

### **ENERGY SYSTEMS LABORATORY**

Texas Engineering Experiment Station Texas A&M University System

3581 TAMU College Station, Texas 77843-3581

August 31st, 2007

To: Code Officials, Energy Raters, Manufacturers, State Agency Officials, Stakeholders and Citizens of Texas

Subject: 15% Above-Code Energy Efficiency Measures for Commercial Buildings in Texas

In the 79<sup>th</sup> Legislature (2005) the Energy Systems Laboratory was required to develop three alternative methods for achieving 15% above-code energy savings in new residential, commercial and industrial construction. The Laboratory has worked closely with code officials, energy raters, manufacturers, state officials and other stakeholders to develop cost effective energy efficiency measures.

In the pages that follow, 15% above-code measures for new commercial buildings are presented for the 41 non-attainment and affected counties in Texas, separated by climate area. Each page contains a description of the individual measures and combined measures that achieve 15% above-code savings, which are based on ASHRAE Standard 90.1-1999. These measures include envelope, HVAC systems, and plant equipment. Annual energy and demand savings, estimated costs, simple payback, and NOx emissions reductions are provided for commercial buildings.

Sincerely,

Jeff S. Haberl, Ph.D., P.E. Associate Director

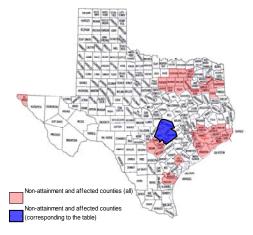
Charles C. Culp, Ph.D., P.E. Associate Director

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### Natural Gas Heating (Bastrop, Caldwell, Hays, Travis and Williamson Counties)

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings (%)	Annual Energy Savings (\$/year)	Annual Demand Savings (%)	Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)		(:	red Cost \$)
Α	Envelope and Fenestration Measures						Margii	nal Cost <sup>1</sup>	New System Cost <sup>2</sup>
A	·								
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	13.2%	\$9,512	3.1%	\$502	\$10,014	\$95,130	- \$174,150	
2	Lighting Load (1.3 to 1.0 w/sq-ft)	6.5%	\$16,417	10.6%	\$1,718	\$18,135	\$0	- \$0	
3	Occupancy Sensors Installation	11.5%	\$32,242	-3.6%	-\$576	\$31,667			\$26,500 - \$28,000
4	Shading (none to 2.5 ft overhangs)	1.6%	\$3,261	2.4%	\$395	\$3,656			\$67,900 - \$110,000
В	HVAC System Measures								
5	Cold Deck Reset	5.7%	\$4,860	-0.8%	-\$124	\$4,736	\$0	- \$800	
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.4%	\$2,733	2.1%	\$337	\$3,070	\$0	- \$200	
С	Plant Equipment Measures								
7	Chiller COP (4.9 to 6.1)	3.9%	\$7,815	6.0%	\$976	\$8,791	\$16,000	- \$18,000	
8	Boiler Efficiency (75% to 95%)	2.4%	\$1,121	0.0%	\$0	\$1,121	\$25,000	- \$35,000	
9	VSD on Chilled Water Pump (from Constant to VSD)	2.4%	\$4,755	0.8%	\$123	\$4,877	\$3,700	- \$4,700	
10	VSD on Hot Water Pump (from Constant to VSD)	2.3%	\$1,649	0.3%	\$47	\$1,696	\$4,000	- \$5,000	



Description of Combined Measures to Achieve 15% Above Code Savings

Description of Combined Measures to Achieve 15% Above	re Code Saving	5								
Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings	Combined Demand Savings	Combined Demand Savings	Combined Savings (Energy+Demand) (\$/year)	(	stimated Cost	Combined Annual NOx Emissions Savings (lbs/year)	Combined Ozone Season Period NOx Emissions Savings	Simple Estimated Payback (yrs)
	(%)	(\$/year)	(%)	(\$/year)	(4,)02.)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	(isolyom)	(lbs/day)	
Combination 1										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	21.7%	\$27.563	13.7%	\$2,208	\$29,771	\$95,130 - \$174,150		345	1.01	3.5 - 6.3
2 Lighting Load (1.3 to 1.0 w/sq-ft)	21.770	Ψ21,303	13.7 70	<b>\$2,200</b>	Ψ23,771	\$0 - \$0		340	1.01	3.0 - 0.0
Combination 2										
3 Occupancy Sensors Installation	19.6%	\$39,109	-4.2%	-\$678	\$38,431		\$26,500 - \$28,000	498	1.35	0.7 - 0.7
5 Cold Deck Reset	13.070	ψ53,103	-4.270	-φ0	ψ50,451	\$0 - \$800		400	1.50	0.1 - 0.1
Combination 3										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)						\$95,130 - \$174,150				
7 Chiller COP (4.9 to 6.1)	17.1%	\$17,201	8.8%	\$1,425	\$18,626	\$16,000 - \$18,000		213	0.70	7.9 - 13.2
8 Boiler Efficiency (75% to 95%)	1					\$25,000 - \$35,000				

#### Note

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost for 12 months

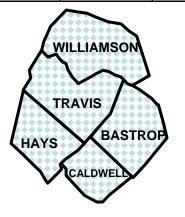
Natural gas cost = \$0.80/therm

### (Building Description)

- Building type: Office
- Gross area: 89,340 sq-ft
- Building dimension: 122ft x 122ft x 78ft (WxLxH)
- Number of floors: 6
- Floor-to-floor height: 13ft
- Window-to-wall ratio: 50%

Table 1a: 15% Above Code Savings (Commercial – Natural Gas Heating) for Bastrop, Caldwell, Hays, Travis and Williamson Counties

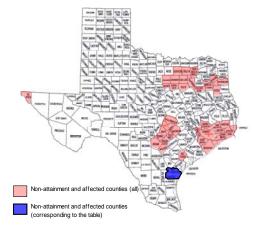




### **Natural Gas Heating (Nueces and San Patricio Counties)**

Description of Individual Measures

	Individual Measures	Annual Energy Savings (%)	Annual Energy Savings (\$/year)	Annual Demand Savings (%)	Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)		(	ted Cost \$)
Α	Envelope and Fenestration Measures						Margii	nal Cost <sup>1</sup>	New System Cost <sup>2</sup>
	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	6.5%	\$5,867	3.3%	\$543	\$6,410	\$95,130	- \$174,150	
2	Lighting Load (1.3 to 1.0 w/sq-ft)	8.4%	\$17,849	10.7%	\$1,751	\$19,600	\$0	- \$0	
3	Occupancy Sensors Installation	15.5%	\$35,065	-3.0%	-\$497	\$34,568			\$26,500 - \$28,000
4	Shading (none to 2.5 ft overhangs)	1.8%	\$3,556	2.5%	\$413	\$3,969			\$67,900 - \$110,000
В	HVAC System Measures								
5	Cold Deck Reset	2.6%	\$2,024	-1.0%	-\$159	\$1,865	\$0	- \$800	
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.4%	\$2,731	2.0%	\$324	\$3,055	\$0	- \$200	
С	Plant Equipment Measures								
7	Chiller COP (4.9 to 6.1)	4.5%	\$8,485	6.2%	\$1,026	\$9,511	\$16,000	- \$18,000	
8	Boiler Efficiency (75% to 95%)	1.0%	\$423	0.0%	\$0	\$423	\$25,000	- \$35,000	
9	VSD on Chilled Water Pump (from Constant to VSD)	2.6%	\$4,844	0.8%	\$131	\$4,976	\$3,700	- \$4,700	
10	VSD on Hot Water Pump (from Constant to VSD)	1.8%	\$1,236	0.2%	\$35	\$1,270	\$4,000	- \$5,000	



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Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Demand Savings (%)	Combined Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)			Combined Annual NOx Emissions Savings (lbs/year)	Combined Ozone Season Period NOx Emissions Savings (lbs/day)	Simple Estimated Payback (yrs)
	, ,	.,,	, ,			Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>		, ,	
Combination 1										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	16.4%	\$24,991	13.8%	\$2,267	\$27,257	\$95,130 - \$174,150		239	0.78	3.8 - 7.0
2 Lighting Load (1.3 to 1.0 w/sq-ft)	141.70	4= 1,000	101070	<b>4</b> =,===	<b>4</b> ,	\$0 - \$0		-**	••	
Combination 2										
Occupancy Sensors Installation	20.7%	\$39,149	-3.8%	-\$618	\$38,531		\$26,500 - \$28,000	369	1.04	0.7 - 0.7
5 Cold Deck Reset	20.170	ψου, 140	0.070	φοιο	ψου,σο1	\$0 - \$800		000	1.04	0.1
Combination 3										
2 Lighting Load (1.3 to 1.0 w/sq-ft)						\$0 - \$0				
5 Cold Deck Reset	40.40/	\$00.0F0	40.70/	E0 740	COE 704	\$0 - \$800		040	0.04	0.0
7 Chiller COP (4.9 to 6.1)	18.4%	\$32,959	16.7%	\$2,746	\$35,704	\$16,000 - \$18,000		312	0.91	0.6 - 0.7
9 VSD on Chilled Water Pump (from Constant to VSD)						\$3,700 - \$4,700				

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost for 12 months

Natural gas cost = \$0.80/therm

### (Building Description)

Building type: Office

Gross area: 89,340 sq-ft

Building dimension: 122ft x 122ft x 78ft (WxLxH)

Number of floors: 6

Floor-to-floor height: 13ft

Window-to-wall ratio: 50%

### Table 2a: 15% Above Code Savings (Commercial – Natural Gas Heating) for Nueces and San Patricio Counties

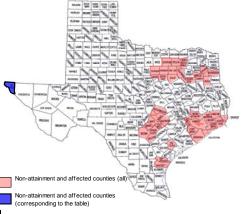




## **Natural Gas Heating (El Paso)**

Description of Individual Measures

De	scription of individual measures								1
	Individual Measures	Annual Energy Savings (%)	Annual Energy Savings (\$/year)	Annual Demand Savings (%)	Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)		mated Cost (\$)  New System Cost <sup>2</sup>	FALSE STATE TO STATE THE S
Α	Envelope and Fenestration Measures						marginar coor	non Cyclem Cool	18800
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	0.0%	-\$6	-0.1%	-\$8	-\$14	\$95,130 - \$174,150		over de de
2	Lighting Load (1.3 to 1.0 w/sq-ft)	10.3%	\$18,598	11.2%	\$1,700	\$20,297	\$0 - \$0		Victoria al monte de l'accessi
3	Occupancy Sensors Installation	19.9%	\$37,024	-3.5%	-\$526	\$36,498		\$26,500 - \$28,000	WORKS CHOICE WAS COMMON WINDS STORY
4	Shading (none to 2.5 ft overhangs)	3.1%	\$5,469	3.5%	\$530	\$5,999		\$67,900 - \$110,000	STANS MISS JOSOCI
В	HVAC System Measures								MESON MINES NAVE
5	Cold Deck Reset	-1.3%	-\$2,494	-2.1%	-\$319	-\$2,813	\$0 - \$800		1
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.5%	\$2,689	2.1%	\$318	\$3,008	\$0 - \$200		~
С	Plant Equipment Measures								
7	Chiller COP (4.9 to 6.1)	4.1%	\$7,162	5.4%	\$819	\$7,982	\$16,000 - \$18,000		
8	Boiler Efficiency (75% to 95%)	0.5%	\$203	0.0%	\$0	\$203	\$25,000 - \$35,000		Non-attainment and affected co
9	VSD on Chilled Water Pump (from Constant to VSD)	2.4%	\$4,214	0.8%	\$127	\$4,341	\$3,700 - \$4,700		Non-attainment and affected co
10	VSD on Hot Water Pump (from Constant to VSD)	0.5%	\$301	0.1%	\$11	\$312	\$4,000 - \$5,000		(corresponding to the table)



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Description of Combined Measures to Achieve 15% Above	e Code Saving	js <u> </u>								
Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Demand Savings (%)	Combined Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)	Combined	Estimated Cost (\$)	Combined Annual NOx Emissions Savings (lbs/year)	Combined Ozone Season Period NOx Emissions Savings (lbs/day)	Simple Estimated Payback (yrs)
	(,	(,,,,,,,	(,	(,,,,,,,		Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>		(,	
Combination 1										
2 Lighting Load (1.3 to 1.0 w/sq-ft)						\$0 - \$0				
4 Shading (none to 2.5 ft overhangs)	16.6%	\$29,884	19.4%	\$2,931	\$32,815		\$67,900 - \$110,000	N/A	N/A	2.8 - 4.3
7 Chiller COP (4.9 to 6.1)						\$16,000 - \$18,000				
Combination 2										
3 Occupancy Sensors Installation	19.9%	\$37,024	-3.5%	-\$526	\$36,498		\$26,500 - \$28,000	N/A	N/A	0.72 - 0.76
Combination 3										
2 Lighting Load (1.3 to 1.0 w/sq-ft)						\$0 - \$0				
4 Shading (none to 2.5 ft overhangs)	16.6%	\$29,850	17.2%	\$2,600	\$32,450		\$67,900 \$110,000	N/A	N/A	0.12 - 0.16
6 Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	10.0%	φ23,030	11.270	φ2,000	φ32,43U	\$0 - \$200		IN/A	IN/A	0.12 - 0.16
9 VSD on Chilled Water Pump (from Constant to VSD)	11					\$2.700 \$4.700		1	l	

#### Note:

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost for 12 months

Natural gas cost = \$0.80/therm

### (Building Description)

Building type: Office

Gross area: 89,340 sq-ft

Building dimension: 122ft x 122ft x 78ft (WxLxH)

Number of floors: 6

Floor-to-floor height: 13ft

Window-to-wall ratio: 50%

### Table 3a: 15% Above Code Savings (Commercial – Natural Gas Heating) for El Paso County



# Natural Gas Heating (Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall and Tarrant Counties)

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings (%)	Annual Energy Savings (\$/year)	Annual Demand Savings (%)	Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)			The second state of the se
Ļ.							Marginal Cost'	New System Cost <sup>2</sup>	ton me date account and the format of the property of the prop
Α	Envelope and Fenestration Measures								The case can man are first to the case are at the case of the case
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	17.8%	\$12,718	2.6%	\$406	\$13,125	\$95,130 - \$174,150		and Comment on the Comment
2	Lighting Load (1.3 to 1.0 w/sq-ft)	5.7%	\$16,433	10.4%	\$1,628	\$18,061	\$0 - \$0		A CONTRACTOR OF THE PROPERTY O
3	Occupancy Sensors Installation	9.2%	\$31,103	-3.9%	-\$612	\$30,491		\$26,500 - \$28,000	Account the property of the pr
4	Shading (none to 2.5 ft overhangs)	1.8%	\$3,802	2.5%	\$391	\$4,193		\$67,900 - \$110,000	DIT FIRST MICES MICHIGAN MICHIANA MICHI
В	HVAC System Measures								MISSON SHEET STORY OF THE PARTY
5	Cold Deck Reset	8.4%	\$7,732	-0.4%	-\$59	\$7,673	\$0 - \$800		MODEL BOX MODEL
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.3%	\$2,667	1.9%	\$302	\$2,970	\$0 - \$200		Dames rest County Count
С	Plant Equipment Measures								STATES AS SECTION ASSESSMENT OF STATES ASSESSMENT O
7	Chiller COP (4.9 to 6.1)	3.5%	\$7,419	5.6%	\$883	\$8,302	\$16,000 - \$18,000		WITH DOOR TO KNOW TO
8	Boiler Efficiency (75% to 95%)	3.5%	\$1,685	0.0%	\$0	\$1,685	\$25,000 - \$35,000		Non-attainment and affected counties (all)
9	VSD on Chilled Water Pump (from Constant to VSD)	2.4%	\$5,030	0.9%	\$143	\$5,173	\$3,700 - \$4,700		Non-attainment and affected counties
10	VSD on Hot Water Pump (from Constant to VSD)	3.0%	\$2,293	0.4%	\$66	\$2,359	\$4,000 - \$5,000		(corresponding to the table)

Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Demand Savings (%)	Combined Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)	(5	stimated Cost 5)	Combined Annual NOx Emissions Savings (lbs/year)	Combined Ozone Season Period NOx Emissions Savings (lbs/day)	Simple Estimated Payback (yrs)
						Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>			
Combination 1										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F) 2 Lighting Load (1.3 to 1.0 w/sg-ft)	26.0%	\$31,422	13.8%	\$2,160	\$33,582	\$95,130 - \$174,150 \$0 - \$0		394	1.02	3.0 - 5.5
Combination 2						φυ φυ				
3 Occupancy Sensors Installation 5 Cold Deck Reset	19.6%	\$40,553	-3.8%	-\$603	\$39,950	\$0 - \$800	\$26,500 - \$28,000	521	1.36	0.7 - 0.7
Combination 3										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F) 7 Chiller COP (4.9 to 6.1) 8 Boiler Efficiency (75% to 95%)	21.4%	\$20,037	8.1%	\$1,267	\$21,305	\$95,130 - \$174,150 \$16,000 - \$18,000 \$25,000 - \$35,000		247	0.66	6.8 - 11.3

#### Note

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost for 12 months

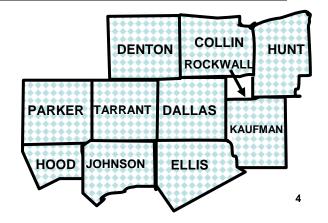
Natural gas cost = \$0.80/therm

#### (Building Description)

- Building type: Office
- Gross area: 89,340 sq-ft
- Building dimension: 122ft x 122ft x 78ft (WxLxH)
- Number of floors: 6
- Floor-to-floor height: 13ft
- Window-to-wall ratio: 50%

Table 4a: 15% Above Code Savings (Commercial – Natural Gas Heating) for Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall and Tarrant Counties

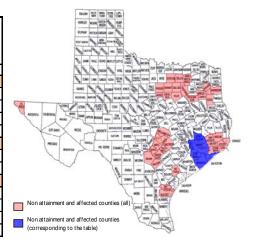




# Natural Gas Heating (Brazoria, Fort Bend, Galveston, Harris, Montgomery and Waller Counties)

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings (%)	Annual Energy Savings (\$/year)	Annual Demand Savings (%)	Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)	(	ted Cost \$)
^	Envelope and Fenestration Measures						Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>
Α	•							
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	10.7%	\$7,114	3.2%	\$517	\$7,631	\$95,130 - \$174,150	
2	Lighting Load (1.3 to 1.0 w/sq-ft)	6.9%	\$16,582	10.4%	\$1,695	\$18,277	\$0 - \$0	
3	Occupancy Sensors Installation	13.0%	\$33,409	-2.3%	-\$377	\$33,032		\$26,500 - \$28,000
4	Shading (none to 2.5 ft overhangs)	1.9%	\$3,785	2.7%	\$438	\$4,223		\$67,900 - \$110,000
В	HVAC System Measures							
5	Cold Deck Reset	4.8%	\$3,978	-0.6%	-\$91	\$3,887	\$0 - \$800	
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.3%	\$2,629	2.0%	\$329	\$2,958	\$0 - \$200	
С	Plant Equipment Measures							
7	Chiller COP (4.9 to 6.1)	3.9%	\$7,717	6.1%	\$1,000	\$8,718	\$16,000 - \$18,000	
8	Boiler Efficiency (75% to 95%)	2.2%	\$993	0.0%	\$0	\$993	\$25,000 - \$35,000	
9	VSD on Chilled Water Pump (from Constant to VSD)	2.4%	\$4,764	0.7%	\$121	\$4,885	\$3,700 - \$4,700	
10	VSD on Hot Water Pump (from Constant to VSD)	3.1%	\$2,243	0.4%	\$63	\$2,306	\$4,000 - \$5,000	



Description of Combined Measures to Achieve 15% Above Code Savings

Description of Combined Measures to Achieve 15% Above	re code Saving	js .								
Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Demand Savings (%)	Combined Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)	t t	stimated Cost	Combined Annual NOx Emissions Savings (lbs/year)	Combined Ozone Season Period NOx Emissions Savings (lbs/day)	Simple Estimated Payback (yrs)
						Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>			
Combination 1										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	20.1%	\$26,160	13.6%	\$2,214	\$28,374	\$95,130 - \$174,150		258	0.95	3.6 - 6.7
2 Lighting Load (1.3 to 1.0 w/sq-ft)	20.170	Ψ20,100	10.070	ΨΖ,Σ1Ψ	Ψ20,014	\$0 - \$0		200	0.50	0.0 0.7
Combination 2										
3 Occupancy Sensors Installation	19.6%	\$38,856	-3.4%	-\$558	\$38,299		\$26,500 - \$28,000	371	1.37	0.7 - 0.7
5 Cold Deck Reset	15.676	ψου,οοο	0.470	ψοσο	ψου,233	\$0 - \$800		371	1.57	0.7
Combination 3										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)						\$95,130 - \$174,150	•			
7 Chiller COP (4.9 to 6.1)	40.00/	640.740	0.50/	04.554	600.070	\$16,000 - \$18,000		107	0.74	7.5 40.4
8 Boiler Efficiency (75% to 95%)	16.8%	\$18,719	9.5%	\$1,554	\$20,273	\$25,000 - \$35,000		187	0.71	7.5 12.4
9 VSD on Chilled Water Pump (from Constant to VSD)	1					\$3.700 - \$4.700				

### Note:

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost for 12 months

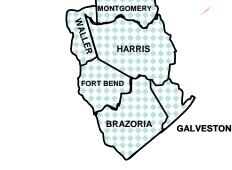
Natural gas cost = \$0.80/therm

### (Building Description)

- Building type: Office
- Gross area: 89,340 sq-ft
- Building dimension: 122ft x 122ft x 78ft (WxLxH)
- Number of floors: 6
- Floor-to-floor height: 13ft
- Window-to-wall ratio: 50%

Table 5a: 15% Above Code Savings (Commercial – Natural Gas Heating) for Brazoria, Fort Bend, Galveston, Harris, Montgomery and Waller Counties

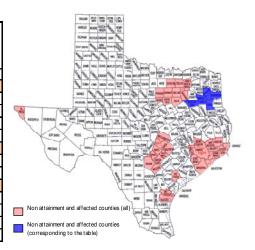




### Natural Gas Heating (Gregg, Harrison, Henderson, Rusk, Smith and Upshur Counties)

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings (%)	Annual Energy Savings (\$/year)	Annual Demand Savings (%)	Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)		Estimat (i	ed Cost (5)  New System Cost <sup>2</sup>
Α	Envelope and Fenestration Measures						Waigii	iai Cost	New System Cost
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	14.5%	\$8,849	1.2%	\$184	\$9,033	\$95,130	- \$174,150	
2	Lighting Load (1.3 to 1.0 w/sq-ft)	5.4%	\$15,477	10.8%	\$1,640	\$17,117	\$0	- \$0	
3	Occupancy Sensors Installation	10.5%	\$31,798	-3.1%	-\$465	\$31,334			\$26,500 - \$28,000
4	Shading (none to 2.5 ft overhangs)	1.7%	\$3,491	2.6%	\$400	\$3,891			\$67,900 - \$110,000
В	HVAC System Measures								
5	Cold Deck Reset	7.1%	\$6,066	-0.9%	-\$131	\$5,936	\$0	- \$800	
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.4%	\$2,870	2.3%	\$357	\$3,226	\$0	- \$200	
С	Plant Equipment Measures								
7	Chiller COP (4.9 to 6.1)	3.3%	\$6,580	5.2%	\$785	\$7,365	\$16,000	- \$18,000	
8	Boiler Efficiency (75% to 95%)	2.8%	\$1,270	0.0%	\$0	\$1,270	\$25,000	- \$35,000	
9	VSD on Chilled Water Pump (from Constant to VSD)	2.3%	\$4,508	0.8%	\$128	\$4,636	\$3,700	- \$4,700	
10	VSD on Hot Water Pump (from Constant to VSD)	2.3%	\$1,663	0.3%	\$48	\$1,711	\$4,000	- \$5,000	



Description of Combined Measures to Achieve 15% Above Code Savings

Description of Combined Measures to Achieve 15% Above	Oouc ouving									
Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Demand Savings (%)	Combined Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)	(9	stimated Cost \$)	Combined Annual NOx Emissions Savings (lbs/year)	Combined Ozone Season Period NOx Emissions Savings (lbs/day)	Simple Estimated Payback (yrs)
						Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>			
Combination 1										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F) 2 Lighting Load (1.3 to 1.0 w/sq-ft)	23.2%	\$26,614	12.6%	\$1,919	\$28,533	\$95,130 - \$174,150 \$0 - \$0		334	0.85	3.6 - 6.5
Combination 2										
Occupancy Sensors Installation     Cold Deck Reset	20.2%	\$39,924	-3.2%	-\$491	\$39,433	\$0 - \$800	\$26,500 - \$28,000	513	1.35	0.7 - 0.7
Combination 3										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F) 7 Chiller COP (4.9 to 6.1) 8 Boiler Efficiency (75% to 95%)	18.0%	\$15,497	6.4%	\$967	\$16,465	\$95,130 - \$174,150 \$16,000 - \$18,000 \$25,000 - \$35,000		191	0.48	8.8 - 14.7

#### Note:

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

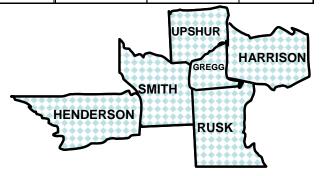
(Yearly demand cost = Sum of monthly demand cost for 12 months

Natural gas cost = \$0.80/therm

### (Building Description)

- Building type: Office
- Gross area: 89,340 sq-ft
- Building dimension: 122ft x 122ft x 78ft (WxLxH)
- Number of floors: 6
- Floor-to-floor height: 13ft
- Window-to-wall ratio: 50%

Table 6a: 15% Above Code Savings (Commercial – Natural Gas Heating) for Gregg, Harrison, Henderson, Rusk, Smith and Upshur Counties

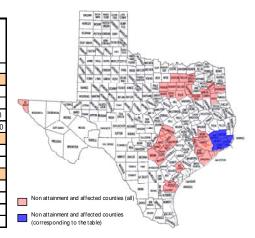




### Natural Gas Heating (Chambers, Hardin, Jefferson, Liberty and Orange Counties)

**Description of Individual Measures** 

-	scription of individual weasures								
	Individual Measures	Annual Energy Savings (%)	Annual Energy Savings (\$/year)	Annual Demand Savings (%)	Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)		(	ed Cost
	Facility of Facility Manager						Marg	nal Cost <sup>1</sup>	New System Cost <sup>2</sup>
Α	Envelope and Fenestration Measures								
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	9.8%	\$6,661	2.0%	\$326	\$6,987	\$95,130	- \$174,150	
2	Lighting Load (1.3 to 1.0 w/sq-ft)	7.2%	\$17,289	10.6%	\$1,686	\$18,975	\$0	- \$0	
3	Occupancy Sensors Installation	12.4%	\$32,661	-3.6%	-\$575	\$32,086			\$26,500 - \$28,000
4	Shading (none to 2.5 ft overhangs)	2.2%	\$4,215	2.5%	\$392	\$4,608			\$67,900 - \$110,000
В	HVAC System Measures								
5	Cold Deck Reset	5.1%	\$4,204	-0.9%	-\$142	\$4,063	\$0	- \$800	
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.3%	\$2,583	1.9%	\$301	\$2,884	\$0	- \$200	
С	Plant Equipment Measures								
7	Chiller COP (4.9 to 6.1)	4.0%	\$7,773	6.0%	\$956	\$8,729	\$16,000	- \$18,000	
8	Boiler Efficiency (75% to 95%)	1.8%	\$804	0.0%	\$0	\$804	\$25,000	- \$35,000	
9	VSD on Chilled Water Pump (from Constant to VSD)	2.5%	\$4,849	0.8%	\$132	\$4,981	\$3,700	- \$4,700	
10	VSD on Hot Water Pump (from Constant to VSD)	2.0%	\$1,416	0.3%	\$40	\$1,457	\$4,000	- \$5,000	



Description of Combined Measures to Achieve 15% Above Code Savings

Description of Combined Measures to Achieve 15% Abov	e code Saving	js –										
Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Demand Savings (%)	Combined Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)	(	stimated Cost \$)	Combined Annual NOx Emissions Savings (lbs/year)	Combined Ozone Season Period NOx Emissions Savings (lbs/day)	Simple Estimated Payback (yrs)		
			, ,			Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>		, ,,			
Combination 1												
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	19.0%	\$ 24,913.29	13.0%	\$2,071	\$26,984	\$95,130 - \$174,150		N/A	N/A	3.8 - 7.0		
2 Lighting Load (1.3 to 1.0 w/sq-ft)	13.076	Ψ 24,913.29	13.078	Ψ2,071	\$20,304	\$0 - \$0		IVA	IVA	3.0 - 7.0		
Combination 2												
3 Occupancy Sensors Installation	20.7%	\$ 39,621.48	-3.9%	-\$620	\$39,002		\$26,500 - \$28,000	N/A	N/A	0.7 - 0.7		
5 Cold Deck Reset	20.176	ψ 39,021.40	-5.576	-ψ020	ψ03,00Z	\$0 - \$800		IVA	IVA	0.7 - 0.7		
Combination 3												
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)						\$95,130 - \$174,150						
7 Chiller COP (4.9 to 6.1)	15.00/	£ 40 470 2E	8.5%	64.257	\$40 F2F	\$16,000 - \$18,000		NI/A	N/A	7.7 - 12.8		
8 Boiler Efficiency (75% to 95%)	15.9%	\$ 18,178.35	0.5%	\$1,357	7 II \$19.535 I <del>I</del>	\$19,535	7 II \$19.535 III	,535 \$25,000 - \$35,000		N/A	IN/A	1.1 - 12.8
9 VSD on Chilled Water Pump (from Constant to VSD)	1					\$3,700 - \$4,700						

#### Note:

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost for 12 months

Natural gas cost = \$0.80/therm

### (Building Description)

- Building type: Office
- Gross area: 89,340 sq-ft
- Building dimension: 122ft x 122ft x 78ft (WxLxH)
- Number of floors: 6
- Floor-to-floor height: 13ft
- Window-to-wall ratio: 50%

Table 7a: 15% Above Code Savings (Commercial – Natural Gas Heating) for Chambers, Hardin, Jefferson, Liberty and Orange Counties

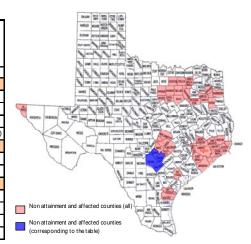




### **Natural Gas Heating (Bexar, Comal, Guadalupe and Wilson Counties)**

### **Description of Individual Measures**

	Individual Measures	Annual Energy Savings (%)	Annual Energy Savings (\$/year)	Annual Demand Savings (%)	Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)		(:	ted Cost \$)
							Margin	al Cost <sup>1</sup>	New System Cost <sup>2</sup>
Α	Envelope and Fenestration Measures								
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	11.6%	\$8,404	3.2%	\$522	\$8,926	\$95,130	- \$174,150	
2	Lighting Load (1.3 to 1.0 w/sq-ft)	6.7%	\$16,410	10.4%	\$1,683	\$18,093	\$0	- \$0	
3	Occupancy Sensors Installation	12.5%	\$32,979	-3.2%	-\$511	\$32,468			\$26,500 - \$28,000
4	Shading (none to 2.5 ft overhangs)	1.7%	\$3,451	2.7%	\$431	\$3,882			\$67,900 - \$110,000
В	HVAC System Measures								
5	Cold Deck Reset	5.1%	\$4,158	-0.7%	-\$115	\$4,042	\$0	- \$800	
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.4%	\$2,739	2.1%	\$342	\$3,081	\$0	- \$200	
С	Plant Equipment Measures								
7	Chiller COP (4.9 to 6.1)	4.0%	\$7,885	6.0%	\$978	\$8,863	\$16,000	- \$18,000	
8	Boiler Efficiency (75% to 95%)	2.1%	\$965	0.0%	\$0	\$965	\$25,000	- \$35,000	
9	VSD on Chilled Water Pump (from Constant to VSD)	2.5%	\$4,869	0.8%	\$131	\$5,001	\$3,700	- \$4,700	
10	VSD on Hot Water Pump (from Constant to VSD)	2.1%	\$1,516	0.3%	\$43	\$1,559	\$4,000	- \$5,000	



Description of Combined Measures to Achieve 15% Abo	ove Code Saving	js –								
Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Demand Savings (%)	Combined Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)	(	stimated Cost \$)	Combined Annual NOx Emissions Savings (lbs/year)	Combined Ozone Season Period NOx Emissions Savings (lbs/day)	Simple Estimated Payback (yrs)
						Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>		, ,	
Combination 1										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	20.5%	\$26,514	13.8%	\$2,238	\$28,751	\$95,130 - \$174,150		338	0.96	3.6 - 6.6
2 Lighting Load (1.3 to 1.0 w/sq-ft)	20.070	ψ20,014	10.070	Ψ2,200	Ψ20,701	\$0 - \$0		555	0.50	0.0 0.0
Combination 2										
3 Occupancy Sensors Installation	20.0%	\$39,211	-3.6%	-\$591	\$38,619		\$26,500 - \$28,000	508	1.30	0.7 - 0.7
5 Cold Deck Reset	20.070	ψ33,211	-5.070	- <del>4</del> 551	ψ30,019	\$0 - \$800		300	1.30	0.7 - 0.7
Combination 3										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)						\$95,130 - \$174,150				
7 Chiller COP (4.9 to 6.1)	15.7%	\$16,193	8.9%	\$1,450	\$17,643	\$16,000 - \$18,000		203	0.66	8.4 - 14.0
8 Boiler Efficiency (75% to 95%)						\$25,000 - \$35,000				

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost for 12 months

Natural gas cost = \$0.80/therm

### (Building Description)

Building type: Office

Gross area: 89,340 sq-ft

Building dimension: 122ft x 122ft x 78ft (WxLxH)

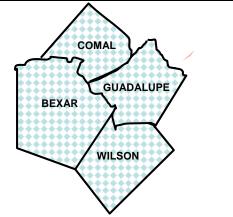
Number of floors: 6

Floor-to-floor height: 13ft

Window-to-wall ratio: 50%

Table 8a: 15% Above Code Savings (Commercial – Natural Gas Heating) for Bexar, Comal, Guadalupe and Wilson Counties

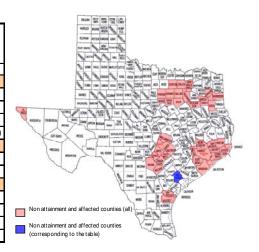




## **Natural Gas Heating (Victoria County)**

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Annual Demand Savings	Annual Demand Savings	Combined Savings (Energy+Demand) (\$/year)			ted Cost \$)
		(%)	(\$/year)	(%)	(\$/year)	(,	Margi	nal Cost <sup>1</sup>	New System Cost <sup>2</sup>
Α	Envelope and Fenestration Measures								
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	8.8%	\$7,107	2.7%	\$429	\$7,536	\$95,130	- \$174,150	
2	Lighting Load (1.3 to 1.0 w/sq-ft)	7.8%	\$17,638	10.5%	\$1,691	\$19,329	\$0	- \$0	
3	Occupancy Sensors Installation	14.3%	\$34,302	-3.4%	-\$544	\$33,758			\$26,500 - \$28,000
4	Shading (none to 2.5 ft overhangs)	2.1%	\$4,169	2.7%	\$427	\$4,595			\$67,900 - \$110,000
В	HVAC System Measures								
5	Cold Deck Reset	3.6%	\$2,835	-0.9%	-\$150	\$2,685	\$0	- \$800	
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.4%	\$2,722	2.0%	\$320	\$3,043	\$0	- \$200	
С	Plant Equipment Measures								
7	Chiller COP (4.9 to 6.1)	4.2%	\$8,021	6.0%	\$956	\$8,977	\$16,000	- \$18,000	
8	Boiler Efficiency (75% to 95%)	1.5%	\$654	0.0%	\$0	\$654	\$25,000	- \$35,000	
9	VSD on Chilled Water Pump (from Constant to VSD)	2.5%	\$4,804	0.8%	\$135	\$4,939	\$3,700	- \$4,700	
10	VSD on Hot Water Pump (from Constant to VSD)	2.5%	\$1,723	0.3%	\$48	\$1,771	\$4,000	- \$5,000	



**VICTORIA** 

Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings	Combined Demand Savings	Combined Demand Savings	Combined Savings (Energy+Demand) (\$/year)			Combined Annual NOx Emissions Savings (Ibs/year)	Combined Ozone Season Period NOx Emissions Savings	Simple Estimated Payback (yrs)			
	(%)	(\$/year)	(%)	(\$/year)	(4/)04./	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	()	(lbs/day)				
Combination 1													
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	18.5%	\$26,186	13.5%	\$2,164	\$28,350	\$95,130 - \$174,150		253	0.80	3.6 - 6.7			
2 Lighting Load (1.3 to 1.0 w/sq-ft)	10.570	Ψ20,100	13.370	ΨZ, 10 <del>4</del>	Ψ20,330	\$0 - \$0		200	0.00	5.0 - 0.7			
Combination 2													
3 Occupancy Sensors Installation	20.7%	\$39,507	-3.6%	-\$582	\$38,924		\$26,500 - \$28,000	373	1.05	0.7 - 0.7			
5 Cold Deck Reset	20.7 /6	φ39,307	-3.076	-\$302	\$30,524	\$0 - \$800		3/3	1.00	0.7 - 0.7			
Combination 3													
2 Lighting Load (1.3 to 1.0 w/sq-ft)						\$0 - \$0							
5 Cold Deck Reset	18.5%	\$20.027	16 40/	¢2 627	\$0E 464	\$0 - \$800		311	0.90	0.6 - 0.7			
7 Chiller COP (4.9 to 6.1)	10.5%	\$32,837	16.4%	\$2,627	\$35,464	\$35,464	7 \$35,464	\$35,464	\$16,000 - \$18,000		311	0.90	0.6 - 0.7
9 VSD on Chilled Water Pump (from Constant to VSD)	1	1				\$3,700 - \$4,700							

### Note:

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost for 12 months

Natural gas cost = \$0.80/therm

### (Building Description)

Building type: Office

Gross area: 89,340 sq-ft

Building dimension: 122ft x 122ft x 78ft (WxLxH)

Number of floors: 6

Floor-to-floor height: 13ft

Window-to-wall ratio: 50%

### Table 9a: 15% Above Code Savings (Commercial – Natural Gas **Heating) for Victoria County**

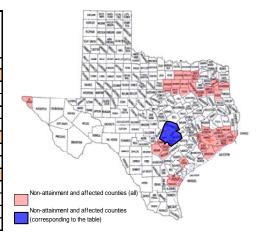




### **Electric Heating (Bastrop, Caldwell, Hays, Travis and Williamson Counties)**

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings (%)	Annual Energy Savings (\$/year)	Annual Demand Savings (%)	Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)			ted Cost \$) New System Cost <sup>2</sup>
Α	Envelope and Fenestration Measures								
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	10.9%	\$21,300	26.3%	\$5,663	\$26,963	\$95,130	- \$174,150	
2	Lighting Load (1.3 to 1.0 w/sq-ft)	7.3%	\$14,297	3.9%	\$832	\$15,128	\$0	- \$0	
3	Occupancy Sensors Installation	13.3%	\$25,987	-8.0%	-\$1,726	\$24,261			\$26,500 - \$28,000
4	Shading (none to 2.5 ft overhangs)	1.6%	\$3,188	2.4%	\$508	\$3,696			\$67,900 - \$110,000
В	HVAC System Measures								
5	Cold Deck Reset	4.6%	\$8,928	7.9%	\$1,701	\$10,628	\$0	- \$800	
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.4%	\$2,720	1.5%	\$319	\$3,039	\$0	- \$200	
С	Plant Equipment Measures								
7	Chiller COP (4.9 to 6.1)	4.0%	\$7,815	3.8%	\$810	\$8,625	\$16,000	- \$18,000	
8	Boiler Efficiency (Not Aplicable)	n/a	n/a	n/a	n/a	n/a	n/a	- n/a	
9	VSD on Chilled Water Pump (from Constant to VSD)	2.4%	\$4,755	1.0%	\$205	\$4,960	\$3,700	- \$4,700	
10	VSD on Hot Water Pump (from Constant to VSD)	1.4%	\$2,789	0.5%	\$111	\$2,901	\$4,000	- \$5,000	



Description of Combined Measures to Achieve 15% Above Code Savings

Description of Combined Measures to Achieve 15% Abov	e coue saving	Jo								
Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings	Combined Demand Savings	Combined Demand Savings	Combined Savings (Energy+Demand) (\$/year)		stimated Cost \$)	Combined Annual NOx Emissions Savings (Ibs/year)	Combined Ozone Season Period NOx Emissions Savings	Simple Estimated Payback (yrs)
	(%)	(\$/year)	(%)	(\$/year)	(4,7==,7	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	(,	(lbs/day)	
Combination 1										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F) 2 Lighting Load (1.3 to 1.0 w/sq-ft)	19.8%	\$38,610	32.8%	\$7,065	\$45,675	\$95,130 - \$174,150 \$0 - \$0		492	1.12	2.5 - 4.5
Combination 2										
3 Occupancy Sensors Installation 5 Cold Deck Reset	19.9%	\$38,849	2.2%	\$478	\$39,327	\$0 - \$800	\$26,500 - \$28,000	495	1.32	0.7 - 0.7
Combination 3										
Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)     Chiller COP (4.9 to 6.1)      VSD on Chilled Water Pump (from Constant to VSD)	16.6%	\$32,496	30.8%	\$6,642	\$39,138	\$95,130 - \$174,150 \$16,000 - \$18,000 \$3,700 - \$4,700		414	0.92	3.5 - 6.1

#### Note:

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- See individual measures above for specific savings
   \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost for 12 months

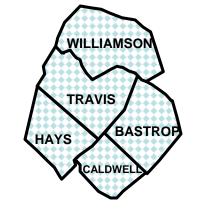
Natural gas cost = \$0.80/therm

### (Building Description)

- Building type: Office
- Gross area: 89,340 sq-ft
- Building dimension: 122ft x 122ft x 78ft (WxLxH)
- Number of floors: 6
- Floor-to-floor height: 13ft
- Window-to-wall ratio: 50%

Table 1b: 15% Above Code Savings (Commercial - Electric Heating) for Bastrop, Caldwell, Hays, Travis and Williamson Counties





### **Electric Heating (Nueces and San Patricio Counties )**

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings (%)	nergy Energy Demand vings Savings Savings		Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)		ated Cost (\$)	
٨	Envelope and Fenestration Measures						Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	The second of the second control of the seco
А	·								Committee that can be seen to be
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	6.0%	\$11,294	13.8%	\$2,570	\$13,864	\$95,130 - \$174,150		and the properties on the last the party and
2	Lighting Load (1.3 to 1.0 w/sq-ft)	8.9%	\$16,677	5.9%	\$1,105	\$17,782	\$0 - \$0		The same of the sa
3	Occupancy Sensors Installation	16.6%	\$31,192	-7.6%	-\$1,419	\$29,773		\$26,500 - \$28,000	MORE THE PARTY AND PARTY A
4	Shading (none to 2.5 ft overhangs)	1.9%	\$3,491	2.1%	\$385	\$3,875		\$67,900 - \$110,000	DET DATE ACCES DESCRIPTIONS SCHOOL SECURITY SECU
В	HVAC System Measures								PRISOD BROWN IN VIOL DAMED AND STATE OF THE PRISON OF THE
5	Cold Deck Reset	2.1%	\$3,950	4.1%	\$765	\$4,715	\$0 - \$800		MINISTRAL MANAGEMENT AND
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.4%	\$2,723	1.7%	\$315	\$3,038	\$0 - \$200		JAMAS THE CHICAGO CONT. TO SECOND CO.
С	Plant Equipment Measures								Direct or court   Col. (8)
7	Chiller COP (4.9 to 6.1)	4.5%	\$8,485	5.0%	\$930	\$9,415	\$16,000 - \$18,000		MESS DATE OF THE PROPERTY OF T
8	Boiler Efficiency (Not Aplicable)	n/a	n/a	n/a	n/a	n/a	n/a - n/a		Non-attainment and affected counties (all)
9	VSD on Chilled Water Pump (from Constant to VSD)	2.6%	\$4,844	1.0%	\$180	\$5,024	\$3,700 - \$4,700		Non-attainment and affected counties
10	VSD on Hot Water Pump (from Constant to VSD)	1.1%	\$2,075	0.5%	\$95	\$2,170	\$4,000 - \$5,000		(corresponding to the table)

Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Demand Savings (%)	Combined Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)	(9	stimated Cost (5)	Combined Annual NOx Emissions Savings (lbs/year)	Combined Ozone Season Period NOx Emissions Savings (lbs/day)	Simple Estimated Payback (yrs)
			, ,			Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>		, ,	
Combination 1										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	15.9%	\$30,004	22.6%	\$4,222	\$34,226	\$95,130 - \$174,150		283	0.84	3.2 - 5.8
2 Lighting Load (1.3 to 1.0 w/sq-ft)	15.576	ψ30,004	22.076	Ψ4,222	ψ34,220	\$0 - \$0		203	0.04	5.2 - 5.0
Combination 2										
3 Occupancy Sensors Installation	20.7%	\$38,924	-1.1%	-\$204	\$38,720		\$26,500 - \$28,000	367	1.03	0.7 - 0.7
5 Cold Deck Reset	20.770	ψ30,924	-1.170	-9204	ψ30,720	\$0 - \$800		307	1.03	0.7 - 0.7
Combination 3										
2 Lighting Load (1.3 to 1.0 w/sq-ft)						\$0 - \$0				
5 Cold Deck Reset	18.1%	\$34,069	16.4%	\$3,060	\$37,128	\$0 - \$800		321	0.91	0.6 - 0.7
7 Chiller COP (4.9 to 6.1)	10.1%	φ34,009	10.4%	φ3,000	φ31,120	\$16,000 - \$18,000		321	0.91	0.0 - 0.7
9 VSD on Chilled Water Pump (from Constant to VSD)						\$3,700 - \$4,700				

#### Note

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings
  \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost for 12 months

Natural gas cost = \$0.80/therm

### (Building Description)

Building type: Office

Gross area: 89,340 sq-ft

Building dimension: 122ft x 122ft x 78ft (WxLxH)

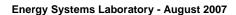
Number of floors: 6

Floor-to-floor height: 13ft

Window-to-wall ratio: 50%

## Table 2b: 15% Above Code Savings (Commercial - Electric Heating) for Nueces and San Patricio Counties





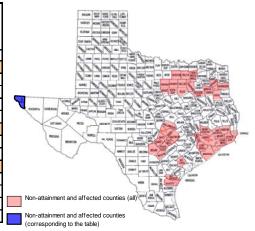
SAN PATRICIO

**NUECES** 

### **Electric Heating (El Paso)**

### **Description of Individual Measures**

	Individual Measures	Annual Energy Savings (%)	Annual Energy Savings (\$/year)	Annual Demand Savings (%)	Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)		(		
	- I I I I I I I I I I I I I I I I I I I	, ,	, , ,	` '	, , ,		Margin	al Cost <sup>1</sup>	New Syste	em Cost <sup>2</sup>
Α	Envelope and Fenestration Measures									
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	0.0%	\$19	0.1%	\$12	\$31	\$95,130	- \$174,150		
2	Lighting Load (1.3 to 1.0 w/sq-ft)	10.4%	\$18,043	9.1%	\$1,512	\$19,555	\$0	- \$0		
3	Occupancy Sensors Installation	20.3%	\$35,271	-4.7%	-\$783	\$34,488			\$26,500 -	\$28,000
4	Shading (none to 2.5 ft overhangs)	3.2%	\$5,487	3.1%	\$518	\$6,005			\$67,900 -	\$110,000
В	HVAC System Measures									
5	Cold Deck Reset	-1.4%	-\$2,421	-1.5%	-\$256	-\$2,677	\$0	- \$800		
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.5%	\$2,689	1.7%	\$288	\$2,977	\$0	- \$200		
С	Plant Equipment Measures									
7	Chiller COP (4.9 to 6.1)	4.1%	\$7,162	4.5%	\$747	\$7,909	\$16,000	- \$18,000		
8	Boiler Efficiency (Not Aplicable)	n/a	n/a	n/a	n/a	n/a	n/a	- n/a		•
9	VSD on Chilled Water Pump (from Constant to VSD)	2.4%	\$4,214	0.9%	\$155	\$4,369	\$3,700	- \$4,700		•
10	VSD on Hot Water Pump (from Constant to VSD)	0.3%	\$506	0.1%	\$16	\$523	\$4,000	- \$5,000		



**EL PASO** 

Description of Combined Measures to Achieve 15% Above Code Savings

Description of Combined Measures to Achieve 15% Abov	e Code Saving	js									
Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Demand Savings (%)	Combined Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)	(	stimated Cost \$)	t Combined Annual NOx Emissions Savings (lbs/year) Combined Ozc Period NOx E (lbs/year)		Simple Estimated Payback (yrs)	
						Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>				
Combination 1											
2 Lighting Load (1.3 to 1.0 w/sq-ft)						\$0 - \$0					
4 Shading (none to 2.5 ft overhangs)	16.8%	\$29,194	16.0%	\$2,665	\$31,859		\$67,900 - \$110,000	N/A	N/A	2.9 - 4.4	
7 Chiller COP (4.9 to 6.1)						\$16,000 - \$18,000					
Combination 2											
3 Occupancy Sensors Installation	20.3%	\$35,271	-4.7%	-\$783	\$34,488		\$26,500 - \$28,000	N/A	N/A	0.75 - 0.79	
Combination 3											
2 Lighting Load (1.3 to 1.0 w/sq-ft)						\$0 - \$0					
4 Shading (none to 2.5 ft overhangs)	16 00/	\$20.142	1 / / / /	¢2 200	\$24 E44		\$67,900 \$110,000	N/A	N/A	0.13 - 0.17	
6 Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	16.8%	\$29,142	14.4%	\$2,399	9 \$31,541	399 \$31,541	\$0 - \$200		IN/A	IN/A	0.13 - 0.17
9 VSD on Chilled Water Pump (from Constant to VSD)	1					\$3.700 - \$4.700					

### Note:

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings

  \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost

for 12 months

Natural gas cost = \$0.80/therm

### (Building Description)

Building type: Office

Gross area: 89,340 sq-ft

Building dimension: 122ft x 122ft x 78ft (WxLxH)

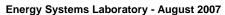
Number of floors: 6

Floor-to-floor height: 13ft

Window-to-wall ratio: 50%

## Table 3b: 15% Above Code Savings (Commercial – Electric Heating) for El Paso County

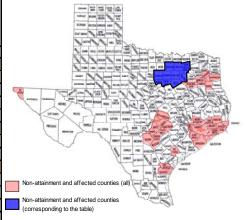




# Electric Heating (Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall and Tarrant Counties)

Description of Individual Measures

Individual Measures	Annual Energy Savings (%)	Annual Energy Savings (\$/year)	Annual Demand Savings (%)	Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)			ted Cost \$)	
A Envelope and Envestration Massaures						Margin	al Cost <sup>1</sup>	New System Cost <sup>2</sup>	
A Envelope and Fenestration Measures	44.00/	000.075	07.70/	00.040	207.017	005.400	0474.450		
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	14.3%	\$28,975	27.7%	\$6,042	\$35,017	\$95,130 -	\$174,150		
2 Lighting Load (1.3 to 1.0 w/sq-ft)	6.8%	\$13,731	3.3%	\$729	\$14,460	\$0 -	\$0		120
3 Occupancy Sensors Installation	11.8%	\$23,907	-6.5%	-\$1,416	\$22,491			\$26,500 - \$28,000	with a
4 Shading (none to 2.5 ft overhangs)	1.9%	\$3,792	2.3%	\$501	\$4,292			\$67,900 - \$110,000	4
B HVAC System Measures									
5 Cold Deck Reset	6.7%	\$13,580	6.4%	\$1,397	\$14,977	\$0 -	\$800		
6 Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.3%	\$2,643	1.4%	\$300	\$2,943	\$0 -	\$200		
C Plant Equipment Measures									
7 Chiller COP (4.9 to 6.1)	3.7%	\$7,419	3.5%	\$765	\$8,184	\$16,000 -	\$18,000		Non-attai
8 Boiler Efficiency (Not Aplicable)	n/a	n/a	n/a	n/a	n/a	n/a -	n/a		]
9 VSD on Chilled Water Pump (from Constant to VSD)	2.5%	\$5,030	1.0%	\$223	\$5,253	\$3,700 -	\$4,700		Non-attai (corresp
10 VSD on Hot Water Pump (from Constant to VSD)	1.9%	\$3,914	0.8%	\$172	\$4,086	\$4,000 -	\$5,000		(*******



Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Demand Savings (%)	Combined Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)	Combined Annual NOV			Simple Estimated Payback (yrs)	
						Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>			
Combination 1										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F) 2 Lighting Load (1.3 to 1.0 w/sq-ft)	23.1%	\$46,774	33.0%	\$7,185	\$53,959	\$95,130 - \$174,150 \$0 - \$0		601	1.16	2.0 - 3.7
Combination 2										
Occupancy Sensors Installation     Cold Deck Reset	20.1%	\$40,592	2.6%	\$569	\$41,162	\$0 - \$800	\$26,500 - \$28,000	521	1.34	0.7 - 0.7
Combination 3										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F) 7 Chiller COP (4.9 to 6.1)	17.9%	\$36,160	31.5%	\$6,855	\$43,015	\$95,130 - \$174,150 \$16,000 - \$18,000		465	0.81	3.1 - 5.3

#### Note

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- See individual measures above for specific savings
   \* Energy Cost: Electricity cost = \$0.119/kWh
   Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost for 12 months

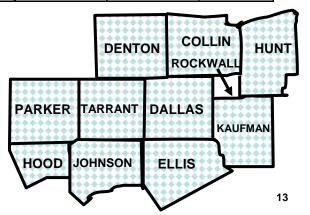
Natural gas cost = \$0.80/therm

#### (Building Description)

- Building type: Office
- Gross area: 89,340 sq-ft
- Building dimension: 122ft x 122ft x 78ft (WxLxH)
- Number of floors: 6
- Floor-to-floor height: 13ft
- Window-to-wall ratio: 50%

Table 4b: 15% Above Code Savings (Commercial – Electric Heating) for Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall and Tarrant Counties

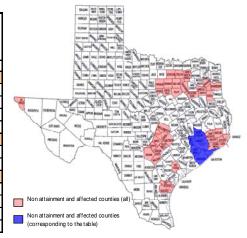




# Electric Heating (Brazoria, Fort Bend, Galveston, Harris, Montgomery and Waller Counties)

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings (%)	Annual Energy Savings (\$/year)	Annual Demand Savings (%)	Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)	(	ted Cost \$)
Α	Envelope and Fenestration Measures						Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	8.9%	\$17,184	22.6%	\$4,726	\$21,910	\$95,130 - \$174,150	
2	Lighting Load (1.3 to 1.0 w/sq-ft)	7.6%	\$14,774	2.6%	\$543	\$15,317	\$0 - \$0	
3	Occupancy Sensors Installation	14.7%	\$28,545	-7.0%	-\$1,468	\$27,078		\$26,500 - \$28,000
4	Shading (none to 2.5 ft overhangs)	2.0%	\$3,849	2.3%	\$471	\$4,321		\$67,900 - \$110,000
В	HVAC System Measures							
5	Cold Deck Reset	3.8%	\$7,412	5.9%	\$1,244	\$8,656	\$0 - \$800	
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.4%	\$2,616	1.4%	\$299	\$2,916	\$0 - \$200	
С	Plant Equipment Measures							
7	Chiller COP (4.9 to 6.1)	4.0%	\$7,717	3.7%	\$765	\$8,482	\$16,000 - \$18,000	
8	Boiler Efficiency (Not Aplicable)	n/a	n/a	n/a	n/a	n/a	n/a - n/a	
9	VSD on Chilled Water Pump (from Constant to VSD)	2.5%	\$4,764	1.0%	\$208	\$4,972	\$3,700 - \$4,700	
10	VSD on Hot Water Pump (from Constant to VSD)	2.0%	\$3,787	0.8%	\$172	\$3,960	\$4,000 - \$5,000	



escription of Combined Measures to Achieve 15% Above Code Savings

Description of Combined Measures to Achieve 15% Abov	e Code Saving	js								
Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Demand Savings (%)	Combined Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)	(	stimated Cost \$)	Combined Annual NOx Emissions Savings (lbs/year)	Combined Ozone Season Period NOx Emissions Savings (lbs/day)	Simple Estimated Payback (yrs)
						Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>			
Combination 1										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F) 2 Lighting Load (1.3 to 1.0 w/sg-ft)	18.5%	\$35,763	29.8%	\$6,237	\$42,000	\$95,130 - \$174,150 \$0 - \$0		341	1.08	2.7 - 4.9
Combination 2										
3 Occupancy Sensors Installation 5 Cold Deck Reset	19.8%	\$38,343	0.0%	\$5	\$38,348	\$0 - \$800	\$26,500 - \$28,000	366	1.36	0.7 - 0.8
Combination 3										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)						\$95,130 - \$174,150				
7 Chiller COP (4.9 to 6.1)	15.5%	\$30,066	27.7%	\$5,793	\$35,859	\$16,000 - \$18,000		287	0.90	4.0 - 6.7
9 VSD on Chilled Water Pump (from Constant to VSD)	15.5%	φ30,066	21.1%	φυ,/93	და <b>ა</b> ,გეყ	\$3,700 - \$4,700		201	0.90	4.0 - 6.7
10 VSD on Hot Water Pump (from Constant to VSD)						\$4.000 - \$5.000				1

#### Note:

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost for 12 months

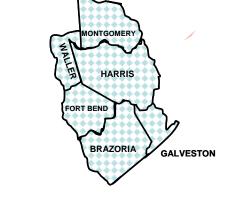
Natural gas cost = \$0.80/therm

### (Building Description)

- Building type: Office
- Gross area: 89,340 sq-ft
- Building dimension: 122ft x 122ft x 78ft (WxLxH)
- Number of floors: 6
- Floor-to-floor height: 13ft
- Window-to-wall ratio: 50%

Table 5b: 15% Above Code Savings (Commercial – Electric Heating) for Brazoria, Fort Bend, Galveston, Harris, Montgomery and Waller Counties

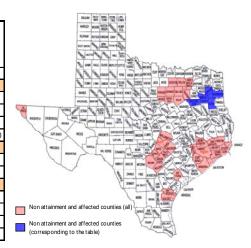




### Electric Heating (Gregg, Harrison, Henderson, Rusk, Smith and Upshur Counties)

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings (%)	Annual Energy Savings (\$/year)	Annual Demand Savings (%)	Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)		ted Cost \$) New System Cost <sup>2</sup>
Α	Envelope and Fenestration Measures						g	
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	11.7%	\$22,258	26.8%	\$5,596	\$27,854	\$95,130 - \$174,150	
2	Lighting Load (1.3 to 1.0 w/sq-ft)	6.6%	\$12,484	1.4%	\$285	\$12,769	\$0 - \$0	
3	Occupancy Sensors Installation	13.0%	\$24,749	-6.0%	-\$1,253	\$23,496		\$26,500 - \$28,000
4	Shading (none to 2.5 ft overhangs)	1.8%	\$3,431	1.6%	\$337	\$3,769		\$67,900 - \$110,000
В	HVAC System Measures							
5	Cold Deck Reset	5.6%	\$10,563	6.5%	\$1,364	\$11,927	\$0 - \$800	
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.5%	\$2,853	1.5%	\$316	\$3,169	\$0 - \$200	
С	Plant Equipment Measures							
7	Chiller COP (4.9 to 6.1)	3.5%	\$6,580	2.8%	\$581	\$7,161	\$16,000 - \$18,000	
8	Boiler Efficiency (Not Aplicable)	n/a	n/a	n/a	n/a	n/a	n/a - n/a	
9	VSD on Chilled Water Pump (from Constant to VSD)	2.4%	\$4,508	1.1%	\$235	\$4,743	\$3,700 - \$4,700	
10	VSD on Hot Water Pump (from Constant to VSD)	1.5%	\$2,823	0.5%	\$112	\$2,935	\$4,000 - \$5,000	



Description of Combined Measures to Achieve 15% Above Code Savings

Description of Combined Measures to Achieve 15% Abov	e Code Saving	3										
Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Demand Savings (%)	Combined Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)			(\$)		Combined Annual NOx Emissions Savings (lbs/year)	Combined Ozone Season Period NOx Emissions Savings (lbs/day)	Simple Estimated Payback (yrs)
		,,,	, ,	( , ,		Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>		, ,,			
Combination 1												
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F) 2 Lighting Load (1.3 to 1.0 w/sq-ft)	20.6%	\$39,107	34.1%	\$7,111	\$46,218	\$95,130 - \$174,150 \$0 - \$0		502	0.96	2.4 - 4.5		
Combination 2												
3 Occupancy Sensors Installation	20.7%	\$39,359	3.9%	\$805	\$40,164		\$26,500 - \$28,000	506	1.32	0.7 - 0.7		
5 Cold Deck Reset		* /		****	, .	\$0 - \$800			·			
Combination 3												
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	15.2%	\$28,873	30.6%	\$6,378	\$35,251	\$95,130 - \$174,150		371	0.62	3.8 - 6.7		
7 Chiller COP (4.9 to 6.1)	1	<b>\$_2,0,0</b>	22.070	\$2,070	755,20	\$16,000 - \$18,000			0.02	0		

#### Note:

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

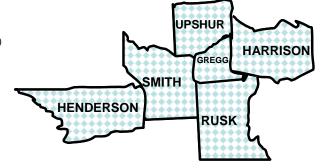
(Yearly demand cost = Sum of monthly demand cost for 12 months

Natural gas cost = \$0.80/therm

### (Building Description)

- Building type: Office
- Gross area: 89,340 sq-ft
- Building dimension: 122ft x 122ft x 78ft (WxLxH)
- Number of floors: 6
- Floor-to-floor height: 13ft
- Window-to-wall ratio: 50%

Table 6b: 15% Above Code Savings (Commercial – Electric Heating) for Gregg, Harrison, Henderson, Rusk, Smith and Upshur Counties

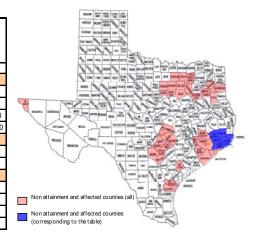




### **Electric Heating (Chambers, Hardin, Jefferson, Liberty and Orange Counties)**

Description of Individual Measures

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Annual Demand Savings	Annual Demand Savings	Combined Savings (Energy+Demand)			ted Cost \$)
		(%)	(\$/year)	(%)	(\$/year)	(\$/year)	Margi	nal Cost <sup>1</sup>	New System Cost <sup>2</sup>
Α	Envelope and Fenestration Measures								
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	8.2%	\$15,613	20.6%	\$4,108	\$19,721	\$95,130	- \$174,150	
2	Lighting Load (1.3 to 1.0 w/sq-ft)	8.0%	\$15,168	2.9%	\$574	\$15,741	\$0	- \$0	
3	Occupancy Sensors Installation	14.2%	\$26,991	-5.9%	-\$1,171	\$25,820			\$26,500 - \$28,000
4	Shading (none to 2.5 ft overhangs)	2.3%	\$4,276	2.0%	\$398	\$4,675			\$67,900 - \$110,000
В	HVAC System Measures						_	,	
5	Cold Deck Reset	3.9%	\$7,478	6.7%	\$1,333	\$8,811	\$0	- \$800	
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.4%	\$2,572	1.5%	\$293	\$2,866	\$0	- \$200	
С	Plant Equipment Measures						_	,	
7	Chiller COP (4.9 to 6.1)	4.1%	\$7,773	3.8%	\$767	\$8,540	\$16,000	- \$18,000	
8	Boiler Efficiency (Not Aplicable)	n/a	n/a	n/a	n/a	n/a	n/a	- n/a	
9	VSD on Chilled Water Pump (from Constant to VSD)	2.6%	\$4,849	1.1%	\$214	\$5,063	\$3,700	- \$4,700	
10	VSD on Hot Water Pump (from Constant to VSD)	1.3%	\$2,389	0.5%	\$95	\$2,484	\$4,000	- \$5,000	



HARDIN ORANGE

**JEFFERSOI** 

LIBERTY

Description of Combined Measures to Achieve 15% Above Code Savings

Description of Combined Measures to Achieve 15% Abov	e code Saving	s								
Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Demand Savings (%)	Combined Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)		stimated Cost \$)	Combined Annual NOx Emissions Savings (lbs/year)	Combined Ozone Season Period NOx Emissions Savings (lbs/day)	Simple Estimated Payback (yrs)
			, ,			Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>		` "	
Combination 1										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	17.6%	\$33,270	28.6%	\$5,709	\$38,979	\$95,130 - \$174,150		N/A	N/A	2.9 - 5.2
2 Lighting Load (1.3 to 1.0 w/sq-ft)	17.070	ψ00,210	20.070	φο,του	φου,515	\$0 - \$0		1471	1071	2.0 0.2
Combination 2										
3 Occupancy Sensors Installation	20.9%	\$39,589	3.9%	\$785	\$40,375		\$26,500 - \$28,000	N/A	N/A	0.7 - 0.7
5 Cold Deck Reset	20.570	ψ00,000	0.570	φιοσ	ψ+0,070	\$0 - \$800		1071	1071	0.7
Combination 3										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)						\$95,130 - \$174,150				
4 Shading (none to 2.5 ft overhangs)	40.00/	COO 704	07.00/	<b>65 500</b>	@00.040		\$67,900 - \$110,000	N/A	NI/A	0.0 40.0
7 Chiller COP (4.9 to 6.1)	16.2%	\$30,704	27.6%	\$5,506	\$36,210	\$16,000 - \$18,000		N/A	N/A	6.0 - 10.0
9 VSD on Chilled Water Pump (from Constant to VSD)	1	1				\$3,700 - \$4,700				

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost for 12 months

### (Building Description)

- Building type: Office
- Gross area: 89,340 sq-ft
- Building dimension: 122ft x 122ft x 78ft (WxLxH)
- Number of floors: 6
- Floor-to-floor height: 13ft
- Window-to-wall ratio: 50%

Heating) for Chambers, Hardin, Jefferson, Liberty and Orange

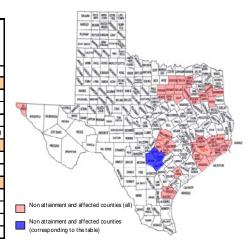




### **Electric Heating (Bexar, Comal, Guadalupe and Wilson Counties)**

### **Description of Individual Measures**

	Individual Measures	Annual Energy Savings (%)	Annual Energy Savings (\$/year)	Annual Demand Savings (%)	Annual Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)		(	ed Cost
Α	Envelope and Fenestration Measures						warg	inal Cost <sup>1</sup>	New System Cost <sup>2</sup>
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	9.7%	\$18,753	22.8%	\$4,701	\$23,454	\$95,130	- \$174,150	
2	Lighting Load (1.3 to 1.0 w/sq-ft)	7.4%	\$14,331	3.6%	\$733	\$15,064	\$0	- \$0	
3	Occupancy Sensors Installation	14.3%	\$27,529	-5.6%	-\$1,146	\$26,383			\$26,500 - \$28,000
4	Shading (none to 2.5 ft overhangs)	1.8%	\$3,455	2.0%	\$422	\$3,877			\$67,900 - \$110,000
В	HVAC System Measures								
5	Cold Deck Reset	4.0%	\$7,734	7.2%	\$1,486	\$9,220	\$0	- \$800	
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.4%	\$2,732	1.5%	\$315	\$3,047	\$0	- \$200	
С	Plant Equipment Measures								
7	Chiller COP (4.9 to 6.1)	4.1%	\$7,885	3.7%	\$765	\$8,650	\$16,000	- \$18,000	
8	Boiler Efficiency (Not Aplicable)	n/a	n/a	n/a	n/a	n/a	n/a	- n/a	
9	VSD on Chilled Water Pump (from Constant to VSD)	2.5%	\$4,869	1.0%	\$215	\$5,084	\$3,700	- \$4,700	
10	VSD on Hot Water Pump (from Constant to VSD)	1.3%	\$2,561	0.5%	\$106	\$2,666	\$4,000	- \$5,000	



Description of Combined Measures to Achieve 15% Above Code Savings

Description of Combined Measures to Achieve 15% Abov	e code Saving	3								
Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Demand Savings (%)	Combined Demand Savings (\$/year)	Combined Savings (Energy+Demand) (\$/year)	(9	stimated Cost \$)	Combined Annual NOx Emissions Savings (lbs/year)	Combined Ozone Season Period NOx Emissions Savings (lbs/day)	Simple Estimated Payback (yrs)
						Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>			
Combination 1										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F) 2 Lighting Load (1.3 to 1.0 w/sq-ft)	18.8%	\$36,294	29.8%	\$6,140	\$42,434	\$95,130 - \$174,150 \$0 - \$0		470	1.06	2.6 - 4.8
Combination 2						,				
3 Occupancy Sensors Installation 5 Cold Deck Reset	20.3%	\$39,230	2.8%	\$584	\$39,814	\$0 - \$800	\$26,500 - \$28,000	508	1.28	0.7 - 0.7
Combination 3										
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F) 7 Chiller COP (4.9 to 6.1)	15.6%	\$30,168	27.7%	\$5,720	\$35,888	\$95,130 - \$174,150 \$16,000 - \$18,000		391	0.87	3.8 - 6.5
9 VSD on Chilled Water Pump (from Constant to VSD)	1	. , ,				\$3,700 - \$4,700				

#### Note:

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings

  \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost

for 12 months

Natural gas cost = \$0.80/therm

### (Building Description)

Building type: Office

Gross area: 89,340 sq-ft

Building dimension: 122ft x 122ft x 78ft (WxLxH)

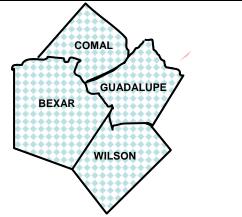
Number of floors: 6

Floor-to-floor height: 13ft

Window-to-wall ratio: 50%

## Table 8b: 15% Above Code Savings (Commercial – Electric Heating) for Bexar, Comal, Guadalupe and Wilson Counties

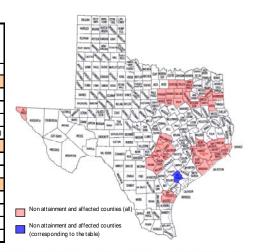




## **Electric Heating (Victoria County)**

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Annual Demand Savings	Annual Demand Savings	Combined Savings (Energy+Demand) (\$/year)			ted Cost \$)
		(%)	(\$/year)	(%)	(\$/year)	(1)	Margin	al Cost <sup>1</sup>	New System Cost <sup>2</sup>
Α	Envelope and Fenestration Measures								
1	Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	7.8%	\$14,873	22.0%	\$4,453	\$19,326	\$95,130	- \$174,150	
2	Lighting Load (1.3 to 1.0 w/sq-ft)	8.4%	\$15,980	3.9%	\$791	\$16,772	\$0	- \$0	
3	Occupancy Sensors Installation	15.7%	\$29,680	-5.7%	-\$1,154	\$28,526			\$26,500 - \$28,000
4	Shading (none to 2.5 ft overhangs)	2.2%	\$4,137	2.5%	\$499	\$4,635			\$67,900 - \$110,000
В	HVAC System Measures								
5	Cold Deck Reset	2.8%	\$5,383	6.6%	\$1,346	\$6,729	\$0	- \$800	
6	Supply Fan Total Pressure (2.5 to 1.5 in-H2O)	1.4%	\$2,708	1.5%	\$301	\$3,009	\$0	- \$200	
С	Plant Equipment Measures								
7	Chiller COP (4.9 to 6.1)	4.2%	\$8,021	3.9%	\$799	\$8,820	\$16,000	- \$18,000	
8	Boiler Efficiency (Not Aplicable)	n/a	n/a	n/a	n/a	n/a	n/a	- n/a	
9	VSD on Chilled Water Pump (from Constant to VSD)	2.5%	\$4,804	1.1%	\$218	\$5,022	\$3,700	- \$4,700	
10	VSD on Hot Water Pump (from Constant to VSD)	1.5%	\$2,899	0.6%	\$127	\$3,026	\$4,000	- \$5,000	



**VICTORIA** 

Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings	Combined Demand Savings	Combined Demand Savings	Combined Savings (Energy+Demand) (\$/year)			(\$)		Combined Annual NOx Emissions Savings (Ibs/year)	Combined Ozone Season Period NOx Emissions Savings	Simple Estimated Payback (yrs)
	(%)	(\$/year)	(%)	(\$/year)	(4/304.)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	(iso/you/)	(lbs/day)			
Combination 1												
1 Glazing U Factor (1.22 to 0.45 Btu/hr-sf-F)	17.6%	\$33,449	29.8%	\$6,047	\$39,497	\$95,130 - \$174,150		315	0.88	2.8 - 5.2		
2 Lighting Load (1.3 to 1.0 w/sq-ft)	17.070	ψ55,445	23.070	Ψ0,047	ψ03,431	\$0 - \$0		313	0.00	2.0 - 3.2		
Combination 2												
Occupancy Sensors Installation	20.8%	\$39,431	3.6%	\$736	\$40,167		\$26,500 - \$28,000	372	1.04	0.7 - 0.7		
5 Cold Deck Reset	20.676	φυσ,4υ1	3.076	\$730	φ40,107	\$0 - \$800		372	1.04	0.7 - 0.7		
Combination 3												
2 Lighting Load (1.3 to 1.0 w/sq-ft)						\$0 - \$0						
5 Cold Deck Reset	18.1%	\$34,324	16.1%	\$3,256	\$37,579	\$0 - \$800		324	0.01	0.57 - 0.68		
7 Chiller COP (4.9 to 6.1)	10.1%	<b>Ф</b> 34,324	10.1%	<b>ФЭ,200</b>	\$31,579	\$16,000 - \$18,000		324	0.91	0.07 - 0.08		
9 VSD on Chilled Water Pump (from Constant to VSD)	1		1	1		\$3,700 - \$4,700						

#### Note:

- 1. Marginal cost = new system cost original system cost
- 2. New system cost = new system cost only
- 3. See individual measures above for specific savings \* Energy Cost: Electricity cost = \$0.119/kWh

Demand cost = \$5.00/kW

(Yearly demand cost = Sum of monthly demand cost for 12 months

Natural gas cost = \$0.80/therm

### (Building Description)

Building type: Office

Gross area: 89,340 sq-ft

Building dimension: 122ft x 122ft x 78ft (WxLxH)

Number of floors: 6

Floor-to-floor height: 13ft

Window-to-wall ratio: 50%

### Table 9b: 15% Above Code Savings (Commercial – Electric **Heating) for Victoria County**



