43	8/19	1.60	0.12	4,961	120,442	19.55	340
3 (Average OSD)	Harris	14,533	408	43	7/15 - 9/15	1.55	0.12	4,961	120,442	18.43	340
4 (2005 Permit#)	Harris	8,375	408	43	7/15 - 9/15	1.55	0.12	2,859	69,408	10.62	196
5 (2007 eGRID)	Harris	8,375	408	43	7/15 - 9/15	1.55	0.12	2,859	69,408	10.62	196

NOx Emissions Reductions

Step	County	Total Annual NOx Reductions from Elec. (Tons/yr) *(Total Value)*	2004 vs. % Diff	Total Annual NOx Reductions from NG (Tons/yr) *(For the County Only)*	2004 vs. % Diff	Total Annual NOx Reductions (Tons/yr)	2004 vs. % Diff	Total Peak-day NOx Reductions from Elec. (Tons/day) *(Total Value)*	2004 vs. % Diff	Total Peak-day NOx Reductions from NG (Tons/day) *(For the County Only)*	2004 vs. % Diff	Total Peak-day NOx Reductions (Tons/day)	2004 vs. % Diff
1 (Original_2004)	Harris	3.68	-	0.54	-	**4.22**	-	0.01	-	0.002	-	**0.012**	-
2 (2005 Input)	Harris	3.91	6.28%	0.55	2.41%	**4.47**	5.79%	0.02	54.12%	0.002	0.00%	**0.017**	46.80%
3 (Average OSD)	Harris	3.91	6.28%	0.55	2.41%	**4.47**	5.79%	0.01	45.30%	0.002	0.00%	**0.016**	39.17%
4 (2005 Permit#)	Harris	2.25	-38.75%	0.32	-40.99%	**2.57**	-39.04%	0.01	-16.27%	0.001	-42.37%	**0.009**	-19.80%
5 (2007 eGRID)	Harris	1.62	-55.87%	0.32	-40.99%	**1.94**	-53.96%	0.01	-43.00%	0.001	-42.37%	**0.007**	-42.91%

1. "Per House" shows the simulation results only from one house type (i.e., Slab-on-grade, 1-story, and fuel option 1)
2. "County Total" shows the combined simulation results from all house type considering no. of building permit, percentage of house type, etc.

Table 87: Comparison of 2004 vs 2005 Energy and NOx Emissions Reductions for Multi-family House (Tarrant County).

Multi Family Houses
Tarrant County

Energy Savings

			Per House[1]					County Total[2]			
Step	County	No. of Building Permits (Single Family Residences)	Annual Elec.Savings per House (kWh/yr)	Annual NG Savings per House (Therms/yr)	Peak date	Peak-day Elec. Savings per House (kWh/day)	Peak-day NG Savings per House (Therm/day)	Total Annual Elec.Savings per County (MWh/yr) w/ 7% T&D Loss	Total Annual NG Savings per County (Therms/yr)	Total Peak-day Elec. Savings per County (MWh/day) w/ 7% T&D Loss	Total Peak-day NG Savings per County (Therm/day)
1 (Original_2004)	Tarrant	3,284	342	39	8/19	1.79	0.12	736	25,456	4.51	77
2 (2005 Input)	Tarrant	3,284	342	39	8/19	1.79	0.12	787	25,305	4.83	77
3 (Average OSD)	Tarrant	3,284	342	39	7/15 - 9/15	1.68	0.12	787	25,306	4.83	77
4 (2005 Permit#)	Tarrant	2,583	342	39	7/15 - 9/15	1.68	0.12	619	19,903	3.54	60
5 (2007 eGRID)	Tarrant	2,583	342	39	7/15 - 9/15	1.68	0.12	619	19,903	3.54	60

NOx Emissions Reductions

Step	County	Total Annual NOx Reductions from Elec. (Tons/yr) *(Total Value)*	2004 vs. % Diff	Total Annual NOx Reductions from NG (Tons/yr) *(For the County Only)*	2004 vs. % Diff	Total Annual NOx Reductions (Tons/yr)	2004 vs. % Diff	Total Peak-day NOx Reductions from Elec. (Tons/day) *(Total Value)*	2004 vs. % Diff	Total Peak-day NOx Reductions from NG (Tons/day) *(For the County Only)*	2004 vs. % Diff	Total Peak-day NOx Reductions (Tons/day)	2004 vs. % Diff
1 (Original_2004)	Tarrant	1.34	-	0.12	-	**1.45**	-	0.012	-	0.0004	-	**0.012**	-
2 (2005 Input)	Tarrant	1.43	6.87%	0.12	-0.59%	**1.55**	6.27%	0.013	4.78%	0.0004	0.00%	**0.013**	4.64%
3 (Average OSD)	Tarrant	1.43	6.87%	0.12	-0.59%	**1.55**	6.27%	0.013	4.78%	0.0004	0.00%	**0.013**	4.64%
4 (2005 Permit#)	Tarrant	1.12	-15.94%	0.09	-21.81%	**1.22**	-16.41%	0.010	-14.80%	0.0003	-21.35%	**0.011**	-14.98%
5 (2007 eGRID)	Tarrant	0.47	-64.63%	0.09	-21.81%	**0.56**	-61.18%	0.003	-77.65%	0.0003	-21.35%	**0.003**	-76.04%

1. "Per House" shows the simulation results only from one house type (i.e., Slab-on-grade, 1-story, and fuel option 1)
2. "County Total" shows the combined simulation results from all house type considering no. of building permit, percentage of house type, etc.

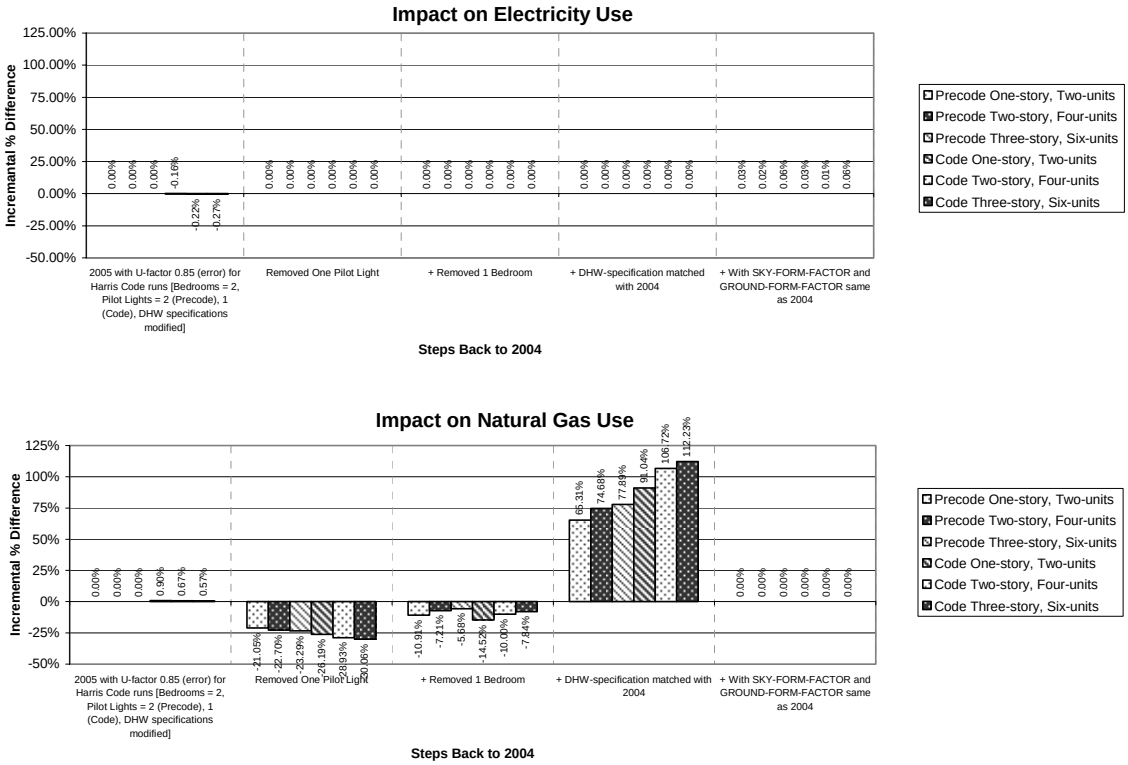


Figure 84: Impact of Changes in the Simulation Input for Multi-family Residences on the Annual Electricity and Natural Gas Consumption (Harris County).

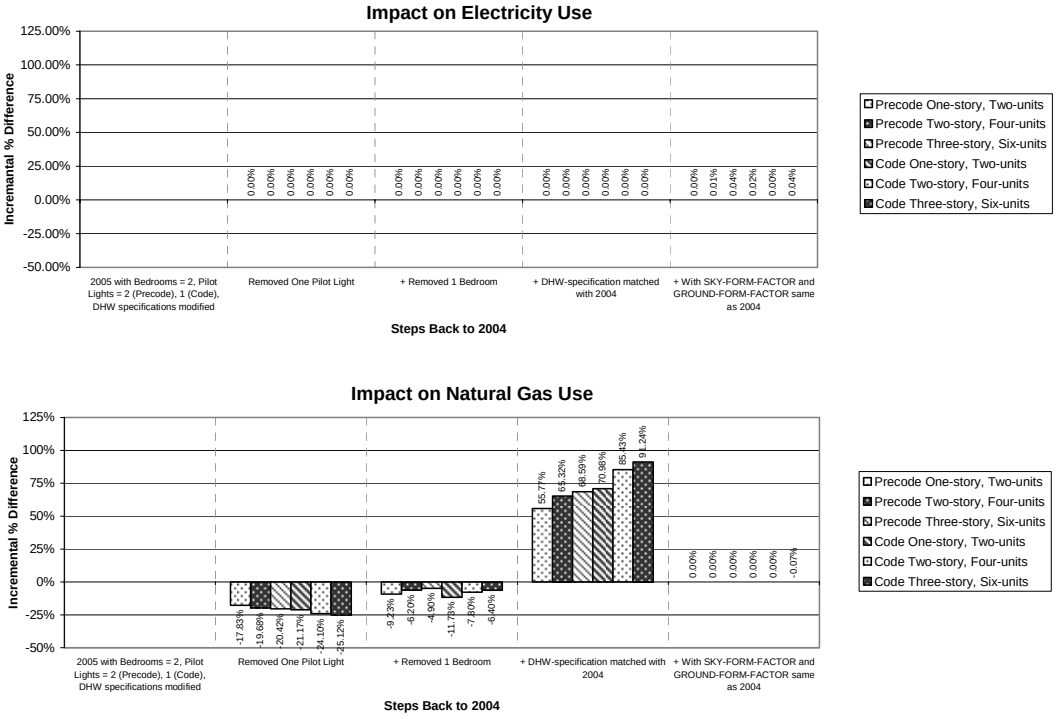


Figure 85: Impact of Changes in the Simulation Input for Multi-family Residences on the Annual Electricity and Natural Gas Consumption (Tarrant County).

7 CALCULATION OF INTEGRATED NOx EMISSIONS REDUCTIONS FROM MULTIPLE STATE AGENCIES PARTICIPATING IN THE TEXAS EMISSIONS REDUCTION PLAN (TERP).

7.1 Background.

In January 2005, the Laboratory was asked to propose a method by which the NOx emissions savings from the energy-efficiency programs from multiple Texas State Agencies working under SB 5 and SB 7 could be reported in a combined format to allow the TCEQ to consider the combined savings for SIP planning purposes. This required that the analysis should include the cumulative savings estimates from all projects through 2013 for both the annual and Ozone Season Day (OSD) NOx reductions. The NOx emissions reductions from all these programs were calculated using the emissions factors for 2007 from the U.S.E.P.A. The different programs included in this cumulative analysis are:

- ESL-Single-family
- ESL-Multi-family
- PUCT-SB 7
- PUCT-SB 5
- SECO
- Wind-ERCOT

The Laboratory's single- and multi-family programs include the energy savings attained by constructing new residences according to the IECC 2000/2001 building code. The baseline for comparison for the code programs is the published data on residential construction characteristics by the National Association of Home Builders (NAHB) for 1999. Annual MWh (electric) and MBtu (natural gas) savings are from the Laboratory's Annual Reports to the TCEQ.

The PUCT's SB 5 and SB 7 programs include their incentive and rebates programs managed by the different Utilities for Texas. These include the Residential Energy Efficiency Programs as well as the Commercial & Industrial Standard Offer Programs (C&I SOP). The energy efficiency measures include high efficiency HVAC equipment, variable speed drives, increased insulation levels, infiltration reduction, duct sealing, Energy Star Homes, etc. Annual MWh savings according to the utilities (or Power Control Authorities –PCAs) were reported for the different programs completed in the years 2001, 2002, 2003 and 2004. The PUCT also reported the savings from the SB 5 grant program which was conducted in 2002 and 2003.

The Texas State Energy Conservation Office (SECO) funds energy-efficiency programs directed towards school districts, government agencies, city and county governments, private industries and residential energy consumers. For the 2004 reporting year SECO submitted annual energy savings values for 149 projects which included projects funded by SECO and by Energy Service projects.

The wind-ERCOT project includes NOx emissions savings from the current installed green power generation capacity in west Texas. For projections through 2013, two annual growth factors were available: 17% annual growth through 2009 to reach a production level of 3700 MW in 1009, and 22.7% annual growth to reach a production level of 7000 MW until 2015.

7.2 Description of Analysis Method.

Annual and Ozone Season Day (OSD) NOx emissions reductions were calculated for 2004 and cumulatively from 2005 up to 2013 using assumed growth factors. The following factors were used to adjust the cumulative savings for future predictions:

Annual Degradation Factor:
This factor was used to account for the decrease in efficiency of the measures installed as the equipment wears down and degrades. An annual degradation factor of 5% was used for all the programs. This value was taken from a study by Kats et al. 1996.

Transmission and Distribution Loss:
This factor adjusts the reported savings to account for the loss in energy resulting in the transmission and distribution of the power from the electricity producers to the electricity consumers. For this calculation, the energy savings reported at the consumer level are increased by 7% to give credit for the actual power produced that gets lost in the transmission and distribution system on its way to the customer. In the case of Wind-ERCOT, The T&D losses were assumed to cancel out since wind energy is displacing the actual power produced by the conventional power plants, therefore, no net increase or decrease in T&D losses.

Initial Discount Factor:
This factor was used to discount the reported savings for the assumptions and methods employed in the calculation procedures. For the Laboratory's single family and multi-family code compliance program, the discount factor was assumed to be 20%. For PUCT's SB 5 and SB 7 programs and Wind-ERCOT, the discount factor was taken as 25%. For the savings in the SECO program, the discount factor was 60%.

Growth Factor:
The factors shown in Table 116 were used to account for several different factors. First, in the case of wind energy, the factor accounted for the increased number of wind turbines which are being installed every year in the western portion of the state. Three different scenarios were studied for wind energy projections:

- No annual growth;
- 17% growth factor, on the basis that the installed wind power generation capacity will grow to 3700 MW until 2009 from current installed level of 2000 MW. For this growth scenario, the 17% growth will achieve 3700 MW by 2009; after that, the wind power generation will be fixed at the production level achieved in 2009.
- 22.7% growth factor, on the basis that the installed wind power generation capacity will grow to 7000 MW in 2015.

In the numbers shown in this report a 17.0% growth factor was assumed for the wind energy portion of savings.

Also, included in Table 116 are growth factors for single-family (3.25%) and multi-family residential (1.54%) construction. These values represent the average growth rate for these housing types from the U.S. Census data for Texas.

Figure 86 shows the overall information flow that was used to calculate the NOx emissions savings from the annual and OSD MWh numbers from all programs. For the Laboratory's single-family and multi-family code-implementation programs, the annual and ozone season savings were calculated from DOE-2 hourly simulation models based on Chapter 4 of IECC 2000/2001. The base case is taken as the average characteristics of single- and multi-family residences for Texas published by the National Association of Home Builders for 1999. The OSD consumption is the average daily consumption between July 15 and September 15, 1999.

The annual MWh numbers from PUCT programs are calculated through deemed savings tables and spreadsheets created for the utilities incentive programs by Frontier Associates in Austin, Texas.

The SECO MWh savings were submitted as annual savings by project, i.e., no break down by project type. A description of the measures completed for the project was also submitted for information purposes.

The electricity production used for the Wind-ERCOT data are from the actual on-site metered data, measured at 15-minute intervals.

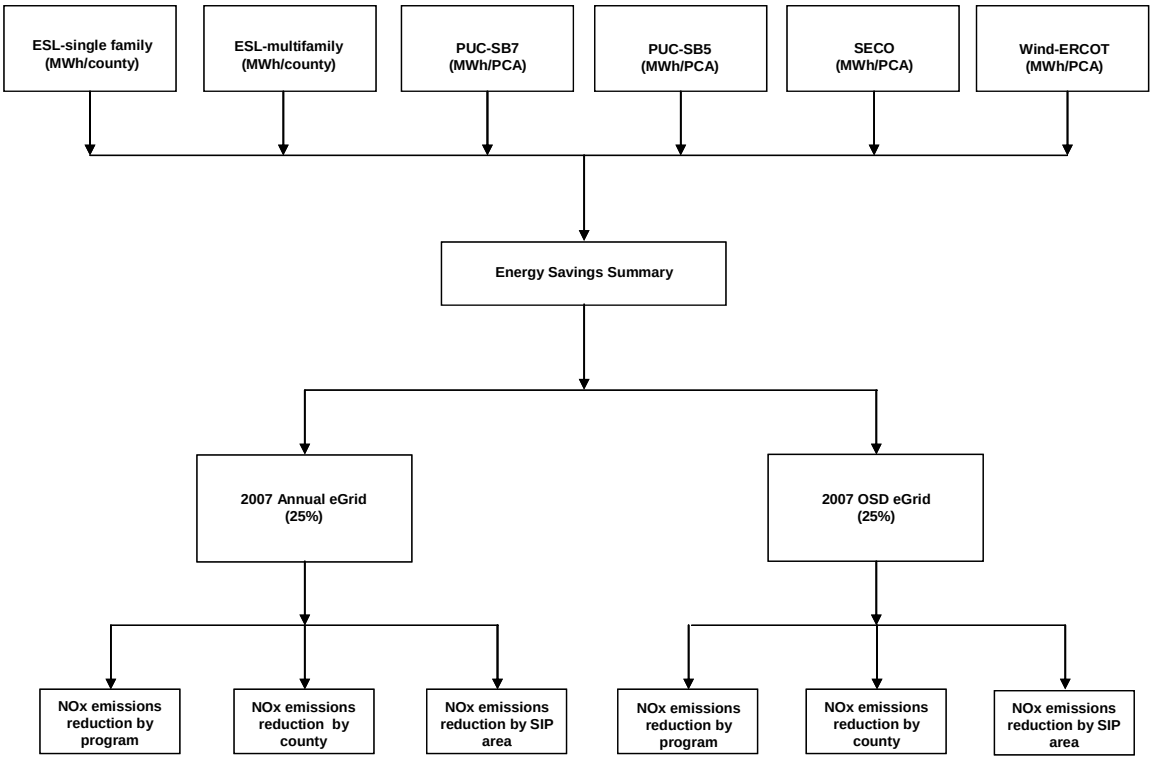


Figure 86: Process Flow Diagram of the NOx Emissions Reduction Calculations.

7.3 Calculation Procedure.

7.3.1 Single Family.

The annual and OSD MWh savings for the 41 non-attainment and affected counties for 2002, 2003 and 2004 were obtained from the annual report for 2002, 2003 and 2004 submitted by the Laboratory to the Texas Council of Environmental Quality (TCEQ). The annual and OSD MWh numbers were calculated according to the county and program as shown in Table 88. Using the values for 2002, 2003, and 2004, savings were projected to 2013 by incorporating the different adjustment factors mentioned above. As an example, using 100 MWh for each of the three calculated years for Bastrop County and 5% for annual degradation factor (a), 7% for the transmission and distribution loss (b) and 20% for the discount factor (c), the projected savings for 2005 will be calculated as:

$$MWh2005 = ((1- 4a \times MWh2001) + (1- 3a \times MWh2002) + (1- 2a \times MWh2003) + (1- a \times MWh2004) + MWh2004) \times ((1 + b) \times (1 - c)) \quad (1)$$

The projected 2005 cumulative savings are 317 MWh for an actual savings of 100 MWh for each of the three years. In the equation above, 2001 is also incorporated since some of the programs were reporting savings from September to December 2001. In this calculation, it was assumed that the same amount of MWh savings will be achieved for each year after 2004 through 2013.The projected energy savings through 2013, according to county, were then divided into the different Power Control Authorities (PCA) in Table 89. The percentage supply to each county from the different PCA is obtained from PUCT's listing published in the Laboratory's 2004 annual report.

For the 2007 annual and OSD NOx emissions calculations the USEPA's eGRID was used. An example of the eGRID spreadsheet is given in Table 90. The total MWh savings for each PCA are used to calculate the NOx emissions reduction for each of the different counties using the emissions factors contained in eGRID. The eGRID spreadsheet shown in Table 90 was used for each year for which the analysis was required. The cumulative NOx emission reduction numbers for each county for the single-family and multi-family savings for 2004 through 2013 by SIP area is provided in Table 91.

Table 88: Annual and OSD MWh Savings for ESL-Single-family Program.

Fip Codes	County	Annual Energy Savings 2001 Electric		Annual Energy Savings 2002 Electric		Annual Energy Savings 2003 Electric		Annual Energy Savings 2004 Electric		Annual Energy Savings 2004 Gas	
		MWh	MWh/ average day	MWh	MWh/ peak-TMY2 day	MWh	MWh/ peak-TMY2 day	MWh	MWh/ ozone season day	Therms	Therms/ ozone season day
021	Bastrop			472	2.2	494	3.1	625	3.0	13,174	26.1
029	Bexar			24,006	94.5	18,119	84.2	13,934	67.3	366,444	665.7
055	Caldwell			327	1.5	296	1.9	251	1.2	5,356	10.5
091	Comal			3,721	14.6	2,948	13.7	2,818	13.6	74,339	134.2
139	Ellis			1,958	11.4	1,590	11.2	3,077	16.1	90,476	127.2
183	Gregg			365	2.0	410	2.7	382	2.0	14,801	26.0
187	Guadalupe			1,601	6.3	1,526	7.1	2,039	9.8	53,659	97.4
203	Harrison			62	0.3	67	0.4	47	0.2	1,845	3.2
209	Hays			2,581	11.4	2,219	14.2	2,509	11.9	55,313	100.0
213	Henderson			0	0.0	0	0.0	170	0.9	6,114	11.8
221	Hood			0	0.0	0	0.0	191	1.0	5,635	7.9
231	Hunt			0	0.0	0	0.0	191	1.1	7,424	7.8
251	Johnson			1,898	11.0	1,545	10.8	1,882	9.8	55,608	77.6
257	Kaufman			721	3.6	915	5.9	1,365	7.6	53,893	56.0
355	Nueces			1,432	5.2	1,749	8.5	2,084	8.2	47,086	117.8
367	Parker			998	5.0	783	5.0	769	4.3	30,089	31.4
397	Rockwall			3,673	18.2	2,830	18.2	2,576	14.4	100,873	105.4
401	Rusk			32	0.2	25	0.2	20	0.1	726	1.4
409	San Patricio			371	1.3	396	1.9	457	1.8	10,268	25.7
423	Smith			877	4.8	778	5.3	737	3.8	26,909	51.3
453	Travis			20,739	91.6	11,640	74.6	13,319	64.7	292,738	529.0
459	Upshur			32	0.2	29	0.2	17	0.1	643	1.1
469	Victoria			261	0.9	302	1.6	143	0.7	3,918	10.1
491	Williamson			14,397	63.6	10,213	65.4	9,646	54.8	211,465	382.0
493	Wilson			54	0.2	85	0.4	52	0.3	1,369	2.5
039	Brazoria			3,777	18.3	3,676	21.0	4,225	18.9	100,778	261.6
071	Chambers			514	2.4	450	2.3	604	2.7	13,699	36.1
085	Collin			31,867	158.3	21,963	140.9	22,290	124.1	864,696	902.2
113	Dallas			25,931	150.6	18,374	129.0	19,470	101.9	571,580	803.5
121	Denton			17,647	87.7	11,266	72.3	8,775	48.9	341,999	356.8
141	El Paso			10,536	52.2	8,751	51.2	10,977	42.9	434,118	417.6
157	Fort Bend			1,706	8.7	1,632	9.3	4,880	21.8	116,829	300.6
167	Galveston			4,398	21.3	4,013	23.0	3,820	17.1	91,050	236.3
199	Hardin			31	0.1	71	0.4	175	0.8	3,976	10.4
201	Harris			31,192	159.2	33,784	193.4	37,145	165.8	888,572	2287.1
245	Jefferson			986	4.6	899	4.7	933	4.1	21,496	55.9
291	Liberty			344	1.6	338	1.8	378	1.7	8,481	22.3
339	Montgomery			6,556	33.5	6,647	38.1	7,917	35.3	186,019	482.6
361	Orange			278	1.3	298	1.5	401	1.8	9,217	24.0
439	Tarrant			31,250	181.4	26,313	184.7	26,153	136.9	771,409	1077.6
473	Waller			45	0.2	36	0.2	78	0.3	1,831	4.8
	Totals			247,633	1,231	197,471	1,210	207,519	1,024	5,955,915	9,888

Table 89: Projected MWh Savings for ESL-Single-family According to Power Control Authorities (PCA).

			2004		2005		2006		2007		2008		2009		2010		2011		2012		2013	
			Energy Savings		Cumulative Energy Savings		Cumulative Energy Savings		Cumulative Energy Savings		Cumulative Energy Savings		Cumulative Energy Savings		Cumulative Energy Savings		Cumulative Energy Savings		Cumulative Energy Savings		Cumulative Energy Savings	
PCAs	Counties	% coverage	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day
American Electric Power - West (ERCOT) /PCA	Caldwell	100%	251	1.2	884	4.6	1,051	5.3	1,207	6.1	1,352	6.7	1,486	7.4	1,609	7.9	1,722	8.4	1,824	8.9	1,916	9.3
	Nueces	100%	2,084	8.2	5,868	23.9	7,338	29.6	8,718	35.0	10,009	40.0	11,211	44.6	12,324	48.9	13,347	52.9	14,282	56.5	15,127	59.8
	San Patricio	100%	457	1.8	1,337	5.4	1,656	6.7	1,956	7.8	2,236	8.9	2,496	9.9	2,737	10.9	2,958	11.7	3,160	12.5	3,342	13.2
	Victoria	100%	143	0.7	661	3.1	747	3.5	827	3.9	901	4.3	969	4.6	1,031	4.9	1,086	5.2	1,135	5.4	1,179	5.6
	Total		**2,935**	**11.8**	**8,751**	**37.0**	**10,792**	**45.1**	**12,708**	**52.7**	**14,497**	**59.9**	**16,162**	**66.5**	**17,700**	**72.6**	**19,114**	**78.2**	**20,401**	**83.3**	**21,563**	**87.9**
Austin Energy/PCA	Chambers	30%	181	0.8	519	2.4	646	3.0	765	3.5	877	4.0	981	4.4	1,077	4.8	1,165	5.2	1,246	5.6	1,319	5.9
	Harris	30%	11,144	49.7	33,217	162.5	40,968	196.2	48,242	227.9	55,038	257.4	61,358	284.8	67,201	310.1	72,567	333.3	77,456	354.3	81,868	373.2
	Travis	3%	400	1.9	1,389	7.0	1,655	8.2	1,904	9.4	2,136	10.6	2,351	11.6	2,549	12.5	2,730	13.4	2,893	14.2	3,040	14.9
	Williamson	3%	289	1.6	1,033	5.6	1,225	6.7	1,404	7.8	1,570	8.7	1,724	9.6	1,866	10.4	1,996	11.2	2,113	11.9	2,217	12.5
	Total		**12,014**	**54.1**	**36,158**	**177.5**	**44,493**	**214.2**	**52,315**	**248.6**	**59,622**	**280.7**	**66,414**	**310.5**	**72,693**	**337.9**	**78,458**	**363.1**	**83,708**	**385.9**	**88,444**	**406.4**
Brownsville Public Utils Board/PCA																						
Lower Colorado River Auhotrity /PCA	Hays	100%	2,509	11.9	7,775	39.2	9,502	47.2	11,122	54.8	12,635	61.9	14,040	68.5	15,337	74.5	16,528	80.0	17,611	85.1	18,586	89.6
	Total		**2,509**	**11.9**	**7,775**	**39.2**	**9,502**	**47.2**	**11,122**	**54.8**	**12,635**	**61.9**	**14,040**	**68.5**	**15,337**	**74.5**	**16,528**	**80.0**	**17,611**	**85.1**	**18,586**	**89.6**
Reliant Energy HL&P/PCA	Brazoria	97%	4,098	18.3	12,254	59.3	15,102	71.7	17,774	83.4	20,271	94.3	22,593	104.5	24,739	113.8	26,710	122.4	28,506	130.2	30,126	137.1
	Chambers	70%	423	1.9	1,210	5.6	1,507	6.9	1,785	8.1	2,046	9.2	2,288	10.3	2,513	11.3	2,719	12.2	2,907	13.0	3,077	13.7
	Fort Bend	100%	4,880	21.8	10,645	49.9	14,262	66.0	17,670	81.0	20,869	95.2	23,860	108.4	26,641	120.7	29,214	132.1	31,578	142.5	33,733	152.0
	Galveston	97%	3,705	16.5	12,288	59.9	14,793	70.8	17,140	81.0	19,328	90.5	21,358	99.2	23,229	107.3	24,942	114.7	26,496	121.3	27,891	127.3
	Harris	70%	26,002	116.0	77,507	379.1	95,592	457.9	112,564	531.8	128,423	600.7	143,169	664.6	156,803	723.6	169,323	777.6	180,731	826.7	191,026	870.7
	Montgomery	70%	5,542	24.7	16,174	78.8	20,048	95.7	23,684	111.5	27,084	126.3	30,246	140.0	33,171	152.6	35,859	164.2	38,310	174.8	40,523	184.2
	Waller	100%	78	0.3	191	0.9	247	1.1	301	1.4	351	1.6	397	1.8	441	2.0	481	2.2	517	2.3	550	2.5
	Hardin	70%	123	0.5	259	1.2	350	1.6	436	2.0	517	2.3	593	2.6	663	2.9	728	3.2	788	3.5	843	3.7
	Total		**44,851**	**200.2**	**130,527**	**634.5**	**161,901**	**771.6**	**191,355**	**900.1**	**218,890**	**1,020.1**	**244,505**	**1,131.5**	**268,201**	**1,234.3**	**289,977**	**1,328.5**	**309,833**	**1,414.2**	**327,770**	**1,491.3**
San Antonio Public Service Bd/PCA	Bexar	100%	13,934	67.3	54,684	246.0	63,615	290.2	71,951	331.5	79,690	370.0	86,832	405.6	93,378	438.2	99,328	468.1	104,682	495.0	109,439	519.0
	Comal	100%	2,818	13.6	9,682	43.9	11,568	53.2	13,333	61.9	14,977	70.0	16,501	77.5	17,904	84.4	19,187	90.8	20,349	96.6	21,390	101.8
	Guadalupe	100%	2,039	9.8	5,743	26.5	7,180	33.5	8,530	40.1	9,792	46.2	10,967	52.0	12,055	57.3	13,055	62.2	13,968	66.7	14,794	70.8
	Wilson	100%	52	0.3	192	0.9	226	1.1	258	1.3	288	1.5	316	1.7	341	1.8	364	2.0	385	2.1	404	2.2
	Total		**18,843**	**91.1**	**70,301**	**317.3**	**82,589**	**378.0**	**94,071**	**434.8**	**104,747**	**487.7**	**114,616**	**536.7**	**123,678**	**581.8**	**131,935**	**623.0**	**139,384**	**660.4**	**146,027**	**693.8**
South Texas Electric Coop INC/PCA																						
Texas Municipal Power Pool/PCA																						
Texas-New Mexico Power Co/PCA	Brazoria	3%	127	0.6	379	1.8	467	2.2	550	2.6	627	2.9	699	3.2	765	3.5	826	3.8	882	4.0	932	4.2
	Galveston	3%	115	0.5	380	1.9	458	2.2	530	2.5	598	2.8	661	3.1	718	3.3	771	3.5	819	3.8	863	3.9
	Collin	2%	446	2.5	1,546	8.6	1,844	10.3	2,122	11.8	2,381	13.3	2,621	14.6	2,842	15.8	3,044	17.0	3,227	18.0	3,391	18.9
	Denton	2%	175	1.0	723	4.0	834	4.6	937	5.2	1,032	5.7	1,120	6.2	1,200	6.7	1,273	7.1	1,339	7.5	1,397	7.8
	Johnson	2%	38	0.2	114	0.7	140	0.8	165	0.9	188	1.0	209	1.1	228	1.2	246	1.3	263	1.4	277	1.5
	Hood	2%	4	0.0	6	0.0	9	0.0	12	0.1	15	0.1	17	0.1	19	0.1	22	0.1	24	0.1	25	0.1
	Hunt	2%	4	0.0	6	0.0	9	0.1	12	0.1	15	0.1	17	0.1	19	0.1	22	0.1	24	0.1	25	0.1
	Total		**908**	**4.8**	**3,156**	**17.0**	**3,761**	**20.2**	**4,327**	**23.2**	**4,855**	**25.9**	**5,344**	**28.5**	**5,794**	**30.8**	**6,205**	**32.9**	**6,577**	**34.9**	**6,910**	**36.6**
TXU Electric/PCA	Collin	98%	21,845	121.6	75,767	422.3	90,338	503.5	103,975	579.4	116,676	650.2	128,443	715.7	139,274	776.1	149,171	831.2	158,132	881.1	166,159	925.9
	Dallas	100%	19,470	101.9	65,523	379.1	78,626	445.6	90,896	507.8	102,333	565.6	112,937	619.1	122,707	668.2	131,644	713.0	139,748	753.3	147,018	789.4
	Denton	98%	8,599	47.9	35,444	197.1	40,856	227.3	45,900	255.4	50,576	281.5	54,884	305.6	58,824	327.6	62,396	347.6	65,600	365.5	68,436	381.3
	Tarrant	100%	26,153	136.9	86,665	502.8	104,350	592.6	120,915	676.5	136,361	754.5	150,688	826.7	163,895	893.1	175,983	953.6	186,952	1,008.2	196,801	1,056.9
	Ellis	100%	3,077	16.1	7,785	43.8	10,004	55.2	12,090	66.0	14,045	76.0	15,869	85.4	17,560	94.1	19,120	102.1	20,549	109.4	21,845	116.0
	Johnson	98%	1,844	9.7	5,598	32.2	6,874	38.7	8,071	44.8	9,189	50.5	10,229	55.8	11,189	60.6	12,071	65.1	12,874	69.1	13,597	72.7
	Kaufman	100%	1,365	7.6	3,508	19.8	4,490	25.3	5,413	30.4	6,278	35.3	7,084	39.7	7,832	43.9	8,521	47.7	9,153	51.2	9,725	54.4
	Parker	100%	769	4.3	2,613	14.6	3,129	17.5	3,612	20.2	4,062	22.7	4,479	25.0	4,863	27.2	5,215	29.1	5,533	30.9	5,819	32.5
	Rockwall	100%	2,576	14.4	9,153	51.2	10,859	60.8	12,455	69.7	13,941	77.9	15,317	85.6	16,582	92.7	17,737	99.1	18,782	104.9	19,717	110.1
	Henderson	100%	170	0.9	284	1.5	414	2.2	538	2.8	654	3.4	763	4.0	865	4.5	960	5.0	1,047	5.5	1,127	5.9
	Hood	98%	187	1.0	312	1.6	456	2.4	592	3.1	720	3.8	841	4.4	953	5.0	1,057	5.5	1,153	6.0	1,241	6.5
	Hunt	98%	187	1.0	312	1.7	456	2.5	592	3.3	720	4.0	841	4.7	953	5.3	1,057	5.9	1,153	6.4	1,241	6.9
	Bastrop	100%	625	3.0	1,767	9.0	2,207	11.1	2,621	13.0	3,007	14.8	3,367	16.5	3,701	18.0	4,007	19.4	4,287	20.7	4,539	21.9
	Travis	97%	12,919	62.8	44,900	225.1	53,508	266.6	61,564	305.3	69,067	341.4	76,016	374.8	82,413	405.5	88,257	433.5	93,548	458.9	98,286	481.5
	Williamson	97%	9,356	53.2	33,410	182.5	39,597	218.1	45,382	251.5	50,768	282.6	55,753	311.3	60,337	337.9	64,521	362.1	68,305	384.1	71,688	403.7
	Smith	100%	737	3.8	2,467	13.9	2,964	16.5	3,429	18.8	3,863	21.0	4,265	23.1	4,635	24.9	4,974	26.6	5,282	28.2	5,558	29.6
	Total		**109,879**	**586.1**	**375,507**	**2,098.3**	**449,128**	**2,485.7**	**518,047**	**2,848.1**	**582,262**	**3,185.3**	**641,775**	**3,497.5**	**696,585**	**3,784.6**	**746,692**	**4,046.6**	**792,096**	**4,283.5**	**832,797**	**4,495.3**
El Paso Electric Co/PCA	El Paso	100%	10,977		32,731	149.0	40,363	177.6	47,524	204.3	54,216	229.2	60,438	252.3	66,190	273.6	71,472	293.0	76,284	310.6	80,627	326.3
	Total		**10,977**	**0.0**	**32,731**	**149.0**	**40,363**	**177.6**	**47,524**	**204.3**	**54,216**	**229.2**	**60,438**	**252.3**	**66,190**	**273.6**	**71,472**	**293.0**	**76,284**	**310.6**	**80,627**	**326.3**
Entergy Electric System/PCA	Liberty	100%	378	1.7	1,143	5.3	1,405	6.4	1,651	7.5	1,881	8.5	2,094	9.4	2,292	10.3	2,473	11.1	2,638	11.8	2,787	12.4
	Montgomery	30%	2,375	10.6	6,932	33.8	8,592	41.0	10,150	47.8	11,607	54.1	12,963	60.0	14,216	65.4	15,368	70.4	16,419	74.9	17,367	79.0
	Hardin	30%	53	0.2	111	0.5	150	0.7	187	0.8	222	1.0	254	1.1	284	1.3	312	1.4	338	1.5	361	1.6
	Jefferson	100%	933	4.1	2,967	13.8	3,605	16.6	4,203	19.2	4,761	21.6	5,279	23.9	5,758	25.9	6,196	27.8	6,595	29.5	6,953	31.1
	Orange	100%	401	1.8	1,101	5.1	1,385	6.3	1,652	7.5	1,902	8.6	2,135	9.6	2,350	10.5	2,549	11.4	2,730	12.2	2,894	12.9
	Total		**4,140**	**18.4**	**12,253**	**58.5**	**15,137**	**71.0**	**17,843**	**82.8**	**20,373**	**93.8**	**22,725**	**104.0**	**24,900**	**113.4**	**26,898**	**122.1**	**28,719**	**129.9**	**30,363**	**137.0**
Southwestern Public Service Co/PCA	Gregg	100%	382	2.0	1,218	6.9	1,479	8.2	1,723	9.5	1,951	10.6	2,163	11.7	2,359	12.7	2,538	13.6	2,701	14.4	2,847	15.1
	Harrison	100%	47	0.2	175	1.0	206	1.2	234	1.3	261	1.4	285	1.6	308	1.7	328	1.8	347	1.9	363	1.9
	Rusk	100%	20	0.1	75	0.4	88	0.5	100	0.6	111	0.6	121	0.7	131	0.7	139	0.7	147	0.8	154	0.8
	Upshur	100%	17	0.1	73	0.4	83	0.5	93	0.5	101	0.6	109	0.6	117	0.6	123	0.7	129	0.7	134	0.7
	Total		**465**	**2.4**	**1,542**	**8.8**	**1,856**	**10.3**	**2,150**	**11.8**	**2,425**	**13.2**	**2,679**	**14.5**	**2,914**	**15.7**	**3,128**	**16.7**	**3,323**	**17.7**	**3,498**	**18.6**

Table 90: Example of NOx Emissions Reduction Calculations According to Counties and PCA.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.008831132	25.91577998	0.010890729	130.8364905	0.006522185	0	0.003944232	9.894617606	0.065444292	2935.236331	0.014877434	280.334179	0.006262315	0	0.004817148	0	0.121274957	110.1090798	0.00816387	897.0370487	4389.363526	2.194681763
	Chambers	0.021762222	63.86326753	0.026955801	323.8352914	0.016072371	0	0.009076193	22.76880853	0.164940225	7397.719943	0.037472294	706.087145	0.015055623	0	0.009553214	0	0.011518588	10.45806307	0.015818592	1738.129488	10262.86201	5.131431003
	Fort Bend	0.070431234	206.6870137	0.087239726	1048.060206	0.052016606	0	0.029374182	73.68894864	0.533812376	23941.97326	0.121275295	2285.179714	0.048726002	0	0.030918012	0	0.037278747	33.84646463	0.051195276	5625.280497	33214.7161	16.60735805
	Galveston	0.033856739	99.35575388	0.041710519	501.092066	0.025004711	0	0.015351589	38.51145312	0.249587379	11194.2222	0.056747051	1069.2797	0.024143087	0	0.019297151	0	0.567751219	515.4779358	0.032836887	3608.080904	17026.02001	8.513010005
	Harris	0.068267332	200.3368438	0.084559408	1015.86002	0.050418468	0	0.028471701	71.4249586	0.517411736	23206.38956	0.117549281	2214.970758	0.047228963	0	0.029968099	0	0.03613341	32.80657927	0.049622373	5452.451609	32194.24033	16.09712017
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.002039135	5.984031972	0.003716345	44.64655142	0.001505992	0	0.005950953	14.92873737	0.002481478	111.2965661	0.000717051	13.51132401	0.019166247	0	0.07668094	0	0.00086441	0.784823251	0.004000199	439.5374901	630.6895243	0.315344762
	Dallas	0.004539471	13.32150078	0.004683963	56.27109377	0.003352602	0	0.00774211	19.42208784	0.002085611	93.54156969	0.00068106	12.83315988	0.007502816	0	0.026717045	0	0.007524933	6.832106809	0.040370454	4435.860968	4638.082487	2.319041243
	Denton	0.00047388	1.390645845	0.000872802	10.48545863	0.000349982	0	0.001396994	3.504540403	0.000585443	26.25767009	0.000168971	3.183896568	0.00454374	0	0.018187155	0	0.000186605	0.169424585	0.000849405	93.33172724	138.3233634	0.069161682
	Tarrant	0.012162492	35.69196628	0.012266309	147.3621168	0.008982543	0	0.020308652	50.94689033	0.005316504	238.4500891	0.001752506	33.022318	0.017326428	0	0.060216761	0	0.020603444	18.7064697	0.110647237	12157.7964	12681.97625	6.340988127
	Ellis	0.003279814	9.62491822	0.003307809	39.73858745	0.002422289	0	0.005476558	13.73865618	0.001433682	64.30193812	0.000472592	8.905004216	0.004672353	0	0.016238427	0	0.005556053	5.044503283	0.029837824	3278.547201	3419.900808	1.709950404
	Johnson	0.000286058	0.839465248	0.000526868	6.329561301	0.000211267	0	0.000843297	2.11552056	0.000353404	15.8504781	0.000101999	1.921963475	0.002742835	0	0.010978701	0	0.000112645	0.10227338	0.000512745	56.33982353	83.4990856	0.041749543
	Kaufman	0.006325453	18.56262944	0.006379446	76.63988996	0.004671629	0	0.010562096	26.49638966	0.002765	124.0127991	0.000911441	17.17420238	0.009011105	0	0.031317452	0	0.010715411	9.728835404	0.057545265	6323.010273	6595.625019	3.297812509
	Parker	0.000217489	0.638243135	0.000400576	4.812348173	0.000160626	0	0.000641157	1.608424505	0.000268692	12.05107522	7.75498E-05	1.461263582	0.00208537	0	0.008347076	0	8.56434E-05	0.077758172	0.000389838	42.83501399	63.48412678	0.031742063
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.000819895	2.406058023	0.000826893	9.933938654	0.000605529	0	0.001369042	3.434419199	0.000358395	16.07433856	0.00011814	2.226092352	0.001168005	0	0.004059317	0	0.001388914	1.261035919	0.007458924	819.5783709	854.9142536	0.427457127
	Hood	0.01252711	36.76197055	0.012634039	151.7798643	0.009251829	0	0.020917482	52.47421976	0.005475887	245.5985497	0.001805044	34.01228928	0.017845854	0	0.062021991	0	0.021221112	19.26726824	0.113964315	12522.27322	13062.16738	6.531083689
	Hunt	0.006187558	18.15796619	0.006240374	74.96914893	0.004569788	0	0.010331844	25.91877133	0.002704724	121.3093339	0.000891572	16.79980669	0.008814664	0	0.030634735	0	0.010481817	9.51674788	0.056290785	6185.169356	6451.841131	3.225920565
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.033413751	98.05576382	0.051775843	622.0125084	0.024677545	0	0.090663423	227.4409672	0.001141841	51.21262461	1.143571754	21548.22202	0.046873844	0	0.004669544	0	0.000519582	0.471743989	0.002503865	275.1219448	22822.53758	11.41126879
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.002000467	5.870557194	0.076378745	917.5810847	0.001477434	0	0.133848731	335.7769168	0.001237133	55.48653602	0.003554796	66.9827136	0.001061766	0	0.001855699	0	0.000401718	0.364731819	0.001835165	201.6458865	1583.708427	0.791854213
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.004502334	13.21251781	0.171901148	2065.145781	0.003325174	0	0.301245466	755.7133583	0.002784342	124.8802832	0.008000571	150.754054	0.002389654	0	0.004176513	0	0.000904124	0.820880454	0.004130298	453.8325371	3564.359412	1.782179706
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.002458599	7.214988141	0.093870431	1127.718618	0.001815785	0	0.164501762	412.6740261	0.001520452	68.19364604	0.004368889	82.32259193	0.001304924	0	0.002280677	0	0.000493717	0.448259963	0.00225544	247.8253139	1946.397444	0.973198722
	Travis	0.000510007	1.496663069	0.299602906	3599.299264	0.000376663	0	0.033939476	85.14158202	0.000334709	15.01199511	0.000906121	17.07395852	0.000271138	0	0.000471744	0	0.000103327	0.093813485	0.000467336	51.35033899	3769.467615	1.884733807
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0.000685965	2.013027701	0.00069182	8.311226706	0.000506616	0	0.001145408	2.873405761	0.000299851	13.44859039	9.88414E-05	1.862459479	0.000977211	0	0.003396227	0	0.001162035	1.055045312	0.006240507	685.6999908	715.2637462	0.357631873
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22756873	667.8216292	0.004556851	54.74403361	0.168069652	0	0.007612767	19.09761457	0.001680888	75.38935771	0.001626796	30.65357368	0.046792036	0	0.007246366	0	0.001609426	1.461244899	0.008283395	910.1702761	1759.33773	0.879668865
	San Patricio	0.050313351	147.6492145	0.001007478	12.10340188	0.037158653	0	0.001683113	4.222306775	0.000371629	16.66789298	0.00035967	6.777222953	0.010345288	0	0.001602105	0	0.000355829	0.323067795	0.001831382	201.2302693	388.9733762	0.194486688
Victoria Area	Victoria	0.021836736	64.08193428	0.002215582	26.61704246	0.016127403	0	0.003612695	9.062915063	0.001199621	53.80410433	0.000555389	10.46514222	0.52545648	0	0.032412721	0	0.000476855	0.432950906	0.002254849	247.7603395	412.2244288	0.206112214
Other ERCOT counties	Andrews	2.47421E-05	0.072607945	2.49533E-05	0.299777839	1.82731E-05	0	4.13138E-05	0.103640943	1.08153E-05	0.485077536	3.56511E-06	0.067177096	3.5247E-05	0	0.000122499	0	4.19135E-05	0.038054455	0.000225089	24.73252973	25.79886554	0.012899433
	Angelina	0.00031082	0.912129998	0.000313473	3.765928899	0.000229554	0	0.000519	1.301978899	0.000135867	6.093737663	4.47864E-05	0.843905505	0.000442787	0	0.001538876	0	0.000526534	0.478055258	0.002827658	310.6999126	324.0956489	0.162047824
	Bosque	0.000595392	1.747232595	0.001096604	13.17411989	0.000439723	0	0.001755208	4.403167956	0.000735562	32.99061167	0.000212298	4.000305242	0.005708837	0	0.02285067	0	0.000234455	0.212868113	0.001067208	117.2636704	173.7919759	0.086895988
	Brazos	0.001939725	5.692304237	0.003572622	42.91992875	0.001432574	0	0.005718288	14.3450687	0.002396384	107.4800225	0.000691644	13.03258338	0.018598805	0	0.074445136	0	0.000763829	0.693502437	0.003476855	382.0329872	566.1963972	0.283098199
	Calhoun	0.082699809	242.6902894	0.001655986	19.89430228	0.061077496	0	0.002766524	6.940184931	0.000610844	27.39693392	0.000591187	11.13968812	0.0170045	0	0.002633372	0	0.000584875	0.53102495	0.003010234	330.7612064	639.3536301	0.319676815
	Cameron	0.048371747	141.9513958	0.000968599	11.63632869	0.297964476	0	0.001618161	4.059366943	0.000357288	16.02467499	0.00034579	6.515688292	0.009946061	0	0.001540279	0	0.000342098	0.310600532	0.001760709	193.4647449	373.9628002	0.1869814
	Cherokee	0.003503899	10.28251761	0.003533808	42.45363085	0.002587786	0	0.00585073	14.67731681	0.001531635	68.69521337	0.00050488	9.513417208	0.00499158	0	0.017347879	0	0.005935657	5.389156835	0.031876422	3502.546052	3653.557304	1.826778652
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.001298787	3.81141104	2.6007E-05	0.312436742	0.000959212	0	4.34478E-05	0.108994462	9.59321E-06	0.430264337	9.2845E-06	0.174946968	0.000267053	0	4.13567E-05	0	9.18536E-06	0.008339659	4.72752E-05	5.194550293	10.0409435	0.005020472
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.003535748	10.37598068	0.003565928	42.83951367	0.002611307	0	0.005903911	14.81072647	0.001545556	69.3196194	0.00050947	9.599889537	0.005036951	0	0.017505563	0	0.00598961	5.438141646	0.032166163	3534.382489	3686.766361	1.84338318
	Fannin	0.007056315	20.70741257	0.007116546	85.49509787	0.005211403	0	0.011782473	29.55786378	0.003084477	138.3416182	0.001016752	19.15856239	0.010052276	0	0.034935966	0	0.011953503	10.85293488	0.064194222	7053.59027	7357.70376	3.67885188
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.003677178	10.79101991	0.003708565	44.55309422	0.00271576	0	0.006140067	15.40315553	0.001607379	72.09240417	0.000529848	9.983885119	0.005238429	0	0.018205785	0	0.006229194	5.655667312	0.033452809	3675.757789	3834.237015	1.917118507
	Frio	0.008588335	25.20326779	0.000871383	10.4684176	0.006342868	0	0.001420864	3.564422295	0.000471808	21.16102244	0.000218433	4.115914802	0.206660746	0	0.012747844	0	0.000187546	0.170278531	0.000886827	97.44353466	162.1268581	0.081063429
	Grimes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.188527456	553.2513749	0.003775086	45.35224758	0.139235931	0	0.006306735	15.82126283	0.001392518	62.45569772	0.001347706	25.39470278	0.03876448	0	0.006003193	0	0.001333316	1.210556403	0.006862311	754.0231324	1457.508975	0.728754487
	Howard	0.000555113	1.629030929	0.000559851	6.725811748	0.000409976	0	0.000926915	2.325286857	0.000242653	10.88319335	7.99868E-05	1.507184473	0.000790802	0	0.002748377	0	0.00094037	0.853789267	0.005050094	554.8987192	578.8230158	0.289411508
	Jack	0.002121449	6.225588409	0.002139557	25.7037082	0.001566784	0	0.003542346	8.886435885	0.000927334	41.59177164	0.000305682	5.759933722	0.00302217	0	0.010503338	0	0.003593766	3.262884987	0.019299698	2120.629493	2212.059816	1.106029908
	Jones	0.040718722	119.4928819	0.000815354	9.795313688	0.030072592	0	0.001362147	3.41712353	0.00030076	13.48936786	0.000291082	5.484823642	0.008372468	0	0.001296587	0	0.000287974	0.261459582	0.001482142	162.8561649	314.7971351	0.157398568
	Lamar	0.000950838	2.790322198	0.000958954	11.52045764	0.000702236	0	0.001587687	3.982919795	0.000415633	18.64152206	0.000137007	2.58161476	0.001354543	0	0.004707619	0	0.001610734	1.462432113	0.008650166	950.4707283	991.4499968	0.495724998
	Limestone	0.000719757	2.112193302	0.000891528	10.71042494	0.000531572	0	0.000300183	0.753048297	0.00545518	244.6698254	0.001239347	23.3529006	0.000497945	0	0.00031596	0	0.000380962	0.345886636	0.000523179	57.48633925	339.4306184	0.169715309
	Llano	0.001238174	3.633536765	0.047274044	567.9298397	0.000914447	0	0.082844655	207.8265711	0.000765714	34.34296982	0.002200214	41.45844158	0.000657172	0	0.001148571	0	0.000248641	0.225747988	0.001135861	124.8071891	980.224296	0.490112148
	McLennan	0.024534317	71.99823859	0.024743738	297.260531	0.018119687	0	0.040966843	102.7706442	0.010724513	481.0042202	0.003535175	66.61299385	0.034951066	0	0.121469933	0	0.041561501	37.73490253	0.22319886	24524.84459	25582.22612	12.79111306
	Milam	0.002245405	6.589349814	0.002264571	27.20557701	0.001658332	0	0.003749326	9.405670725	0.000981518	44.02198069	0.000323543	6.096486904	0.003198756	0	0.011117048	0	0.00380375	3.453535501	0.02042738	2244.537968	2341.310569	1.170655284
	Mitchell	0.014943169	43.85212012	0.015070721	181.053103	0.011036196	0	0.024951762	62.59473455	0.006532002	292.9662622	0.002153177	40.57211767	0.02128772	0	0.07398395	0	0.025313952	22.98327724	0.135944204	14937.39919	15581.42081	7.790710404
	Nolan	0.000564654	1.657028872	0.000569473	6.841407399	0.000417022	0	0.000942846	2.36525126	0.000246823	11.07024138	8.13615E-05	1.533088256	0.000804394	0	0.002795613	0	0.000956532	0.868463232	0.005136889	564.4356912	588.7711716	0.294385586
	Palo Pinto	0.003206998	9.411235268	0.005906709	70.96063919	0.002368511	0	0.009454195	23.71707675	0.003962005	177.6995283	0.001143513	21.54711049	0.030749889	0	0.123082087	0	0.001262858	1.146585692	0.005748375	631.6251158	936.1072916	0.468053646
	Pecos	4.09677E-05	0.120223469	4.13174E-05	0.496368978	3.02565E-05	0	6.84069E-05	0.171607578	1.79079E-05	0.803186257	5.90308E-06	0.111231126	5.83617E-05	0	0.000202832	0	6.93999E-05	0.063010165	0.0003727	40.95186135	42.71748893	0.021358744
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.000737708	2.164872036	0.000835096	10.0324856	0.00054483	0	0.000735917	1.846143476	0.003149678	141.2659305	0.000730875	13.77181895	0.00076086	0	0.001866305	0	0.191632518	173.9887676	0.003397737	373.3396391	716.4096572	0.358204829
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.005696437	16.71672592	0.005745061	69.01867211	0.004207073	0	0.009511781	23.86153779	0.002490043	111.6807282	0.000820806	15.46636671	0.008115023	0	0.028203184	0	0.00964985	8.761381327	0.051822854	5694.237988	5939.7434	2.9698717
	Tom Green	0.001482448	4.350381852	2.96846E-05	0.356618354	0.001094854	0	4.95918E-05	0.124407345	1.09498E-05	0.491107924	1.05974E-05	0.199686181	0.000304817	0	4.72049E-05	0	1.04843E-05	0.009518969	5.39604E-05	5.929110527	11.46083115	0.005730416
	Upton	3.11661E-05	0.091459902	3.14322E-05	0.377612278	2.30176E-05	0	5.20405E-05	0.130550319	1.36234E-05	0.611023262	4.49076E-06	0.084618985	4.43986E-05	0	0.000154304	0	5.27959E-05	0.047934929	0.000283531	31.15409371	32.49729339	0.016248647
	Ward	0.018559529	54.46466495	0.01871795	224.8693237	0.013707039	0	0.030990277	77.74313386	0.008112796	363.866314	0.002674262	50.39087709	0.026439509	0	0.091888626	0	0.03144012	28.54540422	0.16884373	18552.36281	19352.24252	9.676121262
	Webb	0.020014327	58.73390699	0.000400768	4.814655349	0.014781473	0	0.000669531	1.679606453	0.000147832	6.630380525	0.000143074	2.695935661	0.004115289	0	0.000637307	0	0.000141547	0.128514289	0.000728512	80.04810568	154.731105	0.077365552
	Wharton	0.00014434	0.423578282	0.000178787	2.147863736	0.000106601	0	6.01986E-05	0.151015962	0.001093979	49.06597526	0.000248538	4.683180041	9.98576E-05	0	6.33625E-05	0	7.6398E-05	0.069363948	0.000104918	11.52828427	68.0692615	0.034034631
	Wichita	0.000207633	0.609318989	0.000209406	2.515707187	0.000153346	0	0.000346701	0.869744958	9.07612E-05	4.07072466	2.99181E-05	0.56374382	0.00029579	0	0.001027996	0	0.000351734	0.319349377	0.001888925	207.5530431	216.5016321	0.108250816
	Wilbarger	0.028616818	83.97871745	0.000573025	6.884074325	0.021134796	0	0.000957307	2.401529253	0.000211372	9.480228393	0.00020457	3.854693664	0.005884109	0	0.000911232	0	0.000202386	0.183751869	0.001041639	114.4541134	221.2371083	0.110618554
	Wise	0.002844488	8.347413594	0.002882008	34.62319359	0.002100781	0	0.00476997	11.96609017	0.001256075	56.33612829	0.000413241	7.786669269	0.004181914	0	0.014614274	0	0.004797945	4.356194207	0.025761411	2830.635451	2954.05114	1.47702557
	Young	0.006235856	18.29970105	0.006289085	75.55433238	0.004605458	0	0.010412491	26.12108437	0.002725836	122.256233	0.000898531	16.93094022	0.008883468	0	0.030873859	0	0.010563634	9.591032349	0.056730171	6233.448666	6502.201989	3.251100995
	Total	**1.121837219**	**3292.135785**	**1.172570094**	**14086.74814**	**1.090766584**	**0**	**1.189130767**	**2983.088901**	**1.629360006**	**73078.28647**	**1.542362643**	**29062.60368**	**1.359385821**	**0**	**1.231642808**	**0**	**1.221806085**	**1109.313477**	**1.528786947**	**167981.4235**	**291593.6**	**145.7968**
Energy Savings by PCA (MWh)		2,935		12,014		0		2,509		44,851		18,843		0		0		908		109,879			

Table 91: Cumulative NOx Emissions Reductions According to SIP Areas and Counties (ESL-Single-family).

Program	Area	County	FIP Code	Total NOx emissions reduction (Tons) (2007 25% annual and ozone season eGrid)																			
				2004		Cumulative 2005		Cumulative 2006		Cumulative 2007		Cumulative 2008		Cumulative 2009		Cumulative 2010		Cumulative 2011		Cumulative 2012		Cumulative 2013	
				Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day
ESL-Single family	Houston-Galveston Area	Brazoria	039	2.195	0.0111	6.769	0.0367	8.282	0.0442	9.701	0.0513	11.026	0.0578	12.258	0.0639	13.395	0.0696	14.438	0.0747	15.388	0.0794	16.244	0.0836
		Chambers	071	5.131	0.0239	15.688	0.0784	19.234	0.0946	22.560	0.1098	25.666	0.1240	28.553	0.1372	31.221	0.1493	33.668	0.1604	35.896	0.1705	37.905	0.1796
		Fort Bend	157	16.607	0.0609	50.772	0.1995	62.248	0.2408	73.012	0.2795	83.067	0.3156	92.410	0.3491	101.042	0.3800	108.964	0.4083	116.175	0.4340	122.675	0.4571
		Galveston	167	8.513	0.0332	26.307	0.1101	32.173	0.1326	37.675	0.1537	42.812	0.1733	47.585	0.1915	51.994	0.2083	56.038	0.2237	59.718	0.2377	63.034	0.2502
		Harris	201	16.097	0.0846	49.212	0.2771	60.335	0.3345	70.769	0.3882	80.514	0.4384	89.571	0.4849	97.938	0.5278	105.616	0.5671	112.606	0.6028	118.906	0.6349
		Liberty	291	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Montgomery	339	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Waller	473	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
	Beaumont/ Port Arthur Area	Hardin	199	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Jefferson	245	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Orange	361	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
	Dallas/ Fort Worth Area	Collin	085	0.315	0.0015	1.039	0.0054	1.252	0.0064	1.452	0.0074	1.639	0.0083	1.812	0.0091	1.972	0.0099	2.118	0.0106	2.250	0.0112	2.369	0.0117
		Dallas	113	2.319	0.0134	7.886	0.0479	9.442	0.0567	10.899	0.0650	12.257	0.0728	13.515	0.0799	14.674	0.0865	15.734	0.0925	16.694	0.0980	17.556	0.1028
		Denton	121	0.069	0.0005	0.227	0.0016	0.274	0.0019	0.318	0.0022	0.359	0.0025	0.397	0.0028	0.432	0.0030	0.464	0.0032	0.493	0.0034	0.519	0.0036
		Tarrant	439	6.341	0.0430	21.569	0.1536	25.824	0.1820	29.807	0.2087	33.519	0.2335	36.959	0.2564	40.128	0.2775	43.025	0.2968	45.651	0.3142	48.006	0.3298
		Ellis	139	1.710	0.0097	5.817	0.0345	6.964	0.0409	8.038	0.0469	9.039	0.0525	9.967	0.0577	10.821	0.0624	11.602	0.0668	12.311	0.0707	12.946	0.0742
		Johnson	251	0.042	0.0002	0.137	0.0009	0.165	0.0010	0.192	0.0012	0.217	0.0013	0.240	0.0015	0.261	0.0016	0.280	0.0017	0.298	0.0018	0.313	0.0019
		Kaufman	257	3.298	0.0179	11.218	0.0640	13.430	0.0759	15.502	0.0870	17.432	0.0973	19.222	0.1069	20.870	0.1157	22.377	0.1237	23.742	0.1310	24.967	0.1375
		Parker	367	0.032	0.0004	0.104	0.0012	0.126	0.0015	0.146	0.0017	0.165	0.0019	0.182	0.0021	0.198	0.0022	0.213	0.0024	0.226	0.0026	0.238	0.0027
		Rockwall	397	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Henderson	213	0.427	0.0026	1.454	0.0094	1.741	0.0111	2.009	0.0127	2.260	0.0142	2.491	0.0156	2.705	0.0169	2.900	0.0181	3.077	0.0192	3.236	0.0201
		Hood	221	6.531	0.0341	22.216	0.1216	26.598	0.1441	30.701	0.1652	34.523	0.1848	38.067	0.2030	41.331	0.2197	44.315	0.2350	47.020	0.2488	49.445	0.2611
		Hunt	231	3.226	0.0176	10.973	0.0626	13.138	0.0742	15.164	0.0851	17.052	0.0952	18.803	0.1046	20.415	0.1132	21.889	0.1210	23.225	0.1282	24.423	0.1345
	El Paso Area	El Paso	141	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
	San Antonio Area	Bexar	029	11.411	0.0513	42.177	0.1783	49.642	0.2125	56.618	0.2446	63.106	0.2744	69.106	0.3020	74.617	0.3274	79.640	0.3507	84.174	0.3717	88.220	0.3906
		Comal	091	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Guadalupe	187	0.792	0.0037	2.461	0.0124	3.006	0.0149	3.517	0.0172	3.994	0.0194	4.437	0.0214	4.846	0.0233	5.222	0.0250	5.563	0.0266	5.871	0.0280
		Wilson	493	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
	Austin Area	Bastrop	021	1.782	0.0083	5.538	0.0275	6.765	0.0331	7.915	0.0383	8.989	0.0432	9.986	0.0478	10.907	0.0519	11.752	0.0557	12.521	0.0592	13.213	0.0623
		Caldwell	055	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Hays	209	0.973	0.0046	3.024	0.0152	3.694	0.0183	4.322	0.0212	4.908	0.0239	5.453	0.0264	5.956	0.0287	6.418	0.0308	6.837	0.0327	7.215	0.0344
		Travis	453	1.885	0.0084	5.692	0.0277	6.999	0.0335	8.225	0.0388	9.370	0.0438	10.434	0.0485	11.418	0.0527	12.322	0.0567	13.144	0.0602	13.886	0.0634
		Williamson	491	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
	North East Texas Area	Gregg	183	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Harrison	203	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Rusk	401	0.358	0.0000	1.217	0.0000	1.456	0.0000	1.681	0.0000	1.890	0.0000	2.084	0.0000	2.263	0.0000	2.427	0.0000	2.575	0.0000	2.708	0.0000
		Smith	423	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Upshur	459	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
	Corpus Christi Area	Nueces	355	0.880	0.0041	2.832	0.0140	3.432	0.0168	3.994	0.0194	4.518	0.0218	5.005	0.0240	5.454	0.0261	5.865	0.0279	6.239	0.0296	6.575	0.0312
		San Patricio	409	0.194	0.0010	0.626	0.0035	0.759	0.0041	0.883	0.0048	0.999	0.0054	1.107	0.0059	1.206	0.0064	1.297	0.0069	1.379	0.0073	1.454	0.0077
	Victoria Area	Victoria	469	0.206	0.0010	0.672	0.0033	0.812	0.0040	0.943	0.0046	1.065	0.0051	1.179	0.0056	1.283	0.0061	1.379	0.0065	1.466	0.0069	1.545	0.0073
	Other ERCOT counties	Andrews	003	0.013	0.0001	0.044	0.0003	0.053	0.0003	0.061	0.0003	0.068	0.0004	0.075	0.0004	0.082	0.0005	0.088	0.0005	0.093	0.0005	0.098	0.0005
		Angelina	005	0.162	0.0009	0.551	0.0032	0.660	0.0038	0.762	0.0043	0.857	0.0048	0.945	0.0053	1.025	0.0057	1.100	0.0061	1.167	0.0065	1.227	0.0068
		Bosque	035	0.087	0.0007	0.285	0.0024	0.344	0.0029	0.400	0.0033	0.451	0.0037	0.499	0.0041	0.543	0.0044	0.583	0.0048	0.620	0.0050	0.652	0.0053
		Brazos	041	0.283	0.0014	0.930	0.0049	1.122	0.0059	1.302	0.0067	1.469	0.0076	1.625	0.0083	1.768	0.0090	1.899	0.0097	2.019	0.0103	2.126	0.0108
		Calhoun	057	0.320	0.0016	1.029	0.0055	1.247	0.0066	1.451	0.0077	1.642	0.0086	1.819	0.0095	1.982	0.0103	2.131	0.0111	2.267	0.0117	2.389	0.0123
		Cameron	061	0.187	0.0010	0.602	0.0034	0.729	0.0041	0.849	0.0047	0.960	0.0053	1.064	0.0059	1.159	0.0064	1.247	0.0068	1.326	0.0073	1.398	0.0076
		Cherokee	073	1.827	0.0097	6.214	0.0346	7.440	0.0411	8.587	0.0471	9.656	0.0527	10.648	0.0578	11.560	0.0626	12.395	0.0670	13.152	0.0709	13.830	0.0744
		Coke	081	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Coleman	083	0.005	0.0000	0.016	0.0001	0.020	0.0001	0.023	0.0001	0.026	0.0001	0.029	0.0001	0.031	0.0002	0.033	0.0002	0.036	0.0002	0.038	0.0002
		Crockett	105	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Ector	135	1.843	0.0100	6.270	0.0358	7.507	0.0424	8.665	0.0486	9.744	0.0544	10.744	0.0598	11.666	0.0647	12.508	0.0692	13.271	0.0732	13.956	0.0769
		Fannin	147	3.679	0.0211	12.514	0.0752	14.982	0.0892	17.293	0.1022	19.447	0.1144	21.442	0.1256	23.281	0.1360	24.962	0.1454	26.486	0.1539	27.852	0.1616
		Fayette	149	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Freestone	161	1.917	0.0104	6.521	0.0372	7.808	0.0441	9.012	0.0506	10.134	0.0566	11.174	0.0622	12.132	0.0673	13.008	0.0719	13.802	0.0762	14.514	0.0799
		Frio	163	0.081	0.0007	0.264	0.0024	0.319	0.0028	0.371	0.0033	0.419	0.0037	0.464	0.0040	0.505	0.0044	0.542	0.0047	0.577	0.0050	0.608	0.0052
		Grimes	185	0.000	0.0004	0.000	0.0014	0.000	0.0017	0.000	0.0020	0.000	0.0022	0.000	0.0024	0.000	0.0026	0.000	0.0028	0.000	0.0030	0.000	0.0031
		Hardeman	197	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Haskell	207	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Hidalgo	215	0.729	0.0044	2.346	0.0150	2.843	0.0180	3.309	0.0208	3.743	0.0233	4.146	0.0257	4.518	0.0279	4.859	0.0300	5.168	0.0318	5.447	0.0334
		Howard	227	0.289	0.0016	0.984	0.0058	1.179	0.0068	1.360	0.0078	1.530	0.0088	1.687	0.0096	1.831	0.0104	1.964	0.0112	2.084	0.0118	2.191	0.0124
		Jack	237	1.106	0.0060	3.762	0.0215	4.504	0.0255	5.199	0.0292	5.847	0.0326	6.447	0.0359	6.999	0.0388	7.505	0.0415	7.963	0.0439	8.373	0.0461
		Jones	253	0.157	0.0008	0.507	0.0027	0.614	0.0032	0.715	0.0037	0.808	0.0041	0.896	0.0046	0.976	0.0050	1.049	0.0053	1.116	0.0056	1.176	0.0059
		Lamar	277	0.496	0.0030	1.686	0.0107	2.019	0.0126	2.330	0.0145	2.620	0.0162	2.889	0.0178	3.137	0.0192	3.364	0.0206	3.569	0.0218	3.753	0.0229
		Limestone	293	0.170	0.0000	0.519	0.0000	0.636	0.0000	0.746	0.0000	0.849	0.0000	0.944	0.0000	1.033	0.0000	1.114	0.0000	1.187	0.0000	1.254	0.0000
		Llano	299	0.490	0.0023	1.523	0.0077	1.860	0.0092	2.177	0.0107	2.472	0.0120	2.746	0.0133	3.000	0.0144	3.232	0.0155	3.443	0.0165	3.634	0.0173
		McLennan	309	12.791	0.0636	43.510	0.2271	52.092	0.2692	60.127	0.3086	67.614	0.3453	74.554	0.3792	80.946	0.4105	86.791	0.4390	92.089	0.4647	96.838	0.4878
		Milam	331	1.171	0.0046	3.982	0.0163	4.768	0.0193	5.503	0.0221	6.188	0.0248	6.823	0.0272	7.408	0.0295	7.943	0.0315	8.428	0.0333	8.863	0.0350
		Mitchell	335	7.791	0.0469	26.501	0.1673	31.728	0.1983	36.622	0.2273	41.182	0.2543	45.409	0.2793	49.302	0.3023	52.862	0.3233	56.089	0.3422	58.982	0.3592
		Nolan	353	0.294	0.0017	1.001	0.0059	1.199	0.0071	1.384	0.0081	1.556	0.0090	1.716	0.0099	1.863	0.0108	1.997	0.0115	2.119	0.0122	2.229	0.0128
		Palo Pinto	363	0.468	0.0023	1.538	0.0079	1.855	0.0094	2.152	0.0108	2.429	0.0122	2.686	0.0134	2.923	0.0145	3.140	0.0155	3.337	0.0165	3.514	0.0173
		Pecos	371	0.021	0.0001	0.073	0.0004	0.087	0.0005	0.100	0.0006	0.113	0.0006	0.124	0.0007	0.135	0.0008	0.145	0.0008	0.154	0.0009	0.162	0.0009
		Presidio	377	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Red River	387	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Robertson	395	0.358	0.0009	1.193	0.0031	1.435	0.0037	1.661	0.0043	1.872	0.0048	2.068	0.0053	2.249	0.0057	2.414	0.0061	2.564	0.0065	2.698	0.0068
		Taylor	441	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
		Titus	449	2.970	0.0000	10.102	0.0000	12.095	0.0000	13.960	0.0000	15.699	0.0000	17.310	0.0000	18.794	0.0000	20.151	0.0000	21.381	0.0000	22.484	0.0000
		Tom Green	451	0.006	0.0000	0.018	0.0000	0.022	0.0000	0.026	0.0000	0.029	0.0000	0.033	0.0000	0.036	0.0000	0.038	0.0000	0.041	0.0000	0.043	0.0000
		Upton	461	0.016	0.0001	0.055	0.0003	0.066	0.0004	0.076	0.0004	0.086	0.0005	0.095	0.0005	0.103	0.0006	0.110	0.0006	0.117	0.0007	0.123	0.0007
		Ward	475	9.676	0.0547	32.914	0.1953	39.406	0.2315	45.484	0.2654	51.148	0.2970	56.398	0.3262	61.234	0.3530	65.655	0.3775	69.662	0.3997	73.256	0.4195
		Webb	479	0.077	0.0003	0.249	0.0009	0.302	0.0011	0.351	0.0012	0.397	0.0014	0.440	0.0015	0.480	0.0017	0.516	0.0018	0.549	0.0019	0.578	0.0020
		Wharton	481	0.034	0.0002	0.104	0.0006	0.128	0.0007	0.150	0.0008	0.170	0.0009	0.189	0.0010	0.207	0.0011	0.223	0.0011	0.238	0.0012	0.251	0.0013
		Wichita	485	0.108	0.0006	0.368	0.0022	0.441	0.0026	0.509	0.0029	0.572	0.0033	0.631	0.0036	0.685	0.0039	0.735	0.0042	0.779	0.0044	0.820	0.0047
		Wilbarger	487	0.111	0.0000	0.356	0.0000	0.432	0.0000	0.502	0.0000	0.568	0.0000	0.629	0.0000	0.686	0.0000	0.738	0.0000	0.785	0.0000	0.827	0.0000
		Wise	497	1.477	0.0080	5.024	0.0287	6.015	0.0340	6.943	0.0390	7.807	0.0436	8.609	0.0479	9.347	0.0518	10.022	0.0554	10.634	0.0587	11.182	0.0616
		Young	503	3.251	0.0152	11.059	0.0542	13.240	0.0643	15.282	0.0737	17.185	0.0824	18.949	0.0905	20.574	0.0980	22.060	0.1048	23.406	0.1109	24.613	0.1164

7.3.2 ESL-Multi-family.

The calculation for the multi-family program is similar to the single-family analysis. In this calculation, the annual and OSD MWh savings for the 41 non-attainment and affected counties for 2002, 2003 and 2004 were obtained from the annual reports for 2002, 2003 and 2004 submitted by the Laboratory to the Texas Council of Environmental Quality (TCEQ). The annual and OSD MWh savings numbers according to the county and program are shown in Table 92. Using the numbers for 2002, 2003 and 2004, savings through 2013 were projected by incorporating the different adjustment factors mentioned above. It is assumed that the same amount of MWh savings will be achieved for each year after 2004 through 2013. In a similar fashion as the single family calculations, the projected energy saving numbers through 2013, according to the county were divided into the PUCT's different Power Control Authorities (PCA) as shown in Table 93.

In a similar fashion as the single family calculations, the 2007 annual and OSD eGRID was used to calculate the NOx emissions savings for the multifamily program. An example of the eGRID spreadsheet is given in Table 94. The total MWh savings for each PCA were used to calculate the NOx emissions reduction for each of the different county using the emissions factors contained in the 2007 eGRID. The eGRID spreadsheet, shown in Table 94, was used for each annual analysis from 2004 through 2012. Cumulative NOx emissions reductions for each county, by SIP area for the different programs are provided in Table 95.

Table 92: Annual and OSD MWh Savings for ESL-Multi-family Program.

Fip Codes	County	Annual Energy Savings 2001		Annual Energy Savings 2002		Annual Energy Savings 2003		Annual Energy Savings 2004			
		Electric		Electric		Electric		Electric		Gas	
		MWh	MWh/ average day	MWh	MWh/ peak-TMY2 day	MWh	MWh/ peak-TMY2 day	MWh	MWh/ ozone season day	Therms	Therms/ ozone season day
021	Bastrop			4	0.0	33	0.1	24	0.1	579	1.7
029	Bexar			5,807	24.9	993	4.0	516	2.2	15,028	44.8
055	Caldwell			72	0.3	0	0.0	0	0.0	0	0.0
091	Comal			119	0.5	66	0.3	49	0.2	1,431	4.3
139	Ellis			923	4.5	280	1.5	4	0.0	123	0.4
183	Gregg			12	0.1	0	0.0	1	0.0	16	0.0
187	Guadalupe			0	0.0	0	0.0	0	0.0	0	0.0
203	Harrison			0	0.0	0	0.0	0	0.0	0	0.0
209	Hays			1,600	6.2	151	0.7	102	0.4	2,510	17.4
213	Henderson			0	0.0	0	0.0	2	0.0	51	0.2
221	Hood			0	0.0	0	0.0	0	0.0	14	0.0
231	Hunt			0	0.0	0	0.0	11	0.1	310	0.8
251	Johnson			31	0.2	6	0.0	1	0.0	29	0.1
257	Kaufman			335	1.7	1	0.0	63	0.3	1,762	4.7
355	Nueces			209	0.7	99	0.4	87	0.3	1,932	5.5
367	Parker			8	0.0	1	0.0	8	0.0	212	0.6
397	Rockwall			0	0.0	0	0.0	0	0.0	0	0.0
401	Rusk			0	0.0	1	0.0	0	0.0	0	0.0
409	San Patricio			161	0.5	119	0.5	26	0.1	585	1.7
423	Smith			92	0.4	28	0.1	18	0.1	616	1.8
453	Travis			13,958	54.3	1,968	8.9	774	3.2	19,071	53.5
459	Upshur			0	0.0	0	0.0	0	0.0	0	0.0
469	Victoria			0	0.0	0	0.0	0	0.0	0	0.0
491	Williamson			3,169	12.3	115	0.5	116	0.5	2,868	8.0
493	Wilson			79	0.3	0	0.0	0	0.0	0	0.0
039	Brazoria			164	0.6	120	0.6	53	0.2	1,256	3.6
071	Chambers			0	0.0	0	0.0	1	0.0	15	0.0
085	Collin			2,314	11.5	244	1.3	188	1.0	5,295	14.2
113	Dallas			10,805	52.2	2,446	13.5	1,380	7.9	44,589	134.6
121	Denton			2,341	11.7	470	2.4	544	2.8	15,321	41.1
141	El Paso			1,324	5.9	88	0.5	113	0.6	3,262	9.7
157	Fort Bend			72	1.4	0	0.0	229	0.8	5,408	15.6
167	Galveston			444	1.6	18	0.1	874	3.1	20,671	59.8
199	Hardin			0	0.0	0	0.0	0	0.0	0	0.0
201	Harris			2,013	39.3	3,950	17.9	4,646	16.4	109,919	317.8
245	Jefferson			196	0.9	33	0.1	146	0.5	3,206	9.4
291	Liberty			0	0.0	0	0.0	0	0.0	0	0.0
339	Montgomery			40	0.8	188	0.9	234	0.8	5,536	16.0
361	Orange			4	0.0	0	0.0	0	0.0	0	0.0
439	Tarrant			4,541	22.0	1,245	6.9	736	4.2	23,791	71.8
473	Waller			51	1.0	64	0.3	49	0.2	1,157	3.3
	Totals			50,886	256	12,727	61	10,992	46	286,562	842

Table 93: Projected MWh Savings for ESL-Multi-family According to Power Control Authorities (PCA) and Counties.

			2004		2005		2006		2007		2008		2009		2010		2011		2012		2013	
			Energy Savings		Energy Savings		Energy Savings		Energy Savings		Energy Savings		Energy Savings		Energy Savings		Energy Savings		Energy Savings		Energy Savings	
PCAs	Counties	% coverage	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day	MWh	MWh/avg day
American Electric Power - West (ERCOT) /PCA	Caldwell	100%	0	0.0	52	0.2	49	0.2	46	0.2	43	0.2	40	0.2	37	0.2	34	0.1	31	0.1	28	0.1
	Nueces	100%	87	0.3	373	1.2	427	1.4	477	1.6	524	1.7	567	1.8	606	1.9	641	2.1	672	2.1	700	2.2
	San Patricio	100%	26	0.1	253	0.9	262	0.9	269	0.9	275	0.9	280	0.9	283	0.9	286	1.0	288	1.0	288	0.9
	Victoria	100%	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Total		**113**	**0.4**	**679**	**2.3**	**738**	**2.5**	**792**	**2.7**	**842**	**2.8**	**886**	**2.9**	**926**	**3.1**	**961**	**3.1**	**991**	**3.2**	**1,016**	**3.3**
Austin Energy/PCA	Chambers	30%	0	0.0	0	0.0	0	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0
	Harris	30%	1,394	4.9	3,679	20.9	4,676	24.0	5,613	26.8	6,491	29.5	7,310	31.9	8,068	34.1	8,767	36.1	9,406	37.9	9,986	39.5
	Travis	3%	23	0.1	389	1.5	386	1.5	383	1.5	378	1.5	373	1.5	366	1.5	359	1.4	350	1.4	341	1.4
	Williamson	3%	3	0.0	78	0.3	76	0.3	74	0.3	73	0.3	71	0.3	69	0.3	66	0.3	64	0.3	61	0.3
	Total		**1,421**	**5.0**	**4,146**	**22.8**	**5,139**	**25.8**	**6,071**	**28.7**	**6,943**	**31.3**	**7,754**	**33.7**	**8,504**	**35.9**	**9,193**	**37.8**	**9,821**	**39.6**	**10,389**	**41.1**
Brownsville Public Utils Board/PCA																						
Lower Colorado River Auhotrity /PCA	Hays	100%	102	0.4	1,451	5.7	1,454	5.8	1,453	5.8	1,448	5.8	1,438	5.7	1,424	5.7	1,406	5.6	1,383	5.5	1,356	5.4
	Total		**102**	**0.4**	**1,451**	**5.7**	**1,454**	**5.8**	**1,453**	**5.8**	**1,448**	**5.8**	**1,438**	**5.7**	**1,424**	**5.7**	**1,406**	**5.6**	**1,383**	**5.5**	**1,356**	**5.4**
Reliant Energy HL&P/PCA	Brazoria	97%	51	0.2	292	1.1	320	1.2	345	1.3	369	1.4	390	1.5	409	1.5	426	1.6	440	1.6	453	1.7
	Chambers	70%	0	0.0	1	0.0	1	0.0	2	0.0	2	0.0	2	0.0	2	0.0	3	0.0	3	0.0	3	0.0
	Fort Bend	100%	229	0.8	434	2.4	607	2.9	770	3.5	923	3.9	1,067	4.4	1,201	4.8	1,325	5.2	1,439	5.6	1,544	5.9
	Galveston	97%	847	3.0	1,741	6.2	2,375	8.4	2,973	10.5	3,534	12.5	4,059	14.3	4,547	16.1	5,000	17.7	5,416	19.1	5,795	20.5
	Harris	70%	3,252	11.5	8,584	48.9	10,910	56.0	13,098	62.6	15,146	68.8	17,056	74.4	18,826	79.6	20,456	84.3	21,948	88.5	23,300	92.1
	Montgomery	70%	164	0.6	395	1.8	514	2.2	627	2.6	732	2.9	830	3.3	922	3.6	1,006	3.8	1,083	4.1	1,154	4.3
	Waller	100%	49	0.2	168	1.2	201	1.3	231	1.4	260	1.4	286	1.5	311	1.6	333	1.6	353	1.6	371	1.7
	Hardin	70%	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Total		**4,593**	**16.2**	**11,614**	**61.6**	**14,928**	**72.1**	**18,045**	**81.9**	**20,966**	**91.0**	**23,690**	**99.4**	**26,217**	**107.1**	**28,548**	**114.2**	**30,683**	**120.5**	**32,621**	**126.1**
San Antonio Public Service Bd/PCA	Bexar	100%	516	2.2	5,851	25.0	5,958	25.4	6,043	25.8	6,105	26.1	6,146	26.3	6,164	26.4	6,160	26.5	6,134	26.4	6,086	26.2
	Comal	100%	49	0.2	219	0.9	249	1.1	277	1.2	303	1.3	327	1.4	348	1.5	367	1.6	385	1.7	400	1.7
	Guadalupe	100%	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Wilson	100%	0	0.0	58	0.2	54	0.2	51	0.2	48	0.2	44	0.2	41	0.2	37	0.2	34	0.1	31	0.1
	Total		**565**	**2.5**	**6,129**	**26.1**	**6,262**	**26.7**	**6,371**	**27.2**	**6,456**	**27.6**	**6,516**	**27.9**	**6,553**	**28.1**	**6,565**	**28.2**	**6,553**	**28.2**	**6,517**	**28.0**
South Texas Electric Coop INC/PCA																						
Texas Municipal Power Pool/PCA																						
Texas-New Mexico Power Co/PCA	Brazoria	3%	2	0.0	9	0.0	10	0.0	11	0.0	11	0.0	12	0.0	13	0.0	13	0.0	14	0.1	14	0.1
	Galveston	3%	26	0.1	54	0.2	73	0.3	92	0.3	109	0.4	126	0.4	141	0.5	155	0.5	167	0.6	179	0.6
	Collin	2%	4	0.0	44	0.2	44	0.2	45	0.2	45	0.2	46	0.2	46	0.2	46	0.2	45	0.2	45	0.2
	Denton	2%	11	0.1	59	0.3	65	0.3	71	0.4	76	0.4	81	0.4	85	0.4	88	0.4	91	0.5	94	0.5
	Johnson	2%	0	0.0	1	0.0	1	0.0	1	0.0	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Hood	2%	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Hunt	2%	0	0.0	0	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0
	Total		**43**	**0.2**	**167**	**0.7**	**194**	**0.9**	**220**	**1.0**	**243**	**1.0**	**265**	**1.1**	**285**	**1.2**	**303**	**1.3**	**320**	**1.3**	**334**	**1.4**
TXU Electric/PCA	Collin	98%	184	0.9	2,142	10.7	2,176	10.9	2,203	11.1	2,222	11.2	2,233	11.2	2,236	11.2	2,231	11.2	2,218	11.2	2,197	11.1
	Dallas	100%	1,380	7.9	12,049	61.5	12,544	64.8	12,981	67.7	13,359	70.3	13,677	72.5	13,937	74.4	14,137	76.0	14,279	77.2	14,361	78.1
	Denton	98%	533	2.7	2,913	14.7	3,205	16.1	3,475	17.5	3,722	18.8	3,946	19.9	4,147	20.9	4,326	21.8	4,481	22.6	4,614	23.3
	Tarrant	100%	736	4.2	5,492	28.3	5,811	30.3	6,099	32.1	6,356	33.7	6,581	35.2	6,774	36.5	6,936	37.6	7,066	38.5	7,165	39.3
	Ellis	100%	4	0.0	894	4.5	845	4.2	796	4.0	747	3.7	698	3.5	649	3.3	600	3.0	550	2.8	501	2.5
	Johnson	98%	1	0.0	28	0.1	27	0.1	26	0.1	25	0.1	24	0.1	23	0.1	22	0.1	21	0.1	20	0.1
	Kaufman	100%	63	0.3	349	1.7	382	1.9	414	2.1	442	2.2	468	2.4	491	2.5	511	2.6	529	2.7	544	2.7
	Parker	100%	8	0.0	20	0.1	25	0.1	30	0.2	35	0.2	39	0.2	43	0.2	47	0.2	51	0.3	54	0.3
	Rockwall	100%	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Henderson	100%	2	0.0	3	0.0	4	0.0	5	0.0	6	0.0	7	0.0	8	0.0	9	0.0	10	0.1	10	0.1
	Hood	98%	0	0.0	1	0.0	1	0.0	1	0.0	2	0.0	2	0.0	2	0.0	2	0.0	3	0.0	3	0.0
	Hunt	98%	11	0.1	18	0.1	26	0.1	34	0.2	42	0.2	48	0.2	55	0.3	61	0.3	66	0.3	72	0.4
	Bastrop	100%	24	0.1	68	0.3	85	0.3	101	0.4	116	0.4	130	0.5	143	0.5	154	0.6	165	0.6	175	0.7
	Travis	97%	750	3.1	12,574	50.0	12,491	49.8	12,376	49.4	12,228	48.8	12,049	48.2	11,837	47.4	11,594	46.5	11,318	45.4	11,010	44.2
	Williamson	97%	113	0.5	2,510	9.9	2,461	9.8	2,407	9.6	2,348	9.4	2,284	9.2	2,215	9.0	2,142	8.8	2,063	8.5	1,980	8.2
	Smith	100%	18	0.1	118	0.6	127	0.6	135	0.7	143	0.7	149	0.7	155	0.8	160	0.8	164	0.8	168	0.8
	Total		**3,825**	**19.9**	**39,178**	**182.6**	**40,212**	**189.2**	**41,084**	**195.0**	**41,791**	**199.9**	**42,335**	**204.0**	**42,715**	**207.2**	**42,932**	**209.6**	**42,984**	**211.1**	**42,873**	**211.8**
El Paso Electric Co/PCA	El Paso	100%	113	0.6	1,220	5.6	1,247	5.8	1,268	5.9	1,285	6.0	1,297	6.1	1,304	6.2	1,307	6.2	1,304	6.2	1,297	6.2
	Total		**113**	**0.6**	**1,220**	**5.6**	**1,247**	**5.8**	**1,268**	**5.9**	**1,285**	**6.0**	**1,297**	**6.1**	**1,304**	**6.2**	**1,307**	**6.2**	**1,304**	**6.2**	**1,297**	**6.2**
Entergy Electric System/PCA	Liberty	100%	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Montgomery	30%	70	0.2	169	0.8	220	1.0	269	1.1	314	1.3	356	1.4	395	1.5	431	1.6	464	1.7	494	1.8
	Hardin	30%	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Jefferson	100%	146	0.5	412	1.6	515	2.0	611	2.3	702	2.7	786	3.0	863	3.2	935	3.5	1,000	3.7	1,059	3.9
	Orange	100%	0	0.0	3	0.0	3	0.0	2	0.0	2	0.0	2	0.0	2	0.0	2	0.0	2	0.0	1	0.0
	Total		**216**	**0.8**	**584**	**2.4**	**738**	**3.0**	**882**	**3.5**	**1,018**	**3.9**	**1,143**	**4.4**	**1,260**	**4.8**	**1,368**	**5.2**	**1,466**	**5.5**	**1,555**	**5.8**
Southwestern Public Service Co/PCA	Gregg	100%	1	0.0	10	0.0	10	0.0	9	0.0	9	0.0	9	0.0	9	0.0	9	0.0	8	0.0	8	0.0
	Harrison	100%	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Rusk	100%	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Upshur	100%	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Total		**1**	**0.0**	**10**	**0.0**	**10**	**0.0**	**10**	**0.0**	**10**	**0.0**	**10**	**0.0**	**9**	**0.0**	**9**	**0.0**	**9**	**0.0**	**8**	**0.0**

Table 94: Example of NOx Emissions Reduction Calculations According to Counties and PCA.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.008831132	1.001587634	0.010890729	15.4717512	0.006522185	0	0.003944232	0.401470966	0.065444292	300.5676979	0.014877434	8.411626413	0.006262315	0	0.004817148	0	0.121274957	5.175580594	0.00816387	31.22849772	362.2582125	0.181129106
	Chambers	0.021762222	2.46817418	0.026955801	38.29435534	0.016072371	0	0.009076193	0.923837172	0.164940225	757.5252561	0.037472294	21.18664695	0.015055623	0	0.009553214	0	0.011518588	0.49157207	0.015818592	60.50939906	881.3992409	0.44069962
	Fort Bend	0.070431234	7.987996393	0.087239726	123.9358125	0.052016606	0	0.029374182	2.98990568	0.533812376	2451.653964	0.121275295	68.56844253	0.048726002	0	0.030918012	0	0.037278747	1.590923345	0.051195276	195.8325572	2852.559602	1.426279801
	Galveston	0.033856739	3.839880355	0.041710519	59.25542442	0.025004711	0	0.015351589	1.562589975	0.249587379	1146.286437	0.056747051	32.08449786	0.024143087	0	0.019297151	0	0.567751219	24.22958767	0.032836887	125.6079071	1392.866325	0.696433162
	Harris	0.068267332	7.742576358	0.084559408	120.1280577	0.050418468	0	0.028471701	2.898045003	0.517411736	2376.33032	0.117549281	66.46177288	0.047228963	0	0.029968099	0	0.03613341	1.542044447	0.049622373	189.8158754	2764.918691	1.382459346
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.002039135	0.231269614	0.003716345	5.279569431	0.001505992	0	0.005950953	0.605728776	0.002481478	11.39674932	0.000717051	0.405416886	0.019166247	0	0.07668094	0	0.00086441	0.036889928	0.004000199	15.30159265	33.2572166	0.016628608
	Dallas	0.004539471	0.514846571	0.004683963	6.654201434	0.003352602	0	0.00774211	0.788045044	0.002085611	9.578640727	0.00068106	0.385068089	0.007502816	0	0.026717045	0	0.007524933	0.32113718	0.040370454	154.4253655	172.6673046	0.086333652
	Denton	0.00047388	0.053745389	0.000872802	1.239932427	0.000349982	0	0.001396994	0.142195613	0.000585443	2.688780923	0.000168971	0.095535081	0.00454374	0	0.018187155	0	0.000186605	0.007963654	0.000849405	3.2491519	7.477304987	0.003738652
	Tarrant	0.012162492	1.379415633	0.012266309	17.42594898	0.008982543	0	0.020308652	2.067153889	0.005316504	24.41724831	0.001752506	0.990858137	0.017326428	0	0.060216761	0	0.020603444	0.87928118	0.110647237	423.2486471	470.4085532	0.235204277
	Ellis	0.003279814	0.371981822	0.003307809	4.699190079	0.002422289	0	0.005476558	0.55744161	0.001433682	6.584507459	0.000472592	0.267200985	0.004672353	0	0.016238427	0	0.005556053	0.237112447	0.029837824	114.1358698	126.8533042	0.063426652
	Johnson	0.000286058	0.032443477	0.000526868	0.748486888	0.000211267	0	0.000843297	0.085836575	0.000353404	1.623086245	0.000101999	0.057669881	0.002742835	0	0.010978701	0	0.000112645	0.00480727	0.000512745	1.961354944	4.513685281	0.002256843
	Kaufman	0.006325453	0.717404613	0.006379446	9.062863924	0.004671629	0	0.010562096	1.075082593	0.002765	12.6988894	0.000911441	0.515324157	0.009011105	0	0.031317452	0	0.010715411	0.457295364	0.057545265	220.1225827	244.6494427	0.122324721
	Parker	0.000217489	0.024666687	0.000400576	0.569072537	0.000160626	0	0.000641157	0.065261313	0.000268692	1.23402804	7.75498E-05	0.043846253	0.00208537	0	0.008347076	0	8.56434E-05	0.003654955	0.000389838	1.491212808	3.431742594	0.001715871
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.000819895	0.092988826	0.000826893	1.174713772	0.000605529	0	0.001369042	0.139350468	0.000358395	1.646009518	0.00011814	0.066795484	0.001168005	0	0.004059317	0	0.001388914	0.059273886	0.007458924	28.53193335	31.71106531	0.015855533
	Hood	0.01252711	1.420768934	0.012634039	17.94835897	0.009251829	0	0.020917482	2.129124796	0.005475887	25.14924946	0.001805044	1.020562929	0.017845854	0	0.062021991	0	0.021221112	0.905641023	0.113964315	435.9371569	484.510863	0.242255431
	Hunt	0.006187558	0.701765272	0.006240374	8.865294503	0.004569788	0	0.010331844	1.051645912	0.002704724	12.42205504	0.000891572	0.504090148	0.008814664	0	0.030634735	0	0.010481817	0.447326376	0.056290785	215.323935	239.3161122	0.119658056
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.033413751	3.789638612	0.051775843	73.55457746	0.024677545	0	0.090663423	9.228344987	0.001141841	5.244163995	1.143571754	646.5697268	0.046873844	0	0.004669544	0	0.000519582	0.022173912	0.002503865	9.577803991	747.9864298	0.373993215
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.002000467	0.226884064	0.076378745	108.5063211	0.001477434	0	0.133848731	13.62404172	0.001237133	5.681811792	0.003554796	2.009863959	0.001061766	0	0.001855699	0	0.000401718	0.017143899	0.001835165	7.019886319	137.0859529	0.068542976
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.004502334	0.510634619	0.171901148	244.2087953	0.003325174	0	0.301245466	30.66282942	0.002784342	12.78771963	0.008000571	4.523482606	0.002389654	0	0.004176513	0	0.000904124	0.038584765	0.004130298	15.79924527	308.5312916	0.154265646
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.002458599	0.27884335	0.093870431	133.3556244	0.001815785	0	0.164501762	16.7441175	0.001520452	6.983017684	0.004368889	2.470147918	0.001304924	0	0.002280677	0	0.000493717	0.021070066	0.00225544	8.627527995	168.4803489	0.084240174
	Travis	0.000510007	0.057842721	0.299602906	425.6263868	0.000376663	0	0.033939476	3.454592641	0.000334709	1.53722573	0.000906121	0.512316268	0.000271138	0	0.000471744	0	0.000103327	0.00440962	0.000467336	1.787656314	432.9804301	0.216490215
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0.000685965	0.077799073	0.00069182	0.982823915	0.000506616	0	0.001145408	0.116587526	0.000299851	1.377133355	9.88414E-05	0.055884421	0.000977211	0	0.003396227	0	0.001162035	0.049591478	0.006240507	23.87123322	26.53105299	0.013265526
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22756873	25.80983038	0.004556851	6.473622646	0.168069652	0	0.007612767	0.774879644	0.001680888	7.719857327	0.001626796	0.919782279	0.046792036	0	0.007246366	0	0.001609426	0.068684533	0.008283395	31.68570399	73.4523608	0.03672618
	San Patricio	0.050313351	5.7063159	0.001007478	1.431258373	0.037158653	0	0.001683113	0.171318756	0.000371629	1.706789388	0.00035967	0.203355395	0.010345288	0	0.001602105	0	0.000355829	0.015185518	0.001831382	7.005417464	16.23964079	0.00811982
Victoria Area	Victoria	0.021836736	2.476625167	0.002215582	3.147533667	0.016127403	0	0.003612695	0.367724898	0.001199621	5.509531075	0.000555389	0.314014035	0.52545648	0	0.032412721	0	0.000476855	0.020350477	0.002254849	8.625266046	20.46104537	0.010230523
Other ERCOT counties	Andrews	2.47421E-05	0.002806137	2.49533E-05	0.0354495	1.82731E-05	0	4.13138E-05	0.004205198	1.08153E-05	0.049671857	3.56511E-06	0.002015697	3.5247E-05	0	0.000122499	0	4.19135E-05	0.001788716	0.000225089	0.861012095	0.956949199	0.000478475
	Angelina	0.00031082	0.035251809	0.000313473	0.445330769	0.000229554	0	0.000519	0.05282738	0.000135867	0.623997694	4.47864E-05	0.025321985	0.000442787	0	0.001538876	0	0.000526534	0.022470568	0.002827658	10.81637768	12.02157789	0.006010789
	Bosque	0.000595392	0.067526679	0.001096604	1.55787353	0.000439723	0	0.001755208	0.178657141	0.000735562	3.378232989	0.000212298	0.120032004	0.005708837	0	0.02285067	0	0.000234455	0.010005679	0.001067208	4.082293222	9.394621243	0.004697311
	Brazos	0.001939725	0.219994981	0.003572622	5.075391862	0.001432574	0	0.005718288	0.582046605	0.002396384	11.00593591	0.000691644	0.391051933	0.018598805	0	0.074445136	0	0.000763829	0.032597473	0.003476855	13.29969179	30.60671055	0.015303355
	Calhoun	0.082699809	9.379443449	0.001655986	2.352552366	0.061077496	0	0.002766524	0.281595799	0.000610844	2.805441344	0.000591187	0.334254265	0.0170045	0	0.002633372	0	0.000584875	0.024960361	0.003010234	11.51477032	26.6930179	0.013346509
	Cameron	0.048371747	5.486107799	0.000968599	1.376025769	0.297964476	0	0.001618161	0.164707524	0.000357288	1.640923976	0.00034579	0.195507861	0.009946061	0	0.001540279	0	0.000342098	0.014599505	0.001760709	6.735076722	15.61294916	0.007806475
	Cherokee	0.003503899	0.397396586	0.003533808	5.020250938	0.002587786	0	0.00585073	0.595527467	0.001531635	7.034378092	0.00050488	0.285456849	0.00499158	0	0.017347879	0	0.005935657	0.253312584	0.031876422	121.9339285	135.520251	0.067760126
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.001298787	0.147302615	2.6007E-05	0.036946448	0.000959212	0	4.34478E-05	0.004422416	9.59321E-06	0.044058994	9.2845E-06	0.005249408	0.000267053	0	4.13567E-05	0	9.18536E-06	0.000391998	4.72752E-05	0.180837572	0.419209452	0.000209605
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.003535748	0.401008727	0.003565928	5.065882573	0.002611307	0	0.005903911	0.600940521	0.001545556	7.098317163	0.00050947	0.288051513	0.005036951	0	0.017505563	0	0.00598961	0.255615072	0.032166163	123.0422485	136.7520641	0.068376032
	Fannin	0.007056315	0.800295742	0.007116546	10.11001501	0.005211403	0	0.011782473	1.199300932	0.003084477	14.16615803	0.001016752	0.57486629	0.010052276	0	0.034935966	0	0.011953503	0.510132673	0.064194222	245.5562209	272.9169896	0.136458495
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.003677178	0.417049076	0.003708565	5.268517876	0.00271576	0	0.006140067	0.624978142	0.001607379	7.382249849	0.000529848	0.299573573	0.005238429	0	0.018205785	0	0.006229194	0.265839675	0.033452809	127.9639385	142.2221467	0.071111073
	Frio	0.008588335	0.974050612	0.000871383	1.237917281	0.006342868	0	0.001420864	0.144625302	0.000471808	2.166885076	0.000218433	0.123500951	0.206660746	0	0.012747844	0	0.000187546	0.008003793	0.000886827	3.392296009	8.047279024	0.00402364
	Grimes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.188527456	21.3819432	0.003775086	5.363019815	0.139235931	0	0.006306735	0.641942713	0.001392518	6.395452758	0.001347706	0.761986118	0.03876448	0	0.006003193	0	0.001333316	0.056901141	0.006862311	26.24976271	60.85100845	0.030425504
	Howard	0.000555113	0.062958446	0.000559851	0.795344522	0.000409976	0	0.000926915	0.094347775	0.000242653	1.114437137	7.99868E-05	0.045224142	0.000790802	0	0.002748377	0	0.00094037	0.040131615	0.005050094	19.31765629	21.47009993	0.01073505
	Jack	0.002121449	0.240605236	0.002139557	3.039529544	0.001566784	0	0.003542346	0.360564313	0.000927334	4.258990298	0.000305682	0.172830908	0.00302217	0	0.010503338	0	0.003593766	0.153369043	0.019299698	73.82534913	82.05123847	0.041025619
	Jones	0.040718722	4.61813586	0.000815354	1.158321014	0.030072592	0	0.001362147	0.138648702	0.00030076	1.38130896	0.000291082	0.164576034	0.008372468	0	0.001296587	0	0.000287974	0.012289678	0.001482142	5.669502035	13.14278228	0.006571391
	Lamar	0.000950838	0.107839788	0.000958954	1.36232372	0.000702236	0	0.001587687	0.161605705	0.000415633	1.908888668	0.000137007	0.077463187	0.001354543	0	0.004707619	0	0.001610734	0.068740337	0.008650166	33.08868125	36.77554265	0.018387771
	Limestone	0.000719757	0.081631604	0.000891528	1.266535271	0.000531572	0	0.000300183	0.030554695	0.00545518	25.05414825	0.001239347	0.700720391	0.000497945	0	0.00031596	0	0.000380962	0.016258098	0.000523179	2.001268528	29.15111684	0.014575558
	Llano	0.001238174	0.140428167	0.047274044	67.15916291	0.000914447	0	0.082844655	8.432497094	0.000765714	3.516714233	0.002200214	1.243990025	0.000657172	0	0.001148571	0	0.000248641	0.010611086	0.001135861	4.344905293	84.8483088	0.042424154
	McLennan	0.024534317	2.782572838	0.024743738	35.15182163	0.018119687	0	0.040966843	4.169886236	0.010724513	49.25474983	0.003535175	1.998770255	0.034951066	0	0.121469933	0	0.041561501	1.773695954	0.22319886	853.7819643	948.9134611	0.474456731
	Milam	0.002245405	0.254663811	0.002264571	3.217129389	0.001658332	0	0.003749326	0.381632101	0.000981518	4.507843289	0.000323543	0.182929425	0.003198756	0	0.011117048	0	0.00380375	0.162330403	0.02042738	78.13896753	86.84549595	0.043422748
	Mitchell	0.014943169	1.694787549	0.015070721	21.40999467	0.011036196	0	0.024951762	2.539761468	0.006532002	29.99969511	0.002153177	1.217395245	0.02128772	0	0.07398395	0	0.025313952	1.080308762	0.135944204	520.0147947	577.9567375	0.288978369
	Nolan	0.000564654	0.064040505	0.000569473	0.809014005	0.000417022	0	0.000942846	0.095969318	0.000246823	1.133590823	8.13615E-05	0.046001403	0.000804394	0	0.002795613	0	0.000956532	0.040821351	0.005136889	19.64966633	21.83910374	0.010919552
	Palo Pinto	0.003206998	0.363723448	0.005906709	8.391277926	0.002368511	0	0.009454195	0.962312854	0.003962005	18.19640129	0.001143513	0.646536374	0.030749889	0	0.123082087	0	0.001262858	0.053894253	0.005748375	21.9887278	50.60287395	0.025301437
	Pecos	4.09677E-05	0.004646371	4.13174E-05	0.058696907	3.02565E-05	0	6.84069E-05	0.006962923	1.79079E-05	0.082246135	5.90308E-06	0.003337569	5.83617E-05	0	0.000202832	0	6.93999E-05	0.002961737	0.0003727	1.425654727	1.58450637	0.000792253
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.000737708	0.083667521	0.000835096	1.186367202	0.00054483	0	0.000735917	0.074906685	0.003149678	14.46560711	0.000730875	0.413233222	0.00076086	0	0.001866305	0	0.191632518	8.178189217	0.003397737	12.99705077	37.39902173	0.018699511
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.005696437	0.64606452	0.005745061	8.161635329	0.004207073	0	0.009511781	0.968174315	0.002490043	11.43608745	0.000820806	0.464079333	0.008115023	0	0.028203184	0	0.00964985	0.411821035	0.051822854	198.2331703	220.3210323	0.110160516
	Tom Green	0.001482448	0.168132646	2.96846E-05	0.042171037	0.001094854	0	4.95918E-05	0.005047789	1.09498E-05	0.050289367	1.05974E-05	0.005991726	0.000304817	0	4.72049E-05	0	1.04843E-05	0.000447431	5.39604E-05	0.206409774	0.47848977	0.000239245
	Upton	3.11661E-05	0.003534723	3.14322E-05	0.044653622	2.30176E-05	0	5.20405E-05	0.005297038	1.36234E-05	0.062568677	4.49076E-06	0.002539053	4.43986E-05	0	0.000154304	0	5.27959E-05	0.002253139	0.000283531	1.084565622	1.205411874	0.000602706
	Ward	0.018559529	2.104938958	0.01871795	26.59137536	0.013707039	0	0.030990277	3.154402957	0.008112796	37.25984828	0.002674262	1.512014105	0.026439509	0	0.091888626	0	0.03144012	1.341751656	0.16884373	645.8623091	717.8266404	0.35891332
	Webb	0.020014327	2.26993573	0.000400768	0.569345367	0.014781473	0	0.000669531	0.068149498	0.000147832	0.678949831	0.000143074	0.080893467	0.004115289	0	0.000637307	0	0.000141547	0.006040701	0.000728512	2.786709969	6.460024562	0.003230012
	Wharton	0.00014434	0.016370365	0.000178787	0.253990406	0.000106601	0	6.01986E-05	0.006127425	0.001093979	5.024347469	0.000248538	0.140522148	9.98576E-05	0	6.33625E-05	0	7.6398E-05	0.003260391	0.000104918	0.401333478	5.845951682	0.002922976
	Wichita	0.000207633	0.023548833	0.000209406	0.297488839	0.000153346	0	0.000346701	0.035289625	9.07612E-05	0.416841508	2.99181E-05	0.016915534	0.00029579	0	0.001027996	0	0.000351734	0.015010737	0.001888925	7.225531815	8.030626892	0.004015313
	Wilbarger	0.028616818	3.245591874	0.000573025	0.814059478	0.021134796	0	0.000957307	0.097441286	0.000211372	0.970773765	0.00020457	0.115662825	0.005884109	0	0.000911232	0	0.000202386	0.008637095	0.001041639	3.984484279	9.236650603	0.004618325
	Wise	0.002844488	0.322609091	0.002882008	4.094281611	0.002100781	0	0.00476997	0.485520307	0.001256075	5.768809895	0.000413241	0.233644549	0.004181914	0	0.014614274	0	0.004797945	0.204759083	0.025761411	98.54274452	109.6523691	0.054826185
	Young	0.006235856	0.707243011	0.006289085	8.93449395	0.004605458	0	0.010412491	1.059854699	0.002725836	12.51901733	0.000898531	0.508024902	0.008883468	0	0.030873859	0	0.010563634	0.450818052	0.056730171	217.0046797	241.1841317	0.120592066
	Total	**1.121837219**	**127.2337739**	**1.172570094**	**1665.794165**	**1.090766584**	**0**	**1.189130767**	**121.0378844**	**1.629360006**	**7483.204028**	**1.542362643**	**872.0440927**	**1.359385821**	**0**	**1.231642808**	**0**	**1.221806085**	**52.14230575**	**1.528786947**	**5847.927361**	**16169.38361**	**8.084691805**
Energy Savings by PCA (MWh)		113		1,421		0		102		4,593		565		0		0		43		3,825			

Table 95: NOx Emissions Reduction Values According to SIP Areas and Counties (ESL-Multi-family).

Program	Area	County	FIP Code	Total NOx emissions reduction (Tons) (2007 25% annual and ozone season eGrid)																			
				2004		Cumulative 2005		Cumulative 2006		Cumulative 2007		Cumulative 2008		Cumulative 2009		Cumulative 2010		Cumulative 2011		Cumulative 2012		Cumulative 2013	
				Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day
ESL-Multifamily	Houston-Galveston Area	Brazoria	039	0.181	0.001	0.624	0.003	0.745	0.004	0.858	0.004	0.964	0.005	1.062	0.005	1.151	0.005	1.234	0.006	1.308	0.006	1.375	0.006
		Chambers	071	0.441	0.002	1.453	0.007	1.751	0.008	2.031	0.009	2.291	0.010	2.533	0.011	2.756	0.012	2.959	0.012	3.144	0.013	3.311	0.013
		Fort Bend	157	1.426	0.004	4.704	0.019	5.669	0.021	6.573	0.024	7.415	0.026	8.197	0.028	8.918	0.030	9.578	0.031	10.177	0.033	10.714	0.034
		Galveston	167	0.696	0.002	2.423	0.010	2.887	0.011	3.321	0.013	3.725	0.014	4.099	0.015	4.444	0.015	4.759	0.016	5.044	0.017	5.299	0.018
		Harris	201	1.382	0.006	4.559	0.026	5.494	0.030	6.371	0.033	7.188	0.036	7.945	0.039	8.644	0.041	9.284	0.043	9.864	0.045	10.385	0.047
		Liberty	291	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Montgomery	339	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Waller	473	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Beaumont/ Port Arthur Area	Hardin	199	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Jefferson	245	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Orange	361	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Dallas/ Fort Worth Area	Collin	085	0.017	0.000	0.108	0.000	0.116	0.001	0.123	0.001	0.130	0.001	0.136	0.001	0.141	0.001	0.146	0.001	0.150	0.001	0.153	0.001
		Dallas	113	0.086	0.000	0.822	0.004	0.849	0.004	0.873	0.005	0.892	0.005	0.908	0.005	0.920	0.005	0.929	0.005	0.934	0.005	0.935	0.005
		Denton	121	0.004	0.000	0.024	0.000	0.025	0.000	0.027	0.000	0.029	0.000	0.030	0.000	0.031	0.000	0.032	0.000	0.033	0.000	0.034	0.000
		Tarrant	439	0.235	0.002	2.250	0.013	2.323	0.014	2.386	0.014	2.438	0.015	2.481	0.015	2.514	0.015	2.536	0.016	2.549	0.016	2.551	0.016
		Ellis	139	0.063	0.000	0.607	0.003	0.626	0.003	0.643	0.003	0.658	0.003	0.669	0.003	0.678	0.003	0.684	0.004	0.687	0.004	0.688	0.004
		Johnson	251	0.002	0.000	0.014	0.000	0.015	0.000	0.016	0.000	0.017	0.000	0.018	0.000	0.019	0.000	0.020	0.000	0.020	0.000	0.021	0.000
		Kaufman	257	0.122	0.001	1.170	0.006	1.208	0.006	1.241	0.006	1.268	0.006	1.290	0.006	1.307	0.006	1.319	0.007	1.326	0.007	1.327	0.007
		Parker	367	0.002	0.000	0.011	0.000	0.012	0.000	0.012	0.000	0.013	0.000	0.014	0.000	0.014	0.000	0.015	0.000	0.015	0.000	0.016	0.000
		Rockwall	397	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Henderson	213	0.016	0.000	0.152	0.001	0.157	0.001	0.161	0.001	0.164	0.001	0.167	0.001	0.169	0.001	0.171	0.001	0.172	0.001	0.172	0.001
		Hood	221	0.242	0.001	2.317	0.011	2.392	0.011	2.457	0.011	2.511	0.012	2.555	0.012	2.589	0.012	2.612	0.012	2.625	0.013	2.628	0.013
		Hunt	231	0.120	0.001	1.145	0.005	1.182	0.006	1.214	0.006	1.240	0.006	1.262	0.006	1.279	0.006	1.290	0.006	1.297	0.006	1.298	0.006
	El Paso Area	El Paso	141	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	San Antonio Area	Bexar	029	0.374	0.001	3.744	0.015	3.851	0.015	3.941	0.016	4.015	0.016	4.073	0.016	4.116	0.016	4.142	0.017	4.152	0.017	4.146	0.017
		Comal	091	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Guadalupe	187	0.069	0.000	0.310	0.002	0.352	0.002	0.390	0.002	0.426	0.002	0.458	0.002	0.488	0.002	0.515	0.002	0.539	0.002	0.560	0.002
		Wilson	493	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Austin Area	Bastrop	021	0.154	0.001	0.698	0.003	0.791	0.004	0.878	0.004	0.958	0.004	1.032	0.004	1.099	0.005	1.159	0.005	1.213	0.005	1.260	0.005
		Caldwell	055	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Hays	209	0.084	0.000	0.381	0.002	0.432	0.002	0.479	0.002	0.523	0.002	0.563	0.002	0.600	0.003	0.633	0.003	0.662	0.003	0.688	0.003
		Travis	453	0.216	0.001	0.660	0.004	0.809	0.004	0.950	0.004	1.081	0.005	1.203	0.005	1.316	0.006	1.419	0.006	1.513	0.006	1.598	0.006
		Williamson	491	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	North East Texas Area	Gregg	183	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Harrison	203	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Rusk	401	0.013	0.000	0.127	0.000	0.131	0.000	0.135	0.000	0.138	0.000	0.140	0.000	0.142	0.000	0.143	0.000	0.144	0.000	0.144	0.000
		Smith	423	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Upshur	459	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Corpus Christi Area	Nueces	355	0.037	0.000	0.269	0.001	0.286	0.001	0.300	0.001	0.313	0.001	0.325	0.001	0.335	0.001	0.343	0.001	0.350	0.001	0.355	0.001
		San Patricio	409	0.008	0.000	0.060	0.000	0.063	0.000	0.066	0.000	0.069	0.000	0.072	0.000	0.074	0.000	0.076	0.000	0.077	0.000	0.078	0.000
	Victoria Area	Victoria	469	0.010	0.000	0.068	0.000	0.072	0.000	0.077	0.000	0.081	0.000	0.085	0.000	0.088	0.000	0.091	0.000	0.093	0.000	0.095	0.000
	Other ERCOT counties	Andrews	003	0.000	0.000	0.005	0.000	0.005	0.000	0.005	0.000	0.005	0.000	0.005	0.000	0.005	0.000	0.005	0.000	0.005	0.000	0.005	0.000
		Angelina	005	0.006	0.000	0.057	0.000	0.059	0.000	0.061	0.000	0.062	0.000	0.063	0.000	0.064	0.000	0.065	0.000	0.065	0.000	0.065	0.000
		Bosque	035	0.005	0.000	0.030	0.000	0.032	0.000	0.034	0.000	0.036	0.000	0.038	0.000	0.039	0.000	0.041	0.000	0.042	0.000	0.043	0.000
		Brazos	041	0.015	0.000	0.096	0.000	0.104	0.000	0.111	0.001	0.117	0.001	0.123	0.001	0.128	0.001	0.133	0.001	0.136	0.001	0.139	0.001
		Calhoun	057	0.013	0.000	0.098	0.000	0.104	0.000	0.109	0.001	0.114	0.001	0.118	0.001	0.122	0.001	0.125	0.001	0.127	0.001	0.129	0.001
		Cameron	061	0.008	0.000	0.057	0.000	0.061	0.000	0.064	0.000	0.067	0.000	0.069	0.000	0.071	0.000	0.073	0.000	0.074	0.000	0.075	0.000
		Cherokee	073	0.068	0.000	0.648	0.003	0.669	0.003	0.687	0.003	0.702	0.003	0.715	0.003	0.724	0.003	0.731	0.004	0.734	0.004	0.735	0.004
		Coke	081	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Coleman	083	0.000	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000
		Crockett	105	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Ector	135	0.068	0.000	0.654	0.003	0.675	0.003	0.693	0.003	0.709	0.003	0.721	0.004	0.731	0.004	0.737	0.004	0.741	0.004	0.742	0.004
		Fannin	147	0.136	0.001	1.305	0.007	1.348	0.007	1.384	0.007	1.415	0.007	1.439	0.007	1.458	0.008	1.472	0.008	1.479	0.008	1.480	0.008
		Fayette	149	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Freestone	161	0.071	0.000	0.680	0.003	0.702	0.003	0.721	0.004	0.737	0.004	0.750	0.004	0.760	0.004	0.767	0.004	0.771	0.004	0.771	0.004
		Frio	163	0.004	0.000	0.027	0.000	0.028	0.000	0.030	0.000	0.032	0.000	0.033	0.000	0.035	0.000	0.036	0.000	0.037	0.000	0.037	0.000
		Grimes	185	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Hardeman	197	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Haskell	207	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Hidalgo	215	0.030	0.000	0.223	0.001	0.237	0.001	0.249	0.001	0.260	0.001	0.269	0.001	0.277	0.001	0.284	0.002	0.290	0.002	0.294	0.002
		Howard	227	0.011	0.000	0.103	0.001	0.106	0.001	0.109	0.001	0.111	0.001	0.113	0.001	0.115	0.001	0.116	0.001	0.116	0.001	0.116	0.001
		Jack	237	0.041	0.000	0.392	0.002	0.405	0.002	0.416	0.002	0.425	0.002	0.433	0.002	0.438	0.002	0.442	0.002	0.445	0.002	0.445	0.002
		Jones	253	0.007	0.000	0.048	0.000	0.051	0.000	0.054	0.000	0.056	0.000	0.058	0.000	0.060	0.000	0.061	0.000	0.063	0.000	0.064	0.000
		Lamar	277	0.018	0.000	0.176	0.001	0.182	0.001	0.186	0.001	0.191	0.001	0.194	0.001	0.197	0.001	0.198	0.001	0.199	0.001	0.199	0.001
		Limestone	293	0.015	0.000	0.048	0.000	0.058	0.000	0.067	0.000	0.076	0.000	0.084	0.000	0.091	0.000	0.098	0.000	0.104	0.000	0.109	0.000
		Llano	299	0.042	0.000	0.192	0.001	0.218	0.001	0.241	0.001	0.264	0.001	0.284	0.001	0.302	0.001	0.319	0.001	0.333	0.001	0.346	0.001
		McLennan	309	0.474	0.002	4.538	0.020	4.685	0.021	4.812	0.021	4.919	0.022	5.005	0.022	5.071	0.023	5.116	0.023	5.142	0.023	5.147	0.024
		Milam	331	0.043	0.000	0.415	0.001	0.429	0.001	0.440	0.002	0.450	0.002	0.458	0.002	0.464	0.002	0.468	0.002	0.471	0.002	0.471	0.002
		Mitchell	335	0.289	0.002	2.764	0.015	2.854	0.015	2.931	0.016	2.996	0.016	3.048	0.017	3.089	0.017	3.116	0.017	3.132	0.017	3.135	0.017
		Nolan	353	0.011	0.000	0.104	0.001	0.108	0.001	0.111	0.001	0.113	0.001	0.115	0.001	0.117	0.001	0.118	0.001	0.118	0.001	0.118	0.001
		Palo Pinto	363	0.025	0.000	0.159	0.001	0.172	0.001	0.184	0.001	0.194	0.001	0.204	0.001	0.212	0.001	0.219	0.001	0.225	0.001	0.231	0.001
		Pecos	371	0.001	0.000	0.008	0.000	0.008	0.000	0.008	0.000	0.008	0.000	0.008	0.000	0.008	0.000	0.009	0.000	0.009	0.000	0.009	0.000
		Presidio	377	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Red River	387	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Robertson	395	0.019	0.000	0.106	0.000	0.116	0.000	0.125	0.000	0.133	0.000	0.141	0.000	0.148	0.000	0.154	0.000	0.159	0.000	0.164	0.000
		Taylor	441	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Titus	449	0.110	0.000	1.054	0.000	1.088	0.000	1.117	0.000	1.142	0.000	1.162	0.000	1.177	0.000	1.188	0.000	1.194	0.000	1.195	0.000
		Tom Green	451	0.000	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000
		Upton	461	0.001	0.000	0.006	0.000	0.006	0.000	0.006	0.000	0.006	0.000	0.006	0.000	0.006	0.000	0.006	0.000	0.007	0.000	0.007	0.000
		Ward	475	0.359	0.002	3.433	0.017	3.544	0.018	3.640	0.018	3.721	0.019	3.786	0.019	3.836	0.020	3.870	0.020	3.890	0.020	3.893	0.020
		Webb	479	0.003	0.000	0.024	0.000	0.025	0.000	0.026	0.000	0.028	0.000	0.029	0.000	0.029	0.000	0.030	0.000	0.031	0.000	0.031	0.000
		Wharton	481	0.003	0.000	0.010	0.000	0.012	0.000	0.013	0.000	0.015	0.000	0.017	0.000	0.018	0.000	0.020	0.000	0.021	0.000	0.022	0.000
		Wichita	485	0.004	0.000	0.038	0.000	0.040	0.000	0.041	0.000	0.042	0.000	0.042	0.000	0.043	0.000	0.043	0.000	0.044	0.000	0.044	0.000
		Wilbarger	487	0.005	0.000	0.034	0.000	0.036	0.000	0.038	0.000	0.039	0.000	0.041	0.000	0.042	0.000	0.043	0.000	0.044	0.000	0.045	0.000
		Wise	497	0.055	0.000	0.524	0.003	0.541	0.003	0.556	0.003	0.568	0.003	0.578	0.003	0.586	0.003	0.591	0.003	0.594	0.003	0.595	0.003
		Young	503	0.121	0.001	1.153	0.005	1.191	0.005	1.223	0.005	1.250	0.005	1.272	0.005	1.289	0.005	1.300	0.006	1.307	0.006	1.308	0.006

7.3.3 PUCT-SB 7

For the PUCT Senate Bill 7 program savings, the annual MWh savings from 6 PCAs for 2001, 2002, 2003 and 2004 were obtained from the Public Utilities Commission and Frontier Associates. To obtain the Ozone Season Day (OSD) savings, the annual MWh savings were divided by 365. Table 96 shows the annual and OSD MWh savings by PCA. Using the values reported for 2001, 2002, 2003 and 2004, savings were projected through 2013 by incorporating the different adjustment factors mentioned above. As an example, using 100 MWh for each of the four reported years for AEP-North and 5% for annual degradation factor (a), 7% for the transmission and distribution loss (b) and 20% for the discount factor (c), the projected savings for 2005 will be calculated as:

$$MWh2005 = ((1- 4a \times MWh2001) + (1- 3a \times MWh2002) + (1- 2a \times MWh2003) + (1- a \times MWh2004) + MWh2004) \times ((1 + b) \times (1 - c)) \quad (2)$$

In this example, the projected 2005 cumulative savings would be 385 MWh for an actual savings of 100MWh for each of the four years. It is assumed that the same amount of MWh savings will be achieved for each year after 2004 until 2013. The projected cumulative energy savings through 2013, according to PCA, are shown in Table 97.

The 2007 annual and OSD eGRID was also used to calculate the NOx emissions savings for the PUCT-SB 7 program. An example eGRID spreadsheet is given in Table 98. The total MWh savings for each PCA were used to calculate the NOx emissions reductions for each county using the emissions factors contained in the USEPA's eGRID spreadsheet. The eGRID spreadsheet shown in Table 98 was used for each year for which the analysis was required. The cumulative NOx emissions reduction for each county by SIP area for the different programs is provided in Table 99.

Table 96: Annual and OSD MWh Savings for PUCT-SB 7 Program.

PCA	Annual Energy Savings 2001 Electric		Annual Energy Savings 2002 Electric		Annual Energy Savings 2003 Electric		Annual Energy Savings 2004 Electric	
	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day
AEP-North	1,373	3.8	6,171	16.9	7,267	19.9	11,172	30.6
AEP-Central	6,739	18.5	3,190	8.7	34,622	94.9	25,474	69.8
AEP-Southwest	2,139	5.9	6,156	16.9	4,712	12.9	3,213	8.8
CenterPoint Energy	19,355	53.0	63,225	173.2	92,942	254.6	101,659	278.5
TXU	64,599	177.0	152,235	417.1	180,382	494.2	233,533	639.8
TNMP	0	0.0	1,066	2.9	7,708	21.1	7,564	20.7
Entergy[12]	0	0.0	4,460	12.2	16,991	46.6	12,238	33.5
Xcel Energy[12]	0	0.0	0	0.0	0	0.0	8,069	22.1
Totals	**94,205**	**258**	**236,503**	**648**	**344,624**	**944**	**402,922**	**1,104**

Table 97: Projected MWh Savings for PUCT-SB 7 According to Power Control Authorities (PCA).

PCA	Cumulative Energy Savings 2005 Electric		Cumulative Energy Savings 2006 Electric		Cumulative Energy Savings 2007 Electric		Cumulative Energy Savings 2008 Electric		Cumulative Energy Savings 2009 Electric		Cumulative Energy Savings 2010 Electric		Cumulative Energy Savings 2011 Electric		Cumulative Energy Savings 2012 Electric		Cumulative Energy Savings 2013 Electric	
	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day
AEP-North	27,822	76.2	35,297	96.7	42,323	116.0	48,901	134.0	55,031	150.8	60,713	166.3	65,946	180.7	70,731	193.8	75,068	205.7
AEP-Central	71,372	195.5	87,983	241.0	103,572	283.8	118,138	323.7	131,683	360.8	144,205	395.1	155,706	426.6	166,184	455.3	175,640	481.2
AEP-Southwest	14,004	38.4	15,802	43.3	17,472	47.9	19,013	52.1	20,425	56.0	21,708	59.5	22,862	62.6	23,887	65.4	24,783	67.9
CenterPoint Energy	281,764	772.0	348,145	953.8	410,446	1,124.5	468,668	1,284.0	522,811	1,432.4	572,876	1,569.5	618,861	1,695.5	660,767	1,810.3	698,594	1,914.0
TXU	641,047	1,756.3	793,778	2,174.7	937,138	2,567.5	1,071,128	2,934.6	1,195,747	3,276.0	1,310,996	3,591.8	1,416,875	3,881.8	1,513,382	4,146.3	1,600,520	4,385.0
TNMP	18,131	49.7	23,242	63.7	28,050	76.8	32,554	89.2	36,754	100.7	40,651	111.4	44,245	121.2	47,535	130.2	50,521	138.4
Entergy[12]	34,465	94.4	42,443	116.3	49,930	136.8	56,926	156.0	63,431	173.8	69,445	190.3	74,968	205.4	80,000	219.2	84,541	231.6
Xcel Energy[12]	12,627	34.6	18,455	50.6	23,959	65.6	29,139	79.8	33,996	93.1	38,528	105.6	42,737	117.1	46,623	127.7	50,184	137.5
Totals	**1,101,231**	**3017**	**1,365,144**	**3740**	**1,612,890**	**4419**	**1,844,468**	**5053**	**2,059,879**	**5644**	**2,259,123**	**6189**	**2,442,199**	**6691**	**2,609,108**	**7148**	**2,759,850**	**7561**

Table 98: Example of NOx Emissions Reduction Calculations According to Counties and PCA.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)
Houston-Galveston Area	Brazoria	0.008831132	352.0001009	0.010890729	0	0.006522185	0	0.003944232	0	0.065444292	6653.001237
	Chambers	0.021762222	867.4204144	0.026955801	0	0.016072371	0	0.009076193	0	0.164940225	16767.65834
	Fort Bend	0.070431234	2807.318542	0.087239726	0	0.052016606	0	0.029374182	0	0.533812376	54266.83229
	Galveston	0.033856739	1349.495767	0.041710519	0	0.025004711	0	0.015351589	0	0.249587379	25372.80332
	Harris	0.068267332	2721.0676	0.084559408	0	0.050418468	0	0.028471701	0	0.517411736	52599.55965
	Liberty	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.002039135	81.2778878	0.003716345	0	0.001505992	0	0.005950953	0	0.002481478	252.2645909
	Dallas	0.004539471	180.9387802	0.004683963	0	0.003352602	0	0.00774211	0	0.002085611	212.0211488
	Denton	0.00047388	18.88839457	0.000872802	0	0.000349982	0	0.001396994	0	0.000585443	59.51558643
	Tarrant	0.012162492	484.7847813	0.012266309	0	0.008982543	0	0.020308652	0	0.005316504	540.4705307
	Ellis	0.003279814	130.7300875	0.003307809	0	0.002422289	0	0.005476558	0	0.001433682	145.746654
	Johnson	0.000286058	11.40200496	0.000526868	0	0.000211267	0	0.000843297	0	0.000353404	35.92666434
	Kaufman	0.006325453	252.1262119	0.006379446	0	0.004671629	0	0.010562096	0	0.002765	281.087181
	Parker	0.000217489	8.668913234	0.000400576	0	0.000160626	0	0.000641157	0	0.000268692	27.3149448
	Rockwall	0	0	0	0	0	0	0	0	0	0
	Henderson	0.000819895	32.68019204	0.000826893	0	0.000605529	0	0.001369042	0	0.000358395	36.43406605
	Hood	0.01252711	499.3180739	0.012634039	0	0.009251829	0	0.020917482	0	0.005475887	556.6732184
	Hunt	0.006187558	246.6298887	0.006240374	0	0.004569788	0	0.010331844	0	0.002704724	274.9595119
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.033413751	1331.838701	0.051775843	0	0.024677545	0	0.090663423	0	0.001141841	116.0784402
	Comal	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.002000467	79.73662093	0.076378745	0	0.001477434	0	0.133848731	0	0.001237133	125.7656799
	Wilson	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.004502334	179.4585231	0.171901148	0	0.003325174	0	0.301245466	0	0.002784342	283.053419
	Caldwell	0	0	0	0	0	0	0	0	0	0
	Hays	0.002458599	97.99730339	0.093870431	0	0.001815785	0	0.164501762	0	0.001520452	154.5675919
	Travis	0.000510007	20.32836949	0.299602906	0	0.000376663	0	0.033939476	0	0.000334709	34.02616034
	Williamson	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0
	Rusk	0.000685965	27.34187258	0.00069182	0	0.000506616	0	0.001145408	0	0.000299851	30.4825501
	Smith	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22756873	9070.662006	0.004556851	0	0.168069652	0	0.007612767	0	0.001680888	170.8773787
	San Patricio	0.050313351	2005.439868	0.001007478	0	0.037158653	0	0.001683113	0	0.000371629	37.77941539
Victoria Area	Victoria	0.021836736	870.3904473	0.002215582	0	0.016127403	0	0.003612695	0	0.001199621	121.9522833
Other ERCOT counties	Andrews	2.47421E-05	0.98619467	2.49533E-05	0	1.82731E-05	0	4.13138E-05	0	1.08153E-05	1.099475845
	Angelina	0.00031082	12.38897118	0.000313473	0	0.000229554	0	0.000519	0	0.000135867	13.81205451
	Bosque	0.000595392	23.73172061	0.001096604	0	0.000439723	0	0.001755208	0	0.000735562	74.77645938
	Brazos	0.001939725	77.31550689	0.003572622	0	0.001432574	0	0.005718288	0	0.002396384	243.6140201
	Calhoun	0.082699809	3296.331672	0.001655986	0	0.061077496	0	0.002766524	0	0.000610844	62.09783973
	Cameron	0.048371747	1928.049462	0.000968599	0	0.297964476	0	0.001618161	0	0.000357288	36.32149868
	Cherokee	0.003503899	139.6619063	0.003533808	0	0.002587786	0	0.00585073	0	0.001531635	155.7044435
	Coke	0	0	0	0	0	0	0	0	0	0
	Coleman	0.001298787	51.76834622	2.6007E-05	0	0.000959212	0	4.34478E-05	0	9.59321E-06	0.975236349
	Crockett	0	0	0	0	0	0	0	0	0	0
	Ector	0.003535748	140.931365	0.003565928	0	0.002611307	0	0.005903911	0	0.001545556	157.1197211
	Fannin	0.007056315	281.2576476	0.007116546	0	0.005211403	0	0.011782473	0	0.003084477	313.5648559
	Fayette	0	0	0	0	0	0	0	0	0	0
	Freestone	0.003677178	146.5686196	0.003708565	0	0.00271576	0	0.006140067	0	0.001607379	163.4045099
	Frio	0.008588335	342.3224309	0.000871383	0	0.006342868	0	0.001420864	0	0.000471808	47.96353431
	Grimes	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.188527456	7514.515863	0.003775086	0	0.139235931	0	0.006306735	0	0.001392518	141.5619689
	Howard	0.000555113	22.12625095	0.000559851	0	0.000409976	0	0.000926915	0	0.000242653	24.66782592
	Jack	0.002121449	84.55881897	0.002139557	0	0.001566784	0	0.003542346	0	0.000927334	94.27183265
	Jones	0.040718722	1623.007547	0.000815354	0	0.030072592	0	0.001362147	0	0.00030076	30.57497623
	Lamar	0.000950838	37.89944566	0.000958954	0	0.000702236	0	0.001587687	0	0.000415633	42.25283941
	Limestone	0.000719757	28.6887856	0.000891528	0	0.000531572	0	0.000300183	0	0.00545518	554.5681736
	Llano	0.001238174	49.3523756	0.047274044	0	0.000914447	0	0.082844655	0	0.000765714	77.84171186
	McLennan	0.024534317	977.9133511	0.024743738	0	0.018119687	0	0.040966843	0	0.010724513	1090.243276
	Milam	0.002245405	89.49959449	0.002264571	0	0.001658332	0	0.003749326	0	0.000981518	99.78013998
	Mitchell	0.014943169	595.6197621	0.015070721	0	0.011036196	0	0.024951762	0	0.006532002	664.0367878
	Nolan	0.000564654	22.50653194	0.000569473	0	0.000417022	0	0.000942846	0	0.000246823	25.09178863
	Palo Pinto	0.003206998	127.8277469	0.005906709	0	0.002368511	0	0.009454195	0	0.003962005	402.7734221
	Pecos	4.09677E-05	1.632930713	4.13174E-05	0	3.02565E-05	0	6.84069E-05	0	1.79079E-05	1.820500484
	Presidio	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0
	Robertson	0.000737708	29.4042925	0.000835096	0	0.00054483	0	0.000735917	0	0.003149678	320.1930968
	Taylor	0	0	0	0	0	0	0	0	0	0
	Titus	0.005696437	227.0542972	0.005745061	0	0.004207073	0	0.009511781	0	0.002490043	253.1353319
	Tom Green	0.001482448	59.08889688	2.96846E-05	0	0.001094854	0	4.95918E-05	0	1.09498E-05	1.113144311
	Upton	3.11661E-05	1.242250652	3.14322E-05	0	2.30176E-05	0	5.20405E-05	0	1.36234E-05	1.384944196
	Ward	0.018559529	739.7642506	0.01871795	0	0.013707039	0	0.030990277	0	0.008112796	824.7387142
	Webb	0.020014327	797.7510691	0.000400768	0	0.014781473	0	0.000669531	0	0.000147832	15.02840823
	Wharton	0.00014434	5.753235986	0.000178787	0	0.000106601	0	6.01986E-05	0	0.001093979	111.2128487
	Wichita	0.000207633	8.276052114	0.000209406	0	0.000153346	0	0.000346701	0	9.07612E-05	9.226696982
	Wilbarger	0.028616818	1140.637752	0.000573025	0	0.021134796	0	0.000957307	0	0.000211372	21.48786813
	Wise	0.002844488	113.3784293	0.002882008	0	0.002100781	0	0.00476997	0	0.001256075	127.6913641
	Young	0.006235856	248.554997	0.006289085	0	0.004605458	0	0.010412491	0	0.002725836	277.1057515
	Total	**1.121837219**	**44715.30972**	**1.172570094**	**0**	**1.090766584**	**0**	**1.189130767**	**0**	**1.629360006**	**165639.1089**
Energy Savings by PCA (MWh)		39,859				0		0		101,659	

Area	County	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.014877434	0	0.006262315	0	0.004817148	0	0.121274957	917.3237711	0.00816387	1906.533091	9828.8582	4.9144291
	Chambers	0.037472294	0	0.015055623	0	0.009553214	0	0.011518588	87.12660097	0.015818592	3694.163346	21416.3687	10.70818435
	Fort Bend	0.121275295	0	0.048726002	0	0.030918012	0	0.037278747	281.9764422	0.051195276	11955.78647	69311.91374	34.65595687
	Galveston	0.056747051	0	0.024143087	0	0.019297151	0	0.567751219	4294.470219	0.032836887	7668.49669	38685.266	19.342633
	Harris	0.117549281	0	0.047228963	0	0.029968099	0	0.03613341	273.3131098	0.049622373	11588.46163	67182.40198	33.59120099
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.000717051	0	0.019166247	0	0.07668094	0	0.00086441	6.53839834	0.004000199	934.1785502	1274.259427	0.637129714
	Dallas	0.00068106	0	0.007502816	0	0.026717045	0	0.007524933	56.91859377	0.040370454	9427.833259	9877.711781	4.938855891
	Denton	0.000168971	0	0.00454374	0	0.018187155	0	0.000186605	1.411483953	0.000849405	198.3641887	278.1796537	0.139089827
	Tarrant	0.001752506	0	0.017326428	0	0.060216761	0	0.020603444	155.8444532	0.110647237	25839.7813	27020.88106	13.51044053
	Ellis	0.000472592	0	0.004672353	0	0.016238427	0	0.005556053	42.02598717	0.029837824	6968.116575	7286.619304	3.643309652
	Johnson	0.000101999	0	0.002742835	0	0.010978701	0	0.000112645	0.852044199	0.000512745	119.7428111	167.9235246	0.083961762
	Kaufman	0.000911441	0	0.009011105	0	0.031317452	0	0.010715411	81.05137196	0.057545265	13438.71843	14052.9832	7.026491598
	Parker	7.75498E-05	0	0.00208537	0	0.008347076	0	8.56434E-05	0.647806878	0.000389838	91.04013233	127.6717972	0.063835899
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.00011814	0	0.001168005	0	0.004059317	0	0.001388914	10.50574782	0.007458924	1741.90496	1821.524966	0.910762483
	Hood	0.001805044	0	0.017845854	0	0.062021991	0	0.021221112	160.5164914	0.113964315	26614.42835	27830.93614	13.91546807
	Hunt	0.000891572	0	0.008814664	0	0.030634735	0	0.010481817	79.28446111	0.056290785	13145.75587	13746.62973	6.873314866
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	1.143571754	0	0.046873844	0	0.004669544	0	0.000519582	3.93012071	0.002503865	584.7351484	2036.582411	1.018291205
	Comal	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.003554796	0	0.001061766	0	0.001855699	0	0.000401718	3.038597437	0.001835165	428.5715464	637.1124447	0.318556222
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.008000571	0	0.002389654	0	0.004176513	0	0.000904124	6.83879254	0.004130298	964.5607737	1433.911508	0.716955754
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.004368889	0	0.001304924	0	0.002280677	0	0.000493717	3.734474216	0.00225544	526.7197853	783.0191549	0.391509577
	Travis	0.000906121	0	0.000271138	0	0.000471744	0	0.000103327	0.781564427	0.000467336	109.1383245	164.2744188	0.082137209
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	9.88414E-05	0	0.000977211	0	0.003396227	0	0.001162035	8.789630668	0.006240507	1457.364247	1523.9783	0.76198915
	Smith	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.001626796	0	0.046792036	0	0.007246366	0	0.001609426	12.17369797	0.008283395	1934.446021	11188.1591	5.594079552
	San Patricio	0.00035967	0	0.010345288	0	0.001602105	0	0.000355829	2.691492555	0.001831382	427.6882074	2473.598983	1.236799492
Victoria Area	Victoria	0.000555389	0	0.52545648	0	0.032412721	0	0.000476855	3.606933769	0.002254849	526.5816909	1522.531355	0.761265678
Other ERCOT counties	Andrews	3.56511E-06	0	3.5247E-05	0	0.000122499	0	4.19135E-05	0.317033403	0.000225089	52.56570664	54.96841056	0.027484205
	Angelina	4.47864E-05	0	0.000442787	0	0.001538876	0	0.000526534	3.982700185	0.002827658	660.3513931	690.535119	0.345267559
	Bosque	0.000212298	0	0.005708837	0	0.02285067	0	0.000234455	1.77341397	0.001067208	249.2283549	349.5099489	0.174754974
	Brazos	0.000691644	0	0.018598805	0	0.074445136	0	0.000763829	5.777600467	0.003476855	811.9603678	1138.667495	0.569333748
	Calhoun	0.000591187	0	0.0170045	0	0.002633372	0	0.000584875	4.423993107	0.003010234	702.9890083	4065.842513	2.032921257
	Cameron	0.00034579	0	0.009946061	0	0.001540279	0	0.000342098	2.587627211	0.001760709	411.1836168	2378.142205	1.189071102
	Cherokee	0.00050488	0	0.00499158	0	0.017347879	0	0.005935657	44.89731165	0.031876422	7444.196379	7784.46004	3.89223002
	Coke	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	9.2845E-06	0	0.000267053	0	4.13567E-05	0	9.18536E-06	0.069478083	4.72752E-05	11.04032664	63.85338729	0.031926694
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.00050947	0	0.005036951	0	0.017505563	0	0.00598961	45.30540635	0.032166163	7511.860498	7855.21699	3.927608495
	Fannin	0.001016752	0	0.010052276	0	0.034935966	0	0.011953503	90.41629602	0.064194222	14991.46917	15676.70797	7.838353984
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.000529848	0	0.005238429	0	0.018205785	0	0.006229194	47.1176226	0.033452809	7812.334918	8169.42567	4.084712835
	Frio	0.000218433	0	0.206660746	0	0.012747844	0	0.000187546	1.418598216	0.000886827	207.1032892	598.8078527	0.299403926
	Grimes	0	0	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.001347706	0	0.03876448	0	0.006003193	0	0.001333316	10.08520067	0.006862311	1602.576009	9268.739041	4.634369521
	Howard	7.99868E-05	0	0.000790802	0	0.002748377	0	0.00094037	7.112957365	0.005050094	1179.363519	1233.270553	0.616635276
	Jack	0.000305682	0	0.00302217	0	0.010503338	0	0.003593766	27.18324381	0.019299698	4507.116299	4713.130194	2.356565097
	Jones	0.000291082	0	0.008372468	0	0.001296587	0	0.000287974	2.178231718	0.001482142	346.1291458	2001.889901	1.00094495
	Lamar	0.000137007	0	0.001354543	0	0.004707619	0	0.001610734	12.1835887	0.008650166	2020.099279	2112.435153	1.056217576
	Limestone	0.001239347	0	0.000497945	0	0.00031596	0	0.000380962	2.881597358	0.000523179	122.179578	708.3181345	0.354159067
	Llano	0.002200214	0	0.000657172	0	0.001148571	0	0.000248641	1.880716793	0.001135861	265.2611019	394.3359062	0.197167953
	McLennan	0.003535175	0	0.034951066	0	0.121469933	0	0.041561501	314.3711959	0.22319886	52124.29948	54506.8273	27.25341365
	Milam	0.000323543	0	0.003198756	0	0.011117048	0	0.00380375	28.77156194	0.02042738	4770.467303	4988.518599	2.4942593
	Mitchell	0.002153177	0	0.02128772	0	0.07398395	0	0.025313952	191.4747321	0.135944204	31747.45781	33198.58909	16.59929454
	Nolan	8.13615E-05	0	0.000804394	0	0.002795613	0	0.000956532	7.235206837	0.005136889	1199.633086	1254.466613	0.627233307
	Palo Pinto	0.001143513	0	0.030749889	0	0.123082087	0	0.001262858	9.552257752	0.005748375	1342.435283	1882.58871	0.941294355
	Pecos	5.90308E-06	0	5.83617E-05	0	0.000202832	0	6.93999E-05	0.524940559	0.0003727	87.03774155	91.0161133	0.045508057
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.000730875	0	0.00076086	0	0.001866305	0	0.191632518	1449.508367	0.003397737	793.483811	2592.589567	1.296294783
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.000820806	0	0.008115023	0	0.028203184	0	0.00964985	72.99146786	0.051822854	12102.34646	12655.52756	6.327763778
	Tom Green	1.05974E-05	0	0.000304817	0	4.72049E-05	0	1.04843E-05	0.079302964	5.39604E-05	12.60153684	72.882881	0.03644144
	Upton	4.49076E-06	0	4.43986E-05	0	0.000154304	0	5.27959E-05	0.399348084	0.000283531	66.21388789	69.24043082	0.034620215
	Ward	0.002674262	0	0.026439509	0	0.091888626	0	0.03144012	237.8130659	0.16884373	39430.58278	41232.89881	20.6164494
	Webb	0.000143074	0	0.004115289	0	0.000637307	0	0.000141547	1.070658411	0.000728512	170.1316156	983.9817513	0.491990876
	Wharton	0.000248538	0	9.98576E-05	0	6.33625E-05	0	7.6398E-05	0.577874221	0.000104918	24.50183688	142.0457958	0.071022898
	Wichita	2.99181E-05	0	0.00029579	0	0.001027996	0	0.000351734	2.660514245	0.001888925	441.1264233	461.2896866	0.230644843
	Wilbarger	0.00020457	0	0.005884109	0	0.000911232	0	0.000202386	1.53084521	0.001041639	243.2570147	1406.91348	0.70345674
	Wise	0.000413241	0	0.004181914	0	0.014614274	0	0.004797945	36.29165284	0.025761411	6016.139648	6293.501095	3.146750547
	Young	0.000898531	0	0.008883468	0	0.030873859	0	0.010563634	79.90332841	0.056730171	13248.36713	13853.93121	6.926965604
	Total	**1.542362643**	**0**	**1.359385821**	**0**	**1.231642808**	**0**	**1.221806085**	**9241.741225**	**1.528786947**	**357022.2022**	**576618.362**	**288.309181**
Energy Savings by PCA (MWh)		0		0		0		7,564		233,533			

Table 99: Cumulative NOx Emissions Reduction Values According to SIP Areas and Counties (PUCT-SB 7).

Program	Area	County	FIP Code	Total NOx emissions reduction (Tons) (2007 25% annual and ozone season eGrid)																			
				2004		Cumulative 2005		Cumulative 2006		Cumulative 2007		Cumulative 2008		Cumulative 2009		Cumulative 2010		Cumulative 2011		Cumulative 2012		Cumulative 2013	
				Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day
PUC (SB7)	Houston-Galveston Area	Brazoria	039	4.914	0.015	13.436	0.040	16.656	0.049	19.678	0.058	22.504	0.067	25.132	0.074	27.563	0.081	29.797	0.088	31.833	0.094	33.673	0.100
		Chambers	071	10.708	0.029	29.643	0.082	36.637	0.101	43.201	0.119	49.335	0.136	55.039	0.152	60.314	0.166	65.159	0.179	69.575	0.192	73.561	0.203
		Fort Bend	157	34.656	0.075	95.938	0.208	118.572	0.257	139.815	0.303	159.668	0.346	178.130	0.386	195.201	0.423	210.882	0.457	225.172	0.488	238.072	0.516
		Galveston	167	19.343	0.045	52.751	0.122	65.431	0.151	77.336	0.179	88.464	0.205	98.816	0.229	108.392	0.251	117.192	0.272	125.216	0.290	132.463	0.307
		Harris	201	33.591	0.104	92.991	0.289	114.929	0.357	135.519	0.421	154.762	0.480	172.657	0.536	189.204	0.587	204.403	0.635	218.254	0.678	230.757	0.716
		Liberty	291	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Montgomery	339	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Waller	473	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Beaumont/ Port Arthur Area	Hardin	199	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Jefferson	245	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Orange	361	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Dallas/ Fort Worth Area	Collin	085	0.637	0.002	1.755	0.005	2.171	0.006	2.562	0.007	2.928	0.008	3.267	0.009	3.582	0.009	3.870	0.010	4.133	0.011	4.371	0.012
		Dallas	113	4.939	0.015	13.559	0.041	16.789	0.050	19.821	0.059	22.654	0.068	25.290	0.076	27.727	0.083	29.967	0.090	32.008	0.096	33.851	0.101
		Denton	121	0.139	0.001	0.383	0.001	0.474	0.002	0.559	0.002	0.639	0.002	0.713	0.003	0.782	0.003	0.845	0.003	0.902	0.003	0.954	0.004
		Tarrant	439	13.510	0.047	37.089	0.130	45.925	0.161	54.219	0.190	61.971	0.217	69.181	0.243	75.849	0.266	81.974	0.288	87.558	0.307	92.599	0.325
		Ellis	139	3.643	0.011	10.002	0.029	12.385	0.036	14.621	0.043	16.712	0.049	18.656	0.055	20.454	0.060	22.106	0.065	23.611	0.069	24.971	0.073
		Johnson	251	0.084	0.000	0.231	0.001	0.286	0.001	0.338	0.001	0.386	0.001	0.431	0.001	0.472	0.002	0.510	0.002	0.545	0.002	0.576	0.002
		Kaufman	257	7.026	0.020	19.289	0.054	23.885	0.067	28.198	0.079	32.230	0.091	35.980	0.101	39.447	0.111	42.633	0.120	45.537	0.128	48.159	0.135
		Parker	367	0.064	0.000	0.176	0.001	0.218	0.001	0.257	0.002	0.293	0.002	0.327	0.002	0.359	0.002	0.388	0.002	0.414	0.002	0.438	0.003
		Rockwall	397	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Henderson	213	0.911	0.003	2.500	0.008	3.096	0.010	3.655	0.012	4.178	0.013	4.664	0.015	5.113	0.016	5.526	0.018	5.902	0.019	6.242	0.020
		Hood	221	13.915	0.038	38.201	0.103	47.302	0.128	55.845	0.151	63.829	0.172	71.255	0.192	78.123	0.211	84.432	0.228	90.183	0.243	95.375	0.257
		Hunt	231	6.873	0.019	18.869	0.053	23.364	0.066	27.584	0.078	31.527	0.089	35.195	0.099	38.587	0.109	41.704	0.117	44.544	0.125	47.109	0.132
	El Paso Area	El Paso	141	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	San Antonio Area	Bexar	029	1.018	0.003	2.859	0.007	3.522	0.009	4.144	0.011	4.725	0.012	5.266	0.013	5.765	0.015	6.224	0.016	6.641	0.017	7.018	0.018
		Comal	091	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Guadalupe	187	0.319	0.001	0.879	0.002	1.087	0.003	1.283	0.004	1.465	0.004	1.635	0.004	1.792	0.005	1.936	0.005	2.068	0.006	2.186	0.006
		Wilson	493	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Austin Area	Bastrop	021	0.717	0.002	1.979	0.005	2.448	0.007	2.887	0.008	3.298	0.009	3.680	0.010	4.033	0.011	4.358	0.012	4.654	0.013	4.921	0.013
		Caldwell	055	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Hays	209	0.392	0.001	1.081	0.003	1.337	0.004	1.577	0.004	1.801	0.005	2.010	0.006	2.203	0.006	2.380	0.007	2.541	0.007	2.687	0.007
		Travis	453	0.082	0.000	0.227	0.001	0.280	0.001	0.331	0.001	0.378	0.001	0.422	0.001	0.462	0.001	0.499	0.001	0.533	0.001	0.564	0.002
		Williamson	491	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	North East Texas Area	Gregg	183	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Harrison	203	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Rusk	401	0.762	0.000	2.092	0.000	2.590	0.000	3.058	0.000	3.495	0.000	3.902	0.000	4.278	0.000	4.623	0.000	4.938	0.000	5.223	0.000
		Smith	423	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Upshur	459	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Corpus Christi Area	Nueces	355	5.594	0.015	15.787	0.042	19.424	0.052	22.837	0.061	26.026	0.070	28.991	0.078	31.730	0.085	34.246	0.092	36.537	0.098	38.603	0.104
		San Patricio	409	1.237	0.004	3.490	0.011	4.295	0.013	5.049	0.015	5.754	0.017	6.410	0.019	7.015	0.021	7.571	0.023	8.078	0.024	8.535	0.026
	Victoria Area	Victoria	469	0.761	0.002	2.132	0.006	2.628	0.007	3.093	0.008	3.528	0.009	3.932	0.010	4.306	0.011	4.649	0.012	4.961	0.013	5.243	0.014
	Other ERCOT counties	Andrews	003	0.027	0.000	0.075	0.000	0.093	0.000	0.110	0.000	0.126	0.000	0.141	0.000	0.154	0.000	0.167	0.000	0.178	0.001	0.188	0.001
		Angelina	005	0.345	0.001	0.948	0.003	1.174	0.003	1.386	0.004	1.584	0.004	1.768	0.005	1.938	0.005	2.095	0.006	2.238	0.006	2.366	0.007
		Bosque	035	0.175	0.001	0.482	0.002	0.596	0.003	0.703	0.003	0.803	0.003	0.896	0.004	0.982	0.004	1.062	0.005	1.134	0.005	1.199	0.005
		Brazos	041	0.569	0.002	1.569	0.004	1.941	0.005	2.290	0.006	2.617	0.007	2.920	0.008	3.201	0.009	3.459	0.009	3.694	0.010	3.906	0.011
		Calhoun	057	2.033	0.006	5.737	0.017	7.059	0.021	8.299	0.024	9.458	0.028	10.535	0.031	11.531	0.034	12.445	0.036	13.278	0.039	14.029	0.041
		Cameron	061	1.189	0.004	3.356	0.010	4.129	0.013	4.854	0.015	5.532	0.017	6.162	0.019	6.745	0.021	7.279	0.023	7.766	0.024	8.205	0.025
		Cherokee	073	3.892	0.011	10.685	0.029	13.231	0.036	15.620	0.043	17.853	0.049	19.930	0.055	21.851	0.060	23.616	0.065	25.225	0.069	26.677	0.073
		Coke	081	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Coleman	083	0.032	0.000	0.090	0.000	0.111	0.000	0.130	0.000	0.149	0.000	0.165	0.000	0.181	0.001	0.195	0.001	0.209	0.001	0.220	0.001
		Crockett	105	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Ector	135	3.928	0.011	10.782	0.030	13.351	0.038	15.762	0.044	18.016	0.051	20.112	0.057	22.050	0.062	23.831	0.067	25.454	0.072	26.919	0.076
		Fannin	147	7.838	0.023	21.518	0.064	26.645	0.079	31.456	0.093	35.954	0.106	40.137	0.119	44.005	0.130	47.559	0.141	50.799	0.150	53.723	0.159
		Fayette	149	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Freestone	161	4.085	0.011	11.213	0.032	13.885	0.039	16.393	0.046	18.736	0.053	20.916	0.059	22.932	0.064	24.784	0.070	26.472	0.074	27.996	0.079
		Frio	163	0.299	0.001	0.839	0.004	1.034	0.005	1.217	0.006	1.388	0.007	1.546	0.007	1.693	0.008	1.828	0.009	1.951	0.009	2.062	0.010
		Grimes	185	0.000	0.000	0.000	0.001	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.003	0.000	0.003	0.000	0.003	0.000	0.003
		Hardeman	197	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Haskell	207	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Hidalgo	215	4.634	0.016	13.078	0.046	16.092	0.056	18.920	0.066	21.561	0.075	24.017	0.084	26.287	0.092	28.371	0.099	30.269	0.105	31.981	0.111
		Howard	227	0.617	0.002	1.693	0.005	2.096	0.006	2.475	0.007	2.828	0.008	3.158	0.009	3.462	0.010	3.741	0.011	3.996	0.012	4.226	0.012
		Jack	237	2.357	0.007	6.469	0.018	8.011	0.023	9.457	0.027	10.809	0.030	12.067	0.034	13.230	0.037	14.298	0.040	15.272	0.043	16.152	0.045
		Jones	253	1.001	0.003	2.825	0.008	3.476	0.010	4.086	0.012	4.657	0.013	5.187	0.015	5.678	0.016	6.128	0.018	6.537	0.019	6.907	0.020
		Lamar	277	1.056	0.003	2.900	0.009	3.590	0.011	4.239	0.013	4.845	0.015	5.408	0.017	5.930	0.018	6.409	0.020	6.845	0.021	7.239	0.023
		Limestone	293	0.354	0.000	0.980	0.000	1.212	0.000	1.429	0.000	1.632	0.000	1.820	0.000	1.995	0.000	2.155	0.000	2.301	0.000	2.433	0.000
		Llano	299	0.197	0.001	0.544	0.001	0.673	0.002	0.794	0.002	0.907	0.002	1.012	0.003	1.109	0.003	1.198	0.003	1.280	0.004	1.353	0.004
		McLennan	309	27.253	0.070	74.817	0.192	92.641	0.238	109.372	0.281	125.009	0.322	139.553	0.359	153.003	0.394	165.360	0.425	176.623	0.454	186.792	0.480
		Milam	331	2.494	0.005	6.847	0.014	8.479	0.017	10.010	0.020	11.441	0.023	12.772	0.026	14.003	0.028	15.134	0.031	16.165	0.033	17.095	0.034
		Mitchell	335	16.599	0.052	45.569	0.142	56.425	0.175	66.615	0.207	76.140	0.237	84.998	0.264	93.190	0.290	100.716	0.313	107.576	0.335	113.770	0.354
		Nolan	353	0.627	0.002	1.722	0.005	2.132	0.006	2.517	0.007	2.877	0.008	3.212	0.009	3.521	0.010	3.806	0.011	4.065	0.012	4.299	0.013
		Palo Pinto	363	0.941	0.002	2.594	0.007	3.209	0.008	3.786	0.010	4.326	0.011	4.828	0.013	5.292	0.014	5.718	0.015	6.107	0.016	6.458	0.017
		Pecos	371	0.046	0.000	0.125	0.000	0.155	0.000	0.183	0.001	0.209	0.001	0.233	0.001	0.255	0.001	0.276	0.001	0.295	0.001	0.312	0.001
		Presidio	377	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Red River	387	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Robertson	395	1.296	0.002	3.312	0.004	4.175	0.006	4.986	0.007	5.746	0.008	6.453	0.009	7.108	0.009	7.711	0.010	8.262	0.011	8.762	0.012
		Taylor	441	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Titus	449	6.328	0.000	17.371	0.000	21.510	0.000	25.394	0.000	29.025	0.000	32.402	0.000	35.525	0.000	38.394	0.000	41.009	0.000	43.370	0.000
		Tom Green	451	0.036	0.000	0.103	0.000	0.127	0.000	0.149	0.000	0.170	0.000	0.189	0.000	0.207	0.000	0.223	0.000	0.238	0.000	0.251	0.000
		Upton	461	0.035	0.000	0.095	0.000	0.118	0.000	0.139	0.000	0.159	0.000	0.177	0.001	0.194	0.001	0.210	0.001	0.224	0.001	0.237	0.001
		Ward	475	20.616	0.060	56.597	0.165	70.080	0.205	82.737	0.242	94.566	0.277	105.568	0.309	115.743	0.338	125.090	0.366	133.610	0.391	141.303	0.413
		Webb	479	0.492	0.001	1.388	0.003	1.708	0.003	2.009	0.004	2.289	0.004	2.550	0.005	2.791	0.005	3.012	0.006	3.213	0.006	3.395	0.007
		Wharton	481	0.071	0.000	0.197	0.001	0.243	0.001	0.287	0.001	0.327	0.001	0.365	0.001	0.400	0.001	0.432	0.001	0.461	0.001	0.488	0.001
		Wichita	485	0.231	0.001	0.633	0.002	0.784	0.002	0.926	0.003	1.058	0.003	1.181	0.003	1.295	0.004	1.399	0.004	1.495	0.004	1.581	0.005
		Wilbarger	487	0.703	0.000	1.985	0.000	2.443	0.000	2.872	0.000	3.273	0.000	3.646	0.000	3.990	0.000	4.306	0.000	4.595	0.000	4.854	0.000
		Wise	497	3.147	0.009	8.639	0.024	10.697	0.030	12.628	0.036	14.434	0.041	16.113	0.045	17.666	0.050	19.093	0.054	20.393	0.057	21.568	0.061
		Young	503	6.927	0.017	19.016	0.046	23.546	0.057	27.799	0.067	31.773	0.077	35.470	0.086	38.889	0.094	42.029	0.101	44.892	0.108	47.477	0.115

7.3.4 PUCT-SB 5 Grants Program.

To calculate the annual MWh savings from the PUCT's SB 5 program, MWh savings from 6 Power Control Authorities (PCAs) for 2002 and 2003 were obtained from the Public Utilities Commission. The annual MWh savings numbers were then divided by 365 to get average MWh savings per day for OSD calculations[51].

The annual and average day MWh numbers were input according to the PCA and program as shown in Table 100. Using the actual reported numbers for 2002 and 2003, savings up to 2013 were projected incorporating the different adjustment factors mentioned above. As an example, the projected savings for 2005 will be calculated from the following equation incorporating the annual degradation factor (a), the transmission and distribution loss (b), and the discount factor (c):

$$MWh2005 = ((1- 4a \times MWh2001) + (1- 3a \times MWh2002) + (1- 2a \times MWh2003) + (1- a \times MWh2004) + MWh2004) \times ((1 + b) \times (1 - c)) \quad (3)$$

Table 101 shows that the savings from this program are reducing due to the fact that the PUCT-SB 5 Grants Program was implemented just in 2002 and 2003. This reduction in savings is accounted for by the imposed degradation factor. The 2007 annual and OSD eGRID were used to calculate the NOx emissions savings for PUCT-SB 5 Grants Program. An example of the eGRID spreadsheet for these calculations is shown in Table 102. The total MWh savings for each PCA are used to calculate the NOx emissions reduction for each of the different counties using the emission fractions contained in eGRID. The eGRID spreadsheet shown in Table 102 was duplicated for each of the years for which the analysis is required. The resultant NOx emissions reduction numbers for each county and SIP area for the different programs is provided in Table 103, which contains the annual and OSD NOx reductions from the PUCT programs for the years 2004 through 2013.

[51] The preferred approach would be to weather-normalize the savings and then calculate savings for the OSD period. However, only annual values were obtained for the 2005 report to the TCEQ. Dividing the annual values by 365 is probably a reasonable approach for lighting projects. However, this undercounts potential savings from electric loads associated with the cooling season.

Table 100: Annual and OSD MWh Savings for PUCT-SB 5 Grants Program.

Utility	Annual Energy Savings 2001 Electric		Annual Energy Savings 2002 Electric		Annual Energy Savings 2003 Electric		Annual Energy Savings 2004 Electric	
	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day
Austin Energy	0	0.0	0	0.0	5,524	15.1	0	0.0
CenterPoint Energy	0	0.0	625	1.7	0	0.0	0	0.0
City Public Service	0	0.0	0	0.0	4,262	11.7	0	0.0
CoServ	0	0.0	0	0.0	1,464	4.0	0	0.0
El Paso Electric[12]	0	0.0	0	0.0	6,853	18.8	0	0.0
Entergy[12]	0	0.0	1,070	2.9	102	0.3	0	0.0
LCRA	0	0.0	0	0.0	186	0.5	0	0.0
Totals	**0**	**0**	**1,695**	**5**	**18,391**	**50**	**0**	**0**

Table 101: Projected MWh Savings for PUCT-SB 5 Grants Program According to Power Control Authorities (PCA).

Utility	Cumulative Energy Savings 2005 Electric		Cumulative Energy Savings 2006 Electric		Cumulative Energy Savings 2007 Electric		Cumulative Energy Savings 2008 Electric		Cumulative Energy Savings 2009 Electric		Cumulative Energy Savings 2010 Electric		Cumulative Energy Savings 2011 Electric		Cumulative Energy Savings 2012 Electric		Cumulative Energy Savings 2013 Electric	
	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day
Austin Energy	3,990	10.9	3,768	10.3	3,546	9.7	3,325	9.1	3,103	8.5	2,881	7.9	2,660	7.3	2,438	6.7	2,217	6.1
CenterPoint Energy	426	1.2	401	1.1	376	1.0	351	1.0	326	0.9	301	0.8	276	0.8	251	0.7	226	0.6
City Public Service	3,078	8.4	2,907	8.0	2,736	7.5	2,565	7.0	2,394	6.6	2,223	6.1	2,052	5.6	1,881	5.2	1,710	4.7
CoServ	1,057	2.9	999	2.7	940	2.6	881	2.4	822	2.3	764	2.1	705	1.9	646	1.8	587	1.6
El Paso Electric[12]	4,950	13.6	4,675	12.8	4,400	12.1	4,125	11.3	3,850	10.5	3,575	9.8	3,300	9.0	3,025	8.3	2,750	7.5
Entergy[12]	804	2.2	757	2.1	709	1.9	662	1.8	615	1.7	568	1.6	521	1.4	474	1.3	427	1.2
LCRA	134	0.4	127	0.3	119	0.3	112	0.3	104	0.3	97	0.3	90	0.2	83	0.2	75	0.2
Totals	**14,439**	**40**	**13,633**	**37**	**12,827**	**35**	**12,021**	**33**	**11,215**	**31**	**10,409**	**29**	**9,603**	**26**	**8,797**	**24**	**7,991**	**22**

Table 102: Example of NOx Emissions Reduction Calculations According to Counties and PCA.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.008831132	0	0.010890729	43.45083935	0.006522185	0	0.003944232	0.529862189	0.065444292	27.90074212	0.014877434	61.52716771	0.006262315	0	0.004817148	0	0.121274957	0	0.00816387	0	133.4086114	0.066704306
	Chambers	0.021762222	0	0.026955801	107.5458014	0.016072371	0	0.009076193	1.21928216	0.164940225	70.31865687	0.037472294	154.970551	0.015055623	0	0.009553214	0	0.011518588	0	0.015818592	0	334.0542914	0.167027146
	Fort Bend	0.070431234	0	0.087239726	348.0611216	0.052016606	0	0.029374182	3.946083535	0.533812376	227.5792292	0.121275295	501.5465328	0.048726002	0	0.030918012	0	0.037278747	0	0.051195276	0	1081.132967	0.540566484
	Galveston	0.033856739	0	0.041710519	166.4128316	0.025004711	0	0.015351589	2.062309394	0.249587379	106.4061191	0.056747051	234.6833043	0.024143087	0	0.019297151	0	0.567751219	0	0.032836887	0	509.5645644	0.254782282
	Harris	0.068267332	0	0.084559408	337.3674297	0.050418468	0	0.028471701	3.824845628	0.517411736	220.5871752	0.117549281	486.137216	0.047228963	0	0.029968099	0	0.03613341	0	0.049622373	0	1047.916666	0.523958333
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.002039135	0	0.003716345	14.82713367	0.001505992	0	0.005950953	0.799442058	0.002481478	1.057923942	0.000717051	2.965437541	0.019166247	0	0.07668094	0	0.00086441	0	0.004000199	0	19.64993721	0.009824969
	Dallas	0.004539471	0	0.004683963	18.68764781	0.003352602	0	0.00774211	1.040063435	0.002085611	0.889154712	0.00068106	2.816595475	0.007502816	0	0.026717045	0	0.007524933	0	0.040370454	0	23.43346143	0.011716731
	Denton	0.00047388	0	0.000872802	3.482224085	0.000349982	0	0.001396994	0.187670057	0.000585443	0.24959097	0.000168971	0.698795055	0.00454374	0	0.018187155	0	0.000186605	0	0.000849405	0	4.618280166	0.00230914
	Tarrant	0.012162492	0	0.012266309	48.93900501	0.008982543	0	0.020308652	2.728233864	0.005316504	2.266575394	0.001752506	7.24767028	0.017326428	0	0.060216761	0	0.020603444	0	0.110647237	0	61.18148454	0.030590742
	Ellis	0.003279814	0	0.003307809	13.1971973	0.002422289	0	0.005476558	0.735712558	0.001433682	0.611218856	0.000472592	1.954451968	0.004672353	0	0.016238427	0	0.005556053	0	0.029837824	0	16.49858068	0.00824929
	Johnson	0.000286058	0	0.000526868	2.102049284	0.000211267	0	0.000843297	0.113287284	0.000353404	0.150665927	0.000101999	0.421828581	0.002742835	0	0.010978701	0	0.000112645	0	0.000512745	0	2.787831076	0.001393916
	Kaufman	0.006325453	0	0.006379446	25.45213139	0.004671629	0	0.010562096	1.41889617	0.002765	1.178797459	0.000911441	3.769358535	0.009011105	0	0.031317452	0	0.010715411	0	0.057545265	0	31.81918355	0.015909592
	Parker	0.000217489	0	0.000400576	1.598182331	0.000160626	0	0.000641157	0.086132013	0.000268692	0.114550893	7.75498E-05	0.320715119	0.00208537	0	0.008347076	0	8.56434E-05	0	0.000389838	0	2.119580355	0.00105979
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.000819895	0	0.000826893	3.299064129	0.000605529	0	0.001369042	0.183915028	0.000358395	0.152793821	0.00011814	0.48857816	0.001168005	0	0.004059317	0	0.001388914	0	0.007458924	0	4.124351138	0.002062176
	Hood	0.01252711	0	0.012634039	50.40614034	0.009251829	0	0.020917482	2.810023191	0.005475887	2.334524729	0.001805044	7.464947136	0.017845854	0	0.062021991	0	0.021221112	0	0.113964315	0	63.01563539	0.031507818
	Hunt	0.006187558	0	0.006240374	24.89727777	0.004569788	0	0.010331844	1.387964392	0.002704724	1.153099806	0.000891572	3.68718694	0.008814664	0	0.030634735	0	0.010481817	0	0.056290785	0	31.1255289	0.015562764
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.033413751	0	0.051775843	206.5705482	0.024677545	0	0.090663423	12.17958829	0.001141841	0.486799041	1.143571754	4729.359349	0.046873844	0	0.004669544	0	0.000519582	0	0.002503865	0	4948.596285	2.474298142
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.002000467	0	0.076378745	304.7289647	0.001477434	0	0.133848731	17.98103769	0.001237133	0.527424493	0.003554796	14.7012279	0.001061766	0	0.001855699	0	0.000401718	0	0.001835165	0	337.9386548	0.168969327
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.004502334	0	0.171901148	685.8355587	0.003325174	0	0.301245466	40.46886399	0.002784342	1.187043286	0.008000571	33.087189	0.002389654	0	0.004176513	0	0.000904124	0	0.004130298	0	760.578655	0.380289327
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.002458599	0	0.093870431	374.5157051	0.001815785	0	0.164501762	22.09891998	0.001520452	0.648211291	0.004368889	18.06799277	0.001304924	0	0.002280677	0	0.000493717	0	0.00225544	0	415.3308291	0.207665415
	Travis	0.000510007	0	0.299602906	1195.328409	0.000376663	0	0.033939476	4.559378321	0.000334709	0.142695769	0.000906121	3.747357219	0.000271138	0	0.000471744	0	0.000103327	0	0.000467336	0	1203.777841	0.60188892
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0.000685965	0	0.00069182	2.760160984	0.000506616	0	0.001145408	0.153872451	0.000299851	0.127834903	9.88414E-05	0.408768767	0.000977211	0	0.003396227	0	0.001162035	0	0.006240507	0	3.450637106	0.001725319
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22756873	0	0.004556851	18.18051066	0.168069652	0	0.007612767	1.022687714	0.001680888	0.716609769	0.001626796	6.727783159	0.046792036	0	0.007246366	0	0.001609426	0	0.008283395	0	26.6475913	0.013323796
	San Patricio	0.050313351	0	0.001007478	4.019543542	0.037158653	0	0.001683113	0.226106839	0.000371629	0.158435823	0.00035967	1.487450923	0.010345288	0	0.001602105	0	0.000355829	0	0.001831382	0	5.891537127	0.002945769
Victoria Area	Victoria	0.021836736	0	0.002215582	8.839528112	0.016127403	0	0.003612695	0.485324062	0.001199621	0.511432222	0.000555389	2.296867841	0.52545648	0	0.032412721	0	0.000476855	0	0.002254849	0	12.13315224	0.006066576
Other ERCOT counties	Andrews	2.47421E-05	0	2.49533E-05	0.099556314	1.82731E-05	0	4.13138E-05	0.005550029	1.08153E-05	0.00461088	3.56511E-06	0.014743891	3.5247E-05	0	0.000122499	0	4.19135E-05	0	0.000225089	0	0.124461114	6.22306E-05
	Angelina	0.00031082	0	0.000313473	1.250666163	0.000229554	0	0.000519	0.069721683	0.000135867	0.057923719	4.47864E-05	0.185218641	0.000442787	0	0.001538876	0	0.000526534	0	0.002827658	0	1.563530205	0.000781765
	Bosque	0.000595392	0	0.001096604	4.37512933	0.000439723	0	0.001755208	0.235792054	0.000735562	0.313590609	0.000212298	0.877978748	0.005708837	0	0.02285067	0	0.000234455	0	0.001067208	0	5.802490741	0.002901245
	Brazos	0.001939725	0	0.003572622	14.25372174	0.001432574	0	0.005718288	0.768186281	0.002396384	1.021645977	0.000691644	2.860364534	0.018598805	0	0.074445136	0	0.000763829	0	0.003476855	0	18.90391853	0.009451959
	Calhoun	0.082699809	0	0.001655986	6.606904	0.061077496	0	0.002766524	0.371650702	0.000610844	0.260420185	0.000591187	2.444915784	0.0170045	0	0.002633372	0	0.000584875	0	0.003010234	0	9.683890671	0.004841945
	Cameron	0.048371747	0	0.000968599	3.864428392	0.297964476	0	0.001618161	0.217381322	0.000357288	0.152321747	0.00034579	1.430049834	0.009946061	0	0.001540279	0	0.000342098	0	0.001760709	0	5.664181294	0.002832091
	Cherokee	0.003503899	0	0.003533808	14.09886406	0.002587786	0	0.00585073	0.785978349	0.001531635	0.652978914	0.00050488	2.087985197	0.00499158	0	0.017347879	0	0.005935657	0	0.031876422	0	17.62580652	0.008812903
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.001298787	0	2.6007E-05	0.10376034	0.000959212	0	4.34478E-05	0.005836713	9.59321E-06	0.004089856	9.2845E-06	0.038397	0.000267053	0	4.13567E-05	0	9.18536E-06	0	4.72752E-05	0	0.152083909	7.6042E-05
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.003535748	0	0.003565928	14.22701587	0.002611307	0	0.005903911	0.79312251	0.001545556	0.658914175	0.00050947	2.106963966	0.005036951	0	0.017505563	0	0.00598961	0	0.032166163	0	17.78601652	0.008893008
	Fannin	0.007056315	0	0.007116546	28.3929487	0.005211403	0	0.011782473	1.582839784	0.003084477	1.314999332	0.001016752	4.204881779	0.010052276	0	0.034935966	0	0.011953503	0	0.064194222	0	35.49566959	0.017747835
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.003677178	0	0.003708565	14.7960965	0.00271576	0	0.006140067	0.82484741	0.001607379	0.685270742	0.000529848	2.191242524	0.005238429	0	0.018205785	0	0.006229194	0	0.033452809	0	18.49745718	0.009248729
	Frio	0.008588335	0	0.000871383	3.476564754	0.006342868	0	0.001420864	0.190876765	0.000471808	0.20114504	0.000218433	0.903352496	0.206660746	0	0.012747844	0	0.000187546	0	0.000886827	0	4.771939055	0.00238597
	Grimes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.188527456	0	0.003775086	15.06149558	0.139235931	0	0.006306735	0.847237285	0.001392518	0.593669511	0.001347706	5.573577016	0.03876448	0	0.006003193	0	0.001333316	0	0.006862311	0	22.07597939	0.01103799
	Howard	0.000555113	0	0.000559851	2.233644182	0.000409976	0	0.000926915	0.124520384	0.000242653	0.10344965	7.99868E-05	0.330793741	0.000790802	0	0.002748377	0	0.00094037	0	0.005050094	0	2.792407957	0.001396204
	Jack	0.002121449	0	0.002139557	8.53620952	0.001566784	0	0.003542346	0.475873506	0.000927334	0.395348505	0.000305682	1.264178379	0.00302217	0	0.010503338	0	0.003593766	0	0.019299698	0	10.67160991	0.005335805
	Jones	0.040718722	0	0.000815354	3.253026734	0.030072592	0	0.001362147	0.182988835	0.00030076	0.128222511	0.000291082	1.203797786	0.008372468	0	0.001296587	0	0.000287974	0	0.001482142	0	4.768035867	0.002384018
	Lamar	0.000950838	0	0.000958954	3.82594758	0.000702236	0	0.001587687	0.213287535	0.000415633	0.177196055	0.000137007	0.566607486	0.001354543	0	0.004707619	0	0.001610734	0	0.008650166	0	4.783038656	0.002391519
	Limestone	0.000719757	0	0.000891528	3.556935468	0.000531572	0	0.000300183	0.040326149	0.00545518	2.325696787	0.001239347	5.125446482	0.000497945	0	0.00031596	0	0.000380962	0	0.000523179	0	11.04840489	0.005524202
	Llano	0.001238174	0	0.047274044	188.6096771	0.000914447	0	0.082844655	11.12922664	0.000765714	0.326445382	0.002200214	9.099213293	0.000657172	0	0.001148571	0	0.000248641	0	0.001135861	0	209.1645624	0.104582281
	McLennan	0.024534317	0	0.024743738	98.72031515	0.018119687	0	0.040966843	5.503424248	0.010724513	4.572161555	0.003535175	14.62008257	0.034951066	0	0.121469933	0	0.041561501	0	0.22319886	0	123.4159835	0.061707992
	Milam	0.002245405	0	0.002264571	9.034980619	0.001658332	0	0.003749326	0.503678816	0.000981518	0.418448735	0.000323543	1.338044378	0.003198756	0	0.011117048	0	0.00380375	0	0.02042738	0	11.29515255	0.005647576
	Mitchell	0.014943169	0	0.015070721	60.12779205	0.011036196	0	0.024951762	3.351982297	0.006532002	2.78477615	0.002153177	8.904684748	0.02128772	0	0.07398395	0	0.025313952	0	0.135944204	0	75.16923525	0.037584618
	Nolan	0.000564654	0	0.000569473	2.272033533	0.000417022	0	0.000942846	0.1266605	0.000246823	0.105227626	8.13615E-05	0.33647905	0.000804394	0	0.002795613	0	0.000956532	0	0.005136889	0	2.840400709	0.0014202
	Palo Pinto	0.003206998	0	0.005906709	23.56605043	0.002368511	0	0.009454195	1.270062442	0.003962005	1.689113978	0.001143513	4.729115391	0.030749889	0	0.123082087	0	0.001262858	0	0.005748375	0	31.25434224	0.015627171
	Pecos	4.09677E-05	0	4.13174E-05	0.164844293	3.02565E-05	0	6.84069E-05	0.00918968	1.79079E-05	0.007634647	5.90308E-06	0.024412778	5.83617E-05	0	0.000202832	0	6.93999E-05	0	0.0003727	0	0.206081397	0.000103041
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.000737708	0	0.000835096	3.3317916	0.00054483	0	0.000735917	0.098861994	0.003149678	1.342796236	0.000730875	3.022610432	0.00076086	0	0.001866305	0	0.191632518	0	0.003397737	0	7.796060262	0.00389803
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.005696437	0	0.005745061	22.92112256	0.004207073	0	0.009511781	1.277798409	0.002490043	1.061575575	0.000820806	3.394526283	0.008115023	0	0.028203184	0	0.00964985	0	0.051822854	0	28.65502282	0.014327511
	Tom Green	0.001482448	0	2.96846E-05	0.118433067	0.001094854	0	4.95918E-05	0.006662081	1.09498E-05	0.004668202	1.05974E-05	0.043826711	0.000304817	0	4.72049E-05	0	1.04843E-05	0	5.39604E-05	0	0.173590061	8.6795E-05
	Upton	3.11661E-05	0	3.14322E-05	0.125405155	2.30176E-05	0	5.20405E-05	0.006991041	1.36234E-05	0.005808051	4.49076E-06	0.018572	4.43986E-05	0	0.000154304	0	5.27959E-05	0	0.000283531	0	0.156776248	7.83881E-05
	Ward	0.018559529	0	0.01871795	74.67917262	0.013707039	0	0.030990277	4.163187372	0.008112796	3.458713047	0.002674262	11.05968582	0.026439509	0	0.091888626	0	0.03144012	0	0.16884373	0	93.36075886	0.046680379
	Webb	0.020014327	0	0.000400768	1.598948545	0.014781473	0	0.000669531	0.089943845	0.000147832	0.06302475	0.000143074	0.591698401	0.004115289	0	0.000637307	0	0.000141547	0	0.000728512	0	2.343615541	0.001171808
	Wharton	0.00014434	0	0.000178787	0.713306217	0.000106601	0	6.01986E-05	0.008086987	0.001093979	0.466394173	0.000248538	1.027854701	9.98576E-05	0	6.33625E-05	0	7.6398E-05	0	0.000104918	0	2.215642079	0.001107821
	Wichita	0.000207633	0	0.000209406	0.835467142	0.000153346	0	0.000346701	0.046575319	9.07612E-05	0.03869407	2.99181E-05	0.123729332	0.00029579	0	0.001027996	0	0.000351734	0	0.001888925	0	1.044465862	0.000522233
	Wilbarger	0.028616818	0	0.000573025	2.286203233	0.021134796	0	0.000957307	0.128603206	0.000211372	0.090113837	0.00020457	0.846020219	0.005884109	0	0.000911232	0	0.000202386	0	0.001041639	0	3.350940495	0.00167547
	Wise	0.002844488	0	0.002882008	11.4983734	0.002100781	0	0.00476997	0.640790678	0.001256075	0.535500249	0.000413241	1.709002119	0.004181914	0	0.014614274	0	0.004797945	0	0.025761411	0	14.38366645	0.007191833
	Young	0.006235856	0	0.006289085	25.09161737	0.004605458	0	0.010412491	1.398798366	0.002725836	1.162100507	0.000898531	3.715967856	0.008883468	0	0.030873859	0	0.010563634	0	0.056730171	0	31.3684841	0.015684242
	Total	**1.121837219**	**0**	**1.172570094**	**4678.213455**	**1.090766584**	**0**	**1.189130767**	**159.7460435**	**1.629360006**	**694.6419965**	**1.542362643**	**6378.600345**	**1.359385821**	**0**	**1.231642808**	**0**	**1.221806085**	**0**	**1.528786947**	**0**	**11911.20184**	**5.95560092**
Energy Savings by PCA (MWh)		0		3,990		0		134		426		4,136		0		0		0		0			

Table 103: NOx Emissions Reduction Values According to SIP Areas and Counties (PUCT-SB 5 Grants Program).

Program	Area	County	FIP Code	Total NOx emissions reduction (Tons) (2007 25% annual and ozone season eGrid)																			
				2004		Cumulative 2005		Cumulative 2006		Cumulative 2007		Cumulative 2008		Cumulative 2009		Cumulative 2010		Cumulative 2011		Cumulative 2012		Cumulative 2013	
				Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day
PUC (SB5 Grant Program)	Houston-Galveston Area	Brazoria	039	0.000	0.000	0.067	0.000	0.063	0.000	0.059	0.000	0.055	0.000	0.052	0.000	0.048	0.000	0.044	0.000	0.040	0.000	0.037	0.000
		Chambers	071	0.000	0.000	0.167	0.000	0.158	0.000	0.148	0.000	0.139	0.000	0.129	0.000	0.120	0.000	0.111	0.000	0.101	0.000	0.092	0.000
		Fort Bend	157	0.000	0.000	0.541	0.001	0.510	0.001	0.480	0.001	0.449	0.001	0.419	0.001	0.389	0.001	0.358	0.001	0.328	0.001	0.297	0.001
		Galveston	167	0.000	0.000	0.255	0.001	0.240	0.001	0.226	0.001	0.212	0.000	0.197	0.000	0.183	0.000	0.169	0.000	0.154	0.000	0.140	0.000
		Harris	201	0.000	0.000	0.524	0.002	0.494	0.002	0.465	0.001	0.436	0.001	0.406	0.001	0.377	0.001	0.347	0.001	0.318	0.001	0.288	0.001
		Liberty	291	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Montgomery	339	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Waller	473	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Beaumont/ Port Arthur Area	Hardin	199	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Jefferson	245	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Orange	361	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Dallas/ Fort Worth Area	Collin	085	0.000	0.000	0.010	0.000	0.009	0.000	0.009	0.000	0.008	0.000	0.008	0.000	0.007	0.000	0.007	0.000	0.006	0.000	0.005	0.000
		Dallas	113	0.000	0.000	0.012	0.000	0.011	0.000	0.010	0.000	0.010	0.000	0.009	0.000	0.008	0.000	0.008	0.000	0.007	0.000	0.006	0.000
		Denton	121	0.000	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.001	0.000	0.001	0.000
		Tarrant	439	0.000	0.000	0.031	0.000	0.029	0.000	0.027	0.000	0.025	0.000	0.024	0.000	0.022	0.000	0.020	0.000	0.019	0.000	0.017	0.000
		Ellis	139	0.000	0.000	0.008	0.000	0.008	0.000	0.007	0.000	0.007	0.000	0.006	0.000	0.006	0.000	0.005	0.000	0.005	0.000	0.005	0.000
		Johnson	251	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000
		Kaufman	257	0.000	0.000	0.016	0.000	0.015	0.000	0.014	0.000	0.013	0.000	0.012	0.000	0.011	0.000	0.011	0.000	0.010	0.000	0.009	0.000
		Parker	367	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000
		Rockwall	397	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Henderson	213	0.000	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000
		Hood	221	0.000	0.000	0.032	0.000	0.030	0.000	0.028	0.000	0.026	0.000	0.024	0.000	0.023	0.000	0.021	0.000	0.019	0.000	0.017	0.000
		Hunt	231	0.000	0.000	0.016	0.000	0.015	0.000	0.014	0.000	0.013	0.000	0.012	0.000	0.011	0.000	0.010	0.000	0.009	0.000	0.009	0.000
	El Paso Area	El Paso	141	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	San Antonio Area	Bexar	029	0.000	0.000	2.474	0.006	2.337	0.006	2.199	0.006	2.062	0.005	1.924	0.005	1.787	0.005	1.650	0.004	1.512	0.004	1.375	0.004
		Comal	091	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Guadalupe	187	0.000	0.000	0.169	0.000	0.160	0.000	0.150	0.000	0.141	0.000	0.131	0.000	0.122	0.000	0.113	0.000	0.103	0.000	0.094	0.000
		Wilson	493	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Austin Area	Bastrop	021	0.000	0.000	0.380	0.001	0.359	0.001	0.338	0.001	0.317	0.001	0.296	0.001	0.275	0.001	0.254	0.001	0.232	0.001	0.211	0.001
		Caldwell	055	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Hays	209	0.000	0.000	0.208	0.001	0.196	0.001	0.185	0.001	0.173	0.000	0.162	0.000	0.150	0.000	0.138	0.000	0.127	0.000	0.115	0.000
		Travis	453	0.000	0.000	0.602	0.002	0.568	0.002	0.535	0.001	0.502	0.001	0.468	0.001	0.435	0.001	0.401	0.001	0.368	0.001	0.334	0.001
		Williamson	491	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	North East Texas Area	Gregg	183	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Harrison	203	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Rusk	401	0.000	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000
		Smith	423	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Upshur	459	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Corpus Christi Area	Nueces	355	0.000	0.000	0.013	0.000	0.013	0.000	0.012	0.000	0.011	0.000	0.010	0.000	0.010	0.000	0.009	0.000	0.008	0.000	0.007	0.000
		San Patricio	409	0.000	0.000	0.003	0.000	0.003	0.000	0.003	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000
	Victoria Area	Victoria	469	0.000	0.000	0.006	0.000	0.006	0.000	0.005	0.000	0.005	0.000	0.005	0.000	0.004	0.000	0.004	0.000	0.004	0.000	0.003	0.000
	Other ERCOT counties	Andrews	003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Angelina	005	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000
		Bosque	035	0.000	0.000	0.003	0.000	0.003	0.000	0.003	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000
		Brazos	041	0.000	0.000	0.009	0.000	0.009	0.000	0.008	0.000	0.008	0.000	0.007	0.000	0.007	0.000	0.006	0.000	0.006	0.000	0.005	0.000
		Calhoun	057	0.000	0.000	0.005	0.000	0.005	0.000	0.004	0.000	0.004	0.000	0.004	0.000	0.003	0.000	0.003	0.000	0.003	0.000	0.003	0.000
		Cameron	061	0.000	0.000	0.003	0.000	0.003	0.000	0.003	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000
		Cherokee	073	0.000	0.000	0.009	0.000	0.008	0.000	0.008	0.000	0.007	0.000	0.007	0.000	0.006	0.000	0.006	0.000	0.005	0.000	0.005	0.000
		Coke	081	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Coleman	083	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Crockett	105	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Ector	135	0.000	0.000	0.009	0.000	0.008	0.000	0.008	0.000	0.007	0.000	0.007	0.000	0.006	0.000	0.006	0.000	0.005	0.000	0.005	0.000
		Fannin	147	0.000	0.000	0.018	0.000	0.017	0.000	0.016	0.000	0.015	0.000	0.014	0.000	0.013	0.000	0.012	0.000	0.011	0.000	0.010	0.000
		Fayette	149	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Freestone	161	0.000	0.000	0.009	0.000	0.009	0.000	0.008	0.000	0.008	0.000	0.007	0.000	0.007	0.000	0.006	0.000	0.006	0.000	0.005	0.000
		Frio	163	0.000	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.001	0.000	0.001	0.000
		Grimes	185	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Hardeman	197	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Haskell	207	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Hidalgo	215	0.000	0.000	0.011	0.000	0.010	0.000	0.010	0.000	0.009	0.000	0.009	0.000	0.008	0.000	0.007	0.000	0.007	0.000	0.006	0.000
		Howard	227	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000
		Jack	237	0.000	0.000	0.005	0.000	0.005	0.000	0.005	0.000	0.004	0.000	0.004	0.000	0.004	0.000	0.004	0.000	0.003	0.000	0.003	0.000
		Jones	253	0.000	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.001	0.000	0.001	0.000
		Lamar	277	0.000	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.001	0.000	0.001	0.000
		Limestone	293	0.000	0.000	0.006	0.000	0.005	0.000	0.005	0.000	0.005	0.000	0.004	0.000	0.004	0.000	0.004	0.000	0.003	0.000	0.003	0.000
		Llano	299	0.000	0.000	0.105	0.000	0.099	0.000	0.093	0.000	0.087	0.000	0.081	0.000	0.076	0.000	0.070	0.000	0.064	0.000	0.058	0.000
		McLennan	309	0.000	0.000	0.062	0.000	0.058	0.000	0.055	0.000	0.051	0.000	0.048	0.000	0.045	0.000	0.041	0.000	0.038	0.000	0.034	0.000
		Milam	331	0.000	0.000	0.006	0.000	0.005	0.000	0.005	0.000	0.005	0.000	0.004	0.000	0.004	0.000	0.004	0.000	0.003	0.000	0.003	0.000
		Mitchell	335	0.000	0.000	0.038	0.000	0.035	0.000	0.033	0.000	0.031	0.000	0.029	0.000	0.027	0.000	0.025	0.000	0.023	0.000	0.021	0.000
		Nolan	353	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000
		Palo Pinto	363	0.000	0.000	0.016	0.000	0.015	0.000	0.014	0.000	0.013	0.000	0.012	0.000	0.011	0.000	0.010	0.000	0.010	0.000	0.009	0.000
		Pecos	371	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Presidio	377	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Red River	387	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Robertson	395	0.000	0.000	0.004	0.000	0.004	0.000	0.003	0.000	0.003	0.000	0.003	0.000	0.003	0.000	0.003	0.000	0.002	0.000	0.002	0.000
		Taylor	441	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Titus	449	0.000	0.000	0.014	0.000	0.014	0.000	0.013	0.000	0.012	0.000	0.011	0.000	0.010	0.000	0.010	0.000	0.009	0.000	0.008	0.000
		Tom Green	451	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Upton	461	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Ward	475	0.000	0.000	0.047	0.000	0.044	0.000	0.041	0.000	0.039	0.000	0.036	0.000	0.034	0.000	0.031	0.000	0.028	0.000	0.026	0.000
		Webb	479	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000
		Wharton	481	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000
		Wichita	485	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Wilbarger	487	0.000	0.000	0.002	0.000	0.002	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000
		Wise	497	0.000	0.000	0.007	0.000	0.007	0.000	0.006	0.000	0.006	0.000	0.006	0.000	0.005	0.000	0.005	0.000	0.004	0.000	0.004	0.000
		Young	503	0.000	0.000	0.016	0.000	0.015	0.000	0.014	0.000	0.013	0.000	0.012	0.000	0.011	0.000	0.010	0.000	0.010	0.000	0.009	0.000

7.3.5 SECO.

The annual MWh savings from energy conservation projects reported by political subdivisions for 35 counties for 2004 were obtained from the State Energy Conservation Office. These submittals included the the SECO SB 5 website (run by the Laboratory) and paper submittals. These annual MWh savings numbers were divided by 365 to get average MWh savings per day for the OSD calculations. A summary of all the projects submitted is given in Table 105 through Table 108. In these submittals, there were several municipalities whose electricity or natural consumption increased in 2004 as compared to 2001, which caused the reported savings from these municipalities to be negative. Since no additional information was reported from these projects, which might have indicated what the cause of this was, it was assumed that the energy conservation projects were working as designed, but that other factors had changed the energy consumption. Therefore, in the final values of electricity savings from the political subdivisions that reported to SECO for the calculation of annual and OSD NOx reductions, the negative savings were omitted.

The annual and average day MWh numbers where then summarized according to county and program as shown in Table 109. Using the actual reported numbers for 2004, savings up to 2013 were projected using the different adjustment factors mentioned above. As an example, using 100 MWh for the reported year for Bastrop County and 5% for annual degradation factor (a), 7% for the transmission and distribution loss (b), and 50% for the discount factor (c), the projected savings for 2005 will be calculated as:

$$MWh2005 = ((1- 4a \times MWh2001) + (1- 3a \times MWh2002) + (1- 2a \times MWh2003) + (1- a \times MWh2004) + MWh2004) \times ((1 + b) \times (1 - c)) \quad (4)$$

The projected 2005 cumulative savings are 104 MWh for an actual savings of 100MWh for 2004. It is assumed that the same amount of MWh savings will be achieved for each year after 2004 until 2013.

The 2007 annual and OSD eGRID was then used to calculate the NOx emissions savings for the SECO program. An example of the eGRID spreadsheet is given in Table 19. The total MWh savings for each PCA are used to calculate the NOx emissions reduction for each of the different county through the USA-EPA prescribed emission fractions. The eGRID spreadsheet shown in Table 110 was duplicated for each of the analysis from 2004 through 2013. NOx emission reduction numbers for each county and SIP area for the different programs is provided in Table 111, which shows the annual and OSD NOx emissions reductions for each county for the years 2004 to 2013.

Table 104: Summary of the Projects Submitted under the SECO Program.

Serial No:	Project ID	Project Type [1]	Location		Organization		Project Information Uploaded	Savings Reporting Format		
			City	County				Annual electric (MWh)	Peak Demand (kW)	Annual gas (MCF)
1	109	ECRM	Forth Worth	TARRANT	City of Fort Worth	Ft. Worth	ECRM Spreadsheet	4,347	3,431	4,437
2	111	ECRM	Forth Worth	TARRANT	City of Fort Worth	Ft. Worth	ECRM Spreadsheet	86	358	-
3	93	SECO		BEXAR	City of Windcrest	Windcrest	No Information Uploaded	0	-	-
4	100	SECO	Alamo Heights	BEXAR	City of Alamo Heights	Alamo Heights	No Information Uploaded	0	-	-
5	102	SECO		COLLIN	County of Collin	Collin	No Information Uploaded	0	-	-
6	104	SECO		COLLIN	County of Collin	Collin	No Information Uploaded	0	-	-
7	30	SECO		COMAL	County of Comal	Comal	No Information Uploaded	0	-	-
8	85	SECO	Dallas	DALLAS	City of Dallas	Dallas	No Information Uploaded	138,628	-	-
9	107	SECO	Farmers Branch	DALLAS	City of Farmers Branch	Farmers Branch	No Information Uploaded	2,064	-	-
10	116	SECO	Mesquite	DALLAS	City of Mesquite	Mesquite	No Information Uploaded	0	-	-
11	122	SECO	Dallas	DALLAS	Dallas - Fort Worth International Airport	DFW airport	Summary Report	0	-	-
12	127	SECO	Cedar Hill	DALLAS	City of Cedar Hill	Cedar Hill	No Information Uploaded	1,394	-	-
13	103	SECO		EL PASO	Horizon Regional Municipal Utility District	El Paso	No Information Uploaded	0	-	-
14	89	SECO	Milford	ELLIS	City of Milford	Milford	No Information Uploaded	0	-	-
15	98	SECO	Sugar Land	FORT BEND	City of Sugar Land	Sugar Land	No Information Uploaded	0	-	-
16	91	SECO	Galveston	GALVESTON	City of Galveston	Galveston	No Information Uploaded	5,900	-	-
17	82	SECO	Kilgore	GREGG	City of Kilgore	Kilgore	No Information Uploaded	715	-	-
18	90	SECO		GUADALUPE	Cibolo Creek Municipal Authority	Guadalupe	No Information Uploaded	49	-	-
19	126	SECO	Lumberton	HARDIN	City of Lumberton	Lumberton	No Information Uploaded	0	-	-
20	86	SECO	Bellaire	HARRIS	City of Bellaire	Bellaire	Summary Report	2,100	-	-
21	97	SECO	Bellaire	HARRIS	City of Bellaire	Bellaire	Summary Report	2,357	-	-
22	105	SECO	Nederland	JEFFERSON	City of Nederland	Nederland	No Information Uploaded	1,743	-	-
23	118	SECO	Talty	KAUFMAN	Town of Talty	Talty	No Information Uploaded	0	-	-
24	119	SECO	Corpus Christi	NUECES	City of Corpus Christi	Corpus Christi	No Information Uploaded	0	-	-
25	31	SECO		ORANGE	Orange County Navigation and Port District	Orange	No Information Uploaded	5	-	-
26	117	SECO		ROCKWALL	County of Rockwall	Rockwall	Summary Report	0	-	-
27	129	SECO	Tyler	SMITH	City of Tyler, Texas	Tyler	No Information Uploaded	662	-	-
28	94	SECO	Watauga	TARRANT	City of Watauga	Watauga	No Information Uploaded	0	-	-
29	95	SECO	Pantego	TARRANT	Town Of Pantego	Pantego	No Information Uploaded	2	-	-
30	108	SECO	Forth Worth	TARRANT	City of Fort Worth	Ft. Worth	No Information Uploaded	43,116	-	-
31	123	SECO	Pantego	TARRANT	Town Of Pantego	Pantego	No Information Uploaded	65	-	-
32	81	SECO		TRAVIS	Lower Colorado River Authority	LCRA	No Information Uploaded	2,621	-	-
33	83	SECO	Austin	TRAVIS	City of Austin	Austin	No Information Uploaded	31,326	-	-
34	92	SECO		TRAVIS	Travis County Sheriff's Office	Travis	No Information Uploaded	244	-	-
35	84	SECO		VICTORIA	County of Victoria	Victoria	No Information Uploaded	0	-	-
36	134	SECO		TARRANT	County of Tarrant	Tarrant	No Information Uploaded	2,057	-	-
37	135	SECO		LIBERTY	County of Liberty	Liberty	No Information Uploaded	14	-	-
38	139	SECO		TARRANT	County of Tarrant	Tarrant	No Information Uploaded	1,403	-	-
39	140	SECO		GREGG	County of Gregg	Gregg	No Information Uploaded	13,248	-	-
40	142	SECO		ELLIS	County of Ellis	Ellis	No Information Uploaded	0	-	-
41	217	SECO		COLLIN	County of Collin	Collin	No Information Uploaded	0	-	-
42	221	SECO		BEXAR	City of Leon Valley	Leon Valley	Summary Report	96	-	-
43	223	SECO		DENTON	County of Denton	Denton	No Information Uploaded	5,256	-	-
44	Paper submittal	SECO	Carrollton	DENTON, COLLIN, DALLAS	City of Carrollton	Carrollton	Summary Report/utility bills	6,112	-	-
45	Paper submittal	SECO	Plano	COLLIN	City of Plano	Plano	Summary Report	2,417	-	-
46	SECO database	SECO	Bastrop	BASTROP	City of Bastrop	Bastrop	Summary Report	0	-	-
47	SECO database	SECO	Elgin	BASTROP	City of Elgin	Elgin	Summary Report	14	-	-
48	SECO database	SECO	Elmendorf	BEXAR	City of Elmendorf	Elmendorf	Summary Report	0	-	-
49	SECO database	SECO	Helotes	BEXAR	City of Helotes	Helotes	Summary Report	0	-	-
50	SECO database	SECO	Live Oak	BEXAR	City of Live Oak	Live Oak	Summary Report	0	-	-

Table 105: Summary of the Projects Submitted under the SECO Program (cont'd).

Serial No:	Project ID	Project Type [1]	Location		Organization		Project Information Uploaded	Savings Reporting Format		
			City	County				Annual electric (MWh)	Peak Demand (kW)	Annual gas (MCF)
51	SECO database	SECO	San Antonio	BEXAR	City of San Antonio	San Antonio	Summary Report	0	-	-
52	SECO database	SECO		BEXAR	VIA Metropolitan Transit	VIA Transit	Summary Report	984	-	-
53	SECO database	SECO	Liverpool	BRAZORIA	City of Liverpool	Liverpool	Summary Report	0	-	-
54	SECO database	SECO	Manvel	BRAZORIA	City of Manvel	Manvel	Summary Report	0	-	-
55	SECO database	SECO	Quintata	BRAZORIA	City of Quintana	Quintata	Summary Report	2	-	-
56	SECO database	SECO	Richwood	BRAZORIA	City of Richwood	Richwood	Summary Report	0	-	-
57	SECO database	SECO	Allen	COLLIN	City of Allen	Allen	Summary Report	1,443	-	-
58	SECO database	SECO	Mckinney	COLLIN	City of McKinney	Mckinney	Summary Report	0	-	-
59	SECO database	SECO	Nevada	COLLIN	City of Nevada	Nevada	Summary Report	0	-	-
60	SECO database	SECO		COLLIN	North Texas Municipal Water District	NTMWD	Summary Report	0	-	-
61	SECO database	SECO	Bulverde	COMAL	City of Bulverde	Bulverde	Summary Report	0	-	-
62	SECO database	SECO	Garden Ridge	COMAL	City of Garden Ridge	Garden Ridge	Summary Report	38	-	-
63	SECO database	SECO	New Braunfels	COMAL	New Braunfels Utilities	New Braunfels	Summary Report	966	-	-
64	SECO database	SECO	Addison	DALLAS	City of Addison	Addison	Summary Report	0	-	-
65	SECO database	SECO	Coppell	DALLAS	City of Coppell	Coppell	Summary Report	0	-	-
66	SECO database	SECO	DeSoto	DALLAS	City of DeSoto	DeSoto	Summary Report	4	-	-
67	SECO database	SECO	Highland Park	DALLAS	City of Highland Park	Highland Park	Summary Report	57	-	-
68	SECO database	SECO	Irving	DALLAS	City of Irving	Irving	Summary Report	3,003	-	-
69	SECO database	SECO	Rowlett	DALLAS	City of Rowlett	Rowlett	Summary Report	812	-	-
70	SECO database	SECO	Sachse	DALLAS	City of Sachse	Sachse	Summary Report	0	-	-
71	SECO database	SECO	Sunnyvale	DALLAS	City of Sunnyvale	Sunnyvale	Summary Report	0	-	-
72	SECO database	SECO	Unversity Park	DALLAS	City of University Park	Unversity Park	Summary Report	488	-	-
73	SECO database	SECO	Dallas	DALLAS	Dallas Area Rapid Transit	Dallas	Summary Report	0	-	-
74	SECO database	SECO	Bartonville	DENTON	City of Bartonville	Bartonville	Summary Report	0	-	-
75	SECO database	SECO	Cross Roads	DENTON	City of Cross Roads	Cross Roads	Summary Report	0	-	-
76	SECO database	SECO	Hebron	DENTON	City of Hebron	Hebron	Summary Report	0	-	-
77	SECO database	SECO	Justin	DENTON	City of Justin	Justin	Summary Report	0	-	-
78	SECO database	SECO	Krum	DENTON	City of Krum	Krum	Summary Report	0	-	-
79	SECO database	SECO	Lewisville	DENTON	City of Lewisville	Lewisville	Summary Report	0	-	-
80	SECO database	SECO	Northlake	DENTON	City of Northlake	Northlake	Summary Report	0	-	-

Table 106: Summary of the Projects Submitted under the SECO Program (cont'd).

Serial No:	Project ID	Project Type [1]	Location		Organization		Project Information Uploaded	Savings Reporting Format		
			City	County				Annual electric (MWh)	Peak Demand (kW)	Annual gas (MCF)
81	SECO database	SECO	Oak Point	DENTON	City of Oak Point	Oak Point	Summary Report	0	-	-
82	SECO database	SECO	Denton	DENTON	County of Denton	Denton	Summary Report	0	-	-
83	SECO database	SECO		DENTON	Upper Trinity Regional Water District	UTRWD	Summary Report	0	-	-
84	SECO database	SECO	El Paso	EL PASO	City of El Paso	El Paso	Summary Report	0	-	-
85	SECO database	SECO	Horizon City	EL PASO	City of Horizon City	Horizon City	Summary Report	0	-	-
86	SECO database	SECO	Socorro	EL PASO	City of Socorro	Socorro	Summary Report	0	-	-
87	SECO database	SECO	Garrett	ELLIS	City of Garrett	Garrett	Summary Report	0	-	-
88	SECO database	SECO	Glenn Heights	ELLIS	City of Glenn Heights	Glenn Heights	Summary Report	0	-	-
89	SECO database	SECO	Pleak Village	FORT BEND	City of Pleak Village	Pleak Village	Summary Report	2	-	-
90	SECO database	SECO	Rosenberg	FORT BEND	City of Rosenberg	Rosenberg	Summary Report	0	-	-
91	SECO database	SECO	Simonton	FORT BEND	City of Simonton	Simonton	Summary Report	0	-	-
92	SECO database	SECO	Sugar Land	FORT BEND	City of Sugar Land	Sugar Land	Summary Report	0	-	-
93	SECO database	SECO	Thompson	FORT BEND	City of Thompsons	Thompson	Summary Report	0	-	-
94	SECO database	SECO	Gladewater	GREGG	City of Gladewater	Gladewater	Summary Report	760	-	-
95	SECO database	SECO	Seguin	GUADALUPE	City of Seguin	Seguin	Summary Report	1,061	-	-
96	SECO database	SECO	Hardin	HARDIN	County of Hardin	Hardin	Summary Report	0	-	-
97	SECO database	SECO	El Lago	HARRIS	City of El Lago	El Lago	Summary Report	1	-	-
98	SECO database	SECO	Hedwig Village	HARRIS	City of Hedwig Village	Hedwig Village	Summary Report	25	-	-
99	SECO database	SECO	Hilshire Village	HARRIS	City of Hilshire Village	Hilshire Village	Summary Report	0	-	-
100	SECO database	SECO	Humble	HARRIS	City of Humble	Humble	Summary Report	0	-	-
101	SECO database	SECO	Piney Point Village	HARRIS	City of Piney Point Village	Piney Point Village	Summary Report	0	-	-
102	SECO database	SECO	Seabrook	HARRIS	City of Seabrook	Seabrook	Summary Report	0	-	-
103	SECO database	SECO	Spring Valley	HARRIS	City of Spring Valley	Spring Valley	Summary Report	48	-	-
104	SECO database	SECO	Taylor Lake Village	HARRIS	City of Taylor Lake Village	Taylor Lake Village	Summary Report	0	-	-
105	SECO database	SECO	Houston	HARRIS	County of Harris	Houston	Summary Report	0	-	-
106	SECO database	SECO	Houston	HARRIS	Harris County Fresh Water Supply District 61	Houston	Summary Report	0	-	-
107	SECO database	SECO	Athens	HENDERSON	City of Athens	Athens	Summary Report	0	-	-
108	SECO database	SECO	Enchanted Oaks	HENDERSON	City of Enchanted Oaks	Enchanted Oaks	Summary Report	1	-	-
109	SECO database	SECO	Murchison	HENDERSON	City of Murchison	Murchison	Summary Report	46	-	-
110	SECO database	SECO	Celeste	HUNT	City of Celeste	Celeste	Summary Report	72	-	-

Table 107: Summary of the Projects Submitted under the SECO Program (cont'd).

Serial No:	Project ID	Project Type [1]	Location		Organization		Project Information Uploaded	Savings Reporting Format		
			City	County				Annual electric (MWh)	Peak Demand (kW)	Annual gas (MCF)
111	SECO database	SECO	Port Arthur	JEFFERSON	Port Of Port Author Navigation District	Port Arthur	Summary Report	0	-	-
112	SECO database	SECO	Alvarado	JOHNSON	City of Alvarado	Alvarado	Summary Report	37	-	-
113	SECO database	SECO	Burleson	JOHNSON	City of Burleson	Burleson	Summary Report	0	-	-
114	SECO database	SECO	Godley	JOHNSON	City of Godley	Godley	Summary Report	0	-	-
115	SECO database	SECO	Grandview	JOHNSON	City of Grandview	Grandview	Summary Report	0	-	-
116	SECO database	SECO	Venus	JOHNSON	City of Venus	Venus	Summary Report	0	-	-
117	SECO database	SECO	Kenefick	LIBERTY	City of Kenefick	Kenefick	Summary Report	2	-	-
118	SECO database	SECO	Roman Forest	MONTGOMERY	City of Roman Forest	Roman Forest	Summary Report	0	-	-
119	SECO database	SECO	Splendora	MONTGOMERY	City of Splendora	Splendora	Summary Report	3	-	-
120	SECO database	SECO	Montgomery	MONTGOMERY	County of Montgomery	Montgomery	Summary Report	0	-	-
121	SECO database	SECO	Bishop	NUECES	City of Bishop	Bishop	Summary Report	62	-	-
122	SECO database	SECO	Orange	ORANGE	City of Orange	Orange	Summary Report	0	-	-
123	SECO database	SECO	Rose City	ORANGE	City of Rose City	Rose City	Summary Report	0	-	-
124	SECO database	SECO		ORANGE	Orange County Emergency Services District No. 1	OCESD	Summary Report	4	-	-
125	SECO database	SECO	Annetta North	PARKER	City of Annetta North	Annetta North	Summary Report	0	-	-
126	SECO database	SECO	Health	ROCKWALL	City of Heath	Health	Summary Report	0	-	-
127	SECO database	SECO	New London	RUSK	City of New London	New London	Summary Report	0	-	-
128	SECO database	SECO	Reklaw	RUSK	City of Reklaw	Reklaw	Summary Report	0	-	-
129	SECO database	SECO	Lakeside	SAN PATRICIO	City of Lakeside	Lakeside	Summary Report	0	-	-
130	SECO database	SECO	Taft	SAN PATRICIO	City of Taft	Taft	Summary Report	0	-	-
131	SECO database	SECO		SAN PATRICIO	County of San Patricio	San Patricio	Summary Report	0	-	-
132	SECO database	SECO	Bedford	TARRANT	City of Bedford	Bedford	Summary Report	3,479	-	-
133	SECO database	SECO	Benbrook	TARRANT	City of Benbrook	Benbrook	Summary Report	774	-	-
134	SECO database	SECO	Dalworthington Gardens	TARRANT	City of Dalworthington Gardens	Dalworthington Gardens	Summary Report	372	-	-
135	SECO database	SECO	Everman	TARRANT	City of Everman	Everman	Summary Report	34	-	-
136	SECO database	SECO	Lakeside	TARRANT	City of Lakeside	Lakeside	Summary Report	0	-	-
137	SECO database	SECO	Richland Hills	TARRANT	City of Richland Hills	Richland Hills	Summary Report	47	-	-
138	SECO database	SECO	Saginaw	TARRANT	City of Saginaw	Saginaw	Summary Report	0	-	-
139	SECO database	SECO	Westlake	TARRANT	City of Westlake	Westlake	Summary Report	0	-	-
140	SECO database	SECO	Westworth Village	TARRANT	City of Westworth Village	Westworth Village	Summary Report	0	-	-

Table 108: Summary of the Projects Submitted under the SECO Program (cont'd).

Serial No:	Project ID	Project Type [1]	Location		Organization		Project Information Uploaded	Savings Reporting Format		
			City	County				Annual electric (MWh)	Peak Demand (kW)	Annual gas (MCF)
141	SECO database	SECO		TARRANT	County of Tarrant	Tarrant	Summary Report	1,068	-	-
142	SECO database	SECO		TARRANT	Trinity River Authority of Texas	TRA	Summary Report	2,078	-	-
143	SECO database	SECO	Lakeway	TRAVIS	City of Lakeway	Lakeway	Summary Report	0	-	-
144	SECO database	SECO	West Lake hills	TRAVIS	City of West Lake Hills	West Lake hills	Summary Report	30	-	-
145	SECO database	SECO		TRAVIS	County of Travis	Travis	Summary Report	270	-	-
146	SECO database	SECO	Ore City	UPSHUR	City of Ore City	Ore City	Summary Report	0	-	-
147	SECO database	SECO	Pattison	WALLER	City of Pattison	Pattison	Summary Report	0	-	-
148	SECO database	SECO	Leander	WILLIAMSON	City of Leander	Leander	Summary Report	0	-	-
149	SECO database	SECO	Thrall	WILLIAMSON	City of Thrall	Thrall	Summary Report	0	-	-

Table 109: Projected Annual and OSD MWh Savings for SECO by County.

Fip Codes	County	Cumulative Energy Savings 2005 Electric		Cumulative Energy Savings 2006 Electric		Cumulative Energy Savings 2007 Electric		Cumulative Energy Savings 2008 Electric		Cumulative Energy Savings 2009 Electric		Cumulative Energy Savings 2010 Electric		Cumulative Energy Savings 2011 Electric		Cumulative Energy Savings 2012 Electric		Cumulative Energy Savings 2013 Electric	
		MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day
021	Bastrop	12	0.0	17	0.0	22	0.1	27	0.1	31	0.1	36	0.1	40	0.1	43	0.1	46	0.1
029	Bexar	901	2.5	1,317	3.6	1,710	4.7	2,080	5.7	2,427	6.6	2,750	7.5	3,051	8.4	3,328	9.1	3,582	9.8
039	Brazoria	1	0.0	2	0.0	2	0.0	3	0.0	3	0.0	4	0.0	4	0.0	5	0.0	5	0.0
085	Collin	3,221	8.8	4,708	12.9	6,112	16.7	7,434	20.4	8,673	23.8	9,829	26.9	10,903	29.9	11,894	32.6	12,803	35.1
091	Comal	838	2.3	1,225	3.4	1,590	4.4	1,933	5.3	2,256	6.2	2,556	7.0	2,836	7.8	3,094	8.5	3,330	9.1
113	Dallas	125,842	344.8	183,923	503.9	238,777	654.2	290,404	795.6	338,805	928.2	383,979	1,052.0	425,927	1,166.9	464,647	1,273.0	500,141	1,370.2
121	Denton	9,488	26.0	13,868	38.0	18,004	49.3	21,896	60.0	25,546	70.0	28,952	79.3	32,115	88.0	35,034	96.0	37,710	103.3
141	El Paso	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
139	Ellis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
157	Fort Bend	1	0.0	2	0.0	2	0.0	3	0.0	3	0.0	4	0.0	4	0.0	5	0.0	5	0.0
167	Galveston	4,924	13.5	7,197	19.7	9,343	25.6	11,363	31.1	13,257	36.3	15,024	41.2	16,666	45.7	18,181	49.8	19,569	53.6
183	Gregg	12,288	33.7	17,959	49.2	23,315	63.9	28,356	77.7	33,082	90.6	37,493	102.7	41,589	113.9	45,370	124.3	48,836	133.8
187	Guadalupe	927	2.5	1,355	3.7	1,759	4.8	2,139	5.9	2,496	6.8	2,829	7.8	3,138	8.6	3,423	9.4	3,685	10.1
199	Hardin	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
201	Harris	3,781	10.4	5,527	15.1	7,175	19.7	8,726	23.9	10,180	27.9	11,538	31.6	12,798	35.1	13,962	38.3	15,028	41.2
213	Henderson	40	0.1	58	0.2	75	0.2	92	0.3	107	0.3	121	0.3	134	0.4	146	0.4	158	0.4
231	Hunt	60	0.2	88	0.2	114	0.3	139	0.4	162	0.4	184	0.5	204	0.6	223	0.6	240	0.7
245	Jefferson	1,455	4.0	2,126	5.8	2,760	7.6	3,357	9.2	3,917	10.7	4,439	12.2	4,924	13.5	5,371	14.7	5,782	15.8
251	Johnson	31	0.1	46	0.1	59	0.2	72	0.2	84	0.2	95	0.3	105	0.3	115	0.3	124	0.3
257	Kaufmann	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
291	Liberty	13	0.0	20	0.1	25	0.1	31	0.1	36	0.1	41	0.1	45	0.1	49	0.1	53	0.1
339	Montgomery	3	0.0	4	0.0	5	0.0	6	0.0	8	0.0	9	0.0	9	0.0	10	0.0	11	0.0
355	Nueces	51	0.1	75	0.2	98	0.3	119	0.3	139	0.4	157	0.4	174	0.5	190	0.5	205	0.6
361	Orange	172	0.5	251	0.7	326	0.9	397	1.1	463	1.3	524	1.4	582	1.6	634	1.7	683	1.9
367	Parker	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
397	Rockwall	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
401	Rusk	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
409	San Patricio	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
423	Smith	553	1.5	808	2.2	1,048	2.9	1,275	3.5	1,488	4.1	1,686	4.6	1,870	5.1	2,040	5.6	2,196	6.0
439	Tarrant	50,961	139.6	74,481	204.1	96,694	264.9	117,601	322.2	137,201	375.9	155,495	426.0	172,482	472.6	188,162	515.5	202,536	554.9
453	Travis	28,785	78.9	42,070	115.3	54,618	149.6	66,427	182.0	77,498	212.3	87,831	240.6	97,426	266.9	106,283	291.2	114,402	313.4
459	Upshur	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
469	Victoria	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
473	Waller	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
491	Williamson	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Totals	244,349	669	357,125	978	463,636	1,270	563,881	1,545	657,861	1,802	745,576	2,043	827,026	2,266	902,210	2,472	971,129	2,661

Table 110: Example of NOx Emissions Reduction Calculations According to Counties and PCA.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.008831132	0.544907354	0.010890729	26.07120247	0.006522185	0	0.003944232	0	0.065444292	582.4260317	0.014877434	47.52881906	0.006262315	0	0.004817148	0	0.121274957	58.67294524	0.00816387	2131.183955	2846.427861	1.423213931
	Chambers	0.021762222	1.342794396	0.026955801	64.52921058	0.016072371	0	0.009076193	0	0.164940225	1467.897022	0.037472294	119.7124385	0.015055623	0	0.009553214	0	0.011518588	5.572704478	0.015818592	4129.454499	5788.50867	2.894254335
	Fort Bend	0.070431234	4.34581841	0.087239726	208.8422711	0.052016606	0	0.029374182	0	0.533812376	4750.700422	0.121275295	387.4372134	0.048726002	0	0.030918012	0	0.037278747	18.03549507	0.051195276	13364.56232	18733.92354	9.366961769
	Galveston	0.033856739	2.089062378	0.041710519	99.8503755	0.025004711	0	0.015351589	0	0.249587379	2221.220262	0.056747051	181.289351	0.024143087	0	0.019297151	0	0.567751219	274.6786074	0.032836887	8572.092027	11351.21969	5.675609843
	Harris	0.068267332	4.212299208	0.084559408	202.425884	0.050418468	0	0.028471701	0	0.517411736	4604.741785	0.117549281	375.5337461	0.047228963	0	0.029968099	0	0.03613341	17.48137967	0.049622373	12953.9548	18158.3499	9.079174949
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.002039135	0.125820756	0.003716345	8.896518678	0.001505992	0	0.005950953	0	0.002481478	22.08408797	0.000717051	2.290756256	0.019166247	0	0.07668094	0	0.00086441	0.418202493	0.004000199	1044.254803	1078.070189	0.539035095
	Dallas	0.004539471	0.280098988	0.004683963	11.21288926	0.003352602	0	0.00774211	0	0.002085611	18.56104214	0.00068106	2.17577798	0.007502816	0	0.026717045	0	0.007524933	3.640570146	0.040370454	10538.73498	10574.60536	5.287302679
	Denton	0.00047388	0.029239836	0.000872802	2.089390459	0.000349982	0	0.001396994	0	0.000585443	5.210193956	0.000168971	0.539808754	0.00454374	0	0.018187155	0	0.000186605	0.090279924	0.000849405	221.7378646	229.6967775	0.114848389
	Tarrant	0.012162492	0.750462263	0.012266309	29.36419013	0.008982543	0	0.020308652	0	0.005316504	47.31460213	0.001752506	5.598717155	0.017326428	0	0.060216761	0	0.020603444	9.967966987	0.110647237	28884.53789	28977.53383	14.48876692
	Ellis	0.003279814	0.202374334	0.003307809	7.918530642	0.002422289	0	0.005476558	0	0.001433682	12.75915069	0.000472592	1.509784985	0.004672353	0	0.016238427	0	0.005556053	2.688024143	0.029837824	7789.184628	7814.262493	3.907131246
	Johnson	0.000286058	0.017650666	0.000526868	1.26126338	0.000211267	0	0.000843297	0	0.000353404	3.145140637	0.000101999	0.325856285	0.002742835	0	0.010978701	0	0.000112645	0.054497599	0.000512745	133.8523622	138.6567708	0.069328385
	Kaufman	0.006325453	0.390299397	0.006379446	15.2716882	0.004671629	0	0.010562096	0	0.002765	24.60731414	0.000911441	2.911773229	0.009011105	0	0.031317452	0	0.010715411	5.184126759	0.057545265	15022.23131	15070.59652	7.535298258
	Parker	0.000217489	0.013419753	0.000400576	0.958935103	0.000160626	0	0.000641157	0	0.000268692	2.391241838	7.75498E-05	0.247747644	0.00208537	0	0.008347076	0	8.56434E-05	0.041434375	0.000389838	101.7675855	105.4203642	0.052710182
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.000819895	0.050589977	0.000826893	1.979491539	0.000605529	0	0.001369042	0	0.000358395	3.189560283	0.00011814	0.377419339	0.001168005	0	0.004059317	0	0.001388914	0.671958131	0.007458924	1947.157341	1953.42636	0.97671318
	Hood	0.01252711	0.772960263	0.012634039	30.24449493	0.009251829	0	0.020917482	0	0.005475887	48.73303972	0.001805044	5.766560284	0.017845854	0	0.062021991	0	0.021221112	10.26679522	0.113964315	29750.46326	29846.24711	14.92312356
	Hunt	0.006187558	0.381790913	0.006240374	14.9387671	0.004569788	0	0.010331844	0	0.002704724	24.07087744	0.000891572	2.848296898	0.008814664	0	0.030634735	0	0.010481817	5.071113375	0.056290785	14694.74835	14742.0592	7.371029598
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.033413751	2.061728678	0.051775843	123.9456514	0.024677545	0	0.090663423	0	0.001141841	10.16189579	1.143571754	3653.359534	0.046873844	0	0.004669544	0	0.000519582	0.251374449	0.002503865	653.6357393	4443.415924	2.221707962
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.002000467	0.123434826	0.076378745	182.8422801	0.001477434	0	0.133848731	0	0.001237133	11.00994923	0.003554796	11.35647921	0.001061766	0	0.001855699	0	0.000401718	0.194351729	0.001835165	479.0710467	684.5975418	0.342298771
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.004502334	0.277807503	0.171901148	411.5123661	0.003325174	0	0.301245466	0	0.002784342	24.7794452	0.008000571	25.55935984	0.002389654	0	0.004176513	0	0.000904124	0.437416006	0.004130298	1078.217029	1540.783424	0.770391712
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.002458599	0.151702943	0.093870431	224.7154467	0.001815785	0	0.164501762	0	0.001520452	13.53136517	0.004368889	13.95725484	0.001304924	0	0.002280677	0	0.000493717	0.238860703	0.00225544	588.7843022	841.3789325	0.420689466
	Travis	0.000510007	0.031468963	0.299602906	717.2162711	0.000376663	0	0.033939476	0	0.000334709	2.978764145	0.000906121	2.894777541	0.000271138	0	0.000471744	0	0.000103327	0.049989642	0.000467336	121.9983263	845.1695976	0.422584799
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0.000685965	0.042326089	0.00069182	1.656140985	0.000506616	0	0.001145408	0	0.000299851	2.668544625	9.88414E-05	0.315767774	0.000977211	0	0.003396227	0	0.001162035	0.562193562	0.006240507	1629.088588	1634.333561	0.81716678
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22756873	14.04167334	0.004556851	10.90859881	0.168069652	0	0.007612767	0	0.001680888	14.95917858	0.001626796	5.197112111	0.046792036	0	0.007246366	0	0.001609426	0.77864189	0.008283395	2162.385926	2208.271131	1.104135565
	San Patricio	0.050313351	3.104484713	0.001007478	2.411790775	0.037158653	0	0.001683113	0	0.000371629	3.307336674	0.00035967	1.149033645	0.010345288	0	0.001602105	0	0.000355829	0.172150554	0.001831382	478.083622	488.2284183	0.244114209
Victoria Area	Victoria	0.021836736	1.347392101	0.002215582	5.303859041	0.016127403	0	0.003612695	0	0.001199621	10.67611171	0.000555389	1.774296138	0.52545648	0	0.032412721	0	0.000476855	0.230703089	0.002254849	588.6299358	607.9622979	0.303981149
Other ERCOT counties	Andrews	2.47421E-05	0.001526661	2.49533E-05	0.05973539	1.82731E-05	0	4.13138E-05	0	1.08153E-05	0.096251801	3.56511E-06	0.011389436	3.5247E-05	0	0.000122499	0	4.19135E-05	0.020277773	0.000225089	58.75963608	58.94881714	0.029474409
	Angelina	0.00031082	0.019178521	0.000313473	0.750419813	0.000229554	0	0.000519	0	0.000135867	1.209153555	4.47864E-05	0.143078636	0.000442787	0	0.001538876	0	0.000526534	0.254737484	0.002827658	738.1620076	740.5385756	0.370269288
	Bosque	0.000595392	0.036737458	0.001096604	2.625147967	0.000439723	0	0.001755208	0	0.000735562	6.546181933	0.000212298	0.678225483	0.005708837	0	0.02285067	0	0.000234455	0.11342933	0.001067208	278.5954641	288.5951862	0.144297593
	Brazos	0.001939725	0.119686864	0.003572622	8.552462298	0.001432574	0	0.005718288	0	0.002396384	21.326788	0.000691644	2.209588925	0.018598805	0	0.074445136	0	0.000763829	0.3695411	0.003476855	907.6353914	940.2134586	0.470106729
	Calhoun	0.082699809	5.102826292	0.001655986	3.964248665	0.061077496	0	0.002766524	0	0.000610844	5.436253065	0.000591187	1.888660965	0.0170045	0	0.002633372	0	0.000584875	0.282963021	0.003010234	785.823704	802.498656	0.401249328
	Cameron	0.048371747	2.984681902	0.000968599	2.31871919	0.297964476	0	0.001618161	0	0.000357288	3.179705758	0.00034579	1.104692161	0.009946061	0	0.001540279	0	0.000342098	0.165507223	0.001760709	459.6342602	469.3875664	0.234693783
	Cherokee	0.003503899	0.216201074	0.003533808	8.4595452	0.002587786	0	0.00585073	0	0.001531635	13.63088897	0.00050488	1.612937412	0.00499158	0	0.017347879	0	0.005935657	2.871676927	0.031876422	8321.361931	8348.153181	4.17407659
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.001298787	0.080139047	2.6007E-05	0.062257873	0.000959212	0	4.34478E-05	0	9.59321E-06	0.085375459	9.2845E-06	0.02966111	0.000267053	0	4.13567E-05	0	9.18536E-06	0.004443888	4.72752E-05	12.3412319	12.60310927	0.006301555
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.003535748	0.218166236	0.003565928	8.536438346	0.002611307	0	0.005903911	0	0.001545556	13.75478711	0.00050947	1.627598227	0.005036951	0	0.017505563	0	0.00598961	2.897779072	0.032166163	8396.999058	8424.033827	4.212016913
	Fannin	0.007056315	0.435395786	0.007116546	17.03622589	0.005211403	0	0.011782473	0	0.003084477	27.45051867	0.001016752	3.248208437	0.010052276	0	0.034935966	0	0.011953503	5.783116662	0.064194222	16757.94599	16811.89945	8.405949726
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.003677178	0.226892886	0.003708565	8.877895879	0.00271576	0	0.006140067	0	0.001607379	14.30497859	0.000529848	1.692702156	0.005238429	0	0.018205785	0	0.006229194	3.013690234	0.033452809	8732.87902	8760.99518	4.38049759
	Frio	0.008588335	0.529926013	0.000871383	2.085994769	0.006342868	0	0.001420864	0	0.000471808	4.198888586	0.000218433	0.697826325	0.206660746	0	0.012747844	0	0.000187546	0.09073496	0.000886827	231.5067119	239.1100826	0.119555041
	Grimes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.188527456	11.63270961	0.003775086	9.037139596	0.139235931	0	0.006306735	0	0.001392518	12.39280933	0.001347706	4.305505086	0.03876448	0	0.006003193	0	0.001333316	0.645059515	0.006862311	1791.410961	1829.424184	0.914712092
	Howard	0.000555113	0.03425214	0.000559851	1.340222435	0.000409976	0	0.000926915	0	0.000242653	2.159504177	7.99868E-05	0.255533229	0.000790802	0	0.002748377	0	0.00094037	0.454951862	0.005050094	1318.33044	1322.574904	0.661287452
	Jack	0.002121449	0.130899742	0.002139557	5.121863007	0.001566784	0	0.003542346	0	0.000927334	8.252872265	0.000305682	0.976558936	0.00302217	0	0.010503338	0	0.003593766	1.738667443	0.019299698	5038.199435	5054.420296	2.527210148
	Jones	0.040718722	2.512467314	0.000815354	1.951868362	0.030072592	0	0.001362147	0	0.00030076	2.676635918	0.000291082	0.929915829	0.008372468	0	0.001296587	0	0.000287974	0.139321878	0.001482142	386.914282	395.1244913	0.197562246
	Lamar	0.000950838	0.058669548	0.000958954	2.295630084	0.000702236	0	0.001587687	0	0.000415633	3.698955209	0.000137007	0.437695829	0.001354543	0	0.004707619	0	0.001610734	0.779274511	0.008650166	2258.13189	2265.402115	1.132701058
	Limestone	0.000719757	0.044411153	0.000891528	2.13421849	0.000531572	0	0.000300183	0	0.00545518	48.54875704	0.001239347	3.959330935	0.000497945	0	0.00031596	0	0.000380962	0.184309847	0.000523179	136.5762585	191.447286	0.095723643
	Llano	0.001238174	0.076399047	0.047274044	113.1688398	0.000914447	0	0.082844655	0	0.000765714	6.814524412	0.002200214	7.029006507	0.000657172	0	0.001148571	0	0.000248641	0.120292526	0.001135861	296.5173839	423.7264462	0.211863223
	McLennan	0.024534317	1.513840977	0.024743738	59.23377689	0.018119687	0	0.040966843	0	0.010724513	95.44355126	0.003535175	11.29379565	0.034951066	0	0.121469933	0	0.041561501	20.1074959	0.22319886	58266.21697	58453.80943	29.22690471
	Milam	0.002245405	0.138548219	0.002264571	5.421133689	0.001658332	0	0.003749326	0	0.000981518	8.735087955	0.000323543	1.033619318	0.003198756	0	0.011117048	0	0.00380375	1.840257858	0.02042738	5332.58165	5349.750297	2.674875148
	Mitchell	0.014943169	0.92203834	0.015070721	36.07764232	0.011036196	0	0.024951762	0	0.006532002	58.13200651	0.002153177	6.878736109	0.02128772	0	0.07398395	0	0.025313952	12.24691524	0.135944204	35488.32854	35602.58588	17.80129294
	Nolan	0.000564654	0.034840827	0.000569473	1.363256663	0.000417022	0	0.000942846	0	0.000246823	2.196619294	8.13615E-05	0.259925046	0.000804394	0	0.002795613	0	0.000956532	0.462771061	0.005136889	1340.988414	1345.305827	0.672652913
	Palo Pinto	0.003206998	0.197881419	0.005906709	14.14000929	0.002368511	0	0.009454195	0	0.003962005	35.26013563	0.001143513	3.653171081	0.030749889	0	0.123082087	0	0.001262858	0.610971953	0.005748375	1500.617298	1554.479468	0.777239734
	Pecos	4.09677E-05	0.002527829	4.13174E-05	0.098909227	3.02565E-05	0	6.84069E-05	0	1.79079E-05	0.159372715	5.90308E-06	0.018858507	5.83617E-05	0	0.000202832	0	6.93999E-05	0.033575723	0.0003727	97.29358445	97.60682846	0.048803414
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.000737708	0.04551878	0.000835096	1.999128548	0.00054483	0	0.000735917	0	0.003149678	28.0307771	0.000730875	2.334921461	0.00076086	0	0.001866305	0	0.191632518	92.71200387	0.003397737	886.9817025	1012.104052	0.506052026
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.005696437	0.351487275	0.005745061	13.75304219	0.004207073	0	0.009511781	0	0.002490043	22.16031556	0.000820806	2.622220907	0.008115023	0	0.028203184	0	0.00964985	4.668607237	0.051822854	13528.39178	13571.94745	6.785973727
	Tom Green	0.001482448	0.091471492	2.96846E-05	0.071061745	0.001094854	0	4.95918E-05	0	1.09498E-05	0.097448385	1.05974E-05	0.033855481	0.000304817	0	4.72049E-05	0	1.04843E-05	0.005072297	5.39604E-05	14.08640283	14.38531223	0.007192656
	Upton	3.11661E-05	0.001923044	3.14322E-05	0.07524511	2.30176E-05	0	5.20405E-05	0	1.36234E-05	0.121242658	4.49076E-06	0.014346593	4.43986E-05	0	0.000154304	0	5.27959E-05	0.025542703	0.000283531	74.01601167	74.25431177	0.037127156
	Ward	0.018559529	1.145178593	0.01871795	44.8087047	0.013707039	0	0.030990277	0	0.008112796	72.20039188	0.002674262	8.543442287	0.026439509	0	0.091888626	0	0.03144012	15.21076138	0.16884373	44076.77253	44218.68101	22.1093405
	Webb	0.020014327	1.234944033	0.000400768	0.959394844	0.014781473	0	0.000669531	0	0.000147832	1.315637237	0.000143074	0.457078187	0.004115289	0	0.000637307	0	0.000141547	0.068480382	0.000728512	190.1785871	194.2141218	0.097107061
	Wharton	0.00014434	0.008906192	0.000178787	0.427995203	0.000106601	0	6.01986E-05	0	0.001093979	9.735945607	0.000248538	0.794002421	9.98576E-05	0	6.33625E-05	0	7.6398E-05	0.036961413	0.000104918	27.38894063	38.39275146	0.019196376
	Wichita	0.000207633	0.012811592	0.000209406	0.501293723	0.000153346	0	0.000346701	0	9.07612E-05	0.807735985	2.99181E-05	0.095579063	0.00029579	0	0.001027996	0	0.000351734	0.17016915	0.001888925	493.1052915	494.692881	0.247346441
	Wilbarger	0.028616818	1.765743526	0.000573025	1.371758711	0.021134796	0	0.000957307	0	0.000211372	1.881120012	0.00020457	0.653537997	0.005884109	0	0.000911232	0	0.000202386	0.09791439	0.001041639	271.9205081	277.6905827	0.138845291
	Wise	0.002844488	0.175513415	0.002882008	6.89920898	0.002100781	0	0.00476997	0	0.001256075	11.17853009	0.000413241	1.320178639	0.004181914	0	0.014614274	0	0.004797945	2.321250388	0.025761411	6725.034227	6746.928909	3.373464454
	Young	0.006235856	0.384771042	0.006289085	15.055374	0.004605458	0	0.010412491	0	0.002725836	24.25876645	0.000898531	2.870529726	0.008883468	0	0.030873859	0	0.010563634	5.110696746	0.056730171	14809.45051	14857.13065	7.428565326
	Total	**1.121837219**	**69.22072194**	**1.172570094**	**2807.003317**	**1.090766584**	**0**	**1.189130767**	**0**	**1.629360006**	**14500.60288**	**1.542362643**	**4927.373597**	**1.359385821**	**0**	**1.231642808**	**0**	**1.221806085**	**591.1110056**	**1.528786947**	**399090.8905**	**421986.202**	**210.993101**
Energy Savings by PCA (MWh)		62		2,394		0		0		8,900		3,195		0		0		484		261,051			

Table 111: NOx Emissions Reduction Values According to SIP Areas and Counties (SECO).

Program	Area	County	FIP Code	Total NOx emissions reduction (Tons) (2007 25% annual and ozone season eGrid)																			
				2004		Cumulative 2005		Cumulative 2006		Cumulative 2007		Cumulative 2008		Cumulative 2009		Cumulative 2010		Cumulative 2011		Cumulative 2012		Cumulative 2013	
				Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day
SECO	Houston-Galveston Area	Brazoria	039	1.423	0.004	1.188	0.004	1.736	0.005	2.254	0.007	2.741	0.008	3.198	0.009	3.624	0.011	4.020	0.012	4.386	0.013	4.721	0.013
		Chambers	071	2.894	0.008	2.416	0.007	3.530	0.010	4.583	0.013	5.574	0.015	6.503	0.018	7.371	0.020	8.176	0.023	8.919	0.025	9.600	0.025
		Fort Bend	157	9.367	0.020	7.818	0.017	11.426	0.025	14.834	0.032	18.041	0.039	21.048	0.046	23.854	0.052	26.460	0.057	28.865	0.063	31.070	0.063
		Galveston	167	5.676	0.013	4.737	0.011	6.923	0.016	8.988	0.021	10.931	0.026	12.753	0.030	14.454	0.034	16.032	0.038	17.490	0.041	18.826	0.041
		Harris	201	9.079	0.039	7.577	0.024	11.075	0.034	14.378	0.045	17.486	0.054	20.401	0.063	23.121	0.072	25.647	0.080	27.978	0.087	30.116	0.087
		Liberty	291	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Montgomery	339	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Waller	473	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Beaumont/ Port Arthur Area	Hardin	199	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Jefferson	245	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Orange	361	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Dallas/ Fort Worth Area	Collin	085	0.539	0.001	0.450	0.001	0.658	0.002	0.854	0.002	1.038	0.003	1.211	0.003	1.373	0.004	1.523	0.004	1.661	0.005	1.788	0.005
		Dallas	113	5.287	0.016	4.413	0.013	6.449	0.019	8.373	0.025	10.183	0.030	11.881	0.035	13.465	0.040	14.936	0.045	16.293	0.049	17.538	0.049
		Denton	121	0.115	0.000	0.096	0.000	0.142	0.001	0.182	0.001	0.221	0.001	0.258	0.001	0.292	0.001	0.324	0.001	0.354	0.001	0.381	0.001
		Tarrant	439	14.489	0.051	12.092	0.042	17.673	0.062	22.944	0.080	27.905	0.096	32.556	0.114	36.897	0.129	40.928	0.144	44.649	0.157	48.059	0.157
		Ellis	139	3.907	0.011	3.261	0.010	4.766	0.014	6.187	0.018	7.525	0.023	8.779	0.026	9.950	0.029	11.037	0.032	12.040	0.035	12.960	0.035
		Johnson	251	0.069	0.000	0.058	0.000	0.085	0.000	0.110	0.000	0.134	0.000	0.156	0.001	0.177	0.001	0.196	0.001	0.214	0.001	0.230	0.001
		Kaufman	257	7.535	0.021	6.289	0.018	9.192	0.026	11.933	0.034	14.513	0.041	16.932	0.048	19.189	0.054	21.286	0.060	23.221	0.065	24.995	0.065
		Parker	367	0.053	0.000	0.044	0.000	0.064	0.000	0.083	0.001	0.102	0.001	0.118	0.001	0.134	0.001	0.149	0.001	0.162	0.001	0.175	0.001
		Rockwall	397	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Henderson	213	0.977	0.003	0.815	0.003	1.191	0.004	1.547	0.005	1.881	0.006	2.195	0.007	2.487	0.008	2.759	0.009	3.010	0.010	3.240	0.010
		Hood	221	14.923	0.040	12.455	0.034	18.203	0.049	23.632	0.064	28.742	0.077	33.532	0.090	38.003	0.102	42.155	0.114	45.987	0.124	49.500	0.124
		Hunt	231	7.371	0.021	6.152	0.017	8.991	0.025	11.673	0.033	14.197	0.040	16.563	0.047	18.771	0.053	20.822	0.059	22.715	0.064	24.450	0.064
	El Paso Area	El Paso	141	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	San Antonio Area	Bexar	029	2.222	0.006	1.854	0.005	2.710	0.007	3.518	0.009	4.279	0.011	4.992	0.013	5.658	0.014	6.276	0.016	6.846	0.017	7.369	0.017
		Comal	091	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Guadalupe	187	0.342	0.001	0.286	0.001	0.418	0.001	0.542	0.001	0.659	0.002	0.769	0.002	0.872	0.002	0.967	0.003	1.055	0.003	1.135	0.003
		Wilson	493	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Austin Area	Bastrop	021	0.770	0.002	0.643	0.002	0.940	0.003	1.220	0.003	1.484	0.004	1.731	0.005	1.962	0.005	2.176	0.006	2.374	0.006	2.555	0.006
		Caldwell	055	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Hays	209	0.421	0.001	0.351	0.001	0.513	0.001	0.666	0.002	0.810	0.002	0.945	0.003	1.071	0.003	1.188	0.003	1.296	0.004	1.395	0.004
		Travis	453	0.423	0.001	0.353	0.001	0.515	0.001	0.669	0.002	0.814	0.002	0.950	0.003	1.076	0.003	1.194	0.003	1.302	0.004	1.402	0.004
		Williamson	491	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	North East Texas Area	Gregg	183	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Harrison	203	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Rusk	401	0.817	0.000	0.682	0.000	0.997	0.000	1.294	0.000	1.574	0.000	1.836	0.000	2.081	0.000	2.308	0.000	2.518	0.000	2.711	0.000
		Smith	423	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Upshur	459	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Corpus Christi Area	Nueces	355	1.104	0.003	0.922	0.002	1.347	0.004	1.749	0.005	2.127	0.006	2.481	0.007	2.812	0.008	3.119	0.008	3.403	0.009	3.662	0.009
		San Patricio	409	0.244	0.001	0.204	0.001	0.298	0.001	0.387	0.001	0.470	0.001	0.549	0.002	0.622	0.002	0.690	0.002	0.752	0.002	0.810	0.002
	Victoria Area	Victoria	469	0.304	0.001	0.254	0.001	0.371	0.001	0.481	0.001	0.585	0.002	0.683	0.002	0.774	0.002	0.859	0.002	0.937	0.002	1.008	0.002
	Other ERCOT counties	Andrews	003	0.029	0.000	0.025	0.000	0.036	0.000	0.047	0.000	0.057	0.000	0.066	0.000	0.075	0.000	0.083	0.000	0.091	0.000	0.098	0.000
		Angelina	005	0.370	0.001	0.309	0.001	0.452	0.001	0.586	0.002	0.713	0.002	0.832	0.002	0.943	0.003	1.046	0.003	1.141	0.003	1.228	0.003
		Bosque	035	0.144	0.001	0.120	0.001	0.176	0.001	0.229	0.001	0.278	0.001	0.324	0.001	0.367	0.002	0.408	0.002	0.445	0.002	0.479	0.002
		Brazos	041	0.470	0.001	0.392	0.001	0.573	0.002	0.744	0.002	0.905	0.002	1.056	0.003	1.197	0.003	1.328	0.004	1.449	0.004	1.559	0.004
		Calhoun	057	0.401	0.001	0.335	0.001	0.489	0.001	0.635	0.002	0.773	0.002	0.902	0.003	1.022	0.003	1.133	0.003	1.236	0.004	1.331	0.004
		Cameron	061	0.235	0.001	0.196	0.001	0.286	0.001	0.372	0.001	0.452	0.001	0.527	0.002	0.598	0.002	0.663	0.002	0.723	0.002	0.778	0.002
		Cherokee	073	4.174	0.011	3.484	0.010	5.092	0.014	6.610	0.018	8.039	0.022	9.379	0.026	10.630	0.029	11.791	0.032	12.863	0.035	13.845	0.035
		Coke	081	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Coleman	083	0.006	0.000	0.005	0.000	0.008	0.000	0.010	0.000	0.012	0.000	0.014	0.000	0.016	0.000	0.018	0.000	0.019	0.000	0.021	0.000
		Crockett	105	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Ector	135	4.212	0.012	3.515	0.010	5.138	0.014	6.670	0.019	8.112	0.023	9.464	0.027	10.726	0.030	11.898	0.033	12.980	0.037	13.971	0.037
		Fannin	147	8.406	0.025	7.016	0.021	10.254	0.030	13.312	0.039	16.190	0.048	18.888	0.056	21.407	0.063	23.745	0.070	25.904	0.077	27.883	0.077
		Fayette	149	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Freestone	161	4.380	0.012	3.656	0.010	5.343	0.015	6.937	0.020	8.437	0.024	9.843	0.028	11.155	0.031	12.374	0.035	13.499	0.038	14.530	0.038
		Frio	163	0.120	0.001	0.100	0.000	0.146	0.001	0.189	0.001	0.230	0.001	0.269	0.001	0.304	0.001	0.338	0.002	0.368	0.002	0.397	0.002
		Grimes	185	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Hardeman	197	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Haskell	207	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Hidalgo	215	0.915	0.003	0.763	0.002	1.116	0.004	1.449	0.005	1.762	0.006	2.055	0.007	2.329	0.008	2.584	0.009	2.819	0.010	3.034	0.010
		Howard	227	0.681	0.002	0.553	0.002	0.807	0.002	1.047	0.003	1.274	0.004	1.486	0.004	1.684	0.005	1.868	0.005	2.038	0.006	2.193	0.006
		Jack	237	2.527	0.007	2.109	0.006	3.083	0.009	4.002	0.011	4.867	0.014	5.679	0.016	6.436	0.018	7.139	0.020	7.788	0.022	8.383	0.022
		Jones	253	0.198	0.001	0.165	0.000	0.241	0.001	0.313	0.001	0.381	0.001	0.444	0.001	0.503	0.001	0.558	0.002	0.609	0.002	0.655	0.002
		Lamar	277	1.133	0.004	0.945	0.003	1.382	0.004	1.794	0.006	2.182	0.007	2.545	0.008	2.885	0.009	3.200	0.010	3.491	0.011	3.757	0.011
		Limestone	293	0.096	0.000	0.080	0.000	0.117	0.000	0.152	0.000	0.184	0.000	0.215	0.000	0.244	0.000	0.270	0.000	0.295	0.000	0.318	0.000
		Llano	299	0.212	0.001	0.177	0.000	0.258	0.001	0.336	0.001	0.408	0.001	0.476	0.001	0.540	0.001	0.598	0.002	0.653	0.002	0.703	0.002
		McLennan	309	29.227	0.075	24.393	0.063	35.651	0.092	46.284	0.119	56.291	0.145	65.673	0.169	74.429	0.191	82.560	0.212	90.066	0.232	96.946	0.232
		Milam	331	2.675	0.005	2.232	0.005	3.263	0.007	4.236	0.009	5.152	0.010	6.010	0.012	6.812	0.014	7.556	0.015	8.243	0.017	8.873	0.017
		Mitchell	335	17.801	0.055	14.857	0.046	21.714	0.068	28.190	0.088	34.285	0.107	40.000	0.124	45.333	0.141	50.285	0.156	54.856	0.171	59.047	0.171
		Nolan	353	0.673	0.002	0.561	0.002	0.821	0.002	1.065	0.003	1.296	0.004	1.511	0.004	1.713	0.005	1.900	0.006	2.073	0.006	2.231	0.006
		Palo Pinto	363	0.777	0.002	0.649	0.002	0.948	0.002	1.231	0.003	1.497	0.004	1.746	0.005	1.979	0.005	2.196	0.006	2.395	0.006	2.578	0.006
		Pecos	371	0.049	0.000	0.041	0.000	0.060	0.000	0.077	0.000	0.094	0.000	0.110	0.000	0.124	0.000	0.138	0.000	0.150	0.000	0.162	0.000
		Presidio	377	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Red River	387	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Robertson	395	0.506	0.001	0.422	0.001	0.617	0.001	0.801	0.001	0.975	0.001	1.137	0.002	1.289	0.002	1.429	0.002	1.559	0.002	1.679	0.002
		Taylor	441	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Titus	449	6.786	0.000	5.664	0.000	8.278	0.000	10.746	0.000	13.070	0.000	15.248	0.000	17.281	0.000	19.169	0.000	20.912	0.000	22.509	0.000
		Tom Green	451	0.007	0.000	0.006	0.000	0.009	0.000	0.011	0.000	0.014	0.000	0.016	0.000	0.018	0.000	0.020	0.000	0.022	0.000	0.024	0.000
		Upton	461	0.037	0.000	0.031	0.000	0.046	0.000	0.059	0.000	0.072	0.000	0.083	0.000	0.095	0.000	0.105	0.000	0.114	0.000	0.123	0.000
		Ward	475	22.109	0.065	18.452	0.054	26.969	0.079	35.012	0.102	42.583	0.125	49.680	0.145	56.304	0.165	62.454	0.183	68.132	0.199	73.337	0.199
		Webb	479	0.097	0.000	0.081	0.000	0.118	0.000	0.154	0.000	0.187	0.000	0.218	0.000	0.247	0.000	0.274	0.001	0.299	0.001	0.322	0.001
		Wharton	481	0.019	0.000	0.016	0.000	0.023	0.000	0.030	0.000	0.037	0.000	0.043	0.000	0.049	0.000	0.054	0.000	0.059	0.000	0.064	0.000
		Wichita	485	0.247	0.001	0.206	0.001	0.302	0.001	0.392	0.001	0.476	0.001	0.556	0.002	0.630	0.002	0.699	0.002	0.762	0.002	0.820	0.002
		Wilbarger	487	0.139	0.000	0.116	0.000	0.169	0.000	0.220	0.000	0.267	0.000	0.312	0.000	0.354	0.000	0.392	0.000	0.428	0.000	0.461	0.000
		Wise	497	3.373	0.008	2.815	0.008	4.115	0.012	5.342	0.015	6.497	0.018	7.580	0.021	8.591	0.024	9.529	0.027	10.396	0.029	11.190	0.029
		Young	503	7.429	0.018	6.200	0.015	9.061	0.022	11.764	0.028	14.307	0.035	16.692	0.040	18.918	0.046	20.984	0.051	22.892	0.055	24.641	0.055

7.3.6 Wind-ERCOT.

The monthly measured MWh production from 19 wind farms for 2001, 2002, 2003 and 2004 was obtained from the Energy Reliability Council of Texas (ERCOT). To obtain the annual production, the monthly data was summed for the 12 months while for the OSD production average production for the months of July, August and September was taken. The MWh production for the months of July, August and September was divided by the total number of days in these three months to obtain average MWh savings per day for OSD calculations. The annual and OSD MWh numbers obtained were then input according to the wind farm and PCA as shown in Table 112. Using the reported numbers for 2004, savings up to 2013 were projected incorporating the different adjustment factors mentioned above. As an example, using 100 MWh for the reported year for AEP and 5% for annual degradation factor (a), 0% for the transmission and distribution loss (b), 25% for the discount factor (c), and a 17% growth factor (d), the projected savings for 2005 will be calculated as:

$$MWh2005 = (MWh2004 \times d) + (MWh2004 \times (1 + b) \times (1 - c) \times (1 - a)) \quad (5)$$

The wind power production is not cumulative, and it is being assumed that each year the wind production increases by 22.7% or 17% or by 0% of the production level in 2004. If the growth rate is 17%, then it is assumed that the production grows by 17% until 2009; then it is constant at the same rate achieved in 2009, until 2013. Using a growth factor of 17%, the projected 2005 savings come out to be 88.25 MWh for an actual production of 100MWh for 2004. Table 113 shows the projected annual and OSD MWh savings until 2013 with a growth factor of 17%.

2007 annual and OSD eGRID has been used to calculate the NOx emissions savings for the Wind-ERCOT program. An example of the eGRID spreadsheet is given in Table 114. The total MWh savings for each PCA are used to calculate the NOx emissions reduction for each of the different county through the USA-EPA prescribed emission fractions. The eGRID spreadsheet shown in Table 114. is duplicated for each year for which the analysis is required. NOx emissions reduction numbers for each county and SIP area for the different programs is provided in Table 115.

Table 112: Annual and OSD MWh Production According to Wind Farms and PCAs from 2001 to 2004.

Wind Unit Name	Power Purchaser/User	Wind Turbine Unit in Texas	2001 Generation (MWh)		2002 Generation (MWh)		2003 Generation (MWh)		2004 Generation (MWh)		Total
			annual total	OSD	annual total	OSD	annual total	OSD	annual total	OSD	
BRAZ_WND_WND1	American Electric Power	GSITETOT_19_BRAZ_WND_136_U1_W03/W04_2_SU1_BRAZ_WND_WND1	0	0	0	0	5,564	0	253,529	621	259,094
BRAZ_WND_WND2	American Electric Power	GSITETOT_19_BRAZ_WND_136_U1_W03/W04_2_SU1_BRAZ_WND_WND2	0	0	0	0	1,622	0	215,688	376	217,311
DELAWARE_WIND_NWP	Reliant Energy HL&P	GSITETOT_11_DELAWARE_16_U1_W01_130_SU1_DELAWARE_WIND_NWP	6,772	25	54,429	95	55,936	115	59,810	101	176,947
	LCRA		782	3	6,284	11	6,458	13	6,905	12	20,428
INDNENR_INDNENR	City Public Service of San Antonio	GSITETOT_14/77/139_INDNENR_107_U1_W02/03/04_7_SU1_INDNENR_INDNENR	0	0	188,592	578	197,570	577	207,154	435	593,316
INDNENR_INDNENR_2	City Public Service of San Antonio	GSITETOT_14/77/139_INDNENR_107_U1_W02/03/04_7_SU1_INDNENR_INDNENR_2	0	0	173,315	535	178,667	538	189,903	396	541,885
INDNNWP_INDDNWP	City Public Service of San Antonio	GSITETOT_11_INDNNWP_17_U1_W01_7_SU1_INDNNWP_INDNNWP	54,404	196	111,483	348	112,194	347	119,588	252	397,669
INDNNWP_INDNNWP	TXU	GSITETOT_18/19_INDNNWP_86_U1_W01/02/03/04_7_SU1_INDNNWP_INDNNWP	17,208	77	26,532	85	27,543	85	29,011	61	100,294
	LCRA		26,495	119	40,850	131	42,408	131	44,668	94	154,421
KING_NE_KINGNE	TNMP	GSITETOT_58_KING_NE_97_U1_W02/03/04_7_SU1_KING_NE_KINGNE	0	0	7,299	36	13,206	36	13,868	27	34,373
	Reliant Energy HL&P		0	0	74,184	361	134,232	366	140,959	270	349,375
	Austin Energy		0	0	2,642	13	4,780	13	5,020	10	12,441
KING_NW_KINGNW	TNMP	GSITETOT_58_KING_NW_96_U1_W02/03/04_7_SU1_KING_NW_KINGNW	0	0	9,965	43	14,451	43	15,032	28	39,447
	Reliant Energy HL&P		0	0	101,283	436	146,879	433	152,792	282	400,954
	Austin Energy		0	0	3,607	16	5,230	15	5,441	10	14,278
KING_SE_KINGSE	TNMP	GSITETOT_58_KING_SE_97/98_U1_W02/03/04_7_SU1_KING_SE_KINGSE	0	0	3,876	20	6,362	18	6,943	13	17,181
	Reliant Energy HL&P		0	0	39,397	206	64,662	184	70,571	134	174,631
	Austin Energy		0	0	1,403	7	2,303	7	2,513	5	6,219
KING_SW_KINGSW	TNMP	GSITETOT_5_KING_SW_94_U1_W01/02/03/04_7_SU1_KING_SW_KINGSW	5,950	21	13,116	41	13,993	41	14,447	27	47,506
	Reliant Energy HL&P		60,481	213	133,310	421	142,227	419	146,842	272	482,859
	Austin Energy		2,154	8	4,747	15	5,065	15	5,229	10	17,195
KUNITZ_WIND_LGE	LCRA	GSITETOT_11_KUNITZ_67_U1_W01_148_SU1_KUNITZ_WIND_LGE	21,672	57	57,530	73	56,424	91	46,793	70	182,419
KUNITZ_WIND_LGE	LCRA	GSITETOT_5_KUNITZ_87_U1_W02_148_SU1_KUNITZ_WIND_LGE	8,847	24	23,090	30	22,867	37	19,135	29	73,940
SGMTN_SIGNALMT	TXU	GSITETOT_18/19_SGMTN_52_U1_W01/02/03/04_2_SU1_SGMTN_SIGNALMT	43,590	120	100,309	198	97,917	209	93,726	192	335,542
SW_MESA_SW_MESA	American Electric Power	GSITETOT_20_SW_MESA_18_U1_W01/02/03/04_7_SU1_SW_MESA_SW_MESA	85,248	334	190,976	569	170,032	506	169,077	338	615,332
SWEETWND_WND1	TXU	GSITETOT_19_SWEETWND_135_U1_W04_2_SU1_SWEETWND_WND1	0	0	0	0	0	0	129,456	288	129,456
TRENT_TRENT	TXU	GSITETOT_19_TRENT_70_U1_W02/03/04_98_SU1_TRENT_TRENT	0	0	431,798	947	462,302	937	509,928	1,084	1,404,028
WOODWRD1_WOODWD1	TXU	GSITETOT_18/19_WOODWRD1_93_U1_W01/02/03/04_7_SU1_WOODWRD1_WOODWRD1	68,285	312	164,618	530	167,781	524	171,937	339	572,621
WOODWRD2_WOODWRD2	TXU	GSITETOT_18/19_WOODWRD2_93_U1_W01/02/03/04_7_SU1_WOODWRD2_WOODWRD2	31,238	150	159,116	502	159,550	490	161,159	315	511,062

Table 113: Projected Annual and OSD MWh Savings for Wind-ERCOT.

Utility	Cumulative Energy Savings 2005 Electric		Cumulative Energy Savings 2006 Electric		Cumulative Energy Savings 2007 Electric		Cumulative Energy Savings 2008 Electric		Cumulative Energy Savings 2009 Electric		Cumulative Energy Savings 2010 Electric		Cumulative Energy Savings 2011 Electric		Cumulative Energy Savings 2012 Electric		Cumulative Energy Savings 2013 Electric	
	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day	MWh	MWh/ average day
American Electric Power	563,295	1,178	642,444	1,344	716,167	1,498	784,465	1,641	847,337	1,772	796,273	1,666	745,209	1,559	694,146	1,452	643,082	1,345
Austin Energy	16,064	30	18,321	34	20,423	38	22,371	42	24,164	45	22,708	43	21,252	40	19,795	37	18,339	34
City Public Service of San Antonio	455,939	956	520,003	1,091	579,676	1,216	634,957	1,332	685,846	1,439	644,515	1,352	603,183	1,265	561,851	1,179	520,520	1,092
LCRA	103,695	180	118,265	205	131,836	229	144,409	250	155,982	270	146,582	254	137,182	238	127,782	222	118,382	205
Reliant Energy HL&P	503,884	934	574,685	1,065	640,632	1,188	701,726	1,301	757,967	1,405	712,289	1,321	666,611	1,236	620,934	1,151	575,256	1,066
TNMP	44,381	83	50,617	95	56,426	106	61,807	116	66,760	125	62,737	118	58,714	110	54,691	103	50,667	95
TXU	966,529	2,011	1,102,336	2,294	1,228,834	2,557	1,346,022	2,801	1,453,901	3,026	1,366,284	2,843	1,278,666	2,661	1,191,049	2,479	1,103,431	2,296
Totals	**2,653,787**	**5,373**	**3,026,671**	**6,128**	**3,373,994**	**6,832**	**3,695,756**	**7,483**	**3,991,958**	**8,083**	**3,751,388**	**7,596**	**3,510,818**	**7,109**	**3,270,248**	**6,622**	**3,029,678**	**6,134**

Table 114: Example of NOx Emissions Reduction Calculations According to Counties and PCA.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.008831132	5636.867568	0.010890729	198.2403293	0.006522185	0	0.003944232	463.4506863	0.065444292	37366.95039	0.014877434	7686.352554	0.006262315	0	0.004817148	0	0.121274957	6098.948293	0.00816387	8941.211489	66392.02131	33.19601066
	Chambers	0.021762222	13890.71762	0.026955801	490.6675084	0.016072371	0	0.009076193	1066.460611	0.164940225	94176.4829	0.037472294	19359.87524	0.015055623	0	0.009553214	0	0.011518588	579.2727181	0.015818592	17324.79541	146888.272	73.444136
	Fort Bend	0.070431234	44955.90428	0.087239726	1587.995822	0.052016606	0	0.029374182	3451.492031	0.533812376	304792.6729	0.121275295	62656.28042	0.048726002	0	0.030918012	0	0.037278747	1874.757632	0.051195276	56069.95015	475389.0533	237.6945266
	Galveston	0.033856739	21610.58734	0.041710519	759.2427448	0.025004711	0	0.015351589	1803.825078	0.249587379	142507.7569	0.056747051	29318.08309	0.024143087	0	0.019297151	0	0.567751219	28552.35266	0.032836887	35963.52512	260515.3729	130.2576865
	Harris	0.068267332	43574.6969	0.084559408	1539.206868	0.050418468	0	0.028471701	3345.449758	0.517411736	295428.3437	0.117549281	60731.2537	0.047228963	0	0.029968099	0	0.03613341	1817.158322	0.049622373	54347.27923	460783.3885	230.3916942
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.002039135	1301.569768	0.003716345	67.64738967	0.001505992	0	0.005950953	699.2421389	0.002481478	1416.858064	0.000717051	370.460713	0.019166247	0	0.07668094	0	0.00086441	43.47140525	0.004000199	4381.087339	8280.336818	4.140168409
	Dallas	0.004539471	2897.521732	0.004683963	85.26061893	0.003352602	0	0.00774211	909.7046795	0.002085611	1190.82854	0.00068106	351.8664458	0.007502816	0	0.026717045	0	0.007524933	378.430791	0.040370454	44214.41802	50028.03082	25.01401541
	Denton	0.00047388	302.4754211	0.000872802	15.88731679	0.000349982	0	0.001396994	164.1479964	0.000585443	334.2725917	0.000168971	87.29778012	0.00454374	0	0.018187155	0	0.000186605	9.384437551	0.000849405	930.2834404	1843.748984	0.921874492
	Tarrant	0.012162492	7763.258034	0.012266309	223.2795641	0.008982543	0	0.020308652	2386.284365	0.005316504	3035.582708	0.001752506	905.4235883	0.017326428	0	0.060216761	0	0.020603444	1036.152438	0.110647237	121182.7639	136532.7446	68.26637229
	Ellis	0.003279814	2093.488577	0.003307809	60.21095974	0.002422289	0	0.005476558	643.5003239	0.001433682	818.5941645	0.000472592	244.1621715	0.004672353	0	0.016238427	0	0.005556053	279.4153284	0.029837824	32678.89987	36818.2714	18.4091357
	Johnson	0.000286058	182.5896975	0.000526868	9.590400291	0.000211267	0	0.000843297	99.08816029	0.000353404	201.7841026	0.000101999	52.69742319	0.002742835	0	0.010978701	0	0.000112645	5.664928436	0.000512745	561.5668585	1112.981571	0.556490785
	Kaufman	0.006325453	4037.504715	0.006379446	116.122933	0.004671629	0	0.010562096	1241.055538	0.002765	1578.74174	0.000911441	470.8914725	0.009011105	0	0.031317452	0	0.010715411	538.8807554	0.057545265	63024.56758	71007.76473	35.50388236
	Parker	0.000217489	138.8224485	0.000400576	7.291555153	0.000160626	0	0.000641157	75.33645769	0.000268692	153.4159022	7.75498E-05	40.06570695	0.00208537	0	0.008347076	0	8.56434E-05	4.307029621	0.000389838	426.9577491	846.1968492	0.423098425
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.000819895	523.3348348	0.000826893	15.05166687	0.000605529	0	0.001369042	160.8636127	0.000358395	204.6339524	0.00011814	61.03619151	0.001168005	0	0.004059317	0	0.001388914	69.84885245	0.007458924	8169.142575	9203.911686	4.601955843
	Hood	0.01252711	7995.99162	0.012634039	229.9732297	0.009251829	0	0.020917482	2457.822437	0.005475887	3126.586001	0.001805044	932.5671507	0.017845854	0	0.062021991	0	0.021221112	1067.215101	0.113964315	124815.6844	140625.8399	70.31291996
	Hunt	0.006187558	3949.487563	0.006240374	113.5914661	0.004569788	0	0.010331844	1214.000666	0.002704724	1544.325347	0.000891572	460.626091	0.008814664	0	0.030634735	0	0.010481817	527.1332151	0.056290785	61650.63905	69459.8034	34.7299017
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.033413751	21327.8302	0.051775843	942.4585146	0.024677545	0	0.090663423	10653.03143	0.001141841	651.9609965	1.143571754	590820.684	0.046873844	0	0.004669544	0	0.000519582	26.12992681	0.002503865	2742.276361	627164.3715	313.5821857
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.002000467	1276.888192	0.076378745	1390.296971	0.001477434	0	0.133848731	15727.34276	0.001237133	706.3699155	0.003554796	1836.567891	0.001061766	0	0.001855699	0	0.000401718	20.20251653	0.001835165	2009.904183	22967.57242	11.48378621
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.004502334	2873.817156	0.171901148	3129.059623	0.003325174	0	0.301245466	35396.60535	0.002784342	1589.785224	0.008000571	4133.455336	0.002389654	0	0.004176513	0	0.000904124	45.46861578	0.004130298	4523.573135	51691.76445	25.84588222
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.002458599	1569.311542	0.093870431	1708.692348	0.001815785	0	0.164501762	19329.10075	0.001520452	868.1374518	0.004368889	2257.164884	0.001304924	0	0.002280677	0	0.000493717	24.82914524	0.00225544	2470.197354	28227.43348	14.11371674
	Travis	0.000510007	325.5349258	0.299602906	5453.572383	0.000376663	0	0.033939476	3987.918097	0.000334709	191.1098165	0.000906121	468.1429327	0.000271138	0	0.000471744	0	0.000103327	5.19633436	0.000467336	511.8342008	10943.30869	5.471654345
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0.000685965	437.8479279	0.00069182	12.59297244	0.000506616	0	0.001145408	134.5864919	0.000299851	171.2069331	9.88414E-05	51.06591077	0.000977211	0	0.003396227	0	0.001162035	58.43902082	0.006240507	6834.710611	7700.449868	3.850224934
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22756873	145255.9825	0.004556851	82.94685381	0.168069652	0	0.007612767	894.5067845	0.001680888	959.7422735	0.001626796	840.4760888	0.046792036	0	0.007246366	0	0.001609426	80.93843941	0.008283395	9072.116855	157186.7098	78.59335488
	San Patricio	0.050313351	32114.76054	0.001007478	18.3387858	0.037158653	0	0.001683113	197.7672155	0.000371629	212.1901816	0.00035967	185.8215261	0.010345288	0	0.001602105	0	0.000355829	17.89474386	0.001831382	2005.761522	34752.53452	17.37626726
Victoria Area	Victoria	0.021836736	13938.2792	0.002215582	40.32950779	0.016127403	0	0.003612695	424.4948489	0.001199621	684.9517622	0.000555389	286.9388704	0.52545648	0	0.032412721	0	0.000476855	23.98117573	0.002254849	2469.549722	17868.52509	8.934262543
Other ERCOT counties	Andrews	2.47421E-05	15.79274761	2.49533E-05	0.454216231	1.82731E-05	0	4.13138E-05	4.854403465	1.08153E-05	6.175267053	3.56511E-06	1.841897583	3.5247E-05	0	0.000122499	0	4.19135E-05	2.10783847	0.000225089	246.5213441	277.7477145	0.138873857
	Angelina	0.00031082	198.3948006	0.000313473	5.706045631	0.000229554	0	0.000519	60.9829544	0.000135867	77.57617013	4.47864E-05	23.1386528	0.000442787	0	0.001538876	0	0.000526534	26.4795084	0.002827658	3096.899545	3489.177677	1.744588839
	Bosque	0.000595392	380.0355906	0.001096604	19.9611122	0.000439723	0	0.001755208	206.2385119	0.000735562	419.9861309	0.000212298	109.6825101	0.005708837	0	0.02285067	0	0.000234455	11.79077709	0.001067208	1168.824942	2316.519575	1.158259788
	Brazos	0.001939725	1238.116899	0.003572622	65.03125218	0.001432574	0	0.005718288	671.9038772	0.002396384	1368.271653	0.000691644	357.3343461	0.018598805	0	0.074445136	0	0.000763829	38.41314007	0.003476855	3807.911546	7546.982713	3.773491357
	Calhoun	0.082699809	52786.87435	0.001655986	30.14337224	0.061077496	0	0.002766524	325.0690019	0.000610844	348.7759605	0.000591187	305.4339308	0.0170045	0	0.002633372	0	0.000584875	29.41350269	0.003010234	3296.860373	57122.57049	28.56128525
	Cameron	0.048371747	30875.44422	0.000968599	17.63108765	0.297964476	0	0.001618161	190.1353312	0.000357288	204.0017115	0.00034579	178.6506288	0.009946061	0	0.001540279	0	0.000342098	17.2041814	0.001760709	1928.358703	33411.42587	16.70571293
	Cherokee	0.003503899	2236.521148	0.003533808	64.32472873	0.002587786	0	0.00585073	687.4659356	0.001531635	874.5226417	0.00050488	260.8439646	0.00499158	0	0.017347879	0	0.005935657	298.5057086	0.031876422	34911.6071	39333.79122	19.66689561
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.001298787	829.0091711	2.6007E-05	0.473396698	0.000959212	0	4.34478E-05	5.105155157	9.59321E-06	5.477469039	9.2845E-06	4.796789598	0.000267053	0	4.13567E-05	0	9.18536E-06	0.461934217	4.72752E-05	51.77664938	897.1005652	0.448550283
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.003535748	2256.850036	0.003565928	64.90940918	0.002611307	0	0.005903911	693.7146661	0.001545556	882.4716266	0.00050947	263.2149092	0.005036951	0	0.017505563	0	0.00598961	301.2189801	0.032166163	35228.9366	39691.31623	19.84565811
	Fannin	0.007056315	4504.010391	0.007116546	129.5401328	0.005211403	0	0.011782473	1384.4509	0.003084477	1761.154402	0.001016752	525.2997173	0.010052276	0	0.034935966	0	0.011953503	601.1446903	0.064194222	70306.61938	79212.21962	39.60610981
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.003677178	2347.124038	0.003708565	67.50578555	0.00271576	0	0.006140067	721.4632527	0.001607379	917.7704916	0.000529848	273.7435055	0.005238429	0	0.018205785	0	0.006229194	313.2677393	0.033452809	36638.09406	41278.96888	20.63948444
	Frio	0.008588335	5481.891067	0.000871383	15.86149663	0.006342868	0	0.001420864	166.9527843	0.000471808	269.3898503	0.000218433	112.8523549	0.206660746	0	0.012747844	0	0.000187546	9.431737673	0.000886827	971.2678565	7027.647148	3.513823574
	Grimes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.188527456	120336.1324	0.003775086	68.71664366	0.139235931	0	0.006306735	741.0468406	0.001392518	795.0906488	0.001347706	696.285552	0.03876448	0	0.006003193	0	0.001333316	67.05278915	0.006862311	7515.721121	130220.046	65.11002302
	Howard	0.000555113	354.3258825	0.000559851	10.19078952	0.000409976	0	0.000926915	108.9133338	0.000242653	138.5482123	7.99868E-05	41.32479052	0.000790802	0	0.002748377	0	0.00094037	47.29143684	0.005050094	5530.949708	6231.544154	3.115772077
	Jack	0.002121449	1354.110022	0.002139557	38.94564551	0.001566784	0	0.003542346	416.2287997	0.000927334	529.4829759	0.000305682	157.9289455	0.00302217	0	0.010503338	0	0.003593766	180.731388	0.019299698	21137.36196	23814.78974	11.90739487
	Jones	0.040718722	25990.55677	0.000815354	14.84162563	0.030072592	0	0.001362147	160.0535067	0.00030076	171.7260495	0.000291082	150.3858301	0.008372468	0	0.001296587	0	0.000287974	14.48226137	0.001482142	1623.267862	28125.3139	14.06265695
	Lamar	0.000950838	606.9150422	0.000958954	17.4555226	0.000702236	0	0.001587687	186.5546488	0.000415633	237.3154157	0.000137007	70.78409515	0.001354543	0	0.004707619	0	0.001610734	81.00419925	0.008650166	9473.811374	10673.8403	5.336920149
	Limestone	0.000719757	459.4171555	0.000891528	16.22818038	0.000531572	0	0.000300183	35.27177746	0.00545518	3114.762901	0.001239347	640.3023271	0.000497945	0	0.00031596	0	0.000380962	19.15868077	0.000523179	572.9947472	4858.135769	2.429067885
	Llano	0.001238174	790.3202435	0.047274044	860.5137451	0.000914447	0	0.082844655	9734.319285	0.000765714	437.2022914	0.002200214	1136.72974	0.000657172	0	0.001148571	0	0.000248641	12.50419409	0.001135861	1244.014921	14215.60442	7.10780221
	McLennan	0.024534317	15660.13203	0.024743738	450.4020654	0.018119687	0	0.040966843	4813.639845	0.010724513	6123.411817	0.003535175	1826.430717	0.034951066	0	0.121469933	0	0.041561501	2090.138432	0.22319886	244451.2437	275415.3986	137.7076993
	Milam	0.002245405	1433.23073	0.002264571	41.22124129	0.001658332	0	0.003749326	440.5490668	0.000981518	560.4206896	0.000323543	167.1567407	0.003198756	0	0.011117048	0	0.00380375	191.291531	0.02042738	22372.41895	25206.28895	12.60314448
	Mitchell	0.014943169	9538.149879	0.015070721	274.3273427	0.011036196	0	0.024951762	2931.853846	0.006532002	3729.599443	0.002153177	1112.428036	0.02128772	0	0.07398395	0	0.025313952	1273.045055	0.135944204	148888.4383	167747.8419	83.87392095
	Nolan	0.000564654	360.4156353	0.000569473	10.36593729	0.000417022	0	0.000942846	110.7852131	0.000246823	140.9294223	8.13615E-05	42.03503431	0.000804394	0	0.002795613	0	0.000956532	48.1042286	0.005136889	5626.009421	6338.644892	3.169322446
	Palo Pinto	0.003206998	2047.011006	0.005906709	107.5178677	0.002368511	0	0.009454195	1110.876229	0.003962005	2262.199261	0.001143513	590.7902073	0.030749889	0	0.123082087	0	0.001262858	63.50944776	0.005748375	6295.719614	12477.62363	6.238811817
	Pecos	4.09677E-05	26.1494646	4.13174E-05	0.752086435	3.02565E-05	0	6.84069E-05	8.037869957	1.79079E-05	10.22494193	5.90308E-06	3.049794554	5.83617E-05	0	0.000202832	0	6.93999E-05	3.490136664	0.0003727	408.1874363	459.8917305	0.229945865
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.000737708	470.8751569	0.000835096	15.20098285	0.00054483	0	0.000735917	86.47089713	0.003149678	1798.382284	0.000730875	377.6031025	0.00076086	0	0.001866305	0	0.191632518	9637.247891	0.003397737	3721.260649	16107.04096	8.053520482
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.005696437	3636.007492	0.005745061	104.5754455	0.004207073	0	0.009511781	1117.642591	0.002490043	1421.748629	0.000820806	424.0651201	0.008115023	0	0.028203184	0	0.00964985	485.2934181	0.051822854	56757.28353	63946.61623	31.97330811
	Tom Green	0.001482448	946.2391789	2.96846E-05	0.540339623	0.001094854	0	4.95918E-05	5.827074045	1.09498E-05	6.252036753	1.05974E-05	5.475102579	0.000304817	0	4.72049E-05	0	1.04843E-05	0.527256235	5.39604E-05	59.09837419	1023.959362	0.511979681
	Upton	3.11661E-05	19.89318296	3.14322E-05	0.572149116	2.30176E-05	0	5.20405E-05	6.114802737	1.36234E-05	7.778615879	4.49076E-06	2.320128614	4.43986E-05	0	0.000154304	0	5.27959E-05	2.6551185	0.000283531	310.5282452	349.862243	0.174931122
	Ward	0.018559529	11846.45431	0.01871795	340.7166351	0.013707039	0	0.030990277	3641.384657	0.008112796	4632.190724	0.002674262	1381.644037	0.026439509	0	0.091888626	0	0.03144012	1581.131589	0.16884373	184920.5668	208344.0887	104.1720444
	Webb	0.020014327	12775.045	0.000400768	7.295050931	0.014781473	0	0.000669531	78.67052517	0.000147832	84.40788823	0.000143074	73.91860682	0.004115289	0	0.000637307	0	0.000141547	7.118413908	0.000728512	797.8790209	13824.33451	6.912167253
	Wharton	0.00014434	92.13130695	0.000178787	3.254391895	0.000106601	0	6.01986E-05	7.073386174	0.001093979	624.6331323	0.000248538	128.4059368	9.98576E-05	0	6.33625E-05	0	7.6398E-05	3.842073108	0.000104918	114.9081054	974.2483326	0.487124166
	Wichita	0.000207633	132.5312397	0.000209406	3.811739518	0.000153346	0	0.000346701	40.73769335	9.07612E-05	51.82225527	2.99181E-05	15.45702978	0.00029579	0	0.001027996	0	0.000351734	17.68878048	0.001888925	2068.783732	2330.832471	1.165416235
	Wilbarger	0.028616818	18265.9719	0.000573025	10.4305852	0.021134796	0	0.000957307	112.4844258	0.000211372	120.687803	0.00020457	105.6900539	0.005884109	0	0.000911232	0	0.000202386	10.17802664	0.001041639	1140.820699	19766.26349	9.883131745
	Wise	0.002844488	1815.622181	0.002882008	52.460237	0.002100781	0	0.00476997	560.475697	0.001256075	717.1856279	0.000413241	213.4990654	0.004181914	0	0.014614274	0	0.004797945	241.2898489	0.025761411	28214.34215	31814.8748	15.9074374
	Young	0.006235856	3980.315908	0.006289085	114.4781221	0.004605458	0	0.010412491	1223.476738	0.002725836	1556.37982	0.000898531	464.2215803	0.008883468	0	0.030873859	0	0.010563634	531.2478361	0.056730171	62131.86278	70001.98279	35.00099139
	Total	**1.121837219**	**716063.0879**	**1.172570094**	**21343.90474**	**1.090766584**	**0**	**1.189130767**	**139723.9038**	**1.629360006**	**930321.2407**	**1.542362643**	**796854.022**	**1.359385821**	**0**	**1.231642808**	**0**	**1.221806085**	**61444.9376**	**1.528786947**	**1674353.847**	**4340104.944**	**2170.052472**
Energy Savings by PCA (MWh)		638,295		18,203		0		117,501		570,973		516,645		0		0		50,290		1,095,217			

Table 115: NOx Emissions Reduction Values According to SIP Areas and Counties (Wind-ERCOT).

Program	Area	County	FIP Code	Total NOx emissions reduction (Tons) (2007 25% annual and ozone season eGrid)																	
				2004		Cumulative 2005		Cumulative 2006		Cumulative 2007		Cumulative 2008		Cumulative 2009		Cumulative 2010		Cumulative 2011		Cumulative 2012		Cumulative 2013	
				Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day	Annual	Ozone Season Day
Wind-ERCOT	Houston-Galveston Area	Brazoria	039	33.196	0.069	29.295	0.061	33.412	0.070	37.246	0.078	40.798	0.085	44.068	0.092	41.412	0.086	38.756	0.081	36.101	0.075	33.445	0.070
		Chambers	071	73.444	0.143	64.814	0.126	73.922	0.144	82.404	0.160	90.263	0.176	97.497	0.190	91.622	0.178	85.746	0.167	79.870	0.155	73.995	0.144
		Fort Bend	157	237.695	0.364	209.765	0.321	239.240	0.366	266.693	0.408	292.127	0.447	315.539	0.483	296.524	0.454	277.508	0.425	258.493	0.395	239.477	0.366
		Galveston	167	130.258	0.212	114.952	0.187	131.104	0.214	146.149	0.238	160.087	0.261	172.917	0.282	162.496	0.265	152.076	0.248	141.655	0.231	131.235	0.214
		Harris	201	230.392	0.505	203.321	0.446	231.889	0.508	258.499	0.567	283.151	0.621	305.845	0.670	287.414	0.630	268.982	0.590	250.551	0.549	232.120	0.509
		Liberty	291	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Montgomery	339	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Waller	473	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Beaumont/ Port Arthur Area	Hardin	199	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Jefferson	245	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Orange	361	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Dallas/ Fort Worth Area	Collin	085	4.140	0.008	3.654	0.007	4.167	0.008	4.645	0.009	5.088	0.010	5.496	0.010	5.165	0.010	4.834	0.009	4.502	0.008	4.171	0.008
		Dallas	113	25.014	0.057	22.075	0.050	25.177	0.057	28.066	0.063	30.742	0.070	33.206	0.075	31.205	0.071	29.204	0.066	27.203	0.062	25.202	0.057
		Denton	121	0.922	0.002	0.814	0.002	0.928	0.003	1.034	0.003	1.133	0.003	1.224	0.003	1.150	0.003	1.076	0.003	1.003	0.003	0.929	0.003
		Tarrant	439	68.266	0.181	60.245	0.160	68.710	0.182	76.595	0.203	83.899	0.222	90.624	0.240	85.162	0.226	79.701	0.211	74.240	0.197	68.778	0.182
		Ellis	139	18.409	0.041	16.246	0.036	18.529	0.041	20.655	0.046	22.625	0.050	24.438	0.054	22.965	0.051	21.493	0.047	20.020	0.044	18.547	0.041
		Johnson	251	0.556	0.001	0.491	0.001	0.560	0.001	0.624	0.001	0.684	0.002	0.739	0.002	0.694	0.002	0.650	0.002	0.605	0.001	0.561	0.001
		Kaufman	257	35.504	0.075	31.332	0.067	35.735	0.076	39.835	0.085	43.634	0.093	47.131	0.100	44.291	0.094	41.451	0.088	38.610	0.082	35.770	0.076
		Parker	367	0.423	0.002	0.373	0.002	0.426	0.002	0.475	0.002	0.520	0.002	0.562	0.002	0.528	0.002	0.494	0.002	0.460	0.002	0.426	0.002
		Rockwall	397	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Henderson	213	4.602	0.011	4.061	0.010	4.632	0.011	5.163	0.012	5.656	0.014	6.109	0.015	5.741	0.014	5.373	0.013	5.005	0.012	4.636	0.011
		Hood	221	70.313	0.143	62.051	0.126	70.770	0.144	78.891	0.161	86.415	0.176	93.340	0.190	87.715	0.179	82.090	0.167	76.465	0.156	70.840	0.144
		Hunt	231	34.730	0.074	30.649	0.065	34.956	0.074	38.967	0.083	42.683	0.091	46.104	0.098	43.326	0.092	40.547	0.086	37.769	0.080	34.990	0.074
	El Paso Area	El Paso	141	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	San Antonio Area	Bexar	029	313.582	0.611	276.736	0.539	315.620	0.615	351.839	0.685	385.393	0.751	416.280	0.811	391.194	0.762	366.107	0.713	341.021	0.664	315.934	0.615
		Comal	091	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Guadalupe	187	11.484	0.021	10.134	0.019	11.588	0.021	12.885	0.024	14.114	0.026	15.245	0.028	14.326	0.026	13.407	0.025	12.489	0.023	11.570	0.021
		Wilson	493	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Austin Area	Bastrop	021	25.846	0.047	22.809	0.041	26.014	0.047	28.999	0.053	31.765	0.058	34.310	0.062	32.243	0.058	30.175	0.055	28.107	0.051	26.040	0.047
		Caldwell	055	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Hays	209	14.114	0.026	12.455	0.023	14.205	0.026	15.836	0.029	17.346	0.032	18.736	0.034	17.607	0.032	16.478	0.030	15.349	0.028	14.220	0.026
		Travis	453	5.472	0.010	4.829	0.008	5.507	0.010	6.139	0.011	6.725	0.012	7.264	0.013	6.826	0.012	6.388	0.011	5.950	0.010	5.513	0.010
		Williamson	491	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	North East Texas Area	Gregg	183	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Harrison	203	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Rusk	401	3.890	0.000	3.398	0.000	3.875	0.000	4.320	0.000	4.732	0.000	5.111	0.000	4.803	0.000	4.495	0.000	4.187	0.000	3.879	0.000
		Smith	423	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Upshur	459	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Corpus Christi Area	Nueces	355	78.593	0.161	69.359	0.142	79.104	0.162	88.182	0.181	96.591	0.198	104.333	0.214	98.045	0.201	91.758	0.188	85.470	0.175	79.183	0.162
		San Patricio	409	17.376	0.040	15.335	0.035	17.489	0.040	19.496	0.045	21.355	0.049	23.067	0.053	21.677	0.050	20.287	0.047	18.897	0.043	17.507	0.040
	Victoria Area	Victoria	469	8.504	0.017	7.884	0.015	8.992	0.018	10.024	0.020	10.980	0.021	11.862	0.023	11.145	0.022	10.428	0.021	9.716	0.019	9.001	0.018
	Other ERCOT counties	Andrews	003	0.139	0.000	0.123	0.000	0.140	0.000	0.156	0.000	0.171	0.000	0.184	0.000	0.173	0.000	0.162	0.000	0.151	0.000	0.140	0.000
		Angelina	005	1.745	0.004	1.540	0.003	1.756	0.004	1.957	0.004	2.144	0.005	2.316	0.005	2.176	0.005	2.037	0.004	1.897	0.004	1.758	0.004
		Bosque	035	1.158	0.004	1.022	0.003	1.166	0.004	1.300	0.004	1.424	0.005	1.538	0.005	1.445	0.005	1.352	0.004	1.260	0.004	1.167	0.004
		Brazos	041	3.773	0.007	3.330	0.007	3.798	0.008	4.234	0.008	4.638	0.009	5.009	0.010	4.707	0.009	4.406	0.009	4.104	0.008	3.802	0.008
		Calhoun	057	28.561	0.064	25.205	0.056	28.747	0.064	32.046	0.072	35.102	0.078	37.915	0.085	35.636	0.080	33.345	0.075	31.060	0.069	28.775	0.064
		Cameron	061	16.706	0.039	14.743	0.035	16.814	0.040	18.744	0.044	20.531	0.048	22.177	0.052	20.840	0.049	19.504	0.046	18.167	0.043	16.831	0.040
		Cherokee	073	19.667	0.041	17.356	0.036	19.795	0.041	22.066	0.046	24.171	0.050	26.108	0.054	24.534	0.051	22.961	0.048	21.388	0.044	19.814	0.041
		Cole	081	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Coleman	083	0.449	0.001	0.396	0.001	0.451	0.001	0.503	0.001	0.551	0.001	0.595	0.001	0.560	0.001	0.524	0.001	0.488	0.001	0.452	0.001
		Crockett	105	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Ector	135	19.846	0.042	17.514	0.037	19.975	0.042	22.267	0.047	24.390	0.052	26.345	0.056	24.757	0.053	23.170	0.049	21.582	0.046	19.995	0.042
		Fannin	147	39.606	0.089	34.952	0.078	39.864	0.089	44.438	0.099	48.676	0.109	52.577	0.118	49.409	0.111	46.240	0.103	43.072	0.096	39.903	0.089
		Fayette	149	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Freestone	161	20.639	0.044	18.214	0.039	20.774	0.044	23.158	0.049	25.366	0.054	27.399	0.058	25.748	0.055	24.097	0.051	22.445	0.048	20.794	0.044
		Frio	163	3.514	0.013	3.101	0.011	3.537	0.013	3.943	0.014	4.318	0.015	4.665	0.017	4.383	0.016	4.102	0.015	3.821	0.014	3.540	0.013
		Grimes	185	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.002	0.000	0.003	0.000	0.003	0.000	0.003	0.000	0.002	0.000	0.002	0.000	0.002
		Hardeman	197	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Haskell	207	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Hidalgo	215	65.110	0.173	57.460	0.153	65.533	0.174	73.053	0.194	80.020	0.212	86.434	0.229	81.225	0.216	76.018	0.202	70.807	0.188	65.599	0.174
		Howard	227	3.116	0.007	2.750	0.006	3.136	0.007	3.496	0.008	3.829	0.008	4.136	0.009	3.887	0.008	3.638	0.008	3.388	0.007	3.139	0.007
		Jack	237	11.907	0.025	10.508	0.022	11.985	0.025	13.360	0.028	14.634	0.031	15.807	0.034	14.854	0.032	13.902	0.030	12.949	0.027	11.997	0.025
		Jones	253	14.063	0.031	12.410	0.027	14.154	0.031	15.778	0.034	17.283	0.038	18.668	0.041	17.543	0.038	16.418	0.036	15.293	0.033	14.168	0.031
		Lamar	277	5.337	0.013	4.710	0.011	5.372	0.013	5.988	0.014	6.559	0.015	7.085	0.017	6.668	0.016	6.231	0.015	5.804	0.014	5.377	0.013
		Limestone	293	2.429	0.000	2.144	0.000	2.445	0.000	2.725	0.000	2.985	0.000	3.225	0.000	3.030	0.000	2.836	0.000	2.642	0.000	2.447	0.000
		Llano	299	7.108	0.013	6.273	0.012	7.154	0.013	7.975	0.015	8.735	0.016	9.436	0.017	8.867	0.018	8.298	0.015	7.730	0.014	7.161	0.013
		McLennan	309	137.708	0.267	121.527	0.236	138.603	0.269	154.508	0.300	169.243	0.329	182.807	0.355	171.790	0.334	160.774	0.312	149.757	0.291	138.741	0.269
		Milam	331	12.603	0.019	11.122	0.017	12.685	0.019	14.141	0.022	15.489	0.024	16.731	0.025	15.722	0.024	14.714	0.022	13.706	0.021	12.698	0.019
		Mitchell	335	83.874	0.197	74.019	0.174	84.419	0.198	94.107	0.221	103.081	0.242	111.343	0.261	104.633	0.246	97.923	0.230	91.213	0.214	84.503	0.198
		Nolan	353	3.169	0.007	2.797	0.006	3.190	0.007	3.556	0.008	3.896	0.009	4.207	0.009	3.954	0.009	3.700	0.008	3.447	0.008	3.193	0.007
		Palo Pinto	363	6.239	0.012	5.506	0.011	6.279	0.012	7.000	0.013	7.667	0.015	8.282	0.016	7.783	0.015	7.284	0.014	6.785	0.013	6.286	0.012
		Pecos	371	0.230	0.000	0.203	0.000	0.231	0.000	0.258	0.001	0.283	0.001	0.305	0.001	0.287	0.001	0.268	0.001	0.250	0.001	0.232	0.000
		Presidio	377	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Red River	387	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Robertson	395	8.054	0.008	7.107	0.007	8.106	0.008	9.036	0.008	9.898	0.009	10.691	0.010	10.047	0.009	9.402	0.009	8.758	0.008	8.114	0.008
		Taylor	441	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Titus	449	31.975	0.068	28.216	0.060	32.181	0.068	35.874	0.076	39.295	0.083	42.445	0.090	39.887	0.085	37.329	0.079	34.771	0.073	32.213	0.068
		Tom Green	451	0.512	0.000	0.452	0.000	0.515	0.000	0.574	0.000	0.629	0.000	0.680	0.000	0.639	0.000	0.598	0.000	0.557	0.000	0.516	0.000
		Upton	461	0.175	0.000	0.154	0.000	0.176	0.000	0.196	0.000	0.215	0.000	0.232	0.000	0.218	0.000	0.204	0.000	0.190	0.000	0.176	0.000
		Ward	475	104.172	0.230	91.932	0.203	104.849	0.231	116.881	0.258	128.027	0.283	138.288	0.305	129.995	0.287	121.621	0.269	113.287	0.250	104.953	0.232
		Webb	479	8.913	0.010	6.100	0.009	6.957	0.010	7.755	0.011	8.495	0.013	9.176	0.014	8.623	0.013	8.070	0.012	7.517	0.011	6.964	0.010
		Wharton	481	0.487	0.001	0.430	0.001	0.490	0.001	0.547	0.001	0.599	0.001	0.647	0.001	0.608	0.001	0.569	0.001	0.530	0.001	0.491	0.001
		Wichita	485	1.165	0.003	1.028	0.002	1.173	0.003	1.308	0.003	1.432	0.003	1.547	0.003	1.454	0.003	1.361	0.003	1.267	0.003	1.174	0.003
		Wilbarger	487	9.883	0.000	8.722	0.000	9.947	0.000	11.089	0.000	12.146	0.000	13.120	0.000	12.329	0.000	11.539	0.000	10.748	0.000	9.957	0.000
		Wise	497	15.907	0.034	14.038	0.030	16.011	0.034	17.848	0.038	19.550	0.042	21.117	0.045	19.845	0.042	18.572	0.039	17.299	0.037	16.027	0.034
		Young	503	35.001	0.064	30.888	0.056	35.228	0.064	39.271	0.072	43.016	0.078	46.464	0.085	43.664	0.080	40.864	0.075	38.064	0.069	35.263	0.064

7.4 Results

The final reported MWh savings and NOx emissions reduction for all the different programs in the integrated format used the adjustment factors shown in Table 116. The projected NOx emissions reduction for the Ozone Season Day (OSD) across all programs amounts to 17.13 tons in 2013. If the savings are projected through 2013, then around 32% of this reduction comes from the ESL-Single-Family program. The other large contributors are PUCT-SB 7 and Wind-ERCOT. If the projections are only considered through 2010, then Wind-ERCOT is the largest contributor to the NOx reductions with 34% of the 15.99 tons reduced. The cumulative OSD NOx savings and the percentage divisions of the NOx savings among the programs are shown in Figure 87, Figure 88, Figure 89 and Figure 90. A summary of the projected annual and OSD energy savings and NOx emissions reduction is given in Table 117 and Table 118.

Table 116: Final Adjustment Factors used for the Calculation of the Annual and OSD NOx Savings for the Different Programs.

	ESL-Single Family	ESL-Multifamily	PUC (SB7)	PUC (SB5 Grant Program)	SECO	Wind-ERCOT
Annual degradation factor	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
T&D loss	7.00%	7.00%	7.00%	7.00%	7.00%	0.00%
Initial discount factor	20.00%	20.00%	25.00%	25.00%	60.00%	25.00%
Growth factor	3.25%	1.54%				17.00%

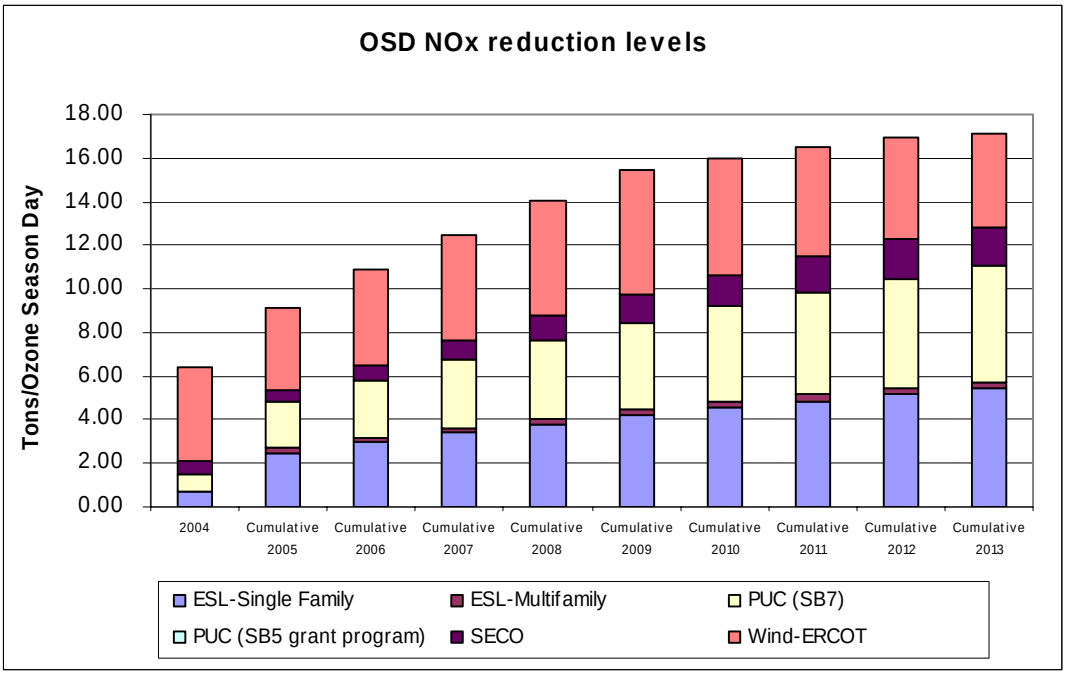


Figure 87: Cumulative OSD NOx Emissions Reduction Projections until 2013.

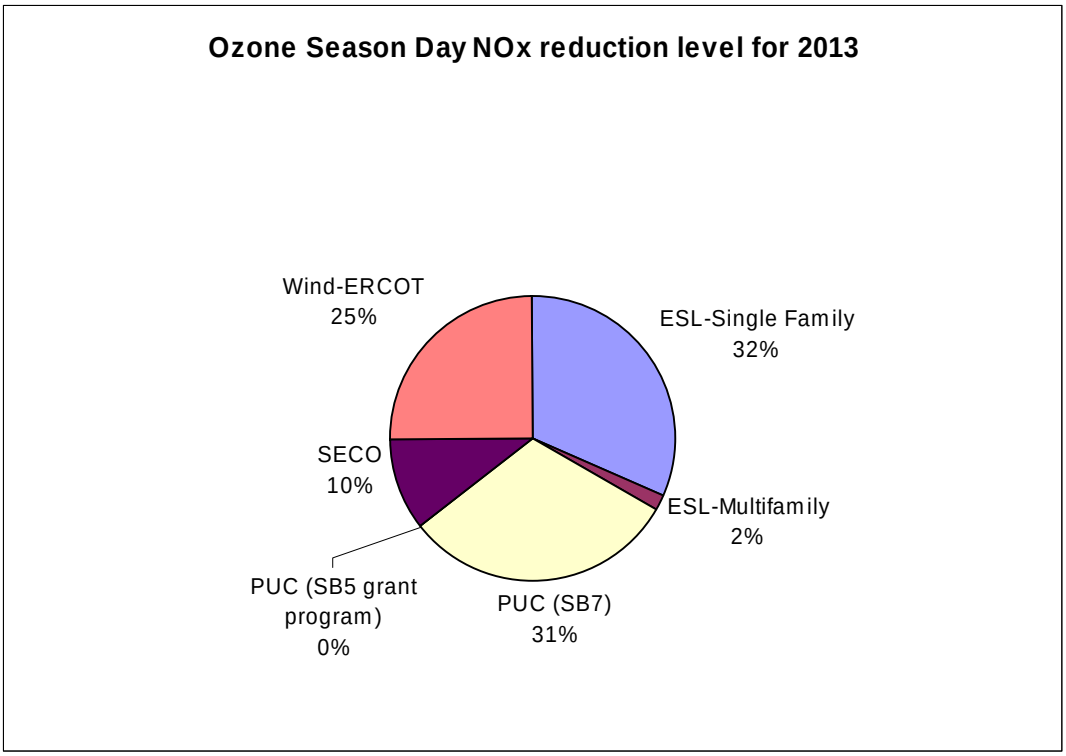


Figure 88: Percentage Division of the NOx Emissions Reductions for the Different Program (2013 Projection).

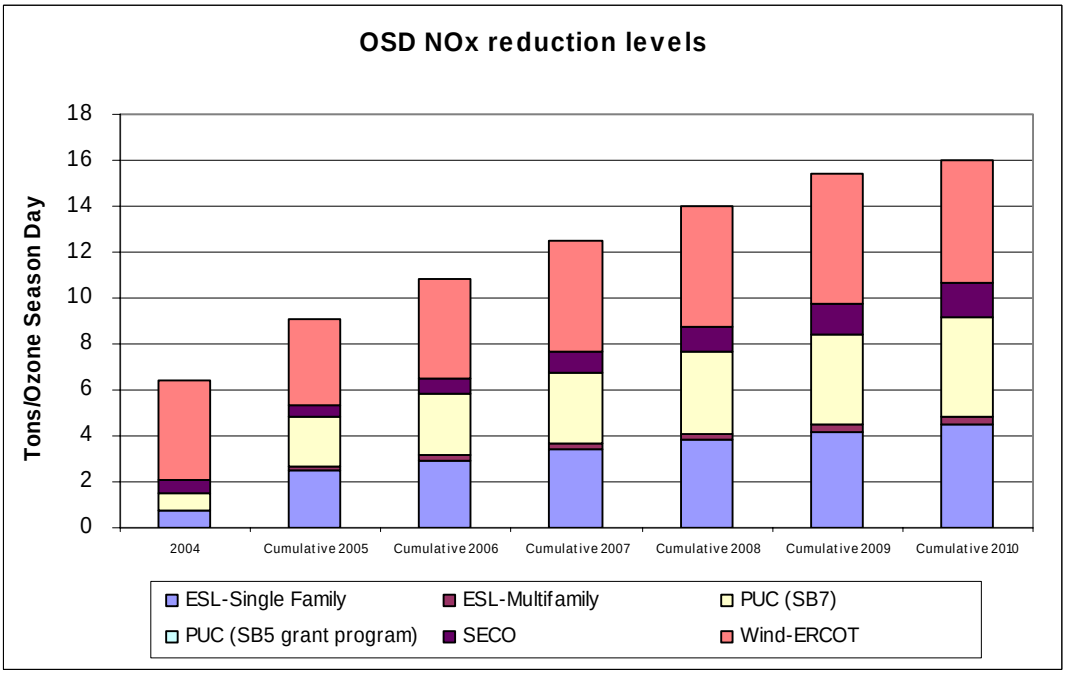


Figure 89: Cumulative OSD NOx Emissions Reduction Projections until 2010.

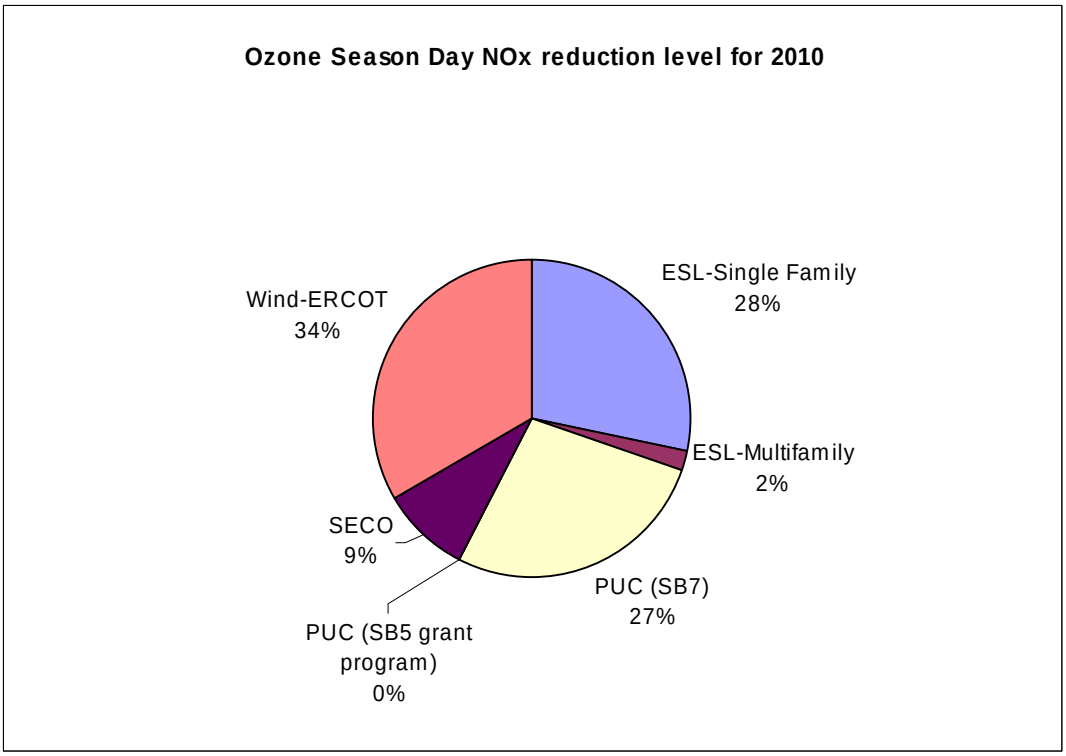


Figure 90: Percentage Division of the NOx Emissions Reductions for the Different Program (2010 Projection).

Table 117: Annual and OSD MWh Savings for the Different Programs.

Program	2004	Cumulative 2005	Cumulative 2006	Cumulative 2007	Cumulative 2008	Cumulative 2009	Cumulative 2010	Cumulative 2011	Cumulative 2012	Cumulative 2013
	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual
ESL-Single Family	207,518.87	678,700.34	819,522.41	951,462.66	1,074,521.11	1,188,697.75	1,293,992.58	1,390,405.60	1,477,936.82	1,556,586.23
ESL-Multifamily	10,991.56	65,176.90	70,922.14	76,196.95	81,001.32	85,335.25	89,198.74	92,591.80	95,514.41	97,966.59
PUC (SB7)	402,922.00	1,101,231.47	1,365,144.19	1,612,889.66	1,844,467.89	2,059,878.87	2,259,122.61	2,442,199.10	2,609,108.34	2,759,850.34
PUC (SB5 grant program)	0.00	14,439.10	13,633.15	12,827.20	12,021.25	11,215.30	10,409.35	9,603.40	8,797.45	7,991.50
SECO	292,773.20	244,348.51	357,124.75	463,635.63	563,881.18	657,861.37	745,576.22	827,025.73	902,209.88	971,128.69
Wind-ERCOT	3,007,124.51	2,653,787.38	3,026,670.82	3,373,993.70	3,695,756.03	3,991,957.79	3,751,387.83	3,510,817.87	3,270,247.91	3,029,677.95
	OSD	OSD	OSD	OSD	OSD	OSD	OSD	OSD	OSD	OSD
ESL-Single Family	1,023.59	3,537.01	4,221.07	4,861.32	5,457.77	6,010.40	6,519.23	6,984.24	7,405.45	7,782.85
ESL-Multifamily	45.90	310.03	331.81	351.63	369.48	385.37	399.29	411.25	421.25	429.28
PUC (SB7)	1,103.90	3,017.07	3,740.12	4,418.88	5,053.34	5,643.50	6,189.38	6,690.96	7,148.24	7,561.23
PUC (SB5 grant program)	0.00	39.56	37.35	35.14	32.93	30.73	28.52	26.31	24.10	21.89
SECO	802.12	669.45	978.42	1,270.23	1,544.88	1,802.36	2,042.67	2,265.82	2,471.81	2,660.63
Wind-ERCOT	6,088.76	5,373.33	6,128.34	6,831.59	7,483.09	8,082.83	7,595.73	7,108.63	6,621.53	6,134.43

Table 118: Annual and OSD NOx Emissions Reduction Values for the Different Programs.

Program	2004	Cumulative 2005	Cumulative 2006	Cumulative 2007	Cumulative 2008	Cumulative 2009	Cumulative 2010	Cumulative 2011	Cumulative 2012	Cumulative 2013
	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual
ESL-Single Family	145.80	480.25	578.99	671.49	757.75	837.77	911.55	979.09	1,040.39	1,095.45
ESL-Multifamily	8.08	47.91	52.14	56.02	59.56	62.75	65.59	68.09	70.24	72.04
PUC (SB7)	288.31	794.13	982.60	1,159.50	1,324.83	1,478.59	1,620.78	1,751.40	1,870.46	1,977.95
PUC (SB5 grant program)	0.00	5.95	5.62	5.29	4.96	4.63	4.29	3.96	3.63	3.30
SECO	210.99	176.09	257.37	334.13	406.37	474.10	537.32	596.01	650.20	699.86
Wind-ERCOT	2,170.05	1,915.07	2,184.16	2,434.80	2,666.99	2,880.74	2,707.14	2,533.54	2,359.93	2,186.33
	OSD	OSD	OSD	OSD	OSD	OSD	OSD	OSD	OSD	OSD
ESL-Single Family	0.71	2.47	2.94	3.39	3.80	4.19	4.54	4.86	5.16	5.42
ESL-Multifamily	0.03	0.22	0.24	0.25	0.27	0.28	0.29	0.29	0.30	0.31
PUC (SB7)	0.77	2.13	2.64	3.11	3.56	3.97	4.35	4.70	5.02	5.31
PUC (SB5 grant program)	0.00	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
SECO	0.57	0.48	0.70	0.91	1.10	1.29	1.46	1.62	1.76	1.76
Wind-ERCOT	4.28	3.78	4.31	4.81	5.26	5.69	5.34	5.00	4.66	4.32

7.5 Planned Work for 2006 Integrated NOx Emissions Calculations.

In the Spring of 2006, planning for the integrated NOx emissions reporting was initiated. This included expansion of the areas of reporting (ESL, Federal Buildings, Furnace Pilot Lights, PUCT, SECO and Wind/ERCOT), and inclusion of all ERCOT counties in the calculations. Table 119 shows the new categories to be included in the 2006 Integrated NOx emissions reporting, and Figure 91 provides a map of Texas showing all the counties within the ERCOT region.

Table 119: Input Categories and Factors for the 2006 Integrated NOx Emissions Reporting.

Energy savings summary: (program wise)

Base year	**1999**
Projection year	**2020**

Adjustment factors

	ESL-Single Family	ESL-Multifamily	ESL-Commercial	Federal Buildings[15]	Furnace Pilot Light Program[15]	PUC (SB7)[15]	PUC (SB5 Grant Program)[15]	SECO[15]	Wind-ERCOT[8]
Annual degradation factor [11]	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
T&D loss [9]	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	0.00%
Initial discount factor [12]	20.00%	20.00%	20.00%	20.00%	20.00%	25.00%	25.00%	60.00%	25.00%
Growth factor	3.25%	1.54%	3.25%	0.00%	0.00%	0.00%	0.00%	0.00%	25.00%
Weather normalized	Yes	Yes	Yes	No	No	No	No	No	See note 7

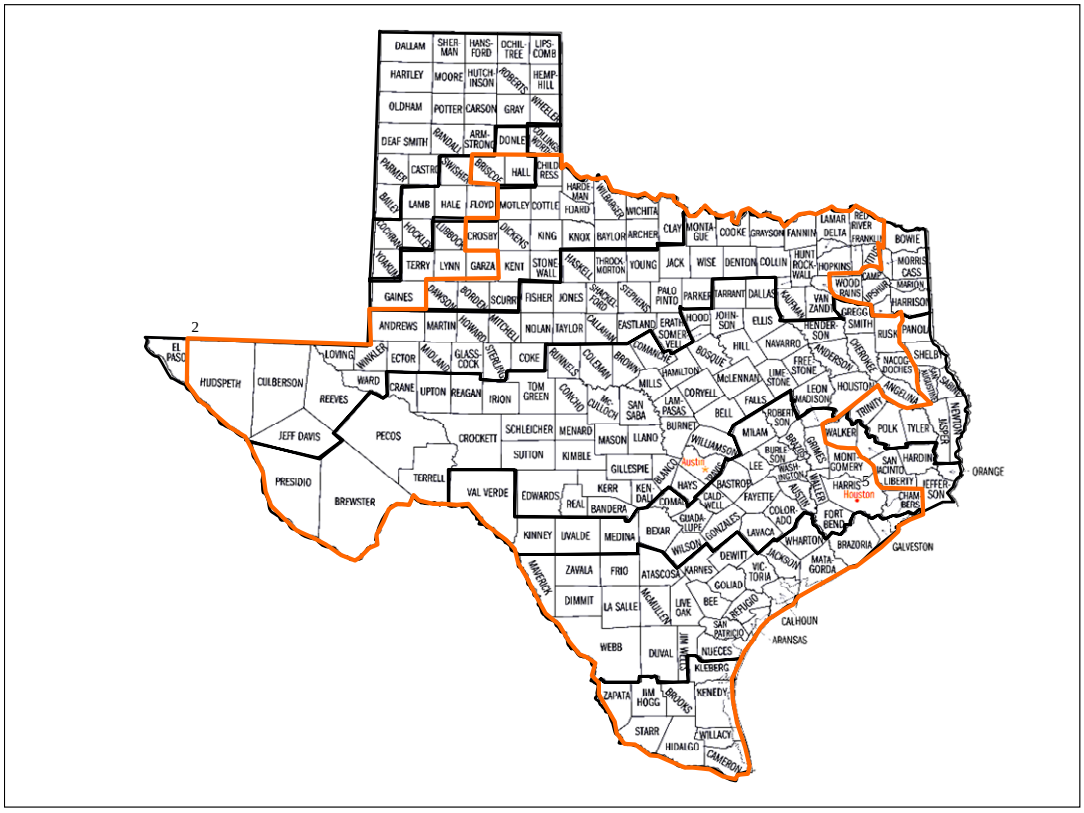


Figure 91: Map of Texas Showing Counties to be Included in 2006 Integrated Savings Reporting.

8 ENHANCEMENTS TO THE EMISSIONS REDUCTION CALCULATOR

In the Fall of 2003, the Laboratory formed a partnership with the Texas Commission on Environmental Quality (TCEQ), and the US EPA, to enhance the Emissions Reduction Calculator. In 2004, the Laboratory has worked closely with the TCEQ, using funding provided by the US EPA, to enhance the calculator. In 2005, the Laboratory continued to enhance the functionality of the calculator, working closely with the TCEQ. This section of the report provides details about the 2005 efforts to enhance the calculator.

8.1 Web Structure.

Figure 92 provides a block diagram of the original software elements contained in the Laboratory's 2004 web-based emissions calculator. The calculator is composed of four major elements, including: a web interface, a calculation engine, a weather database, and a general project/operations database. The web interface handles the interaction with the user, which includes receiving the general project information (including their email address for returning the results). Instructions from the user are passed to the calculation engine along with other information kept in the calculator's libraries. Once the user decides on a particular analysis, the calculator then routes their information into one of several legacy models, including: the DOE-2 program for building simulation analysis (LBNL 2000)[52]; the F-CHART program for solar thermal analysis[53]; and PV F-CHART program for solar photovoltaic analysis (Haberl 2004b)[54]; and the ASHRAE Inverse Model Toolkit (IMT) for monthly utility billing analysis used in the monthly municipal, traffic light, street light, water, wastewater and wind energy analyses.[55] A special-purpose peak-extractor has also been developed for extracting either the peak-day use (i.e., DOE-2 simulations) or the coefficients that can derive the peak-day use[56]. Annual and peak-day savings are passed to the US EPA's eGRID database where specific emissions data are contained for the electric utility provider associated with the user.

Figure 93 illustrates the screen that the eCALC user sees to select the different models. These models are grouped into three groups of models, including: New Building Models, Community Projects, and Renewables. The models in the New Building Models group include single-family residential, multi-family residential, and two choices of commercial buildings, including: office and retail models which represent the two largest groups of commercial buildings in Texas, according to the USDOE's Energy Information Agency's Commercial Building Energy Characteristics (CBECS 1995) database. The second group includes models for Community Projects, including: two municipal models (new construction and retrofit), two street light models (new construction and retrofit), two traffic light models (new construction and retrofit), a retrofit model for municipal water supply projects, and a retrofit model for municipal wastewater projects. In the third category, three models for renewable energy projects are included: solar photovoltaic, two solar thermal models (pool and DHW), and a model for wind energy systems.

In 2005, eCalc enhancements to the calculator included:

- Ongoing tuning of the eCalc system. This involved the identification and fixing of problems with eCalc that were reported to the Laboratory. This effort continues through 2006.

[52] Additional information on the DOE-2 program can be found at the Lawrence Berkeley National Laboratory's website: www.lbnl.gov.

[53] Additional information on the F-Chart program can be found at Klein, S.A. and Beckman, W.A. 1993. F-Chart Solar Energy System Analysis: Version 6.17W, F-Chart Software, 4406 Fox Bluff Road, Middleton, WI 53562, www.fchart.com.

[54] Additional information of the PV F-Chart program can be found at F-Chart Solar Energy System Analysis: Version 6.17W, F-Chart Software, 4406 Fox Bluff Road, Middleton, WI 53562, www.fchart.com.

[55] Additional information on the ASHRAE Inverse Model Toolkit can be found at Kissock, K., Haberl, J.S., and Claridge, D.E. 2002. Development of a Toolkit for Calculating Linear, Change-point Linear and Multiple-Linear Inverse Building Energy Analysis Models. Final Report for ASHRAE Research Project 1050-RP.

[56] A description of the peak day extractor was provided in the Laboratory's 2003 report to the TCEQ, and can be found in Haberl, J., Im, P., Culp, C. 2004. NOx Emissions Reductions From Implementation of the 2000 IECC/IRC Conservation Code to Residential Construction in Texas. Proceedings of the Fourteenth Symposium on Improving Building Systems in Hot and Humid Climates, Texas A&M University, Richardson, Texas, accepted for publication (February), pp. 139-150.

- Maintenance on the BDI tool used by the Staff and Grad students to do large numbers of batch building simulations. This feature evolved from the numerous requests by TCEQ where the Laboratory was asked to investigate a series of scenarios that required the development of a rapid-fire, batch analysis system. To accomplish this, the basic engine of the residential and commercial simulations (BDI) was modified to run in a stand-alone mode, which now allows for 100s or 1000s of batch simulations to be run automatically, and the results collected for rapid analysis of the many difficult energy efficiency questions that TCEQ must answer for policy makers.
- Expanded system to cover 2007 Annual and 2007 OSD (25%) eGRID. In 2005, the TCEQ requested and received a new version of eGRID for calculating NOx emissions reductions for future years. In 2005, eCalc was re-tooled to accommodate the new 2007 version of eGRID for annual (25% plant capacity factor) and Ozone Season Day (OSD) calculations.
- Two new scenarios for the Water and Wastewater Models. In order to support municipalities in Texas that need quick electricity saving estimates for municipal water supply and wastewater pumping retrofits, the TCEQ sought and received funding from the EPA to expand eCalc to include a new "design" module for municipal water supply and wastewater systems. This new model, referred to as the M1 and M2 models is discussed in the section that follows the current section.

In 2005, several additional tasks were initiated that continue into 2006, including:

- Design/Prototype work on e^{2}Calc v2. This task involved 7 main sub-tasks that were added to the new version of eCalc, which is called *e^{2}Calc* for energy and emissions calculations, as follows:
  - *Architecture oriented towards adding new models.* This task involves the retooling of the basic architecture inside of *e^{2}Calc* as shown in Figure 94. Additional information about this effort can be found on the Laboratory's *e^{2}Calc* web page "ecalc.tamu.edu".
  - *Friendlier, easier to use, and educational user interface.* This includes the addition of context-sensitive help screens, and the addition of explanations of the different calculation procedures as shown in Figure 95 and Figure 96.
  - *Extensive artwork to support user interface.* This artwork was added to also enhance the use of *e^{2}Calc* by web users as shown in Figure 97 and Figure 98.
  - *The ability to save, edit, and retrieve projects.* This task was requested by current users.
  - *Onscreen reporting.* Also requested by current users to speed the use of the system.
  - *Charting for reports.* Another request by current users.
  - *GIS Prototype Report.* Another request by current users to see where the emissions are.

- Started work on implementing a Code Compliance Checker version of the Calculator. This task was requested by the users of eCalc, and involves the retooling of the calculator to allow for municipalities to more easily enter information about their code compliance issues as shown in Figure 98.

- Started work on updating SECO's data gathering website. This effort involved modifying and updating the web page created for the Texas State Energy Conservation Office (SECO) to enable the collection of information for the 2005 Annual reporting process (Figure 99).

- Tested and evaluated a new web testing tool from Microsoft. Tested and evaluated Visual Studio 2005 as well as .NET Framework 2.0. These tools are being considered for the enhanced version of e2Calc.

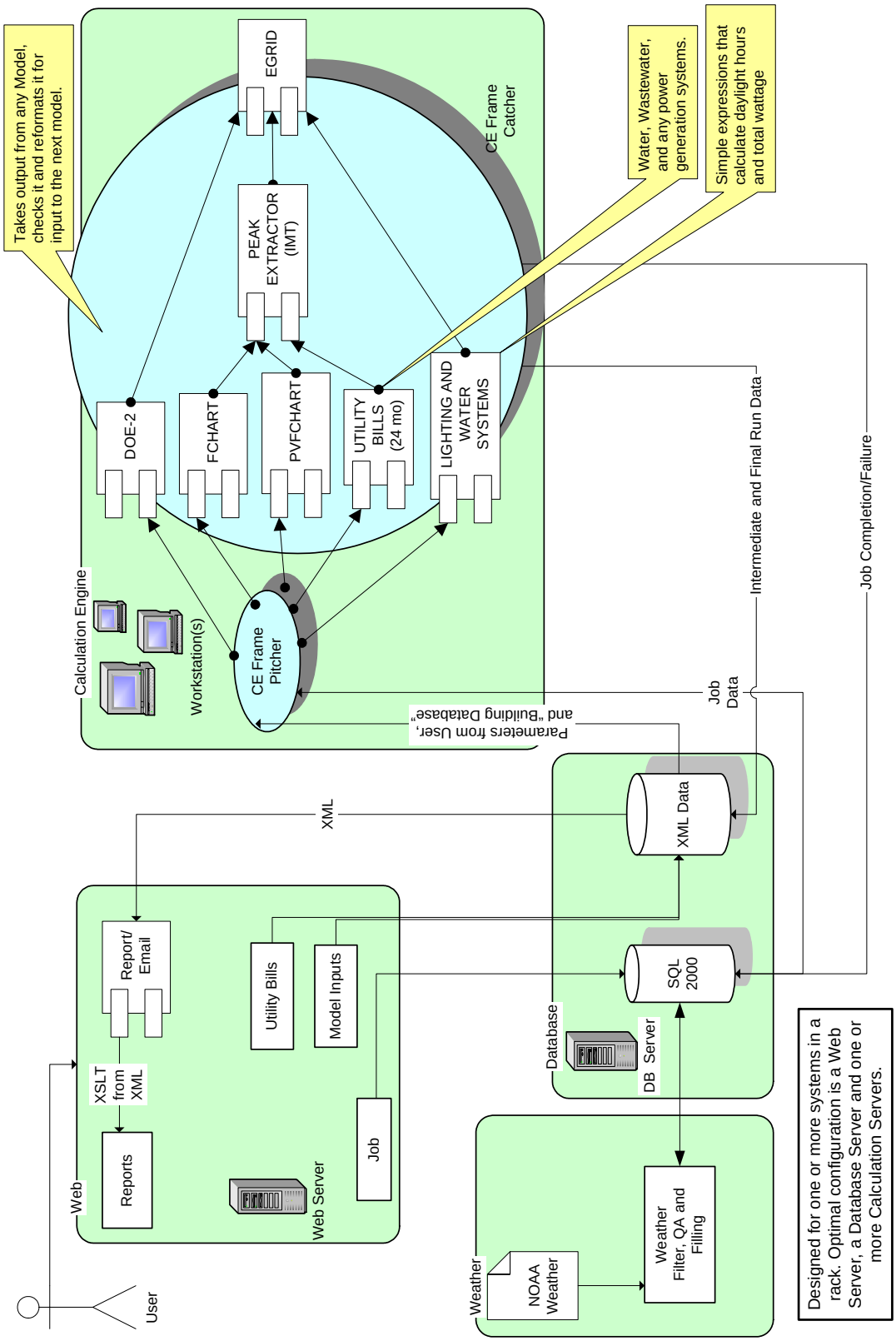


Figure 92: Block-diagram Showing Interactive-functionality of the Emissions Reduction Calculator.

Figure 93: Laboratory's Emissions Reduction Calculator (Main eCALC Screen).

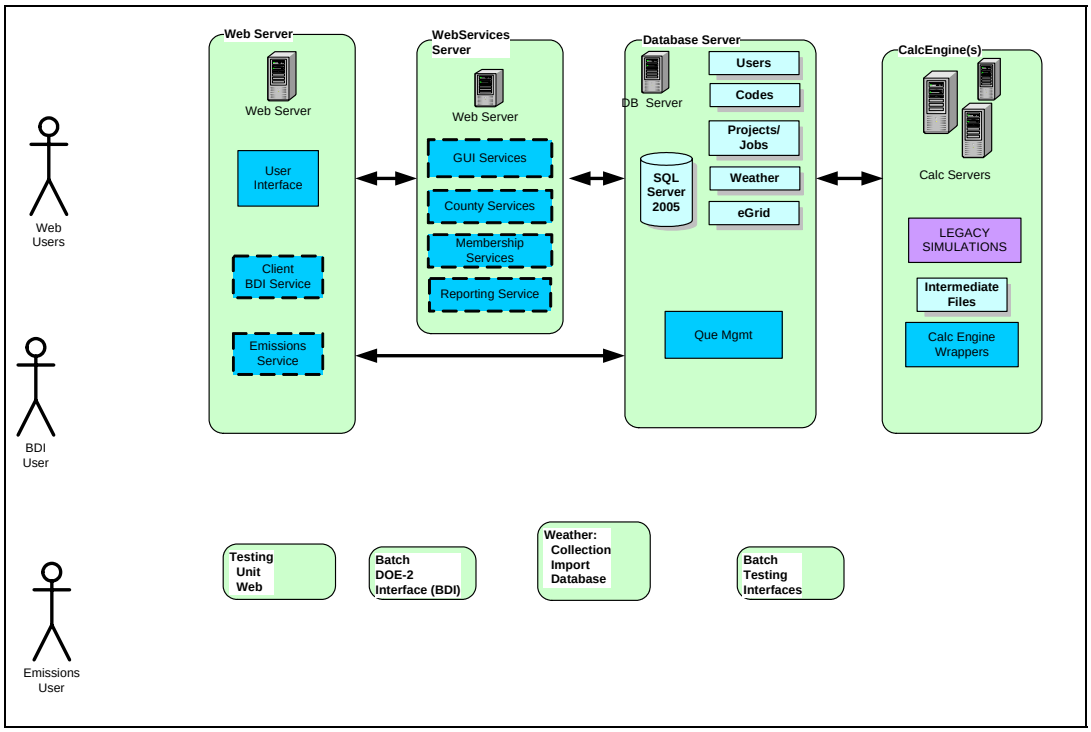


Figure 94: System Architecture for Enhanced Version of e2Calc.

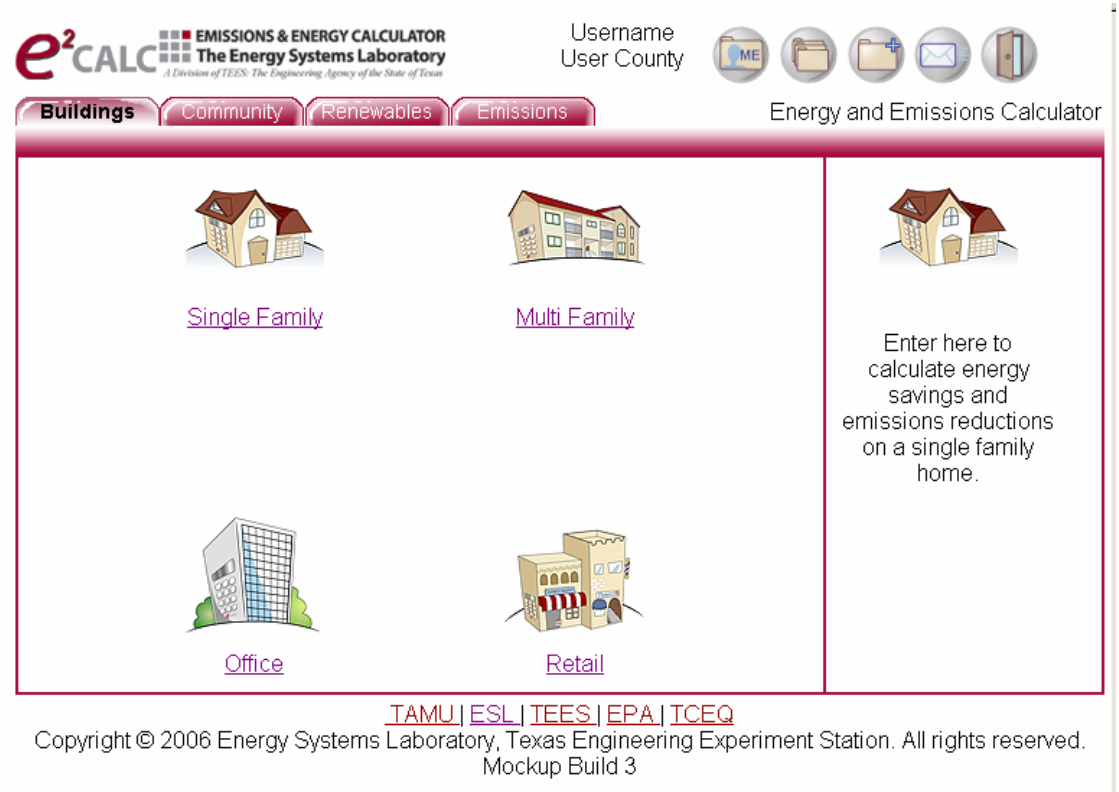


Figure 95: New Screen Layout for Enhanced Version of e2CALC (Single-family, Multi-family, Office, Retail).

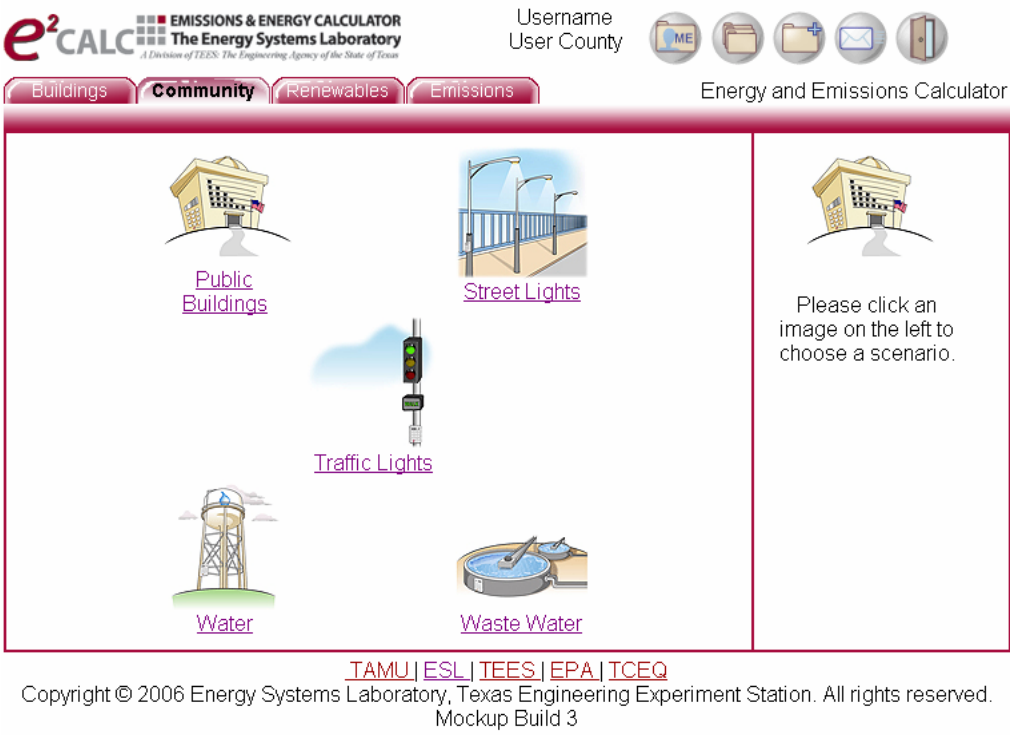


Figure 96: New Screen Layout for Enhanced Version of e2CALC (Public Buildings, Street Lights, Traffic Lights, Water and Wastewater).

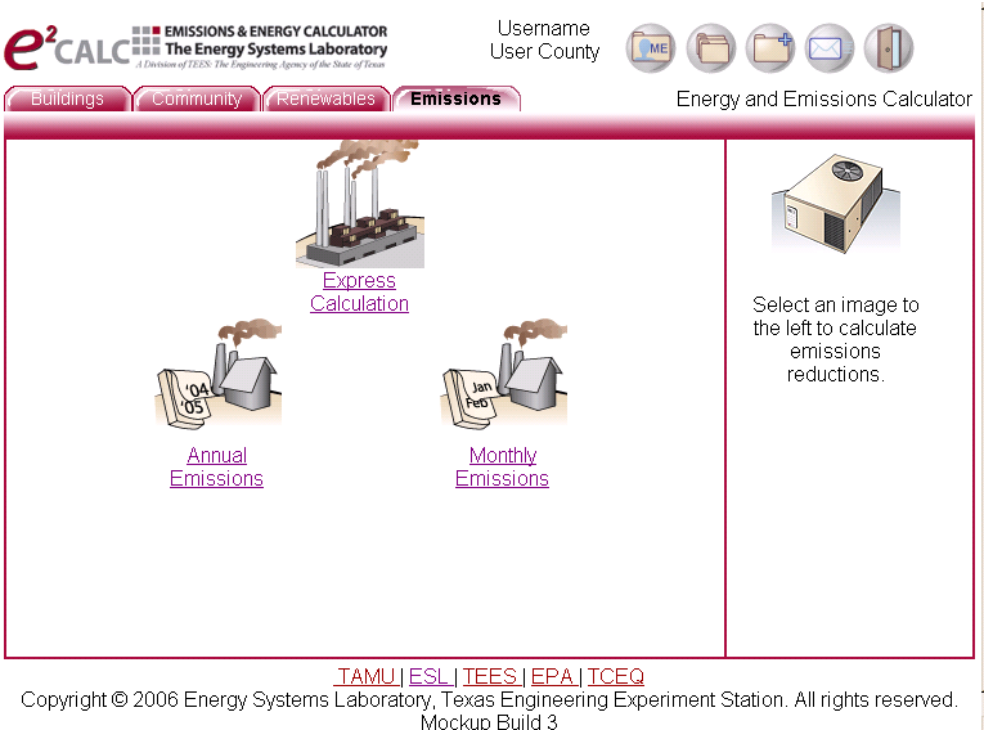


Figure 97: Example of New Artwork to Enhanced Version of e2Calc: Entry Screen.

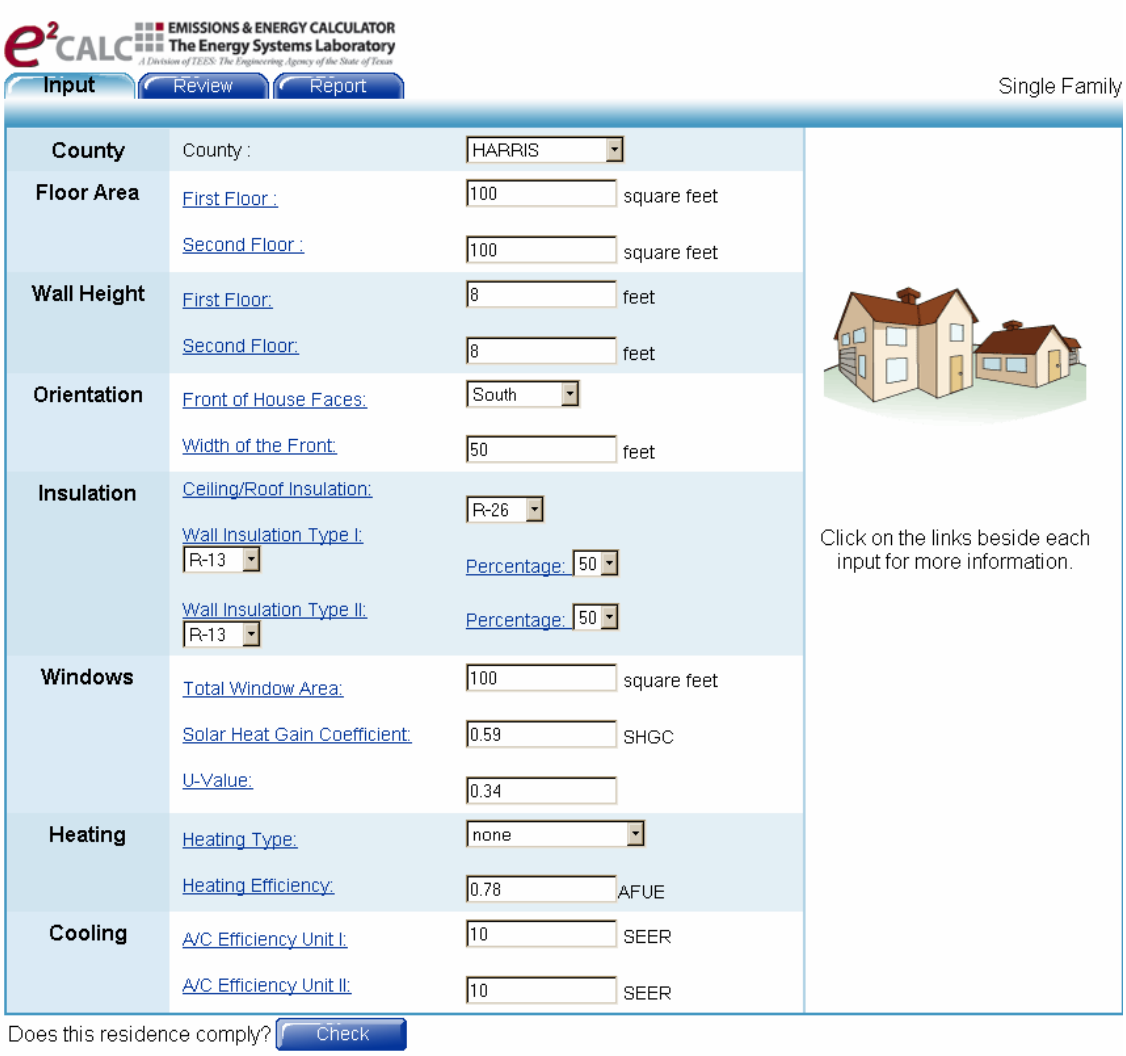


Figure 98: Example of New Artwork to Enhanced Version of e2Calc: Code Compliance Calculator.

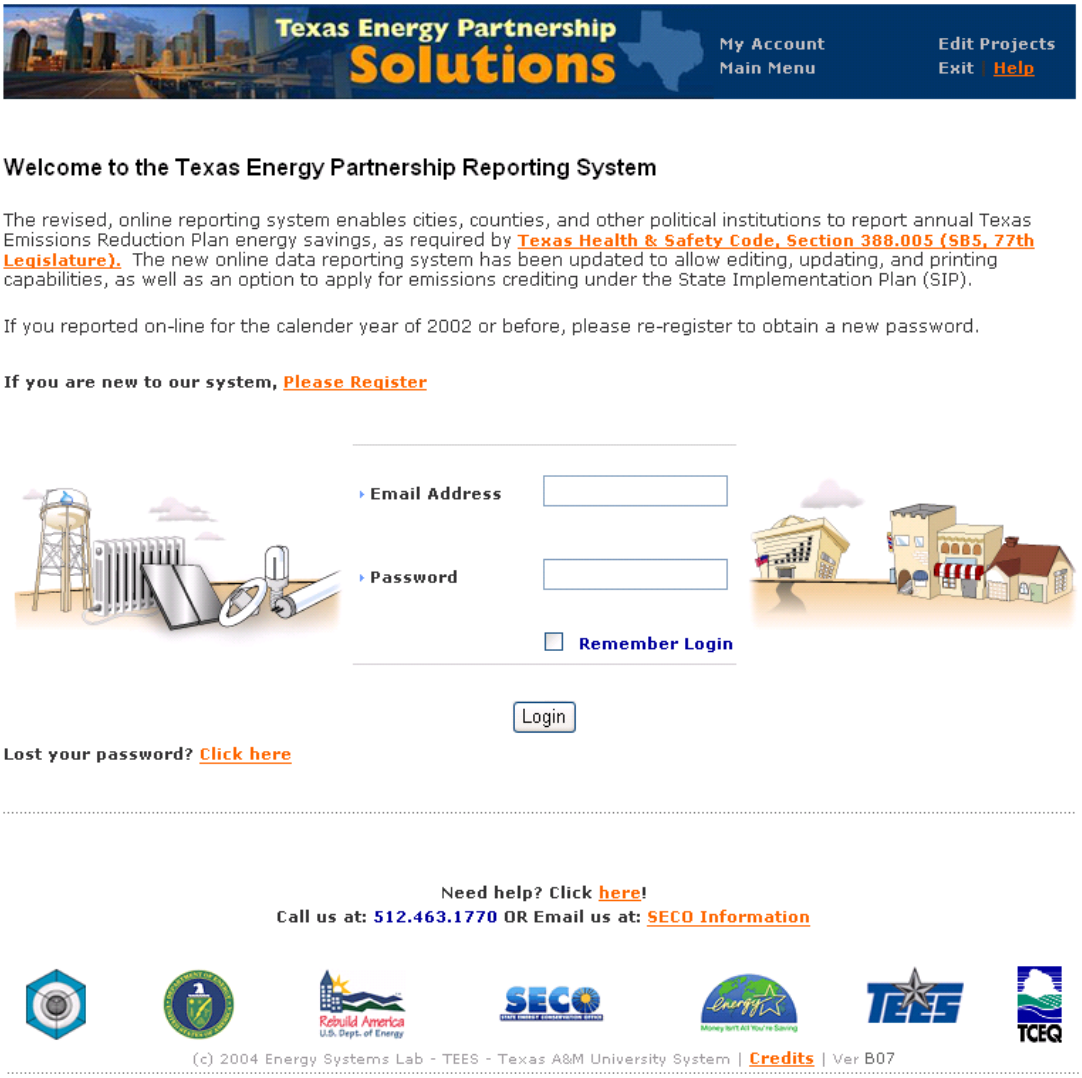


Figure 99: Enhancement to the SECO Web Page for Collection of Information for Reporting Emissions Reductions.

8.2 Municipal Water and Wastewater Module

8.2.1 M1 MODEL - Storm Sewer/Infiltration Sanitary Sewage Separation

In some cities the municipal sewer system collects both storm water and sanitary sewage in the same pipes. During dry weather these sewers carry all the sanitary sewage to the wastewater treatment plant for treatment. However, when rainstorms increase the amount of runoff, the combined flow of sanitary sewage and storm water can exceed the capacity of the sewer system, which can cause serious problems when mixed storm water and sewage are discharged untreated into rivers or, in the worst cases, when sewage backs up into streets. Storm water treated in the sewage treatment plant causes unnecessary energy use. Therefore, separating the storm water/infiltration and sanitary sewage reduces the possibility of sewage discharge during heavy rain periods and saves energy.

8.2.1.1 M1 Model Description

The intention of the M1 model is to calculate the energy savings and emissions reductions from storm sewer/infiltration sanitary sewage separation. The flow chart shown in Figure 100 describes the methodology of the M1 model. First, the user is required to input the pre-retrofit monthly wastewater treated, and the coincident electricity use for a minimum of ten periods (Table 120), growth rates covering 1999, 2002, 2007, and 2010, and the percent of storm water or infiltration that can be blocked or fixed (Figure 101). Next, ASHRAE's Inverse Model Toolkit (Kissock et al. 2002) is used in a two-step analysis to determine the regression coefficients for the weather normalization of the monthly wastewater vs. rainfall and monthly wastewater vs. energy consumption using two-parameter linear regression models (Figure 102). Then, the two sets of regression coefficients are adjusted based on the input growth factors. The adjusted coefficients are used to determine the daily wastewater treated and the daily energy consumption in the base years (1999 and 2002) when there is rain. Finally, the annual energy savings and average daily energy savings in the Ozone Season Days (OSD) in the base years are calculated, and the annual energy savings and average daily energy savings in the OSD period are predicted for 2007 and 2010 based on the growth rates (Table 121). In the output report, the annual energy savings (kWh/yr), OSD energy savings (kWh/day), and emissions reductions in 1999/2007/2010 and 2002/2007/2010 for annual and OSD period are provided.

In this analysis, the 2007 eGRID, developed by the EPA for the TCEQ, was used to predict the 2007 electricity and pollution for utilities in the ERCOT Power Control Area. The 2007-OSD eGRID was used for calculating the daily emissions on Ozone Season Days, and the 2007 eGRID was used for the annual calculations. Both the annual and OSD calculations assume eGRID's 25% plant capacity factor. In eGRID, the NOx production for each power plant is provided for ten electric utility suppliers (i.e., AEP, Austin Energy, Brownsville Public Utility, LCRA, Reliant, San Antonio Public Service, South Texas Coop, TMPP, TNMP, and TXU). In the case of an unknown power provider, the M1 model assigns the utility based on the PUCT's 2002 Power Control Authority (PCA) listing[57]. Once the utility provider has been chosen for a given county the eGRID emission factor for 2007 is used for both 2007 and 2010 calculations.

[57] For more information on the assumptions behind this assignment see the ESL's 2004 Annual Report to the TCEQ (Haberl et al. 2004a, b, c).

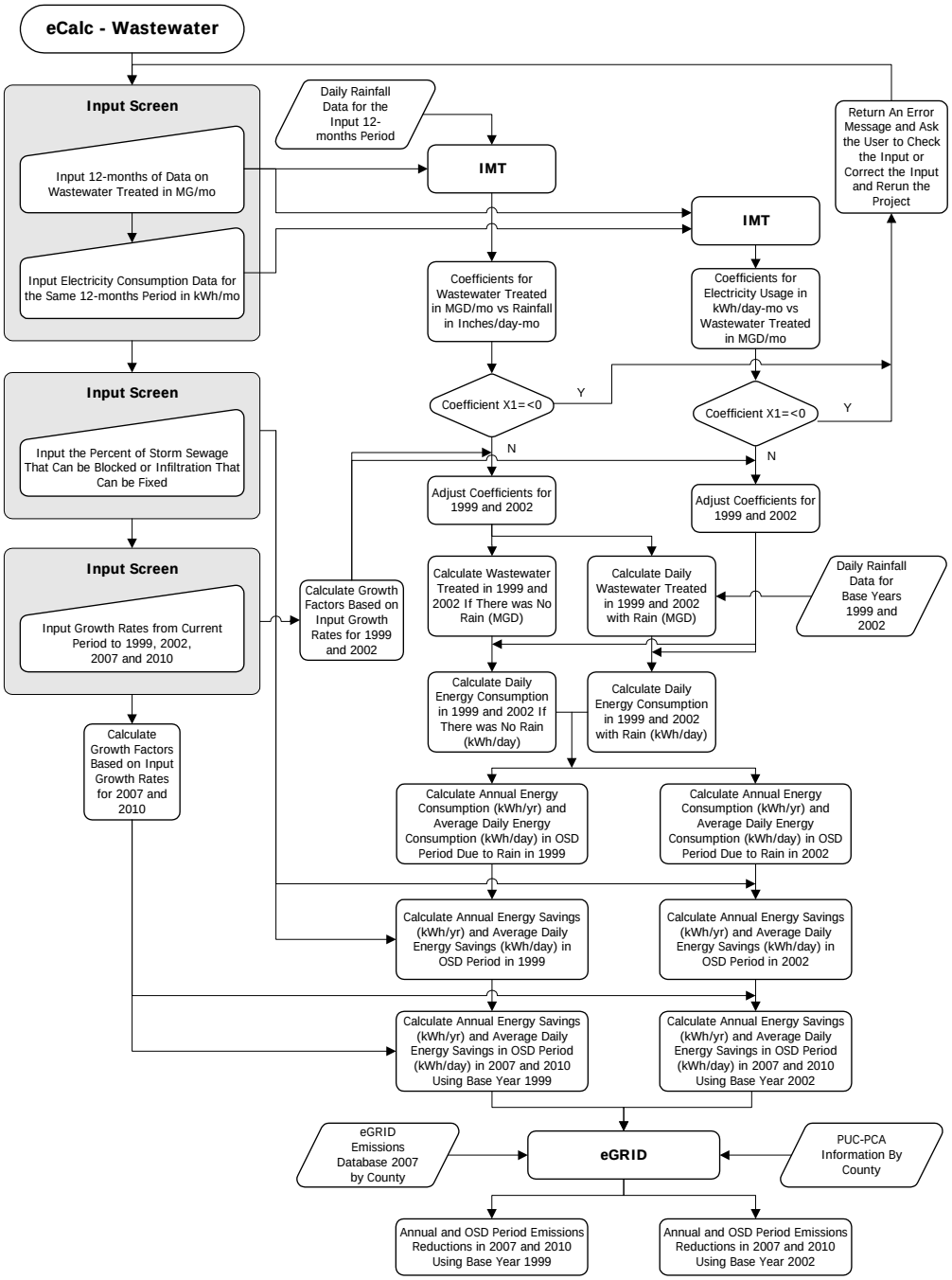


Figure 100: Flow Chart for M1 Model.

Table 120: Sample Input for Monthly Wastewater Treated and Electricity Consumption.

Per	Month	Beginning Date	Ending Date	No. Of Days	Total Wastewater Treated (MG/mo)	Total Electricity Consumption (kWh/mo)
1						
2	Feb-04	2/1/2004	2/29/2004	29	197.49	504,800
3	Mar-04	3/1/2004	3/31/2004	31	196.54	537,600
4	Apr-04	4/1/2004	4/30/2004	30	201.60	468,000
5	May-04	5/1/2004	5/31/2004	31	218.86	496,400
6	Jun-04	6/1/2004	6/30/2004	30	214.80	524,000
7	Jul-04	7/1/2004	7/31/2004	31	196.54	502,000
8	Aug-04	8/1/2004	8/31/2004	31	206.46	514,400
9	Sep-04	9/1/2004	9/30/2004	30	193.20	467,600
10	Oct-04	10/1/2004	10/31/2004	31	202.12	458,800
11	Nov-04	11/1/2004	11/30/2004	30	193.50	488,000
12						

If the input starting period is after Jan 01, 2002, use Screen B-I for input Screen B-I:

b1	Percent of Storm Sewer that can be blocked, or Percent of Infiltration that can be fixed:	80%
b2	Total Growth Rate From 1999 to Current Period	20%
b3	Total Growth Rate From 2002 to Current Period	10%
b4	Total Projected Growth From Current Period to 2007	15%
b5	Total Projected Growth From Current Period to 2010	30%

If the input starting period is between Jan. 01, 1999 to Jan 01, 2002, use Screen B-II for input Screen B-II:

b1	Percent of Storm Sewer that can be blocked, or Percent of Infiltration that can be fixed:	80%
b2	Total Growth Rate From 1999 to Current Period	10%
b3	Total Growth Rate From current period to 2002	10%
b4	Total Projected Growth From Current Period to 2007	30%
b5	Total Projected Growth From Current Period to 2010	45%

Figure 101: Sample Input for Growth Factors.

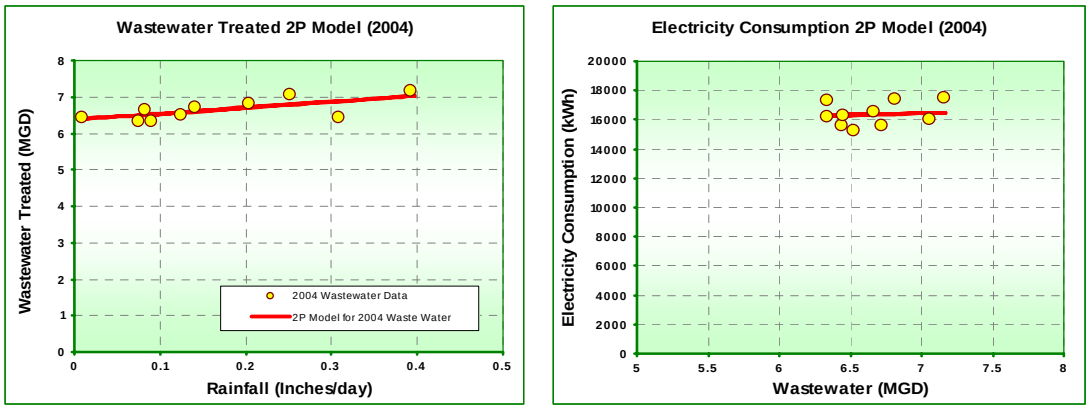


Figure 102: IMT Regression Results from the 2-Step Analysis.

RF.OUT

```
**********************************************
 ASHRAE INVERSE MODELING TOOLKIT (1.9)
**********************************************
  Output file name = IMT.Out
**********************************************
  Input data file name =  RF.RES
  Model type =           2P
  Grouping column No =    0
  Value for grouping =    0
  Residual mode =         0
  # of X(Indep.) Var =    1
  Y1 column number =      4
  X1 column number =   5
  X2 column number =   0 (unused)
  X3 column number =   0 (unused)
  X4 column number =   0 (unused)
  X5 column number =   0 (unused)
  X6 column number =   0 (unused)
**********************************************
  Regression Results
 ------------------------------------
       N =     10
 ------------------------------------
      R2 =     0.470
 ------------------------------------
    AdjR2 =     0.470
 ------------------------------------
     RMSE =      0.2233
 ------------------------------------
  CV-RMSE =     3.358%
 ------------------------------------
       p =     0.022
 ------------------------------------
      DW =     1.448 (p>0)
 ------------------------------------
      a =     6.3713 (     0.1263)
 ------------------------------------
     X1 =     1.6686 (     0.6271)
 ------------------------------------
```

FE_2P.OUT

```
**********************************************
 ASHRAE INVERSE MODELING TOOLKIT (1.9)
**********************************************
  Output file name = IMT.Out
**********************************************
  Input data file name =  FE.RES
  Model type =           2P
  Grouping column No =    0
  Value for grouping =    0
  Residual mode =         0
  # of X(Indep.) Var =    1
  Y1 column number =      4
  X1 column number =   5
  X2 column number =   0 (unused)
  X3 column number =   0 (unused)
  X4 column number =   0 (unused)
  X5 column number =   0 (unused)
  X6 column number =   0 (unused)
**********************************************
  Regression Results
 ------------------------------------
       N =     10
 ------------------------------------
      R2 =     0.014
 ------------------------------------
    AdjR2 =     0.014
 ------------------------------------
     RMSE =    552.8624
 ------------------------------------
  CV-RMSE =     3.374%
 ------------------------------------
       p =    -0.272
 ------------------------------------
      DW =     1.832 (p>0)
 ------------------------------------
      a =  14966.9697 (   4243.2271)
 ------------------------------------
     X1 =   213.3271 (   637.5375)
 ------------------------------------
```

Figure 103: IMT Regression Results from the 2-Step Analysis.

Table 121: Example Predicted Annual and OSD Period Energy Savings in 2007 and 2010.

Base Year: 1999

Year	Savings for 2007 (kWh/yr) [10c=(1+10a)* 9a1999]	Savings for 2010 (kWh/yr) [10d=(1+10b)* 9a1999]	Savings for 2007 OSD (kWh/day) [10e=(1+10a)* 9b1999]	Savings for 2010 OSD (kWh/day) [10f=(1+10b)* 9b1999]
2007	7,926		7	
2010		8,807		7

Base Year: 2002

Year	Savings for 2007 (kWh/yr) [10i=(1+10g)* 9a2002]	Savings for 2010 (kWh/yr) [10j=(1+10h)* 9a2002]	Savings for 2007 OSD (kWh/day) [10k=(1+10g)* 9b2002]	Savings for 2010 OSD (kWh/day) [10l=(1+10h)* 9b2002]
2007	13,925		26	
2010		15,596		30

8.2.1.2 M1 Model Input Screens and Output Report

The user input screens for water and wastewater retrofit projects - Storm Sewer/Infiltration Sanitary Sewage Separation (M1 Model) begin with the project input screen as shown in Figure 104. When the user submits this type of project to the emissions calculator, they are directed to the screen shown in Figure 105. This input screen asks for specific information about the beginning date, ending date, and number of periods for the wastewater and energy consumption data. It also asks the percent of storm sewer that can be blocked or infiltration that can be fixed. After entering this information, the user can then begin entering the wastewater and electricity consumption data into the screen shown in Figure 106. When the user completes entering at least 10 months of data, they are directed to the screen shown in Figure 107. This screen asks the growth rate information for the emissions calculator to predict the savings for 2007 and 2010. When the user completes the input in this screen, the project is submitted for analysis. Finally, in the next step the eGRID database is used to project annual and average daily OSD period NOx, SOx, and CO2 reductions in 2007/2010 using base year 1999 and 2002. Figure 108 shows an example of the emissions reduction report that will be sent to the user.

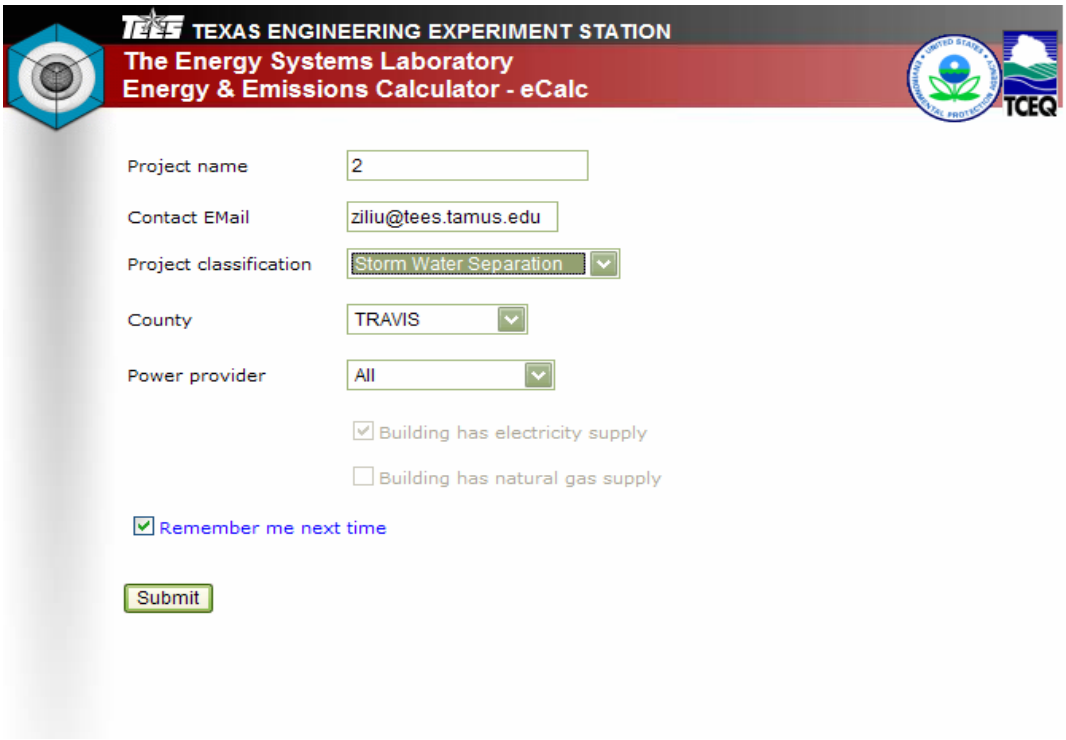


Figure 104: M1 Model Input Screens.

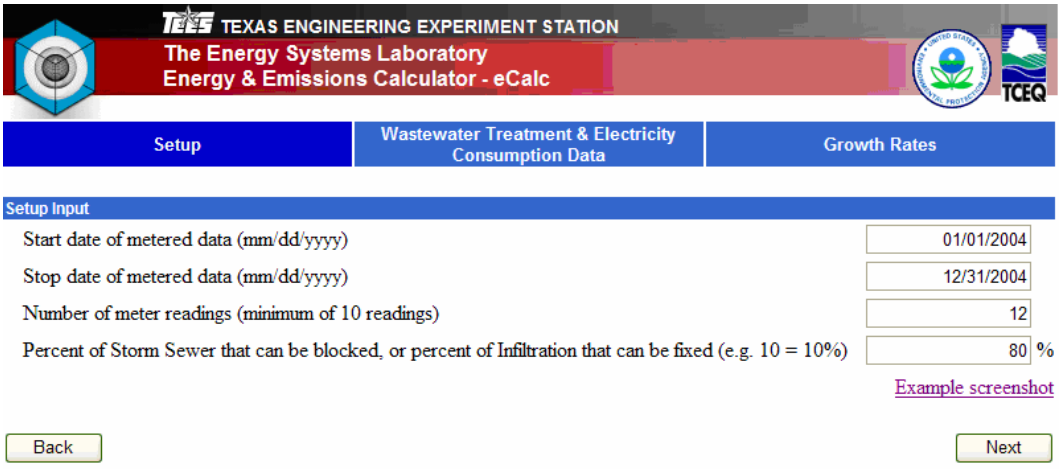
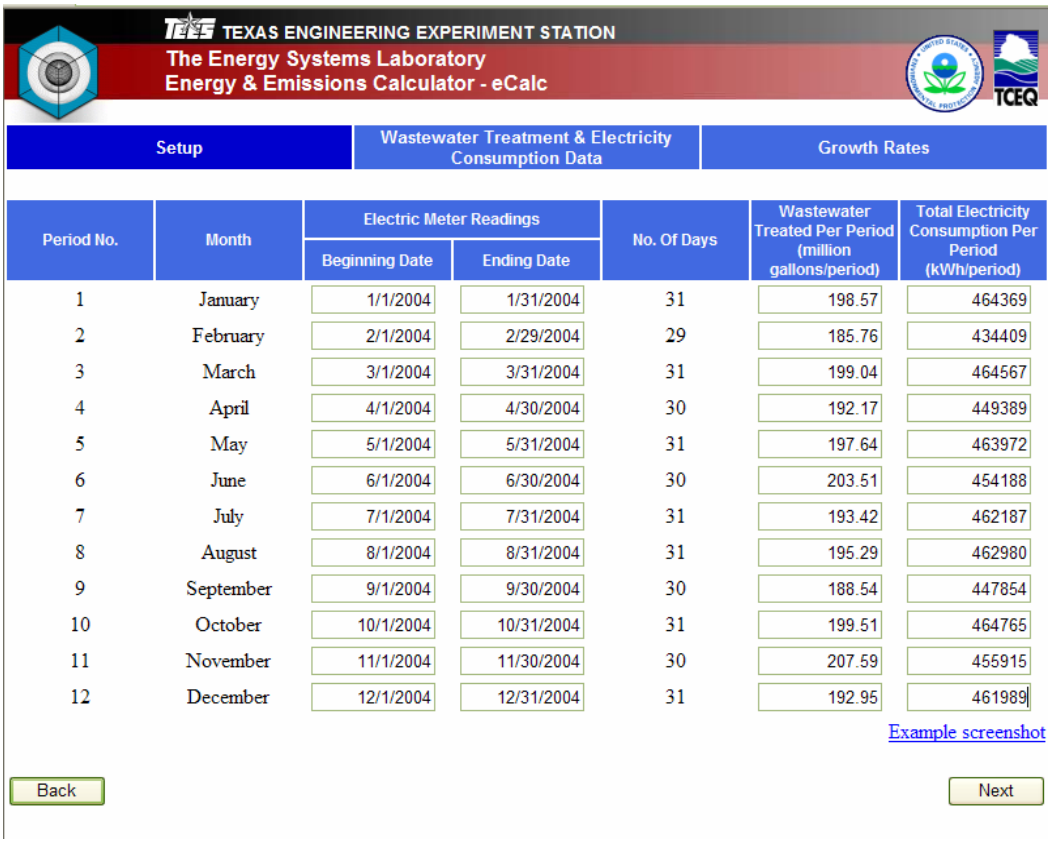


Figure 105: M1 Model Input Screens.



Period No.	Month	Electric Meter Readings		No. Of Days	Wastewater Treated Per Period (million gallons/period)	Total Electricity Consumption Per Period (kWh/period)
		Beginning Date	Ending Date			
1	January	1/1/2004	1/31/2004	31	198.57	464369
2	February	2/1/2004	2/29/2004	29	185.76	434409
3	March	3/1/2004	3/31/2004	31	199.04	464567
4	April	4/1/2004	4/30/2004	30	192.17	449389
5	May	5/1/2004	5/31/2004	31	197.64	463972
6	June	6/1/2004	6/30/2004	30	203.51	454188
7	July	7/1/2004	7/31/2004	31	193.42	462187
8	August	8/1/2004	8/31/2004	31	195.29	462980
9	September	9/1/2004	9/30/2004	30	188.54	447854
10	October	10/1/2004	10/31/2004	31	199.51	464765
11	November	11/1/2004	11/30/2004	30	207.59	455915
12	December	12/1/2004	12/31/2004	31	192.95	461989

Figure 106: M1 Model Input Screens.

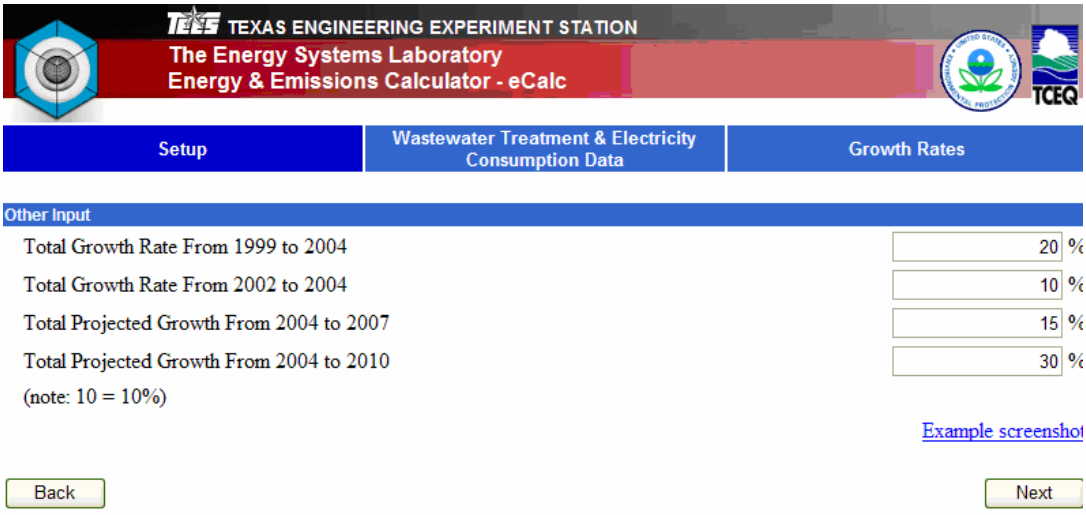


Figure 107: M1 Model Input Screens.

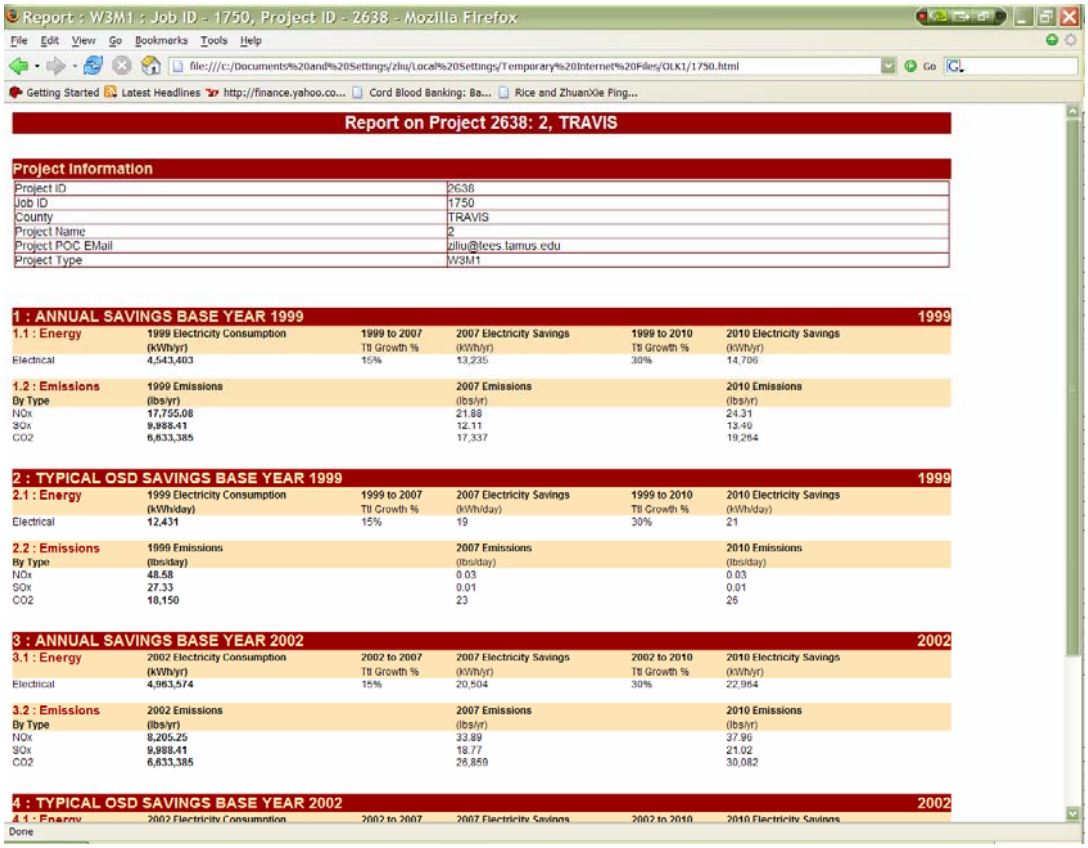


Figure 108: Sample Output Report Sent to the User.

8.2.2 M2 Model - High Efficiency Pump/Motor Replacement.

Pumping water or wastewater is the largest use of electricity for a municipal water supply or wastewater treatment plant. Increasing the overall efficiency of the pump system can achieve significant energy savings. Overall pump system efficiency depends on the efficiency of the motor, the pump, and the design of the piping layout. The model developed in this project focuses on improvements mostly to the pumping system rather than a municipal piping system. Furthermore, this model primarily addresses electric motor-driven pumps, not including the pump drivers using gas and diesel engines.

There are many ways to increase the efficiency of the pump, including impeller trimming, pump speed changes, and parallel or series pumping. Pumping system efficiency improvements can also be made by increasing the efficiency of the motor or pump directly. Pump efficiency can be improved by replacing worn or damaged impellers or replacing the old pump with a new high-efficiency pump. Improved motor efficiency can be accomplished by replacing a standard-efficiency motor with a high- or premium-efficiency motor. In this section, a methodology for calculating the savings from high efficiency pump/motor replacement, i.e., the "M2 model." It also includes the description of the M2 model, the input screens, and the output report.

8.2.2.1 Description of the M2 Model.

The intention of the M2 model is to calculate the energy savings and emissions reductions from high efficiency pump/motor replacements. As shown in Figure 109, the user is first required to input the general information about the old pump and motor including motor HP, motor nominal efficiency, rated pump capacity, total dynamic head. Then the user can choose from one of the three screens to input the flow rate, motor power/head, old pump and new pump efficiencies, percentage of operating hours annually and in Ozone Season Day (OSD) period for a maximum of five periods in one year. The user is also required to input the motor efficiencies for the same periods if they want to replace the old motor with premium efficiency motor. Based on the above input, the Laboratory's emission's calculator (eCalc) calculates the electricity savings from the pump/motor replacement. In the output report, the annual electricity savings (kWh/yr), OSD electricity savings (kWh/day), and emissions reductions in 1999, 2002, 2007 and 2010 for annual and OSD periods will be provided. The model also addresses growth rates from 1999 or 2002 to the year of the retrofit, and from the year of the retrofit to 2007 and 2010.

For this analysis the 2007-annual eGRID, developed by the EPA especially for Texas, was used to predict the annual 2007 pollution for utilities in the ERCOT Power Control Area. The 2007-OSD eGRID was used for calculating the daily emissions on Ozone Season Days. Both the annual and OSD calculations assume eGRID's 25% plant capacity factor. In eGRID, the NOx production for each power plant is provided for ten electric utility suppliers (i.e., AEP, Austin Energy, Brownsville Public Utility, LCRA, Reliant, San Antonio Public Service, South Texas Coop, TMPP, TNMP, and TXU). In the case of an unknown power provider, the M2 model assigns the utility based on the PUCT's 2002 Power Control Authority (PCA) listing[58]. Once the utility provider had been chosen for a given county the eGRID emission factor for 2007 is used for both 2007 and 2010 calculations.

[58] For more information on the assumptions behind this assignment see the ESL's 2004 Annual Report to the TCEQ (Haberl et al. 2004a, b, c).

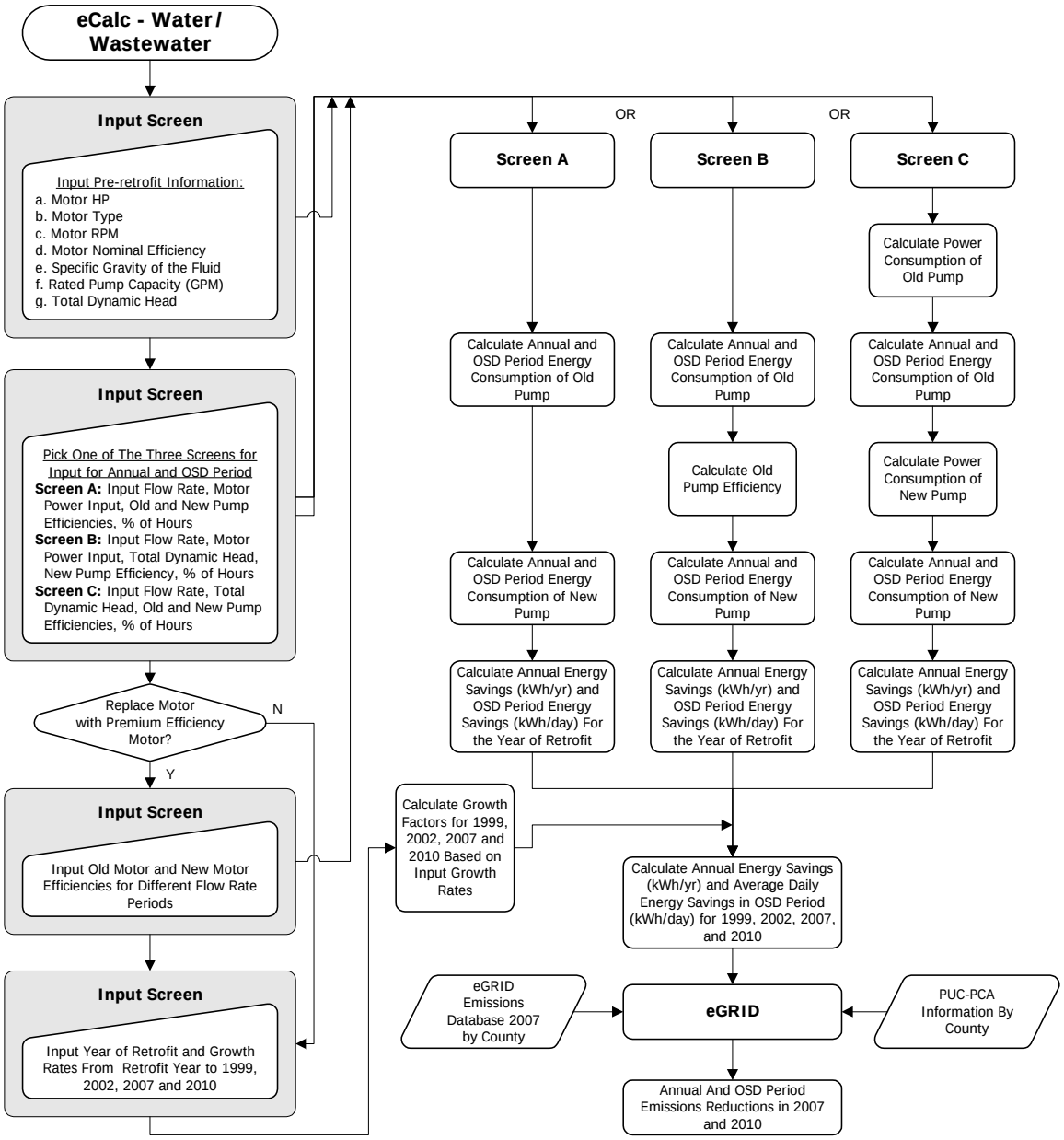


Figure 109: Flow Chart for the M2 Model.

8.2.2.2 M2 Model Input Screens and Output Report.

The user input screens for water and wastewater retrofit projects - High Efficiency Pump/Motor Replacement (M2 Model) - begin with the project input screen as shown in Figure 110. When the user submits this type of project to the emissions calculator they are directed to the screen shown in Figure 111. This input screen asks for specific information for the old pumping system, including the horsepower, type, RPM, and nominal efficiency of motor, specific gravity of the fluid, rated pump capacity, total dynamic head, as well as the year of the retrofit. It also asks the user to select a method to input the necessary information for calculating the energy savings for a maximum of five flow-duration periods annually, and in the OSD period depending on the availability of the information.

For the first method, the user needs to input Flow Rate, Motor Power Input, Old Pump Efficiency and New Pump Efficiency for each period[59]. In the second method, the user needs to input Flow Rate, Motor Power Input, Total Dynamic Head, and New Pump Efficiency for each period. In the third method, the user needs to input Flow Rate, Total Dynamic Head, Old Pump Efficiency and New Pump Efficiency for each period. Figure 112 shows an example input screen using the first method.

Next, the user inputs the efficiency of the old motor and new motor if it is determined to replace the old standard-efficiency motor with a high- or premium-efficiency motor (Figure 113). The default nominal efficiencies for NEMA Premium induction motors are provided in the input screen for the new motors. Then, as shown in Figure 114, the user provides the anticipated growth of their system covering 1999 or 2002 to the current period and from the current period to 2007 and 2010. In this example, the user inputs the growth rates from 1999 and 2002 to 2005 and from 2005 to 2007 and 2010. This allows the calculations to evaluate the conditions in the base year (i.e., 1999 or 2002) and in the 2007 and 2010 future years, given the current year of 2005. Finally, the eGRID database is used to project annual and average daily OSD period NOx, SOx, and CO2 reductions in 1999, 2002, 2007, and 2010. Figure 115 shows an example of the emissions reduction report that will be sent to the user.

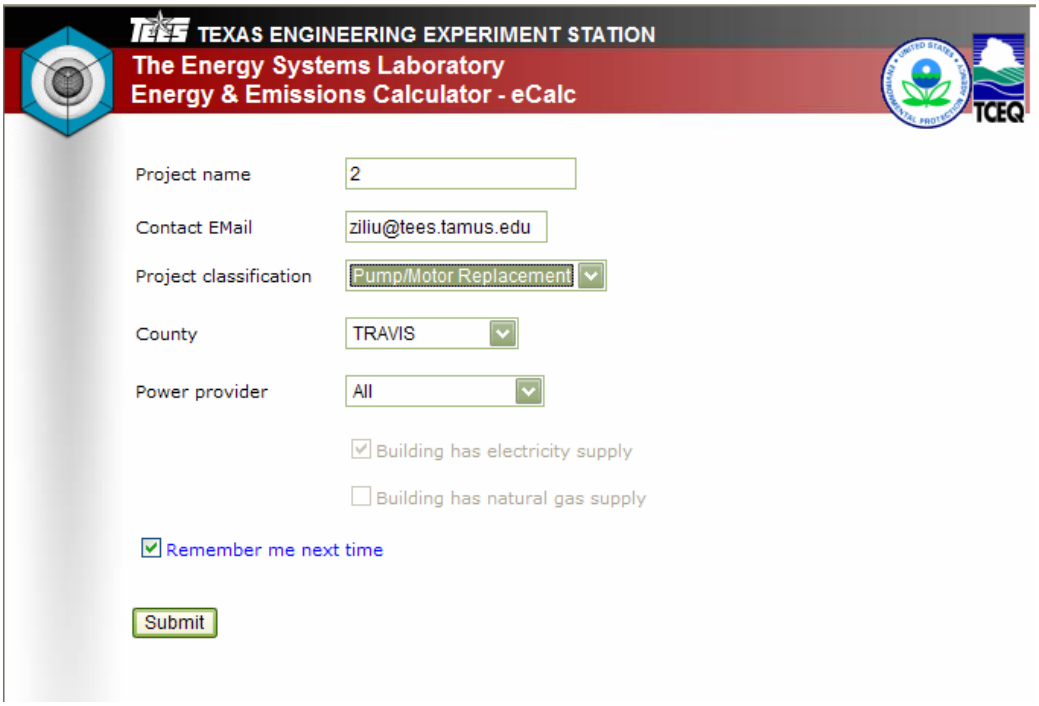


Figure 110: M2 Model Input Screens.

[59] The M2 model assumes the year or OSD can be divided into 5 periods that represent the operation of the pump. The user is then required to supply the needed information for each of these periods.

Figure 111: M2 Model Input Screens.

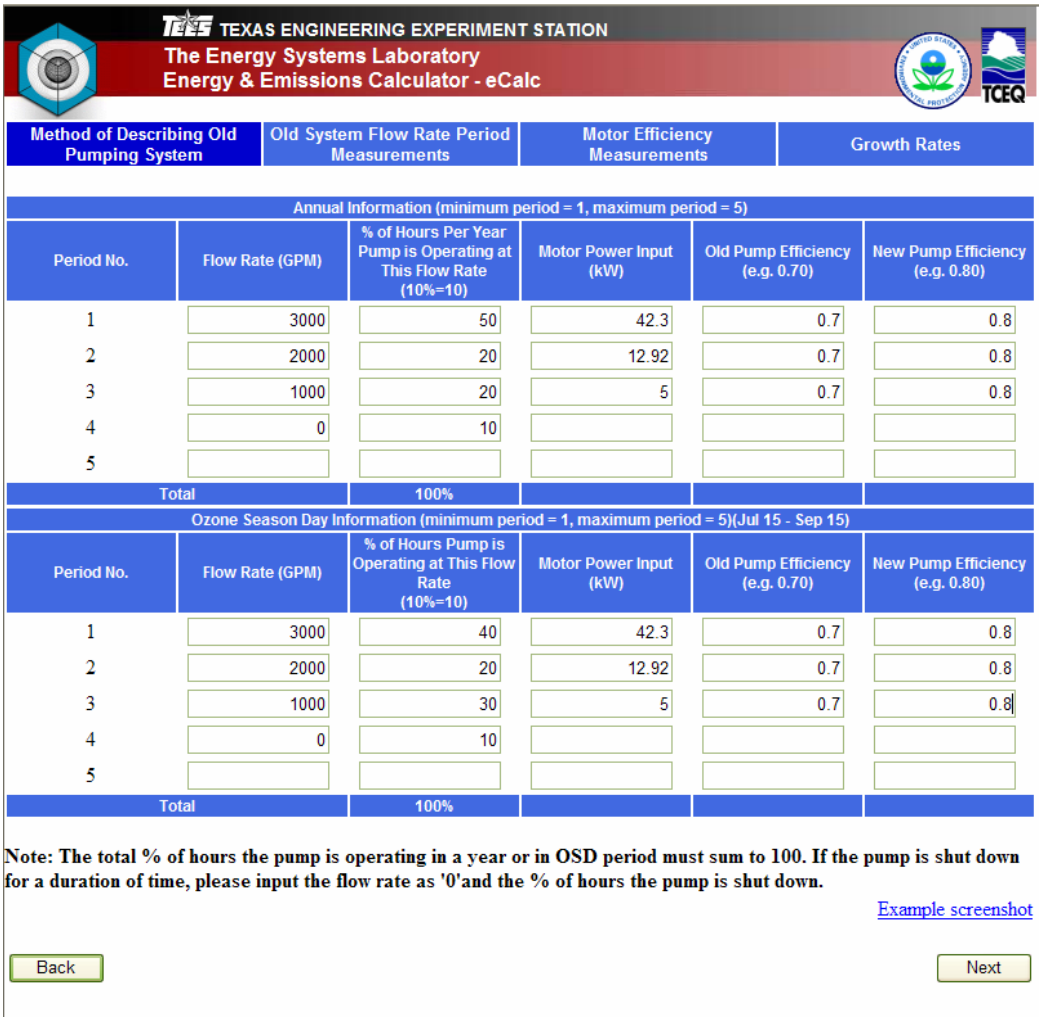


Figure 112: M2 Model Input Screens.

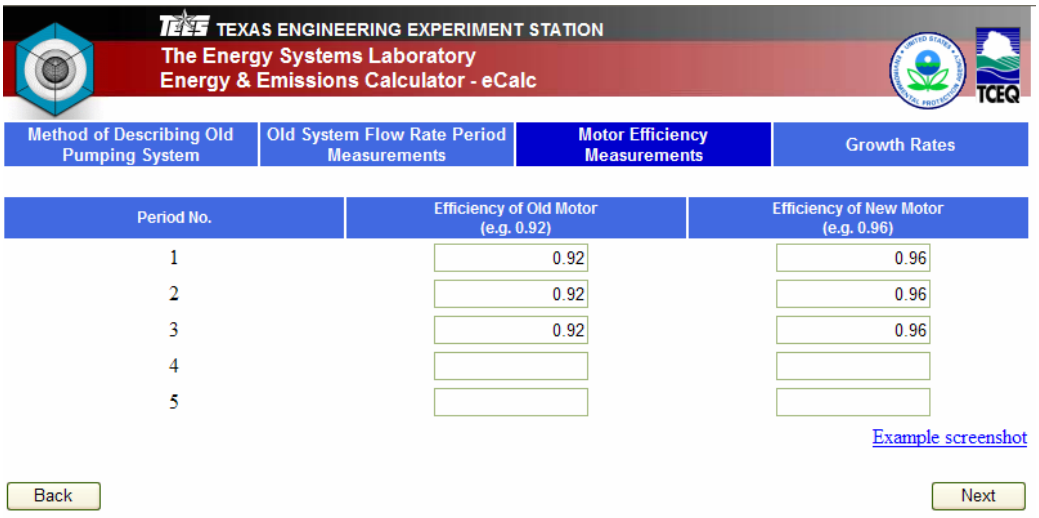


Figure 113: M2 Model Input Screens.

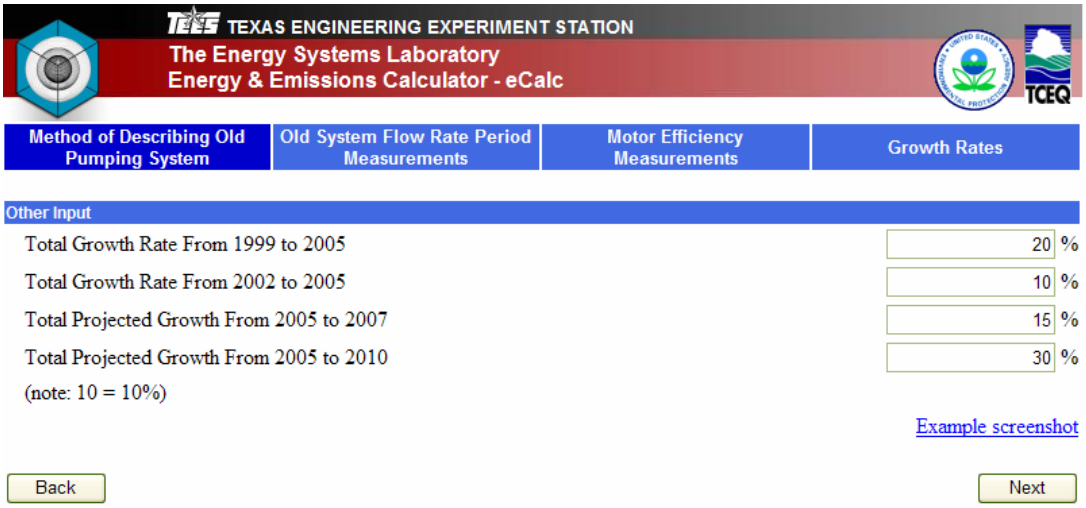


Figure 114: M2 Model Input Screens.

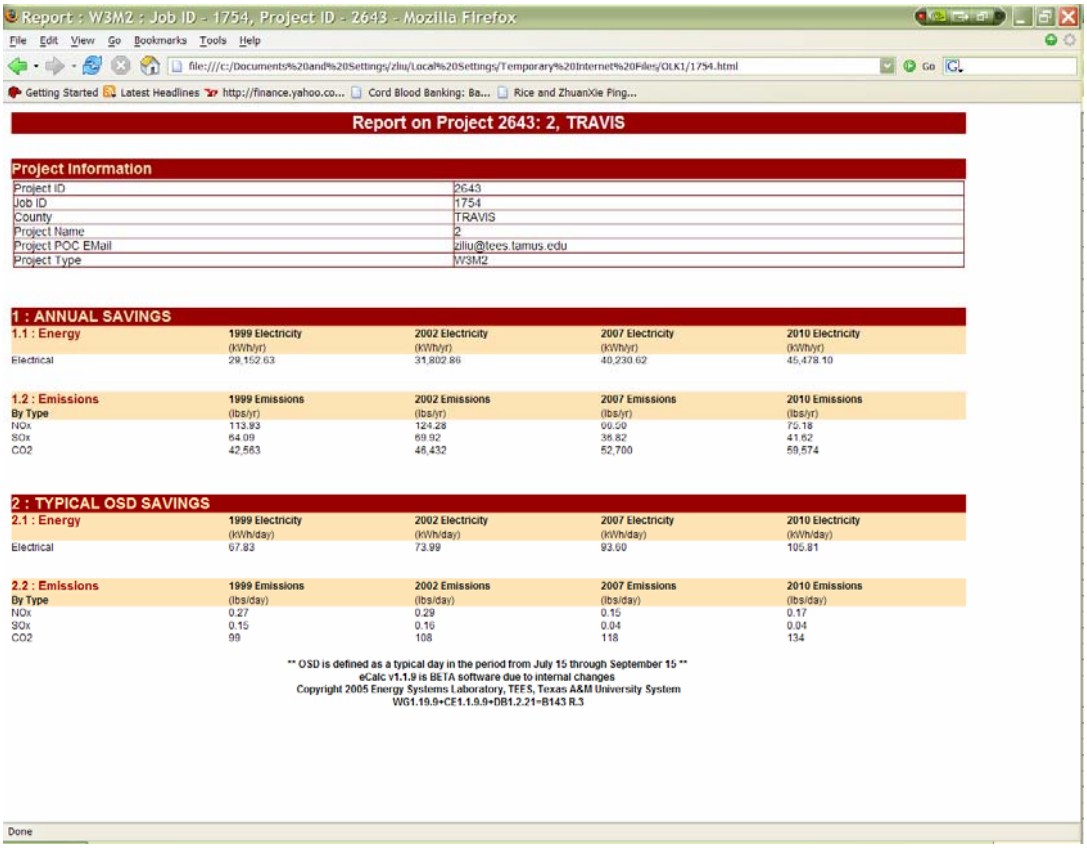


Figure 115: M2 Output Report Sent to the User.

8.3 Weather Data.

8.3.1 Expansion of the Weather Data to include all ERCOT Counties using 17 Weather Stations.

In order to calculate the NOx emissions from energy efficiency and renewable energy (EE/RE) projects in non-attainment and affected counties in Texas (Figure 116) several weather data sets needed to be assembled from the many different weather sources (Figure 117 and Table 122), including hourly weather data sets needed for the DOE-2 simulations and daily average weather data for analysis that used monthly utility billing data.

To accomplish this, the counties were grouped according to the nearest TMY2 weather station as shown in Table 123. Next, for each group, weather files were determined for F-CHART, PV F-CHART, ASHRAE 90.1-1989, and ASHRAE 90.1-1999 analysis. Finally, as shown in Table 124, weather files were assigned for NOAA data (temperature, humidity, wind speed) and NREL (solar radiation). In some instances, where solar radiation data were not available from the NREL database, TCEQ solar data were used. For NREL solar sources, solar data included global horizontal, direct normal beam, and diffuse solar radiation. For TCEQ solar sources, only global horizontal solar radiation data were available which required synthesis of direct normal beam and diffuse radiation using an iterative kt procedure (Erbs 1982). Synthetic beam and diffuse solar data were also used to fill missing NREL data.

In 2005, at the request of the TCEQ, the 9 weather stations assembled for calculating emissions from the non-attainment and affected counties were expanded to include all counties in ERCOT (Figure 121). To accomplish this, 8 additional weather stations were added to the original 9 stations for a total of 17 weather stations (Table 125). Assignment of weather stations was then performed as shown in Table 126, with additional details provided in Table 127. Figure 118 shows an updated map of Texas showing the available weather files, 2000/2001 IECC weather zones, and ERCOT county outline. Figure 119 shows the clustering of the counties around their chosen TMY2 and NOAA weather stations. Figure 120 shows the 2000/2001 and 2006 IECC weather zones and available weather files.

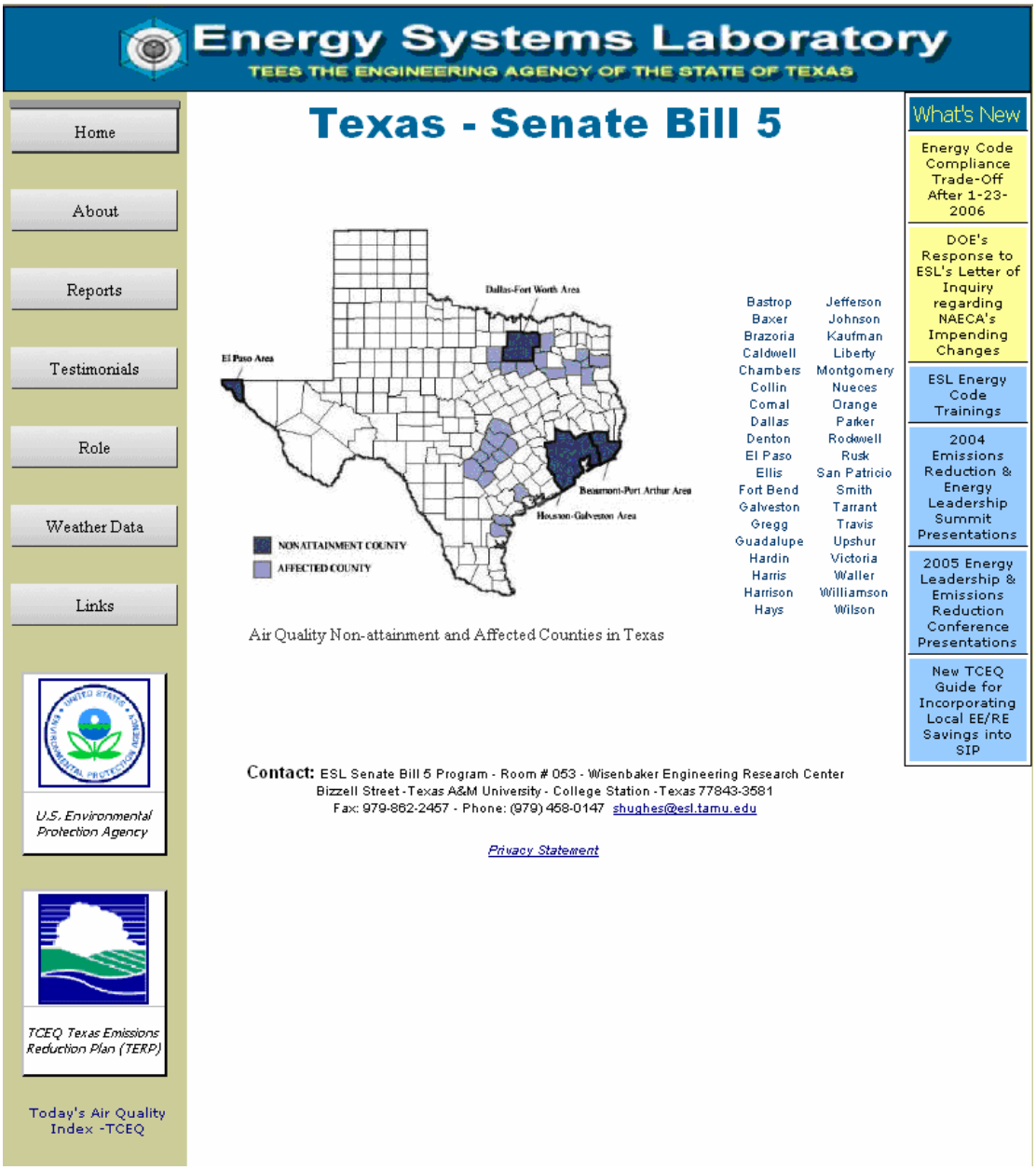


Figure 116: Main Screen of the Senate Bill 5 Web Page Showing the New Weather Data Button.

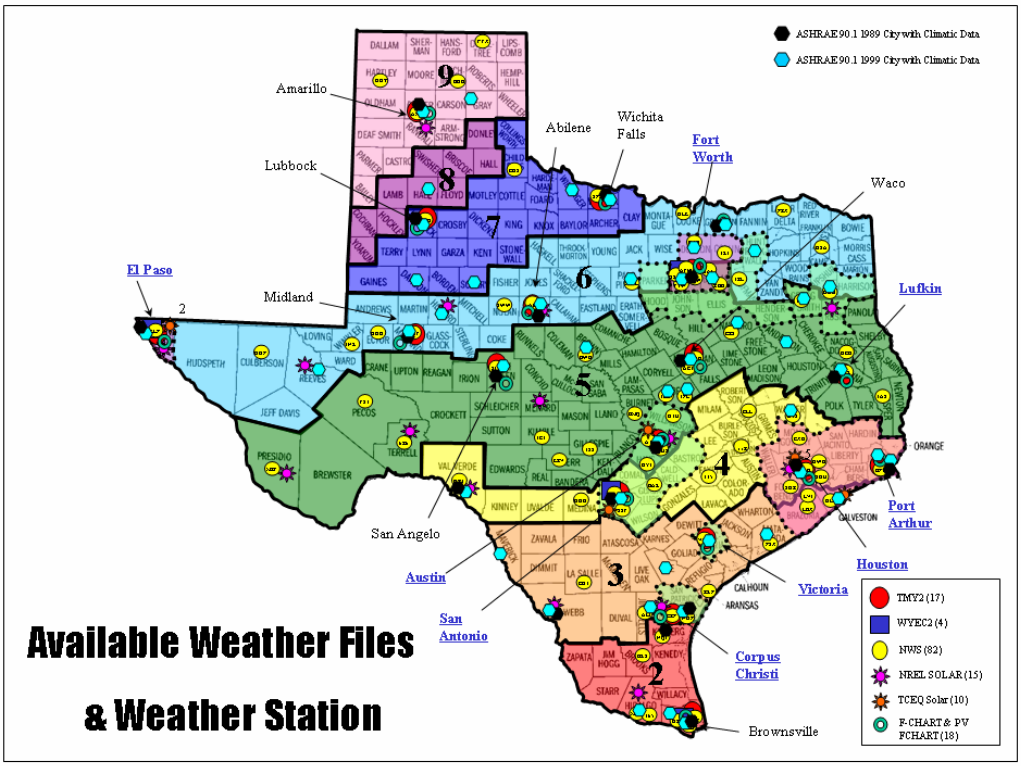


Figure 117: Available Weather Stations in Texas for 41 Non-attainment and Affected Counties.

Table 122: List of Available Weather Files in Texas (Listed by Symbol).

List of Available Weather Files and Weather Stations of Texas

Texas Weather Stations (NOAA)

1	Abilene Regional Airport (ABI)
2	Alice International Airport (ALI)
3	Amarillo International Airport (AMA)
4	Angleton / Lake Jackson Brazoria (LBX)
5	Arlington Municipal Airport (GKY)
6	Austin - Bergstrom International (AUS)
7	Austin Camp Mabry (ATT)
8	Borger Hutchinson County Airport (BGD)
9	BRENHAM: BRENHAM MUNICIPAL AIRPORT (11R)
10	Brownsville S. Padre Isl International (BRO)
11	BROWNWOOD: BROWNWOOD REGIONAL AIRPORT (BWD)
12	Burnet Municipal Airport (BMQ)
13	Childress Municipal Airport (CDS)
14	College Station (CLL)
15	Conroe: Montgomery County Airport (CXO)
16	Corpus Christi International Airport (CRP)
17	CORPUS CHRISTI: CORPUS CHRISTI NAS/TRUAX FIELD ARPT (NGP)
18	Corsicana Campbell Field (CRS)
19	Cotulla La Salle Co Airport (COT)
20	Dalhart Municipal Airport (DHT)
21	Dallas - Fort Worth International Airport (DFW)
22	Dallas Love Field (DAL)
23	Dallas Redbird Airport (RBD)
24	Del Rio International Airport (DRT)
25	Denton Municipal Airport (DTO)
26	Dyess Terrell County Airport (6R6)
27	El Paso International Airport (ELP)
28	FALFURRIAS : BROOKS COUNTY AIRPORT (BKS)
29	Fort Stockton Pecos County Airport (FST)
30	Fort Worth Alliance Airport (AFW)
31	Fort Worth Meacham (FTW)
32	FREDERICKSBURG: GILLESPIE COUNTY AIRPORT (T82)
33	GAINESVILLE : GAINESVILLE MUNICIPAL AIRPORT (GLE)
34	Galveston Scholes Field (GLS)
35	GEORGETOWN : GEORGETOWN MUNICIPAL AIRPORT (GTU)
36	Harlingen Rio Grande Valley I (HRL)
37	Hondo Municipal Airport (HDO)
38	Houston Bush Intercontinental (IAH)
39	Houston Clover Field (LVJ)
40	Houston Hooks Memorial Airport (DWH)
41	Houston Sugarland Mem (SGR)
42	Houston William P Hobby Airport (HOU)
43	Huntsville Municipal Airport (UTS)
44	JASPER : JASPER COUNTY-BELL FIELD AIRPORT (JAS)
45	Junction Kimble County Airport (JCT)
46	KERRVILLE : KERRVILLE MUNI/LOUIS SCHREINER F LD AIRPORT (ERV)
47	KILLEEN : KILLEEN MUNICIPAL AIRPORT (ILE)
48	KINGSVILLE : KINGSVILLE NAS AIRPORT (NQI)
49	LA GRANGE : FAYETTE REGIONAL AIR CENTER AIRPORT (3T5)
50	Longview ETx Rgnl Airport (GGG)
51	Lubbock International Airport (LBB)
52	Lufkin Angelina Cty Airport (LFK)
53	MARFA : MARFA MUNICIPAL AIRPORT (MRF)
54	McAllen Miller International Airport (MFE)
55	McKinney Municipal Airport (TKI)
56	Midland International Airport (MAF)
57	Mineral Wells Airport (MWL)
58	MOUNT PLEASANT : MOUNT PLEASANT REGIONAL AIRPORT (DSA)
59	NACOGDOCHES : A L MANGHAM JR REGIONAL AIRPORT (OCH)
60	New Braunfels Municipal Airport (BAZ)
61	Odessa Schlemeyer Field (ODO)
62	Palacios Municipal Airport (PSX)
63	PARIS : COX FIELD AIRPORT (PRX)
64	PERRYTON : PERRYTON/OCHILTREE COUNTY AIRPORT (PYX)
65	Pine Springs Guadalupe Mountains (GDP)
66	Port Arthur Se Tx Rgnl Airport (BPT)
67	Port Isabel Cameron County Airport (PIL)
68	Rockport Aransas Co Airport (RKP)
69	San Angelo Mathis Field (SJT)
70	San Antonio International Airport (SAT)
71	San Antonio Stinson Municipal Airport (SSF)
72	SAN MARCOS : SAN MARCOS MUNICIPAL AIRPORT (HYI)
73	SWEETWATER : AVENGER FIELD AIRPORT (SWW)
74	TEMPLE: DRAUGHON-MILLER CNTRL TEXAS REGIONAL ARPT (TPL)
75	Terrell Municipal Airport (TRL)
76	Tyler Pounds Field (TYR)
77	Victoria Regional Airport (VCT)
78	WACO : MC GREGOR EXECUTIVE AIRPORT (PWG)
79	Waco Regional Airport (ACT)
80	WESLACO : MID VALLEY AIRPORT (T65)
81	Wichita Falls Municipal Airport (SPS)
82	Wink Winkler Co Airport (INK)

Texas TMY2 Weather Files

1	Abilene
2	Amarillo
3	Austin
4	Brownsville
5	Corpus Christi
6	El Paso
7	Fort Worth
8	Houston
9	Lubbock
10	Lufkin
11	Midland
12	Port Arthur
13	San Angelo
14	San Antonio
15	Victoria
16	Waco
17	Wichita Falls

Texas WYEC2 Weather Files

1	El Paso
2	Brownsville
3	Fort Worth
4	San Antonio

NREL Solar Stations

1	Abilene
2	Austin
3	Big Spring
4	Canyon
5	Clear Lake
6	Corpus Christi
7	Del Rio
8	Edinburg
9	El Paso
10	Laredo
11	Midland
12	Ouerbe
13	Pecos
14	Presidio
15	Sanderson

TCEQ Solar Stations

1	Bexar
2	Travis
3	El Paso (2)
4	Galveston
5	Harris (5)

FCHART and PV FCHART (New Weather File)

1	ABILENE
2	AMARILLO
3	AUSTIN
4	BROWNSVILLE
5	CORPUS CHRISTI
6	EL PASO
7	FORT WORTH
8	HOUSTON
9	LUBBOCK
10	LUFKIN
11	MIDLAND-ODESSA
12	PORT ARTHUR
13	SAN ANGELO
14	SAN ANTONIO
15	SHERMAN
16	VICTORIA
17	WACO
18	WICHITA FALLS

Table 123: Assignment of Weather Stations for 41 Non-attainment and Affected Counties (NOAA, TMY2, F-CHART, PV F-CHART, NAHB, Climate Zone, HDD, CDD, 90.1-1989, 90.1-1999).

Area	No.	County	NOAA Weather Station			Solar Station		TMY2		FCHART		PV-FCHART		DOE Include File	Weather File	DOE TRY weather file name	East or West Texas	Climate Zone	HDD		CDD		ANSRAE 90.1-1989		ANSRAE 90.1-1999		County
	ID	County	Weather Station	WBAN No.	Source	x	File	WBAN No.	x	TMY2File	Fchart	FchartID	PVFChart	PVFChart ID	DOE_INC	x	DOE_WF	PRECODE	CZ	1989	1999	1989	1999	Nearest City	Table 8A (10,12,16)	Nearest City	Table B, 6, & 10)	
Austin	22	Bastrop	Austin Camp Mabry (ATT)	13958	NREL	Austin		13958	Austin		14	Austin	18	BAS	Austin	ATT	West	4					Austin	12	Austin	6	Bastrop
	26	Caldwell	Austin Camp Mabry (ATT)	13958	NREL	Austin		13958	Austin		14	Austin	18	CAL	Austin	ATT	West	4					Austin	12	Austin	6	Caldwell
	8	Hays	Austin Camp Mabry (ATT)	13958	NREL	Austin		13958	Austin		14	Austin	18	HAY	Austin	ATT	West	5					Austin	12	Austin	6	Hays
	40	Travis	Austin Camp Mabry (ATT)	13958	NREL	Austin		13958	Austin		14	Austin	18	TRA	Austin	ATT	West	5	1735	1688	6873	7171	Austin	12	Austin	6	Travis
	41	Williamson	Austin Camp Mabry (ATT)	13958	NREL	Austin		13958	Austin		14	Austin	18	WIL	Austin	ATT	West	5					Austin	12	Kleen/Robert-grey or Austin	6	Williamson
Corpus	38	Nueces	Corpus Christi International Airport (CRP)	12924	NREL	Corpus Christi		12924	Corpus Christi		52	Corpus Christi	58	NUE	Corpus Christi	CRP	East	3	896	1016	8200	8023	Corpus Christi	16	Corpus Christi or Alice	5	Nueces
	15	San Patricio	Corpus Christi International Airport (CRP)	12924	NREL	Corpus Christi		12924	Corpus Christi		52	Corpus Christi	58	SAP	Corpus Christi	CRP	East	3					Corpus Christi	16	Corpus Christi or Alice	5	San Patricio
El Paso	30	El Paso	El Paso International Airport (ELP)	23044	TCEQ	C12-El Paso UTEP		23044	El Paso		66	El Paso	70	ELP	El Paso	BJP	West	6	2695	2708	5601	5686	El Paso	12		10	El Paso
Dallas-Ft. Worth	27	Collin	Dallas - Fort Worth International Airpor (DFW)	03927	NREL	Overton		03927	Fort Worth		78	Fort Worth	83	COL	Fort Worth	DFW	West	6					Sherman or Fort Worth	12	Denton, Greenville or Sherman	8	Collin
	4	Dallas	Dallas - Fort Worth International Airpor (DFW)	03927	NREL	Overton		03927	Fort Worth		78	Fort Worth	83	DAL	Fort Worth	DFW	West	5		2259		6597	Fort Worth	12	Dallas	8	Dallas
	29	Denton	Dallas - Fort Worth International Airpor (DFW)	03927	NREL	Overton		03927	Fort Worth		78	Fort Worth	83	DEN	Fort Worth	DFW	West	6					Shermano Fort Worth	12	Denton	8	Denton
	31	Ellis	Dallas - Fort Worth International Airpor (DFW)	03927	NREL	Overton		03927	Fort Worth		78	Fort Worth	83	ELL	Fort Worth	DFW	West	5					Fort Worth	12	Fort Worth, Dallas or Corsicana	8	Ellis
	23	Hood	Dallas - Fort Worth International Airpor (DFW)	03927	NREL	Overton		03927	Fort Worth		78	Fort Worth	83	HOD	Fort Worth	DFW	West	5					Fort Worth	12	Mineral Wells or Fort Worth	8	Hood
	24	Hunt	Dallas - Fort Worth International Airpor (DFW)	03927	NREL	Overton		03927	Fort Worth		78	Fort Worth	83	HNT	Fort Worth	DFW	West	6					Shermano Fort Worth	12	Greenville	10	Hunt
	36	Johnson	Dallas - Fort Worth International Airpor (DFW)	03927	NREL	Overton		03927	Fort Worth		78	Fort Worth	83	JOH	Fort Worth	DFW	West	5					Fort Worth	12	Mineral Wells or Fort Worth	8	Johnson
	10	Kaufman	Dallas - Fort Worth International Airpor (DFW)	03927	NREL	Overton		03927	Fort Worth		78	Fort Worth	83	KAU	Fort Worth	DFW	West	6					Fort Worth	12	Greenville, Dallas or Corsicana	8	Kaufman
	39	Parker	Dallas - Fort Worth International Airpor (DFW)	03927	NREL	Overton		03927	Fort Worth		78	Fort Worth	83	PAR	Fort Worth	DFW	West	6					Fort Worth	12	Mineral Wells or Fort Worth	8	Parker
	13	Rockwall	Dallas - Fort Worth International Airpor (DFW)	03927	NREL	Overton		03927	Fort Worth		78	Fort Worth	83	ROC	Fort Worth	DFW	West	6					Shermano Fort Worth	12	Dallas or Greenville	8	Rockwall
	17	Tarrant	Dallas - Fort Worth International Airpor (DFW)	03927	NREL	Overton		03927	Fort Worth		78	Fort Worth	83	TAR	Fort Worth	DFW	West	5	2284		6174		Fort worth	12	Fort worth	8	Tarrant
Houston/Galveston	2	Brazoria	Houston Bush Intercontinental (IAH)	12960	NREL	Clear Lake		12960	Houston		96	Houston	102	BRA	Houston	IAH	East	3					Houston	10	Houston, Galveston or Bay City	5	Brazoria
	5	Fort Bend	Houston Bush Intercontinental (IAH)	12960	NREL	Clear Lake		12960	Houston		96	Houston	102	FOB	Houston	IAH	East	4					Houston	10	Houston or Bay City	5	Fort Bend
	32	Galveston	Houston Bush Intercontinental (IAH)	12960	NREL	Clear Lake		12960	Houston		96	Houston	102	GAL	Houston	IAH	East	3	1263	7378			Galveston	10	Galveston	5	Galveston
	34	Harris	Houston Bush Intercontinental (IAH)	12960	NREL	Clear Lake		12960	Houston		96	Houston	102	HAR	Houston	IAH	East	4	1346	1371	7125	7351	Houston	10	Houston	5	Harris
	37	Montgomery	Houston Bush Intercontinental (IAH)	12960	NREL	Clear Lake		12960	Houston		96	Houston	102	MOG	Houston	IAH	East	4					Houston	10	Huntsville or Houston	5	Montgomery
	20	Waller	Houston Bush Intercontinental (IAH)	12960	NREL	Clear Lake		12960	Houston		96	Houston	102	WAL	Houston	IAH	East	4					Houston	10	Houston	5	Waller
Tyler/Longview	33	Gregg	Longview E Tx Rgnl Airport (GGG)	93987	NREL	Overton		93987	Lufkin		125	Lufkin	131	GRE	Lufkin	GGG	East	6					Lufkin	12	Longview	8	Gregg
	35	Harrison	Longview E Tx Rgnl Airport (GGG)	93987	NREL	Overton		93987	Lufkin		125	Lufkin	131	HAN	Lufkin	GGG	East	6					Lufkin	12	Longview	8	Harrison
	9	Henderson	Longview E Tx Rgnl Airport (GGG)	93987	NREL	Overton		93987	Lufkin		125	Lufkin	131	HDS	Lufkin	GGG	East	5					Lufkin, Waco or Fort Worth	12	Tyler, Palestine or Corsicana	8	Henderson
	14	Rusk	Longview E Tx Rgnl Airport (GGG)	93987	NREL	Overton		93987	Lufkin		125	Lufkin	131	RUS	Lufkin	GGG	East	5					Lufkin	12	Tyler or Longview	8	Rusk
	16	Smith	Longview E Tx Rgnl Airport (GGG)	93987	NREL	Overton		93987	Lufkin		125	Lufkin	131	SMI	Lufkin	GGG	East	5		1296		6662	Lufkin	12	Tyler	8	Smith
	18	Upshur	Longview E Tx Rgnl Airport (GGG)	93987	NREL	Overton		93987	Lufkin		125	Lufkin	131	UPS	Lufkin	GGG	East	6					Lufkin	12	Tyler or Longview	8	Upshur
Beaumont Pt. Arthur	3	Chambers	Port Arthur Se Tx Rgnl Airport (BPT)	12917	TCEQ	C34-Galveston Airport		12917	Port Arthur		156	Port Arthur	172	CHA	Port Arthur	BPT	East	4					Houston or Port Arthur	10	Beaumont or Houston	5	Chambers
	7	Hardin	Port Arthur Se Tx Rgnl Airport (BPT)	12917	TCEQ	C34-Galveston Airport		12917	Port Arthur		156	Port Arthur	172	HAD	Port Arthur	BPT	East	4					Port Arthur	10	Beaumont	6	Hardin
	25	Jefferson	Port Arthur Se Tx Rgnl Airport (BPT)	12917	TCEQ	C34-Galveston Airport		12917	Port Arthur		156	Port Arthur	172	JEF	Port Arthur	BPT	East	4	1418	1671	6888	6703	Port Arthur	10	Beaumont	6	Jefferson
	11	Liberty	Port Arthur Se Tx Rgnl Airport (BPT)	12917	TCEQ	C34-Galveston Airport		12917	Port Arthur		156	Port Arthur	172	LIB	Port Arthur	BPT	East	4					Houston or Port Arthur	10	Beaumont, Galveston or Houston	5	Liberty
	12	Orange	Port Arthur Se Tx Rgnl Airport (BPT)	12917	TCEQ	C34-Galveston Airport		12917	Port Arthur		156	Port Arthur	172	ORA	Port Arthur	BPT	East	4					Port Arthur	10	Beaumont	6	Orange
San Antonio	1	Bexar	San Antonio International Airport (SAT)	12921	TCEQ	C58-Camp Bullis		12921	San Antonio		187	San Antonio	194	BEX	San Antonio	SAT	West	4	1578	1644	7170	7142	San Antonio	12	San Antonio	6	Bexar
	28	Comal	San Antonio International Airport (SAT)	12921	TCEQ	C58-Camp Bullis		12921	San Antonio		187	San Antonio	194	COM	San Antonio	SAT	West	4					San Antonio	12	San Antonio	6	Comal
	6	Guadalupe	San Antonio International Airport (SAT)	12921	TCEQ	C58-Camp Bullis		12921	San Antonio		187	San Antonio	194	GUA	San Antonio	SAT	West	4					San Antonio	12	San Antonio	6	Guadalupe
	21	Wilson	San Antonio International Airport (SAT)	12921	TCEQ	C58-Camp Bullis		12921	San Antonio		187	San Antonio	194	WIL	San Antonio	SAT	West	4					San Antonio	12	San Antonio	6	Wilson
Victoria	19	Victoria	Victoria Regional Airport (VCT)	12912	TCEQ	C58-Camp Bullis		12912	Victoria		347	Victoria	225	VIC	Victoria	VCT	East	3	Hou	1296	Hou	7503	Victoria		Victoria	5	Victoria

Table 124: Availability of Weather Data for 41 Non-attainment and Affected County (NOAA, NREL, TCEQ, ESL).

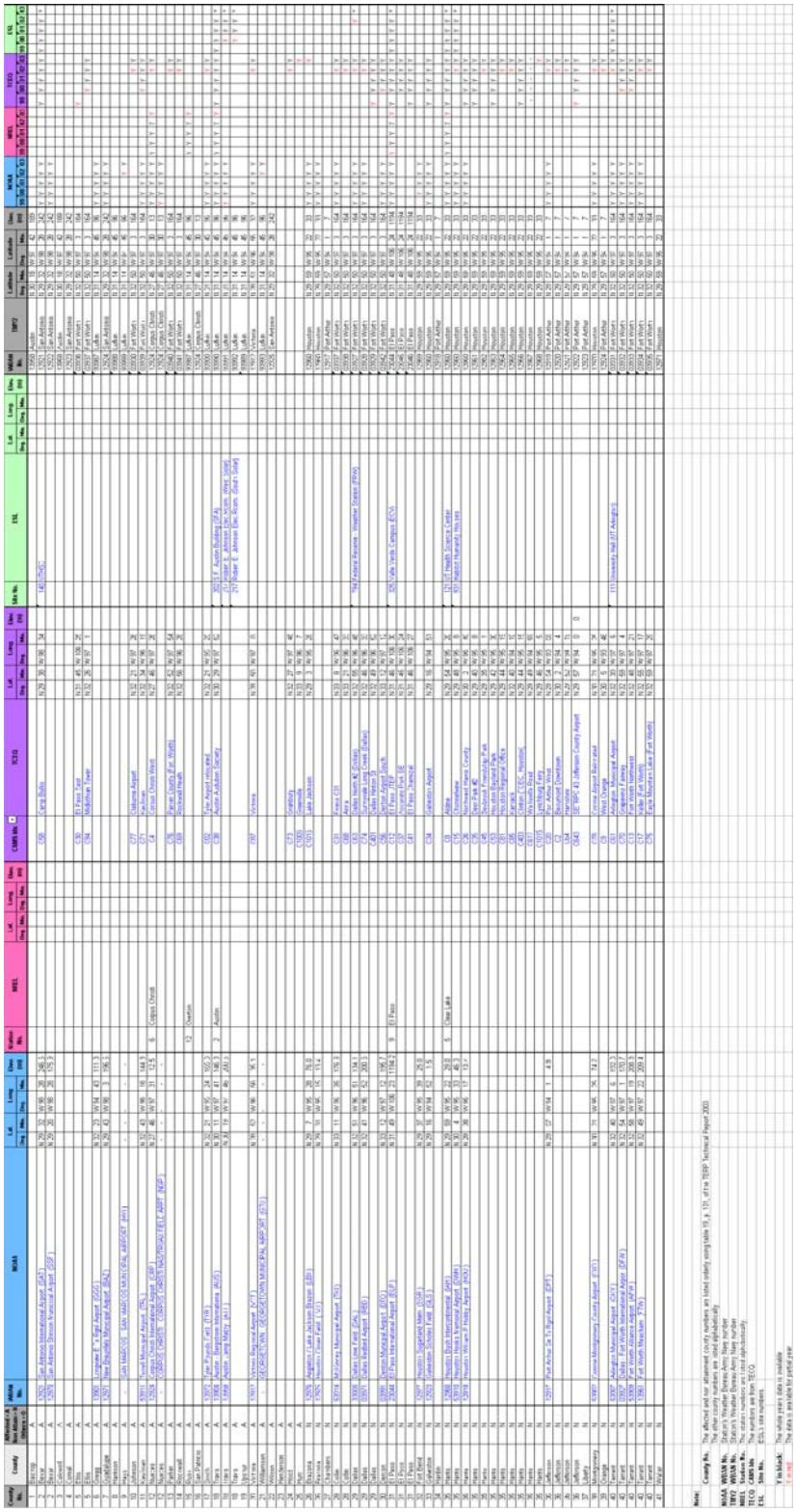


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Table 125: Main NOAA Weather Stations used in eCALC.

ABI	Abilene Regional Airport
AMA	Amarillo International Airport
BRO	Brownsville S. Padre Island International
LBB	Lubbock International Airport
MAF	Midland International Airport
SJT	San Angelo Mathis Field
ACT	Waco Regional Airport
SPS	Wichita Falls Municipal Airport
ATT	Austin Camp Mabry
BPT	Port Arthur Se TX Rgnl Airport
CRP	Corpus Christi International Airport
DFW	Dallas - Fort Worth International Airport
ELP	El Paso International Airport
GGG	Longview E TX Rgnl Airport
IAH	Houston Bush Intercontinental
SAT	San Antonio International Airport
VCT	Victoria Regional Airport

Table 126: Summary of Weather Data Assignments for ERCOT Counties.

ERCOT COUNTY	ASSIGNED WEATHER STATION
ANDERSON	GGG
ANDREWS	MAF
ANGELINA	GGG
ARANSAS	CRP
ARCHER	SPS
ATASCOSA	SAT
AUSTIN	IAH
BANDERA	SAT
BASTROP	ATT
BAYLOR	SPS
BEE	VCT
BELL	ACT
BEXAR	SAT
BLANCO	ATT
BORDEN	LBB
BOSQUE	ACT
BRAZORIA	IAH
BRAZOS	IAH
BREWSTER	SJT
BRISCOE	AMA
BROOKS	BRO
BROWN	ACT
BURLESON	IAH
BURNET	ATT
CALDWELL	ATT
CALHOUN	VCT
CALLAHAN	ABI
CAMERON	BRO
CHAMBERS	BPT
CHEROKEE	GGG
CHILDRESS	LBB
CLAY	SPS
COKE	SJT
COLEMAN	ABI
COLLIN	DFW
COLORADO	IAH
COMAL	SAT
COMANCHE	ACT
CONCHO	SJT
COOKE	SPS
CORYELL	ACT
COTTLE	SPS
CRANE	MAF
CROCKETT	SJT
CROSBY	LBB
CULBERSON	ELP
DALLAS	DFW
DAWSON	LBB
DE WITT	VCT
DELTA	DFW
DENTON	DFW
DICKENS	LBB
DIMMIT	CRP
DUVAL	CRP
EASTLAND	ABI
ECTOR	MAF
EDWARDS	SJT
ELLIS	DFW
ERATH	ABI
FALLS	ACT
FANNIN	SPS
FAYETTE	IAH
FISHER	ABI
FOARD	SPS
FORT BEND	IAH
FRANKLIN	DFW
FREESTONE	ACT
FRIO	SAT
GALVESTON	IAH
GILLESPIE	ATT
GLASSCOCK	MAF
GOLIAD	VCT
GONZALES	SAT
GRAYSON	SPS
GRIMES	IAH
GUADALUPE	SAT
HALL	AMA
HAMILTON	ACT
HARDEMAN	SPS
HARRIS	IAH
HASKELL	ABI
HAYS	ATT
HENDERSON	DFW
HIDALGO	BRO
HILL	ACT
HOOD	DFW
HOPKINS	DFW
HOUSTON	GGG
HOWARD	MAF
HUDSPETH	ELP
HUNT	SPS
IRION	SJT
JACK	ABI
JACKSON	VCT
JEFF DAVIS	MAF
JIM HOGG	BRO
JIM WELLS	CRP
JOHNSON	DFW
JONES	ABI
KARNES	VCT
KAUFMAN	DFW
KENDALL	SAT
KENEDY	BRO
KENT	LBB
KERR	ATT
KIMBLE	SJT
KING	LBB
KINNEY	SAT
KLEBERG	CRP
KNOX	SPS
LA SALLE	CRP
LAMAR	DFW
LAMPASAS	ACT
LAVACA	VCT
LEE	ATT
LEON	ACT
LIMESTONE	ACT
LIVE OAK	CRP
LLANO	ATT
LOVING	MAF
MADISON	IAH
MARTIN	MAF
MASON	ATT
MATAGORDA	VCT
MAVERICK	CRP
MCCULLOCH	SJT
MCLENNAN	ACT
MCMULLEN	CRP
MEDINA	SAT
MENARD	SJT
MIDLAND	MAF
MILAM	IAH
MILLS	ACT
MITCHELL	ABI
MONTAGUE	SPS
MONTGOMERY	IAH
MOTLEY	LBB
NACOGDOCHES	GGG
NAVARRO	ACT
NOLAN	ABI
NUECES	CRP
PALO PINTO	ABI
PARKER	DFW
PECOS	SJT
PRESIDIO	SJT
RAINS	DFW
REAGAN	MAF
REAL	ATT
RED RIVER	DFW
REEVES	MAF
REFUGIO	VCT
ROBERTSON	IAH
ROCKWALL	DFW
RUNNELS	SJT
RUSK	GGG
SAN PATRICIO	CRP
SAN SABA	ATT
SCHLEICHER	SJT
SCURRY	LBB
SHACKELFORD	ABI
SMITH	DFW
SOMERVELL	DFW
STARR	BRO
STEPHENS	ABI
STERLING	SJT
STONEWALL	LBB
SUTTON	SJT
TARRANT	DFW
TAYLOR	ABI
TERRELL	SJT
THROCKMORTON	ABI
TITUS	DFW
TOM GREEN	SJT
TRAVIS	ATT
UPTON	MAF
UVALDE	SAT
VAL VERDE	SAT
VAN ZANDT	DFW
VICTORIA	VCT
WALLER	IAH
WARD	MAF
WASHINGTON	IAH
WEBB	CRP
WHARTON	VCT
WICHITA	SPS
WILBARGER	SPS
WILLACY	BRO
WILLIAMSON	ATT
WILSON	SAT
WINKLER	MAF
WISE	DFW
YOUNG	ABI
ZAPATA	BRO
ZAVALA	CRP

Table 127: Assignment of NWS Weather Stations for all ERCOT Counties.

No.	The City TMY2 Weather File is Available	County with TMY2 Weather Station					Adjacent Counties						Nearest Counties					
		County Name	Weather Zone	HDD	Table	Weather Station Assigned	No.	County Name	Weather Zone	HDD	Table	Weather Station Assigned	No.	County Name	Nearest Cities with TMY2 Files	Weather Zone	HDD	Table	Weather Station Assigned
1	Abilene	TAYLOR	6B	2584	B-8	ABI	1	CALLAHAN	6B			ABI	1	EASTLAND	Abilene (6B)	6B			ABI
							2	COLEMAN	6B			ABI	2	ERATH	Abilene (6B), Fort Worth (5B)	6B			ABI
							3	FISHER	6B			ABI	3	HASKELL	Abilene (6B), Wichita Falls (7B)	6B			ABI
							4	JONES	6B			ABI	4	JACK	Fort Worth (5B), Abilene (6B)	6B			ABI
							5	NOLAN	6B			ABI	5	MITCHELL	Abilene (6B), Midland (6B)	6B			ABI
							6	SHACKELFORD	6B			ABI	6	PALO PINTO	Fort Worth (5B), Abilene (6B)	6B	2625	B-8	ABI
													7	STEPHENS	Abilene (6B)	6B			ABI
													8	THROCKMORTON	Abilene (6B), Wichita Falls (7B)	6B			ABI
													9	YOUNG	Wichita Falls (7B), Abilene (6B), Fort Worth (5B)	6B			ABI
2	Amarillo	POTTER	9B	4258	B-13	AMA							10	BRISCOE	Amarillo (9B), Lubbock (7B)	8			AMA
													11	HALL	Amarillo (9B), Lubbock (7B)	8			AMA
3	Austin	TRAVIS	5B	1688	B-6	ATT	7	BASTROP	4B			ATT	12	GILLESPIE	San Antonio (4B), Austin (5B)	5A			ATT
							8	BLANCO	5A			ATT	13	KERR	San Antonio (4B), Austin (5B)	5A			ATT
							9	BURNET	5A			ATT	14	LEE	Austin (5B), Houston (4B)	4B			ATT
							10	CALDWELL	4B			ATT	15	LLANO	Austin (5B), San Antonio (4B),	5B			ATT
							11	HAYS	5B			ATT	16	MASON	Austin (5B), San Antonio (4B),	5B			ATT
							12	WILLIAMSON	5B			ATT	17	REAL	San Antonio (4B), Austin (5B), San Angelo (5B)	5A			ATT
													18	SAN SABA	Austin (5B), San Angelo (5B), Waco (5B)	5B			ATT
4	Brownsville	CAMERON	2B	635	B-3	BRO	13	HIDALGO	2B	778	B-3	BRO	19	BROOKS	Brownsville (2B), Corpus Christie (3B)	2B			BRO
							14	WILLACY	2B			BRO	20	JIM HOGG	Brownsville (2B), Corpus Christie (3B)	2B			BRO
													21	KENEDY	Brownsville (2B), Corpus Christie (3B)	2B			BRO
													22	STARR	Brownsville (2B)	2B			BRO
													23	ZAPATA	Brownsville (2B), Corpus Christie (3B)	2B			BRO
5	Corpus Christi	NUECES	3B	1016	B-5	CRP	15	ARANSAS	3B			CRP	24	DIMMIT	Corpus Christi (3B), San Anotonio (4B)	3C			CRP
							16	JIM WELLS	3C	1062	B-5	CRP	25	DUVAL	Corpus Christi (3B)	3C			CRP
							17	KLEBERG	2H			CRP	26	LA SALLE	Corpus Christi (3B)	3C			CRP
							18	SAN PATRICIO	3C			CRP	27	LIVE OAK	Corpus Christi (3B), Victoria (3B)	3C			CRP
													28	MAVERICK	San Anotonio (4B), Corpus Christi (3B)	3C	1441	B-5	CRP
													29	MCMULLEN	Corpus Christi (3B), Victoria (3B)	3C			CRP
													30	WEBB	Corpus Christi (3B)	3C	1025	B-5	CRP
													31	ZAVALA	San Anotonio (4B), Corpus Christi (3B)	3C			CRP
6	El Paso	EL PASO	6B	2708	B-10	ELP	19	HUDSPETH	6B			ELP	32	CULBERSON	El Paso (6B)	6B			ELP
7	Fort Worth	TARRANT	5B	2304	B-8	DFW	20	COLLIN	6B			DFW	33	DELTA	Fort Worth (5B)	6B			DFW
							21	DALLAS	5B	2259	B-8	DFW	34	FRANKLIN	Fort Worth (5B)	6B			DFW
							22	DENTON	6B	2665	B-8	DFW	35	HENDERSON	Fort Worth (5B), Lufkin (5A), Waco (5B)	5B			DFW
							23	ELLIS	5B			DFW	36	HOOD	Fort Worth (5B), Waco (5B)	5B			DFW
							24	JOHNSON	5B			DFW	37	HOPKINS	Fort Worth (5B)	6B			DFW
							25	PARKER	6B			DFW	38	KAUFMAN	Fort Worth (5B)	6B			DFW
							26	WISE	6B			DFW	39	LAMAR	Fort Worth (5B)	6B			DFW
													40	RAINS	Fort Worth (5B)	6B			DFW
													41	RED RIVER	Fort Worth (5B)	6B			DFW
													42	ROCKWALL	Fort Worth (5B)	6B			DFW
													43	SMITH	Fort Worth (5B), Lufkin (5A)	5B	2194	B-8	DFW
													44	SOMERVELL	Fort Worth (5B), Waco (5B)	5B			DFW
													45	TITUS	Fort Worth (5B)	6B			DFW
													46	VAN ZANDT	Fort Worth (5B)	6B			DFW
8	Houston	HARRIS	4B	1371	B-5	IAH	27	BRAZORIA	3B			IAH	47	AUSTIN	Houston (4B)	4B			IAH
							28	FORT BEND	4B			IAH	48	BRAZOS	Houston (4B), Austin (5B), Waco (5B)	4B			IAH
							29	GALVESTON	3B	1263	B-5	IAH	49	BURLESON	Austin (5B), Waco (5B), Houston (4B)	4B			IAH
							30	MONTGOMERY	4B			IAH	50	COLORADO	Houston (4B), Victoria (3B)	4B			IAH
							31	WALLER	4B			IAH	51	FAYETTE	Houston (4B), San Antonio (4B)	4B			IAH
													52	GRIMES	Houston (4B)	4B			IAH
													53	MADISON	Houston (4B), Waco (5B), Lufkin (5A)	4B			IAH
													54	MILAM	Austin (5B), Waco (5B), Houston (4B)	4B			IAH
													55	ROBERTSON	Waco (5B), Houston (4B)	4B			IAH
													56	WASHINGTON	Houston (4B), Austin (5B)	4B			IAH
9	Lubbock	LUBBOCK	7B	3431	B-11	LBB	32	CROSBY	7B			LBB	57	BORDEN	Lubbock (7B), Abilene (6B), Midland (6B)	7B			LBB
													58	CHILDRESS	Lubbock (7B), Wichita Falls (7B)	7B			LBB
													59	DAWSON	Lubbock (7B), Midland (6B)	7B	3159	B-11	LBB
													60	DICKENS	Lubbock (7B)	7B			LBB
													61	KENT	Lubbock (7B), Abilene (6B)	7B			LBB
													62	KING	Lubbock (7B), Abilene (6B), Wichita Falls (7B)	7B			LBB
													63	MOTLEY	Lubbock (7B)	7B			LBB
													64	SCURRY	Lubbock (7B), Midland (6B), Abilene (6B)	7B	3185	B-11	LBB
													65	STONEWALL	Abilene (6B), Lubbock (7B), Wichita Falls (7B)	7B			LBB
10	Lufkin	ANGELINA	5A	1951	B-8	GGG	33	CHEROKEE	5A			GGG	66	ANDERSON	Lufkin (5A)	5A	2005	B-8	GGG
							34	HOUSTON	5A			GGG	67	RUSK	Lufkin (5A)	5B			GGG
							35	NACOGDOCHES	5A			GGG	67						
11	Midland	MIDLAND	6B	2751	B-10	MAF	36	ANDREWS	6B			MAF	68	HOWARD	Midland (6B)	6B	2772	B-10	MAF
							37	CRANE	5B			MAF	69	JEFF DAVIS	Midland (6B), El Paso (6B)	6B			MAF
							38	ECTOR	6B			MAF	70	LOVING	Midland (6B)	6B			MAF
							39	GLASSCOCK	6B			MAF	71	REEVES	Midland (6B)	6B	2505	B-8	MAF
							40	MARTIN	6B			MAF	72	WARD	Midland (6B)	6B			MAF
							41	REAGAN	5B			MAF	73	WINKLER	Midland (6B)	6B			MAF
							42	UPTON	5B			MAF	73						
12	Port Arthur	JEFFERSON	4B	1577	B-6	BPT	43	CHAMBERS	4B			BPT	73						
13	San Angelo	TOM GREEN	5B	2414	B-8	SJT	44	COKE	6B			SJT	74	BREWSTER	El Paso (6B), San Angelo (5B)	5A			SJT
							45	CONCHO	5B			SJT	75	CROCKETT	San Angelo (5B)	5B			SJT
							46	IRION	5B			SJT	76	EDWARDS	San Angelo (5B)	5A			SJT
							47	MENARD	5B			SJT	77	KIMBLE	San Angelo (5B), Austin (5B)	5A			SJT
							48	RUNNELS	5B			SJT	78	MCCULLOCH	San Angelo (5B)	5B			SJT
							49	SCHLEICHER	5B			SJT	79	PECOS	San Angelo (5B)	5A			SJT
							50	STERLING	6B			SJT	80	PRESIDIO	El Paso (6B), San Angelo (5B)	5A			SJT
													81	SUTTON	San Angelo (5B)	5A			SJT
													82	TERRELL	San Angelo (5B)	5A			SJT
14	San Antonio	BEXAR	4B	1644	B-6	SAT	51	ATASCOSA	3C			SAT	83	FRIO	San Antonio (4B), Corpus Christi (3B)	3C			SAT
							52	BANDERA	5A			SAT	84	GONZALES	San Antonio (4B), Victoria (3B)	4B			SAT
							53	COMAL	4B			SAT	85	KINNEY	San Antonio (4B)	4B			SAT
							54	GUADALUPE	4B			SAT	86	UVALDE	San Antonio (4B)	4B			SAT
							55	KENDALL	5A			SAT	87	VAL VERDE	San Anotonio (4B), San Angelo (5B)	4B	1565	B-5	SAT
							56	MEDINA	4B			SAT	87						
							57	WILSON	4B			SAT	87						
15	Victoria	VICTORIA	3B	1296	B-5	VCT	58	CALHOUN	3B			VCT	88	BEE	Corpus Christi (3B), Victoria (3B)	3B	1372	B-5	VCT
							59	DE WITT	3C			VCT	89	KARNES	Victoria (3B), San Antonio (4B), Corpus Christi (3B)	3C			VCT
							60	GOLIAD	3B			VCT	90	MATAGORDA	Victoria (3B)	3B	1370	B-5	VCT
							61	JACKSON	3B			VCT	91	WHARTON	Victoria (3B), Houston (4B)	3B			VCT
							62	LAVACA	4B			VCT	91						
							63	REFUGIO	3B			VCT	91						
16	Waco	MCLENNAN	5B	2179	B-8	ACT	64	BELL	5B	2127	B-8	ACT	92	BROWN	Abilene (6B), Waco (5B), San Angelo (5B)	5B	2199	B-8	ACT
							65	BOSQUE	5B			ACT	93	COMANCHE	Waco (5B), Abilene (6B)	5B			ACT
							66	CORYELL	5B			ACT	94	FREESTONE	Waco (5B)	5B			ACT
							67	FALLS	5B			ACT	95	HAMILTON	Waco (5B)	5B			ACT
							68	HILL	5B			ACT	96	LAMPASAS	Waco (5B), Austin (5B)	5B			ACT
							69	LIMESTONE	5B			ACT	97	LEON	Waco (5B), Lufkin (5A)	5B			ACT
													98	MILLS	Waco (5B), Austin (5B)	5B			ACT
													99	NAVARRO	Waco (5B), Fort Worth (5B)	5B	2396	B-8	ACT
17	Wichita Falls	WICHITA	7B	3042	B-10	SPS	70	ARCHER	7B			SPS	100	COOKE	Fort Worth (5B), Wichita Falls (7B)	6B			SPS
							71	BAYLOR	7B			SPS	101	COTTLE	Wichita Falls (7B), Lubbock (7B)	7B			SPS
							72	CLAY	7B			SPS	102	FANNIN	Fort Worth (5B), Wichita Falls (7B)	6B			SPS
							73	WILBARGER	7B	3186	B-10	SPS	103	FOARD	Wichita Falls (7B)	7B			SPS
													104	GRAYSON	Fort Worth (5B), Wichita Falls (7B)	6B	2890	B-10	SPS
													105	HARDEMAN	Wichita Falls (7B)	7B			SPS
													106	HUNT	Fort Worth (5B), Wichita Falls (7B)	6B	2953	B-10	SPS
													107	KNOX	Wichita Falls (7B)	7B			SPS
													108	MONTAGUE	Wichita Falls (7B), Fort Worth (5B)	6B			SPS

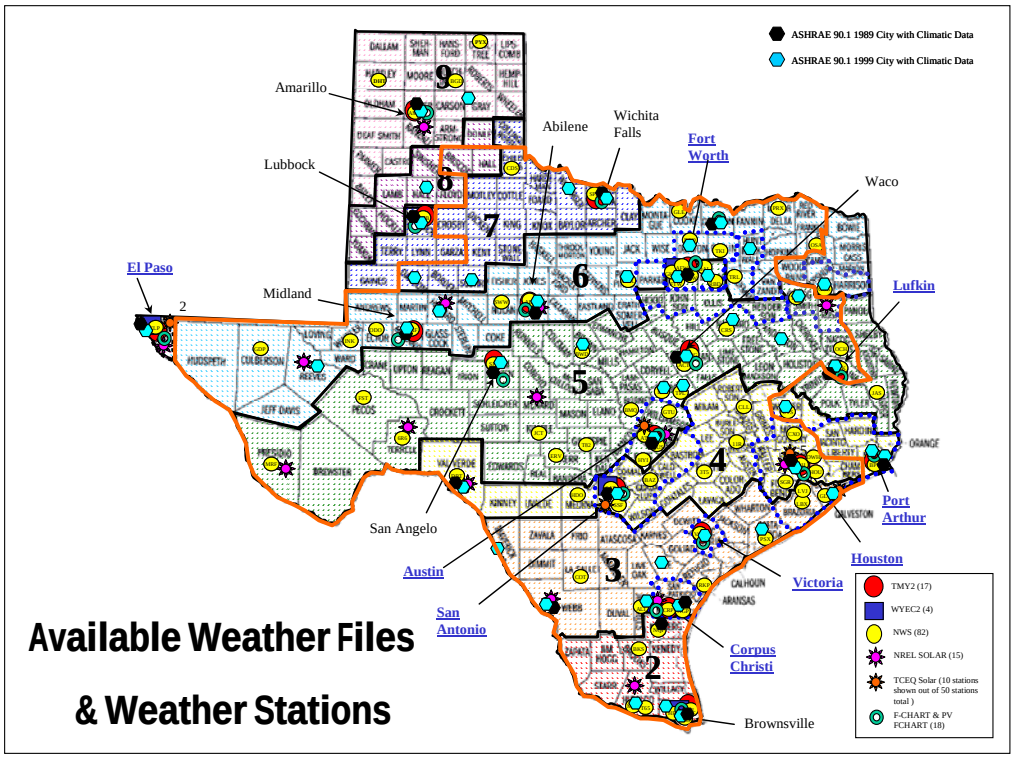

Figure 118: Available Weather Stations in Texas for all ERCOT Counties.

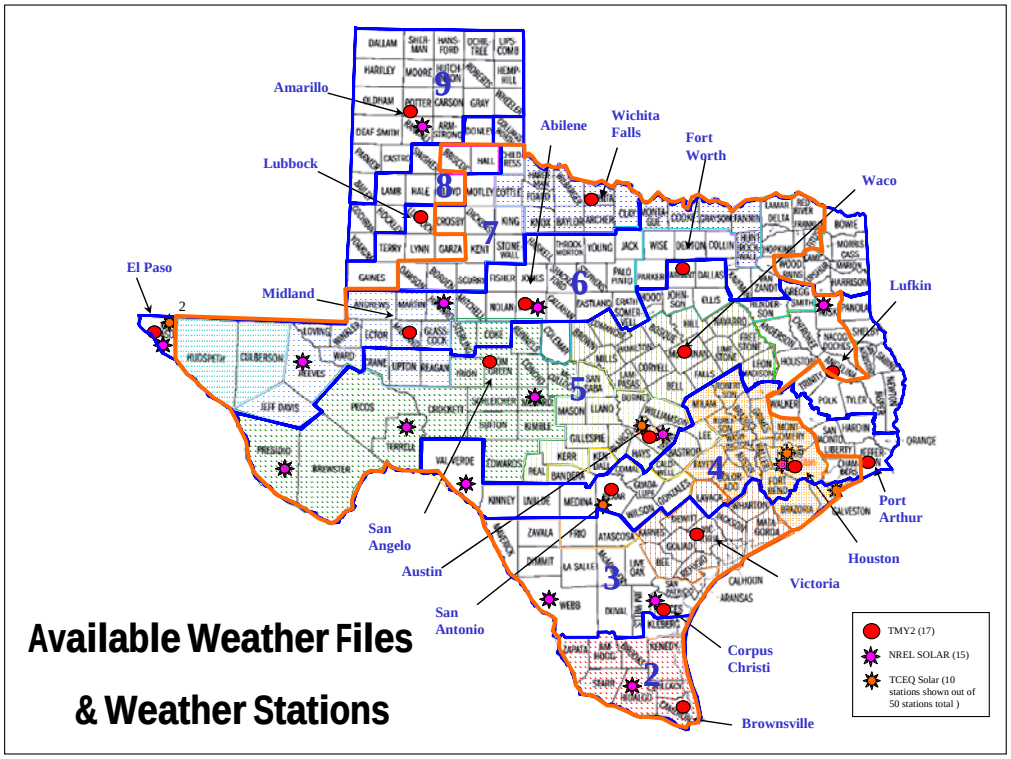

Figure 119: Grouping of Weather Stations in Texas for all ERCOT Counties.

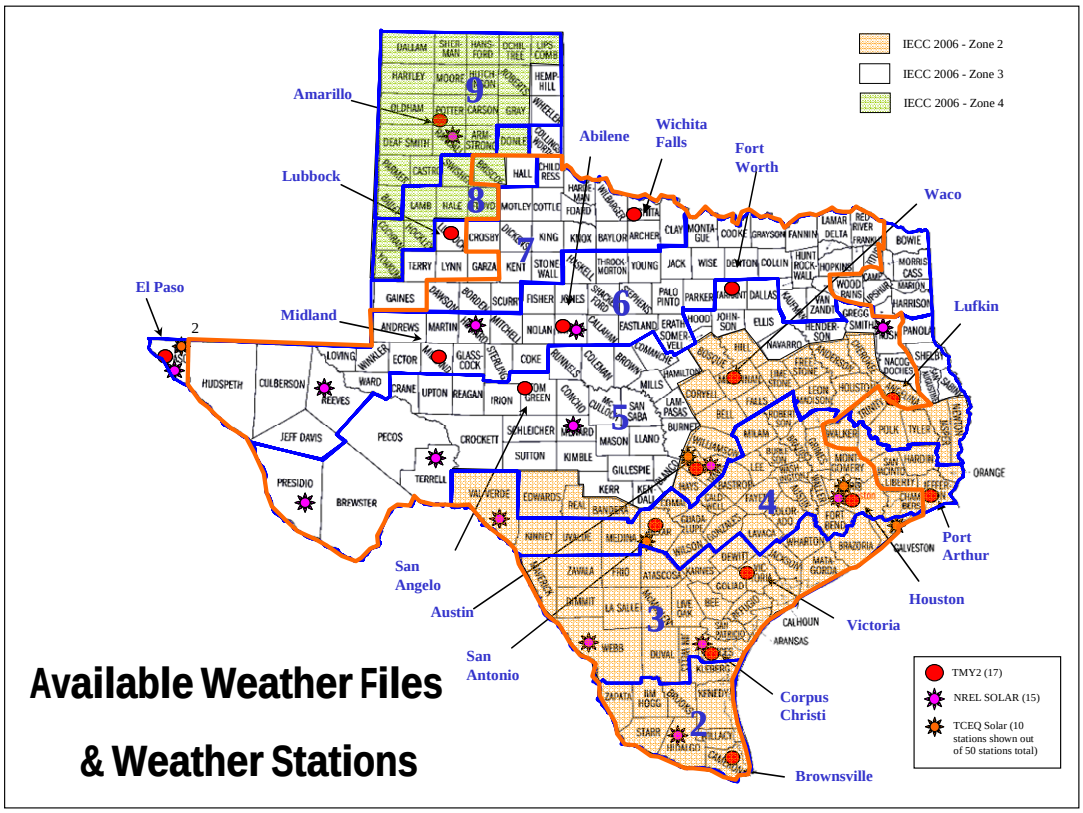

Figure 120: Available Weather Stations in Texas for all ERCOT Counties Showing 2000/2001 and 2006 Climate Zones.

Table 128: List of Available Weather Files in Texas (Listed by Symbol).

List of Available Weather Files and Weather Stations of Texas

Texas Weather Stations (NOAA)

1 Abilene Regional Airport (ABI)
2 Alice International Airport (ALI)
3 Amarillo International Airport (AMA)
4 Angleton / Lake Jackson Brazori (LBX)
5 Arlington Municipal Airport (GKY)
6 Austin - Bergstrom International (AUS)
7 Austin Camp Mabry (ATT)
8 Borger Hutchinson County Airport (BGD)
9 BRENHAM: BRENHAM MUNICIPAL AIRPORT (11R)
10 Brownsville S Padre Isl International (BRO)
11 BROWNWOOD: BROWNWOOD REGIONAL AIRPORT (BWD)
12 Burnet Municipal Airport (BMQ)
13 Childress Municipal Airport (CDS)
14 College Station (CLL)
15 Conroe Montgomery County Airport (CXO)
16 Corpus Christi International Airport (CRP)
17 CORPUS CHRISTI: CORPUS CHRISTI NAS/TRUAX FIELD ARPT (NGP)
18 Corsicana Campbell Field (CRS)
19 Cotulla La Salle Co Airport (COT)
20 Dalhart Municipal Airport (DHT)
21 Dallas - Fort Worth International Airport (DFW)
22 Dallas Love Field (DAL)
23 Dallas Redbird Airport (RBD)
24 Del Rio International Airport (DRT)
25 Denton Municipal Airport (DTO)
26 Dryden Terrell County Airport (6R6)
27 El Paso International Airport (ELP)
28 FALFURRIAS : BROOKS COUNTY AIRPORT (BKS)
29 Fort Stockton Pecos County Airport (FST)
30 Fort Worth Alliance Airport (AFW)
31 Fort Worth Meacham (FTW)
32 FREDERICKSBURG: GILLESPIE COUNTY AIRPORT (T82)
33 GAINESVILLE : GAINESVILLE MUNICIPAL AIRPORT (GLE)
34 Galveston Scholes Field (GLS)
35 GEORGETOWN : GEORGETOWN MUNICIPAL AIRPORT (GTU)
36 Harlingen Rio Grande Valley I (HRL)
37 Hondo Municipal Airport (HDO)
38 Houston Bush Intercontinental (IAH)
39 Houston Clover Field (LVJ)
40 Houston Hooks Memorial Airport (DWH)
41 Houston Sugarland Mem (SGR)
42 Houston William P Hobby Airport (HOU)
43 Huntsville Municipal Airport (UTS)
44 JASPER : JASPER COUNTY-BELL FIELD AIRPORT (JAS)
45 Junction Kimble County Airport (JCT)
46 KERRVILLE : KERRVILLE MUNI/LOUIS SCHREINER FLD AIRPORT (ERV)
47 KILLEEN : KILLEEN MUNICIPAL AIRPORT (ILE)
48 KINGSVILLE : KINGSVILLE NAS AIRPORT (NQI)
49 LA GRANGE : FAYETTE REGIONAL AIR CENTER AIRPORT (3T5)
50 Longview E Tx Rgnl Airport (GGG)
51 Lubbock International Airport (LBB)
52 Lufkin Angelina Cty Airport (LFK)
53 MARFA : MARFA MUNICIPAL AIRPORT (MRF)
54 McAllen Miller International Airport (MFE)
55 McKinney Municipal Airport (TKI)
56 Midland International Airport (MAF)
57 Mineral Wells Airport (MWL)
58 MOUNT PLEASANT : MOUNT PLEASANT REGIONAL AIRPORT (OSA)
59 NACOGDOCHES : A L MANGHAM JR REGIONAL AIRPORT (OCH)
60 New Braunfels Municipal Airport (BAZ)
61 Odessa Schlemeyer Field (ODO)
62 Palacios Municipal Airport (PSX)
63 PARIS : COX FIELD AIRPORT (PRX)
64 PERRYTON : PERRYTON OCHILTREE COUNTY AIRPORT (PYX)
65 Pine Springs Guadalupe Mounta (GDP)
66 Port Arthur Se Tx Rgnl Airport (BPT)
67 Port Isabel Cameron County Airport (PIL)
68 Rockport Aransas Co Airport (RKP)
69 San Angelo Mathis Field (SJT)
70 San Antonio International Airport (SAT)
71 San Antonio Stinson Municipal Airport (SSF)
72 SAN MARCOS : SAN MARCOS MUNICIPAL AIRPORT (HYI)
73 SWEETWATER : AVENGER FIELD AIRPORT (SWW)
74 TEMPLE: DRAUGHON-MILLER CNTRL TEXAS REGIONAL ARPT (TPL)
75 Terrell Municipal Airport (TRL)
76 Tyler Pounds Field (TYR)
77 Victoria Regional Airport (VCT)
78 WACO : MC GREGOR EXECUTIVE AIRPORT (PWG)
79 Waco Regional Airport (ACT)
80 WESLACO : MID VALLEY AIRPORT (T65)
81 Wichita Falls Municipal Airport (SPS)
82 Wink Winkler Co Airport (INK)

Texas TMY2 Weather Files

1 Abilene
2 Amarillo
3 Austin
4 Brownsville
5 Corpus Christi
6 El Paso
7 Fort Worth
8 Houston
9 Lubbock
10 Lufkin
11 Midland
12 Port Arthur
13 San Angelo
14 San Antonio
15 Victoria
16 Waco
17 Wichita Falls

Texas WYEC2 Weather Files

1 El Paso
2 Brownsville
3 Fort Worth
4 San Antonio

NREL Solar Stations

1 Abilene
2 Austin
3 Big Spring
4 Canyon
5 Clear Lake
6 Corpus Christi
7 Del Rio
8 Edinburg
9 El Paso
10 Laredo
11 Menard
12 Overton
13 Pecos
14 Presidio
15 Sanderson

TCEQ Solar Stations

1 Bexar
2 Travis
3 El Paso (2)
4 Galveston
5 Harris (5)

FCHART and PV FCHART (New Weather File)

1 ABILENE
2 AMARILLO
3 AUSTIN
4 BROWNSVILLE
5 CORPUS CHRISTI
6 EL PASO
7 FORT WORTH
8 HOUSTON
9 LUBBOCK
10 LUFKIN
11 MIDLAND-ODESSA
12 PORT ARTHUR
13 SAN ANGELO
14 SAN ANTONIO
15 SHERMAN
16 VICTORIA
17 WACO
18 WICHITA FALLS

8.3.2 Development of a Web-based Data Archive

To facilitate the wide usage of the assembled weather files, a weather data archive was established on the Laboratory's SB 5 webpage (Figure 116), where a "weather data" button was added for interested parties to go to find the assembled weather data files for 1999 through 2004. When the user selects the "weather data" button on the Laboratory's main SB 5 page they are directed to the page shown in Figure 121. Selection of one of the weather files (left side) the provides the user with a choice of files as shown in Figure 122, including daily average and hourly time intervals. Time series plots (daily and hourly), TRY format and packed TRY format (i.e., binary) files are also provided for each site for the years shown.

Figure 123 shows an example of the hourly time series plots for Dallas, Texas. Figure 124 shows an example of the daily time series plots for Dallas. Table 129 provides an example of the daily average weather data in CSV (comma separated variable). **Error! Reference source not found.** provides an example of the hourly weather data in CSV format. Finally, Table 131 provides an example of the data in TRY format, which can be used directly by the DOE-2 simulation program.

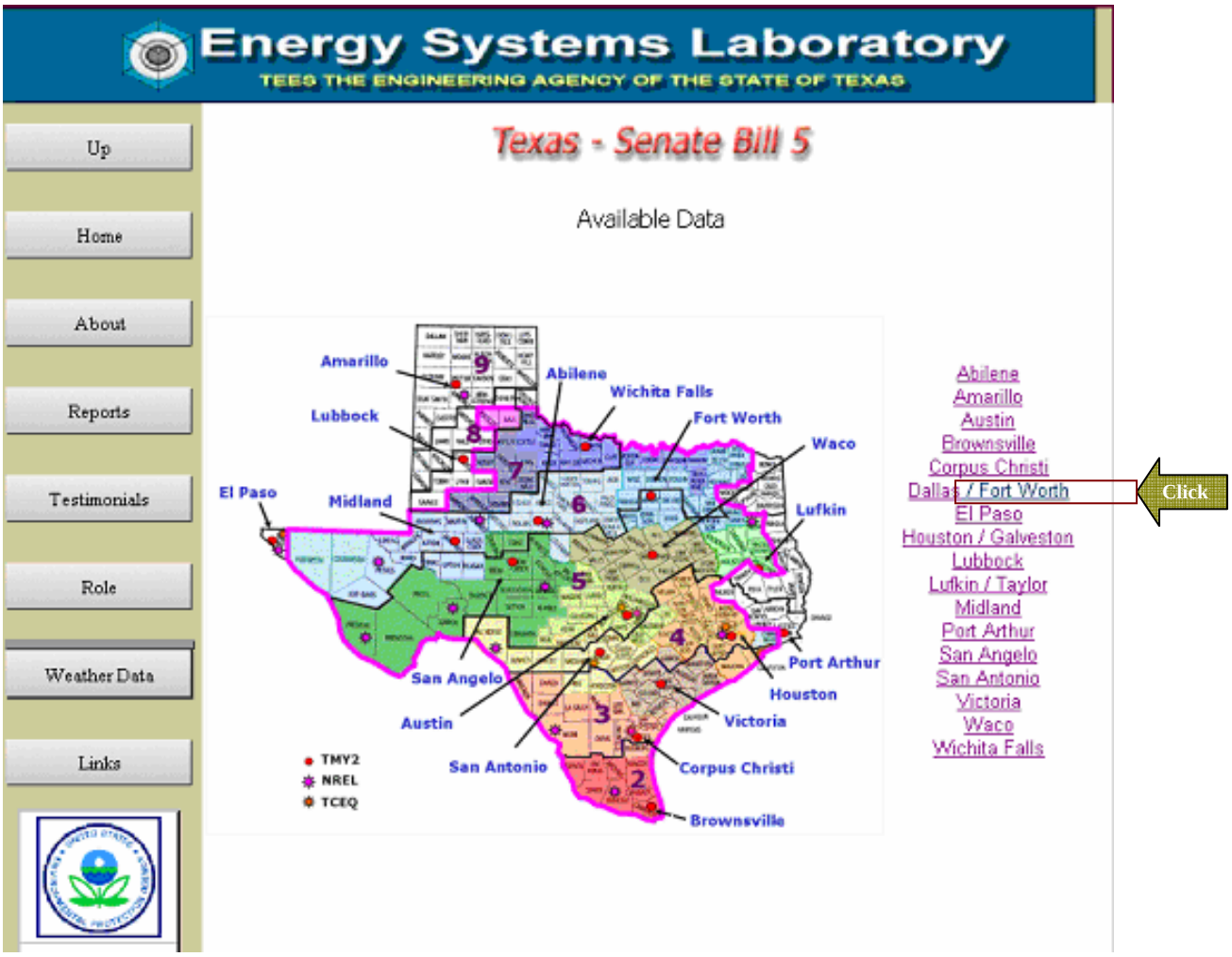

Figure 121: Weather Data Web Page Screenshot Showing the ERCOT Area and the Available Locations with Data.

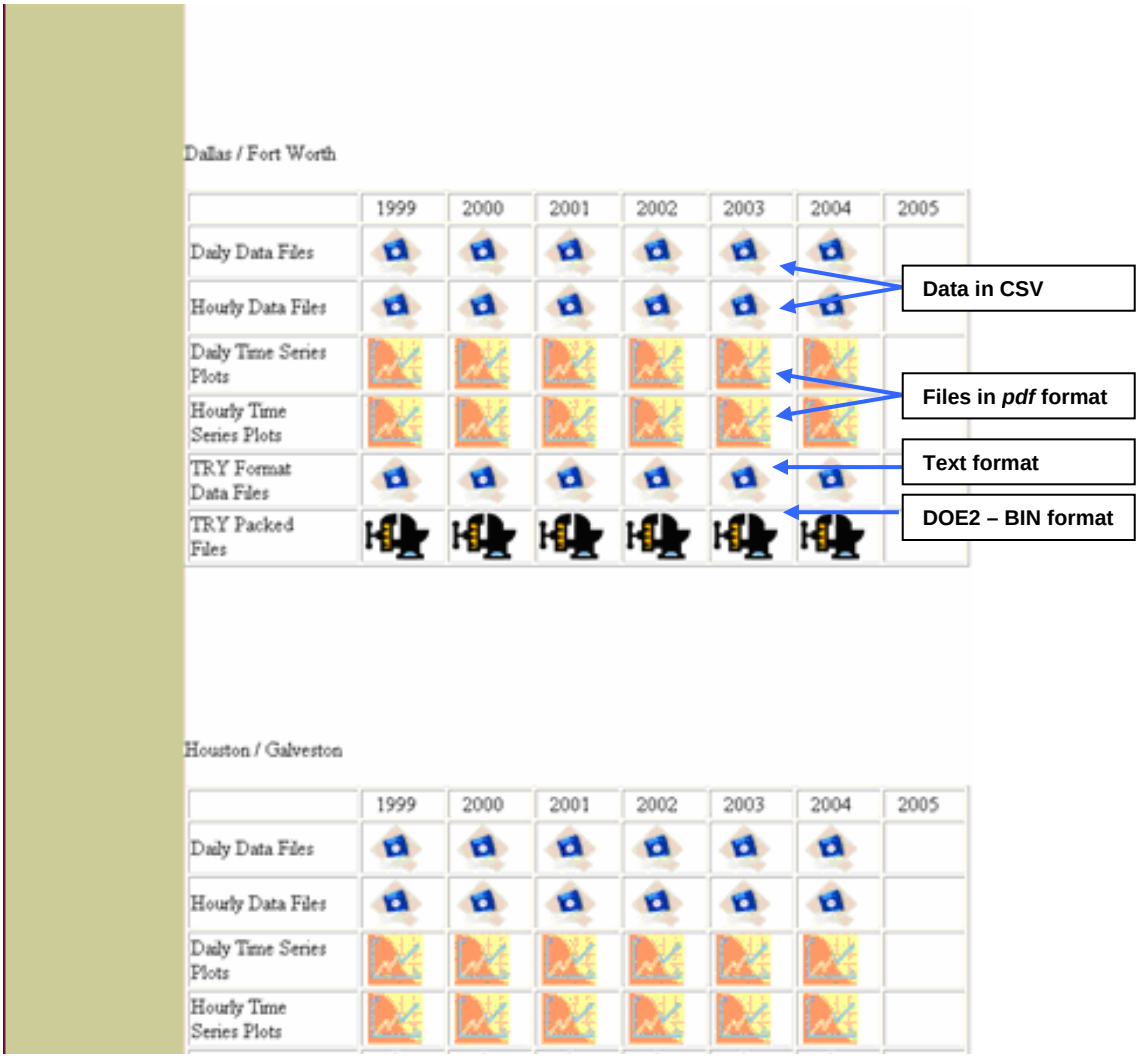

Figure 122: Available File Types and Years for Each Available Location. The Screenshot Shows the Corresponding Files for Dallas, TX.

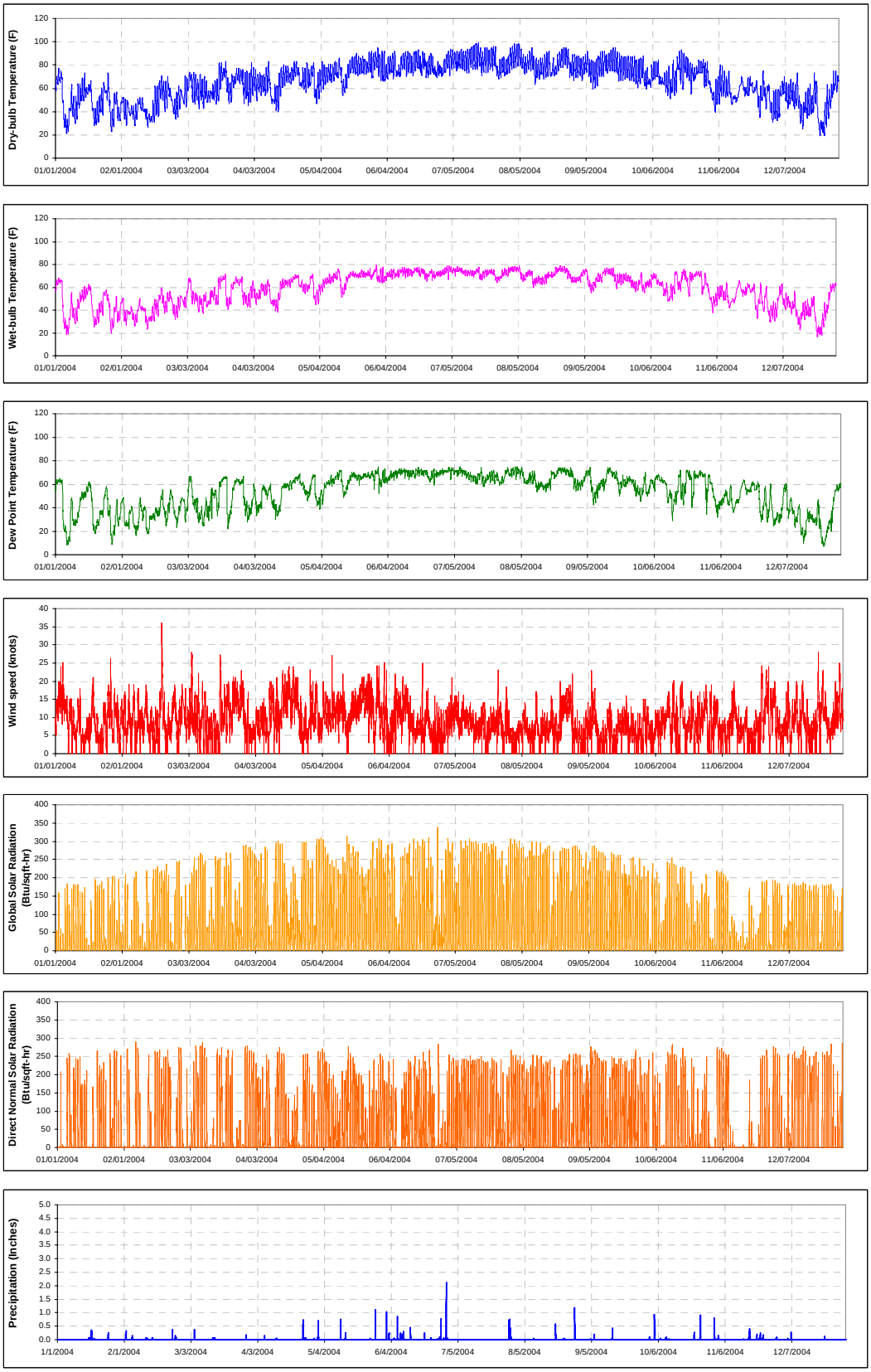

Figure 123: Hourly Data Set Time Series Plots for Dallas, TX on 2004.

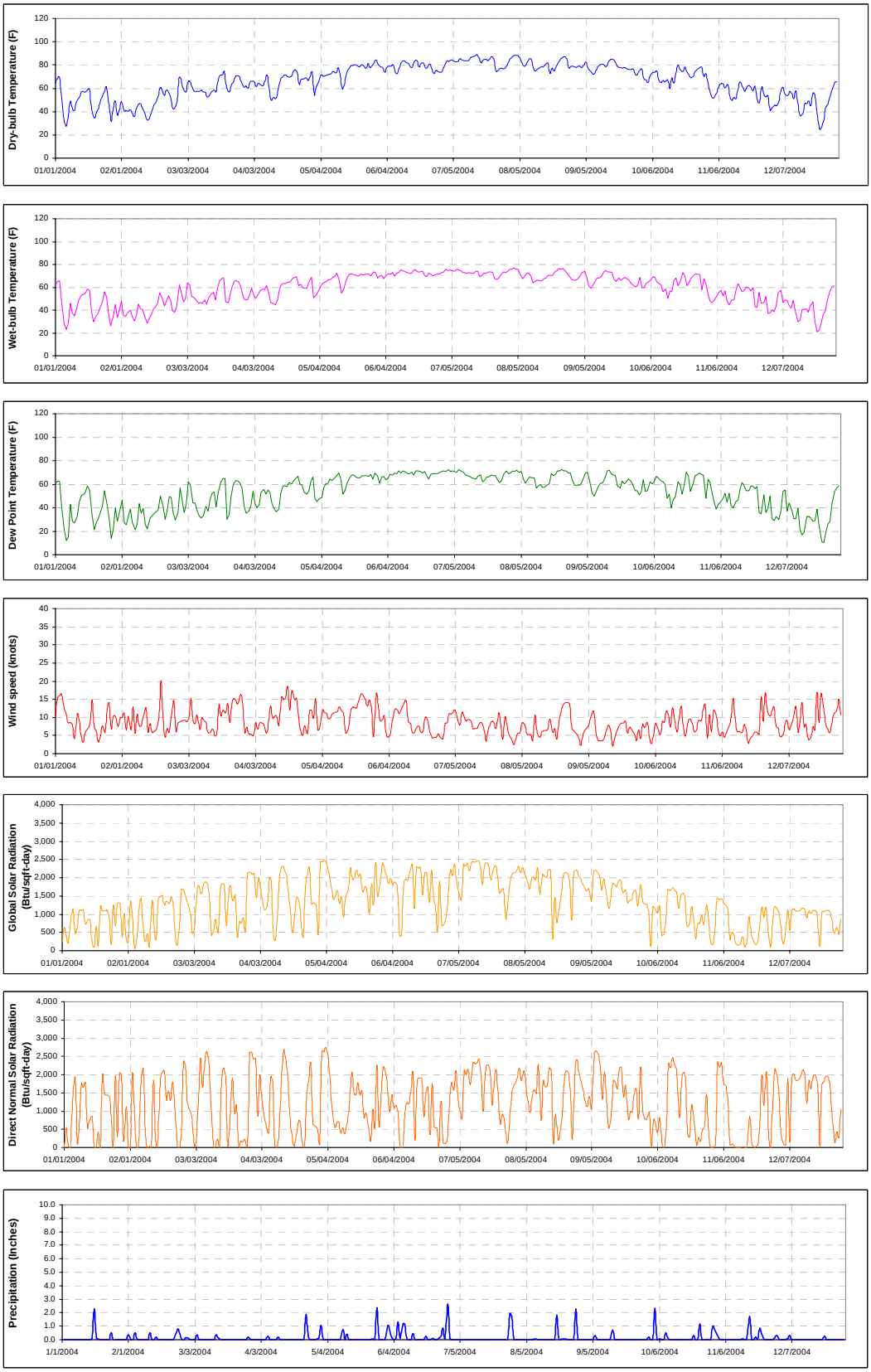

Figure 124: Daily Data Set Time Series Plots for Dallas, TX on 2004.

Table 129: Extraction of the Dallas, TX, Daily Data in CSV Format.

Date	Average Dry-Bulb Temperature (øF)	Average Wet-Bulb Temperature (øF)	Average Dew-Point Temperature (øF)	Average Wind Speed (knot)	Total Global Solar Radiation (Btu/day-sqft)	Total Normal Drect Solar Radiation (Btu/day-sqft)	Total Precipitation (in)
1/1/2004	64.4	61.8	60	10	227.7	7.2	0
1/2/2004	68.7	64.8	62.5	15.3	638.8	542.5	0
1/3/2004	69.7	65.4	62.8	15.9	380.2	33.1	0
1/4/2004	52.8	48	42	16.5	223.3	7.6	0
1/5/2004	31	27.8	21.7	12.4	926.2	1139.1	0
1/6/2004	27.5	23	12.4	10.6	1120.7	1901.1	0
1/7/2004	35.6	28.8	15	8.5	486.3	134.3	0
1/8/2004	49	46	42.8	8.7	618.9	533.1	0
1/9/2004	42.8	37	28.5	8.2	1109.6	1749.3	0
1/10/2004	40.8	35.4	27.3	4.2	1094.2	1643.1	0
1/11/2004	48.3	41.2	32.7	10.8	1127.3	1774.8	0
1/12/2004	51.9	48.2	44.6	9.3	736.1	541.9	0
1/13/2004	57	53.3	50.3	4.7	857.7	733.4	0
1/14/2004	57.5	54	51.3	3.2	835.5	842.8	0
1/15/2004	56.5	54.8	53.4	5.9	207.8	7.6	0.1
1/16/2004	58.8	58.5	58.3	6.8	86.2	1.1	2.3
1/17/2004	59.9	57.1	55	8.5	656.5	431.3	0.2
1/18/2004	42.5	38.7	32.8	14.9	119.4	2.6	0
1/19/2004	34.7	29.9	21.2	7.2	1218	1956.1	0
1/20/2004	38.6	34	27	6.4	1087.5	1466.7	0
1/21/2004	42.4	37.5	30.8	3.3	1100.8	1430.1	0
1/22/2004	48.3	42.8	36.2	4.6	1107.4	1395.2	0
1/23/2004	52.7	47	41.3	7.8	937.2	833.8	0
1/24/2004	57.2	55.9	54.7	6	168	3.2	0.5
1/25/2004	60.9	51.6	42.5	12.4	1255.5	1958.7	0
1/26/2004	43.1	37.7	30	13.8	696.3	306.6	0
1/27/2004	31.7	26	13.7	6.7	1293.1	2038.4	0
1/28/2004	42.8	34.5	21.4	10.4	1293.1	2008.1	0
1/29/2004	49.1	44.8	39.9	10.4	373.6	183.6	0
1/30/2004	36.7	33.4	28.3	7.6	1012.4	1116.9	0
1/31/2004	41.4	40.3	39.1	10	287.4	8.9	0
2/1/2004	48.8	47.7	46.6	10	225.5	6.3	0.3
2/2/2004	40.3	35.2	27.4	11.1	1346.2	2033.8	0
2/3/2004	41	34.8	25.4	6.7	1012.4	919.3	0
2/4/2004	40.6	37.3	32.6	10.4	81.8	0.7	0.5
2/5/2004	41.3	40.1	38.6	6.5	380.2	18.5	0.1

Table 130: Extraction of the Dallas, TX, Hourly Data in CSV Format.

Date Time	Dry-Bulb Temperature (øF)	Wet-Bulb Temperature (øF)	Dew-Point Temperature (øF)	Wind Speed (knot)	Global Solar Radiation (Btu/hr-sqft)	Normal Drect Solar Radiation (Btu/hr-sqft)	Precipitation (in)
1/1/2004 0:00	61	56.7	53.1	9	0	0	0
1/1/2004 1:00	60.1	57.2	55	10	0	0	0
1/1/2004 2:00	61	57.6	55	7	0	0	0
1/1/2004 3:00	61	58.1	55.9	6	0	0	0
1/1/2004 4:00	60.1	57.7	55.9	5	0	0	0
1/1/2004 5:00	59	57.9	57	8	0	0	0
1/1/2004 6:00	59	58.5	57.9	5	0	0	0
1/1/2004 7:00	57.9	57.9	57.9	6	0	0	0
1/1/2004 8:00	59	59	59	6	2.2	0	0
1/1/2004 9:00	60.1	60.1	60.1	10	8.8	0.1	0
1/1/2004 10:00	64	63.3	63	10	24.3	0.6	0
1/1/2004 11:00	66.9	65.1	64	14	48.6	1.7	0
1/1/2004 12:00	68	65.5	64	15	55.3	1.9	0
1/1/2004 13:00	68	65.5	64	13	26.5	0.5	0
1/1/2004 14:00	69.1	65.8	64	14	28.7	0.8	0
1/1/2004 15:00	70	66.2	64	12	24.3	1.1	0
1/1/2004 16:00	70	65.7	63	12	8.8	0.5	0
1/1/2004 17:00	69.1	65.3	63	11	0	0	0
1/1/2004 18:00	69.1	64.8	62.1	13	0	0	0
1/1/2004 19:00	69.1	64	61	13	0	0	0
1/1/2004 20:00	66.9	63.3	61	10	0	0	0
1/1/2004 21:00	66.9	62.8	60.1	10	0	0	0
1/1/2004 22:00	64.9	62.1	60.1	10	0	0	0
1/1/2004 23:00	64.9	62.1	60.1	11	0	0	0
1/2/2004 0:00	64.9	62.6	61	14	0	0	0
1/2/2004 1:00	64	62.2	61	14	0	0	0
1/2/2004 2:00	64.9	63.1	62.1	11	0	0	0
1/2/2004 3:00	64	62.8	62.1	11	0	0	0
1/2/2004 4:00	64	62.8	62.1	13	0	0	0
1/2/2004 5:00	63	62.4	62.1	16	0	0	0
1/2/2004 6:00	63	62.4	62.1	15	0	0	0
1/2/2004 7:00	63	62.4	62.1	12	2.2	0	0
1/2/2004 8:00	64.9	63.7	63	9	15.5	1.6	0
1/2/2004 9:00	69.1	65.8	64	13	28.7	1.5	0
1/2/2004 10:00	71.1	66	63	15	39.8	1.5	0
1/2/2004 11:00	73	66.7	63	13	66.3	4.6	0

Table 131: Extraction of the TRY Format File Needed for Packing the DOE-2 File.

```
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392700600570551700102955099999999999999999999999999999900000000   2004010101
392700610580551700072956099999999999999999999999999999900000000   2004010102
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392700770680631600162929099999999999999999999999999999901220142   2004010214
392700750670631700202928099999999999999999999999999999900710058   2004010215
392700730670631700152928099999999999999999999999999999900440114   2004010216
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392700700650621700172927099999999999999999999999999999900000000   2004010218
```

9 PLANNED VERIFICATION TO THE EMISSIONS CALCULATOR (eCALC)

As part of the analysis effort, verification and validation efforts are planned for each of the major analysis areas in the emissions calculator, including: utility billing analysis, on-site inspections, and calibrated simulations.

9.1 Utility Billing Analysis

In cooperation with the City of College Station, utility billing data were analyzed for a sample of 26 homes in College Station, Texas, as shown in Figure 125 and Figure 126. Thirteen of these homes were built before the implementation of the 2001 IECC and 13 of the homes were built after the implementation of the 2001 IECC. All homes were built in roughly the same area of town, separated by only a few streets. All homes were built by the same builder using a series of floor plans that remained roughly the same for all houses.

Figure 127 shows the conditioned floor area for each of the houses versus the permitted building date (upper graph), building permit date versus area above 1500 sq. ft. (middle graph), and building permit date versus average annual electricity use (kWh/ft2-day) (lower graph). Figure 128 provides several photographs of the different house types used by the builder.

Figure 129 shows the utility bills for the 13 houses built before the adoption of the 2001 IECC (approx. 6 years), and Figure 130 shows the utililty bills for the 13 houses built after the adoption of the 2001 IECC (approx. 2½ years). Figure 131 shows an example of the utility bills for three of the pre-code houses plotted against the average temperature for the billing date, Figure 132 shows an example of the utility bills for three of the post-code houses plotted against the average temperature for the billing date. In both Figure 131 and Figure 132, the three-parameter, change-point model is shown superimposed upon the data points. In Figure 133, the weather normalized average of all 13 pre-code houses and 13 post-code houses is shown as a time series plot (upper graph) and plotted against average monthly temperature (lower plot). The preliminary analysis using ASHRAE's IMT resulted in approximately 15% difference between the two groups of houses. This difference is in good agreement with the energy savings predicted by the DOE-2 model used for the calculation of energy savings from code-compliant construction. Additional analysis is underway using Sliding PRISM to allow for a more accurate analysis of both group and individual houses over several years.

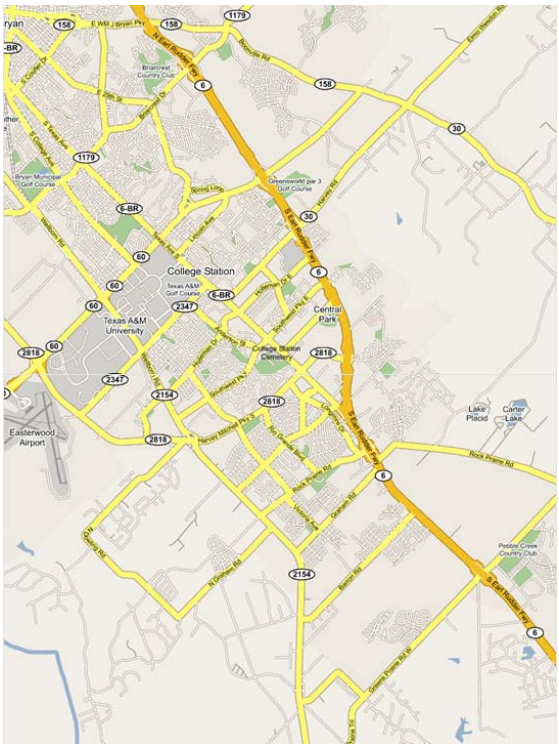


Figure 125: Map of College Station Showing Approximate Area of Town used for Demonstration of Pre/Post 2001 Building Code Implementation.

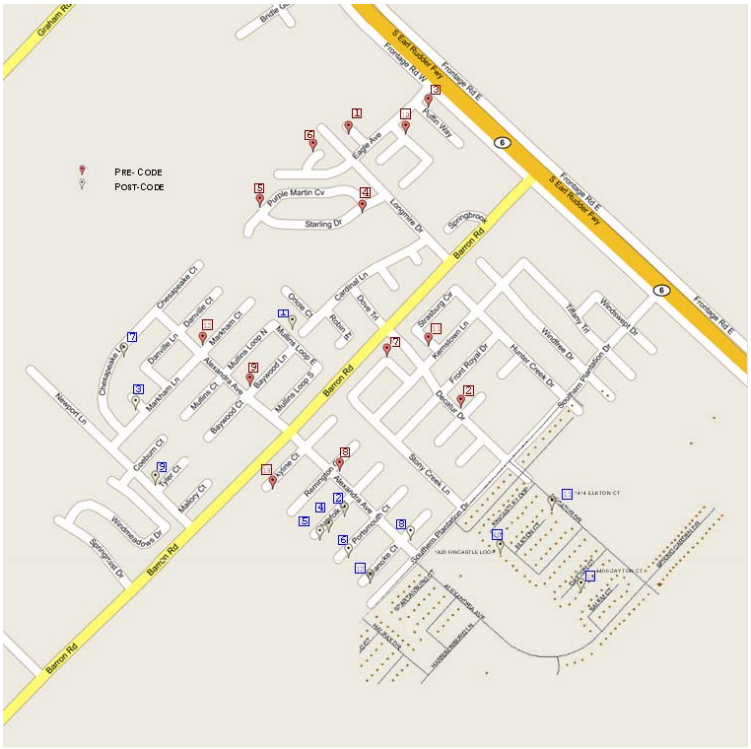
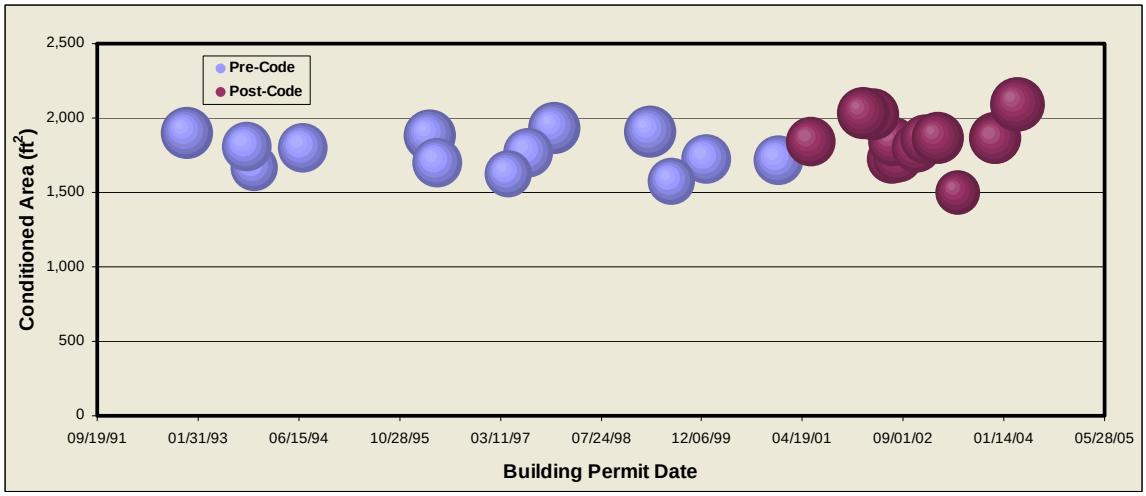
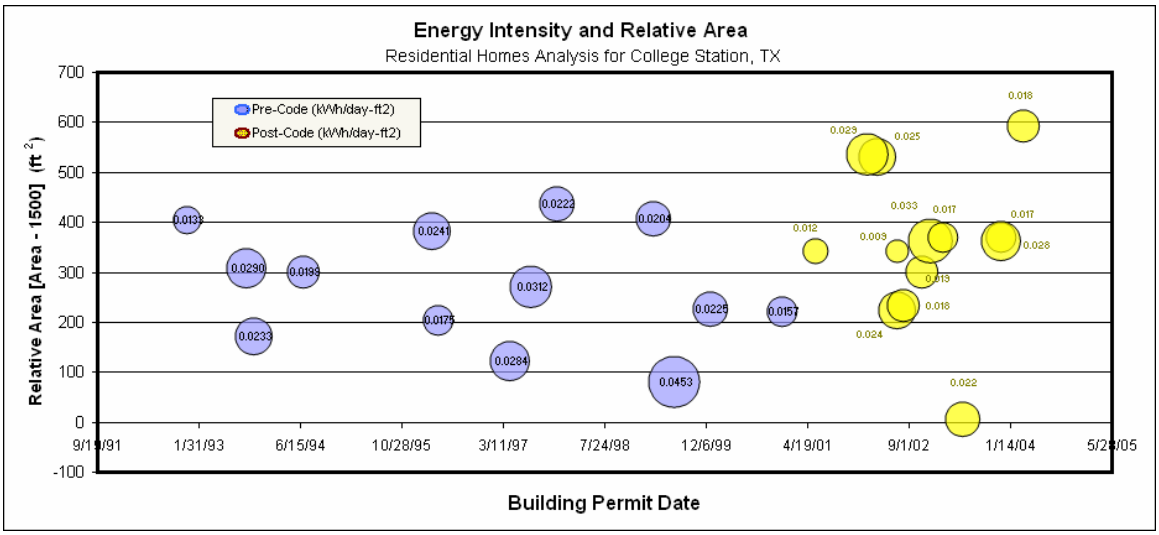


Figure 126: Close-up Map Showing Approximate Area of Town used for Demonstration of Pre/Post 2001 Building Code Implementation.





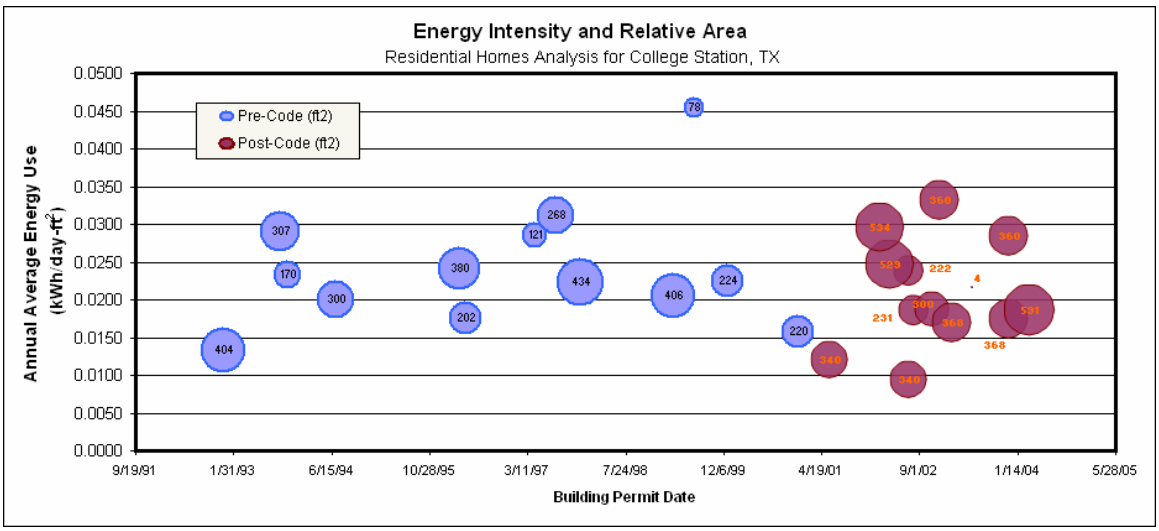


Figure 127: Analysis of houses chosen for demonstration of utility billing analysis. Building permit date vs. conditioned area (upper graph), building permit date vs. area above 1500 sq. ft. (middle graph), and building permit date vs. average annual electricity use (kWh/sq. ft.-day) (lower graph).

Figure 128: Photographs of Houses used in Demonstration of Utility Billing Analysis.

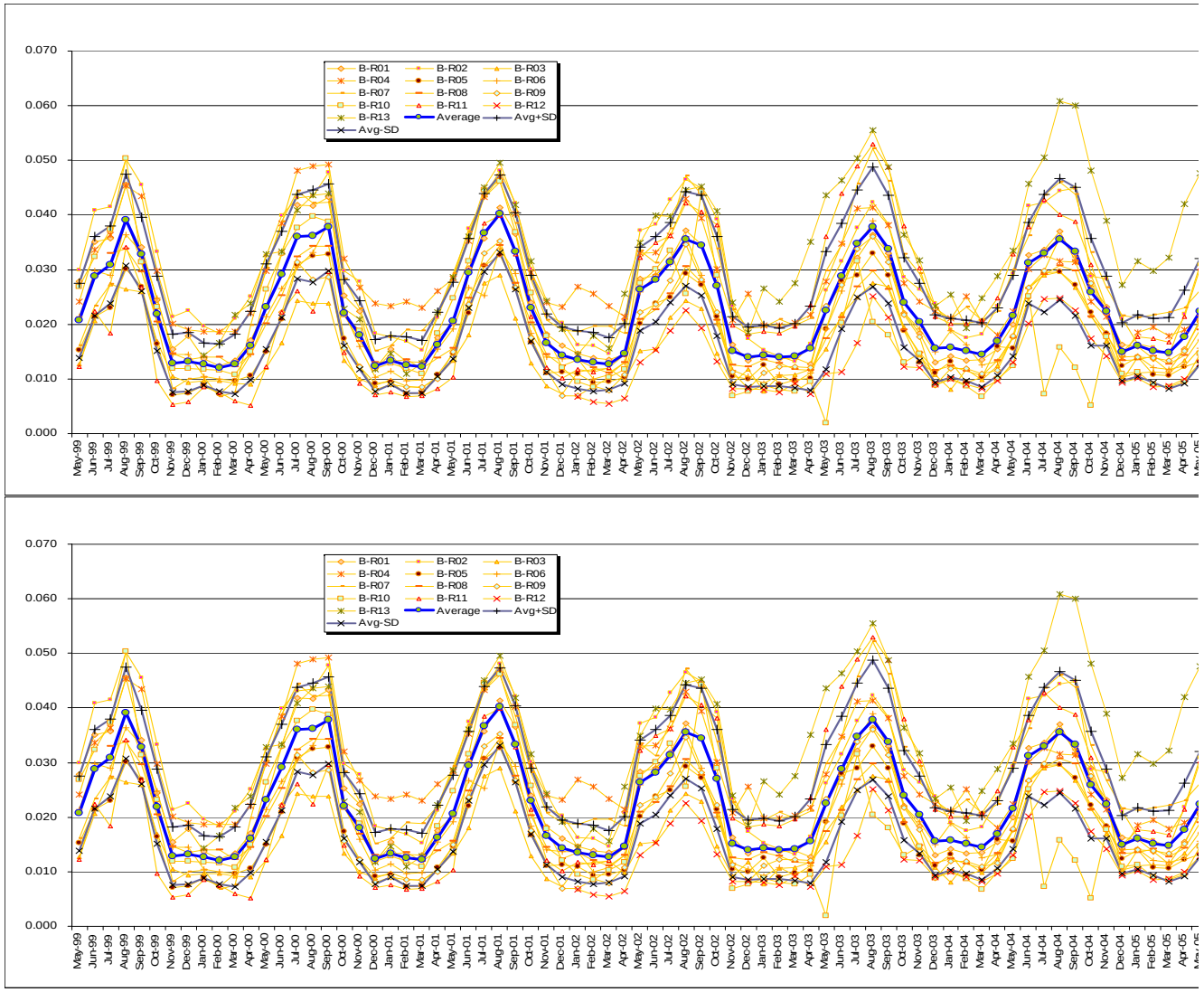


Figure 129: Utility Billing Data for 13 Houses Built Before the Adoption of the 2001 IECC.

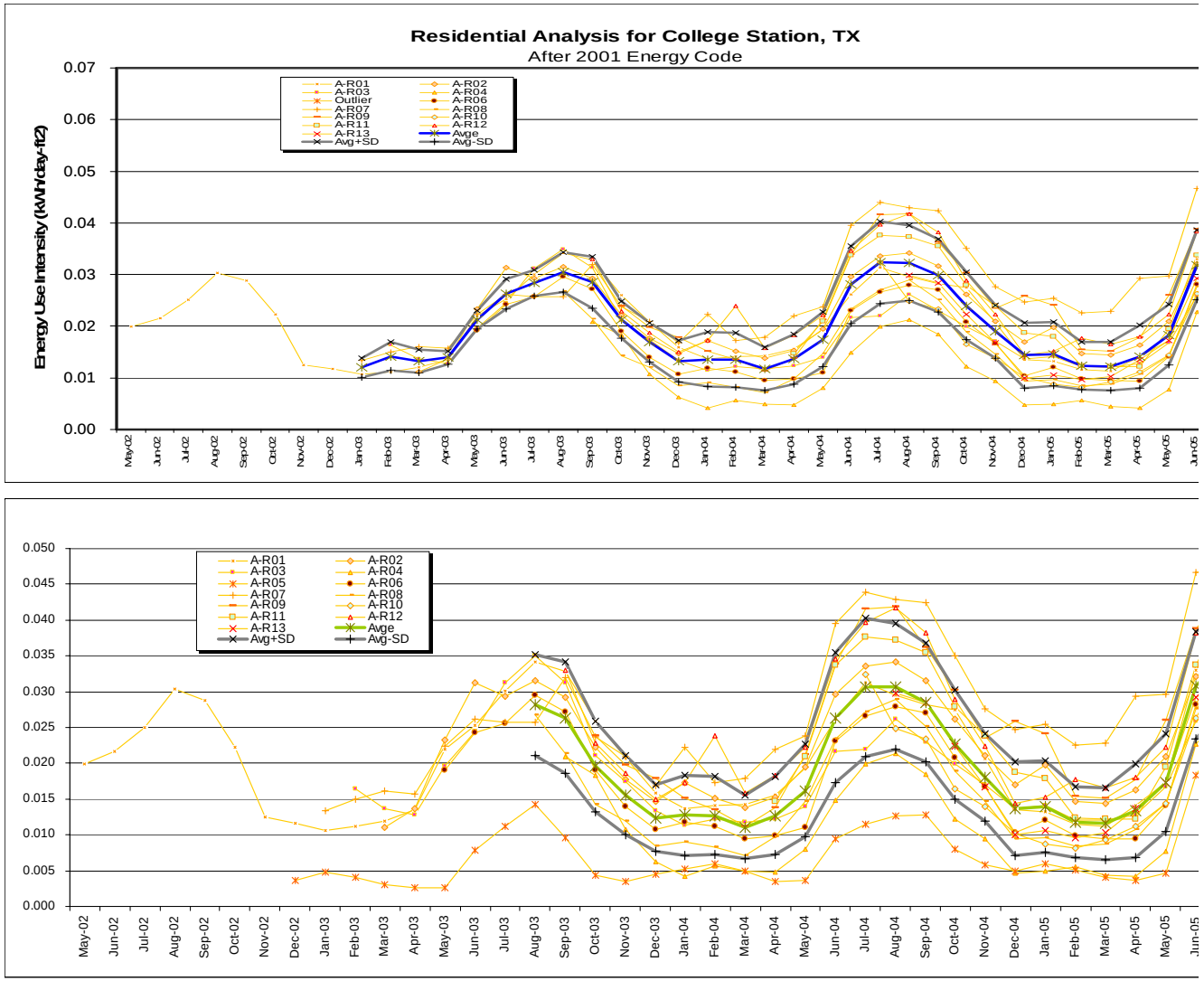


Figure 130: Utility Billing Data for 13 Houses Built After the Adoption of the 2001 IECC.

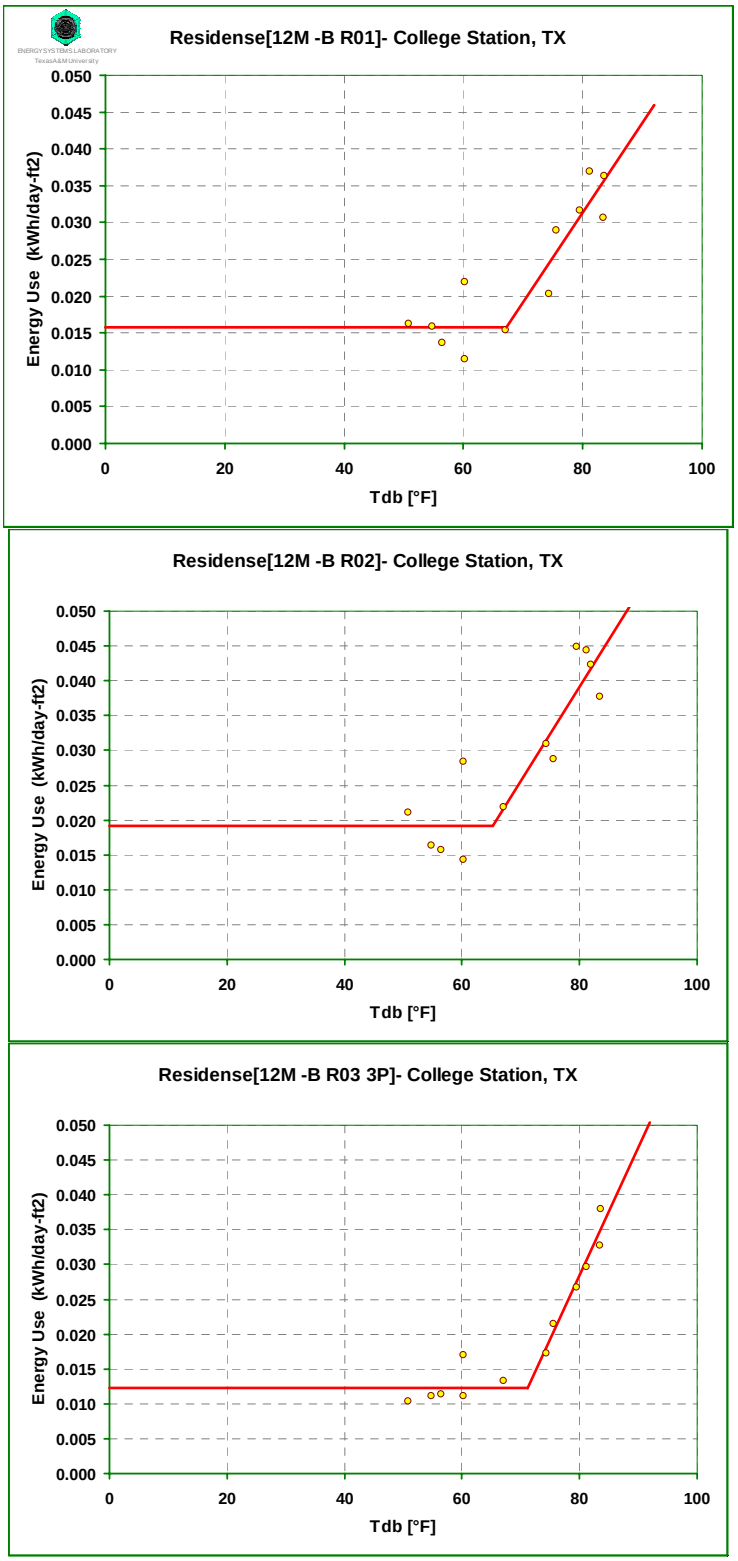


Figure 131: Sample Analysis for 3 Houses Built Before the Adoption of the 2001 IECC.

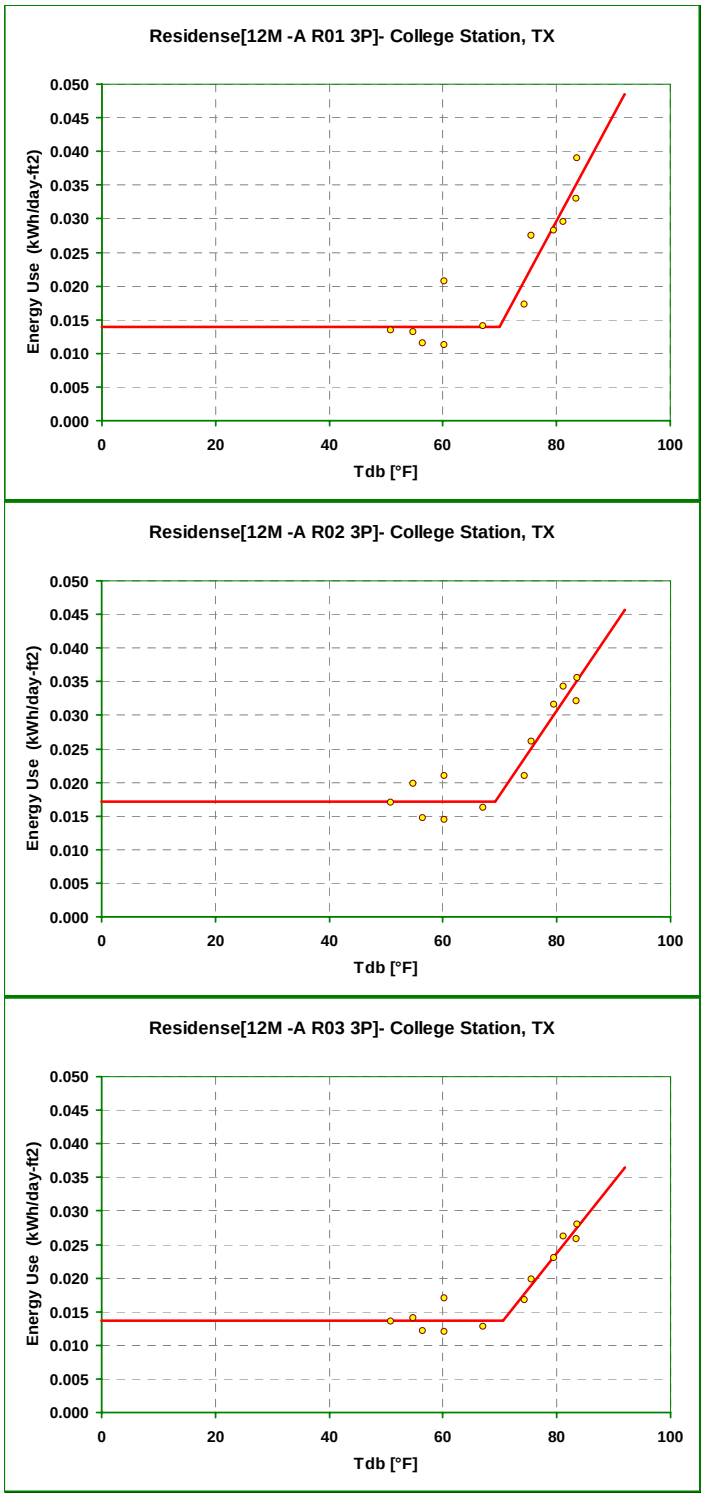


Figure 132: Sample Analysis for 3 Houses Built After the Adoption of the 2001 IECC.

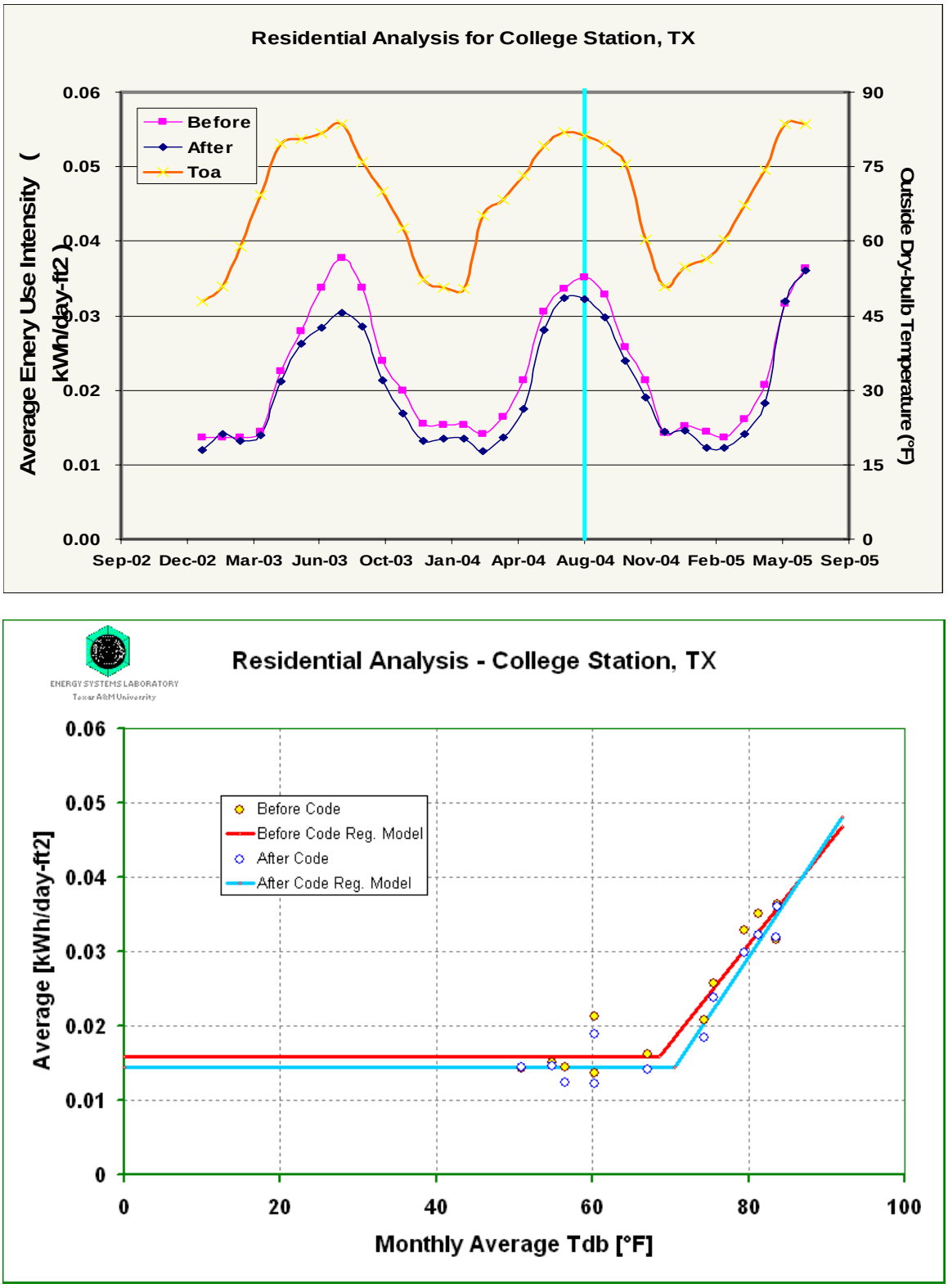


Figure 133: Average Weather-normalized Difference for Houses Built Before and After the 2001 IECC.

9.2 On-site Inspections

On-site inspection work continued in 2005, including residential and commercial buildings to determine if specific energy-conserving features are being installed properly.

9.3 Calibrated Simulations

Calibrated simulations are planned for two commercial sites and one residential site to help confirm the accuracy of the code-compliant DOE-2 simulations. For each site, existing data loggers, installed from previous projects were restarted and the data from the sensors checked for accuracy. These sites include a standard office building in College Station, Texas, a high-efficiency office building in Austin, Texas, and a residence in Bryan, Texas.

9.3.1 Standard Office building

The calibrated simulation of a standard office building using the Texas A&M University Systems Building in College Station, Texas, continues. Figure 134, Figure 135, and Table 132 show the related information from this site. This building is currently being monitored as part of the campus energy conservation program and includes the channels shown in Table 132.

Figure 134: Standard Office Building (Texas A&M University Systems Building, College Station, Texas).

Table 132: Standard Office Building (Listing of Monitored Channels).

Chid	cp	Description
4347	1	CHW PUMPS (power, A1B1/A1B1)
4348	2	CHW PUMPS (power, C1B1/C1B1)
4349	3	CHIL 1 FLOW
4350	4	CHIL 1 SUP TEMP
4351	5	CHIL 1 RET TEMP
4352	6	COND 1 FLOW
4353	7	COND 1 SUP TEMP
4354	8	COND 1 RET TEMP
4355	9	CHIL 2 FLOW
4356	10	CHIL 2 SUP TEMP
4357	11	CHIL 2 RET TEMP
4358	12	COND 2 FLOW
4359	13	COND 2 SUP TEMP
4360	14	COND 2 RET TEMP
4361	15	OUTDOOR TEMP
4362	16	OUTDOOR RH
4363	17	WBE ENERGY
4364	18	OFFICE BLDG ELEC
4365	19	CHILLERS 1&2

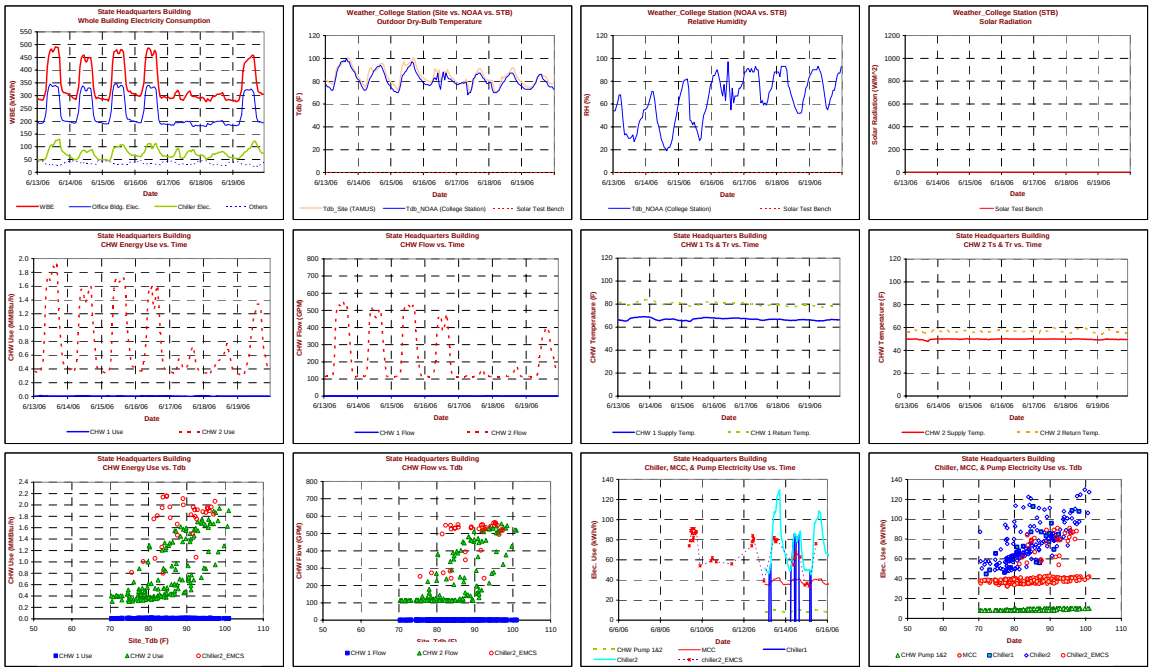


Figure 135: Standard Office Building (Example of Weekly Inspection Plots).

9.3.2 K-12 Elementary School.

To expand the capabilities of the emissions calculator, which currently covers office and retail type buildings, K-12 schools were identified as the next largest category of buildings that needed to be included in the emissions reductions calculations. To begin to prepare for this new model, in cooperation with the College Station Independent School District (CSISD), the Laboratory collected representative utility billing data to determine average electricity and natural gas use as shown in Figure 136, Figure 137 and Figure 138. The Laboratory then re-started the existing data logger in a nearby K-12 elementary school building in College Station, Texas. These data will be used to verify the calibrated simulation to be used for determining the energy savings from code compliance in K-12 school construction. Figure 140 contains an example of the data from the elementary school. Figure 139 shows a preliminary image of the calibrated computer simulation.

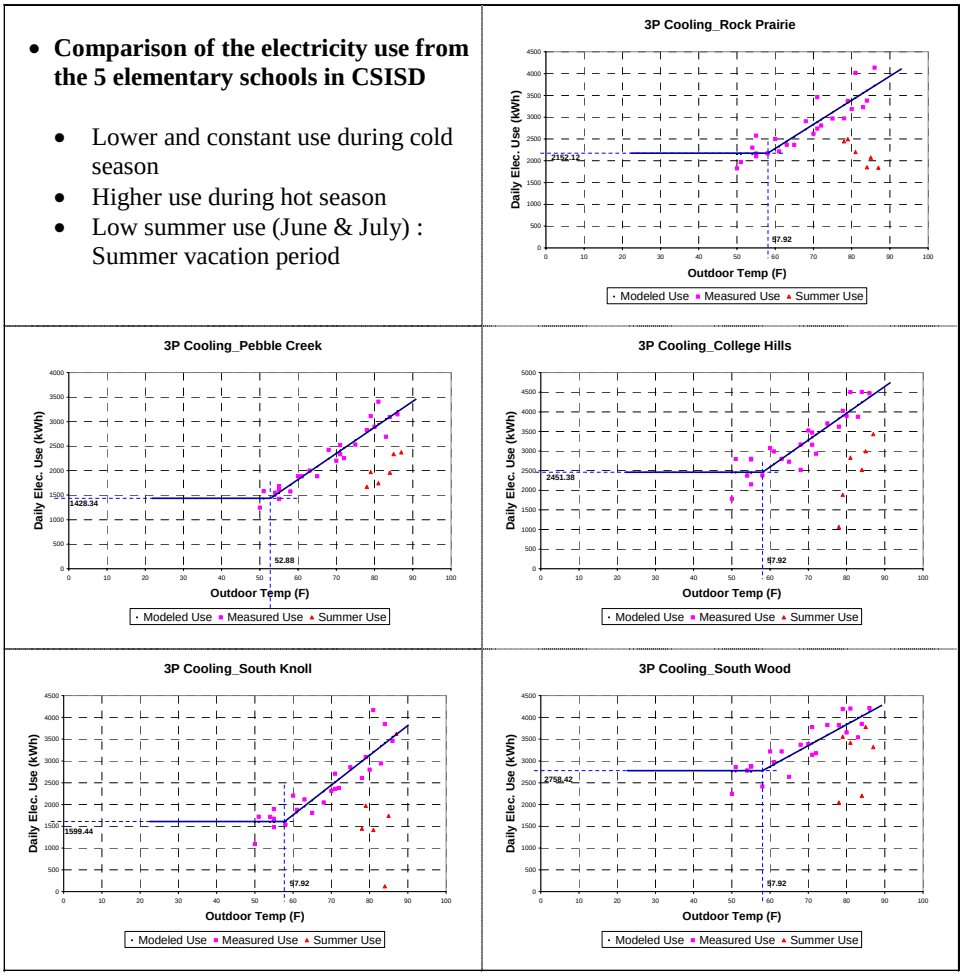


Figure 136: Monthly Electricity Utility Bills for Five K-12 Schools in College Station, Texas.

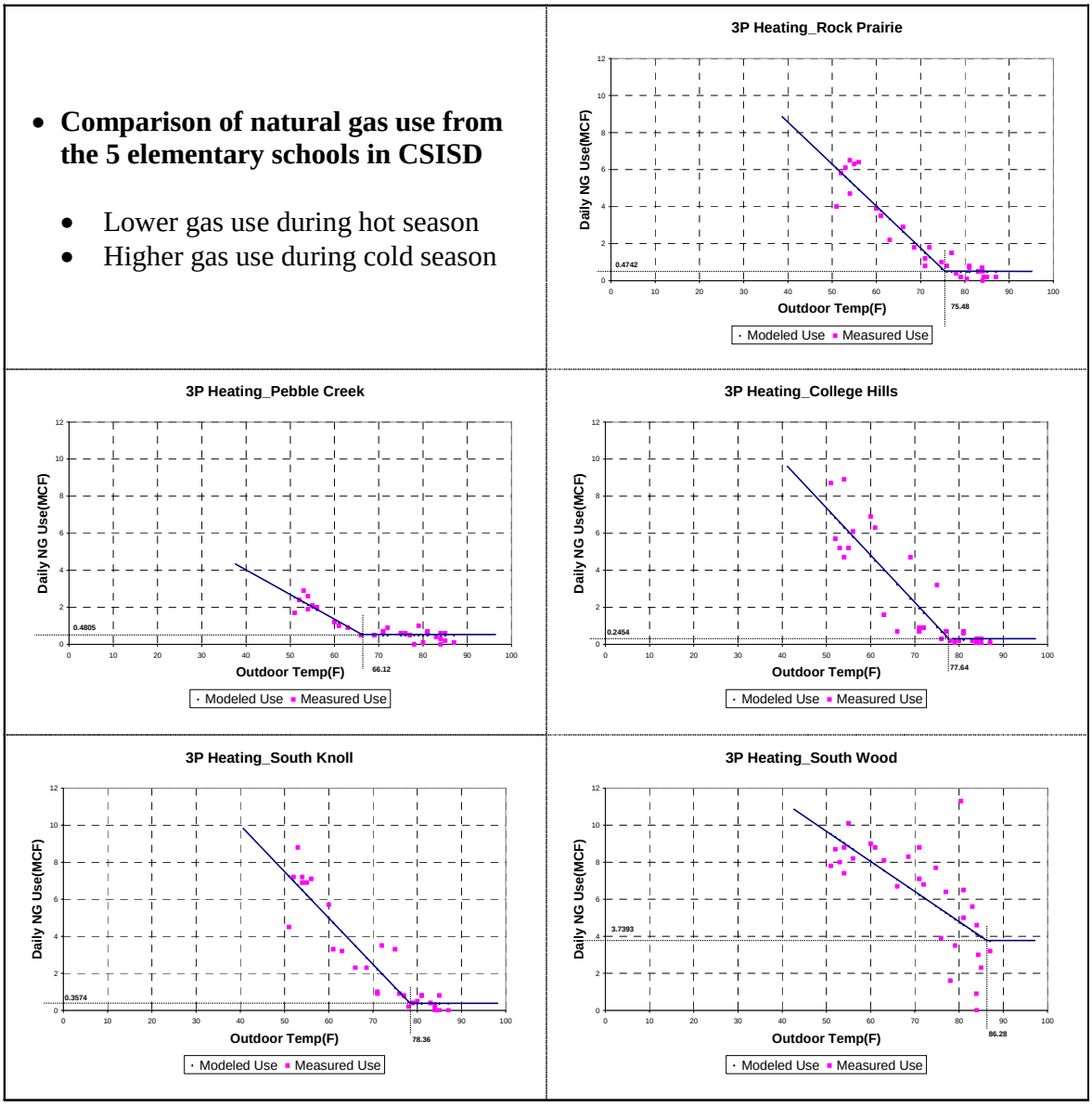


Figure 137: Monthly Natural Gas Utility Bills for Five K-12 Schools in College Station, Texas.

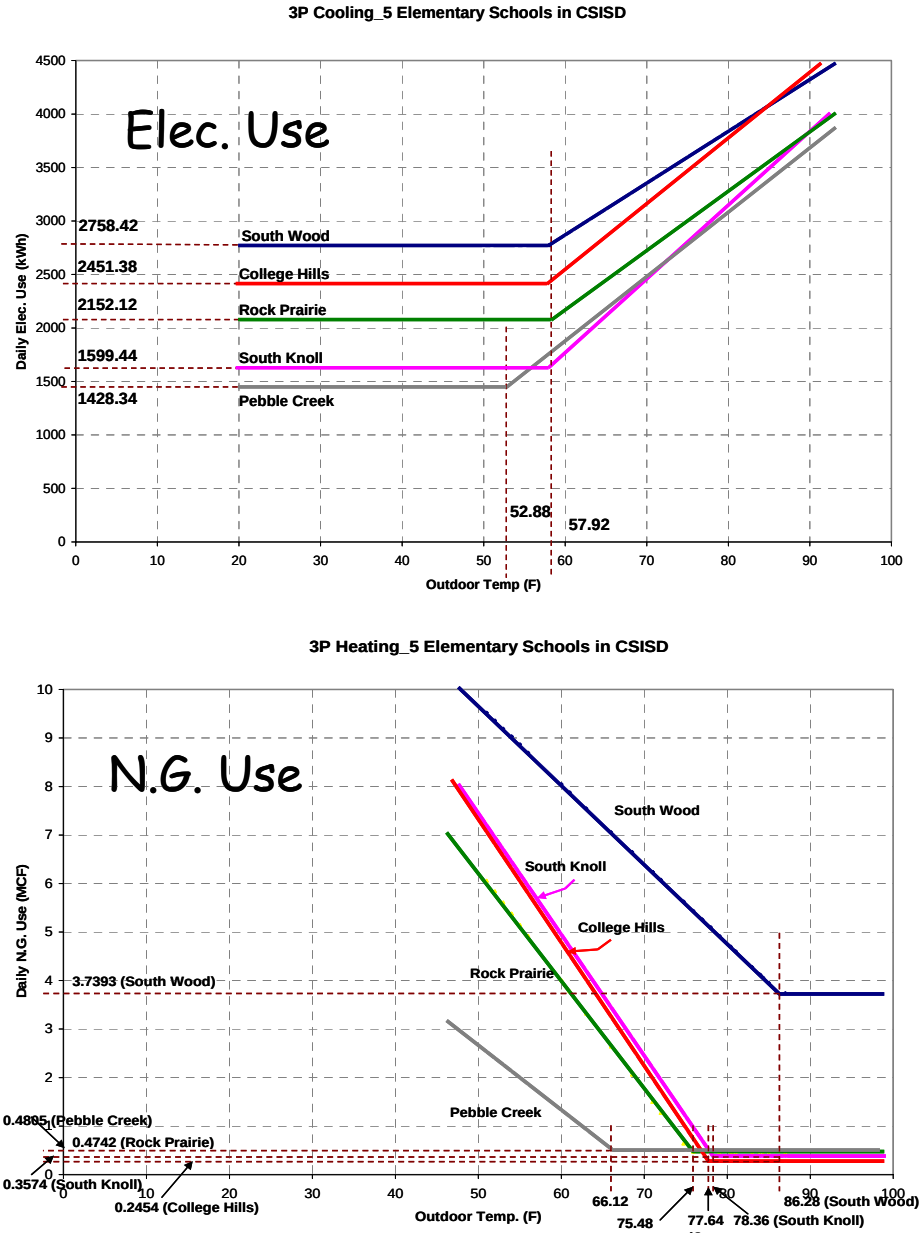


Figure 138: Normalized Comparison of Monthly Utility Bills for Five K-12 Schools in College Station, Texas.

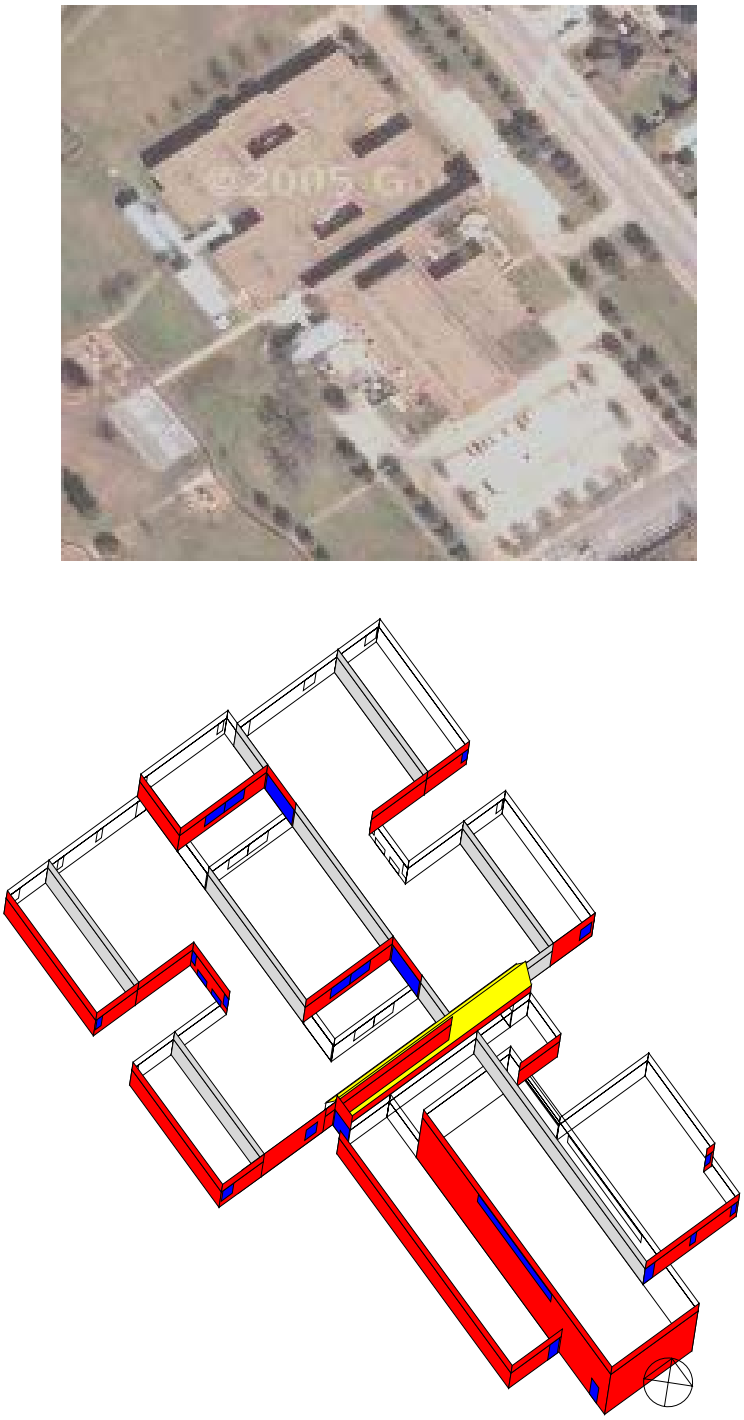


Figure 139: Photo and Preliminary Computer Simulation of Case Study Elementary School.

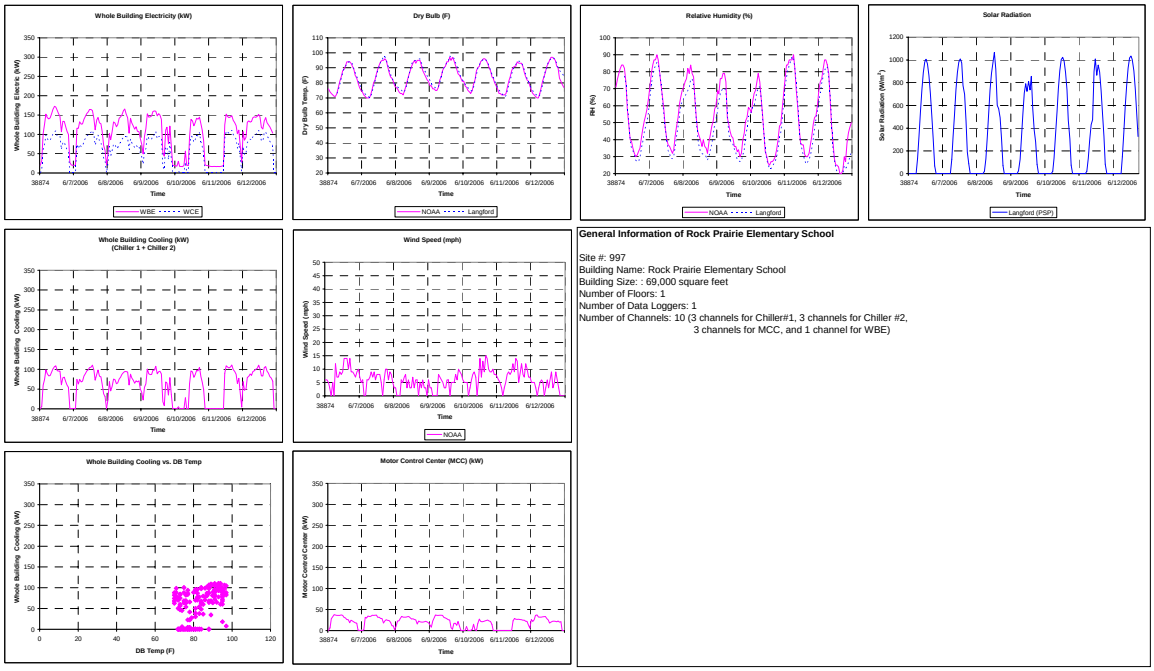


Figure 140: Example Weekly Inspection Plots From Case Study Elementary School.

9.3.3 High Performance Office Building

Work on the calibrated simulation of the high performance office building using the Robert E. Johnson State Office Building in Austin, Texas, (Figure 141) was completed in 2005[60]. This building is a 5-story, 303,389 square foot office building for state legislative support staff, including Legislative House Committees, Legislative Council, State Auditor, the Legislative Reference Library, the Senate Print Shop, and the Sunset Commission. Overall, the building is divided into three sections with divisions created by a ground-level breezeway and vehicular access area, which are covered by the upper floors above these areas. The building's northern façade is approximately 14 degrees west of north, exposing it to direct sunlight during the late afternoon hours in the winter. It is also important to note that the building contains over 50% glazing in the façade consisting of two types of energy efficient, low-E glazing. Deciduous trees shade a large portion of the south façade up to the third level.

The monitored data from this building is being provided by three loggers that were installed as part of a project to verify the performance of the building for the Texas State Energy Conservation Office (SECO) in 2001 (Sylvester et al. 2002). Two of these loggers are located in the main central plant, where measurements are recorded for the electricity use, chilled-water production, and hot water production (Table 133). A third logger is located in the office wing of the fourth floor, where it records the electricity use of the plug and lighting loads on the floor, as well as interior solar radiation data on two windows (south and west facing). An example of the weekly inspection plot from the loggers can be seen in Figure 142.

Results of the analysis from the savings are shown in Figure 143. These results show that the building is performing better than the existing code used at the time of design (i.e., ASHRAE Standard 90.1-1989) and is performing at a level equal to the ASHRAE Standard 90.1-2001. This work has helped verify the calculation procedures used for quantifying emissions reductions from commercial construction built to code.

[60] This work will be published in the PhD Thesis by Suwon Song, 2006 "Development of New Methodologies for Evaluating the Energy Performance of New Commercial Buildings," Texas A&M University (August).

Figure 141: High Performance Office Building (Robert E. Johnson Building, Austin, Texas).

Table 133. High Performance Office Building (Listing of Monitored Channels).

Logger #	Channel Type	Chan	Description	Chid	Sensors Type	Remarks
Data acquisition system		Synergistic control system C180E DAS with Modem & PT				MAIN CENTRAL PLANT ROOM
215 (2546)	Watt	CT0	MCC Electric	4476	Current Transformer	
		CT1	MCC Electric	4477	Current Transformer	
		CT2	Chiller 1 Elec	4478	Current Transformer	
		CT3	Chiller 1 Elec	4479	Current Transformer	
		CT4	Chiller 2 Elec	4480	Current Transformer	
		CT5	Chiller 2 Elec	4481	Current Transformer	
		CT6	Chiller 4 Elec	4482	Current Transformer	
		CT7	Chiller 4 Elec	4483	Current Transformer	
	Analog	A0	Chil 1 ChWS Flow	4484	Flow Meter	ONICON FM 0-1200 GPM
		A1	Chil 1 ChWS Temp	4485	RTD Temp	1000 OHM RTD
		A2	Chil 1 ChWR Temp	4486	RTD Temp	1000 OHM RTD
		A3	Cond 1 Sup Temp	4487	RTD Temp	1000 OHM RTD
		A4	Cond 1 Ret Temp	4488	RTD Temp	1000 OHM RTD
		A5	Chil 2 ChWS Flow	4489	Flow meter	ONICON FM 0-1200 GPM
		A6	Chil 2 ChWS Temp	4490	RTD Temp	1000 OHM RTD
		A7	Chil 2 ChWR Temp	4491	RTD Temp	1000 OHM RTD
		A8	Cond 2 Sup Temp	4492	RTD Temp	1000 OHM RTD
		A9	Cond 2 Ret Temp	4493	RTD Temp	1000 OHM RTD
		A10	HW Flow	4494	Flow meter	ONICON FM 0-400 GPM
		A11	HW Sup temp	4495	RTD Temp	1000 OHM RTD
		A12	HW Ret temp	4496	RTD Temp	1001 OHM RTD
User Channel		-	Chiller 1 kBtu	4520	kBtu = (gph * (supply T - return T))/2	
User Channel		-	Chiller 2 kBtu	4521	kBtu = (gph * (supply T - return T))/2	
User Channel		-	HW kBtu	1522	kBtu = (gph * (supply T - return T))/2	
Data acquisition system		Synergistic control system C160E DAS with Modem & PT				MAIN ELEC. ROOM-LOWER LEVEL
216 (2900)	Watt	CT0	Bldg Electric 1	4497	Current Transformer	
		CT1	Bldg Electric 1	4498	Current Transformer	
		CT2	Bldg Electric 1	4499	Current Transformer	
		CT3	Bldg Electric 2	4500	Current Transformer	
		CT4	Bldg Electric 2	4501	Current Transformer	
		CT5	Bldg Electric 2	4502	Current Transformer	
	Digital	D0	Conf Center Elec	4503	Current Transformer	CH IQ200 METER
		D1	Senate Print shp	4504	Current Transformer	CH IQ200 METER
		D2	TLC Print Shop	4505	Current Transformer	CH IQ200 METER
Data acquisition system		Synergistic control system C140E DAS with Modem & PT				4TH FLOOR TELECOMM ROOM
217 (2901)	Watt	CT0	4th Floor East	4506	Current Transformer	
		CT1	4th Floor East	4507	Current Transformer	
		CT2	4th Floor East	4508	Current Transformer	
		CT3	4th Floor Central	4509	Current Transformer	
		CT4	4th Floor Central	4510	Current Transformer	
		CT5	4th Floor Central	4511	Current Transformer	
		CT6	4th Floor West	4512	Current Transformer	
		CT7	4th Floor West	4513	Current Transformer	
		CT8	4th Floor West	4514	Current Transformer	
		CT9	Summed XFMRS	4515	Current Transformer	
		CT10	Summed XFMRS	4516	Current Transformer	
		CT11	Summed XFMRS	4517	Current Transformer	
	Analog	A0	Solar -West	4518	Solar Radiation	Conference room 4.411 on 4th floor
		A1	Solar -South	4519	Solar Radiation	Conference room 4.411 on 4th floor

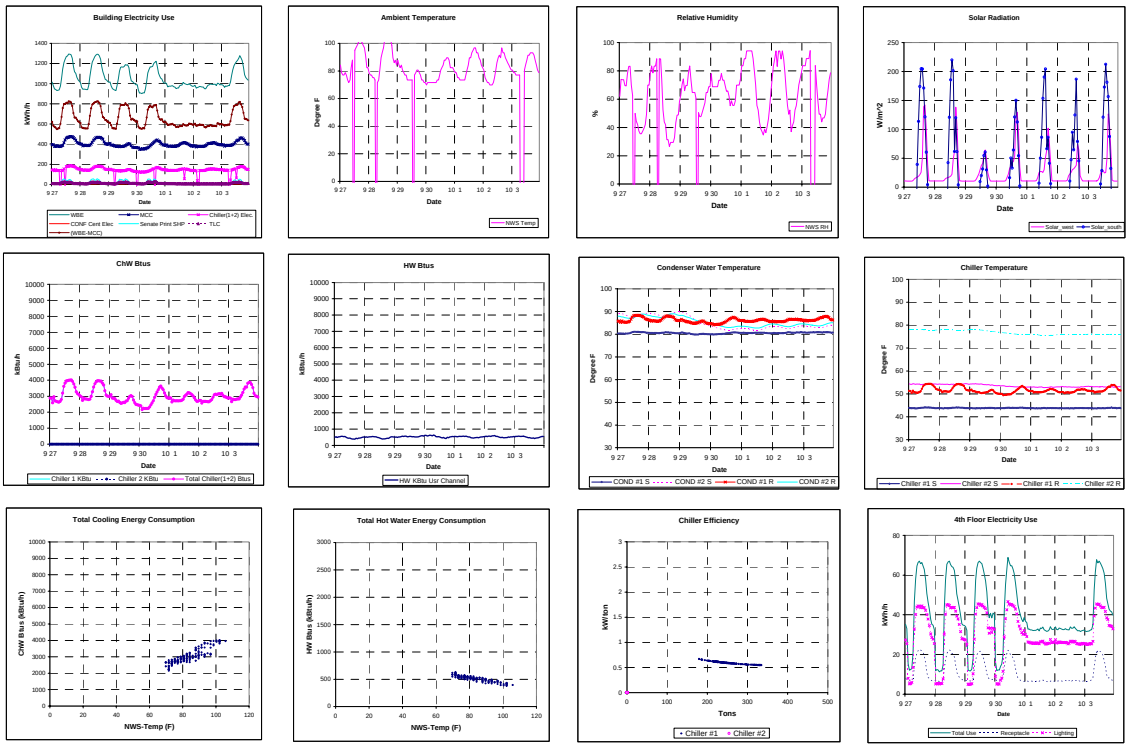
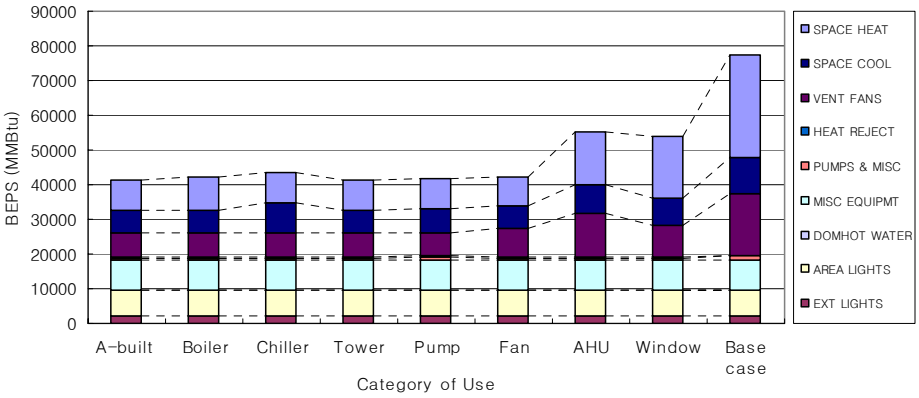


Figure 142: High Performance Office Building (Example of Weekly Inspection Plots).



Model Category	Standard 90.1-1989	Standard 90.1-2001	2001 As-built	2004 As-built	2004 Improved	Savings		
						89 Model	01 Model	Improved
AREA LIGHTS	9782.5	7466.9	7294.4	7219.1	7219.1	2488.10	172.5	0
MISC EQUIPMT	8259	8458.8	8458.8	8339.4	8339.4	-199.80	0.0	0
SPACE HEAT	15944.4	8619.8	8595.7	4918.7	1992	7348.70	24.1	2926.7
SPACE COOL	9911.4	6055.9	6659.7	6308.1	5018.7	3251.70	-603.8	1289.4
HEAT REJECT	2404.8	1219.3	372.5	351.7	295.1	2032.30	846.8	56.6
PUMPS & MISC	647	772.8	796.8	581	558.4	-149.80	-24.0	22.6
VENT FANS	7839	7340.5	6694.9	6598.7	3840.7	1144.10	645.6	2758
DOMHOT WATER	138.8	135.1	115.3	115.3	115.3	23.50	19.8	0
EXT LIGHTS	2177	2177	2177	2177	2177	0.00	0.0	0
Total (MMBtu)	57103.9	42246.1	41165.1	36609	29555.7	15938.80	1081.0	7053.3
Total(kBtu/sqft-yr)	161.5	136.6	133.7	118.9	96.0	27.80 (20.79%)	2.9 (2.17%)	22.9 (19.26%)

Figure 143: Results from Calibrated Simulations for the REJ Building.

9.3.4 Residential Building

Work on the calibrated simulation of the residential building using the occupied Habitat for Humanity house in Bryan, Texas, (Figure 144) continues. This building is a single story, 1,050 square foot, three-bedroom residence that has central air conditioning, a gas-fired furnace, DHW, and kitchen stove/oven (Kootin-Sanwu 2004).

The monitored data from this building is being provided by a logger that was installed as part of a project to verify the performance of a low-income house. The logger records energy and environmental data, including electricity use, natural gas use, indoor, slab, attic and ambient conditions, as shown in Table 134. An example of the weekly inspection plot from the loggers can be seen in Figure 145.

In 2005, a duct model was developed and tested using a calibrated simulation of the Habitat House. Figure 146 shows a schematic of the duct model and results from the improved, calibrated simulation[61]. This analysis has been used to expand the emissions calculator to include the heat/loss from ductwork located in the attic of a residence.

Figure 144: Residential Building (Habitat Residence, Bryan, Texas).

[61] This work will be published in the PhD Thesis by Seongchan Kim, 2006. "An Analysis of International Energy Conservation Code (IECC)-Compliant Single-Family Residential Energy Use," Texas A&M University (August).

Table 134: Residential Building (Listing of Monitored Channels).

Name	Description / Unit	ESL Channel
Power channels		
Phase I	The electricity use for the first phase of the house (kW)	ch3789
Phase II	The electricity use for the second phase of the house (kW)	ch3790
WBE	The combined electricity use of the first and second phases of the house (kW)	ch3789 + ch3790
Dryer	The electricity use for the dryer (kW)	ch4151
Air-conditioner	The electricity use for the air-conditioner (kW)	ch 4152
Air-conditioner Blower	The electricity use air-conditioner blower (kW)	ch4153
Refrigerator	The electricity use refrigerator (kW)	ch3794
Freezer	This plot represents the electricity use for the freezer (kW)	ch4154
Washer	This plot represents the electricity use for the dishwasher (kW)	ch3796
Dishwasher	This plot represents the electricity use for the washer (kW)	ch3797
Analog channels		
Ground Temperature -N	The ground temperature for the north sensor (F)	ch3798
Ground Temperature -C	The ground temperature for the center sensor (F)	ch 3799
Ground Temperature -S	The ground temperature for the south sensor (F)	ch 3800
Supply Relative Humidity	The relative humidity of the supply air from the air-conditioning coils (%)	ch 3801
Supply Temperature	The temperature of the supply air from the air-conditioning system (F)	ch 3802
Return Relative Humidity	The relative humidity of indoor air of the house (%)	ch 3803
Return Temperature	The temperature of the indoor air of the house (F)	ch3804
Carbon Dioxide Concentration inside	The carbon dioxide concentration inside the house (ppm)	ch3805
Carbon Dioxide Concentration outside	The carbon dioxide concentration outside the house (ppm)	ch3806
Solar Radiation	The solar radiation at the on-site weather station at the house (W/m^2)	ch3807
Wind Speed	The wind speed outside the house (mph)	ch3808
Outdoor Relative Humidity	The relative humidity of the outdoor air at the on-site weather station (%)	ch3809
Outdoor Temperature	The temperature of the outdoor air the on-	ch3810

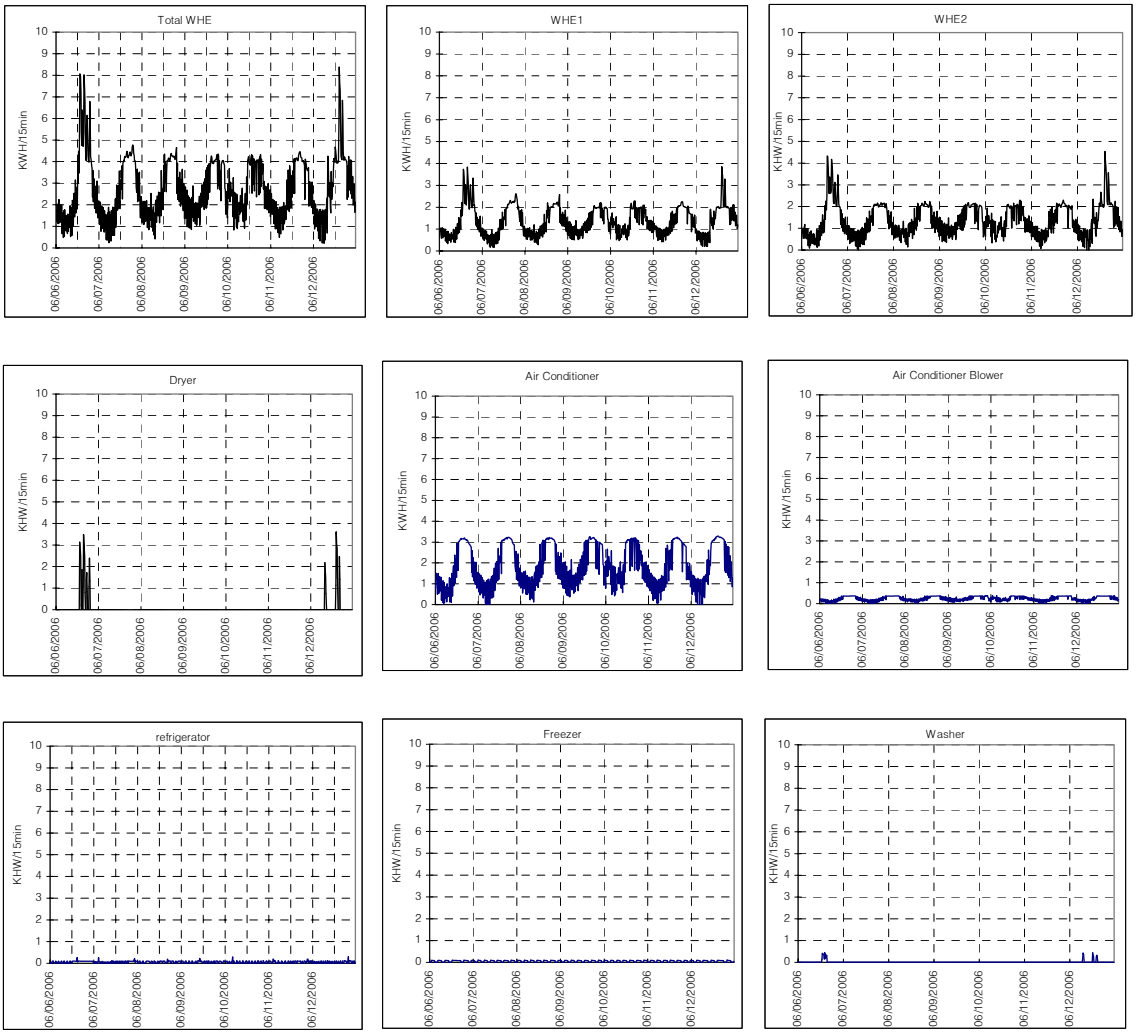


Figure 145: Residential Building (Example of Weekly Inspection Plots).

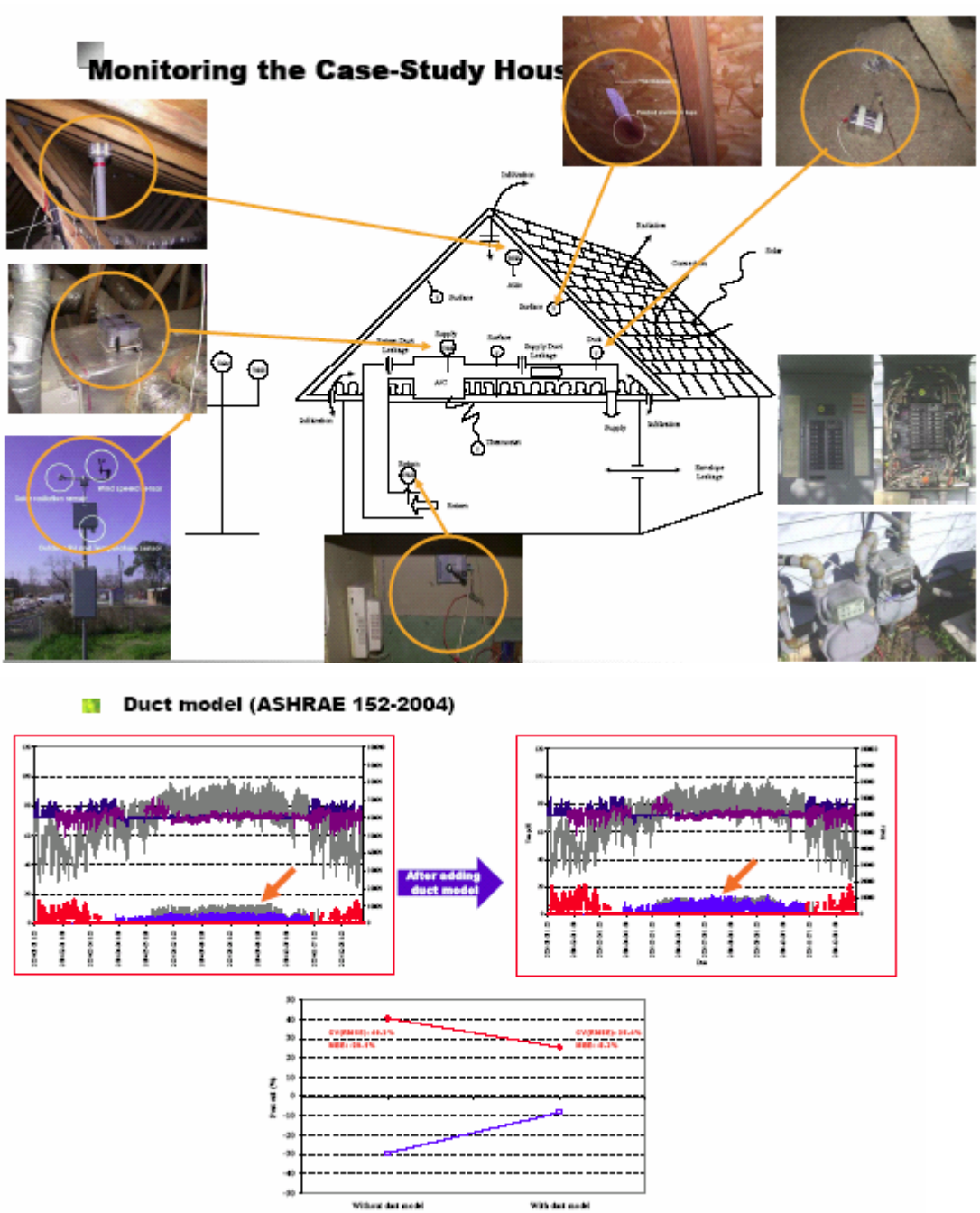


Figure 146: Schematic of Duct Model Addition to Calibrated Simulation of Habitat House.

9.3.5 Solar Test Bench

The Laboratory has recalibrated the Solar Test Bench to accommodate the testing of energy-efficient glazing for purposes of verifying the calibrated simulations. Figure 147 shows photos of the instrumentation at the test bench, and Figure 148 shows weekly inspection plots from the solar test bench. Figure 149 shows preliminary results from tests at the REJ building. These tests show that the low-e glazing installed at the building are performing as expected, when measured using the proper instrumentation (i.e., photovoltaic type sensor versus thermopile type sensor). These tests are useful for verifying the simulations of the energy savings from energy efficient glazing.

Figure 147: Photos of the Laboratory's Solar Test Bench.

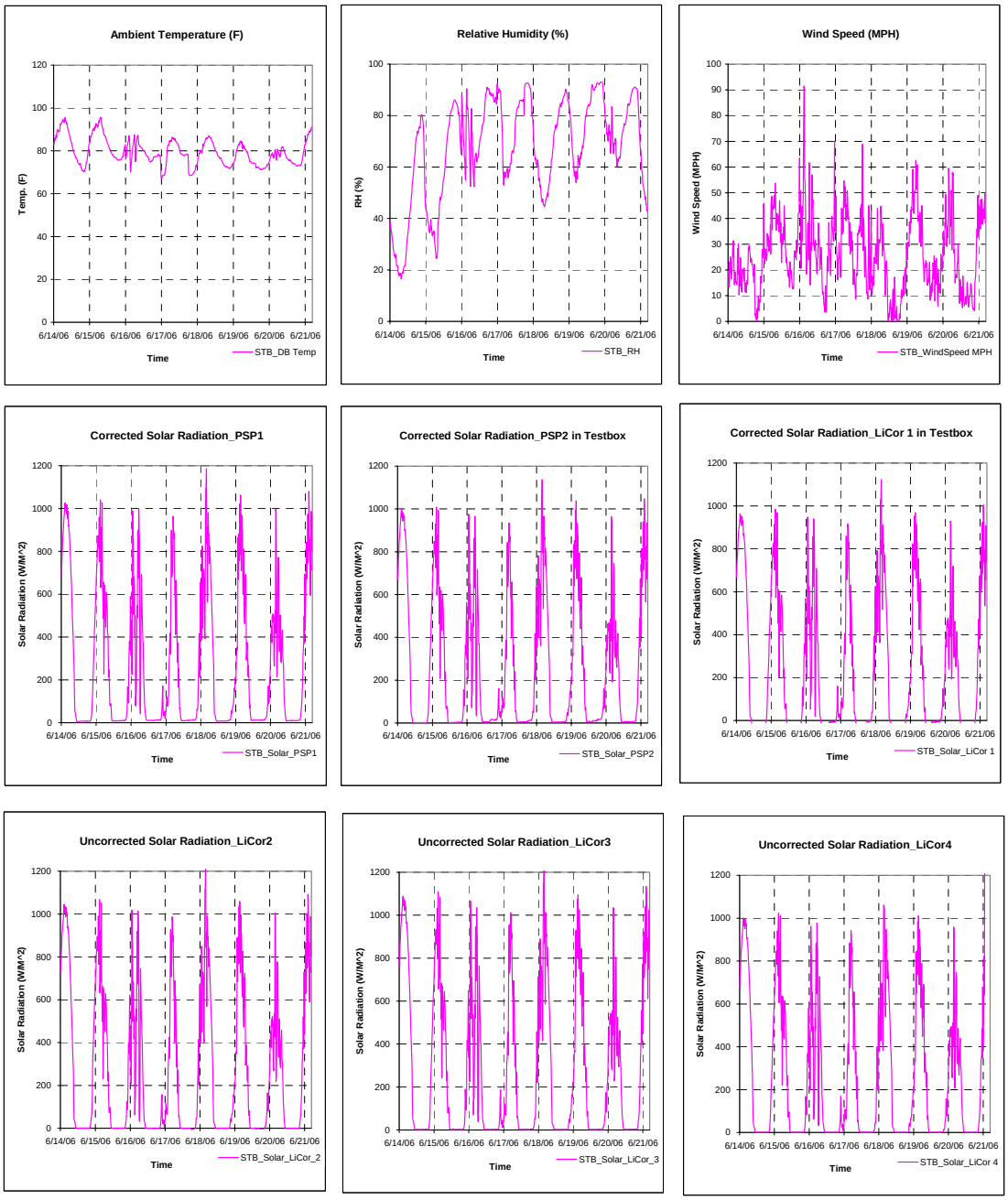


Figure 148: Weekly Inspection Plots from the Laboratory's Solar Test Bench.

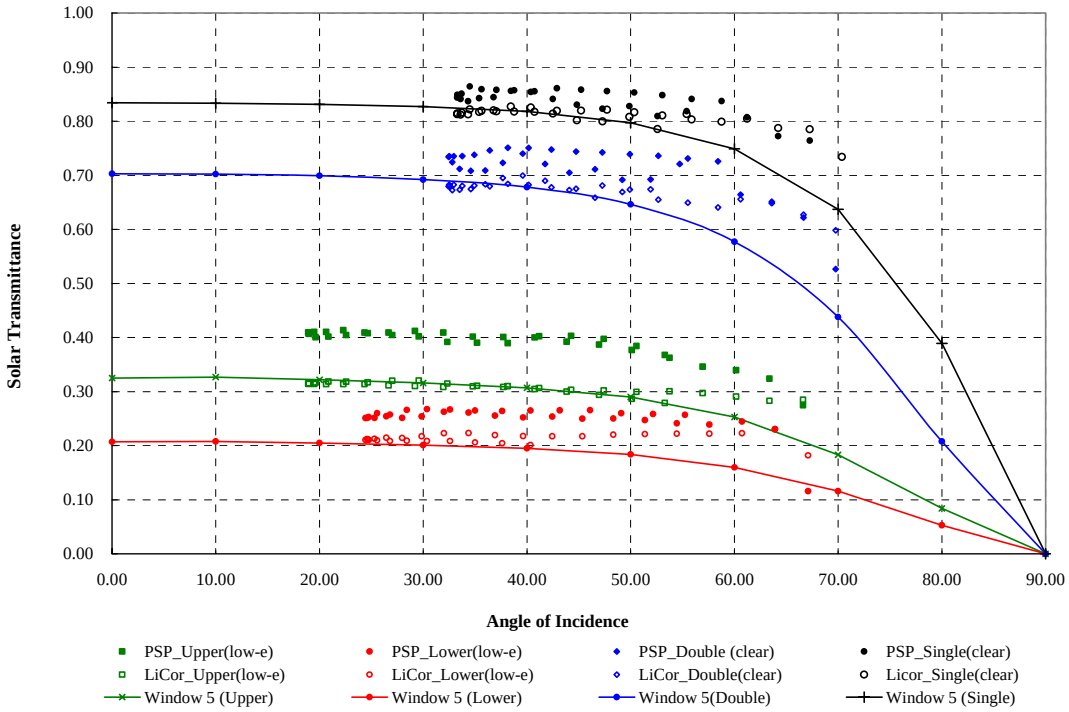


Figure 149: Results From Measured Transmittance Tests from the Laboratory's Solar Test Bench.

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11 REPORTS CONTAINED ON THE ACCOMPANYING CDROM

11.1 Volume I Summary Report

11.2 Volume II Technical Report

11.3 Volume III Technical Report

11.4 Technical Papers Published in the Proceedings of the 5th International Conference for Enhanced Building Operations, Pittsburg, PA.

11.4.1 Baltazar-Cervantes, J.C., Liu, Z., Gilman, D., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Retrofits to Municipal Water Supply and Wastewater Facilities."

11.4.2 Liu, Z., Gilman, D., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Street Light and Traffic Light Retrofits."

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11.4.4 Ahmed, M., Gilman, D., Mukhopadhyay, J., Haberl, J., Culp, C. 2005. "Development of a Web-based Emissions Reduction Calculator for Code-compliant Single-family and Multi-family Construction."

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