Deemed Savings, Installation & Efficiency Standards
2006 Residential and Small Commercial
Standard Offer Program

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October, 2005

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DEEMED SAVINGS

All Residential and Small Commercial Measures for Texas Programs

INTRODUCTION

This document contains all of the approved energy and peak demand deemed savings values established for energy efficiency programs in Texas. The figures correspond with the set of residential and small commercial sector deemed savings values approved by the Public Utility Commission of Texas in Project No. 22241. A more detailed description of the methodology used to calculate these savings is found in the Petitions, which may be found at: www.puc.state.tx.us/electric/projects/22241/22241.cfm.

For all envelope measures, e.g., ceiling insulation, ENERGY STAR® windows, etc., the presence of electric refrigerated air conditioning is assumed. Separate deemed savings values have been calculated for homes with electric air conditioning / gas heat, for electric air conditioning / electric resistance heat, and for heat pumps.

For climate-sensitive energy efficiency measures, separate calculations have been performed for four different regions of the state:

- Panhandle Region - using typical weather information for Amarillo or Oklahoma City (for windows only).
- North Region - using typical weather information for Dallas or Fort Worth.
- South Region - using typical weather information for Houston or San Antonio (for windows only).
- Valley Region - using typical weather information for Corpus Christi or Brownsville (for windows).

General Installation Standards

Equipment must exceed applicable federal energy standards adopted at the time the Project Sponsor submits the project application.

No used or reconditioned equipment shall be qualified for incentives. All equipment shall be new.

Project Sponsor must follow all state and local building codes. Project Sponsor shall be responsible for licenses, building permits and inspections. Any fees/payments for licenses, building permits, and inspections shall be paid by the Project Sponsor.

CENTRAL AIR CONDITIONER REPLACEMENT

Measure

Residential retrofit with a new central air conditioning system (packaged unit, or split system consisting of an indoor unit with a matching remote condensing unit). Maximum cooling capacity per unit is 65,000 Btu/hour.

Baseline

In the Residential/Small Commercial Standard Offer Program, the baseline is assumed to be a new central air conditioning system with an ARI-listed Seasonal Energy Efficiency Ratio (SEER) rating of 13.

Installation & Efficiency Standard

Air conditioning equipment shall be properly sized to dwelling based on American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) or Air-Conditioner Contractors of America (ACCA) Manual J standards.

Manufacturer data sheets on installed air conditioning equipment or ARI equivalent combined compressor and coil SEER must be provided to the utility in the Implementation Report.

The central air conditioning equipment must have a minimum ARI-listed SEER rating of 14.00 for the Residential/Small Commercial Standard Offer Program (Res/SC SOP).

Deemed Savings

Demand Savings (kW) – All Climate Zones

Central Air Conditioner Replacement – Res/SC SOP Demand Savings, All Climate Zones

Size (tons)	ARI Rated BTU/Hr		SEER Range				
	Minimum	Maximum	14.00-14.99	15.00-15.99	16.00-16.99	17.00-17.99	18+
1.5	15,000	20,999	0.16	0.25	0.33	0.40	0.46
2.0	21,000	26,999	0.21	0.33	0.44	0.53	0.62
2.5	27,000	32,999	0.27	0.42	0.55	0.67	0.77
3.0	33,000	38,999	0.32	0.50	0.66	0.80	0.93
3.5	39,000	44,999	0.37	0.58	0.77	0.93	1.08
4.0	45,000	50,999	0.43	0.67	0.88	1.07	1.24
4.5	51,000	56,999	0.48	0.75	0.99	1.20	1.39
5.0	57,000	62,999	0.53	0.83	1.10	1.33	1.55

Residential/Small Commercial Standard Offer Program

Energy Savings (kWh)

Climate Zone 3: South Region

Central Air Conditioner Replacement – Res/SC SOP Energy Savings, Climate Zone 3							
Size (tons)	ARI Rated BTU/Hr		SEER Range				
	Minimum	Maximum	14.00-14.99	15.00-15.99	16.00-16.99	17.00-17.99	18+
1.5	15,000	20,999	246	383	504	611	706
2.0	21,000	26,999	328	511	672	815	942
2.5	27,000	32,999	410	639	840	1,018	1,177
3.0	33,000	38,999	492	766	1,008	1,222	1,413
3.5	39,000	44,999	574	894	1,176	1,426	1,648
4.0	45,000	50,999	655	1,022	1,344	1,629	1,884
4.5	51,000	56,999	737	1,150	1,512	1,833	2,119
5.0	57,000	62,999	819	1,277	1,680	2,037	2,355

HEAT PUMP REPLACEMENT

Measure

All measure installation standards and baseline data from the central air conditioner measure shall apply to the heat pump measure.

Only installations, which replace an existing central heat pump with supplemental electric resistance heat or existing central electric resistance heating system are eligible to receive the annual heat pump heating kWh component of the deemed energy savings.

Baseline

Baseline is assumed to be a new heat pump system with a SEER of 13 and an HSPF of 7.7.

Installation & Efficiency Standard

Equipment shall be properly sized to dwelling based on ASHRAE or ACCA Manual J standards.

Manufacturer data sheets on installed air conditioning equipment or ARI equivalent combined compressor and coil HSPF must be provided to the utility in the Implementation Report.

Heat pumps shall have a minimum SEER of 14.00 and an HSPF of 8.0.

Deemed Savings

Demand Savings (kW) – All Climate Zones

Central Air Conditioner Replacement – Cooling Demand Savings, All Climate Zones							
Size (tons)	ARI Rated BTU/Hr		SEER Range				
	Minimum	Maximum	14.00-14.99	15.00-15.99	16.00-16.99	17.00-17.99	18+
1.5	15,000	20,999	0.15	0.23	0.31	0.38	0.44
2.0	21,000	26,999	0.20	0.31	0.41	0.50	0.58
2.5	27,000	32,999	0.25	0.39	0.51	0.63	0.73
3.0	33,000	38,999	0.30	0.47	0.62	0.75	0.87
3.5	39,000	44,999	0.35	0.54	0.72	0.88	1.02
4.0	45,000	50,999	0.40	0.62	0.82	1.00	1.16
4.5	51,000	56,999	0.44	0.70	0.92	1.13	1.31
5.0	57,000	62,999	0.49	0.78	1.03	1.25	1.45

Climate Zone 3: South Region

Heat Pump Replacement – Cooling Energy Savings, Climate Zone 3							
Size (tons)	ARI Rated BTU/Hr		SEER Range				
	Minimum	Maximum	14.00-14.99	15.00-15.99	16.00-16.99	17.00-17.99	18+
1.5	15,000	20,999	246	383	504	611	706
2.0	21,000	26,999	328	511	672	815	942
2.5	27,000	32,999	410	639	840	1,018	1,177
3.0	33,000	38,999	492	766	1,008	1,222	1,413
3.5	39,000	44,999	574	894	1,176	1,426	1,648
4.0	45,000	50,999	655	1,022	1,344	1,629	1,884
4.5	51,000	56,999	737	1,150	1,512	1,833	2,119
5.0	57,000	62,999	819	1,277	1,680	2,037	2,355

Heat Pump – Energy Savings (Heating kWh Only), Climate Zone 3						
	HSPF Range					
Size (tons)	8.0 - 8.1	8.2 - 8.3	8.4 - 8.5	8.6 - 8.7	8.8 - 8.9	9.0 - 9.1
1.5	44	69	93	117	141	164
2.0	59	92	124	156	187	218
2.5	74	115	155	195	234	273
3.0	88	138	186	234	281	327
3.5	103	161	217	273	328	382
4.0	118	184	248	312	375	436
4.5	133	207	279	351	422	491
5.0	147	230	310	390	468	546

GROUND SOURCE HEAT PUMP

Measure

The following tables present the deemed savings values for ground source heat pumps for each of the four climate zones. The deemed savings are dependent upon the energy efficiency rating (EER) of the equipment, and are presented as kWh and kW savings per ton installed.

Baseline

Only ground source heat pumps that replace an existing air source heat pump, ground source heat pump system, or other combination of electric heating and cooling systems are eligible for these deemed savings. Deemed savings values are calculated based on replacement of an existing 13 SEER air source heat pump with minimum 8.0 HSPF.

Installation & Efficiency Standard

The ground source heat pump must meet a minimum Energy Star criteria of 14 EER (ISO/ARI 13256-1) in order to be eligible for these deemed savings.

Deemed Savings

Climate Zone 3 – South Region

Ground Source Heat Pumps – Climate Zone 3		
Climate Zone 3 - with desuperheaters		
GSHP Efficiency	Energy savings [kWh/ton]	Demand savings [kW/ton]
Low (less than 17 EER)	1,030	0.52
High (17 EER and above)	1,114	0.50
Climate Zone 3 - without desuperheaters		
Low (less than 17 EER)	218	0.06
High (17 EER and above)	322	0.15

SPLIT SYSTEM AND SINGLE-PACKAGE AIR CONDITIONERS BETWEEN 65,000 BTU/H AND 240,000 BTU/H

Measure

The following deemed savings values could be used to calculate an incentive for replacing an existing central air conditioner with a premium efficiency central air conditioner through a standard offer program.

Baseline

Baseline is assumed to be a new central air conditioning system with an EER of 8.9 for units up to 135,000 Btu/h, and 8.5 for units between 135,000 Btu/h and 240,000 Btu/h.

Installation & Efficiency Standard

Minimum standard for units up to 135,000 Btu/h is 10.0 EER and 9.5 EER for units between 135,000 Btu/h and 240,000 Btu/h.

Deemed Savings

Units greater than 65,000 Btu/h and less than 135,000 Btu/h

For units greater than 65,000 Btu/h and less than 135,000 Btu/h							
Zone 1		Zone 2		Zone 3		Zone 4	
kW per	kWh per	kW per	kWh per	kW per	kWh per	kW per	kWh per
EER-Ton	EER-Ton	EER-Ton	EER-Ton	EER-Ton	EER-Ton	EER-Ton	EER-Ton
0.10	202	0.10	309	0.11	392	0.11	440

Units greater than 135,000 Btu/h and less than 240,000 Btu/h

For units greater than 135,000 Btu/h and less than 240,000 Btu/h							
Zone 1		Zone 2		Zone 3		Zone 4	
kW per	kWh per	kW per	kWh per	kW per	kWh per	kW per	kWh per
EER-Ton	EER-Ton	EER-Ton	EER-Ton	EER-Ton	EER-Ton	EER-Ton	EER-Ton
0.12	151	0.12	242	0.12	284	0.12	324

Deemed Savings Example

New unit is a 10-ton package rooftop unit with an EER of 10.5 installed in Zone 2. Baseline EER is 8.9 for units less than 135,000 Btu/h.

From the table above, select deemed savings values of 0.10 kW/ton and 309 kWh/ton.

KW savings = 0.10 * (Unit EER – Baseline EER) * tons

KW savings = 0.10 * (10.5 – 8.9) * 10 = 1.6 kW

KWh savings = 309 * (Unit EER – Baseline EER) * tons

KWh savings = 309 * 1.6 * 10 = 4,944 kWh

SPLIT SYSTEM AND SINGLE PACKAGE HEAT PUMP SYSTEMS BETWEEN 65,000 BTU/H AND 240,000 BTU/H

Measure

The following tables provide annual heating kWh energy savings. Additional cooling savings are based on the heat pump's EER, and are the same values as for an air conditioning system of the same cooling capacity and EER. Please refer to the Split System and Single-Package Air Conditioning System Measure for those values.

Only installations which replace an existing split system or single package heat pump system or other electric heating system are eligible to receive this annual heating savings component of the

deemed energy savings.

Baseline

Baseline is assumed to be a new rooftop package or split system heat pump system. For units with cooling capacities between 65,000 Btu/h and 135,000 Btu/h, the baseline is a coefficient of performance (COP) of 3.0 (current ASHRAE 90.1 standard). For units with cooling capacities between 135,000 Btu/h and 240,000 Btu/h, the baseline is a coefficient of performance (COP) of 2.9 (current ASHRAE 90.1 standard).

Installation & Efficiency Standard

For units with cooling capacities between 65,000 Btu/h and 135,000 Btu/h, there are two efficiency levels for which deemed energy savings have been calculated:

- 3.2 is ASHRAE 90.1-1999 / Consortium for Energy Efficiency (CEE) Tier 1 Standard.
- 3.4 is ASHRAE 90.1-1999 / CEE Tier 2 Standard.

For units with cooling capacities between 135,000 Btu/h and 240,000 Btu/h, the two efficiency levels for which deemed energy savings have been calculated are as follows:

- 3.1 is ASHRAE 90.1-1999 / Consortium for Energy Efficiency (CEE) Tier 1 Standard.
- 3.3 is ASHRAE 90.1-1999 / CEE Tier 2 Standard.

Deemed Savings – Heating

Energy Savings

Units greater than 65,000 Btu/h and less than 135,000 Btu/h

Annual Heating Savings:

For units greater than 65,000 Btu/h and less than 135,000 Btu/h				
	Zone 1	Zone 2	Zone 3	Zone 4
COP	kWh per Ton	kWh per Ton	kWh per Ton	kWh per Ton
3.2	342	121	53	38
3.4	674	232	101	72

Ton = Cooling Ton

Units greater than 135,000 Btu/h and less than 240,000 Btu/h

Annual Heating Savings:

For units greater than 135,000 Btu/h and less than 240,000 Btu/h				
	Zone 1	Zone 2	Zone 3	Zone 4
COP	kWh per Ton	kWh per Ton	kWh per Ton	kWh per Ton
3.1	372	79	30	20
3.3	730	132	58	39

Ton = Cooling Ton

Demand Savings

For this measure, the deemed kW savings are based on the heat pump's EER, and are the same values as for a split system or single-package air conditioning system of the same capacity and EER. Please refer to the Split System and Single-Package Air Conditioning System Measure for those values.

CEILING INSULATION

Measure

Ceiling insulation savings are per square foot of treated ceiling area above a conditioned space. Ceiling insulation must be added only to homes with electric air conditioning to qualify for these deemed savings values.

Baseline

In existing construction, ceiling insulation levels vary greatly depending on the age of the home, type of insulation, and activity in the attic (such as using the attic for storage and HVAC equipment). Deemed savings tables are based on the current level of ceiling insulation in the home from R-0 to R-22. The current insulation level of each home will be determined and documented by the insulation installer. Degradation due to age and density of the existing insulation should be taken into account.

In the event that existing insulation is or has been removed, the existing R-value will be based upon the R-value of the existing insulation prior to removal.

Installation & Efficiency Standard

A ceiling insulation level of R-30 is recommended throughout Texas as prescribed by DOE. The combined R-values of the existing insulation and the insulation being added will total at least R-30. The R-value of the existing insulation can be no greater than R-22.

Deemed Savings

Climate Zone 3 - South Region					
Ceiling Insulation					
	kWh Savings	kWh Savings	kWh Savings	Summer Peak kW Savings	
Ceiling Insulation Base R-value	Gas Heat	Electric Heat	Heat Pump	Gas Heat & Electric Heat	Heat Pump
	(per sq. ft.)	(per sq. ft.)	(per sq. ft.)	(per sq. ft.)	(per sq. ft.)
R-0	1.00	4.40	2.14	0.000973	0.000973
R-1 to R-4	0.64	2.81	1.40	0.000608	0.000622
R-5 to R-8	0.32	1.38	0.70	0.000297	0.000297
R-9 to R-14	0.17	0.72	0.36	0.000153	0.000153
R-15 to R-22	0.07	0.30	0.15	0.000074	0.000074

WALL INSULATION

Measure

Wall insulation savings are per square foot of treated wall area (gross wall area less window and door area), and are based on R-0 increased to R-13. Wall insulation must be added only to homes with electric air conditioning to qualify for these deemed savings values.

Baseline

The baseline is considered to be a house with no wall insulation in the 4" wall cavity.

Installation & Efficiency Standard

The standard throughout Texas for adding wall insulation to an existing wall cavity is R-13, as prescribed by United States Department of Energy (DOE) and Texas Department of Housing and Community Affairs (TDHCA) programs. To qualify for the incentive, there must be no existing wall insulation.

Under the Hard-To-Reach template, wall insulation reduces the ventilation rate in the home and therefore a post-installation blower door test must be conducted. Results must comply with the Minimum Final Ventilation Rate table found in the Air Infiltration section of this document.

Deemed Savings

Climate Zone 3: South Region

Wall Insulation – Climate Zone 3				
Electric A/C Gas Heat kWh Savings per sq. ft.	Electric A/C Electric Heat kWh Savings per sq. ft.	Electric A/C Heat Pump kWh Savings per sq. ft.	Summer Peak kW Savings per sq. ft.	
			Gas Heat & Electric Heat	Heat Pump
0.24242	4.529	1.726	0.0006734	0.0006734

FLOOR INSULATION

Measure

Floor insulation savings are per square foot of treated floor area above a non-conditioned space. Floor insulation must be added only to existing homes with electric air conditioning to qualify for these deemed savings values.

Baseline

The baseline is considered to be a house with pier and beam construction and no floor insulation against the floor of conditioned area.

Installation & Efficiency Standard

A floor insulation level of R-19 is recommended for site-built homes throughout Texas as prescribed by DOE and TDHCA programs. To qualify for the incentive, there must be no existing floor insulation. Batt insulation is recommended in most cases and must have the vapor barrier installed facing up and against the floor or conditioned area. Insulation should be attached or secured so that it remains in place for at least 10 years.

Typical floor construction depth of manufactured homes usually does not allow R-19 batt to be installed within the floor joists so R-15 loose-fill insulation is recommended by TDHCA.

A minimum of 24" clearance from bottom of the insulation to the ground is required by Occupational Safety and Health Association (OSHA).

Deemed Savings

Climate Zone 3: South Region

Floor Insulation - Climate Zone 3				
Electric A/C And Heating Type	Site Built Home		Manufactured Home	
	kWh Savings per sq. ft.	Summer Peak kW Savings per sq. ft.	kWh Savings per sq. ft.	Summer Peak kW Savings per sq. ft.
Gas Heat	No Savings	0.000216	No Savings	0.000266
Electric Heat	1.70757	0.000216	1.65891	0.000266
Heat Pump	0.58324	0.000216	0.55718	0.000266

ENERGY STAR® WINDOWS

Measure

ENERGY STAR® windows savings are per square foot of window, inclusive of frame and sash. Windows must be installed only in homes with electric air conditioning to qualify for these deemed savings values.

Baseline

The baseline is a double-glazed (i.e., double-pane), clear window with an aluminum frame, with a U-factor of 0.87, a solar heat gain coefficient (SHGC) of 0.66, and air infiltration of 1 cfm/ft^2.

Installation & Efficiency Standard

For a window to qualify for these deemed savings, it must meet ENERGY STAR® criteria anywhere in the state, it must have a U-factor less than or equal to 0.40 and a Solar Heat Gain Coefficient (SHGC) less than or equal to 0.40.

Deemed Savings

ENERGY STAR® WINDOWS		
	kWh Savings per sq. ft.	kW Savings per sq. ft.
Climate Zone 3: South Region		
Installed in home with non-electric heating	3.81	0.0024
Installed in home with electric resistance heating	6.48	0.0024
Installed in home with heat pump	5.26	0.0024

AIR INFILTRATION

Measure

This measure reduces air infiltration into the residence, using pre- and post-treatment blower door air pressure readings to confirm air leakage reduction. Homes treated for air infiltration reduction must have electric air conditioning to qualify for these deemed savings values.

Blower door air pressure measurements will also be used to ensure that air infiltration in a residence shall not be less than the standards set forth in the following table:

Minimum Final Ventilation Rate*

	Number of Stories		
Shielding	**Single Story**	**Two Story**	**3 or More Stories**
Well shielded	1.18	0.95	0.83
Normal	0.99	0.79	0.69
Exposed	0.89	0.71	0.62

* Measured in cubic feet per minute at 50 Pascal per square foot of conditioned area.

Well Shielded is defined as urban areas with high buildings or sheltered areas, and building surrounded by trees, bermed earth, or higher terrain.

Normal is defined as buildings in a residential neighborhood or subdivision setting, with yard space between buildings. 80-90% of houses fall in this category.

Exposed is defined as buildings in an open setting with few buildings or trees around and buildings on top of a hill or ocean front, exposed to winds.

As an example, the minimum post-installation air exchange rate for an 1800 square foot, one-story home with normal shielding is 1782 CFM_{50} (1800 x 0.99). In order to qualify for the air infiltration control deemed savings, there must be a minimum 10% reduction between the pre- and post-installation ventilation rate. Therefore, the pre-installation ventilation rate must be at least 1960 CFM_{50} (1782 x 110%) in order to be considered for air infiltration control measures.

Baseline

For residential dwellings, the winter/summer air change per hour (ACH) differential was derived from ESPRE model weather data for the Panhandle (Amarillo weather), North (Dallas weather), South (Houston weather), and Valley (Corpus Christi weather) climate zones. Electric air conditioning was assumed for all homes, with gas, electric or heat pump heating.

Air Infiltration Values (ACH)		
Region	**Winter ACH**	**Summer ACH**
Panhandle	1.25	0.96
North	0.94	0.49
South	0.86	0.54
Valley	0.95	0.94

Installation & Efficiency Standard

To qualify for an incentive, a minimum air leakage reduction of 10% of the pre-installation reading is required. Utilities may require competency testing of personnel who will perform the blower door tests.

Deemed Savings

The following formula shall be used to calculate deemed savings for infiltration efficiency improvements. The formula applies to Residential and Hard-to-Reach single family and multifamily dwellings, and to all building heights and shielding factors. Only structures with electric refrigerated air conditioning systems are eligible.

Deemed Savings: CFM_{50} * V

Where:

CFM_{50} = Air infiltration reduction in Cubic Feet per Minute at 50 Pascal

V = the corresponding value in the following table:

	KWh Impact per CFM_{50} Reduction			**KW Impact per CFM_{50} Reduction**
Region	**Gas Heat**	**Resistance Heat**	**Heat Pump Heat**	
Panhandle	0.1262	1.6673	0.7933	0.00024
North	0.1929	1.0565	0.5046	0.00019
South	0.2694	0.7945	0.4438	0.00026
Valley	0.6268	0.9732	0.7368	0.00043

DUCT EFFICIENCY IMPROVEMENT

Measure

These deemed savings values are applicable to measures which seal leaks in supply and return ducts and repair or reinsulate ducts of existing homes and small commercial facilities that have central electric air conditioning or heat pumps. All treated sites must have a majority of the treated ducts and returns located in an unconditioned space. Alternatively, the utility may establish other requirements to ensure that savings result from the measure.

Administrator Comment: [UTILITY] will employ the following procedure to ensure that savings result from the duct efficiency measure:

1. *When a majority of the supply and return is in an unconditioned space, [UTILITY] may inspect for adequate treatment, or may conduct a standard (e.g., Duct Blaster™) leakage test to verify that the total duct leakage does not exceed the applicable maximum post-installation leakage rate taken from the following table. See following definitions of "conditioned space" and "majority."*
2. *When a majority of ducts and returns are in a conditioned space (as defined herein), or it cannot be determined that a majority of ducts and returns are in an unconditioned space, the measure is not applicable, unless the Project Sponsor documents pre- and post-installation leakage-to-outside rates, via testing conducted and documented in accordance with one of the procedures laid out below. [UTILITY] may inspect for adequate treatment, or may conduct standard leakage-to-outside tests to verify that the leakage rate from unconditioned space does not exceed the applicable maximum post-installation rate taken from the following table. See the following definitions of "unconditioned space," and "leakage-to-outside tests."*

Definitions:

Unconditioned space*: space within a building that is not conditioned space. See ASHRAE 90.2-2001 (Low-Rise Residential) or 90.1-1999 (Buildings Except Residential Low Rise). The definitions set forth below assume the structure meets the definition of a low-rise residential building as set forth in the ASHRAE Standard 90.2-2001 Scope (Section 2). ASHRAE Standard 90.1-1999 will be used for commercial applications.*

Conditioned Space: *cooled space, heated space, or indirectly conditioned space:*

Cooled space: enclosed space within a building that is cooled by a cooling system whose sensible capacity exceeds 5 Btu/(h-ft^2) or is capable of maintaining a space drybulb temperature of 90°F or less at design cooling conditions.

Heated space: *enclosed space within a building that is heated by a heating system whose output capacity exceeds 10 Btu/(h·ft$_2$) or is capable of maintaining a space drybulb temperature of 50°F or more at design heating conditions.*

Indirectly conditioned space: *enclosed space within a building that is not heated or cooled space, whose area-weighted heat transfer coefficient to heated or cooled space exceeds that to the outdoors or to unconditioned space, or through which air from*

heated or cooled space is transferred at a rate exceeding three air changes per hour (see heated space and cooled space).

Majority: For purposes of determining majority of treated ducts and returns, the proportion of surface area of plenums and ducts located in an unconditioned space shall exceed 50% of the total surface area of all ducts and plenums. Examples of systems in conditioned versus unconditioned space are provided below. These examples are not inclusive.

Single-family dwellings (defined as dwelling units in buildings with fewer than 3 dwelling units) can be treated without pre-qualification by [UTILITY]. Regardless of pre-qualification, [UTILITY] will not pay incentives for installations that do not meet the standards as described herein.

Multifamily units (defined as buildings with 3 or more dwelling units), must be pre-qualified for installation. Prior to beginning installation, Project Sponsor must contact [UTILITY] with a property description. [UTILITY] may pre-qualify, or may require [UTILITY's] site inspection in order to determine eligibility. Regardless of pre-qualification, [UTILITY] will not pay incentives for installations that do not meet the standards as described herein.

Examples of Systems in Conditioned and Unconditioned Spaces

The following examples are intended to illustrate some of the situations that will be found in the field. It is not all-inclusive.

Return/evaporator is in a closet with ceiling. The entire enclosure is considered conditioned space. This is a common installation in older homes in which central air was a post-construction retrofit, but is also utilized in new construction.

Duct is contained within, or consists of, a stud-cavity, joist cavity, or enclosed chase; evaporator is in the attic. The portion of the duct within the cavity is located within a conditioned space.

Return/evaporator in a sealed closet without ceiling that is left open to supply combustion air for a gas/propane furnace. The entire closet is considered unconditioned space.

Supply ducts are within a furr-down. This is considered indirectly conditioned space.

Supply ducts within an attic separated from the conditioned spaced by an insulated ceiling. This is considered an unconditioned space.

Supply ducts within an attic with finished floor, insulated roof and openings to the conditioned space. This is considered an indirectly conditioned space.

Return or supply ducts located in joist cavity in a floor over a crawlspace. If the floor under the ducts (the crawlspace ceiling) is insulated, the ducts are in a conditioned space. If the floor and walls of the crawlspace are insulated and sealed, the ducts are in a conditioned space. If the floor, walls and ceiling of the crawlspace are uninsulated, the ducts are located in an unconditioned space.

Baseline

This measure would be applicable if existing duct system has a leakage rate of greater than or equal to the appropriate values in the following table, as measured by a pre-retrofit duct pressurization test. The calibrated deemed savings model uses an average duct loss factor of 30%.

Installation & Efficiency Standard

Materials used should be long-lasting materials, e.g., mastics, tape-applied mastics, foil tape, and/or aerosol-based sealants, to reduce total leakage rates to less than 10% of total air handler fan flow, verified by post-retrofit duct pressurization test.

Duct Improvement Air Flow Requirements

Measurements to determine whether the air-flow requirements are met must be performed in accordance with [UTILITY]-approved procedures. In applications where a majority of the ducts is in an unconditioned space, the most commonly-used acceptable test method is the Duct Blaster™ (or equivalent) total duct leakage test. Other tests may be accepted at [UTILITY's] sole option.

In applications where duct leakage to outside must be directly measured, the Project Sponsor may use one of several methods, including the blower door subtraction method, the combination duct blaster (or equivalent) and blower door, or the Delta Q method. Other tests may be accepted at [UTILITY's] sole option.

Prior to beginning any installations, the Project Sponsor must submit the intended method(s) and may be required to provide [UTILITY] with evidence of competency.

Leakage rates indicated in the following table must be measured and reported at the average air distribution system operating pressure.

Air Flow Requirements for Duct Efficiency Measure		
AC Size (tons)	Minimum Pre-Installation Leakage Rate (CFM)	Maximum Post-Installation Leakage Rate (CFM)
1.5	120	60
2.0	160	80
2.5	200	100
3.0	240	120
3.5	280	140
4.0	320	160
4.5	360	180
5.0	400	200

Deemed Savings

Duct Efficiency Improvement				
Weather Zone	Electric AC Gas Heat Avg. kWh Savings per sq. ft. of conditioned space	Electric AC Electric Heat Avg. kWh Savings per sq. ft. of conditioned space	Electric AC Heat Pump Avg. kWh Savings per sq. ft. of conditioned space	Summer Peak Avg. kW Savings per sq. ft. of conditioned space
1	0.42092	3.73605	1.97773	0.000486
2	0.71800	2.57573	1.39989	0.000486
3	0.74378	1.80968	1.13027	0.000486
4	0.96962	1.67277	1.23428	0.000486

WATER HEATER REPLACEMENTS – HIGH EFFICIENCY AND FUEL SUBSTITUTION

Measure

Water heating values are on a per-unit basis. Deemed savings variables include tank volume and installed-unit energy factor as rated in the Gas Appliance Manufacturers Association Directory of Certified Water Heating Products. The following table presents the energy savings for high efficiency electric water heaters meeting the required standards (based on tank size and final Energy Factor (EF)).

Baseline

The baseline for electric and gas water heaters is the DOE energy efficiency standard (10 CFR Part 430). The method for calculating standards compliance is:

Electric: 0.93 - 0.00 132 * volume

Gas: 0.62 - 0.0019 * volume

Efficiency Standard

The efficiency threshold for new water heaters is 4% above baseline.

Deemed Savings

Energy Savings - Electric Water Heater Replacements

Electric Water Heater Replacements - Energy Savings			
Approximate Volume (gal) ->	80	50	30
Baseline (DOE Standard) EF	0.82	0.86	0.89
Minimum EF for Incentive Qualification	kWh Savings	kWh Savings	kWh Savings
0.86	150	NAP	NAP
0.87	190	NAP	NAP
0.88	229	NAP	NAP
0.89	267	NAP	NAP
0.90	304	138	NAP
0.91	341	175	NAP
0.92	377	210	NAP
0.93	411	245	143
0.94	446	280	177
0.95	479	313	210

Energy Savings - Gas Water Heater Replacements

The following table presents the energy savings for high efficiency gas water heaters replacing an electric unit.

Gas Water Heater Replacements - Energy Savings			
Approximate Volume (gal) ER->	80	52	30
Approximate Volume (gal) Gas->	50	40	30
Federal Standard EF	0.53	0.54	0.56
4% Improvement	0.55	0.56	0.57
Annual Therms	163	160	157
Gas equivalent kWh	1,554	1,526	1,499
kWh Savings (Base less gas equivalent)	2,070	1,932	1,856

Demand Savings

The following table presents the demand savings for high efficiency electric or fuel-substitution units.

Electric Water Heater Replacements - Demand Savings			
Approximate Volume (gal)->	80	50	30
Standard EF	0.82	0.86	0.89
Minimum EF for Incentive Qualification			
0.86	0.01	NAP	NAP
0.87	0.02	NAP	NAP
0.88	0.02	NAP	NAP
0.89	0.02	NAP	NAP
0.9	0.03	0.01	NAP
0.91	0.03	0.02	NAP
0.92	0.03	0.02	NAP
0.93	0.04	0.02	0.01
0.94	0.04	0.02	0.02
0.95	0.04	0.03	0.02
All Gas Units Meeting the Gas Standards (above)	0.42	0.42	0.42

WATER HEATER JACKETS

Measure

Water heater jackets must have an R-value of at least R-6.7 and must be installed on electric water heaters. These estimates apply to all weather regions.

Baseline

Baseline is assumed to be the post-1991, storage-type, electric resistance water heater, with no water heater jacket.

Installation & Efficiency Standard

Water heater jackets must have an R-value of at least R-6.7 and must be installed on electric water heaters. Manufacturer's instructions of the water heater jacket and the water heater itself should be followed. Thermostat and heating element access panels must be left uncovered.

Deemed Savings

Water Heater Jacket	
KWh Savings per home	Peak kW Savings per home
100	0.010

WATER HEATER PIPE INSULATION

Measure

Water heater pipe insulation must have a minimum thickness of 3/4". Water heaters plumbed with heat traps are not eligible to receive incentives for this measure. The pipe insulation must be installed in a home with electric water heating in order to qualify for an incentive.

Baseline

Baseline is assumed to be the typical electric water heater with no heat traps and no insulation on water heater pipes.

Installation & Efficiency Standard

Water heater pipe insulation must have a minimum thickness of 3/4". All hot and cold vertical lengths of pipe should be insulated, plus the initial length of horizontal hot and cold water pipe, up to three feet from the transition, or until wall penetration, whichever is less.

Deemed Savings

Water Heater Pipe Insulation	
KWh Savings per home	Peak kW Savings per home
40	0.004

ENERGY STAR® REFRIGERATORS

Measure

Retrofit replacement of an existing refrigerator in a residential or small commercial application. Existing unit must be a working unit with a remaining service life of 10 years or more.

Baseline

The baseline for refrigerators is the equivalent of the DOE minimum efficiency standards for refrigerators. Current standards have been in effect since July 1, 2001.

For an individual refrigerator retrofit program, the savings calculations are based on the following assumptions:

Application:	Residential and small commercial
Existing Unit Types:	50% are 22 cu. ft. top-mounted freezers with auto defrost, 50% are 23.5 cu. ft. side-by-side models with auto defrost. Unit ages are between five and fifteen years.
Baseline Consumption:	Original AHAM test data, adjusted for age and other operating conditions, using methodology developed by PNNL.

For a multi-family projects, the savings calculations are based on the following assumptions:

Application:	Multi-family projects
Existing Unit Types:	50% are 15 cu. ft. TF with auto defrost, 50% are 18.5 cu. ft. TF with auto defrost. Unit ages are between five and fifteen years.
Baseline Consumption:	Original Association of Home Appliance Manufacturers (AHAM) test data, adjusted for age and other operating conditions, using methodology developed by Pacific Northwest National Labs.

Installation & Efficiency Standard

Refrigerators must meet current ENERGY STAR® standards.

All Project Sponsor-installed refrigerators must be connected to an adequately sized electrical receptacle and be grounded in accordance to the National Electric Code (NEC).

All refrigerators shall replace refrigerators currently in use, and all replaced refrigerators shall be dismantled in an environmentally-safe manner, in accordance with applicable federal, state, and local regulations. Project Sponsor shall provide documentation of proper disposal of refrigerators according to all local, state and federal laws. The Project Sponsor shall not sell, trade, give away, export across state or international borders any turned-in refrigerator.

ENERGY STAR® standards for 2001 are set at 10% more efficient than applicable DOE standard for 2001.

Deemed Savings

ENERGY STAR® Refrigerators					
Replace on Burnout kWh Savings	Replace on Burnout Peak kW Savings	Multifamily Retrofit kWh Savings	Multifamily Retrofit Peak kW Savings	Single Family Retrofit kWh Savings	Single Family Retrofit Peak kW Savings
61	0.008	728	0.099	866	0.118

From the Refrigerator Energy Savings Program Analysis, developed by Battelle Labs, the peak monthly load index (ratio of peak monthly consumption to average monthly consumption) is 1.12. The average of the hourly load indices for 1300 – 1900 hours is 1.06. This produces an average load index for peak hours during August (peak month) of 1.19.

Average demand savings is calculated as:

Single Family Applications	Multifamily Applications
(866 / 8760) *1.19 = 0.118 kW	(728 / 8760) *1.19 = 0.099 kW

ENERGY STAR® DISHWASHERS

Measure

Purchase ENERGY STAR® dishwasher in a "new construction" or "replacement on burnout" situation. To be eligible, the source of the water for the dishwasher must be an electric water heater.

Baseline

Department of Energy (DOE) minimum efficiency standard for dishwashers.

Type	Energy Factor, EF (load/kWh)	Unit Energy Consumption (kWh/cycle)	Annual energy consumption (kWh) (1) (2)	Assumed demand (kW)
Standard, top loading (capacity > 1.6 cu ft.)	0.46	2.18	700	1.3

(1) Assumes annual usage of 322 cycles (Source: DOE test procedure)
(2) Annual energy consumption = Annual cycles / Energy factor

Approximately 80% of the energy used during a dishwashing cycle is used by the water heater to raise the temperature of the incoming water. DOE test procedure for dishwashers includes this energy, and assumes electrically-heated hot water.

Installation & Efficiency Standard

According to ENERGY STAR® requirement, eligible dishwashers should have an Energy Factor 0.575 or greater, effective 1/1/2001.

Deemed Savings

ENERGY STAR® Dishwashers			
w/ Electric Water Heating		w/out Electric Water Heating	
kWh Savings	Peak kW Savings	kWh Savings	Peak kW Savings
142	0.012	37	0.0032

ENERGY STAR® CLOTHES WASHERS

Measure

Purchase Energy Star® or CEE-qualifying clothes washer in a "new construction" or "replacement on burnout" situation.

Baseline

Department of Energy (DOE) minimum efficiency standard for clothes washer, effective 1/2004.

Modified Energy Factor, MEF (lbs. /kWh)	Unit Energy Consumption (kWh/cycle)	Annual energy consumption (kWh) (1) (2)
1.04	2.84	1115

(1) Assume standard size capacity of 2.96 cu. ft., and annual usage of 392 cycles.
(2) Annual energy consumption includes energy consumed to heat the water (with electric water heating) and to dry the clothes (with an electric dryer).

Installation & Efficiency Standard

Effective 1/1/2004, the ENERGY STAR® standard for clothes washers is a minimum Modified Energy Factor (MEF) of 1.42. The Consortium for Energy Efficiency (CEE) has developed additional specifications for models which exceed ENERGY STAR® specifications.

ENERGY STAR® / CEE Clothes Washer
Specifications and Deemed Savings

Units With Electric Water Heaters

Model	Modified Energy Factor	Annual kWh	KWh Savings	KW Savings
2004 Baseline	1.04	1115		
2004 ENERGY STAR®	1.42	817	**298**	**0.036**
CEE Tier 3	1.60	725	390	0.047
CEE Tier 4A	1.80	644	471	0.057
CEE Tier 4B	1.80	644	471	0.057

Notes:
Modified Energy Factor = MEF = Cubic feet of laundry that can be washed and dried per kWh
392 washer cycles per year (normalized for 2.96 cu.ft. tub volume). Source: DOE
KW demand savings based on 0.00012 peak kW per annual kWh of energy savings. Source: Bonneville Power Administration's ELCON Study.

Units With Gas Water Heaters

Model	MEF	Adjusted MEF*	Annual kWh	KWh Savings	KW Savings
2004 Baseline	1.04	1.75	662		
2004 ENERGY STAR®	1.42	1.92	604	**59**	**0.007**
CEE Tier 3	1.60	2.16	537	125	0.015
CEE Tier 4A	1.80	2.45	474	188	0.023
CEE Tier 4B	1.80	2.45	474	188	0.023

Notes:
*Adjusted MEF based on CEE's kWh/cycle values for clothes washers with gas water heaters. Source: *Consortium for Energy Efficiency Clothes Washer Initiative Program Description*, Table 7.

WATER HEATING REPLACEMENTS - SOLAR WATER HEATING

Measure

Solar water heating deemed savings values are calculated based on the Solar Rating and Certification Corporation's (SRCC) test for solar water heaters (test OG-300).

Installation & Efficiency Standard

Only solar water heaters meeting the SRCC OG-300 standard (based on tank size and final Solar Energy Factor-SEF) qualify for these deemed savings estimates.

Deemed Savings

The following table presents the energy savings for solar water heaters based on tank size and final Solar Energy Factor (SEF).

Demand Savings

	kW
Solar Water Heating Demand Savings	0.42

Energy Savings

Water Heating Replacements – Solar Water Heating Energy Savings			
Approximate Volume (gal) ->	80	50	30
Baseline (DOE Standard) EF	0.82	0.86	0.89
SRCC OG-300 Solar Energy Factor	kWh Savings	kWh Savings	kWh Savings
1.0	637	471	368
1.1	909	743	640
1.2	1,135	969	866
1.3	1,326	1,160	1,057
1.4	1,490	1,324	1,221
1.5	1,633	1,467	1,364
1.6	1,757	1,591	1,488
1.7	1,867	1,701	1,598
1.8	1,965	1,799	1,696
1.9	2,052	1,886	1,783
2.0	2,131	1,965	1,862
2.1	2,202	2,036	1,933
2.2	2,266	2,100	1,997
2.3	2,325	2,159	2,056
2.4	2,379	2,213	2,110
2.5	2,429	2,263	2,160
2.6	2,475	2,309	2,206
2.7	2,518	2,352	2,249
2.8	2,557	2,391	2,288
2.9	2,594	2,428	2,325
3.0	2,628	2,462	2,359
3.1	2,660	2,494	2,391
3.2	2,691	2,525	2,422
3.3	2,719	2,553	2,450
3.4	2,745	2,579	2,476
3.5	2,771	2,605	2,502
3.6	2,794	2,628	2,525
3.7	2,817	2,651	2,548
3.8	2,838	2,672	2,569
3.9	2,858	2,692	2,589
4.0	2,877	2,711	2,608
4.1	2,895	2,729	2,626
4.2	2,913	2,747	2,644
4.3	2,929	2,763	2,660
4.4	2,945	2,779	2,676
4.5	2,960	2,794	2,691
4.6	2,975	2,809	2,706
4.7	2,988	2,822	2,719
4.8	3,002	2,836	2,733
4.9	3,014	2,848	2,745
5.0	3,027	2,861	2,758

SOLAR ELECTRIC (PHOTOVOLTAIC) ENERGY SYSTEMS

Measure

Solar electric (photovoltaic) energy systems deemed savings values are calculated based on the system's rated watts DC_{STC}[1]. Only photovoltaic systems that result in net reductions of the customer's purchased energy and peak demand qualify for these deemed savings estimates. These deemed savings values apply to all customer classes and all weather regions in Texas.

Installation & Efficiency Standard

The installation must also meet the following requirements in order to be eligible for these deemed savings values:

1. The system shall be installed by a licensed electrical contractor or, in the case of a residential installation by the homeowner, with the approval of the electrical inspector in accordance with the National Electric Code (NEC 690, "Solar Photovoltaic Systems") or local building codes.

2. If the system is utility interactive the inverter shall be listed by national testing laboratory (see, for example, UL 1741, "Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems") and meet the requirements of the Institute of Electrical and Electronics Engineers (IEEE) Standard 929-2000 "Recommended Practice for Utility Interface of Photovoltaic (PV) Systems".

3. The array azimuth shall be within +/- 20 degrees of south; the tilt angle shall be between 0 (horizontal) and latitude + 15 degrees.

4. The estimated annual energy generation from the PV system shall not exceed the customer's annual energy consumption.

Deemed Savings

Energy Savings

The following formula calculates the energy savings for solar electric photovoltaic energy systems based on the rated watts DC_{STC}.

$$\text{Deemed Energy Savings (kWh)} = 1.6 * \text{watts } DC_{STC} \text{ installed}$$

Demand Savings

The following formula calculates the demand savings for solar electric photovoltaic energy systems based on the rated watts DC_{STC}.

$$\text{Deemed Demand Savings (kW)} = .83 * \text{kW } DC_{STC} \text{ installed}$$

[1] Watts DC_{STC} refers to the system's factory rated output at standard test conditions, which assumes 1,000 w/m^2 of solar radiation and 25 degree Celsius cell operating temperature.