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

VOLUME III – APPENDIX

Annual Report to the
Texas Commission on Environmental Quality
January 2006 – June 2007

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Texas Engineering Experiment Station
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December 10, 2007

Chairman H. S. Buddy Garcia
Texas Council on Environmental Quality
P. O. Box 13087
Austin, TX 78711-3087

Dear Chairman Garcia:

The Energy Systems Laboratory (Laboratory) at the Texas Engineering Experiment Station of the Texas A&M University System is pleased to provide its fifth 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 Laboratory 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 Texas non-attainment and near-non-attainment counties as part of the Texas Emissions Reduction Plan (TERP).

Please contact me at (979) 862-1280 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 reduction from energy efficiency and renewable energy measures as a result of the TERP implementation.

Sincerely,

David E. Claridge, Ph.D., P.E.
Director

Enclosure

cc: Commissioner Larry R. Soward
Commissioner Bryan Shaw
Executive Director Glenn Shankle

Disclaimer

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VOLUME III – TECHNICAL APPENDIX

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

1 EXECUTIVE SUMMARY

The Energy Systems Laboratory (Laboratory), at the Texas Engineering Experiment Station of the Texas A&M University System, in fulfillment of its responsibilities under Texas Health and Safety Code Ann. § 388.003 (e), Vernon Supp. 2002, submits its fifth 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 I – Summary Report – provides an executive summary and overview;
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 counties included in the analysis.

Accomplishments:

1. Energy Code Amendments

The Laboratory was requested by several municipalities to analyze the stringency of several proposed residential and commercial energy code amendments, including: the 2003 and 2006 IECC and the ASHRAE Standards 90.1-2001 and 90.1-2004. Results of the analysis are included in the Vol II Technical Report.

2. Technical Assistance

The Laboratory provided technical assistance to the TCEQ, PUCT, SECO, ERCOT, and several political subdivisions, as well as Stakeholders participating in improving the compliance of the Texas Building Energy Performance Standards (TBEPS). The Laboratory also worked closely with the TCEQ to refine the integrated NOx emissions reduction calculation procedures that provide the TCEQ with a standardized, creditable NOx emissions reduction from energy efficiency and renewable energy (EE/RE) programs, which are acceptable to the US EPA. These activities have improved the accuracy of the creditable NOx emissions reduction from EE/RE initiatives contained in the TERP and have assisted the TCEQ, local governments, and the building industry with effective, standardized implementation and reporting.

3. NOx Emissions Reduction

Under the TERP legislation, the Laboratory 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.

Figure 1 shows the cumulative NOx emissions reduction through 2020 for the electricity and natural gas savings from the various EE/RE programs. In 2006, the cumulative NOx emissions reduction were calculated to be 17.52 tons/Ozone-Season-Day. By 2013, the cumulative NOx emissions reduction are projected to be 40.86 tons/Ozone-Season-Day.

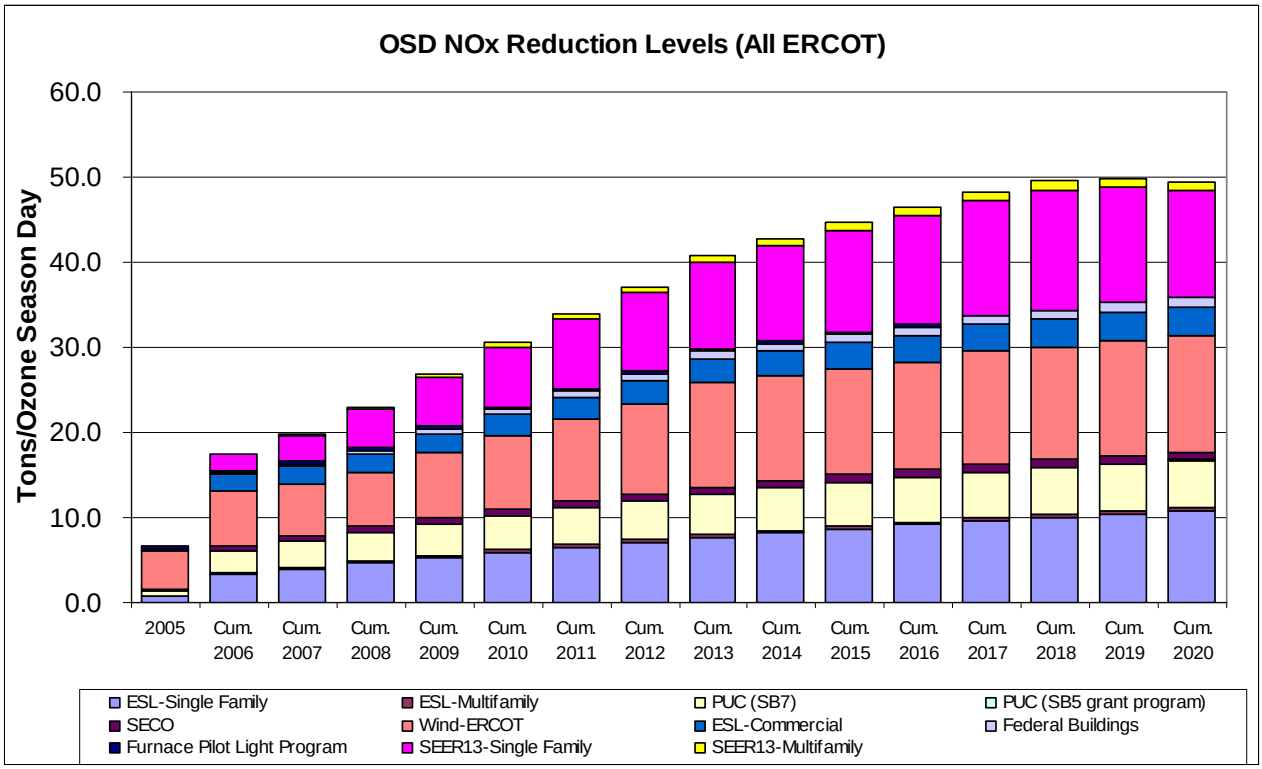


Figure 1: Cumulative OSD NOx Emissions Reduction Projected through 2020.

4. Technology Transfer

The Laboratory, along with the TCEQ, is host to the annual Clean Air Through Energy Efficiency (CATEE) conference, which is attended by top experts and policy makers in Texas and from around the country. At the conference the latest educational programs and technology is presented discussed, including efforts by the Laboratory, and others to reduce air pollution in Texas through energy efficiency and renewable energy. These efforts have produced significant success in bringing EE/RE closer to US EPA acceptance in the Texas SIP. The Laboratory will continue to provide superior technology to the State of Texas through such efforts with the TCEQ and the US EPA.

To accelerate the transfer of technology developed as part of the TERP, the Laboratory has also made presentations at national, state and local meetings and conferences, which includes the publication of peer-reviewed papers. The Laboratory will continue to provide 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 quality for all Texans.

These efforts have been recognized nationally by the US EPA. In 2007, the Laboratory was awarded a National Center of Excellence on Displaced Emissions Reduction (CEDER) by the US EPA so that these accomplishments could be rapidly disseminated to other states for their use. The benefits of CEDER include: reducing the financial, technical, and administrative costs of determining the emissions reduction from EE/RE measures; continuing to accelerate implementation of EE/RE strategies as a viable clean air effort in Texas and other states; helping other states better identify and prioritize cost-effective clean air strategies from EE/RE;, and communicating the results of quantification efforts through case-studies and a clearinghouse of information.

2 ACKNOWLEDGEMENTS

This work has been completed as a fulfillment of the requirements in Texas Health Code, Senate Bill 5, Section 388.003, and through Senate Bill 20, House Bill 2481 and House Bill 2129, which requires the Laboratory 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). Similarly, selected Code training workshops were funded by the US DOE through the Texas State Energy Conservation Office (SECO). Partial funding on the Texas Climate Vision project, a joint project with the City of Austin was also provided by the US DOE through 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, TCEQ, for contributing helpful insight about improvement to the Emissions Reduction Calculator, and the integrated emissions calculations, and Dr.Akin Olubiyi.

Numerous additional individuals at the Laboratory contributed significantly to this report, including: Dr. Dan Turner, Kyle Marshall, Robert Stackhouse, Jason Cordes, Ms. Sherrie Hughes, Ms. Angie Shafer, Mr. Stephen O'Neal, Mr. Piljae Im, Mr. Soolyeon Cho, Ms. Mini Malhotra, and Mr. Eduardo Rameriez.

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY 3
2 ACKNOWLEDGEMENTS 5
3 CODE AND PRE-CODE SIMULATION RESULTS BY COUNTY 7

LIST OF TABLES

Table 1: Simulation Results for Individual Single Family and Multi Family Residences for All Counties. 10

LIST OF FIGURES

Figure 1: Cumulative OSD NOx Emissions Reduction Projected through 2020. 4
Figure 1: Code and Pre-code Simulation Results for Individual Residences for Tarrant County (Single-Family and Multi-Family). 7
Figure 2: Code and Pre-code Annual Simulation Results and Average OSD Simulation Results for Tarrant County (Single-Family). 8
Figure 3: Code and Pre-code Annual Simulation Results and Average OSD Simulation Results for Tarrant County (Multifamily). 9

3 CODE AND PRE-CODE SIMULATION RESULTS BY COUNTY

This appendix to the Laboratory's 2006 Annual report contains the simulation results for single-family and multi-family residences in all ERCOT counties.

For each county, pre-code and code simulation, and annual and peak day results, for 1999, 2000 and 2002 base year, for individual Single-family an Multi-family residences can be viewed using the links provided in Table 1. For counties other than 41 non-attainment and affected counties, simulations were performed for one representative county per climate zone. The annual and peak day savings for each county were calculated using the simulation results for the representative county for the same climate zone and number of houses.

Figure 1 through Figure 3 show an example of the results for Tarrant County for "1999 base year", as viewed by clicking the corresponding links provided in Table 1. The "summary" of Code and Pre-code simulation results (i.e. annual and average ozone season day energy savings) for a single-family and a multifamily residential building is shown in Figure 1, which is calculated for Dallas as the representative county and weather data of year 1999. Figure 2 and Figure 3 show the total energy savings for "single-family" and "multifamily" construction in Tarrant County, taking into account the number of new construction.

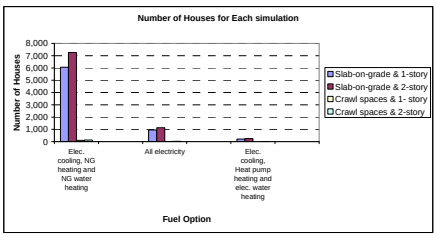
County	SF or MF	Precode or Code-compliant	Options			Simulation #	Annual Elec. (kWh/yr)	Annual NG (Therms/yr)	Avg. OSD Elec. (kWh/day)	Avg. OSD NG (Therm/day)	Annual Elec.Savings (kWh/yr)	Annual NG Savings (Therms/yr)	Avg. OSD Elec. Savings (kWh/day)	Avg. OSD NG Savings (Therm/day)
Dallas	SF	Precode	Slab-on-grade	Fuel Option 1	1-story	1	14549	474	72.926	0.725762				
					2-story	2	13825	472	66.8809	0.725762				
				Fuel Option 2	1-story	3	20920	0	81.372	0				
					2-story	4	20325	0	75.327	0				
				Fuel Option 3	1-story	5	21404	0	81.372	0				
					2-story	6	20583	0	75.327	0				
			Crawl Space	Fuel Option 1	1-story	7	16451	550	78.3519	0.725762				
					2-story	8	15475	510	71.7017	0.725762				
				Fuel Option 2	1-story	9	24118	0	86.798	0				
					2-story	10	22674	0	80.1478	0				
				Fuel Option 3	1-story	11	24514	0	86.798	0				
					2-story	12	22798	0	80.1478	0				
		Code - Compliant	Slab-on-grade	Fuel Option 1	1-story	13	12136	407	55.6458	0.605762	2,413	67	17.28	0.12
					2-story	14	11752	437	52.8759	0.605762	2,073	35	14.01	0.12
				Fuel Option 2	1-story	15	18142	0	64.0918	0	2,778	0	17.28	0.00
					2-story	16	18432	0	61.3218	0	1,893	0	14.01	0.00
				Fuel Option 3	1-story	17	18407	0	64.0918	0	2,997	0	17.28	0.00
					2-story	18	18386	0	61.3218	0	2,197	0	14.01	0.00
			Crawl Space	Fuel Option 1	1-story	19	13343	436	59.5193	0.605762	3,108	114	18.83	0.12
					2-story	20	12769	452	56.4204	0.605762	2,706	58	15.28	0.12
				Fuel Option 2	1-story	21	19869	0	67.9654	0	4,249	0	18.83	0.00
					2-story	22	19734	0	64.8665	0	2,940	0	15.28	0.00
				Fuel Option 3	1-story	23	20054	0	67.9654	0	4,460	0	18.83	0.00
					2-story	24	19578	0	64.8665	0	3,220	0	15.28	0.00
	MF	Precode	Slab-on-grade	Fuel Option 1	1-story	1	5606	258.5	24.24905	0.4974865				
					2-story	2	5453	237.75	22.180675	0.4653				
					3-story	3	5550.666667	227	22.16066667	0.454573333				
				Fuel Option 2	1-story	4	8676.5	0	28.92795	0				
					2-story	5	8130	0	26.27475	0				
					3-story	6	8034.833333	0	26.05983333	0				
				Fuel Option 3	1-story	7	8776	0	28.92795	0				
					2-story	8	8298.75	0	26.27475	0				
					3-story	9	8201.833333	0	26.05983333	0				
		Code - Compliant	Slab-on-grade	Fuel Option 1	1-story	10	5193.5	223.5	21.27525	0.3774865	413	35	2.97	0.12
					2-story	11	5108.5	198.75	19.8187	0.3453	345	39	2.36	0.12
					3-story	12	5160.666667	188	19.74666667	0.334573333	390	39	2.41	0.12
				Fuel Option 2	1-story	13	8414	0	25.95415	0	263	0	2.97	0.00
					2-story	14	7855.5	0	23.9127	0	275	0	2.36	0.00
					3-story	15	7717.666667	0	23.64566667	0	317	0	2.41	0.00
				Fuel Option 3	1-story	16	8387.5	0	25.95415	0	389	0	2.97	0.00
					2-story	17	7932	0	23.9127	0	367	0	2.36	0.00
					3-story	18	7805.5	0	23.64566667	0	396	0	2.41	0.00

Figure 2: Code and Pre-code Simulation Results for Individual Residences for Tarrant County (Single-Family and Multi-Family).

Prototype of the simulation result for one county

County Name	Tarrant
Division (East or West Texas)	West Texas
Number of new building permits for SFD	16,121

		Fuel Option 1	Fuel Option 2	Fuel Option 3	Total
		Elec. cooling, NG heating and NG water heating	All electricity	Elec. cooling, Heat pump heating and elec. water heating	
		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%



Number of Houses for each simulation

		Fuel Option 1	Fuel Option 2	Fuel Option 3	Total
		Elec. cooling, NG heating and NG water heating	All electricity	Elec. cooling, Heat pump heating and elec. water heating	
		84.1%	13.1%	2.8%	
Slab-on-grade (98.3%)	1-Story (45.5%)	6,064	945	202	7,210
	2-Story (54.5%)	7,263	1,131	242	8,637
Crawl spaces (1.7%)	1-Story (45.5%)	105	16	3	125
	2-Story (54.5%)	126	20	4	149
Total		13,558	2,112	451	16,121

Precode Energy Use for each option (per house)

		Fuel Option 1		Fuel Option 2		Fuel Option 3	
		Elec. cooling, NG heating and NG water heating		All electricity		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	14,555	473	20,916	0	21,399	0
	2-Story	13,833	473	20,324	0	20,581	0
Crawl spaces	1-Story	16,458	580	24,116	0	24,513	0
	2-Story	15,485	510	22,675	0	22,803	0
Total		60,330	2,004	88,027	0	89,296	0

Code compliant Energy Use for each option (per house)

		Fuel Option 1		Fuel Option 2		Fuel Option 3	
		Elec. cooling, NG heating and NG water heating		All electricity		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	12,139	406	18,137	0	18,402	0
	2-Story	11,758	427	18,429	0	18,373	0
Crawl spaces	1-Story	13,347	438	19,866	0	20,056	0
	2-Story	12,773	451	19,730	0	19,574	0
Total		50,017	1,724	76,158	0	76,405	0

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

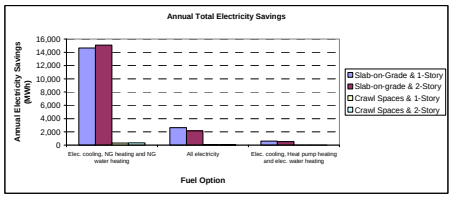
		Fuel Option 1		Fuel Option 2		Fuel Option 3		Total	
		Elec. cooling, NG heating and NG water heating		All electricity		Elec. cooling, Heat pump heating and elec. water heating			
		Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)
Slab-on-grade	1-Story	88,260	2,868,230	19,758	0	4,320	0	112,337	2,868,230
	2-Story	100,467	3,421,046	22,990	0	4,977	0	128,434	3,421,046
Crawl spaces	1-Story	1,726	57,676	394	0	86	0	2,205	57,676
	2-Story	1,945	64,062	444	0	95	0	2,484	64,062
Total		192,398	6,411,017	43,584	0	9,478	0	245,460	6,411,017

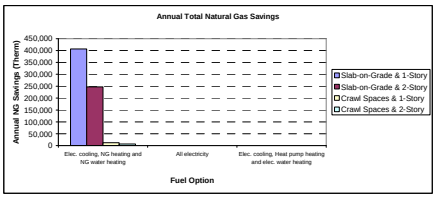
Code compliant Total Energy Use (For total houses in a County)

		Fuel Option 1		Fuel Option 2		Fuel Option 3		Total	
		Elec. cooling, NG heating and NG water heating		All electricity		Elec. cooling, Heat pump heating and elec. water heating			
		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	73,610	2,461,948	17,131	0	3,715	0	94,456	2,461,948
	2-Story	85,388	3,174,091	20,846	0	4,444	0	110,678	3,174,091
Crawl spaces	1-Story	1,405	45,723	325	0	70	0	1,794	45,723
	2-Story	1,665	56,651	386	0	82	0	2,073	56,651
Total		162,068	5,738,414	38,688	0	8,311	0	209,001	5,738,414

Total Energy Savings Due to the Code Adoption

		Fuel Option 1		Fuel Option 2		Fuel Option 3		Total	
		Elec. cooling, NG heating and NG water heating		All electricity		Elec. cooling, Heat pump heating and elec. water heating			
		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	14,650	406,282	2,623	0	605	0	17,880	406,282
	2-Story	15,079	246,954	2,144	0	533	0	17,755	246,954
Crawl spaces	1-Story	326	11,955	69	0	16	0	411	11,955
	2-Story	340	7,411	58	0	13	0	412	7,411
Total		30,396	672,603	4,894	0	1,167	0	36,459	672,603





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

		Fuel Option 1		Fuel Option 2		Fuel Option 3	
		Elec. cooling, NG heating and NG water heating		All electricity		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	72.99	0.73	81.41	0.00	81.41	0.00
	2-Story	66.93	0.73	75.37	0.00	75.37	0.00
Crawl spaces	1-Story	78.39	0.73	86.84	0.00	86.84	0.00
	2-Story	71.74	0.73	80.19	0.00	80.19	0.00
Total		290.03	2.90	323.80	0.00	323.80	0.00

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

		Fuel Option 1		Fuel Option 2		Fuel Option 3	
		Elec. cooling, NG heating and NG water heating		All electricity		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	55.67	0.61	64.13	0.00	64.13	0.00
	2-Story	52.90	0.61	61.35	0.00	61.35	0.00
Crawl spaces	1-Story	59.54	0.61	67.99	0.00	67.99	0.00
	2-Story	56.42	0.61	64.93	0.00	64.93	0.00
Total		224.56	2.42	258.39	0.00	258.39	0.00

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

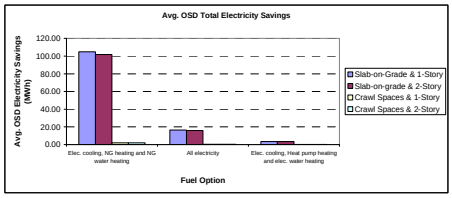
		Fuel Option 1		Fuel Option 2		Fuel Option 3		Total	
		Elec. cooling, NG heating and NG water heating		All electricity		Elec. cooling, Heat pump heating and elec. water heating			
		Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)
Slab-on-grade	1-Story	442.44	4,400.96	76.93	0.00	16.44	0.00	535.78	4,400.96
	2-Story	466.67	5,271.46	85.27	0.00	18.23	0.00	589.57	5,271.46
Crawl spaces	1-Story	8.22	76.11	1.43	0.00	0.30	0.00	9.94	76.11
	2-Story	9.01	91.18	1.57	0.00	0.34	0.00	10.92	91.18
Total		945.75	9,839.71	165.19	0.00	35.30	0.00	1,146.20	9,839.71

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

		Fuel Option 1		Fuel Option 2		Fuel Option 3		Total	
		Elec. cooling, NG heating and NG water heating		All electricity		Elec. cooling, Heat pump heating and elec. water heating			
		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	337.57	3,673.29	60.56	0.00	12.94	0.00	411.08	3,673.29
	2-Story	384.29	4,399.87	69.41	0.00	14.84	0.00	468.46	4,399.87
Crawl spaces	1-Story	6.24	63.53	1.11	0.00	0.24	0.00	7.58	63.53
	2-Story	7.09	76.09	1.27	0.00	0.27	0.00	8.63	76.09
Total		735.15	8,212.78	132.35	0.00	28.29	0.00	895.79	8,212.78

Avg. OSD Total Energy Savings Due to the Code Adoption

		Fuel Option 1		Fuel Option 2		Fuel Option 3		Total	
		Elec. cooling, NG heating and NG water heating		All electricity		Elec. cooling, Heat pump heating and elec. water heating			
		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	104.87	727.67	16.34	0.00	3.43	0.00	124.70	727.67
	2-Story	101.83	871.66	15.86	0.00	3.39	0.00	121.08	871.66
Crawl spaces	1-Story	1.98	12.58	0.31	0.00	0.07	0.00	2.36	12.58
	2-Story	1.92	15.07	0.30	0.00	0.06	0.00	2.28	15.07
Total		210.60	1,626.97	32.80	0.00	7.01	0.00	250.41	1,626.97



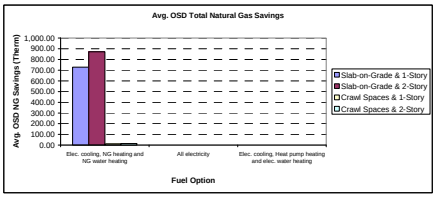
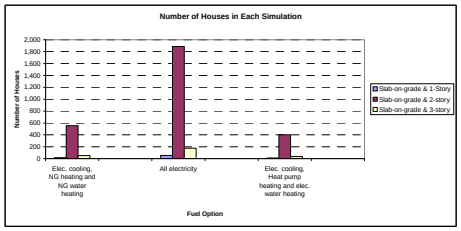


Figure 3: Code and Pre-code Annual Simulation Results and Average OSD Simulation Results for Tarrant County (Single-Family).

The simulation result for one county

County Name	Tarrant
NAHB Division	West South Central
Number of new building permits for MF	3,191

		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%	14.1%	
Slab-on-grade (100%)	1-Story (2.6%)	16	55	12	83
	2-Story (89.1%)	554	1,888	401	2,843
	3-Story (8.3%)	52	176	37	265
Total		622	2,119	450	3,191

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	5,608	259	8,676	0	8,776	0
	2-Story	5,454	238	8,129	0	8,298	0
	3-Story	5,552	227	8,035	0	8,202	0
Total		16,614	725	24,839	0	25,275	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	5,195	224	8,413	0	8,388	0
	2-Story	5,109	199	7,859	0	7,931	0
	3-Story	5,161	188	7,717	0	7,805	0
Total		15,465	610	23,984	0	24,124	0

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

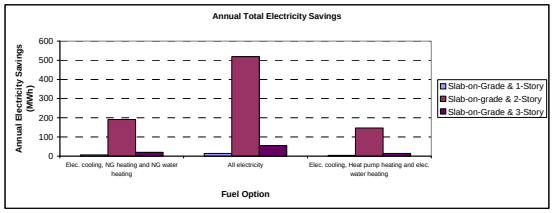
		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating		Total	
		Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)
Slab-on-grade	1-Story	91	4,182	478	0	103	0	671	4,182
	2-Story	3,024	131,813	15,347	0	3,326	0	21,697	131,813
	3-Story	287	11,724	1,413	0	306	0	2,006	11,724
Total		3,401	147,719	17,238	0	3,735	0	24,374	147,719

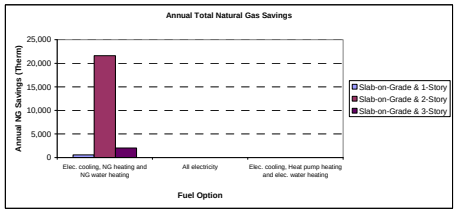
Code compliant Total Energy Use (For total houses in a County)

		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	84	3,616	463	0	98	0	646	3,616
	2-Story	2,833	110,191	14,828	0	3,179	0	20,840	110,191
	3-Story	267	9,719	1,357	0	290	0	1,913	9,719
Total		3,183	123,526	16,648	0	3,569	0	23,401	123,526

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	7	568	14	0	5	0	26	568
	2-Story	191	21,622	519	0	147	0	857	21,622
	3-Story	20	2,014	56	0	15	0	91	2,014
Total		218	24,203	589	0	166	0	973	24,203





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	24.28	0.56	28.94	0.00	28.94	0.00
	2-Story	22.19	0.47	26.28	0.00	26.28	0.00
	3-Story	22.17	0.45	26.07	0.00	26.07	0.00
Total		68.61	1.43	81.28	0.00	81.28	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	21.28	0.38	25.96	0.00	25.96	0.00
	2-Story	19.82	0.35	23.92	0.00	23.92	0.00
	3-Story	19.75	0.33	23.65	0.00	23.65	0.00
Total		60.85	1.06	73.53	0.00	73.53	0.00

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

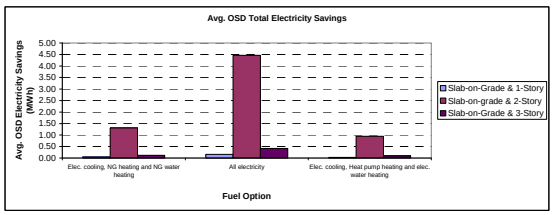
		Fuel Option 1: Elec. cooling, NG heating and NG water heating		Fuel Option 2: All electricity		Fuel Option 3: Elec. cooling, Heat pump heating and elec. water heating		Total	
		Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)	Elec. Use (MWh)	NG Use (Therm)
Slab-on-grade	1-Story	0.38	8.05	1.59	0.00	0.34	0.00	2.33	8.05
	2-Story	12.30	257.97	49.61	0.00	10.54	0.00	72.45	257.97
	3-Story	1.14	23.48	4.58	0.00	0.97	0.00	6.70	23.48
Total		13.84	289.50	55.79	0.00	11.85	0.00	81.47	289.50

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	0.34	6.11	1.43	0.00	0.30	0.00	2.08	6.11
	2-Story	10.99	191.44	45.15	0.00	9.59	0.00	65.73	191.44
	3-Story	1.03	17.28	4.16	0.00	0.88	0.00	6.06	17.28
Total		12.35	214.83	50.74	0.00	10.77	0.00	73.87	214.83

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	0.09	1.94	0.16	0.00	0.03	0.00	0.25	1.94
	2-Story	1.31	66.53	4.46	0.00	0.95	0.00	6.72	66.53
	3-Story	0.12	6.26	0.42	0.00	0.09	0.00	0.64	6.26
Total		1.48	74.67	5.05	0.00	1.07	0.00	7.61	74.67



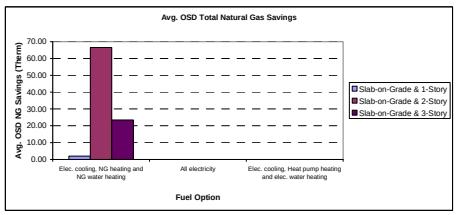


Figure 4: Code and Pre-code Annual Simulation Results and Average OSD Simulation Results for Tarrant County (Multifamily).

Table 1: Simulation Results for Individual Single Family and Multi Family Residences for All Counties.

Non-attainment or Affected Counties	1999			2000			2002		
BASTROP	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
BEXAR	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
CALDWELL	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
COMAL	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
ELLIS	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
GREGG	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
GUADALUPE	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
HARRISON	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
HAYS	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
JOHNSON	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
KAUFMAN	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
NUECES	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
PARKER	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
ROCKWALL	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
RUSK	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
SAN PATRICIO	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
SMITH	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
TRAVIS	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
UPSHUR	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
VICTORIA	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
WILLIAMSON	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
WILSON	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
BRAZORIA	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
CHAMBERS	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
COLLIN	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
DALLAS	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
DENTON	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
EL PASO	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
FORT BEND	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
GALVESTON	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
HARDIN	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
HARRIS	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
JEFFERSON	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
LIBERTY	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
MONTGOMERY	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
ORANGE	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
TARRANT	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
WALLER	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
HOOD	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
HENDERSON	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
HUNT	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily

	ERCOT Counties (*Representative counties)	1999			2000			2002		
*	COLEMAN	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	CALLAHAN		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	EASTLAND		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	ERATH		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	FISHER		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	HASKELL		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	JACK		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	JONES		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MITCHELL	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	NOLAN		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	PALO PINTO		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	SHACKELFORD		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	STEPHENS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	TAYLOR		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	THROCKMORTON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	YOUNG		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	LEON	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
*	BELL		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	BOSQUE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	BROWN		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	COMANCHE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	CORYELL		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	FALLS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	FREESTONE	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	HAMILTON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	HILL		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	LAMPASAS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	LIMESTONE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MCLENNAN		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MILLS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	NAVARRO		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	BRISCOE	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
*	HALL		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	BASTROP		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	CALDWELL	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	LEE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	BLANCO		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	BURNET		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	GILLESPIE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	KERR		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	REAL		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	HAYS	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	LLANO		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MASON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	SAN SABA		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	TRAVIS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	WILLIAMSON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily

	ERCOT Counties (*Representative counties)	1999			2000			2002		
*	CHAMBERS	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	BROOKS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	CAMERON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	HIDALGO		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	KENEDY	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	STARR		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	WILLACY		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	JIM HOGG		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	ZAPATA	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
*	KLEBERG	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	ARANSAS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	NUECES		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	DUVAL		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	JIM WELLS	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	LIVE OAK		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	SAN PATRICIO		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	DIMMIT		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	LA SALLE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MAVERICK		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MCMULLEN	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
*	WEBB		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	ZAVALA		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	HENDERSON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	SMITH	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
*	DALLAS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	ELLIS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	HOOD		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	JOHNSON	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	SOMERVELL		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	TARRANT		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	LAMAR		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	RED RIVER	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
*	TITUS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	COLLIN		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	DELTA		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	DENTON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	FRANKLIN		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	HOPKINS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	KAUFMAN	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	PARKER		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	RAINS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	ROCKWALL		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	VAN ZANDT		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	WISE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	CULBERSON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	HUDSPETH	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily

	ERCOT Counties (*Representative counties)	1999			2000			2002		
	ANDERSON	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	ANGELINA		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	CHEROKEE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	HOUSTON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	NACOGDOCHES		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	RUSK		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	BRAZORIA	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
*	GALVESTON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	AUSTIN	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	BRAZOS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	BURLESON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	COLORADO		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	FAYETTE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	FORT BEND		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	GRIMES		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	HARRIS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MADISON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MONTGOMERY		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	ROBERTSON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	WALLER		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	WASHINGTON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	MILAM	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	BORDEN	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	CHILDRESS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	CROSBY		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	DAWSON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	DICKENS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	KENT		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	KING		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MOTLEY		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	SCURRY		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	STONEWALL		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	CRANE	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	REAGAN		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	UPTON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	ANDREWS	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
*	ECTOR		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	GLASSCOCK		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	HOWARD		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	JEFF DAVIS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	LOVING		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MARTIN		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MIDLAND		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	REEVES		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	WARD		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	WINKLER		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily

ERCOT Counties (* Representative County)		1999			2000			2002		
*	ATASCOSA	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	FRIO		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	BEXAR	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	COMAL		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	GONZALES		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	GUADALUPE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	KINNEY		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MEDINA		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	UVALDE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	VAL VERDE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	WILSON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	BANDERA	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
*	KENDALL		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	BREWSTER	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	EDWARDS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	KIMBLE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	PECOS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	PRESIDIO		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	SUTTON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	TERRELL		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	CONCHO	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	CROCKETT		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	IRION		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MCCULLOCH		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MENARD		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	RUNNELS		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	SCHLEICHER		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	TOM GREEN		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	COKE	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	STERLING		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	COOKE	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	FANNIN		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	GRAYSON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	HUNT		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MONTAGUE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	ARCHER	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	BAYLOR		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	CLAY		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	COTTLE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	FOARD		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	HARDEMAN		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	KNOX		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	WICHITA		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	WILBARGER		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily

	ERCOT Counties (* Representative County)	1999			2000			2002		
	BEE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	CALHOUN		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	GOLIAD		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	JACKSON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MATAGORDA	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	REFUGIO		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	VICTORIA		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	WHARTON		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	DE WITT		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
*	KARNES	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
*	LAVACA	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily