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

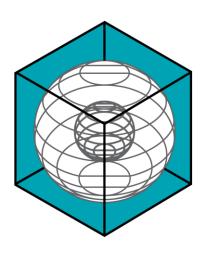
VOLUME III—TECHNICAL APPENDIX

Annual Report to the Texas Commission on Environmental Quality January 2010-December 2010



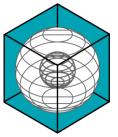
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December 2011



ENERGY SYSTEMS LABORATORY

Texas Engineering Experiment Station Texas A&M University System



ENERGY SYSTEMS LABORATORY

Texas Engineering Experiment Station Texas A&M University System

3581 TAMU College Station, Texas 77843-3581

December 19, 2011

Chairman Bryan W. Shaw Texas Council on Environmental Quality P. O. Box 13087 Austin, TX 78711-3087

Dear Chairman Shaw:

The Energy Systems Laboratory (Laboratory) at the Texas Engineering Experiment Station of the Texas A&M University System is pleased to provide its seventh 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) 845-1280 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.

David E. Claudo

Director

Enclosure

cc: Commissioner Carlos Rubinstein

Commissioner Buddy Garcia Executive Director Mark Vickery

Disclaimer

This report is provided by the Texas Engineering Experiment Station (TEES) as required under Section 388.003, (e) (2) (A) & (B) of the Texas Health and Safety Code and is distributed for purposes of public information. The information provided in this report is intended to be the best available information at the time of publication. TEES makes no claim or warranty, express or implied, that the report or data herein is necessarily error-free. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not constitute or imply its endorsement, recommendation, or favoring by the Energy Systems Laboratory or any of its employees. The views and opinions of authors expressed herein do not necessarily state or reflect those of the Texas Engineering Experiment Station or the Energy Systems Laboratory.

VOLUME III – 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 seventh 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 Council of Governments (COGs) and 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 2010, the OSD NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 7.34 tons-NOx/day (14.2%), savings from retrofits to Federal buildings is 0.59 tons-NOx/day (1.1%), savings from furnace pilot light retrofits is 0.32 tons-NOx/day (0.6%), savings from the PUC's Senate Bill 5 and Senate Bill 7 programs is 4.79 tons-NOx/day (9.3%), savings from SECO's Senate Bill 5 program is 0.97 tons-NOx/day (1.9%), electricity savings from green power purchases (wind) are 30.04 tons-NOx/day (58.2%), and savings from residential air conditioner retrofits are 7.53 tons-NOx/day (14.6%). The total NOx emissions reduction from all programs is 51.58 tons-NOx/day.

By 2013, the NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 1,620 tons-NOx/year (7.6% of the total NOx savings), savings from retrofits to Federal buildings will be 308 tons-NOx/year (1.4%), savings from furnace pilot light retrofits will be 117 tons-NOx/year (0.5%), savings from the PUC's Senate Bill 5 and Senate Bill 7 programs will be 2,147 tons-NOx/year (10.0%), savings from SECO's Senate Bill 5 program will be 373 tons-NOx/year (1.7%), electricity savings from green power purchases (wind) will be 15,257 tons-NOx/year (71.3%), and savings from residential air conditioner retrofits will be 1,574 tons-NOx/year (7.4%). The total NOx emissions reduction from all programs will be 21.396 tons-NOx/year.

By 2013, the OSD NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 9.03 tons-NOx/day (14.9%), savings from retrofits to Federal buildings will be 0.81 tons-NOx/day (1.3%), savings from furnace pilot light retrofits will be 0.32 tons-NOx/day (0.5%), savings from the PUC's Senate Bill 5 and Senate Bill 7 programs will be 5.78 tons-NOx/day (9.5%), savings from SECO's Senate Bill 5 program will be 1.01 tons-NOx/day (1.7%), electricity savings from green power purchases (wind) will be 32.63 tons-NOx/day (53.8%), and savings from residential air conditioner retrofits will be 11.03 tons-NOx/day (18.2%). The total NOx emissions reduction from all programs will be 60.61 tons-NOx/day.

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 and 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.

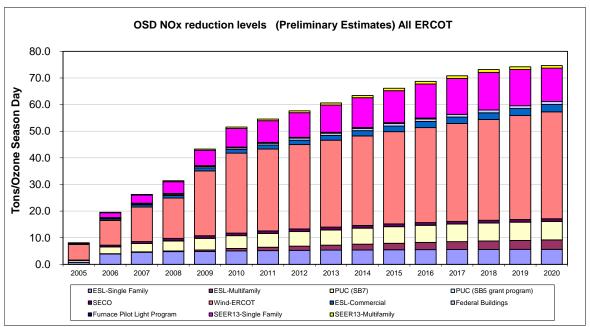


Figure 1: OSD NOx Emissions Reduction Projections through 2020

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.

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.

If any questions arise, please contact us by phone at 979-458-0675, or by email at terpinfo@tees.tamus.edu.

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.

Numerous additional individuals at the Laboratory contributed to this report, including: Dr. David Claridge, Stephen O'Neal, Kee Han Kim, Sunglok Do, Hyojin Kim, and Christina Riddle.

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3 CODE AND PRE-CODE SIMULATION RESULTS BY COUNTY

This appendix to the Laboratory's 2010 Annual report contains the simulation results for single-family and multi-family residences in the 41 counties. For each county, code and pre-code simulation, and annual and peak-day results for individual residence are provided (Single-Family and Multi-Family).

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 2. 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.

Table 1: List of Counties

	County	Climate Zone
	Bastrop	4
	Bexar	4
	Caldwell	4
	Comal	4
	Ellis	5
	Gregg	6
	Guadalupe	4
	Harrison	6
	Hays	5
	Henderson	6
	Hood	5
	Hunt	5
Affected County	Johnson	5
	Kaufman	6
	Nueces	3
	Parker	6
	Rockwell	6
	Rusk	5
	San Patricio	3
	Smith	5
	Travis	5
	Upshur	6
	Victoria	3
	Williamson	5
	Wilson	4
	Brazoria	3
	Chambers	4
	Collin	5
	Dallas	5
	Denton	6
	El Paso	6
	Fort Bend	4
Namattainu 10	Galveston	3
Nonattainment County	Hardin	4
	Harris	4
	Jefferson	4
	Liberty	4
	Montgomery	4
	Orange	4
	Tarrant	5
		4

Table 2: 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	<u>Multifamily</u>	Summary	Single Family	Multifamily	
BEXAR	Summary	Single Family	<u>Multifamily</u>	Summary	Single Family	<u>Multifamily</u>	Summary	Single Family	Multifamily	
CALDWELL	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	
COMAL	Summary	Single Family	<u>Multifamily</u>	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	
ELLIS	Summary	Single Family	Multifamily	Summary	Single Family	<u>Multifamily</u>	Summary	Single Family	Multifamily	
GREGG	Summary	Single Family	<u>Multifamily</u>	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	
GUADALUPE	Summary	Single Family	Multifamily	Summary	Single Family	<u>Multifamily</u>	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	<u>Multifamily</u>	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	
KAUFMAN	Summary	Single Family	<u>Multifamily</u>	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	<u>Multifamily</u>	Summary	Single Family	Multifamily	
ROCKWALL	Summary	Single Family	Multifamily	Summary	Single Family	<u>Multifamily</u>	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	<u>Multifamily</u>	Summary	Single Family	Multifamily	
COLLIN	Summary	Single Family	Multifamily	Summary	Single Family	<u>Multifamily</u>	Summary	Single Family	Multifamily	
DALLAS	Summary	Single Family	Multifamily	Summary	Single Family	<u>Multifamily</u>	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	<u>Multifamily</u>	Summary	Single Family	Multifamily	
GALVESTON	Summary	Single Family	Multifamily	Summary	Single Family	<u>Multifamily</u>	Summary	Single Family	Multifamily	
HARDIN	Summary	Single Family	Multifamily	Summary	Single Family	<u>Multifamily</u>	Summary	Single Family	Multifamily	
HARRIS	Summary	Single Family	Multifamily	Summary	Single Family	<u>Multifamily</u>	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	<u>Multifamily</u>	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 F	Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
CALLAHAN	<u>Summary</u>	Single F		Multifamily	<u>Summary</u>	Single Family	Multifamily	<u>Dummary</u>	Single Family	Multifamily
EASTLAND		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
ERATH		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
FISHER		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
HASKELL		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
JACK		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
JONES		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
MITCHELL	Summary	Single F		Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
NOLAN	<u>Summary</u>	Single F		Multifamily	Summary	Single Family	Multifamily	<u>Summary</u>	Single Family	Multifamily
PALO PINTO		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
SHACKELFORD		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
STEPHENS		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
* TAYLOR		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
THROCKMORTON	4	Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
YOUNG		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
* LEON	Summary	Single F		Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
* BELL	Summary	Single F		Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
BOSQUE	4	Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
BROWN		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
COMANCHE		Single F		Multifamily	Summary	Single Family	Multifamily		Single Family	Multifamily
CORYELL		Single F		Multifamily		Single Family	Multifamily	<u>Summary</u>	Single Family	Multifamily
FALLS	4	Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
FREESTONE		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
HAMILTON	Summary	Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
HILL		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
LAMPASAS	4	Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
LIMESTONE		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
MCLENNAN		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
MILLS		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
NAVARRO	4	Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
BRISCOE		Single F		Multifamily		Single Family	Multifamily		Single Family	Multifamily
* HALL	Summary	Single F		Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
* BASTROP				Multifamily		Single Family			Single Family	
CALDWELL	Summary	Single I		Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
LEE	Jummary	Single I		Multifamily	<u>Summary</u>	Single Family	Multifamily	<u>Summary</u>	Single Family	Multifamily
BLANCO		Single I		Multifamily		Single Family	Multifamily		Single Family	Multifamily
BURNET		Single I		Multifamily		Single Family	Multifamily		Single Family	Multifamily
GILLESPIE	4	Single I		Multifamily		Single Family Single Family	Multifamily		Single Family	Multifamily
KERR		Single I		Multifamily		Single Family	Multifamily		Single Family	Multifamily
REAL	4	Single I		Multifamily		Single Family	Multifamily		Single Family	Multifamily
HAYS	Summary	Single I		Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
LLANO	Summary	Single I		Multifamily	<u>Summary</u>	Single Family	Multifamily	<u>Summary</u>	Single Family	Multifamily
MASON		Single F		Multifamily		Single Family Single Family	Multifamily		Single Family Single Family	Multifamily
SAN SABA		Single F		Multifamily Multifamily		Single Family Single Family	Multifamily		Single Family Single Family	Multifamily Multifamily
* TRAVIS		Single F		Multifamily		Single Family Single Family	Multifamily		Single Family Single Family	Multifamily
WILLIAMSON		Single F		Multifamily Multifamily		Single Family Single Family	Multifamily		Single Family Single Family	Multifamily Multifamily
WILLIAMSUN		Single F	ailily	iviuitiiamiiy		Single rainily	winitiamily		Single ramily	winitiailily

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	G	Single Family	Multifamily	G	Single Family	Multifamily	G	Single Family	Multifamily
KENEDY	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
STARR		Single Family	<u>Multifamily</u>		Single Family	Multifamily		Single Family	Multifamily
WILLACY		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
JIM HOGG	G	Single Family	Multifamily	C	Single Family	Multifamily	C	Single Family	Multifamily
* ZAPATA	<u>Summary</u>	Single Family	<u>Multifamily</u>	<u>Summary</u>	Single Family	Multifamily	<u>Summary</u>	Single Family	<u>Multifamily</u>
* KLEBERG	Summary	Single Family	<u>Multifamily</u>	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
ARANSAS		Single Family	<u>Multifamily</u>		Single Family	Multifamily		Single Family	<u>Multifamily</u>
* NUECES		Single Family	<u>Multifamily</u>		Single Family	<u>Multifamily</u>		Single Family	<u>Multifamily</u>
DUVAL	Summary	Single Family	<u>Multifamily</u>	Summary	Single Family	Multifamily	Summary	Single Family	<u>Multifamily</u>
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	<u>Multifamily</u>		Single Family	Multifamily		Single Family	<u>Multifamily</u>
MAVERICK	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
MCMULLEN	Summary	Single Family	<u>Multifamily</u>	<u>'</u>	Single Family	Multifamily		Single Family	<u>Multifamily</u>
* WEBB		Single Family	<u>Multifamily</u>		Single Family	Multifamily		Single Family	<u>Multifamily</u>
ZAVALA		Single Family	<u>Multifamily</u>		Single Family	<u>Multifamily</u>		Single Family	<u>Multifamily</u>
HENDERSON	Summary	Single Family	<u>Multifamily</u>	Summary	Single Family	<u>Multifamily</u>	Summary	Single Family	<u>Multifamily</u>
* SMITH	<u>Summary</u>	Single Family	<u>Multifamily</u>	<u>Summary</u>	Single Family	Multifamily	Summary	Single Family	<u>Multifamily</u>
* DALLAS		Single Family	<u>Multifamily</u>		Single Family	<u>Multifamily</u>		Single Family	<u>Multifamily</u>
ELLIS		Single Family	<u>Multifamily</u>		Single Family	Multifamily		Single Family	<u>Multifamily</u>
HOOD	Summary	Single Family		Summary	Single Family	Multifamily	Summary	Single Family	<u>Multifamily</u>
JOHNSON	<u> </u>	Single Family	<u>Multifamily</u>	Bummary	Single Family	Multifamily		Single Family	<u>Multifamily</u>
SOMERVELL		Single Family			Single Family			Single Family	
TARRANT		Single Family	<u>Multifamily</u>		Single Family			Single Family	<u>Multifamily</u>
LAMAR		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
RED RIVER	Summary			Summary	Single Family		Summary		
* TITUS		Single Family			Single Family			Single Family	
* COLLIN		Single Family			Single Family			Single Family	
DELTA		Single Family			Single Family			Single Family	
DENTON		Single Family			Single Family			Single Family	
FRANKLIN		Single Family			Single Family			Single Family	
HOPKINS	G	Single Family		G	Single Family		G.	Single Family	
KAUFMAN	Summary	Single Family		Summary			Summary		
PARKER		Single Family			Single Family			Single Family	
RAINS		Single Family			Single Family			Single Family	
ROCKWALL		Single Family		•	Single Family			Single Family	
VAN ZANDT		Single Family			Single Family			Single Family	
WISE		Single Family			Single Family			Single Family	
CULBERSON	Summary	Single Family		Summary	Single Family		Summary	Single Family	
* HUDSPETH		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily

(*)	ERCOT Counties Representative counties)		1999			2000			2002	
	ANDERSON		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
	ANGELINA		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
	CHEROKEE		Single Family Multif	family		Single Family	Multifamily	C	Single Family	Multifamily
	HOUSTON	Summary	Single Family Multif	family	<u>Summary</u>	Single Family	Multifamily	Summary	Single Family	Multifamily
	NACOGDOCHES		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
*	RUSK		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
	BRAZORIA	G	Single Family Multif	family	C	Single Family	<u>Multifamily</u>	C	Single Family	Multifamily
*	GALVESTON	<u>Summary</u>	Single Family Multif	family	<u>Summary</u>	Single Family	Multifamily	Summary	Single Family	Multifamily
	AUSTIN		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
	BRAZOS		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
	BURLESON		Single Family Multif	family		Single Family	<u>Multifamily</u>		Single Family	Multifamily
	COLORADO		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
	FAYETTE		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
	FORT BEND		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
	GRIMES	<u>Summary</u>	Single Family Multif	family	<u>Summary</u>	Single Family	Multifamily	Summary	Single Family	Multifamily
*	HARRIS		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
	MADISON		Single Family Multif	<u>family</u>		Single Family	Multifamily		Single Family	Multifamily
	MONTGOMERY		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
	ROBERTSON		Single Family Multif	<u>family</u>		Single Family	Multifamily		Single Family	Multifamily
	WALLER		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
	WASHINGTON		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
*	MILAM	<u>Summary</u>	Single Family Multif	family	Summary	Single Family	<u>Multifamily</u>	<u>Summary</u>	Single Family	<u>Multifamily</u>
	BORDEN		Single Family Multif	family		Single Family	<u>Multifamily</u>		Single Family	<u>Multifamily</u>
	CHILDRESS		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
	CROSBY		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
	DAWSON		Single Family Multif	family		Single Family	Multifamily		Single Family	Multifamily
	DICKENS	Summary	Single Family Multif	family	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	KENT	Bullinary	Single Family Multif	family	<u>Sammar</u>	Single Family	Multifamily		Single Family	<u> </u>
	KING		Single Family Multif			Single Family			Single Family	
	MOTLEY		Single Family Multif			Single Family	4		Single Family	÷
*	SCURRY		Single Family Multif	family		Single Family			Single Family	Multifamily
	STONEWALL		Single Family Multif			Single Family			Single Family	
	CRANE		Single Family Multif			Single Family			Single Family	
	REAGAN	Summary	Single Family Multif		Summary					÷
	UPTON		Single Family Multif			Single Family			Single Family	<u> </u>
	ANDREWS		Single Family Multif			Single Family			Single Family	
*	ECTOR		Single Family Multif			Single Family			Single Family	
	GLASSCOCK		Single Family Multif			Single Family	i		Single Family	4
	HOWARD		Single Family Multif			Single Family	<u> </u>		Single Family	<u> </u>
	JEFF DAVIS	~	Single Family Multif		_	Single Family		~	Single Family	
	LOVING	Summary	Single Family Multif		<u>Summary</u>	Single Family		Summary	Single Family	
	MARTIN		Single Family Multif			Single Family			Single Family	4
	MIDLAND		Single Family Multif			Single Family			Single Family	
	REEVES		Single Family Multif		į.	Single Family	 		Single Family	ļ
	WARD		Single Family Multif			Single Family			Single Family	ļ
	WINKLER		Single Family Multif	family		Single Family	<u>Multifamily</u>		Single Family	Multifamily

(*	ERCOT Counties Representative County)		1999			2000		2002		
*	ATASCOSA	_	Single Family	Multifamily	_	Single Family	Multifamily	_	Single Family	Multifamily
	FRIO	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
*	BEXAR		Single Family	Multifamily		Single Family	Multifamily		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	<u>Summary</u>	Single Family	Multifamily	<u>Summary</u>	Single Family	Multifamily	Summary	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	<u> </u>	Single Family	Multifamily	6	Single Family	Multifamily	6	Single Family	Multifamily
*	KENDALL	<u>Summary</u>	Single Family	Multifamily	<u>Summary</u>	Single Family	Multifamily	Summary	Single Family	Multifamily
	BREWSTER		Single Family	Multifamily		Single Family	Multifamily		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	Summary	Single Family	Multifamily		Single Family	Multifamily
	TERRELL		Single Family	Multifamily		Single Family	Multifamily	Summary	Single Family	Multifamily
	CONCHO	<u>Summary</u>	Single Family	Multifamily		Single Family	Multifamily		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	~	Single Family	Multifamily	~	Single Family	Multifamily	~	Single Family	Multifamily
	STERLING	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily	Summary	Single Family	Multifamily
	COOKE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	FANNIN		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	GRAYSON	<u>Summary</u>	Single Family	Multifamily	<u>Summary</u>	Single Family	Multifamily	Summary	Single Family	Multifamily
*	HUNT		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	MONTAGUE		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	ARCHER		Single Family	Multifamily		Single Family	Multifamily		Single Family	Multifamily
	BAYLOR		Single Family	ļ		Single Family			Single Family	
	CLAY		Single Family	Multifamily		Single Family	Multifamily		Single Family	
	COTTLE	ļ.	Single Family			Single Family			Single Family	
	FOARD		Single Family	Multifamily	Summary	Single Family	Multifamily	<u>Summary</u>	Single Family	Multifamily
	HARDEMAN		Single Family			Single Family			Single Family	
	KNOX		Single Family			Single Family			Single Family	
*	WICHITA		Single Family			Single Family			Single Family	
	WILBARGER		Single Family			Single Family			Single Family	

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