V

2008 Oncor Electric Delivery Commercial & Industrial Standard Offer Program

Appendices

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V A Standard Cooling Equipment Tables

A.1 Overview

This document contains reference data for estimating demand and energy savings for cooling equipment in the C&I Standard Offer Program. The data are equipment efficiency standards or climate data that will be used to develop the baseline system models and to evaluate savings for all projects under the C&I Standard Offer Program.

Cooling equipment installed under the program must exceed the minimum new equipment efficiency standards shown in the tables. In addition, the minimum baseline efficiencies define the baseline for calculating energy savings. The guidelines in Section III (M&V Guidelines), Chapter 3 (Guidelines for Cooling Equipment) describe the application of these equipment efficiency standards and coefficient tables for estimating baseline demand and energy use and cooling equipment demand and energy savings.

For the following types of cooling equipment, baseline efficiency ratings are provided in Table A.1 through Table A.8 below:

- Unitary air conditioners and heat pumps (air cooled, evaporatively cooled, or water cooled)
- Packaged-terminal air conditioners and heat pumps
- Room air conditioners and heat pumps
- Water-source and ground-water source heat pumps
- Water- and air-cooled water chilling packages

Table A.1 through Table A.8 are based on American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 90.1-1989 and ASHRAE 90.1 2004 Table 6.8.1. The tables present the minimum efficiencies of particular types of cooling equipment. The performance standard data in these tables should be used to determine the rated baseline equipment efficiencies.

The baseline efficiency for existing equipment shall be established as the 1989 standard efficiency. The baseline for equipment for which rating conditions are not provided shall be defined as the energy consumption of the actual existing equipment.

Table A.9 of this document presents the cooling degree-days (CDD) for a weather station located in the Oncor Electric Delivery distribution service territory. Cooling degree-day data are used to normalize metered energy consumption to a typical meteorological year (TMY2). M&V Guideline 3 describes the application of weather data for estimating baseline energy use and cooling equipment energy savings.

Table A.10 the coefficients necessary to complete the air-conditioning equipment deemed savings calculation described in Section III, Chapter 3 and Section IV, Chapter 2.

A.2 Tables

Table A.1: Standard rating conditions and minimum performance for unitary air conditioners and heat pumps, air cooled, electric, <135,000 Btu/hr (< 11.25 tons) capacity, - Except packaged terminal and room air conditioners.

Mode	Cooling Capacity		Rating Condition, °F db	Type	Baseline Performance Standard[1]	New Equipment Standard[2]
	Btu/hr	tons				
	< 65,000	< 5.42	95	1 Ph Split & Packaged	9.5 EER/ 1.263 kW/ton	11.5 EER/ 1.043 kW/ton
	< 65,000	< 5.42	95	3 Ph Split & Packaged	9.5 EER/ 1.263 kW/ton	10.0 EER/ 1.200 kW/ton
	≥ 65,000 & < 135,000	≥ 5.42 & < 11.25	95	Packaged and split	8.9 EER/ 1.348 kW/ton	10.3 EER†/ 1.165 kW/ton

$$Performance\left(\frac{kW}{ton}\right)=\frac{1}{EER}\left(\frac{Watt\cdot hr}{Btu_{out}}\right)*12{,}000\left(\frac{Btu_{out}}{ton\cdot hr}\right)*\frac{1}{1{,}000}\left(\frac{kW}{Watt}\right)=\frac{12}{EER}\left(\frac{kW}{ton}\right)$$

† decrease to 10.1 EER and 1.188 kW/ton for units with a heating section other than electric resistance heat.

Table A.2: Standard rating conditions and minimum performance for unitary air conditioners and heat pumps – evaporatively cooled, electric, <135,000 Btuh (< 11.25 tons) cooling capacity.

Cooling Capacity		Rating indoor air °F db / °F wb	Rating outdoor air °F db/°F wb	Baseline Performance Standard[3]	New Equipment Standard[4]
Btuh	tons				
< 65,000	< 5.42	80/67	95/75	9.3 EER/ 1.290 kW/ton	12.1 EER/ 0.992kW/ton
≥ 65,000 & < 135,000	≥ 5.42 & < 11.25	80/67	95/75	10.5 EER†/ 1.143 kW/ton	11.5 EER†/ 1.043 kW/ton

† Deduct 0.2 from the required EERs for units with a heating section other than electric resistance heat.

1. [1] Reference: ASHRAE Standard 90.1-1989, Table 10-1.
[2] Reference: ASHRAE 90.1 2004, Table 6.8.1.A and Table 6.8.1.B.
Reference Title 42, Chapter 77, Sec 6295 and DOE 10 CFR Part 430
http://www.eere.energy.gov/buildings/appliance_standards/residential/pdfs/central_ac_hp_finalrule.pdf
[3] Reference: ASHRAE Standard 90.1-1989, Table 10-2.
[4] Reference: ASHRAE 90.1 2004, Table 6.8.1.A.

Table A.3: Standard rating conditions and minimum performance for water-cooled air conditioners and heat pumps, electric, <135,000 Btuh (< 11.25 tons) capacity.

Equipment	Cooling capacity, BTU/h	Rating Condition, air °F db / °F wb	Rating Condition, entering water °F†	Baseline Performance Standard[5]	New Equipment Standard[6]
Water cooled heat pumps	< 65,000	80/67	85	9.3 EER/ 1.290kW/ton	-
			86	-	12.0 EER/ 1.000kW/ton
	< 65,000	80/67	75	10.2 EER/ 1.176kW/ton	-
	≥ 65,000 and <135,000	80/67	85	10.5 EER/ 1.143kW/ton	-
			86	-	12.0 EER/ 1.000 kW/ton
	< 135,000, heating	70/60	70	3.8 COP/ 0.925kW/ton	-
			68	-	4.2 COP/ 0.837kW/ton
Ground water cooled heat pumps	< 135,000	80/67	70	11.0 EER/ 1.090kW/ton	-
			59	-	16.2 EER/ 0.741kW/ton
	< 135,000	80/67	50	11.5 EER/ 1.043 kW/ton	-
	< 135,000, heating	70/60	70	3.4 COP/ 1.034kW/ton	-
	< 135,000, heating	70/60	50	3.0 COP/ 1.172kW/ton	3.6 COP/ 0.977kW/ton
Water cooled unitary air conditioners	< 65,000	80/67	85	9.3 EER/ 1.290kW/ton	-
			86	-	12.0 EER/ 1.000kW/ton
	≥ 65,000 and <135,000	80/67	85	10.5 EER 1.143kW/ton	-
			86	-	12.0 EER/ 1.0kW/ton

1.

[5] Reference: ASHRAE Standard 90.1-1989, Table 10-3 and Table 10-5.
[6] Reference: ASHRAE 90.1 2004, Table 6.8.1.B.

Table A.4: Standard rating conditions and minimum performance for packaged terminal air conditioners and heat pumps, air-cooled, electric

Mode	Rating condition, outside air °F db	Baseline Performance Standard†[7]	New Equipment Standard[8]
Cooling	95	10-(0.16 * Cap/1000) EER	12.5-(0.213 * Cap/1000) EER
Cooling	82	12.2-(0.20 * Cap/1000) EER	-
Heating (heat pump)	47 db/43 wb	2.9 - (0.026 * Cap/1000), COP	2.9 - (0.026 * Cap/1000) COP

† Cap is the rated cooling capacity of the unit in Btu/h. If the unit's capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the calculation.

Table A.5: Standard rating conditions and minimum performance for room air conditioners and room air conditioner heat pumps, electric

Category	Capacity, BTUH	Baseline performance standard (EER)[9] EER/kW/ton	New Equipment Standard (EER)[10] EER/kW/ton
Without reverse cycle and with louvered sides	< 6,000	8.0 / 1.500	9.7 / 1.237
	≥ 6,000 and <8,000	8.5 / 1.412	9.7 / 1.237
	≥ 8,000 and <14,000	9.0 / 1.333	9.8 / 1.224
	≥ 14,000 and <20,000	8.8 / 1.364	9.7 / 1.237
	≥ 20,000	8.2 / 1.463	8.5 / 1.412
Without reverse cycle and without louvered sides	< 8,000	8.0 / 1.500	9.0 / 1.333
	≥ 8,000 and <20,000	8.5 / 1.412	8.5 / 1.412
	≥ 20,000	8.2 / 1.463	8.5 / 1.412
With reverse cycle and with louvered sides	< 20,000	8.5 / 1.412	9.0 / 1.333
	≥ 20,000	8.5 / 1.412	8.5 / 1.412
With reverse cycle and without louvered sides	< 14,000	8.0 / 1.500	8.5 / 1.412
	≥ 14,000	8.0 / 1.500	8.0 / 1.500

1.

[7] Reference: ASHRAE Standard 90.1-1989, Table 10-4A.
[8] Reference: ASHRAE 90.1 2004, Table 6.8.1.D.
[9] Reference: ASHRAE Standard 90.1-1989, Table 10-4B.
[10] Reference: ASHRAE 90.1 2004, Table 6.8.1.D.

Table A.6: Baseline and New Equipment Standards for large unitary air conditioners and heat pumps, electric, ³ 135,000 Btuh (³ 11.25 tons) capacity.

Equipment Type	Cooling Capacity		Baseline Performance Standard[11]		New Equipment Standard[12]	
	Btuh	tons	EER	kW/ton	EER	kW/ton
Air cooled air conditioners	≥ 135,000 & <240,000	≥ 11.25 & < 20.00	8.5	1.412	9.7	1.237
	≥ 240,000 & <760,000	≥ 20.00 & < 63.33	8.5	1.412	9.5	1.263
	≥ 760,000	≥ 63.33	8.2	1.463	9.2†	1.304
Water or evaporatively cooled air conditioners	≥ 135,000	≥ 11.25	9.6	1.250	11.0†	1.091
Air cooled heat pumps	≥ 135,000 & <240,000	≥ 11.25 & < 20.00	8.5†	1.412	9.3†	1.290
	≥ 240,000 & <760,000	≥ 20.00 & < 63.33	8.5†	1.412	9.0†	1.333
	≥ 760,000	≥ 63.33	8.7†	1.379	9.0†	1.333
	≥ 135,000	≥ 11.25	2.9††	N/A	3.1††	N/A
Air cooled condensing units	≥ 135,000	≥ 11.25	9.9	1.212	10.1	1.188
Water or evaporatively cooled condensing units	≥ 135,000	≥ 11.25	12.9	0.930	13.1	0.916

† Deduct 0.2 from the required EERs for units with a heating section other than electric resistance heat.

†† Coefficient of Performance (COP) for heating mode rated at 47 °F dry bulb, 43 °F wet bulb outdoor conditions.

$$Performance\left(\frac{kW}{ton}\right)=\frac{1}{EER}\left(\frac{Watt\cdot hr}{Btu_{out}}\right)*12{,}000\left(\frac{Btu_{out}}{ton\cdot hr}\right)*\frac{1}{1{,}000}\left(\frac{kW}{Watt}\right)=\frac{12}{EER}\left(\frac{kW}{ton}\right)$$

1. [11] Reference: ASHRAE Standard 90.1-1989, Table 10-6.
[12] Reference: ASHRAE 90.1 2004, Table 6.8.1.A and Table 6.8.1.B.

Table A.7: Baseline and New Equipment Standards for water chilling packages, electric.

Equipment Type	Cooling Capacity (tons)	Baseline Performance Standard[13]		New Equipment Standard[14]	
		COP	kW/ton	COP	kW/ton
Water cooled, positive displacement (rotary screw, scroll)	< 150	3.80	0.926	4.45	0.790
	≥ 150 and <300	4.20	0.837	4.90	0.718
	≥ 300	4.70	0.748	5.50	0.639
Water cooled, centrifugal	< 150	3.80	0.926	5.00	0.703
	≥ 150 and <300	4.20	0.837	5.55	0.634
	≥ 300	4.70	0.748	6.10	0.577
Air cooled with condenser	< 150	2.70	1.303	2.80	1.256
	≥ 150	2.50	1.407	2.80	1.256
Air cooled without condenser	All	3.10	1.135	3.10	1.135

$$Performance\left(\frac{kW}{ton}\right)=\frac{1}{COP}\left(\frac{Btu_{in}}{Btu_{out}}\right)*12{,}000\left(\frac{Btu_{out}}{ton\cdot hr}\right)*\frac{1}{3{,}412}\left(\frac{kWh}{Btu_{in}}\right)=\frac{3.517}{COP}\left(\frac{kW}{ton}\right)$$

Table A.8: Standard rating conditions and minimum performance for water chilling packages, gas absorption

Equipment Type	Cooling Capacity	Baseline Performance Standard[15] (COP)	New Equipment Standard[16] (COP)
Air-cooled absorption, single-effect	All capacities	0.48	0.60
Water-cooled absorption, single-effect	All capacities	0.60	0.70
Absorption double effect, indirect-fired	All capacities	0.95	1.00
Absorption double effect, direct-fired	All capacities	0.95	1.00

1. _____

[13] Reference: ASHRAE Standard 90.1-1989, Table 10-7.
[14] Reference: ASHRAE 90.1 2004, Table 6.8.1.C.
[15] Reference: ASHRAE Standard 90.1-1999, Table 6.2.1.C.
[16] Reference: ASHRAE 90.1 2004, Table 6.*.1.C.

Table A.9: TMY2 Cooling Degree Days (base 65) for the Oncor Electric Delivery service territory

Weather Station	WBAN No.	CDD(65) (^{o}F)
Abilene	13962	2,284
Dallas/Ft. Worth	03927	2.414
Odessa/Midland	23023	2,031
Waco	13959	2,546
Wichita Falls	13966	2,385

Table A.10: Deemed savings coefficients for the Oncor Electric Delivery area climate for various building types and equipment types.

Building Type	Demand Coefficient			Energy Coefficient		
	Air Cooled Chiller	Water Cooled Chiller	DX	Air Cooled Chiller	Water Cooled Chiller	DX
College	0.89	0.81	0.91	1,587	1,761	1,955
Convenience			0.92			3,831
Fast Food			0.92			3,106
Grocery		0.87	0.92		2,708	2,815
Hospital	1.15	0.83		2,453	2,733	
Hotel	0.89	0.84	0.92	1,633	1,698	2,137
Motel			0.92			2,211
Nursing Home	0.90	0.82	0.92	1,744	1,854	2,218
Large Office	0.88	0.80	0.92	2,232	2,406	2,493
Small Office	0.90	0.80	0.92	1,598	1,649	1,970
Public Assembly	0.90	0.84	0.92	2,005	2,116	2,385
Restaurant			0.92			2,405
Religious Worship	0.88	0.83	0.90	1,355	1,396	1,946
Retail	0.90	0.83	0.92	1,770	1,828	2,225
School	0.88	0.81	0.91	1,136	1,273	1,569
Service			0.92			2,262
Warehouse	0.90	0.86	0.92	1,378	1,435	2,110

Table A.11: Useful Formulas

	Chillers	**A/C units**
Rating	COP = 3.516 / kW/Tons	EER = BTU/(Watt*Hour)
kW/Ton	3.516/COP	12/EER
kW	(Tons*12)/(3.413*COP)	(Tons*12)/EER

V B Table of Standard Motor Efficiencies

B.1 Overview

This document contains reference data for estimating demand and energy savings in C&I Standard Offer Program for energy efficient motors and related measures. For motors installed under the program, the equipment must exceed these minimum efficiency standards. In addition, the minimum efficiencies define the baseline for calculating demand and energy savings. M&V Guideline 4 for motor measures describes the application of these equipment efficiency standards for estimating baseline demand and energy use and measure demand and energy savings.

B.2 Table

The efficiencies of permanently wired, poly-phase motors that are at least one horsepower in size and that are used for fan, pumping, and conveyance applications are defined in Table B.1. Table B.1 is based on ASHRAE 90.1 2004 Table 10.8. Note, however, that the following motors are exempt from these requirements:

- Motors in appliances.
- Refrigeration compressor motors.
- Multi-speed motors.
- Motors that are used as components of cooling equipment where the motors are part of the efficiency ratings listed in the Standard Cooling Equipment Tables.
- For motors exceeding 200 horsepower, the existing motor is the baseline, the new motor must be more efficient than the baseline.

The efficiency values given in Table B.1 should be used to determine the equipment baseline. Equipment installed under the C&I Standard Offer Program must be more efficient than the standards shown in order to be eligible for incentives.

Table B.1: Minimum nominal full-load motor efficiency for single speed poly-phase motors

Motor	Horsepower	2-Pole	4-Pole	6-Pole
Open	1.0	--	82.5	80.0
	1.5	82.5	84.0	84.0
	2.0	84.0	84.0	85.5
	3.0	84.0	86.5	85.5
	5.0	85.5	87.5	87.5
	7.5	87.5	88.5	88.5
	10.0	88.5	89.5	90.2
	15.0	89.5	91.0	90.2
	20.0	90.2	91.0	91.0
	25.0	91.0	91.7	91.7
	30.0	91.090.2	92.4	92.4
	40.0	91.7	93.0	93.0
	50.0	92.4	93.0	93.0
	60.0	93.0	93.6	93.6
	75.0	93.0	94.1	94.1
	100.0	93.0	94.1	94.1
	125.0	93.6	94.5	94.1
	150.0	93.6	95.0	94.5
	200.0	94.5	95.0	94.5
Enclosed	1.0	75.5	82.5	80.0
	1.5	82.5	84.0	85.5
	2.0	84.0	84.0	86.5
	3.0	85.5	87.5	87.5
	5.0	87.5	87.5	87.5
	7.5	88.5	89.5	89.5
	10.0	89.5	89.5	89.5
	15.0	90.2	91.0	90.2
	20.0	90.2	91.0	90.2
	25.0	91.0	92.4	91.7
	30.0	91.0	92.4	91.7
	40.0	91.7	93.0	93.0
	50.0	92.4	93.0	93.0
	60.0	93.0	93.6	93.6
	75.0	93.0	94.1	93.6
	100.0	93.6	94.5	94.1
	125.0	94.5	94.5	94.1
	150.0	94.5	95.0	95.0
	200.0	95.0	95.0	95.0

V C Table of Standard Fixture Wattages

C.1 Overview

The Table of Standard Fixture Wattages contains reference data for estimating demand and energy savings in the C&I Standard Offer Program for lighting measures. The Table assigns identification codes and demand values (watts) to common fixture types (fluorescent, incandescent, HID, LED, etc.) used in commercial applications. The Table wattage values for each fixture type are averages of various manufacturers' laboratory tests performed to ANSI test standards. By using standardized demand values for each fixture type, the Table simplifies the accounting procedures for lighting equipment retrofits.

Oncor Electric Delivery posts updated versions of the Table on the program Web site at http://www.oncor.com/electricity/teem/services/candi/standards.aspx as new fixtures are added. Service Providers should make sure that they are working with the most recent version of the Table as they prepare *Lighting Equipment Survey* forms.

If a project uses a fixture type not listed in the Table, the Service Provider should request that Oncor Electric Delivery add a new fixture code. The request should include all information required to uniquely identify the fixture type and to fix its demand. If possible, the request should be supported by manufacturer's ANSI test data.

The *Lighting Equipment Survey Form* is linked to a copy of the Standard Wattage Table and looks up wattage values for fixture codes automatically. For this reason, Service Providers should use only the identification codes included in the Table.

C.2 Table

The Table is subdivided into fixture types such as linear fluorescent, compact fluorescent, mercury vapor, etc, with each subdivision sorted by fixture code. Each record, or row, in the Table contains a fixture code, which serves as a unique identifier. Each record also includes a description of the fixture, the number of lamps, the number of ballasts if applicable, and the fixture wattage. A legend explains the rules behind the fixture codes.

The US Energy Policy Act of 1992 (EPACT) sets energy efficiency standards that preclude certain lamps and ballasts from being manufactured or imported into the US. Under the C&I Standard Offer Program 2008, all lighting equipment, including existing or baseline equipment, must be EPACT compliant. As a result, certain lamp/ballast combinations, which are non-EPACT compliant, are assigned EPACT demand values. Thus, a 4-foot fixture with 40-watt T-12 lamps and a standard

magnetic ballast has the same demand value as a like fixture equipped with 34-watt T-12 lamps and an energy efficient magnetic ballast.

The fixture codes and the demand values listed in the watt/fixture column in the Table of Standard Fixture Wattages must be used in calculating energy and demand savings for any lighting efficiency project in the C&I Standard Offer Program. These are incorporated into our lighting inventory tables and can be found at http://www.oncor.com/electricity/teem/services/candi/standards.aspx.

V D M&V Sampling Guidelines

D.1 Overview

This appendix provides guidelines for defining a sample of equipment for measurement and verification purposes. In sampling, a large number of similar pieces of equipment affected by the same energy-efficiency measure can be grouped into usage groups from which samples are selected. These sampling guidelines are designed to provide assistance in determining the number of sample points that should be monitored in order to meet the program precision requirements and provide a reliable estimate of parameters such as annual energy savings or hours of operation. If alternative approaches are proposed, they must be approved by Oncor Electric Delivery and based on sound statistical principles.

D.2 Steps in Calculating Sample Size

The number of pieces of equipment requiring monitoring can be calculated according to the following steps:

1. Compile measure information

Compile the following information for the equipment affected by the measures. This step is normally undertaken during the preparation of the Final Application.

- *Number of Fixtures/Equipment*. Identify and document the fixtures/equipment that are affected by the installation of measures in a survey that includes nameplate data, quantity of equipment, and location information.
- *Projected Hours of Operation*. Project the average hours of operation of the equipment. It should be based on the experience of the building operator, on the operation of the affected equipment or even some preliminary monitoring.

2. Designate usage group

Next, provide a brief description of the functional use of the space being audited. Functional uses typically encountered in lighting for commercial and industrial facilities are provided in Section III, Chapter 2, Table 2.3 of this manual. Usage groups for non-lighting measures are dependent on type of application. Sources of information on operating characteristics, other than monitoring, used in defining usage groups include: (a) operating schedules that provide information on energy consumption or hours of operation; and (b) type of application or location that provides information on how and when equipment (e.g., fixtures or motors) are operated. In some instances, area type alone may be insufficient to designate usage groups. Usage groups may need to be further subdivided if an area type is inherently variable in nature due to different characteristics of their occupants. For example, some laboratories may have longer operating hours than others and should be

divided into different usage groups (e.g., computer laboratory lighting operates for 8 hours per day while agriculture laboratories operate 4 hours per day).

3. Calculate sample sizes

Once the equipment has been divided into usage groups, the total sample size needed for these groupings can be calculated. This approach produces a sample (with a coefficient of variation of 0.5) expected to estimate the average hours of operation with sufficient accuracy. The following table shows the number of samples required in a usage group.

Table D.1: Sample Size based on Usage Group Sampling

Population of Lines in Usage Group (n)	Sample Size*
n<4	3
5≤n≤6	4
7≤n≤9	5
10≤n≤14	6
15≤n≤21	7
22≤n≤36	8
37≤n≤72	9
72≤n≤377	10
n>377	11

* Sample sizes assume a confidence interval of 80%, precision of 20%, and a coefficient of variation (cv) of 0.5 for the populations indicated.

D.3 Over-sampling

The initial sample size should be increased to compensate for potential reductions in the final usable sample due to equipment failure or loss. Suggested guidelines are that the sample size be increased by 10 percent.

V E Program and M&V Definitions

The following are definitions to commonly used terms in the Oncor Electric Delivery C&I Standard Offer Program:

Affiliate: (A) a person who directly or indirectly owns or holds at least 5.0% of the voting securities of an energy efficiency service provider; (B) a person in a chain of successive ownership of at least 5.0% of the voting securities of an energy efficiency service provider; (C) a corporation that has at least 5.0% of its voting securities owned or controlled, directly or indirectly, by an energy efficiency service provider; (D) a corporation that has at least 5.0% of its voting securities owned or controlled, directly or indirectly, by: (i) a person who directly or indirectly owns or controls at least 5.0% of the voting securities of an energy efficiency service provider; or (ii) a person in a chain of successive ownership of at least 5.0% of the voting securities of an energy efficiency service provider; or (E) a person who is an officer or director of an energy efficiency service provider or of a corporation in a chain of successive ownership of at least 5.0% of the voting securities of an energy efficiency service provider; (F) a person who actually exercises substantial influence or control over the policies and actions of an energy efficiency service provider; (G) a person over which the energy efficiency service provider exercises the control described in subparagraph (F) of this paragraph; (H) a person who exercises common control over an energy efficiency service provider, where "exercising common control over an energy efficiency service provider" means having the power, either directly or indirectly, to direct or cause the direction of the management or policies of an energy efficiency service provider, without regard to whether that power is established through ownership or voting of securities or any other direct or indirect means; or (I) a person who, together with one or more persons with whom the person is related by ownership, marriage or blood relationship, or by action in concert, actually exercises substantial influence over the policies and actions of an energy efficiency service provider even though neither person may qualify as an affiliate individually.

Approved: shall mean approved by Oncor Electric Delivery

Baseline Energy Use: The calculated or measured energy use by a piece of equipment or a site prior to the implementation of the project measures. Baseline physical conditions, such as equipment counts, nameplate data, and control strategies, will typically be determined through surveys, inspections, and/or metering at the site.

Commission: The Public Utility Commission of Texas (PUCT).

Contract Documents: shall mean (1) the Service Provider's Standard Contract (2) this Program manual (3) each approved Initial Application (4) each approved Final Application, together with any and all other exhibits, addenda, or amendments referenced in the Contract Documents or made a part thereof in accordance with this Program Manual; as the same may be amended from time to time. To the extent of

any conflict between the Standard Contract and any other Contract Documents, the terms of the Standard Contract shall prevail.

Customer: shall mean a large commercial or industrial customer of Oncor Electric Delivery that owns or leases facilities at a Project Site. A large commercial customer shall mean a retail commercial customer with a demand that exceeds 100 kW; a customer's load within Oncor Electric Delivery's service territory that is under common ownership shall be combined for the purpose of determining demand. Eligible energy efficiency Measures installed at multiple facilities owned by the same commercial customer are eligible for incentives under this Program if the total demand associated with these facilities exceeds 250 kW. For purposes of the C&I Standard Offer Program, "site" is synonymous with "customer," and is also distinguished by a unique address or Oncor Electric Delivery account number (ESI ID).

Customer and Service Provider Agreement: shall mean the agreement signed by the Service Provider and Customer that complies with Appendix B to Chapter 2 of this Program Manual.

Deemed Savings: shall mean the maximum one-hour average demand reduction, expressed in kilowatts (kW), that results only from those Measures included in the Service Provider's approved FA and that occurs when the Measures are operating at peak conditions during the summer period. The summer period is defined as Monday through Friday, between the hours of 1 PM and 7 PM Central Daylight Savings Time from May 1 through September 30, excluding Federal holidays. Any demand savings that may result from Measures installed or activities completed by the Service Provider that are not included in the approved FA will be excluded from this definition and are not eligible for payment under the Program. Demand savings will be calculated based upon savings over and above standard efficiency equipment and not in relationship to existing equipment, except in cases where no standards exist. Equipment standard efficiencies are ASHRAE 90.1-1989, ASHRAE 90.1 2004, and the Oncor Electric Delivery Standard Lighting Wattage Table, unless the equipment being removed is more efficient than these standards.

Deemed Savings Estimates: A pre-determined, validated estimate of energy and peak demand savings attributable to an energy efficiency measure in a particular type of application that a utility may use instead of energy and peak demand savings determined through measurement and verification activities.

Demand Savings: The maximum one-hour average demand reduction (in kW) that occurs when the system undergoing retrofit is operating at peak conditions during the summer period. The summer period is defined as weekdays, between the hours of 1 PM and 7 PM from May 1 until September 30, excluding Federal holidays.

Energy Efficiency Measure (EEM): A system, piece of equipment, or materials that result in either reduced electric energy consumption, or reduced peak demand, or both.

Energy Efficiency Project: An energy efficiency measure or combination of measures installed under a Standard Agreement that results in both a reduction in customers' electric energy consumption and peak demand, as well as a reduction in energy costs.

Energy Savings: shall mean the amount of annual (one-year) electric energy reduction, expressed in kilowatt-hours (kWh), that results only from those Measures included in the Service Provider's approved FA. Any energy savings that may result from Measures installed or activities completed by the Service Provider that are not included in the approved FA will be excluded from this definition and are not eligible for payment under the Program. Energy savings will be calculated based upon savings over and above standard efficiency equipment and not in relationship to existing equipment, except in cases where no standards exist. Equipment standard efficiencies are ASHRAE 90.1-1989, ASHRAE 90.1 2004, and the Oncor Electric Delivery Standard Lighting Wattage Table, unless equipment being removed is more efficient than these standards.

Estimated Demand Savings and **Estimated Energy Savings**: shall mean the savings estimated to be produced by Service Provider in the approved FA.

Estimated Payment Amount: is the amount included in the approved FA related to Estimated Demand Savings and Estimated Energy Savings.

Final Application (FA): The purpose of the Final Application is to detail the expected demand and energy savings and incentive payments for each project, to be included in the Project Authorization, which is attached to the signed Standard Offer Program Contract between Oncor Electric Delivery and the Service Provider. The Final Application will require more complex engineering estimates than the IA, and will ask for a letter of intent from the customers involved in each application.

Full Measurement and Verification: A detailed estimate of savings using a higher level of rigor than in the deemed savings or simple M&B approaches through the application of metering, billing analysis, or computer simulation.

Initial Application (IA): In the IA, Service Providers must have identified customers and energy efficiency measures, but need not have completed a detailed engineering study. With the IA, Oncor Electric Delivery will collect a non-refundable deposit equal to 5% of the incentive funding requested. Approval by Oncor Electric Delivery of the IA signifies that funding has been reserved for the project.

Installation Notice (IN): After approval of the FA and issuance of a Project Authorization, a Service Provider may proceed to install the energy efficiency measures included in an application. After installation is complete, the Service Provider will submit an IN giving details about the equipment actually installed at each customer site. Once Oncor Electric Delivery receives the IN, Oncor Electric Delivery or its M&V contractor will inspect the customer sites to ensure installation and operation of the equipment.

Installation Payment: The first of two incentive payments made to a Service Provider. The installation payment is 40% of the total estimated incentive amount.

Measure: shall mean new equipment, material, or systems installed pursuant to the Project that when installed and used at a Project Site result in a measurable and verifiable reduction in purchased electric energy consumption, measured in kWh, or peak demand, measured in kW, or both, that meet the requirements of the Contract Documents, and that, in the determination of Oncor Electric Delivery or the Public Utility Commission of Texas ("PUCT"), meet the requirements of PUCT Substantive Rule 25.181 and 25.184.

Measured Demand Savings and **Measured Energy Savings**: shall mean the Demand Savings and the Energy Savings derived from the Measures installed at the Project Site as determined in accordance with the Measurement and Verification Plan, and as documented in a Savings Report approved by Oncor Electric Delivery.

Measurement & Verification (M&V): A term referring to all necessary equipment surveys, metering and monitoring, statistical estimation and analysis, and reporting used to quantify the Energy and Demand savings resulting from the installation of EEMs. Any M&V approach will need to result in savings estimates that meet certain accuracy requirements.

Measurement and Verification Plan: shall mean a plan submitted with the FA and approved by Oncor Electric Delivery to measure and verify Demand Savings and Energy Savings.

Party: shall refer to either Oncor Electric Delivery or Service Provider, which may be referred to jointly as the "**Parties**".

Performance Period: shall mean the period lasting no longer than twelve (12) months following approval of the IN, during which measurement and verification activities take place.

Performance Payment: The second of two incentive payments that is equal to the balance of the incentive calculated from the actual savings minus the installation payment and may be up to 60% of the total estimated incentive payment.

Post-Installation (or Post-Retrofit) Energy Use: The calculated energy usage (or demand) by a piece of equipment or a site after implementation of the project. Post-installation energy use is verified by the Service Provider and Oncor Electric Delivery. They also verify that the reported equipment components or systems were installed, are operating, and have the potential to generate the predicted savings.

Power Adjustment Factor: A stipulated value used to estimate the reduction in operating hours associated with a lighting controls measure.

Pre-Installation (or Pre-Retrofit) Energy Use: The calculated energy usage (or demand) by a piece of equipment or a site before implementation of the project. Pre-installation energy use is verified by the Service Provider and Oncor Electric

Delivery. They also verify that the existing equipment components or systems were properly documented and can be retrofitted to generate savings.

Project: The term "project" refers to a single application's set of proposed energy efficiency measures or other improvements that are necessary to produce energy savings under the program. To be eligible, a project must be expected to save at least 20 kW of peak demand and must be developed at a Oncor Electric Delivery commercial or industrial distribution customer's site.

Project Authorization: A document containing project savings and incentive estimates as stated in the approved FA. The Oncor Electric Delivery Program Manager and the Service Provider will sign the Project Authorization and attach it to the Standard Offer Contract. The Project Authorization is a signal to the Service Provider to begin the installation of EEMs.

Project Site: shall mean the location of a Customer's facilities where approved Measures will be installed and from which Demand Savings and Energy Savings will be obtained.

Project-Specific M&V Plan: Plan providing details on how a specific project's savings will be verified based on the general M&V approaches contained in this document and the contract between Oncor Electric Delivery and Service Provider.

Service Provider: Any organization, group, or individual contracting with Oncor Electric Delivery to provide energy savings at customer sites under the program(s).

Prudent Electrical Practices: shall mean those practices, methods, standards and equipment commonly used in prudent Electrical engineering and operations to operate Electrical equipment lawfully and with safety, dependability and efficiency and in accordance with the National Electrical Safety Code, the National Electrical Code and any other applicable federal state and local codes; provided, however, in the event of a conflict, the applicable federal, state or local code shall govern.

Sampling Plan: A description of the methods for choosing a representative number of pieces of equipment for monitoring. Often used with lighting retrofits, sample sizes should be generated based on an 80% confidence interval, precision of 20%, and a coefficient of variation (cv) of 0.5 for the population indicated.

Savings Report (SR): Pre-specified documentation provided by the Service Provider to document energy savings achieved for 12 months after project installation. This documentation verifies continued operation of the installed equipment components or systems and the associated energy savings and provides M&V results. The energy savings documented in the SR serves as the basis for the Service Provider's invoice once the report has been reviewed and approved by Oncor Electric Delivery.

Simplified M&V: Savings values are based on engineering calculations using typical equipment characteristics and operating schedules developed for particular applications, with some short-term testing of simple, long-term metering.

Standard Contract: All Service Providers participating in any of the Standard Offer Programs will be required to sign a Standard Contract with Oncor Electric Delivery. The terms of the contract are standard for all participants, and will include a maximum payment value, a scope of work, a nondisclosure form, and an installation deadline.

Usage Group: A collection of equipment (e.g., motors or rooms with light fixtures) with similar operating schedules and functional uses.

V F M&V Example

F.1 Project Summary

An owner of a 250,000 square foot office complex is participating in Oncor Electric Delivery's Commercial and Industrial Standard Offer Program. A central chilled water plant cools the facility with a 15-year-old 700-ton centrifugal chiller. The owner of the building is planning to replace the older chiller with a new, high efficiency unit. The new unit under consideration is rated with an ARI nominal COP of 6.4 (0.55 kW/Ton). The baseline and minimum efficiency standards for water-cooled electric chillers is taken from Appendix A, Table 7 of the *Standard Cooling Equipment Tables*. For a 700-ton water-cooled chiller, the baseline efficiency is 4.7 COP, which is equivalent to 0.748 kW/ton. Likewise, for a 700-ton water-cooled chiller, the minimum efficiency is 6.1 COP, which is equivalent to 0.577 kW/ton (and the unit qualifies for the program by having a higher efficiency than the required minimum).

F.2 Assumptions

This M&V plan is written with the following assumptions:

1. The office building is not planning any major projects that would significantly alter the chiller load or schedule, such as building additions, significant changes in building occupancy, or significant changes in building schedule.

2. The chiller operating schedule will not change because of this project.

Based on the assumptions and the fact that the new chiller is similar to the existing one (similar size, water-cooled, no VFD, etc.), the only characteristic needed to estimate the demand and energy savings is the full load efficiency of each chiller.

F.3 Project Activities

The proposed method for conducting the M&V is from Section III, Chapter 3: *Guidelines for Replacement of Cooling Equipment*. Since the simplified guidelines are being used, pre-installation monitoring is not required. The project may require pre-installation and does require post-installation inspections, post-installation monitoring of chiller demand (kW for at least one hour at peak operating conditions), post-installation monitoring of chiller consumption (kWh for the entire year), an Installation Report, and a Savings Report. The Service Provider shall be responsible for all M&V activities and production of reports.

F.3.1 Inspections

Oncor Electric Delivery may perform a pre-installation inspection to validate assumptions used in the savings calculations, and verify the existing chiller

efficiency. The best source of information for the existing efficiency is the ARI certification, which accompanies the existing chiller. A post-installation inspection will be performed to verify that the chiller was installed and is operating as proposed in the approved Final Application.

F.3.2 Post-Installation Monitoring

Post-installation monitoring of chiller electrical consumption shall be conducted for the entire M&V period. This monitoring will be accomplished using an ACME Inc, self contained, three-phase, true RMS kW logger. The logger collects time stamped data at 15-minute intervals. The logger will be downloaded monthly and the data validated and stored. In the event that there is a significant gap in the data due to a logger failure, the process to replace the missing data with interpolated or averaged data will be clearly documented. The 15-minute time stamped data will be used to satisfy all post-installation monitoring requirements.

F.3.3 Reports

After the chiller is installed and commissioned, an Installation Report will be produced documenting that the equipment specified in the FA was installed and is functioning as expected. A Savings Report, following the guidelines and forms provided in the procedures manual, will be generated and submitted upon completion of the data collection activities. Savings estimates will be provided in spreadsheet form, following the template provided in Table 2, below. In addition to the reports, all monitoring data will be submitted in electronic format for review by Oncor Electric Delivery.

F.4 Metering Plan

The electrical demand of the proposed (new) chiller will be monitored to support the required M&V activities. This three-phase load will be monitored using an ACME true RMS kW meter. Current Transducers will be placed on Breakers 1, 3 and 5 of switch-gear SG-1. These breakers are the A, B, and C phases of the 460 volt service that supplies the chiller. No other devices draw power from these breakers.

The ACME meter will record electrical consumption at 15 Minute intervals for the duration of the monitoring period. This logger is capable of storing 41 days of 15-minute data using a fifteen minute interval. Data will be downloaded and stored on the first working day of each month to ensure that the logger does not run out of memory.

F.5 Accuracy Requirements

The ACME logger will be calibrated at the time of installation and then checked for calibration every 6 months. This will be accomplished using a Powersite true RMS meter calibrated at the factory to ±2 percent of reading.

F.6 Data Gathering and Quality Control

The data will be collected using quality control procedures for checking reasonableness. Any and all missing intervals will be replaced either by interpolation or use of average values. Oncor Electric Delivery will be notified of any data substitution because of missing data, and the method employed to substitute the data.

F.7 Calculations and Adjustments

The calculations described below will be performed for the Savings Report and will form the basis of incentive payments. The nominal efficiencies of the chillers are provided again in Table F.1 below.

Table F.1: Proposed and Baseline Chiller Statistics

Chiller	Efficiency (COP)	Full-Load kW
Baseline	4.7	524
Proposed	6.4	385

Using the post-installation data described above and the information in Table F.1, the savings will be calculated using Equations F.1 and F.2.

Equation F.1: Calculation of Energy Savings

$$\text{Energy Savings [kWh]} = \text{Post Installation Metering [kWh]} \bullet \left\{\left[\frac{\text{COP of new chiller}}{\text{Baseline COP}}\right] - 1\right\}$$

Equation F.2: Calculation of Peak Demand Savings

$$\text{Demand Savings [kW]} = \text{Max Demand Measured [kW]} \bullet \left\{\left[\frac{\text{COP of new chiller}}{\text{Baseline COP}}\right] - 1\right\}$$

The ratio of new to existing chiller is computed as 6.4 divided by 4.7 to yield 1.36. Table F.2 below provides a template to illustrate how monthly savings calculations will be estimated when actual M&V data are available.

Table F.2: Template for Computing Savings

Time of Day	Measured kW for peak day in June (hourly average)	Peak savings (kW)	Average demand profile in June (kW)	Days of Operation for June	Energy Consumption (kWh)	Energy Savings for June (kWh)
0:00	127.0	45.7	82.6	23	1899	684
1:00	142.4	51.3	92.6	23	2129	767
2:00	134.8	48.5	87.6	23	2015	725
3:00	127.0	45.7	82.6	23	1899	684
4:00	134.8	48.5	87.6	23	2015	725
5:00	127.0	45.7	95.3	23	2191	789
6:00	142.4	51.3	106.8	23	2456	884
7:00	173.2	62.4	129.9	23	2988	1076
8:00	269.6	97.1	202.2	23	4651	1674
9:00	288.8	104.0	216.6	23	4982	1793
10:00	319.6	115.1	271.7	23	6248	2250
11:00	346.6	124.8	294.6	23	6776	2439
12:00	354.2	127.5	301.1	23	6925	2493
13:00	358.0	128.9	304.3	23	6999	2520
14:00	362.0	130.3	271.5	23	6245	2248
15:00	365.8	131.7	274.4	23	6310	2272
16:00	365.8	131.7	274.4	23	6310	2272
17:00	346.6	124.8	260.0	23	5979	2153
18:00	327.2	117.8	245.4	23	5644	2032
19:00	308.0	110.9	200.2	23	4605	1658
20:00	192.6	69.3	125.2	23	2879	1037
21:00	127.0	45.7	82.6	23	1899	684
22:00	142.4	51.3	92.6	23	2129	767
23:00	115.6	41.6	75.1	23	1728	622
Total Savings:		131.7				35,248

The illustrative load data represents chiller consumption in the month of June. Energy savings (kWh) will be estimated in each month by multiplying the average hourly kWh with the number of days in the month and then applying equation F.1. The energy savings for each month will then be aggregated into an annual savings estimate. The peak data shall be used in equation F.2 to estimate the peak demand savings (kW).

V Stipulated Savings for Window Films

G.1 Overview

The installation of window films decreases the window shading coefficient and reduces the solar heat transmitted to the building space. During months when perimeter cooling is required in the building, this measure decreases cooling energy use.

The simplified M&V guidelines developed for this measure are applicable for window films applied to south- and west-facing windows only. The measure demand and energy savings are calculated based on the window-film area, change in shading coefficient and cooling equipment efficiency. Savings for window film measures are determined using the E4.xls Microsoft Excel spreadsheet available on the Oncor Electric Delivery C&I Standard Offer Program website (http://www.oncor.com/electricity/teem/services/candi/standards.aspx).

The following steps comprise the simplified M&V procedure for window-film installations.

1. Collect data characterizing the existing south and west windows including: shading coefficient, type of interior shading devices, and presence of exterior shading from buildings or other obstacles. Identify the type and rated efficiency of the cooling equipment in the building.
2. Document the installed window-film shading coefficient and window application area for the south and west windows.
3. Based on the characteristics of the existing windows, newly installed window-films, and cooling equipment; determine the annual demand and energy savings using the window-film calculation spreadsheet (E4.xls).

G.2 Pre-installation M&V Activities

G.2.1 Pre-installation Site Survey

The goal of the pre-installation site survey is to identify the existing south and west window characteristics. At a minimum, the surveys should include the following data for the south and west windows:

- Existing window description
- Existing window shading coefficient
- Window area by cardinal orientation
- Description of interior shading devices

- If applicable, an estimate of combined window-interior shading coefficient determined from 1997 ASHRAE Fundamentals, Chapter 29, Tables 24-29.
- Description of exterior shading
- Description of building cooling equipment.

This information will be included as part of the Initial Application (IA). For window film measures, the IA should be submitted after the project site has been identified. Submitting the IA prior to site identification could result in significant under or over estimation of savings since variations in window area and shading characteristics

G.2.2 Pre-installation Inspection

After the FA is submitted, Oncor Electric Delivery or its contractor may conduct a pre-installation inspection to verify that the Service Provider has properly documented the baseline characteristics of the building, including: window area by orientation, shading devices, and cooling equipment type. Oncor Electric Delivery will make any necessary corrections to the pre-installation survey based on the results of the inspection. Removal or demolition of existing shading devices and equipment or installation of new films, shading devices, and equipment cannot commence until the pre-installation inspection is completed.

G.3 Post-Installation M&V Activities

G.3.1 Post-installation Survey

The Service Provider should provide manufacturer's data for the window films; specifically the National Fenestration Rating Council (NFRC) shading coefficient for the installed window films. The area of the window films applied for each different solar orientation must also be specified. These data are required as part of the Installation Notice (IN).

G.3.2 Post-installation Inspection

Oncor Electric Delivery or its contractor will conduct a post-installation inspection to verify the documented characteristics of the building, windows, shading, cooling equipment, and window films. Oncor Electric Delivery will make any necessary corrections to the reported conditions based upon the results of the inspection. If the project is comprised of many small installations, Oncor Electric Delivery will inspect a randomly selected sample of the window-film installations completed by the Service Provider.

G.4 Calculation of Energy Savings

The window film demand and energy savings result from a reduction in demand and energy use of cooling equipment. For evaluating savings, a calculation worksheet is available as a spreadsheet located in the online program applications on the Oncor Electric Delivery C&I SOP website. The savings estimates rely on tabulated values

of solar heat gain factors (SHGF) as published in the 1997 ASHRAE Fundamentals, Chapter 29, Table 17. The ASHRAE data represent the amount of solar radiation that is transmitted through single-pane clear glass for a cloudless day at 32^{o} N Latitude for the 21st day of each month by hour of day and solar orientation. The solar gain values are translated to electric energy savings by considering the cooling equipment efficiency. In the calculation, the cooling equipment efficiency equals the rated efficiency of the installed equipment or the ASHRAE Standard 90.1-1989 minimum cooling equipment efficiency (see the Cooling Equipment Standard Efficiency Tables – Appendix A), whichever is more efficient.

To determine the coincident, peak summer demand savings associated with window films, the highest, hourly, ASHRAE SHGF value that occurs during the summer peak period is identified for each of the south and west building orientations. These data for the Oncor Electric Delivery service territory are presented in Table G.1. The building demand savings are determined from the maximum of these peak SHG values for the applicable window orientations.

To determine cooling energy savings associated with window films, the ASHRAE SHGF data are aggregated into daily totals for weekdays during the months of April through October. These totaled, SHG values are presented in Table G.1. In the table, orientations that are symmetrical relative to the southern sky have the same SHGF values.

Table G.1: Solar Heat Gain Determined for Dallas, TX

Orientation	Solar heat gain (Btu/ft^2-year)	Peak hour solar heat gain (Btu/hr-ft^2-year)
SE	158,323	59
SSE	133,894	119
S	120,095	164
SSW	133,894	189
SW	158,323	219
WSW	168,978	228
W	162,388	220
WNW	139,995	208
NW	106,876	176

The data from Table G.1 are used to determine the demand and energy savings associated with the window film measure using the equations below. Equation G.1 presents the demand savings calculation. Demand savings are determined for the window orientation that results in the highest savings. Demand savings by orientation are not additive.

Equation G.1: Calculation of peak demand savings for window films

$$kW_{savings,o} = \frac{A_{film,o} \cdot SHGF_o \cdot \left(SC_{pre,o} - SC_{post,o}\right)}{3413 \cdot COP}$$

$$kW_{savings,peak} = kW_{savings,o,\max}$$

Where:

kW(savings,o)	=	Peak demand savings per window orientation.
kW(savings,peak)	=	Peak summer demand savings.
A(film,o)	=	Area of window film applied to orientation (ft2).
SHGF(o)	=	Peak hour solar heat gain factor (Btu/hr-ft2-yr) for orientation of interest from Table G.1 on vertical glazing at 32°N latitude.
SC(pre)	=	Shading coefficient for existing glass/interior-shading device.
SC(post)	=	Shading coefficient for new film/interior-shading device.
COP	=	Cooling equipment COP or SEER based on ASHRAE Standard 90.1-1989 or actual COP of equipment, whichever is greater.
3413	=	Conversion factor (Btu/kW).

Equation G.2 presents the annual energy savings calculation for window films. The total annual energy savings is equal to the sum of the savings determined for each orientation, as shown below.

Equation G.2: Calculation of annual cooling energy savings

$$kWh_{savings,o} = \frac{A_{film,o} \cdot SHG_o \cdot \left(SC_{pre,o} - SC_{post,o}\right)}{3413 \cdot COP}$$

$$kWh_{savings} = \sum kWh_{savings,o}$$

Where:

SHG(o)	=	Solar heat gain factor (Btu/ft2-yr) for orientation of interest from Table G.1.

The following is an example of the savings calculations for a window film project.

Window films are installed on an office building in Dallas. The building does not have interior shading devices. The building is not self-shaded or shaded externally by neighboring buildings. The window shading characteristics, film surface area, and SHGFs are presented below. The SHG and SHGF values are based on the data presented in Table 5.1. Cooling is provided to the building by a 600 ton, water-cooled, centrifugal chiller. The ASHRAE 90.1-1989 rated COP for this type of chiller is 5.2, as specified in the Oncor Electric Delivery Standard Cooling Equipment Tables.

Orientation	Area (ft2)	Window SC (baseline)	Window SC (w/films)	Interior Shading	SHG (Btu/ft2-yr)	Peak SHGF (Btu/hr-ft2-yr)
South	**10,000**	**0.95**	**0.35**	**None**	**120,095**	**164**
West	**10,000**	**0.95**	**0.35**	**None**	**162,388**	**220**

The energy savings for installing the window films can be found using the information provided and Equations 5.2. Due to the absence of interior shading devices in the building, the window shading coefficients are used in the savings calculation. The energy savings for the south and west films are equal to:

$$kWh_{savings,s/w} = \frac{10{,}000 \cdot 120{,}095 \cdot (0.95 - 0.35)}{3{,}413 \cdot 5.2} + \frac{10{,}000 \cdot 162{,}388 \cdot (0.95 - 0.35)}{3{,}413 \cdot 5.2}$$

$$kWh_{savings,s/w} = 40{,}601 + 54{,}899 = 95{,}500$$

The demand savings for installing the window films can be found using the information provided and Equations 5.1. Due to the absence of interior shading devices in the building, the window shading coefficients are used in the savings calculation. The demand savings for the south and west films are equal to:

$$kW_{savings,s} = \frac{10{,}000 \cdot 164 \cdot (0.95 - 0.35)}{3{,}413 \cdot 5.2} = 74.4$$

$$kW_{savings,w} = \frac{10{,}000 \cdot 220 \cdot (0.95 - 0.35)}{3{,}413 \cdot 5.2} = 58.1$$

$$\therefore \quad kW_{savings,peak} = kW_{savings,s} = 74.4$$

V H Stipulated Savings for Energy Star® Roofing Savings

H.1 Overview

The installation of an Energy Star® Roof decreases the roofing heat transfer coefficient and reduces the solar heat transmitted to the building space. During months when cooling is required in the building, this measure decreases cooling energy use.

The simplified M&V guidelines developed for this measure are applicable for Energy Star® Roof materials applied to a roof with a slope of 2/12 or less only. The measure demand and energy savings are calculated based on the roof area above conditioned space, change in heat transfer coefficient and cooling equipment efficiency. Savings for roofing measures are determined using the E5.xls Microsoft Excel spreadsheet available on the Oncor Electric Delivery C&I Standard Offer Program website (http://www.oncor.com/electricity/teem/services/candi/standards.aspx).

The following steps comprise the simplified M&V procedure for Energy Star® Roof installations.

1. Collect data characterizing the existing roofing area: square footage of conditioned roofing (roofing plan with dimensions required), amount of insulation, amount of slope, and the reflectance of the current roof. Identify the type and rated efficiency of the cooling equipment in the building.
2. Document the installed Energy Star® Roof reflectance coefficient and insulation value of the newly installed roof.
3. Based on the characteristics of the existing roof, newly installed roofing, and cooling equipment; determine the annual demand and energy savings using the Roof Savings calculation spreadsheet (E5.xls).

H.2 Pre-installation M&V Activities

H.2.1 Pre-installation Site Survey

The goal of the pre-installation site survey is to identify the existing insulation and reflectivity characteristics and the amount of roof over a conditioned space. At a minimum, the surveys should include the following data for the Roof:

- Existing roof insulation description (Amount of each material and it's "R" value combined for a total insulating value)
- Existing Energy Star® Roof reflectivity coefficient

- Square footage of roof area above conditioned space.
- Roof slope
- Description of building cooling equipment.

This information will be included as part of the Initial Application (IA). For roofing measures, the IA should be submitted after the project site has been identified. Submitting the IA prior to site identification could result in significant under or over estimation of savings since variations in roof area and reflectivity characteristics between sites are large.

H.2.2 Pre-installation Inspection

After the FA is submitted, Oncor Electric Delivery or its contractor may conduct a pre-installation inspection to verify that the Service Provider has properly documented the baseline characteristics of the building, including: roof area above conditioned space, slope, insulation, reflectivity and cooling equipment type. Oncor Electric Delivery will make any necessary corrections to the pre-installation survey based on the results of the inspection. Removal or demolition of existing roofing, insulation, and equipment cannot commence until the pre-installation inspection is completed. The pre-inspection can be waved provided the Service Provider provides documentation that is acceptable to Oncor Electric Delivery as to the condition of the roof and all its components.

H.3 Post-Installation M&V Activities

H.3.1 Post-installation Survey

The Service Provider should provide manufacturer's data for the Energy Star® Roof; specifically the solar reflectance, both initial and after 3 years, the insulating value, and the rated life of the installed roof.

These data are required as part of the Installation Notice (IN).

H.3.2 Post-installation Inspection

Oncor Electric Delivery or its contractor will conduct a post-installation inspection to verify the documented characteristics of the building, roof area above conditioned space, slope, insulation, reflectivity and cooling equipment type. Oncor Electric Delivery will make any necessary corrections to the reported conditions based upon the results of the inspection. If the project is comprised of many small installations, Oncor Electric Delivery will inspect a randomly selected sample of the Energy Star® Roof installations completed by the Service Provider.

H.4 Calculation of Energy Savings

Oncor Electric Delivery uses the ASHRAE heat balance method.

V I Mastered Metered Apartments

Individually metered apartments have many categories of deemed savings opportunities available in the Residential and Small Commercial Standard Offer Program (RSCSOP). We may extend these deemed savings to the Commercial and Industrial Standard Offer Program (C&ISOP) for Master Metered Apartments since these do not qualify in the RSCOP.

These measures will apply to the individual apartments only, and not to any common areas. Incentives will be paid at the C&I SOP rate. Not all measures will qualify.

The projects must follow the procedures for the C&I SOP.

Please contact the C&I SOP Program Manager for additional details.

V J

Oncor Electric Delivery Service Territory Information

Oncor Electric Delivery serves accounts in all of the listed cities, but may not serve all accounts in all cities.

ABBOTT	ACKERLY	ADDISON
ALEDO	ALLEN	ALMA
ALTO	ALVARADO	ALVORD
ANDREWS	ANGUS	ANNA
ANNETTA	ANNETTA NORTH	ANNETTA SOUTH
ANNONA	APPLEBY	ARCHER CITY
ARGYLE	ARLINGTON	ARP
ATHENS	AURORA	AUSTIN
AZLE	BALCH SPRINGS	BANGS
BARDWELL	BARRY	BARTLETT
BEDFORD	BELLEVUE	BELLMEAD
BELLS	BELTON	BENBROOK
BEVERLY HILLS	BIG SPRING	BLANKET
BLOOMING GROVE	BLUE MOUND	BONHAM
BOYD	BRECKENRIDGE	BRIDGEPORT
BROWNSBORO	BROWNWOOD	BRUCEVILLE-EDDY
BUCKHOLTS	BUCKINGHAM	BUFFALO
BULLARD	BURKBURNETT	BURKE
BURLESON	BYNUM	CADDO MILLS
CAMERON	CAMPBELL	CANEY CITY
CANTON	CARBON	CARROLLTON
CASHION COMMUNITY	CEDAR HILL	CELINA
CENTERVILLE	CHANDLER	CHICO
CHIRENO	CLARKSVILLE	CLEBURNE
COAHOMA	COCKRELL HILL	COLLEYVILLE
COLLINSVILLE	COLORADO CITY	COMANCHE
COMMERCE	COMO	COOL
COOLIDGE	COOPER	COPPELL
COPPERAS COVE	CORINTH	CORSICANA
CRANDALL	CRANE	CRESSON
CROCKETT	CROSS ROADS	CROWLEY
CUMBY	CUSHING	DALLAS
DALWORTHINGTON GARDENS	DAWSON	DE LEON

DEAN
DECATUR
DENISON
DENTON
DESOTO
DIBOLL
DODD CITY
DORCHESTER
DUBLIN
DUNCANVILLE
EARLY
EASTLAND
ECTOR
EDGECLIFF
EDGEWOOD
EDOM
ELECTRA
ELGIN
ELKHART
EMHOUSE
ENCHANTED OAKS
ENLOE
ENNIS
EULESS
EUREKA
EUSTACE
EVERMAN
FAIRFIELD
FAIRVIEW (COLLIN)
FARMERS BRANCH
FATE
FERRIS
FLORENCE
FLOWER MOUND
FOREST HILL
FORNEY
FORSAN
FORT WORTH
FRANKSTON
FRISCO
FROST
GAINESVILLE
GALLATIN
GARLAND
GARRETT
GEORGETOWN
GHOLSON
GLENN HEIGHTS
GODLEY
GOLINDA
GOODLOW
GORMAN
GRAFORD
GRAHAM
GRANBURY
GRAND PRAIRIE
GRANDFALLS
GRANDVIEW
GRANGER
GRAPELAND
GRAPEVINE
GROESBECK
GUN BARREL CITY
GUNTER
HALTOM CITY
HARKER HEIGHTS
HASLET
HEATH
HEBRON
HENRIETTA
HEWITT
HICKORY CREEK
HIDEAWAY
HIGHLAND PARK
HILLSBORO
HOLLAND
HOLLIDAY
HONEY GROVE
HOWE
HUBBARD
HUDSON
HUDSON OAKS
HUNTINGTON
HURST
HUTCHINS
HUTTO
IOWA PARK
IRVING
ITALY
ITASCA
JACKSBORO
JACKSONVILLE
JARRELL
JEWETT
JOLLY
JOSEPHINE
JOSHUA
JUSTIN
KAUFMAN
KEENE
KELLER
KEMP
KENNEDALE
KERENS
KILLEEN
KNOLLWOOD
KRUM
LACY LAKEVIEW
LADONIA
LAKE BRIDGEPORT
LAKE DALLAS
LAKE WORTH
LAKESIDE
LAKESIDE CITY
LAMESA
LANCASTER
LATEXO
LAVON
LEONA
LEROY
LEWISVILLE
LINDALE
LINDSAY

LIPAN	LITTLE RIVER-ACADEMY	LORAINE
LORENA	LOS YBANEZ	LOTT
LOVELADY	LOWRY CROSSING	LUCAS
LUELLA	LUFKIN	MABANK
MALAKOFF	MALONE	MANSFIELD
MARLIN	MARQUEZ	MARSHALL CREEK
MART	MAYPEARL	MCGREGOR
MCKINNEY	MCLENDON-CHISHOLM	MELISSA
MERTENS	MESQUITE	MEXIA
MIDLAND	MIDLOTHIAN	MILANO
MILDRED	MILFORD	MILLSAP
MINERAL WELLS	MOBILE CITY	MONAHANS
MOODY	MORGANS POINT RESORT	MOUNT CALM
MUENSTER	MURCHISON	MURPHY
MUSTANG	NACOGDOCHES	NAVARRO
NEVADA	NEW CHAPEL HILL	NEW FAIRVIEW (WISE)
NEW SUMMERFIELD	NEWARK	NEYLANDVILLE
NOLANVILLE	NOONDAY	NORTH RICHLAND HILLS
NORTHCREST	NORTHLAKE	O'DONNELL
OAK GROVE	OAK LEAF	OAK POINT
OAK VALLEY	OAKWOOD	ODESSA
OGLESBY	OUTSIDE CITY LIMITS	OVERTON
OVILLA	PALESTINE	PALMER
PANTEGO	PARADISE	PARIS
PARKER	PAYNE SPRINGS	PECAN GAP
PECAN HILL	PENELOPE	PFLUGERVILLE
PLANO	PLEASANT VALLEY	PONDER
POST OAK BEND	POTTSBORO	POWELL
POYNOR	PRINCETON	PROSPER
PURDON	PYOTE	QUINLAN
RANGER	RAVENNA	RED OAK
RENO (LAMAR CO)	RENO(PARKER CO)	RETREAT
RHOME	RICE	RICHARDSON
RICHLAND	RICHLAND HILLS	RIESEL
RIVER OAKS	ROANOKE	ROBINSON
ROCKDALE	ROCKWALL	ROGERS
ROSCOE	ROSEBUD	ROSSER
ROUND ROCK	ROWLETT	ROXTON
ROYSE CITY	RUNAWAY BAY	RUSK
SACHSE	SADLER	SAGINAW

SALADO
SANCTUARY
SANSOM PARK
SAVOY
SEAGOVILLE
SEYMOUR
SHADY SHORES
SHERMAN
SNYDER
SOUTHLAKE
SOUTHMAYD
SPRINGTOWN
ST. PAUL
STANTON
STEPHENVILLE
STREETMAN
SULPHUR SPRINGS
SUNNYVALE
SUNSET
SWEETWATER
TAYLOR
TEAGUE
TEHUACANA
TEMPLE
TERRELL
THE COLONY
THORNDALE
THORNTON
THORNTONVILLE
THRALL
TIRA
TOOL
TRINIDAD
TROPHY CLUB
TROUP
TROY
TYLER
UNIVERSITY PARK
VALLEY VIEW (COOKE)
VAN
VAN ALSTYNE
VENUS
WACO
WATAUGA
WAXAHACHIE
WEATHERFORD
WEIR
WELLS
WEST
WESTBROOK
WESTOVER HILLS
WESTWORTH
WHITE SETTLEMENT
WHITEHOUSE
WICHITA FALLS
WICKETT
WILLOW PARK
WILLS POINT
WILMER
WINDOM
WINK
WOLFE CITY
WOODWAY
WORTHAM
WYLIE
YANTIS
ZAVALLA