

### **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 Residential 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 residential 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 the 2001 IECC. These measures include envelope, HVAC systems, and plant equipment. Annual energy savings, estimated costs, simple payback, and NOx emissions reductions are provided for commercial buildings.

Sincerely,

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

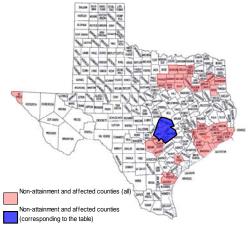
Charles C. Culp, Ph.D., P.E. Associate Director

Bahman L. Yazdani, P.E. Associate Director

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

Description of Individual Measures

Des	cription of Individual Measures					
	Individual Measures	Annual Energy Savings	Annual Energy Savings		ted Cost \$)	SOLDHI SECO COLUMN COLU
		(%)	(\$/year) <sup>4</sup>	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	CO/ DATE TO 300 STATE TO 10 ST
Α	Domestic Hot Water Measures					THE MAN WAS ADD MOUNTS OF
1	Tankless Gas Water Heater (without a Standing Pilot Light)	9.0%	\$73	\$1,000 - \$3,500		Joseph Complete co
2	Solar Domestic Hot Water System	16.9%	\$91		\$2,900 - \$5,200	COMES
3	Removal of Pilot Light from Domestic Hot Water System	5.3%	\$43	\$200 - \$600		100 mm & 1 mm 200
В	Air Distribution System Measures					ADM OF THE BY ON OF
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	8.4%	\$216	\$1,000 - \$7,000		RECORDS CORRECON ACCES COM LANCE RECORD FOR COM
5	Improved Duct Sealing (10% to 5% Duct Leakage)	4.1%	\$109		\$450 - \$650	ETT DATE ACCE DECORT SCHOOLS WITH
С	Envelope and Fenestration Measures					MEDIO UNICL IN STREET TRANSPORT
6	Reduced Air Infiltration (0.46 to 0.35 Air-changes/hr)	2.3%	\$34		\$350 - \$1,500	MOSTA CHARGE NO
7	Window Shading (None to 4 ft. Eaves on All Sides)	2.1%	\$139		\$3,100 - \$3,500	( ) m
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	4.0%	\$167		\$3,100 - \$3,500	8 30
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	2.6%	\$104	\$800 - \$1,100		Non-attainment and affected counties (all
D	HVAC System Measures					Ton diament and arrested countes (an
10	Air Conditioner (SEER 13 to SEER 15)	2.7%	\$98	\$900 - \$2,500		Non-attainment and affected counties
11	Furnace (0.78 AFUE to 0.93 AFUE)	2.2%	\$18	\$600 - \$1,500		(corresponding to the table)



Description of Combined Measures to Achieve 15% Above Code Savings

Description of Combined Measures to Achieve 15% Above Code Savings	11				Combined Annual		
	Combined	Combined	Combined E	Combined Estimated Cost (\$)		Combined Ozone	
015		Energy Savings	(			Season Period NO <sub>x</sub>	Simple Estimated
Combination of Measures <sup>3</sup>	Energy Savings (%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (lbs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
1 Tankless Gas Water Heater (without a Standing Pilot Light)	17.4%	\$289	\$1,000 - \$3,500		2.83	0.016	6.9 - 36.4
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	17.476	\$209	\$1,000 - \$7,000		2.03		
Combination 2							
2 Solar Domestic Hot Water System	21.0%	\$201		\$2,900 - \$5,200	1.10	0.010	16.7 - 29.2
5 Improved Duct Sealing (10% to 5% Duct Leakage)	21.076	\$201		\$450 - \$650	1.10	0.010	
Combination 3							
3 Removal of Pilot Light from Domestic Hot Water System			\$200 - \$600				
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	16.9%	\$393	\$1,000 - \$7,000		3.92	0.023	10.9 - 28.2
8 Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	10.9%	ψυθυ		\$3,100 - \$3,500	5.92		

- 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

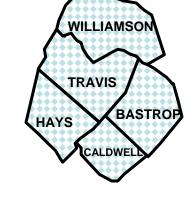
4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1 \* Floor-to-floor height: 8ft
- \* Window-to-wall ratio: 18%

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

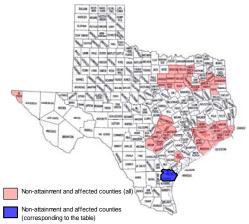




### **Natural Gas Heating (Nueces and San Patricio Counties)**

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings	Annual Energy Savings		ted Cost \$)	
	muviduai measures	(%)	(\$/year) <sup>4</sup>	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	
Α	Domestic Hot Water Measures					Ī
1	Tankless Gas Water Heater (without a Standing Pilot Light)	9.0%	\$69	\$1,000 - \$3,500		1
2	Solar Domestic Hot Water System	14.8%	\$67		\$2,900 - \$5,200	1
3	Removal of Pilot Light from Domestic Hot Water System	5.7%	\$43	\$200 - \$600		1
В	Air Distribution System Measures					1
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	9.3%	\$293	\$1,000 - \$7,000		1
5	Improved Duct Sealing (10% to 5% Duct Leakage)	5.0%	\$160		\$450 - \$650	]
С	Envelope and Fenestration Measures					
6	Reduced Air Infiltration (0.49 to 0.35 Air-changes/hr)	2.5%	\$58		\$350 - \$1,500	]
7	Window Shading (None to 4 ft. Eaves on All Sides)	3.8%	\$154		\$3,100 - \$3,500	]
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	4.9%	\$175		\$3,100 - \$3,500	
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	3.3%	\$113	\$800 - \$1,100		]
D	HVAC System Measures					l
10	Air Conditioner (SEER 13 to SEER 15)	3.6%	\$123	\$900 - \$2,500		] [
11	Furnace (0.78 AFUE to 0.93 AFUE)	0.6%	\$5	\$600 - \$1,500		l



SAN PATRICIO

**NUECES** 

Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings	Combined Estimated Cost (\$)		Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of Measures	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (Ibs/year)	Emissions Savings (Ibs/day)	Payback (yrs)
Combination 1							
1 Tankless Gas Water Heater (without a Standing Pilot Light)	18.3%	\$362	\$1,000 - \$3,500		2.84	0.016	5.5 - 29.0
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	10.370	ψ30Z	\$1,000 - \$7,000		2.04		5.5 - 25.0
Combination 2							
2 Solar Domestic Hot Water System				\$2,900 - \$5,200		0.015	12.9 - 25.3
5 Improved Duct Sealing (10% to 5% Duct Leakage)	22.9%	\$329		\$450 - \$650	1.97		
10 Air Conditioner (SEER 13 to SEER 15)			\$900 - \$2,500				
Combination 3							
3 Removal of Pilot Light from Domestic Hot Water System			\$200 - \$600		2.93		
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	16.8%	\$378	\$1,000 - \$7,000			0.018	4.1 - 24.1
6 Reduced Air Infiltration (0.49 to 0.35 Air-changes/hr)				\$350 - \$1,500			

### 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
  \* Floor-to-floor height: 8ft
- \* Window-to-wall ratio: 18%



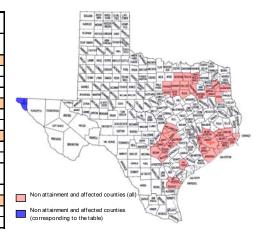




### **Natural Gas Heating (El Paso)**

### **Description of Individual Measures**

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Estimated Cost (\$)		
	muvida measures	(%)	(\$/year) <sup>4</sup>	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	
Α	Domestic Hot Water Measures					
1	Tankless Gas Water Heater (without a Standing Pilot Light)	10.3%	\$79	\$1,000 - \$3,500		
2	Solar Domestic Hot Water System	23.0%	\$130		\$2,900 - \$5,200	
3	Removal of Pilot Light from Domestic Hot Water System	5.7%	\$44	\$200 - \$600		
В	Air Distribution System Measures					
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	5.2%	\$104	\$1,000 - \$7,000		
5	Improved Duct Sealing (10% to 5% Duct Leakage)	2.3%	\$46		\$450 - \$650	
С	Envelope and Fenestration Measures					
6	Reduced Air Infiltration (0.43 to 0.35 Air-changes/hr)	1.4%	\$12		\$350 - \$1,500	
7	Window Shading (None to 4 ft. Eaves on All Sides)	1.0%	\$121		\$3,100 - \$3,500	
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	4.2%	\$165		\$3,100 - \$3,500	
9	Improved Windows (U-factor: 0.44 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	0.1%	\$75	\$800 - \$1,100		
D	HVAC System Measures					
10	Air Conditioner (SEER 13 to SEER 15)	2.1%	\$72	\$900 - \$2,500		
11	Furnace (0.78 AFUE to 0.93 AFUE)	2.0%	\$15	\$600 - \$1,500		



**EL PASO** 

Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings	Combined E	Combined Estimated Cost (\$)		Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of Measures	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (lbs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
1 Tankless Gas Water Heater (without a Standing Pilot Light)	15.5%	\$183	\$1,000 - \$3,500		0.92	0.002	10.9 - 57.3
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	13.370	Ψ105	\$1,000 - \$7,000		0.32	0.002	
Combination 2							
2 Solar Domestic Hot Water System	23.0%	\$130		\$2,900 - \$5,200	0.00	0.005	25.7 - 44.9
5 Improved Duct Sealing (10% to 5% Duct Leakage)	25.070	Ψ130		\$450 - \$650	0.00		
Combination 3							
3 Removal of Pilot Light from Domestic Hot Water System			\$200 - \$600				
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space			\$1,000 - \$7,000				
6 Reduced Air Infiltration (0.43 to 0.35 Air-changes/hr)	17.1%	\$349		\$350 - \$1,500	0.62	0.001	15.9 - 43.3
Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	17.176	ψ349		\$3,100 - \$3,500	0.02	0.001	10.5 - 40.5
10 Air Conditioner (SEER 13 to SEER 15)			\$900 - \$2,500				

### 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
  \* Floor-to-floor height: 8ft
- \* Window-to-wall ratio: 18%

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

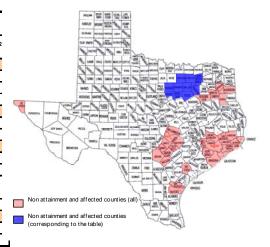




# Natural Gas Heating (Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall and Tarrant Counties)

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings	Annual Energy Savings		Estimated Cost (\$)		
	murrida incasures	(%)	(\$/year) <sup>4</sup>	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>		
Α	Domestic Hot Water Measures						
1	Tankless Gas Water Heater (without a Standing Pilot Light)	8.8%	\$78	\$1,000 - \$3,500			
2	Solar Domestic Hot Water System	16.7%	\$100		\$2,900 - \$5,200		
3	Removal of Pilot Light from Domestic Hot Water System	4.9%	\$43	\$200 - \$600			
В	Air Distribution System Measures						
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	9.0%	\$208	\$1,000 - \$7,000			
5	Improved Duct Sealing (10% to 5% Duct Leakage)	4.4%	\$105		\$450 - \$650		
С	Envelope and Fenestration Measures						
6	Reduced Air Infiltration (0.51 to 0.35 Air-changes/hr)	4.1%	\$54		\$350 - \$1,500		
7	Window Shading (None to 4 ft. Eaves on All Sides)	0.3%	\$112		\$3,100 - \$3,500		
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	3.2%	\$155		\$3,100 - \$3,500		
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	1.6%	\$88	\$800 - \$1,100			
D	HVAC System Measures						
10	Air Conditioner (SEER 13 to SEER 15)	2.2%	\$84	\$900 - \$2,500			
11	Furnace (0.78 AFUE to 0.93 AFUE)	3.4%	\$30	\$600 - \$1,500			



Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings	Combined E	stimated Cost \$)	Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of Measures	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (lbs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
Tankless Gas Water Heater (without a Standing Pilot Light)	17.8%	\$286	\$1,000 - \$3,500		2.79	0.017	7.0 - 36.8
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	17.076	Ψ200	\$1,000 - \$7,000		2.19	0.017	7.0 - 30.0
Combination 2							
2 Solar Domestic Hot Water System	21.2%	\$205		\$2,900 - \$5,200	1.05	0.010	16.3 - 28.5
5 Improved Duct Sealing (10% to 5% Duct Leakage)	21.270	\$200		\$450 - \$650	1.00	0.010	
Combination 3							
3 Removal of Pilot Light from Domestic Hot Water System			\$200 - \$600				
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	17.1%	\$293	\$1,000 - \$7,000		2.87	0.018	5.3 - 31.1
6 Reduced Air Infiltration (0.51 to 0.35 Air-changes/hr)	1			\$350 - \$1,500			

### 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 = \$0.15/kWh
    - Natural gas cost = \$1.00/therm

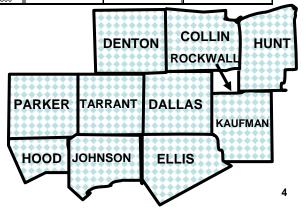
4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
- \* Floor-to-floor height: 8ft
- \* Window-to-wall ratio: 18%

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

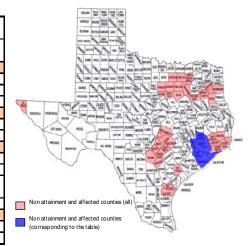




# Natural Gas Heating (Brazoria, Fort Bend, Galveston, Harris, Montgomery and Waller Counties)

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Estimated Cost (\$)		
	marriada medadres	(%)	(\$/year) <sup>4</sup>	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	
Α	Domestic Hot Water Measures					
1	Tankless Gas Water Heater (without a Standing Pilot Light)	9.3%	\$73	\$1,000 - \$3,500		
2	Solar Domestic Hot Water System	15.2%	\$74		\$2,900 - \$5,200	
3	Removal of Pilot Light from Domestic Hot Water System	5.5%	\$43	\$200 - \$600		
В	Air Distribution System Measures					
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	8.5%	\$221	\$1,000 - \$7,000		
5	Improved Duct Sealing (10% to 5% Duct Leakage)	4.3%	\$117		\$450 - \$650	
С	Envelope and Fenestration Measures					
6	Reduced Air Infiltration (0.46 to 0.35 Air-changes/hr)	2.1%	\$35		\$350 - \$1,500	
7	Window Shading (None to 4 ft. Eaves on All Sides)	2.1%	\$128		\$3,100 - \$3,500	
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	3.6%	\$152		\$3,100 - \$3,500	
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	2.6%	\$97	\$800 - \$1,100		
D	HVAC System Measures					
10	Air Conditioner (SEER 13 to SEER 15)	2.7%	\$93	\$900 - \$2,500		
11	Furnace (0.78 AFUE to 0.93 AFUE)	1.9%	\$15	\$600 - \$1,500		



Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined gs Energy Savings (\$/year)	Combined Estimated Cost (\$)		Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of Measures	(%)		Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (lbs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
1 Tankless Gas Water Heater (without a Standing Pilot Light)	17.8%	\$295	\$1,000 - \$3,500		2.39	0.018	6.8 - 35.7
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space			\$1,000 - \$7,000		2.39		
Combination 2							
2 Solar Domestic Hot Water System				\$2,900 - \$5,200		0.011	15.8 - 31.0
5 Improved Duct Sealing (10% to 5% Duct Leakage)	21.8%	\$269		\$450 - \$650	1.50		
10 Air Conditioner (SEER 13 to SEER 15)			\$900 - \$2,500				
Combination 3							
3 Removal of Pilot Light from Domestic Hot Water System			\$200 - \$600				
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	16.8%	\$383	\$1,000 - \$7,000		2.99	0.025	11.2 - 29.0
Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	10.0%	φοσο		\$3,100 - \$3,500	2.99		

### 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
  \* Floor-to-floor height: 8ft
- \* Window-to-wall ratio: 18%

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

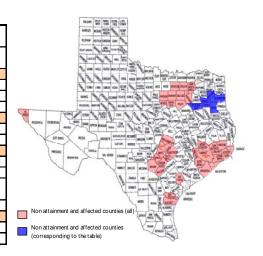




### Natural Gas Heating (Gregg, Harrison, Henderson, Rusk, Smith and Upshur Counties)

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Estimated Cost (\$)		
	muividuai measures	(%)	(\$/year) <sup>4</sup>	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	
Α	Domestic Hot Water Measures					
1	Tankless Gas Water Heater (without a Standing Pilot Light)	9.5%	\$76	\$1,000 - \$3,500		
2	Solar Domestic Hot Water System	16.7%	\$87		\$2,900 - \$5,200	
3	Removal of Pilot Light from Domestic Hot Water System	5.4%	\$43	\$200 - \$600		
В	Air Distribution System Measures					
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	8.7%	\$225	\$1,000 - \$7,000		
5	Improved Duct Sealing (10% to 5% Duct Leakage)	4.4%	\$118		\$450 - \$650	
С	Envelope and Fenestration Measures					
6	Reduced Air Infiltration (0.51 to 0.35 Air-changes/hr)	2.7%	\$40		\$350 - \$1,500	
7	Window Shading (None to 4 ft. Eaves on All Sides)	1.8%	\$129		\$3,100 - \$3,500	
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	3.9%	\$159		\$3,100 - \$3,500	
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	2.4%	\$95	\$800 - \$1,100		
D	HVAC System Measures					
10	Air Conditioner (SEER 13 to SEER 15)	2.5%	\$89	\$900 - \$2,500		
11	Furnace (0.78 AFUE to 0.93 AFUE)	2.2%	\$17	\$600 - \$1,500		



Description of Combined Measures to Achieve 159/ Above Code Soving

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings (\$/year)	Combined Estimated Cost (\$)		Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of Measures	(%)		Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (lbs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
1 Tankless Gas Water Heater (without a Standing Pilot Light)	18.2%	\$301	\$1,000 - \$3,500		2.96	0.018	6.7 - 34.9
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	10.2 //	φουτ	\$1,000 - \$7,000		2.90	0.016	0.7 - 34.9
Combination 2							
2 Solar Domestic Hot Water System	21.1%	\$205		\$2,900 - \$5,200	1.19	0.011	16.3 - 28.5
5 Improved Duct Sealing (10% to 5% Duct Leakage)	21.170	\$205		\$450 - \$650	1.19		
Combination 3							
3 Removal of Pilot Light from Domestic Hot Water System			\$200 - \$600				
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space			\$1,000 - \$7,000				
6 Reduced Air Infiltration (0.51 to 0.35 Air-changes/hr)	19.2%	\$419		\$350 - \$1,500	4.20	0.025	11.1 - 30.1
Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)				\$3,100 - \$3,500			1

- 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 = \$0.15/kWh

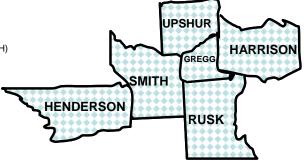
Natural gas cost = \$1.00/therm

4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
- \* Floor-to-floor height: 8ft
- \* Window-to-wall ratio: 18%

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

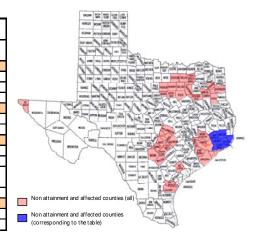




## Natural Gas Heating (Chambers, Hardin, Jefferson, Liberty and Orange Counties) 8-02

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Estimated Cost (\$)	
	marvada measures	(%)	(\$/year) <sup>4</sup>	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>
Α	Domestic Hot Water Measures				
1	Tankless Gas Water Heater (without a Standing Pilot Light)	9.5%	\$74	\$1,000 - \$3,500	
2	Solar Domestic Hot Water System	15.9%	\$78		\$2,900 - \$5,200
3	Removal of Pilot Light from Domestic Hot Water System	5.6%	\$44	\$200 - \$600	
В	Air Distribution System Measures				
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	8.5%	\$232	\$1,000 - \$7,000	
5	Improved Duct Sealing (10% to 5% Duct Leakage)	4.4%	\$125		\$450 - \$650
С	Envelope and Fenestration Measures				
6	Reduced Air Infiltration (0.45 to 0.35 Air-changes/hr)	2.3%	\$36		\$350 - \$1,500
7	Window Shading (None to 4 ft. Eaves on All Sides)	2.1%	\$129		\$3,100 - \$3,500
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	3.9%	\$160		\$3,100 - \$3,500
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	2.5%	\$96	\$800 - \$1,100	
D	HVAC System Measures				
10	Air Conditioner (SEER 13 to SEER 15)	2.7%	\$93	\$900 - \$2,500	
11	Furnace (0.78 AFUE to 0.93 AFUE)	1.7%	\$14	\$600 - \$1,500	



Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings (\$/year)	Combined E	stimated Cost (\$)	Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of Measures	(%)		Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (lbs/year)	Emissions Savings (Ibs/day)	Payback (yrs)
Combination 1							
1 Tankless Gas Water Heater (without a Standing Pilot Light)	18.0%	\$306	\$1,000 - \$3,500		0.85	0.002	6.5 - 34.3
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	10.076	φουσ	\$1,000 - \$7,000		0.00	0.002	
Combination 2							
2 Solar Domestic Hot Water System				\$2,900 - \$5,200		0.004	15.2 - 29.8
5 Improved Duct Sealing (10% to 5% Duct Leakage)	22.6%	\$280		\$450 - \$650	0.07		
10 Air Conditioner (SEER 13 to SEER 15)			\$900 - \$2,500				
Combination 3							
3 Removal of Pilot Light from Domestic Hot Water System			\$200 - \$600				
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	17.0%	\$397	\$1,000 - \$7,000		0.51	0.001	10.8 - 28.0
8 Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	17.0%			\$3,100 - \$3,500			

### 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

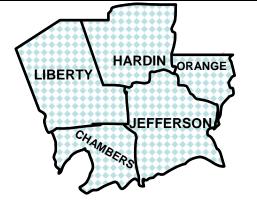
4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
- \* Floor-to-floor height: 8ft
- \* Window-to-wall ratio: 18%

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

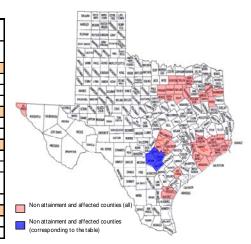




## Natural Gas Heating (Bexar, Comal, Guadalupe and Wilson Counties)<sub>SL-TR-07-08-02</sub>

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Estimated Cost (\$)	
	muividual Measures	(%)	(\$/year) <sup>4</sup>	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>
Α	Domestic Hot Water Measures				
1	Tankless Gas Water Heater (without a Standing Pilot Light)	9.2%	\$73	\$1,000 - \$3,500	
2	Solar Domestic Hot Water System	17.4%	\$92		\$2,900 - \$5,200
3	Removal of Pilot Light from Domestic Hot Water System	5.5%	\$43	\$200 - \$600	
В	Air Distribution System Measures				
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	8.1%	\$212	\$1,000 - \$7,000	
5	Improved Duct Sealing (10% to 5% Duct Leakage)	4.0%	\$108		\$450 - \$650
С	Envelope and Fenestration Measures				
6	Reduced Air Infiltration (0.47 to 0.35 Air-changes/hr)	2.3%	\$36		\$350 - \$1,500
7	Window Shading (None to 4 ft. Eaves on All Sides)	2.4%	\$140		\$3,100 - \$3,500
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	4.0%	\$165		\$3,100 - \$3,500
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	2.8%	\$104	\$800 - \$1,100	
D	HVAC System Measures				
10	Air Conditioner (SEER 13 to SEER 15)	2.8%	\$98	\$900 - \$2,500	
11	Furnace (0.78 AFUE to 0.93 AFUE)	1.9%	\$15	\$600 - \$1,500	



Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings	Combined Estimated Cost (\$)		Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of Measures	(%)	0, 0 0, 0		New System Cost <sup>2</sup>	Savings (lbs/year)	Emissions Savings (Ibs/day)	Payback (yrs)
Combination 1							
Tankless Gas Water Heater (without a Standing Pilot Light)	17.3%	\$285	\$1,000 - \$3,500		2.83	0.016	7.0 - 36.8
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	17.576	Ψ <b>2</b> 00	\$1,000 - \$7,000		2.05		
Combination 2							
2 Solar Domestic Hot Water System	21.5%	\$201		\$2,900 - \$5,200	1.10	0.010	16.7 - 29.1
5 Improved Duct Sealing (10% to 5% Duct Leakage)	21.576	Ψ201		\$450 - \$650	1.10	0.010	
Combination 3							
3 Removal of Pilot Light from Domestic Hot Water System			\$200 - \$600				
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	16.7%	\$387	\$1,000 - \$7,000		3.91	0.022	11.1 - 28.7
8 Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	10.7 /6	\$3,100 - \$3,500		0.022	11.1 - 20.7		

### 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

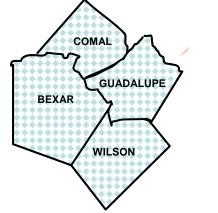
4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
  \* Floor-to-floor height: 8ft
- \* Window-to-wall ratio: 18%

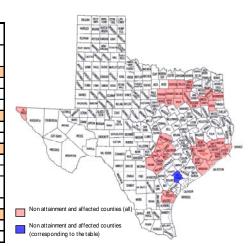
Table 8a: 15% Above Code Savings (Residential – Natural Gas Heating) for Bexar, Comal, Guadalupe and Wilson Counties





### **Description of Individual Measures**

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Estimated Cost (\$)		
	marvada measures	(%)	(\$/year) <sup>4</sup>	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	
Α	Domestic Hot Water Measures					
1	Tankless Gas Water Heater (without a Standing Pilot Light)	9.3%	\$71	\$1,000 - \$3,500		
2	Solar Domestic Hot Water System	15.9%	\$76		\$2,900 - \$5,200	
3	Removal of Pilot Light from Domestic Hot Water System	5.7%	\$44	\$200 - \$600		
В	Air Distribution System Measures					
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	8.3%	\$237	\$1,000 - \$7,000		
5	Improved Duct Sealing (10% to 5% Duct Leakage)	4.3%	\$125		\$450 - \$650	
С	Envelope and Fenestration Measures					
6	Reduced Air Infiltration (0.49 to 0.35 Air-changes/hr)	2.5%	\$46		\$350 - \$1,500	
7	Window Shading (None to 4 ft. Eaves on All Sides)	3.0%	\$143		\$3,100 - \$3,500	
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	4.3%	\$166		\$3,100 - \$3,500	
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	2.9%	\$105	\$800 - \$1,100		
D	HVAC System Measures					
10	Air Conditioner (SEER 13 to SEER 15)	3.1%	\$104	\$900 - \$2,500		
11	Furnace (0.78 AFUE to 0.93 AFUE)	1.1%	\$9	\$600 - \$1,500		



Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings (\$/year)	Combined E	stimated Cost (\$)	Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of measures	(%)		Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (lbs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
1 Tankless Gas Water Heater (without a Standing Pilot Light)	17.6%	\$308	\$1,000 - \$3,500		2.44	0.015	6.5 - 34.1
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	17.0%	\$306	\$1,000 - \$7,000		2.44		
Combination 2							
2 Solar Domestic Hot Water System				\$2,900 - \$5,200		0.014	14.6 - 28.8
5 Improved Duct Sealing (10% to 5% Duct Leakage)	23.0%	\$290		\$450 - \$650	1.60		
10 Air Conditioner (SEER 13 to SEER 15)			\$900 - \$2,500				
Combination 3							
3 Removal of Pilot Light from Domestic Hot Water System			\$200 - \$600				
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	17.3%	\$410	\$1,000 - \$7,000		3.16	0.020	10.5 - 27.1
8 Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	17.5%	φ <del>4</del> IU		\$3,100 - \$3,500		0.020	

### 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
  \* Floor-to-floor height: 8ft

\* Window-to-wall ratio: 18%

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





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

### **Description of Individual Measures**

	Individual Measures	Annual Energy Savings	0,		ted Cost (\$)	94.00 (95) (95) (95) (25) (25) (25) (15) (15) (15) (15) (15) (15) (15) (1
	mandaa maada oo	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	The course of th
Α	Domestic Hot Water Measures					Promise and type mentance constitutions of the constitution of the constitutions of the const
1	Tankless Electric Water Heater	1.5%	\$43	\$700 - \$1,400		THE CHI CHI CHICA COL
2	Solar Domestic Hot Water System	12.2%	\$350		\$2,900 - \$5,200	CALL OF THE PARTY
В	Air Distribution System Measures					And I want I wan
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	7.5%	\$216	\$1,000 - \$7,000		SCORES CHRESH AND SEASON AND SEAS
5	Improved Duct Sealing (10% to 5% Duct Leakage)	4.5%	\$127		\$450 - \$650	EXT BASS MICOL SCHOOL SCHOOL SHOOL SAND SAND SAND SAND SAND SAND SAND SAND
С	Envelope and Fenestration Measures					MELIZAC NAMES AND CALIFORNIA AND CAL
6	Reduced Air Infiltration (0.46 to 0.35 Air-changes/hr)	1.7%	\$49		\$350 - \$1,500	Moreover Max leading life to the life
7	Window Shading (None to 4 ft. Eaves on All Sides)	4.1%	\$117		\$3,100 - \$3,500	DAMA PRE ASSESSION CARROLL COMPANY
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	5.6%	\$160		\$3,100 - \$3,500	WEST NOTE OF THE PROPERTY OF T
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	3.4%	\$98	\$800 - \$1,100		Non-attainment and affected counties (all)
D	HVAC System Measures					Non-attainment and affected counties
12	Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)	4.2%	\$119	\$1,500 - \$2,400		(corresponding to the table)

Description	of Combined N	Massurae to	Achieve 1	5% Ahove I	Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings (\$/year)	Combined Estimated Cost (\$)		Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of measures	(%)		Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (Ibs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
2 Solar Domestic Hot Water System	16.7%	\$478		\$2,900 - \$5,200	1.29	0.018	7.0 - 12.2
5 Improved Duct Sealing (10% to 5% Duct Leakage)	10.770	Ψ470		\$450 - \$650	1.25	0.010	7.0 - 12.2
Combination 2							
1 Tankless Electric Water Heater			\$700 - \$1,400				
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space		\$462	\$1,000 - \$7,000		4.68	0.026	13.6 - 30.9
8 Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	16.1%			\$3,100 - \$3,500			
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)			\$1,500 - \$2,400				
Combination 3							
1 Tankless Electric Water Heater			\$700 - \$1,400				
5 Improved Duct Sealing (10% to 5% Duct Leakage)				\$450 - \$650			1
Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	15.8%	\$451		\$3,100 - \$3,500	4.56	0.024	14.5 - 20.1
9 Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)		ĺ	\$800 - \$1,100		1		i
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)			\$1,500 - \$2,400				

### 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

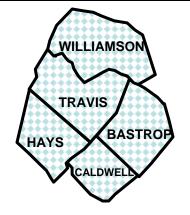
4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
  \* Floor-to-floor height: 8ft
  \* Window-to-wall ratio: 18%

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

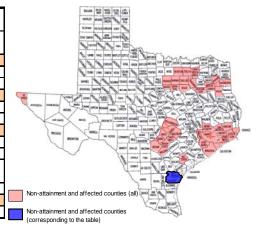




### **Electric Heating (Nueces and San Patricio Counties )**

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Estimated Cost (\$)		
	muividual measures	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	
Α	Domestic Hot Water Measures					
1	Tankless Electric Water Heater	1.4%	\$40	\$700 - \$1,400		
2	Solar Domestic Hot Water System	10.2%	\$289		\$2,900 - \$5,200	
В	Air Distribution System Measures					
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	10.6%	\$300	\$1,000 - \$7,000		
5	Improved Duct Sealing (10% to 5% Duct Leakage)	5.8%	\$165		\$450 - \$650	
С	Envelope and Fenestration Measures					
6	Reduced Air Infiltration (0.49 to 0.35 Air-changes/hr)	2.5%	\$70		\$350 - \$1,500	
7	Window Shading (None to 4 ft. Eaves on All Sides)	5.0%	\$141		\$3,100 - \$3,500	
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	6.0%	\$169		\$3,100 - \$3,500	
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	3.9%	\$110	\$800 - \$1,100		
D	HVAC System Measures					
12	Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)	4.6%	\$130	\$1,500 - \$2,400		



SAN PATRICIO

**NUECES** 

Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings (\$/year)	Combined E	stimated Cost (\$)	Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination or Measures	(%)		Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (lbs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
2 Solar Domestic Hot Water System	16.1%	\$453		\$2,900 - \$5,200	1.23	0.016	7.4 - 12.9
5 Improved Duct Sealing (10% to 5% Duct Leakage)	10.1%	\$455		\$450 - \$650	0 - \$650	0.016	7.4 - 12.3
Combination 2							
1 Tankless Electric Water Heater			\$700 - \$1,400			0.020	10.3 - 25.4
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	16.6%	\$468	\$1,000 - \$7,000		3.50		
Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	10.0%			\$3,100 - \$3,500			
Combination 3							
1 Tankless Electric Water Heater			\$700 - \$1,400				
5 Improved Duct Sealing (10% to 5% Duct Leakage)				\$450 - \$650			
6 Reduced Air Infiltration (0.49 to 0.35 Air-changes/hr)	16.0%	\$452		\$350 - \$1,500	3.38	0.019	8.4 - 15.6
9 Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	7	į l	\$800 - \$1,100				
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)			\$1,500 - \$2,400				

### 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
  \* Floor-to-floor height: 8ft



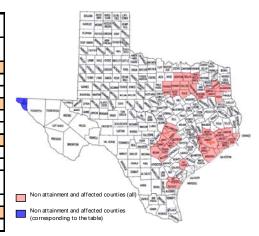
## Table 2b: 15% Above Code Savings (Residential – Electric Heating) for Nueces and San Patricio Counties



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

### **Description of Individual Measures**

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Estimated Cost (\$)		
	marriada medadies	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	
Α	Domestic Hot Water Measures					
1	Tankless Electric Water Heater	1.7%	\$46	\$700 - \$1,400		
2	Solar Domestic Hot Water System	17.3%	\$460		\$2,900 - \$5,200	
В	Air Distribution System Measures					
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	3.5%	\$93	\$1,000 - \$7,000		
5	Improved Duct Sealing (10% to 5% Duct Leakage)	2.3%	\$61		\$450 - \$650	
С	Envelope and Fenestration Measures					
6	Reduced Air Infiltration (0.43 to 0.35 Air-changes/hr)	0.9%	\$25		\$350 - \$1,500	
7	Window Shading (None to 4 ft. Eaves on All Sides)	3.3%	\$88		\$3,100 - \$3,500	
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	5.6%	\$150		\$3,100 - \$3,500	
9	Improved Windows (U-factor: 0.44 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	1.8%	\$47	\$800 - \$1,100		
D	HVAC System Measures					
12	Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)	3.4%	\$90	\$1,500 - \$2,400		



**EL PASO** 

Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings (\$/year)		stimated Cost \$)	Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of Measures	(%)		Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (Ibs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
2 Solar Domestic Hot Water System	17.3%	\$460		\$2,900 - \$5,200	N/A	N/A	6.3 - 11.3
Combination 2							
1 Tankless Electric Water Heater			\$700 - \$1,400				20.5 - 46.5
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space			\$1,000 - \$7,000		N/A		
6 Reduced Air Infiltration (0.43 to 0.35 Air-changes/hr)	<b>∐</b>			\$350 - \$1,500			
8 Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	13.6%	\$363		\$3,100 - \$3,500		N/A	
9 Improved Windows (U-factor: 0.44 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)			\$800 - \$1,100				
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)			\$1,500 - \$2,400				
Combination 3							
1 Tankless Electric Water Heater			\$700 - \$1,400				
5 Improved Duct Sealing (10% to 5% Duct Leakage)				\$450 - \$650			
6 Reduced Air Infiltration (0.43 to 0.35 Air-changes/hr)				\$350 - \$1,500	11		
8 Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	13.0%	\$348		\$3,100 - \$3,500	N/A	N/A	19.8 - 30.3
9 Improved Windows (U-factor: 0.44 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)		1 F	\$800 - \$1,100				d
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)			\$1,500 - \$2,400				

### 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
  \* Floor-to-floor height: 8ft
  \* Window-to-wall ratio: 18%



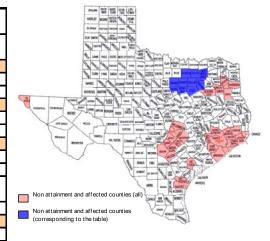




# Electric Heating (Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall and Tarrant Counties)

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Estimated Cost (\$)		
	murruua measures	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	
Α	Domestic Hot Water Measures					
1	Tankless Electric Water Heater	1.5%	\$45	\$700 - \$1,400		
2	Solar Domestic Hot Water System	12.9%	\$376		\$2,900 - \$5,200	
В	Air Distribution System Measures					
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	5.8%	\$171	\$1,000 - \$7,000		
5	Improved Duct Sealing (10% to 5% Duct Leakage)	4.4%	\$129		\$450 - \$650	
С	Envelope and Fenestration Measures					
6	Reduced Air Infiltration (0.51 to 0.35 Air-changes/hr)	2.6%	\$77		\$350 - \$1,500	
7	Window Shading (None to 4 ft. Eaves on All Sides)	2.8%	\$82		\$3,100 - \$3,500	
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	4.9%	\$143		\$3,100 - \$3,500	
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	2.6%	\$76	\$800 - \$1,100		
D	HVAC System Measures					
12	Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)	4.0%	\$117	\$1,500 - \$2,400		



Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings		stimated Cost (\$)	Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of weasures	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (lbs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
2 Solar Domestic Hot Water System	17.3%	\$505		\$2,900 - \$5,200	1.32	0.019	6.6 - 11.6
5 Improved Duct Sealing (10% to 5% Duct Leakage)	17.376	\$303		\$450 - \$650	1.32	0.019	0.0 - 11.0
Combination 2							
1 Tankless Electric Water Heater			\$700 - \$1,400		4.47		14.4 - 32.6
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space		\$438	\$1,000 - \$7,000			0.030	
Window Shading and Redistribution (Equal Windows on All Four Sides with No	15.0%			\$3,100 - \$3,500			
Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)				\$3,100 - \$3,500			
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)			\$1,500 - \$2,400		1		
Combination 3							
1 Tankless Electric Water Heater			\$700 - \$1,400				
5 Improved Duct Sealing (10% to 5% Duct Leakage)				\$450 - \$650			
6 Reduced Air Infiltration (0.51 to 0.35 Air-changes/hr)	15.5%	\$452		\$350 - \$1,500	4.60	0.023	13.5 - 20.9
Window Shading and Redistribution (Equal Windows on All Four Sides with No	13.576	\$45Z		\$3,100 - \$3,500		0.023	13.5 - 20.9
Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)		ĺ		φ3,100 - φ3,500			
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)	11		\$1,500 - \$2,400				

### 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

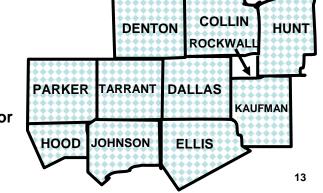
4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
  \* Floor-to-floor height: 8ft
- \* Window-to-wall ratio: 18%

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

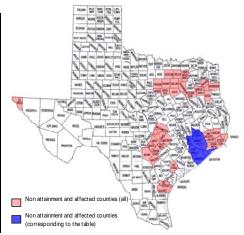




# Electric Heating (Brazoria, Fort Bend, Galveston, Harris, Montgomery and Waller Counties)

### **Description of Individual Measures**

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Estimated Cost (\$)		
	murridad measures	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	
Α	Domestic Hot Water Measures					
1	Tankless Electric Water Heater	1.5%	\$42	\$700 - \$1,400		
2	2 Solar Domestic Hot Water System		\$304		\$2,900 - \$5,200	
В	Air Distribution System Measures					
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	8.7%	\$242	\$1,000 - \$7,000		
5	Improved Duct Sealing (10% to 5% Duct Leakage)	4.8%	\$134		\$450 - \$650	
С	Envelope and Fenestration Measures					
6	Reduced Air Infiltration (0.46 to 0.35 Air-changes/hr)	1.8%	\$50		\$350 - \$1,500	
7	Window Shading (None to 4 ft. Eaves on All Sides)	3.7%	\$103		\$3,100 - \$3,500	
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	5.0%	\$141		\$3,100 - \$3,500	
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	3.3%	\$92	\$800 - \$1,100		
D	HVAC System Measures					
12	Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)	4.1%	\$114	\$1,500 - \$2,400		



Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings		Combined Estimated Cost (\$)		Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of Measures	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (Ibs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
2 Solar Domestic Hot Water System	15.7%	\$438		\$2,900 - \$5,200	1.01	0.020	7.6 - 13.4
5 Improved Duct Sealing (10% to 5% Duct Leakage)	13.7 /6	Ψ430		\$450 - \$650	1.01	0.020	7.0 - 13.4
Combination 2							
1 Tankless Electric Water Heater		\$431	\$700 - \$1,400		3.26	0.029	9.3 - 27.6
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	15.4%		\$1,000 - \$7,000				
9 Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	13.470		\$800 - \$1,100				
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)			\$1,500 - \$2,400				
Combination 3							
1 Tankless Electric Water Heater			\$700 - \$1,400				
5 Improved Duct Sealing (10% to 5% Duct Leakage)				\$450 - \$650			
6 Reduced Air Infiltration (0.46 to 0.35 Air-changes/hr)	15.1%	\$422		\$350 - \$1,500	3.19	0.026	14.5 - 22.4
Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	15.1%	φ422		\$3,100 - \$3,500		0.026	
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)			\$1,500 - \$2,400				

### 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
  \* Floor-to-floor height: 8ft
- \* Window-to-wall ratio: 18%

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

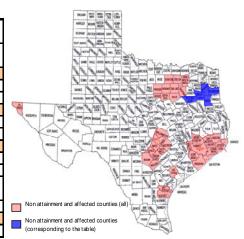




## Electric Heating (Gregg, Harrison, Henderson, Rusk, Smith and Upshur Counties)

### **Description of Individual Measures**

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Estimated Cost (\$)		
	marriada medadies	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	
Α	Domestic Hot Water Measures					
1	Tankless Electric Water Heater	1.6%	\$44	\$700 - \$1,400		
2	Solar Domestic Hot Water System	12.4%	\$341		\$2,900 - \$5,200	
В	Air Distribution System Measures					
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	6.9%	\$191	\$1,000 - \$7,000		
5	Improved Duct Sealing (10% to 5% Duct Leakage)	4.6%	\$128		\$450 - \$650	
С	Envelope and Fenestration Measures					
6	Reduced Air Infiltration (0.51 to 0.35 Air-changes/hr)	1.9%	\$52		\$350 - \$1,500	
7	Window Shading (None to 4 ft. Eaves on All Sides)	4.0%	\$110		\$3,100 - \$3,500	
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	5.5%	\$150		\$3,100 - \$3,500	
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	3.3%	\$90	\$800 - \$1,100		
D	HVAC System Measures					
12	Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)	3.9%	\$107	\$1,500 - \$2,400		



Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings	Combined E	stimated Cost \$)	Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of measures	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (Ibs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
2 Solar Domestic Hot Water System	17.0%	\$470		\$2,900 - \$5,200	1.31	0.020	7.1 - 12.5
5 Improved Duct Sealing (10% to 5% Duct Leakage)	17.078	φ470		\$450 - \$650		0.020	7.1 - 12.5
Combination 2							
1 Tankless Electric Water Heater			\$700 - \$1,400		4.69		
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space			\$1,000 - \$7,000				
6 Reduced Air Infiltration (0.51 to 0.35 Air-changes/hr)	16.7%	\$461		\$350 - \$1,500		0.029	14.4 - 34.3
8 Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	10.776			\$3,100 - \$3,500			
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)	1		\$1,500 - \$2,400				
Combination 3							
1 Tankless Electric Water Heater			\$700 - \$1,400				
5 Improved Duct Sealing (10% to 5% Duct Leakage)				\$450 - \$650			
6 Reduced Air Infiltration (0.51 to 0.35 Air-changes/hr)				\$350 - \$1,500	4.73		
8 Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	16.8%	\$464		\$3,100 - \$3,500		0.026	14.9 - 22.8
9 Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	1		\$800 - \$1,100				
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)	1		\$1,500 - \$2,400				

### 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 = \$0.15/kWh

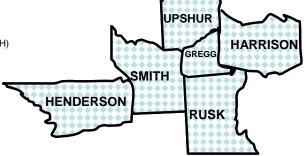
Natural gas cost = \$1.00/therm

4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
- \* Floor-to-floor height: 8ft
- \* Window-to-wall ratio: 18%

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

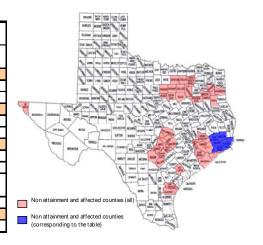




## Electric Heating (Chambers, Hardin, Jefferson, Liberty and Orange Counties)<sub>07-08-02</sub>

**Description of Individual Measures** 

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Estimated Cost (\$)		
	muridual measures	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	
Α	Domestic Hot Water Measures					
1	Tankless Electric Water Heater	1.5%	\$43	\$700 - \$1,400		
2	Solar Domestic Hot Water System	11.4%	\$314		\$2,900 - \$5,200	
В	Air Distribution System Measures					
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	9.1%	\$251	\$1,000 - \$7,000		
5	Improved Duct Sealing (10% to 5% Duct Leakage)	5.0%	\$139		\$450 - \$650	
C	Envelope and Fenestration Measures					
6	Reduced Air Infiltration (0.45 to 0.35 Air-changes/hr)	1.9%	\$53		\$350 - \$1,500	
7	Window Shading (None to 4 ft. Eaves on All Sides)	3.8%	\$104		\$3,100 - \$3,500	
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	5.3%	\$147		\$3,100 - \$3,500	
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	3.3%	\$90	\$800 - \$1,100		
D	HVAC System Measures					
12	Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)	4.1%	\$112	\$1,500 - \$2,400		



HARDIN GRANGE

EFFERSO

LIBERTY

Description of Combined Measures to Achieve 15% Above Code Savings

Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings	Combined E	stimated Cost \$)	Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of Measures	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (Ibs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
2 Solar Domestic Hot Water System	16.4%	\$453		\$2,900 - \$5,200	N/A	N/A	7.4 - 12.9
5 Improved Duct Sealing (10% to 5% Duct Leakage)	10.476	φ403		\$450 - \$650	IN/A		7.4 - 12.9
Combination 2							
1 Tankless Electric Water Heater			\$700 - \$1,400		N/A	N/A	8.4 - 26.4
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	15.7%	\$434	\$1,000 - \$7,000				
9 Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	15.7 /6	φ434		\$450 - \$650	IN/A		
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)			\$1,500 - \$2,400				
Combination 3							
1 Tankless Electric Water Heater			\$700 - \$1,400				
5 Improved Duct Sealing (10% to 5% Duct Leakage)				\$450 - \$650			
6 Reduced Air Infiltration (0.45 to 0.35 Air-changes/hr)	15.6%	\$431		\$350 - \$1,500	N/A	N/A	14.2 - 21.9
8 Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	13.0%	φ431		\$3,100 - \$3,500		IV/A	
12 Air Conditioner with Heat Pump (SEER 13/7 7 HSPE to SEER 15/8 5 HSPE)	11		\$1.500 - \$2.400				

### 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

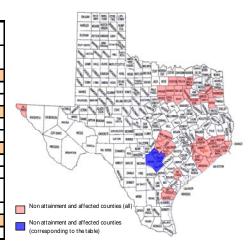
- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1
  \* Floor-to-floor height: 8ft
- \* Window-to-wall ratio: 18%





### **Description of Individual Measures**

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Estimated Cost (\$)		
	marriada medadies	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	
Α	Domestic Hot Water Measures					
1	Tankless Electric Water Heater	1.5%	\$43	\$700 - \$1,400		
2	Solar Domestic Hot Water System	12.5%	\$355		\$2,900 - \$5,200	
В	Air Distribution System Measures					
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	8.3%	\$237	\$1,000 - \$7,000		
5	Improved Duct Sealing (10% to 5% Duct Leakage)	4.4%	\$126		\$450 - \$650	
С	Envelope and Fenestration Measures					
6	Reduced Air Infiltration (0.47 to 0.35 Air-changes/hr)	1.9%	\$53		\$350 - \$1,500	
7	Window Shading (None to 4 ft. Eaves on All Sides)	4.0%	\$115		\$3,100 - \$3,500	
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	5.4%	\$155		\$3,100 - \$3,500	
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	3.4%	\$98	\$800 - \$1,100		
D	HVAC System Measures					
12	Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)	4.2%	\$119	\$1,500 - \$2,400		



Combination of Measures <sup>3</sup>	Combined Energy Savings	Combined Energy Savings		stimated Cost \$)	Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
Combination of Measures	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (Ibs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
2 Solar Domestic Hot Water System	16.9%	\$481		\$2,900 - \$5,200	1.30	0.018	7.0 - 12.2
5 Improved Duct Sealing (10% to 5% Duct Leakage)	10.576	φτοι		\$450 - \$650	1.30		
Combination 2							
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space			\$1,000 - \$7,000				
Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	21.5%	\$201		\$3,100 - \$3,500	4.47	0.025	24.4 - 57.7
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)			\$800 - \$1,100				
Combination 3							
1 Tankless Electric Water Heater			\$700 - \$1,400				
5 Improved Duct Sealing (10% to 5% Duct Leakage)				\$450 - \$650			
6 Reduced Air Infiltration (0.47 to 0.35 Air-changes/hr)	16.7%	\$387		\$350 - \$1,500	4.48	0.022	15.8 - 24.4
8 Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	10.7%	φ367		\$3,100 - \$3,500	4.40	0.022	15.0 - 24.4
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)	1		\$1,500 - \$2,400				

- 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

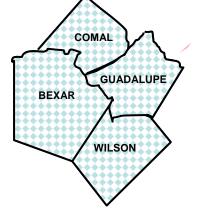
4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1 \* Floor-to-floor height: 8ft
- \* Window-to-wall ratio: 18%

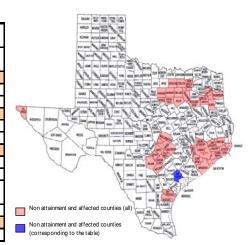
Table 8b: 15% Above Code Savings (Residential - Electric Heating) for Bexar, Comal, Guadalupe and Wilson Counties





### **Description of Individual Measures**

	Individual Measures	Annual Energy Savings	Annual Energy Savings	Estimated Cost (\$)		
	muriuua measures	(%)	(\$/year)	Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	
Α	Domestic Hot Water Measures					
1	Tankless Electric Water Heater	1.5%	\$41	\$700 - \$1,400		
2	Solar Domestic Hot Water System	11.3%	\$312		\$2,900 - \$5,200	
В	Air Distribution System Measures					
4	Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space	9.1%	\$250	\$1,000 - \$7,000		
5	Improved Duct Sealing (10% to 5% Duct Leakage)	4.9%	\$135		\$450 - \$650	
С	Envelope and Fenestration Measures					
6	Reduced Air Infiltration (0.49 to 0.35 Air-changes/hr)	2.2%	\$60		\$350 - \$1,500	
7	Window Shading (None to 4 ft. Eaves on All Sides)	4.5%	\$124		\$3,100 - \$3,500	
8	Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)	5.7%	\$158		\$3,100 - \$3,500	
9	Improved Windows (U-factor: 0.47 to 0.42 Btu/h-sf-F, SHGC: 0.4 to 0.33)	3.7%	\$101	\$800 - \$1,100		
D	HVAC System Measures					
12	Air Conditioner with Heat Pump (SEER 13/7.7 HSPF to SEER 15/8.5 HSPF)	4.2%	\$116	\$1,500 - \$2,400		



Combination of Measures <sup>3</sup>	Combined Energy Savings (%)	Combined Energy Savings (\$/year)	Combined Estimated Cost (\$)		Combined Annual NO <sub>x</sub> Emissions	Combined Ozone Season Period NO <sub>x</sub>	Simple Estimated
			Marginal Cost <sup>1</sup>	New System Cost <sup>2</sup>	Savings (Ibs/year)	Emissions Savings (lbs/day)	Payback (yrs)
Combination 1							
2 Solar Domestic Hot Water System	16.2%	\$447		\$2,900 - \$5,200	1.01	0.015	7.5 - 13.1
5 Improved Duct Sealing (10% to 5% Duct Leakage)				\$450 - \$650			
Combination 2							
1 Tankless Electric Water Heater	15.0%	\$414	\$700 - \$1,400		3.09	0.019	11.6 - 28.8
4 Relocate HVAC Unit including Supply and Return Ducts in Conditioned Space			\$1,000 - \$7,000				
8 Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)				\$3,100 - \$3,500			
Combination 3							
1 Tankless Electric Water Heater	16.2%	\$447	\$700 - \$1,400		3.09	0.019	13.6 - 21.1
5 Improved Duct Sealing (10% to 5% Duct Leakage)				\$450 - \$650			
6 Reduced Air Infiltration (0.49 to 0.35 Air-changes/hr)				\$350 - \$1,500			
8 Window Shading and Redistribution (Equal Windows on All Four Sides with No Shading to 45% Windows on the South with 4ft. Eaves on All Four Sides)				\$3,100 - \$3,500			
12 Air Conditioner with Heat Pump (SEER 13/7.7 HSPE to SEER 15/8.5 HSPE)			\$1.500 - \$2.400				

- 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 = \$0.15/kWh

Natural gas cost = \$1.00/therm

4. Savings depend on fuel mix used. See detailed writeup

### (Building Description)

- \* Building type: Residential
- \* Gross area: 2,323 sq-ft.
- \* Building dimension: 48.2ft x 48.2ft x 8ft (WxLxH)
- \* Number of floors: 1 \* Floor-to-floor height: 8ft \* Window-to-wall ratio: 18%

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



