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Summary of Program-year Three Measures, by Type

NEW indicates a new measure for PY3; Modified indicates the eligibility criteria or incentive amount have changed from program-year two. The three-part number preceding each measure indicates where this measure is located in this report.

9.1 LIGHTING		
	Measure	Code
	Highbay Fixtures	
9.1.1	Highbay Fixture Replacement Option	BPL91
	Linear Fluorescent and Occupancy Sensors	
9.1.2	Fluorescent U-bend Relamp and reballast	BPL40 NEW
9.1.3	T12 to T8 (32 watt) Relamp and Reballast	BPL60 Modified
9.1.4	T12 to T8 (low wattage 28 watt) Relamp and reballast	BPL41 NEW
9.1.5	T12 to T8 (ultra low Wattage 25 watt) Relamp and reballast	BPL42 NEW
9.1.6	T8 to T5 Relamp and reballast	BPL44 NEW
9.1.7	New Fluorescent Fixtures	BPL62
9.1.8	T12 to T8 Fluorescent Fixtures with Reflectors	BPL63
9.1.9	T12 to T5 New Fluorescent fixture	BPL43 NEW
9.1.10	Single lamp T5 fluorescent fixture with reflector	BPL45 NEW
9.1.11	High Efficiency Fluorescent Fixtures	BPL64 Modified
9.1.12	Low Glare High Efficiency Recessed Fixtures	BPL65 Modified
9.1.13	Controls for T5 and High Performance T8 Systems	BPL72
9.1.14	Remote Mounted Occupancy Sensors	BPL73
9.1.15	Occupancy Sensors	BPL74
	Incandescent Replacements	
9.1.16	CFL Lamps	On-line store
9.1.17	LED Lamps	BPL81
9.1.18	LED Recessed Down Lamps	BPL84
	Low Wattage Ceramic Metal Halide (CMH)	
9.1.19	CMH Fixtures: <100 Watts	BPL85 Modified
9.1.20	CMH Fixtures: 100-350 Watts	BPL89 NEW
9.1.21	CMH Integral Ballast Lamps	BPL86
	Hard-Wired CFL	
9.1.22	Hard-Wired CFL Fixtures ≤30 Watts	BPL87
9.1.23	Hard-Wired CFL Fixtures >30 Watts	BPL88
	Exterior HID (High Intensity Discharge) Fixtures	
9.1.24	Garage Type Fixtures w/ electronic ballast	BPL50 NEW
9.1.25	Canopy Lighting w/ electronic ballasts	BPL51 NEW
	LED Cooler/Freezer Lighting	
9.1.26	LED Cooler/Freezer Lighting	BPL93
9.1.27	LED cooler/Freezer Lighting Controls	BPL94
	Miscellaneous	
9.1.28	PSMH/CMH with Electronic Ballasts	BPL75
9.1.29	Controls for H.I.D. Systems	BPL77
9.1.30	LED Exit Signs	BPL78
9.1.31	Permanent Lamp Removal	NA

9.2 HVAC		
	Measure	Code
	Seasonal Tune-Ups	
9.2.1	Air Conditioner Tune-Up	BPC21
9.2.2	Gas Boiler Tune-Up	BPH1
9.2.3	Gas Forced-Air Furnace Tune-Up	BPH2

	New Cooling Equipment	
9.2.4	**AC Systems and Air Source Heat Pumps (Up to 65,000 Btuh; Minimum 14 SEER)**	BPC1
9.2.5	**AC Systems and Air Source Heat Pumps (Up to 65,000 Btuh; Minimum: 15 SEER)**	BPC2 Modified
9.2.6	**AC Systems and Air Source Heat Pumps (65,000 through 239,999 Btuh; Minimum 11.5 EER / 11.9 IPLV)**	BPC3
9.2.7	**AC Systems and Air Source Heat Pumps (65,000 through 239,999 Btuh; Minimum 12 EER / 12.4 IPLV)**	BPC4 Modified
9.2.8	**AC Systems and Air Source Heat Pumps (240,000 through 759,999 Btuh; Minimum 10.5 EER / 10.9 IPLV)**	BPC5
9.2.9	**AC Systems and Air Source Heat Pumps(240,000 through 759,999 Btuh; Minimum 10.8 EER / 12.0 IPLV)**	BPC6 Modified
9.2.10	**AC Systems and Air Source Heat Pumps (760,000 or more Btuh; Minimum 9.7 EER / 11.0 IPLV)**	BPC7
9.2.11	**AC Systems and Air Source Heat Pumps (760,000 or more Btuh; Minimum 10.2 EER / 11.0 IPLV)**	BPC8 Modified
9.2.12	**Air-Cooled Chillers**	BPC12
	New Cooling Equipment	
9.2.13	**Room Air Conditioner (ENERGY STAR qualified)**	BPC13
9.2.14	**Room Air Conditioner (SEHA Tier 1)**	BPC14 Modified
9.2.15	**PTAC/PTHP**	BPC15
	New Heating Equipment	
9.2.16	**Gas Boiler Replacement (≤ 300 kBtuh input; AFUE 85% minimum**	BPH3
9.2.17	**Gas Boiler Replacement (> 300 kBtuh input; Thermal Efficiency 90% minimum**	BPH4
9.2.18	**Gas Furnace Replacement (90% AFUE)**	BPH5
9.2.19	**Gas Furnace Replacement (92% AFUE)**	BPH6
9.2.20	**Gas Furnace Replacement (94% AFUE)**	BPH7
	HVAC Controls	
9.2.21	**Variable Frequency Drive on HVAC Motor**	BPC20

9.3 LODGING

	Measure	**Code**
	Lodging (HVAC)	
9.3.1	**Guest Room Energy Management (GREM) Controls (PTAC)**	BPLD1 NEW
9.3.2	**Guest Room Energy Management (GREM) Controls (PTHP)**	BPLD2 NEW

9.4 REFRIGERATION

	Measure	**Code**
	Closers	
9.4.1	**Automatic Door Closer for Walk-In Freezer (back access door)**	BPR7 Modified
9.4.2	**Auto Closer for display case door**	BPR13 NEW
	Curtains, Doors, Anti-Sweat Heater Controls, and Gaskets	
9.4.3	**Strip Curtain on Walk-in Coolers or Freezers**	BPR1
9.4.4	**Night Curtain for Open Cooler**	BPR12 NEW
9.4.5	**Anti-Sweat Heater Control (freezer)**	BPR33 (was BPR2)
9.4.6	**Anti-Sweat Heater Control (refrigerator)**	BPR34 (was BPR3)
9.4.7	**Door Gaskets**	BPR14 NEW (Discontinued)
9.4.8	**Solid Door Freezer (up to 15 cu ft)**	BPR27 NEW
9.4.9	**Solid Door Freezer (15-30 cu ft)**	BPR28 NEW
9.4.10	**Solid Door Freezer (31-50 cu ft)**	BPR29 NEW
9.4.11	**Solid Door Freezer (51+ cu ft)**	BPR30 NEW
9.4.12	**Glass Door Freezer (31-50 cu ft)**	BPR31 NEW
9.4.13	**Glass Door Freezer (51+ cu ft)**	BPR32 NEW
9.4.14	**Evaporator Fan Controls**	BPR6
	Vending Macines and controls, and Ice Machines	
9.4.15	**ENERGY STAR Vending Machine**	BPR8
9.4.16	**Beverage Machine Control**	BPR9
9.4.17	**Snack Machine Control**	BPR10
9.4.18	**High Efficiency Ice Makers (101-200 lbs/24hr capacity)**	BPR20

9.4.19	High Efficiency Ice Makers (201-300 lbs/24hr capacity)	BPR21
9.4.20	High Efficiency Ice Makers (301-400 lbs/24hr capacity)	BPR22
9.4.21	High Efficiency Ice Makers (401-500 lbs/24hr capacity)	BPR23
9.4.22	High Efficiency Ice Makers (501-1000 lbs/24hr capacity)	BPR24
9.4.23	High Efficiency Ice Makers (1001-1500 lbs/24hr capacity)	BPR25
9.4.24	High Efficiency Ice Makers (Greater than 1500 lbs/24hr capacity)	BPR26
	EC Motors	
9.4.25	EC Motor for Walk-In Cooler	BPR4 Modified
9.4.26	EC Motor for Walk-In Freezer	BPR19 NEW
9.4.27	EC Motor for Reach-In Cooler	BPR5 Modified
9.4.28	EC Motor for Reach-In Freezer	BPR18 NEW
	Tune-up	
9.4.29	Refrigeration Tune-up	BPR11 NEW

	9.5 MOTORS	
	MOTORS	
9.5.1	Efficient Motors (ODP and TEFC) - 1-200 hp	
	VFD	
9.5.2	Variable Frequency Drives (non-HVAC)	BPM1B

	9.6 WATER HEATERS	
	Measure	**Code**
9.6.1	High Efficiency Tanked Water heater (electric)	BPWH1 NEW
9.6.2	High Efficiency Tankless Water Heater (electric)	BPWH2 NEW
9.6.3	High Efficiency Tankless Water Heater (gas)	BPWH3 NEW
9.6.4	High Efficiency Condensing Tanked Water Heater (gas)	BPWH4 NEW
9.6.5	High Efficiency Tanked Water Heater (gas)	BPWH5 NEW
9.6.6	Supplemental Plumbing Measures (gas)	None

	9.7 COMMERCIAL KITCHEN EQUIPMENT	
	Measure	**Code**
	Kitchen Equipment	
9.7.1	Steamer (3 pan)	BPCK1 NEW
9.7.2	Steamer (4 pan)	BPCK2 NEW
9.7.3	Steamer (5 pan)	BPCK3 NEW
9.7.4	Steamer (6 pan)	BPCK4 NEW
9.7.5	Hot Holding Cabinet (half)	BPCK5 NEW
9.7.6	Hot Holding Cabinet (3/4)	BPCK6 NEW
9.7.7	Hot Holding Cabinet (full)	BPCK7 NEW
9.7.8	Griddle	BPCK8 NEW
9.7.9	5-pan Steamer (gas)	BPCK9 NEW
9.7.10	6-pan Steamer (gas)	BPCK10 NEW
9.7.11	Griddle (gas)	BPCK11 NEW
9.7.12	Fryer (gas)	BPCK12 NEW
9.7.13	Dishwasher - High Temperature (includes booster heater)	BPCK13 NEW
9.7.14	Dishwasher - Low Temperature (no booster heater)	BPCK14 NEW
9.7.15	Green Nozzle	NA

	9.8 AGRICULTURAL EQUIPMENT	
	Measure	**Code**
	Fans	
9.8.1	High Efficiency High Speed Exhaust/ Ventilation Fans (24-35” diameter)	BPA1 NEW
9.8.2	High Efficiency High Speed Exhaust/ Ventilation Fans (36-47” diameter)	BPA2 NEW
9.8.3	High Efficiency High Speed Exhaust/ Ventilation Fans (48-71” diameter)	BPA3 NEW
9.8.4	High Efficiency Circulation Fans (24-35 “ diameter)	BPA4 NEW

9.8.5	**High Efficiency Circulation Fans (36-47" diameter)**	BPA5 NEW
9.8.6	**High Efficiency Circulation Fans (48-71" diameter)**	BPA6 NEW
9.8.7	**High Volume Low Speed (HVLS) Fans**	BPA7 NEW
	Heater Timers and Waterers	
9.8.8	**Equipment Heater Timers**	BPA8 NEW
9.8.9	**Live Stock Waterer (Electrically heated)**	BPA9 NEW
9.8.10	**Live Stock Waterer (ground source heated (non-electrical))**	BPA10 NEW

9.9 On-line Store		
	Measure	**Cdoe**
	Free CFL offer	
9.9.1	**3-pack (15/20/25W)**	**NA**
9.9.2	**3-pack (25W)**	**NA**
	CFLs	
9.9.3	**15W 975 lumens (mini)**	**NA**
9.9.4	**15W 1000 lumens**	**NA**
9.9.5	**20W 1300 lumens**	**NA**
9.9.6	**20W 1400 lumens**	**NA**
9.9.7	**25W 1725 lumens**	**NA**
9.9.8	**25W1800 lumens (micro max)**	**NA**
9.9.9	**30W 2050 lumens**	**NA**
9.9.10	**15W flood 750 lumens**	**NA**
9.9.11	**23W flood 1300 lumens**	**NA**
9.9.12	**14W globe 800 lumens**	**NA**
9.9.13	**15 flood (dimmable) 720 lumens**	**NA**
	LED Down Lights	
9.9.14	**12W 650 lumens (module)**	**NA**
	LED Exit Signs	
9.9.15	**2W, double sided with battery backup**	**NA**
9.9.16	**2.7W exit-sign bulbs**	**NA**
	Power Strips	
9.9.17	**10 outlet "Smart Strip"**	**NA**
	T8 Lamps and Ballasts	
9.9.18	**32W, 1-2 lamp configuration**	**NA**
9.9.19	**32W, 2-3 lamp configuration**	**NA**
9.9.20	**32W, 3-4 lamp configuration**	**NA**
9.9.21	**32W T8 lamp 4' (case of 36)**	**NA**
	Vending Machine Controls	
9.9.22	**Snack Miser (non-refrigerated) – wall mounted**	**NA**
9.9.23	**Snack Miser EZ (non-refrigerated) – machine mounted**	**NA**
9.9.24	**Vending Miser (refrigerated) – wall mounted**	**NA**
9.9.25	**Vending Miser EZ (refrigerated) – machine mounted**	**NA**
	Occupancy Sensor	
9.9.26	**Wall-switch (PIR, controls 0-800W)**	**NA**

1.0 Introduction

This reference manual provides methods, formulas, and default assumptions for estimating energy savings and peak reduction impacts from measures and projects that receive Standard cash incentives from the Ameren Illinois Business Program. The Custom, Demand Response (E-Smart thermostat), and Retro-Commissioning programs, and Competitive Large Project Incentive program are not addressed in this document.

The reference manual is organized by measure type (as identified in pages 6-9). Each section provides mathematical equations for determining savings (algorithms), as well as default assumptions for all equation parameters that are not based on site-specific information. In addition, any descriptions of calculation methods or baselines are provided, as appropriate. The parameters for calculating savings are listed in the same order for each measure. Algorithms are provided for estimating annual energy and demand impacts. Data assumptions are based on Illinois specific data, where available. Where Illinois data was not available, data from neighboring regions is used where available and in some cases, engineering judgment is used.

Data sources used, in the general order of preference, included, but were not limited to the following:

- AIU Energy Efficiency and Demand Response Plan (dated November 15, 2007)
- AIU Natural Gas Energy Efficiency Plan (dated February 11, 2008)
- 2004-2005 Database for Energy Efficiency Resources (CA DEER database)
- 2007-2008 Database for Energy Efficiency Resources (CA DEER database) Update
- ComEd Program Design Information
- Other EE Program Design Information (e.g. Efficiency Maine, Focus on Energy, etc.)
- GDS/SAIC Staff expertise

A number of programs and incentives were researched and considered for PY3, but were not included, for various reasons. Programs such as green houses, and commercial kitchen measures, such as fryers, convection ovens, dishwashers, etc. were researched but after consideration were not deemed suitable for program-year three. More information about measures not included can be obtained from the Act On Energy technical team.

2.0 Net-to-Gross Savings Calculation

The algorithms shown with each measure calculate gross customer electric savings without counting the effects of line losses from the generator to the customer, free ridership, spillover, or persistence. The algorithms do not distribute the savings among the different costing periods. The formulae for converting gross customer-level savings to net generation-level savings (counting free ridership, spillover and persistence) for the different costing periods are as follows:

$$\text{Net kWh}_i = \Delta\text{kWh} \times (1+\text{LLF}_i) \times (1-\text{FR}+\text{SPL}) \times \text{PF} \times \text{AF}_i$$

and

$$\text{Net kW}_j = \Delta\text{kW} \times (1+\text{LLF}_j) \times (1-\text{FR}+\text{SPL}) \times \text{PF} \times \text{CF}_j$$

where

NetkWh_i	=	kWh energy savings at generation-level, net of free riders and persistence, and including spillover, for period *i*
i	=	subscript used to denote variable energy rating periods (Winter Peak, Winter Off-Peak, Summer Peak, Summer Off-Peak)
ΔkWh	=	gross customer annual kWh savings for the measure
LLF_i	=	line loss factor for period *i*
FR	=	freeridership
SPL	=	spillover for measure
PF	=	persistence factor for measure
AF_i	=	allocation of annual energy savings by season for period *i*
netkW_j	=	kW demand savings, net of free riders and persistence, and including spillover, for season *j*
j	=	subscript used to denote variable seasonal peaks (Summer, Winter and Spring/Fall).
ΔkW	=	gross customer connected load kW savings for the measure
LLF_j	=	line loss factor for seasonal peak *j*
CF_j	=	the percent of kW savings that is concurrent with Illinois seasonal peak, for season *j*

All of the parameters except line loss factors (LLF), allocation factor (AF), and coincidence factor (CF) for the above equations may be found in the specific section for the measure. AF and CF are summarized in Table 6.0-1.

3.0 Interactive Effects

The TRM provides specific savings algorithms for many prescriptive measures. When a customer installs a prescriptive measure, the savings are determined according to these algorithms. In some cases these algorithms include the effects of interactions with other measures or end uses (e.g., cooling and heating effects from interior lighting waste heat). For "custom" measures, Act On Energy performs site-specific customized calculations. In this case, Act On Energy takes into account interactions between measures (e.g., individual savings from installation of window film and replacement of a chiller are not additive because the first measure reduces the cooling load met by the second measure). Act On Energy will calculate total savings for the package of custom measures being installed, either as a single package or in rank order of measures as described below. If a project includes both prescriptive and custom measures, the prescriptive measures will be calculated in the normal manner. However, the prescriptive measures will be assumed to be installed prior to determining the impacts for the custom measures. Custom interior lighting measures will use the standard prescriptive algorithm to estimate waste heat impacts.

4.0 Persistence

Persistence factors may be used to reduce lifetime measure savings in recognition that initial engineering estimates of annual savings may not persist long term. This might be because a measure is removed or stops functioning prior to the end of its normal engineering lifetime, because it is not properly maintained, it is overridden, it goes out of calibration (controls only), or for some other reason. Each measure algorithm contains an entry for persistence factor. The default value if none is indicated is 1.00 (100%). A value lower than 1.00 will result in a downward adjustment of lifetime savings and total resource benefits. For any measure with a persistence value less than 1.00, the normal measure life ("Engineering Measure Life") will be reduced to arrive at an "Adjusted Measure Life" for the purposes of measure screening, savings, Forward Capacity Market claims, and tracking. The "Adjusted Measure Life" used will be equal to the product of the Engineering Measure Life and the persistence factor. Both the Engineering Measure Life and the Adjusted Measure Life will be shown in each measure algorithm.

5.0 Glossary

The following glossary provides definitions for terms used in this document that are necessary assumptions needed to calculate measure savings.

AIB	"Ameren Illinois Business" database – the database used to record all activity in the Act On Energy business program.
Allocation of Annual Energy Savings by Season (AF):	Allocation factors for defined times of the year that describe when energy savings will be realized for a specific measure. Allocation factors have been developed for four time periods: winter on and off-peak; and summer on and off-peak.
Baseline Efficiency (η_{base}):	The assumed standard efficiency of equipment, absent an Act On Energy program.
Coincidence Factor (CF):	Coincidence factors represent the fraction of connected load expected to be "on" and using electricity coincident with a particular system peak period, on a diversified basis. Coincidence factors are provided for summer and winter peak periods.
Coincident Demand Savings	Same as Demand Savings
Coincident Diversity Factor	The value reflects the fact that the connected load may not be operating at 100% during the peak utility period.
Connected Load:	The maximum wattage of the equipment, under normal operating conditions, when the equipment is "on" (also "Peak Load").
DEER data	Database for Energy Efficient Resources – developed by the California PUC. www.DEEResources.com/
Demand Interactive Effects	The value reflects the impacts that the energy-efficient upgrade could have on other systems energy demand. For example, a lighting upgrade that reduces the energy demand also reduces the cooling load for a conditioned space. As such, there is a corresponding decrease in the cooling demand. Demand interactive effects factors greater than "1" indicate that there is an additional positive benefit to installation of the efficiency measure.
Demand Savings	Potential change to the peak load by making the upgrade to energy-efficient equipment .
Energy Interactive Effects	The value reflects the impacts that the energy-efficient upgrade could have on other systems energy use. For example, a lighting upgrade that reduces the energy use also reduces the cooling load for a conditioned space. As such, there is a corresponding decrease in the cooling energy use. Energy interactive effects factors greater than "1" indicate that there is an additional positive benefit to installation of the efficiency measure.
Energy Savings	The actual first year energy savings by making the upgrade to energy-

	efficient equipment.
Freeridership (FR):	A program's ***free ridership rate*** is the percentage of program participants deemed to be free riders. A ***free rider*** refers to a customer who received an incentive through an energy efficiency program who would have installed the same or a smaller quantity of the same high efficiency measure on their own within one year if the program had not been offered.
Full Load Hours (FLH):	The equivalent hours that equipment would need to operate at its peak capacity in order to consume its estimated annual kWh consumption (annual kWh/connected kW).
High Efficiency (η_{effic}):	The efficiency of the energy-saving equipment installed as a result of an efficiency program.
Hours of Operation (HOURS):	The annual hours that equipment is expected to operate.
Incremental Cost:	The cost difference between the installed cost of the high efficiency measure and the standard efficiency measure.
Installed Cost: High Performance	The cost of installing the item as specified, as an energy-efficient option.
Installed Cost: Standard Practice	The cost of installing the item as the "standard" non-energy-efficient option. A cost of zero ($0) indicates that the measure is operating and being replaced by a high performance replacement.
Lifetimes:	The number of years (or hours) that the new high efficiency equipment is expected to function. These are generally based on engineering lives, but sometimes adjusted based on expectations about frequency of remodeling or demolition.
Line Loss Factor (LLF):	The marginal electricity losses from the generator to the customer meter – expressed as a percent of meter-level savings. The Energy Line Loss Factors vary by period. The Peak Line Loss Factors reflect losses at the time of system peak, and are shown for two seasons of the year (winter and summer). Line loss factors are the same for all measures.
Load Factor (LF):	The fraction of full load (wattage) for which the equipment is typically run.
Measure Demand Savings	The calculation used to determine the savings for that particular job/measure – including variables such as quantities of units and hours of operation for that business.
Measure Energy Savings	The calculation used to determine the savings for that particular job/measure – including variables such as quantities of units and hours of operation for that business.
Non-coincident Demand Savings	Demand savings – per the unit specifications – the difference between the baseline and the proposed energy-efficient upgrade (entered as one when this does not apply to the measure)
Persistence Factor (PF):	The fraction of gross measure savings obtained over the measure life.

Spillover (SPL):	Spillover refers to energy-efficient equipment installed in any facility in the program service area due to program influences, but without any financial or technical assistance from the Program. It is expressed as a percent or fraction of the gross savings attributable to program participation.
Supplemental Information Collected on the Application	This indicates information collected on the application, in addition to quantities of units. Other pertinent information is also collected from the product specification sheets sent with the application.

6.0 Loadshapes

The following table includes a listing of measure end-uses and associated loadshapes.

Table 6.0-1 Measure End-Uses and Associated Loadshapes

#	End use	Coincidence Factor (CF) Winter	Coincidence Factor (CF) Summer	Allocation of Annual Energy Savings by Season (AF) Winter Peak	Winter Off Peak	Summer Peak	Summer Off Peak
1	Commercial Lighting	50%	70%	50%	10%	30%	10%
2	Commercial Motors	100%	100%	50%	10%	30%	10%
3	Commercial HVAC	1.5%	72%	15%	2.5%	60%	17.5%
4	Commercial Refrigeration	100%	0%	33%	37%	12%	18%
5	Commercial Flat	100%	100%	32%	35%	16%	18%

All loadshape numbers referenced in the measure characterizations correspond to the most recent generation of the loadshape as detailed in the loadshape table shown above. The coincidence factors in the standard load profile shown above are based on the listed assumptions for full load hours. To account for the effect on peak savings from a change in full load hours, use of full load hours different than the standard will result in an automatic adjustment of the coincident peak factors (% of connected load kW) used in screening and reported in the database, unless custom coincident peak factors are also entered. The coincidence factors are multiplied by the ratio of [custom full load hours]/[standard full load hours], with a maximum value of 100% for each factor. As a result, coincidence factors for particular measures may be higher or lower than the standard factors listed above even when a standard load profile is used.

8.0 Mapping Strategy

In many instances the DEER database was used as a basis for savings calculations. For those measures that used the DEER information the following strategy was used to map the building types between those in the DEER database and the building types used in the Act On Energy program.

DEER Market Sector	Act On Energy
Education - Primary School	School/College
Education - Secondary School	
Education - Community College	
Education - University	
Grocery	Grocery
Health/Medical - Hospital	Medical
Health/Medical - Nursing Home	
Lodging - Hotel	Hotel/Motel
Lodging - Motel	
Lodging – Guest Room	
Manufacturing - Light Industrial	Manufacturing/Industrial
Office - Large	Office
Office - Small	
Restaurant - Sit-Down	Restaurant
Restaurant - Fast-Food	
Retail - 3-Story Large	Retail/Service
Retail - Single-Story Large	
Retail - Small	
Storage - Conditioned	Warehouse/Distribution
Storage - Unconditioned	
Warehouse - Refrigerated	

9.0 Commercial Measures (Standard Programs)

Section 9 contains the pertinent information for each Standard measure of the Act On Energy Business Program (this does not include information about: Custom, Demand Response (E-Smart Thermostat), the on-line store, Retro Commissioning, or Competitive Large Project Incentive measures).

This section is organized in the following sub-categories:

9.1 Lighting
9.2 HVAC
9.3 Lodging
9.4 Refrigeration
9.5 Motors
9.6 Water Heaters
9.7 Commercial Kitchen Equipment
9.8 Agricultural Equipment

Within each section the measures are numbered (e.g, 9.1.1 is the first lighting measure) and within each measure there are four tables (numbered 1-4 (e.g., the first table in the second lighting measure is 9.1.2-1)). This numbering format is followed throughout this manual.

General layout for each measure

First page – general measure information

Algorithms used to calculate Demand Savings and Energy Savings

Table 1 "*Energy Factor Assumptions*" by Building Type – Includes:

- Demand Interactive Effects
- Coincident Diversity Factor
- Energy Interactive Effects
- Annual Operating Hours
- Peak kW Savings (per Watt Reduced)
- kWh Savings (per Watt Reduced)

Table 2 "*Specifications and Calculated Non-coincident Demand Savings*" – Includes:

- Configuration (e.g., lists 4-foot and 8-foot lamps, if both are an option)
- Base Unit Type
- Base Unit Wattage
- Base Fixture Wattage
- Retrofit Unit Type
- Retrofit Unit Wattage
- Retrofit Fixture Wattage
- Non-Coincident Demand Savings (kW)

(This table is deleted when the incentive is calculated on a "watts reduced" basis.)

Table 3 "*Calculated Demand and Energy Savings by Type of Business*" – Includes:

- Demand Savings (kW)
- Energy Savings (kWh)

(This table is deleted when the incentive is calculated on a "watts reduced" basis.)

The formulas for Demand Savings and Energy Savings, shown in this table, are included immediately after the table.

Demand Savings Calculation

Non-coincident Demand Savings (from Table 2)*	X	Demand Interactive Effects (from Table 1)	X	Coincident Diversity Factor (from Table 1)

Energy Savings Calculation

Non-coincident Demand Savings (from Table 2)*	X	Energy Interactive Effects (Table 1)	X	Hours of Operation (from Table 1)

(these calculations are removed for gas measures)

*if the incentive is based on a "watts saved" calculation then the non-coincident demand savings is just ($Watts_{Base}$ – $Watts_{EE}$)

Table 4 "*Measure Costs and Incentive Levels*" – Includes:

- Installed Cost: High Performance
- Installed Cost: Standard Practice
- Incremental Cost
- Incentive Payment

9.1 Lighting

The following measures are included in the PY3 lighting program

9.1 LIGHTING		
	Measure	Code
	Highbay Fixtures	
9.1.1	Highbay Fixture Replacement Option	BPL91
	Linear Fluorescent and Occupancy Sensors	
9.1.2	Fluorescent U-bend Relamp and reballast	BPL40 NEW
9.1.3	T12 to T8 (32 watt) Relamp and Reballast	BPL60 Modified
9.1.4	T12 to T8 (low wattage 28 watt) Relamp and reballast	BPL41 NEW
9.1.5	T12 to T8 (ultra low Wattage 25 watt) Relamp and reballast	BPL42 NEW
9.1.6	T8 to T5 Relamp and reballast	BPL44 NEW
9.1.7	New Fluorescent Fixtures	BPL62
9.1.8	T12 to T8 Fluorescent Fixtures with Reflectors	BPL63
9.1.9	T12 to T5 New Fluorescent fixture	BPL43 NEW
9.1.10	Single lamp T5 fluorescent fixture with reflector	BPL45 NEW
9.1.11	High Efficiency Fluorescent Fixtures	BPL64 Modified
9.1.12	Low Glare High Efficiency Recessed Fixtures	BPL65 Modified
9.1.13	Controls for T5 and High Performance T8 Systems	BPL72
9.1.14	Remote Mounted Occupancy Sensors	BPL73
9.1.15	Occupancy Sensors	BPL74
	Incandescent Replacements	
9.1.16	CFL Lamps	On-line store
9.1.17	LED Lamps	BPL81
9.1.18	LED Recessed Down Lamps	BPL84
	Low Wattage Ceramic Metal Halide (CMH)	
9.1.19	CMH Fixtures: <100 Watts	BPL85 Modified
9.1.20	CMH Fixtures: 100-350 Watts	BPL89 NEW
9.1.21	CMH Integral Ballast Lamps	BPL86
	Hard-Wired CFL	
9.1.22	Hard-Wired CFL Fixtures ≤30 Watts	BPL87
9.1.23	Hard-Wired CFL Fixtures >30 Watts	BPL88
	Exterior HID (High Intensity Discharge) Fixtures	
9.1.24	Garage Type Fixtures w/ electronic ballast	BPL50 NEW
9.1.25	Canopy Lighting w/ electronic ballasts	BPL51 NEW
	LED Cooler/Freezer Lighting	
9.1.26	LED Cooler/Freezer Lighting	BPL93
9.1.27	LED cooler/Freezer Lighting Controls	BPL94
	Miscellaneous	
9.1.28	PSMH/CMH with Electronic Ballasts	BPL75
9.1.29	Controls for H.I.D. Systems	BPL77
9.1.30	LED Exit Signs	BPL78
9.1.31	Permanent Lamp Removal	NA

9.1.1 Relamp Highbay Fixture Replacement Option

Measure Code: BPL91

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	June 1, 2009
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace HID-type fixtures with T8/T5 fluorescent fixtures with electronic ballasts

Eligibility Criteria for New Energy-Efficient Equipment:

- New T5 or T8 fluorescent fixture with electronic ballasts
- T8 Fluorescent lamps and Ballasts must be listed on the CEE web site (www.cee1.org) – there are no requirements for the T5 lamps and ballasts
- Each unit must have a wattage greater than 125 Watts
- Must be installed in areas with ceiling heights of 16' or greater (if less than 16, call to see if your circumstances would allow this project to be eligible for incentive money)
- Overall fixture efficiency must exceed 80%
- NOTE: replacement of highbay incandescent fixtures with HIF must apply for incentive money through the Act On Energy Custom Program.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[1]: 15 years

Revision Details: Starting in PY2 (6-1-09) the incentive was reduced from 40 cents per watt reduced, to 25 cents per watt reduced.

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls (REVISED - anything new for PY3?).

Bonus Incentives offered:

11/16/09 through 1/31/10 offered a 10% bonus

10/20/10 Early completion bonus offered – additional 5.5 cents per watt reduced if done by 3/31/11 (and FPW turned in within 30 days of project completion), OR an additional 4.5 cents per watt reduced if project is completed by 4/30/11 (and FPW turned in within 30 days).

Supplemental Information Collected on the Application: None

[1] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_W \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_W \times N_F \times ISR$

ΔkW	= Gross customer connected load kW savings for the measure
ΔkW_W	= Demand Savings per fixture
W_{BASE}	= Baseline connected kW from current fixture
W_{EE}	= Energy efficient connected kW from proposed fixture
N_F	= Number of fixtures being replaced
ISR	= In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh	= Gross customer annual kWh savings for the measure
ΔkWh_W	= Energy Savings per fixture

Table 9.1.1-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours	Peak kW Savings Per Watt Reduced	kWh Savings Per Watt Reduced
Office	1.25	0.81	1.17	2,808	0.001	3
School (K-12)	1.23	0.42	1.15	1,873	0.001	2
College/University	1.22	0.68	1.15	3,433	0.001	4
Retail/Service	1.19	0.88	1.11	4,210	0.001	5
Restaurant	1.26	0.68	1.15	5,278	0.001	6
Hotel/Motel	1.14	0.67	1.14	4,941	0.001	6
Medical	1.26	0.74	1.18	6,474	0.001	8
Grocery	1.25	0.81	1.13	5,824	0.001	7
Warehouse	1.09	0.84	1.06	4,160	0.001	4
Light Industry	1.08	0.99	1.04	4,290	0.001	4
Heavy Industry	1.08	0.99	1.04	4,290	0.001	4
Average = Miscellaneous	**1.19**	**0.77**	**1.12**	**4,325**	**0.001**	**5**

Source: DEER database

Demand Savings Calculation (ΔkW_W) =

Non-coincident Demand Savings ($(W_{BASE} – W_{EE})$)	X	Demand Interactive Effects (from Table 9.1.1-1)	X	Coincident Diversity Factor (from Table 9.1.1-1)

Energy Savings Calculation (ΔkWh_W) =

Non-coincident Demand Savings ($W_{BASE} – W_{EE}$)	X	Energy Interactive Effects (from Table 9.1.1-1)	X	Hours of Operation (from Table 9.1.1-1)

Table 9.1.1-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost[2]	Incentive Payment
Fluorescent highbay system	Per invoice	N/A	$332 per fixture	$0.25 per watt reduced

[2] Used only for TRC calculation purposes

9.1.2 Fluorescent U-bend Relamp and Reballast

Measure Code: BPL40

Version Date & Revision History:

Draft date: May 3, 2010
Effective date: May 3, 2010
Revised NA
End date: TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Upgrade an existing T12 U-Tube lamps and ballasts

Eligibility Criteria for New Energy-Efficient Equipment:

- Lamps must be T8 U-tube
- 2 lamp fixtures
- Lamps and Ballasts must be listed on the CEE web site (www.cee1.org) (32 watt listed under High Performance, 28 and 25 watt listed under Reduced Wattage)

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[3]: 11 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered:
T12 bonus (10%) 11/16/09-1/31/10
T12 Ramp down bonus (15%) 6/15/10-12/31/10
T12 Ramp down bonus (10%) 1/1/11-TBD (5/31/11?)

Supplemental Information Collected on the Application: None

[3] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta\ kW_S \times N_L \times ISR$

Measure Energy Savings $\Delta kWh = \Delta\ kWh_S \times N_L \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Demand savings per 2-lamp fixture
N_L = Number of lamps being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Energy savings per 2-lamp fixture

Table 9.1.2-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,306	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	8,736	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	3,597	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,489**	**1.19**	**0.77**	**1.12**

Source: DEER database

Table 9.1.2-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Lamp Type	Base Lamp Wattage (watts)	Base Fixture Wattage (watts)	Retrofit Lamp Type	Retrofit Lamp Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
T8 U Tube Lamp 2-lamp, 4 foot	F40T12 / ES	40	89	F32T8 / ES	32	54	0.035

Source: ComEd

Table 9.1.2-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Office	0.035	115
School (K-12)	0.018	75
College/University	0.029	138
Retail/Service	0.037	167
Restaurant	0.030	212
Hotel/Motel	0.027	197
Medical	0.033	361
Grocery	0.035	230
Warehouse	0.032	133
Light Industry	0.037	156
Heavy Industry	0.037	156
Average = Miscellaneous	**0.032**	**176**

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (from Table 9.1.2-2)	X	Demand Interactive Effects (from Table 9.1.2-1)	X	Coincident Diversity Factor (from Table 9.1.2-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (from Table 9.1.2-2)	X	Energy Interactive Effects (Table 9.1.2-1)	X	Hours of Operation (from Table 9.1.2-1)

Table 9.1.2-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
U-bend relamp and reballast	$35	$0 (replacement)	$35	$10.00/2-lamp fixture

9.1.3 Relamp and Reballast from T12 to High Performance T8 (32 Watt)

Measure Code: BPL60

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	May 3, 2010
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Upgrade an existing T12 lamp/fixture with new T8

Eligibility Criteria for New Energy-Efficient Equipment:

- Lamps must be 32-Watt T8 (or up to 59-watt for 8' lamps)
- "High Performance" lamps and ballasts must be listed on the CEE web site (www.cee1.org) - "Qualifying lamps, 120- and 277-volt ballasts" (high-performance) located at http://www.cee1.org/com/com-lt/com-lt-main.php3
- Cannot be combined with purchases from the On-line store

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[4]: 11 years

Revision Details: In PY3 (5-3-10) this measure was modified to include only replacement by high-performance (32W) T8 lamps. The replacement by the low-wattage T8 lamps (28w or 25 W) have been split out into their own measures. Also, upgrading T8 to low-wattage T8 lamps is now a custom measure and no longer included with this measure. This measure used to be $5/lamp, but now that the 32 watt lamps are their own category, this incentive has been reduced to $3/lamp.

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered:
T12 bonus (10%) 11/16/09-1/31/10
T12 Ramp down bonus (15%) 6/15/10-12/31/10
T12 Ramp down bonus (10%) 1/1/11-TBD (5/31/11?)

Supplemental Information Collected on the Application: None

[4] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_L \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_L \times ISR$

ΔkW	= Gross customer connected load kW savings for the measure
ΔkW_S	= Demand savings per lamp
N_L	= Number of lamps being replaced
ISR	= In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh	= Gross customer annual kWh savings for the measure
ΔkWh_S	= Energy savings per lamp

Table 9.1.3-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Coincident Demand Savings (kW)	Energy Savings (kWh)
4-foot lamps – 1-, 2-, 3-, or 4-lamp HP T8 fixture						
Office	2,808	1.25	0.81	1.17	0.012	40.03
School (K-12)	1,873	1.23	0.42	1.15	0.006	26.24
College/University	3,433	1.22	0.68	1.15	0.010	48.09
Retail/Service	4,306	1.19	0.88	1.11	0.013	58.23
Restaurant	5,278	1.26	0.68	1.15	0.010	73.95
Hotel/Motel	4,941	1.14	0.67	1.14	0.009	68.62
Medical	8,736	1.26	0.74	1.18	0.011	125.59
Grocery	5,824	1.25	0.81	1.13	0.012	80.18
Warehouse	3,597	1.09	0.84	1.06	0.011	46.45
Light Industry	4,290	1.08	0.99	1.04	0.013	54.36
Heavy Industry	4,290	1.08	0.99	1.04	0.013	54.36
Average = Miscellaneous	**4,489**	**1.19**	**0.77**	**1.12**	**0.011**	**61.25**
8-foot lamps – 1-, 2-, 3-, or 4-lamp HP T8 fixture						
Office	2,808	1.25	0.81	1.17	0.016	53.39
School (K-12)	1,873	1.23	0.42	1.15	0.008	34.99
College/University	3,433	1.22	0.68	1.15	0.013	64.14
Retail/Service	4,306	1.19	0.88	1.11	0.017	77.66
Restaurant	5,278	1.26	0.68	1.15	0.014	98.63
Hotel/Motel	4,941	1.14	0.67	1.14	0.012	91.52
Medical	8,736	1.26	0.74	1.18	0.015	167.51
Grocery	5,824	1.25	0.81	1.13	0.016	106.94
Warehouse	3,597	1.09	0.84	1.06	0.015	61.95
Light Industry	4,290	1.08	0.99	1.04	0.017	72.50
Heavy Industry	4,290	1.08	0.99	1.04	0.017	72.50
Average = Miscellaneous	**4,489**	**1.19**	**0.77**	**1.12**	**0.015**	**81.69**

Source: DEER database

Table 9.1.3-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Lamp Type	Base Lamp Wattage (watts)	Base Fixture Wattage (watts)	Retrofit Lamp Type	Retrofit Lamp Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)	Weight Percent-age
Four Foot Lamps								
4-lamp	F40T12 / ES	34	144	F32T8 / ES	28	96	0.012	35%
3-lamp	F40T12 / ES	34	103	F32T8 / ES	28	72	0.010	25%
1-lamp	F40T12 / ES	34	43	F32T8 / ES	28	25	0.018	10%
2-lamp	F40T12 / ES	34	72	F32T8 / ES	28	48	0.012	30%
Weighted Average		----	----	----	----	----	**0.012**	----
Eight Foot Lamps								
2 lamp	F96T12 / ES	60	132	F96T8	57	100	0.016	75%
1-lamp	F96T12 / ES	60	77	F96T8	57	60	0.017	25%
Weighted Average		----	----	----	----	----	**0.016**	----

Source: ComEd

Table 9.1.3-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)	Demand Savings (kW)	Energy Savings (kWh)
	4-foot Lamp		8-foot Lamp	
Office	0.012	40.03	0.016	53.39
School (K-12)	0.006	26.24	0.008	34.99
College/University	0.010	48.09	0.013	64.14
Retail/Service	0.013	58.23	0.017	77.66
Restaurant	0.010	73.95	0.014	98.63
Hotel/Motel	0.009	68.62	0.012	91.52
Medical	0.011	125.59	0.015	167.51
Grocery	0.012	80.18	0.016	106.94
Warehouse	0.011	46.45	0.015	61.95
Light Industry	0.013	54.36	0.017	72.50
Heavy Industry	0.013	54.36	0.017	72.50
Average = Miscellaneous	**0.011**	**61.25**	**0.015**	**81.69**

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (weighted average from Table 9.1.3-2)	X	Demand Interactive Effects (from Table 9.1.3-1)	X	Coincident Diversity Factor (from Table 9.1.3-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (weighted average from Table 9.1.3-2)	X	Energy Interactive Effects (from Table 9.1.3-1)	X	Hours of Operation (from Table 9.1.3-1)

Table 9.1.3-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Four-foot, 1-Lamp Systems	$28	$0	$28	$3/system
Four-foot, 2-Lamp Systems	$32	$0	$32	$6/system
Four-foot, 3-Lamp Systems	$42	$0	$42	$9/system
Four-foot, 4-Lamp Systems	$47	$0	$47	$12/system
Eight-foot, 4-Lamp Systems	$47	$0	$47	$12/system
Measure Average	**$39**	**$0**	**$39**	**$3/lamp**

9.1.4 T12 to T8 (Low Wattage 28 Watt) Relamp and Reballast

Measure Code: BPL41

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Upgrade an existing T12 lamp/fixture with new reduced wattage T8

Eligibility Criteria for New Energy-Efficient Equipment:

- Lamps must be 28 Watt T8
- "Reduced Wattage" lamps and ballast combinations must be listed on the CEE1.org web site**

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[5]: 11 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered:
T12 bonus (10%) 11/16/09-1/31/10
T12 Ramp down bonus (15%) 6/15/10-12/31/10
T12 Ramp down bonus (10%) 1/1/11-TBD (5/31/11?)

Supplemental Information Collected on the Application: None

[5] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta\ kW_S \times N_L \times ISR$

Measure Energy Savings $\Delta kWh = \Delta\ kWh_S \times N_L \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Demand savings per lamp
N_L = Number of lamps being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Energy savings per lamp

Table 9.1.4-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,210	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,160	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,325**	**1.19**	**0.77**	**1.12**

Source: DEER database

Table 9.1.4-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Lamp Type	Base Lamp Wattage (watts)	Base Fixture Wattage (watts)	Retrofit Lamp Type	Retrofit Lamp Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)	Weight Percent-age
T8 Relamp and Reballast (28W) – four foot								
4-lamp	F40T12 / ES	34	144	F28T8 / ES	28	96	0.012	35%
3-lamp	F40T12 / ES	34	113	F28T8 / ES	28	72	0.014	25%
1-lamp	F40T12 / ES	34	43	F28T8 / ES	28	25	0.018	10%
2-lamp	F40T12 / ES	34	72	F32T8 / ES	28	48	0.012	30%
Weighted Average		----	----	----	----	----	**0.013**	

Source: ComEd

Table 9.1.4-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Office	0.013	43.04
School (K-12)	0.007	28.22
College/University	0.011	51.72
Retail/Service	0.014	61.22
Restaurant	0.011	79.51
Hotel/Motel	0.010	73.79
Medical	0.012	100.08
Grocery	0.013	86.21
Warehouse	0.012	57.77
Light Industry	0.014	58.45
Heavy Industry	0.014	58.45
Average = Miscellaneous	0.012	63.46

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (weighted average from Table 9.1.4-2)	X	Demand Interactive Effects (from Table 9.1.4-1)	X	Coincident Diversity Factor (from Table 9.1.4-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (weighted average from Table 9.1.4-2)	X	Energy Interactive Effects (from Table 9.1.4-1)	X	Hours of Operation (from Table 9.1.4-1)

Table 9.1.4-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Four-foot, 1-Lamp Systems	$28	$0	$28	$5/system
Four-foot, 2-Lamp Systems	$32	$0	$32	$10/system
Four-foot, 3-Lamp Systems	$42	$0	$42	$15/system
Four-foot, 4-Lamp Systems	$47	$0	$47	$20/system

9.1.5 T12 to T8 (Ultra Low Wattage 25 Watts) Relamp and Reballast

Measure Code: BPL42

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Upgrade an existing T12 lamp/fixture with new ultra-low wattage T8"

Eligibility Criteria for New Energy-Efficient Equipment:

- Lamps must be 25 Watt T8 (ultra-low wattage)
- "Reduced Wattage" lamps and ballast combinations must be listed on the CEE1.org web site

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[6]: 11 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered:
T12 bonus (10%) 11/16/09-1/31/10
T12 Ramp down bonus (15%) 6/15/10-12/31/10
T12 Ramp down bonus (10%) 1/1/11-TBD (5/31/11?)

Supplemental Information Collected on the Application: None

[6] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta\ kW_S \times N_L \times ISR$

Measure Energy Savings $\Delta kWh = \Delta\ kWh_S \times N_L \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Demand savings per lamp
N_L = Number of lamps being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Energy savings per lamp

Table 9.1.5-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,210	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,160	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,325**	**1.19**	**0.77**	**1.12**

Source: DEER database

Table 9.1.5-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Lamp Type	Base Lamp Wattage (watts)	Base Fixture Wattage (watts)	Retrofit Lamp Type	Retrofit Lamp Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)	Weight Percent-age
T8 Relamp and Reballast (25W) – four foot								
4-lamp	F40T12 / ES	34	144	F28T8 / ES	25	90	0.014	35%
3-lamp	F40T12 / ES	34	113	F28T8 / ES	25	65	0.016	25%
1-lamp	F40T12 / ES	34	43	F28T8 / ES	25	22	0.021	10%
2-lamp	F40T12 / ES	34	72	F32T8 / ES	25	41	0.016	30%
Weighted Average		----	----	----	----	----	**0.016**	----

Source: ComEd

Table 9.1.5-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Office	0.016	51.91
School (K-12)	0.008	34.03
College/University	0.013	62.38
Retail/Service	0.017	73.83
Restaurant	0.014	95.90
Hotel/Motel	0.012	89.00
Medical	0.015	120.70
Grocery	0.016	103.98
Warehouse	0.014	69.67
Light Industry	0.017	70.49
Heavy Industry	0.017	70.49
Average = Miscellaneous	**0.011**	**76.54**

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (weighted average from Table 9.1.5-2)	X	Demand Interactive Effects (from Table 9.1.5-1)	X	Coincident Diversity Factor (from Table 9.1.5-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (weighted average from Table 9.1.5-2)	X	Energy Interactive Effects (from Table 9.1.5-1)	X	Hours of Operation (from Table 9.1.5-1)

Table 9.1.5-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Four-foot, 1-Lamp Systems	$28	$0	$28	$5/system
Four-foot, 2-Lamp Systems	$32	$0	$32	$10/system
Four-foot, 3-Lamp Systems	$42	$0	$42	$15/system
Four-foot, 4-Lamp Systems	$47	$0	$47	$20/system

9.1.6 T8 to T5 Relamp and Reballast

Measure Code: BPL44

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Upgrade an existing 32watt T8 with T5 system

Eligibility Criteria for New Energy-Efficient Equipment:

- T5 fixtures must use 28 watt T5 lamps (T5HO are not eligible (54 watt)).

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[7]: 11 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

[7] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_W \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_W \times N_F \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_W = Demand Savings per fixture
W_{BASE} = Baseline connected kW from current fixture
W_{EE} = Energy efficient connected kW from proposed fixture
N_F = Number of fixtures being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_W = Energy Savings per fixture

Table 9.1.6-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,210	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,160	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,325**	**1.19**	**0.77**	**1.12**

Source: DEER database

Demand Savings Calculation (ΔkW_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Demand Interactive Effects (from Table 9.1.6-1)	X	Coincident Diversity Factor (from Table 9.1.6-1)

Energy Savings Calculation (ΔkWh_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Energy Interactive Effects (from Table 9.1.6-1)	X	Hours of Operation (from Table 9.1.6-1)

Table 9.1.6-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
4 lamp T8 to 3 lamp	$28	0	$28	$0.25/watt

28W T5				reduced

9.1.7 New Fluorescent Fixtures

Measure Code: BPL62

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace T12 fixture with T5, or high-performance or low-wattage T8 fixture

Eligibility Criteria for New Energy-Efficient Equipment:

- May use 32W T8, 28W T8, 25W T8, 28W T5, or 54W T5 (T5HO) lamps
- Lamps and Ballasts must be listed on the CEE web site (www.cee1.org)

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[8]: 15 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls

Bonus Incentives offered:
T12 bonus (10%) 11/16/09-1/31/10
T12 Ramp down bonus (15%) 6/15/10-12/31/10
T12 Ramp down bonus (10%) 1/1/11-TBD (5/31/11?)

Supplemental Information Collected on the Application: None

[8] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_L \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_L \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Demand savings per lamp
N_L = Number of lamps being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Energy savings per lamp

Table 9.1.7-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,210	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,160	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,325**	**1.19**	**0.77**	**1.12**

Source: DEER database

Table 9.1.7-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Lamp Type	Base Lamp Wattage (watts)	Base Fixture Wattage (watts)	Retrofit Lamp Type	Retrofit Lamp Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)	Weight Percent-age
Four Foot Lamps								
4-lamp	F40T12 / ES	34	144	F32T8 / ES	28	96	0.012	35%
3-lamp	F40T12 / ES	34	103	F32T8 / ES	28	72	0.010	25%
1-lamp	F40T12 / ES	34	43	F32T8 / ES	28	25	0.018	10%
2-lamp	F40T12 / ES	34	72	F32T8 / ES	28	48	0.012	30%
Weighted Average		----	----	----	----	----	**0.012**	----
Eight Foot Lamps								
2 lamp	F96T12 / ES	60	132	F96T8	57	100	0.016	75%
1-lamp	F96T12 / ES	60	77	F96T8	57	60	0.017	25%
Weighted Average		----	----	----	----	----	**0.016**	----

Source: ComEd

Table 9.1.7-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)	Demand Savings (kW)	Energy Savings (kWh)
	4-foot Lamp		8-foot Lamp	
Office	0.012	40.03	0.016	53.39
School (K-12)	0.006	26.24	0.008	34.99
College/University	0.010	48.09	0.013	64.14
Retail/Service	0.013	58.23	0.017	77.66
Restaurant	0.010	73.95	0.014	98.63
Hotel/Motel	0.009	68.62	0.012	91.52
Medical	0.011	125.59	0.015	167.51
Grocery	0.012	80.18	0.016	106.94
Warehouse	0.011	46.45	0.015	61.95
Light Industry	0.013	54.36	0.017	72.50
Heavy Industry	0.013	54.36	0.017	72.50
Average = Miscellaneous	**0.011**	**61.25**	**0.015**	**81.69**

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (weighted average from Table 9.1.7-2) X Demand Interactive Effects (from Table 9.1.7-1) X Coincident Diversity Factor (from Table 9.1.7-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (weighted average from Table 9.1.7-2) X Energy Interactive Effects (from Table 9.1.7-1) X Hours of Operation (from Table 9.1.7-1)

Table 9.1.7-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Four-foot, 1-Lamp Systems	$64	$0	$64	$5/system
Four-foot, 2-Lamp Systems	$75	$0	$75	$10/system
Four-foot, 3-Lamp Systems	$84	$0	$84	$15/system
Four-foot, 4-Lamp Systems	$98	$0	$98	$20/system
Eight-foot, 4-Lamp Systems	$98	$0	$98	$20/system
Measure Average	**$82**	**$0**	**$82**	**$5/lamp**

9.1.8 T12 to T8 Fluorescent Fixtures with Reflectors

Measure Code: BPL63

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace T12 fixture with high-performance or low-wattage T8 fixture, with a reflector

Eligibility Criteria for New Energy-Efficient Equipment:

- May use 32W T8, 28W T8, or 25W T8 lamps
- Lamps and Ballasts must be listed on the CEE web site (www.cee1.org)
- Each unit must include an aluminum/silver or new white integral reflector with a minimum surface reflectivity of 87%

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[9]: 15 years

Revision Details: PY2 allowed T5 or T8 to be installed

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered:
T12 bonus (10%) 11/16/09-1/31/10
T12 Ramp down bonus (15%) 6/15/10-12/31/10
T12 Ramp down bonus (10%) 1/1/11-TBD (5/31/11?)

Supplemental Information Collected on the Application: None

[9] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_L \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_L \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Demand savings per lamp
N_L = Number of lamps being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Energy savings per lamp

Table 9.1.8-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Four-foot lamps, 1-, 2-, 3-, or 4-lamp fixtures, HP T8				
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,306	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	8,736	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	3,597	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,489**	**1.19**	**0.77**	**1.12**
Eight-foot lamps, 1- or 2-lamp fixtures, HP T8				
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,306	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	8,736	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	3,597	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,489**	**1.19**	**0.77**	**1.12**

Table 9.1.8-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Lamp Type	Base Lamp Wattage (watts)	Base Fixture Wattage (watts)	Retrofit Lamp Type	Retrofit Lamp Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)	Weight Percent-age
Four Foot Lamps								
4-lamp	F40T12 / ES	34	144	F32T8 / ES	28	96	0.012	35%
3-lamp	F40T12 / ES	34	103	F32T8 / ES	28	72	0.010	25%
1-lamp	F40T12 / ES	34	43	F32T8 / ES	28	25	0.018	10%
2-lamp	F40T12 / ES	34	72	F32T8 / ES	28	48	0.012	30%
Weighted Average		----	----	----	----	----	**0.012**	----
Eight Foot Lamps								
2 lamp	F96T12 / ES	60	132	F96T8	57	100	0.016	75%
1-lamp	F96T12 / ES	60	77	F96T8	57	60	0.017	25%
Weighted Average		----	----	----	----	----	**0.016**	----

Source: ComEd

Table 9.1.8-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)	Demand Savings (kW)	Energy Savings (kWh)
	4-foot Lamp		8-foot Lamp	
Office	0.012	40.03	0.016	53.39
School (K-12)	0.006	26.24	0.008	34.99
College/University	0.010	48.09	0.013	64.14
Retail/Service	0.013	58.23	0.017	77.66
Restaurant	0.010	73.95	0.014	98.63
Hotel/Motel	0.009	68.62	0.012	91.52
Medical	0.011	125.59	0.015	167.51
Grocery	0.012	80.18	0.016	106.94
Warehouse	0.011	46.45	0.015	61.95
Light Industry	0.013	54.36	0.017	72.50
Heavy Industry	0.013	54.36	0.017	72.50
Average = Miscellaneous	**0.011**	**61.25**	**0.015**	**81.69**

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (weighted average from Table 9.1.8-2)	X	Demand Interactive Effects (from Table 9.1.8-1)	X	Coincident Diversity Factor (from Table 9.1.8-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (weighted average from Table 9.1.8-2)	X	Energy Interactive Effects (from Table 9.1.8-1)	X	Hours of Operation (from Table 9.1.8-1)

Table 9.1.8-4 Typical Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Four-foot, 1-Lamp Systems	$67	$0	$67	$7/system
Four-foot, 2-Lamp Systems	$67	$0	$67	$14/system
Four-foot, 3-Lamp Systems	$81	$0	$81	$21/system
Four-foot, 4-Lamp Systems	$81	$0	$81	$28/system
Measure Average	**$77**	**$0**	**$77**	**$7/lamp**

9.1.9 T12 to T5 New Fluorescent Fixture

Measure Code: BPL43

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace an existing T12 system with T5 high efficiency fixture

Eligibility Criteria for New Energy-Efficient Equipment:

- May use 28W T5, 49W T5 (T5HO), or 54W T5 (T5HO)
- Specular reflector kits are NOT eligible for this incentive (see highbay measure)
- New fixture does not have to have a reflector

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[10]: 12 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls

Bonus Incentives offered:
T12 bonus (10%) 11/16/09-1/31/10
T12 Ramp down bonus (15%) 6/15/10-12/31/10
T12 Ramp down bonus (10%) 1/1/11-TBD (5/31/11?)

Supplemental Information Collected on the Application: None

[10] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_W \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_W \times N_F \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_W = Demand Savings per fixture
W_{BASE} = Baseline connected kW from current fixture
W_{EE} = Energy efficient connected kW from proposed fixture
N_F = Number of fixtures being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_W = Energy Savings per fixture

Table 9.1.9-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,210	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,160	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,325**	**1.19**	**0.77**	**1.12**

Source: DEER database

Demand Savings Calculation (ΔkW_W) =

Non-coincident Demand Savings ($W_{BASE} – W_{EE}$)	X	Demand Interactive Effects (from Table 9.1.9-1)	X	Coincident Diversity Factor (from Table 9.1.9-1)

Energy Savings Calculation (ΔkWh_W) =

Non-coincident Demand Savings ($W_{BASE} – W_{EE}$)	X	Energy Interactive Effects (from Table 9.1.9-1)	X	Hours of Operation (from Table 9.1.9-1)

Table 9.1.9-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Replace T12 fixture with T5 fixture	Per invoice	N/A	$180/fixture	$0.25/watt reduced

9.1.10 Single Lamp T5 Fluorescent Fixture with Reflector

Measure Code: BPL45

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace an existing HID fixture for aisle lighting in a warehouse/ distribution facility

Eligibility Criteria for New Energy-Efficient Equipment:

- Single lamp T5 fixture with reflector(white or specular)
- May use 28W T5 or 54W T5 (T5HO)

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[11]: 11 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls

Bonus Incentives offered: T12 ramp-down bonus (see Appendix B)

Supplemental Information Collected on the Application: None

[11] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Demand Savings $\Delta kW = \Delta kW_W \times N_F \times ISR$

Energy Savings $\Delta kWh = \Delta kWh_W \times N_F \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_W = Demand Savings per fixture
W_{BASE} = Baseline connected kW from current fixture
W_{EE} = Energy efficient connected kW from proposed fixture
N_F = Number of fixtures being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_W = Energy Savings per fixture

Table 9.1.10-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,306	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	8,736	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	3,597	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,489**	**1.19**	**0.77**	**1.12**

Source: DEER database

Demand Savings Calculation (ΔkW_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Demand Interactive Effects (from Table 9.1.10-1)	X	Coincident Diversity Factor (from Table 9.1.10-1)

Energy Savings Calculation (ΔkWh_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Energy Interactive Effects (from Table 9.1.10-1)	X	Hours of Operation (from Table 9.1.10-1)

Table 9.1.10-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
T5 Lamp Fixture	$65	$0	$65	$0.25 per watt

				reduced

9.1.11 High Efficiency Fluorescent Fixtures

Measure Code: BPL64

Version Date & Revision History:

Draft date: December 17, 2008
Effective date: December 17, 2008
Revised NA
End date: TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace 3- or 4-lamp T12 recessed or surface mounted troffer (lensed) or parabolic (egg crate) fixture with T5 or high-performance T8 Lamps and ballasts

Eligibility Criteria for New Energy-Efficient Equipment:

- Recessed or surface mounted T5 or high performance T8 troffer or parabolic fixture
- Lamps and Ballasts must be listed on the CEE web site (www.cee1.org)**
- May use 28W T5 or 54W T5 (T5HO)
- Overall fixture efficiency must exceed 83% for prismatic lensed fixtures and 75% for parabolic fixtures

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[12]: 15 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered:

T12 bonus (10%) 11/16/09-1/31/10
T12 Ramp down bonus (15%) 6/15/10-12/31/10
T12 Ramp down bonus (10%) 1/1/11-TBD (5/31/11?)

Supplemental Information Collected on the Application: None

[12] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_W \times N_F$ x ISR

Measure Energy Savings $\Delta kWh = \Delta kWh_W \times N_F$ x ISR

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_W = Demand Savings per fixture
W_{BASE} = Baseline connected kW from current fixture
W_{EE} = Energy efficient connected kW from proposed fixture
N_F = Number of fixtures being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_W = Energy Savings per fixture

Table 9.1.11-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,306	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	8,736	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	3,597	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,489**	**1.19**	**0.77**	**1.12**

Source: DEER database

Demand Savings Calculation (ΔkW_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Demand Interactive Effects (from Table 9.1.11-1)	X	Coincident Diversity Factor (from Table 9.1.11-1)

Energy Savings Calculation (ΔkWh_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Energy Interactive Effects (from Table 9.1.11-1)	X	Hours of Operation (from Table 9.1.11-1)

Table 9.1.11-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
HE Fluorescent Fixture	$120	$0	$120	$0.25 per watt reduced

9.1.12 Low Glare High Efficiency Recessed Fixtures

Measure Code: BPL65

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	May 3, 2010
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace 3- or 4-lamp T12 recessed or surface mounted low-glare (semi-indirect) fixture with T5 or high-performance T8 Lamps and ballast

Eligibility Criteria for New Energy-Efficient Equipment:

- Recessed or surface mounted T5 or high performance T8 semi-indirect fixture•
- Lamps and Ballasts must be listed on the CEE web site (www.cee1.org)**
- May use 28W T5 or 54W T5 (T5HO)
- Overall fixture efficiency must exceed 80%
- Must be a new fixture incorporating advanced glare control features (semi-indirect lighting)

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[13]: 15 years

Revision Details: In PY3 (5-3-10) this measure was modified so the new fixtures going in were not limited to two or three lamp fixtures with one ballast – the new fixture could be any number of lamps. The incentive was also changed from $20/fixture to $0.25 per watt reduced.

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls

Bonus Incentives offered:
T12 bonus (10%) 11/16/09-1/31/10
T12 Ramp down bonus (15%) 6/15/10-12/31/10
T12 Ramp down bonus (10%) 1/1/11-TBD (5/31/11?)

Supplemental Information Collected on the Application: None

[13] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_W \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_W \times N_F \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_W = Demand Savings per fixture
W_{BASE} = Baseline connected kW from current fixture
W_{EE} = Energy efficient connected kW from proposed fixture
N_F = Number of fixtures being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_W = Energy Savings per fixture

Table 9.1.12-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,306	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	8,736	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	3,597	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,489**	**1.19**	**0.77**	**1.12**

Source: DEER database

Demand Savings Calculation (per watt reduced) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Demand Interactive Effects (from Table 9.1.12-1)	X	Coincident Diversity Factor (from Table 9.1.12-1)

Energy Savings Calculation (per watt reduced) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Energy Interactive Effects (from Table 9.1.12-1)	X	Hours of Operation (from Table 9.1.12-1)

Table 9.1.12-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost*	Incentive Payment
Recessed semi-indirect fluorescent fixture	Per invoice	N/A	$337	$0.25 per watt reduced

*low glare, high efficiency recessed fixture

9.1.13 Controls for T5 and High Performance T8 Systems

Measure Code: BPL72

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- New installation – may not replace existing control

Eligibility Criteria for New Energy-Efficient Equipment:

- May be used for Highbay applications
- Controls for HIF Systems
- Occupancy Control (Hi/Lo-HIF) or Daylight Dimming Control (DDS-HIF)
- Incentive may not be combined with other control incentives
- Ballast must be automatically controlled based on occupancy or daylight
- Microprocessor controlled, all digital PIR sensor
- Zero arc point switching to reduce stress on relay
- Multiple output
- Selectable lamp switching
- Supports multiple mounting heights
- Wall, ceiling, or fixture mounted only – cannot be switch plate mounted
- Multiple passive infrared options
- Must control from 125 through 800 watts (over 800 watts is custom)

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[14]: 10 years

Revision Details: PY2 did not have a limit of 800 watts, only "control a minimum of 125 watts"

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. For high-occupancy buildings (offices, retails, etc) the Time Off is 20% (source: DEER). For low-occupancy buildings (warehouses, etc) the Time Off is 50%. The Annual Operating Hours are taken from DEER's non-CFL Table, except for Guest Rooms operating hours, which have been corrected to 1,145 hrs.

Bonus Incentives offered:
T12 and controls bonus (10%) 11/16/09-1/31/10

Supplemental Information Collected on the Application: Wattage controlled, per control

[14] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times W_{CTRL} \times N_C \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times W_{CTRL} \times N_C \times ISR$

ΔkW = Gross customer connected load kW savings per watt controlled for the measure
ΔkW_S = Demand savings per watts controlled
W_{CTRL} = Watts controlled by HIF control
N_C = Number of controls being installed
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer kWh savings for the measure
ΔkWh_S = Energy savings per watt controlled

Table 9.1.13-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings*	kWh Savings*
Daylight Sensors and Occupancy Sensors (Hi/Lo)						
Office	2,808	1.25	0.81	1.17	0.0002025	0.66
School (K-12)	1,873	1.23	0.42	1.15	0.0001033	0.43
College/University	3,433	1.22	0.68	1.15	0.0001659	0.79
Retail/Service	4,210	1.19	0.88	1.11	0.0002094	0.93
Restaurant	5,278	1.26	0.68	1.15	0.0001714	1.21
Hotel/Motel	4,941	1.14	0.67	1.14	0.0001528	1.13
Medical	6,474	1.26	0.74	1.18	0.0001865	1.53
Grocery	5,824	1.25	0.81	1.13	0.0002025	1.32
Warehouse	4,160	1.09	0.84	1.06	0.0004578	2.20
Light Industry	4,290	1.08	0.99	1.04	0.0005346	2.23
Heavy Industry	4,290	1.08	0.99	1.04	0.0005346	2.23
Average = Miscellaneous	**4,325**	**1.19**	**0.77**	**1.12**	**0.0002656**	**1.33**

Source: DEER database
* Per Watt Controlled

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (per watt controlled)	X	Demand Interactive Effects (from Table 9.1.13-1)	X	Coincident Diversity Factor (from Table 9.1.13-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (per watt controlled)	X	Energy Interactive Effects (from Table 9.1.13-1)	X	Hours of Operation (from Table 9.1.13-1)

Table 9.1.13-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Occupancy Sensor –	$50	$15/control

Hi/Lo		

9.1.14 Remote Mounted Occupancy Sensors

Measure Code: BPL73

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- New installation – may not replace existing control

Eligibility Criteria for New Energy-Efficient Equipment:

- Wall or ceiling mounted only – cannot be fixture or switch plate mounted
- Must control from 125 through 800 watts (over 800 watts is custom)
- Ultrasonic or Passive Infrared sensor controlling non-highbay fixtures

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[15]: 10 years

Revision Details: PY2 did not have a limit of 800 watts, only “control a minimum of 125 watts”

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. For high-occupancy buildings (offices, retail, etc) the Time Off is 20% (source: DEER). For low-occupancy buildings (warehouses, etc) the Time Off is 50%. The Annual Operating Hours are taken from DEER's non-CFL Table, except for Guest Rooms operating hours, which have been corrected to 1,145 hrs.

Bonus Incentives offered:
T12 and controls bonus (10%) 11/16/09-1/31/10

Supplemental Information Collected on the Application: Wattage controlled, per control

[15] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times W_{CTRL} \times N_{OS} \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times W_{CTRL} \times N_{OS} \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Demand savings per watts controlled
W_{CTRL} = Watts controlled by HIF control
N_{OS} = Number of occupancy sensors being installed

ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Energy savings per watts controlled

Table 9.1.14-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings*	kWh Savings*
Office	2,808	1.25	0.81	1.17	0.0002025	0.66
School (K-12)	1,873	1.23	0.42	1.15	0.0001033	0.43
College/University	3,433	1.22	0.68	1.15	0.0001659	0.79
Retail/Service	4,210	1.19	0.88	1.11	0.0002094	0.93
Restaurant	5,278	1.26	0.68	1.15	0.0001714	1.21
Hotel/Motel	4,941	1.14	0.67	1.14	0.0001528	1.13
Medical	6,474	1.26	0.74	1.18	0.0001865	1.53
Grocery	5,824	1.25	0.81	1.13	0.0002025	1.32
Warehouse	4,160	1.09	0.84	1.06	0.0004578	2.20
Light Industry	4,290	1.08	0.99	1.04	0.0005346	2.23
Heavy Industry	4,290	1.08	0.99	1.04	0.0005346	2.23
Average = Miscellaneous	**4,325**	**1.19**	**0.77**	**1.12**	**0.0002656**	**1.33**

Source: DEER database
* Per Watt Controlled

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (per watt controlled)	X	Demand Interactive Effects (from Table 9.1.14-1)	X	Coincident Diversity Factor (from Table 9.1.14-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (per watt controlled)	X	Energy Interactive Effects (from Table 9.1.14-1)	X	Hours of Operation (from Table 9.1.14-1)

Table 9.1.14-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Remote Mounted	$145	$25/control

Occupancy Sensor		

9.1.15 Occupancy Sensors

Measure Code: BPL74

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- New installation – may not replace existing control

Eligibility Criteria for New Energy-Efficient Equipment:

- Manual On/Auto Off Occupancy Sensor OR Auto On/Auto Off Occupancy Sensor
- Must control from 125 through 800 watts (over 800 watts is custom)
- Wall switch plate controls only – cannot be wall, ceiling, or fixture mounted
- Ultrasonic or Passive Infrared sensor controlling non-highbay fixtures
- Socket-based and fixture-mounted occupancy sensors do not qualify
- Cannot be combined with purchases from the On-line store

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[16]: 10 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. For high-occupancy buildings (offices, retails, etc) the Time Off is 20% (source: DEER). For low-occupancy buildings (warehouses, etc) the Time Off is 50%. The Annual Operating Hours are taken from DEER's non-CFL Table, except for Guest Rooms operating hours, which have been corrected to 1,145 hrs.

Bonus Incentives offered:
T12 and controls bonus (10%) 11/16/09-1/31/10

Supplemental Information Collected on the Application: Wattage controlled, per control

[16] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times W_{CTRL} \times N_{OS} \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times W_{CTRL} \times N_{OS} \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Demand savings per watts controlled
W_{CTRL} = Watts controlled by HIF control
N_{OS} = Number of occupancy sensors being installed
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Energy savings per watts controlled

Table 9.1.15-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings*	kWh Savings*
Office	2,808	1.25	0.81	1.17	0.0002025	0.66
School (K-12)	1,873	1.23	0.42	1.15	0.0001033	0.43
College/University	3,433	1.22	0.68	1.15	0.0001659	0.79
Retail/Service	4,210	1.19	0.88	1.11	0.0002094	0.93
Restaurant	5,278	1.26	0.68	1.15	0.0001714	1.21
Hotel/Motel	4,941	1.14	0.67	1.14	0.0001528	1.13
Medical	6,474	1.26	0.74	1.18	0.0001865	1.53
Grocery	5,824	1.25	0.81	1.13	0.0002025	1.32
Warehouse	4,160	1.09	0.84	1.06	0.0004578	2.20
Light Industry	4,290	1.08	0.99	1.04	0.0005346	2.23
Heavy Industry	4,290	1.08	0.99	1.04	0.0005346	2.23
Average = Miscellaneous	**4,325**	**1.19**	**0.77**	**1.12**	**0.0002656**	**1.33**

Source: DEER database
* Per Watt Controlled

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (per watt controlled	X	Demand Interactive Effects (from Table 9.1.15-1)	X	Coincident Diversity Factor (from Table 9.1.15-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (per watt controlled	X	Energy Interactive Effects (from Table 9.1.15-1)	X	Hours of Operation (from Table 9.1.15-1)

Table 9.1.15-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Occupancy	$50	$20/control

Sensor		

9.1.16 CFL Lamps

Measure Code: None

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replacement of incandescent, or CFL bulbs (limit 100 per year)

Eligibility Criteria for New Energy-Efficient Equipment:

- Ameren Illinois Utility business customers with an electric delivery service rate of DS-2 ("small businesses") are eligible to use the On-line store at the ActOnEnergy.com web site

Was incentivized in PY1 – then moved to the on-line store only in PY2.

See ActOnEnergy.com (For my business – Small business on-line store) for discounted CFLs.

9.1.17 LED Lamps

Measure Code: BPL81

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace 100W or less incandescent lamps

Eligibility Criteria for New Energy-Efficient Equipment:

- Must have minimum efficacy of 35 lumens per Watt
- Lamps must be listed on the ENERGY STAR website: energystar.gov
- Medium base (Edison or candelabra base only
- Minimum 18,000 hour rated life

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[17]: 8 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

[17] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta\, kW_S \times N_L \times ISR$

Measure Energy Savings $\Delta kWh = \Delta\, kWh_S \times N_L \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Demand savings per lamp
N_L = Number of lamps being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Energy savings per lamp

Table 9.1.17-1 Energy Factor Assumptions

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
Office	2,616	1.25	0.81	1.17	0.023	68
School (K-12)	1,873	1.23	0.42	1.15	0.012	48
College/University	3,433	1.22	0.68	1.15	0.019	88
Retail/Service	4,117	1.19	0.88	1.11	0.023	102
Restaurant	4,816	1.26	0.68	1.15	0.019	124
Hotel/Motel	4,941	1.14	0.67	1.14	0.017	126
Medical	6,474	1.26	0.74	1.18	0.021	171
Grocery	5,824	1.25	0.81	1.13	0.023	147
Warehouse	4,160	1.09	0.84	1.06	0.020	98
Light Industry	4,290	1.08	0.99	1.04	0.024	100
Heavy Industry	4,290	1.08	0.99	1.04	0.024	100
Average = Miscellaneous	**4,257**	**1.19**	**0.77**	**1.12**	**0.020**	**106**

Source: DEER database

Table 9.1.17-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Lamp Type	Base Lamp Wattage (watts)	Base Fixture Wattage (watts)	Retrofit Lamp Type	Retrofit Lamp Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
LED Lamp	Incandescent	28	n/a	LED	6	n/a	0.022

Source: ComEd

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (from Table 9.1.17-2)	X	Demand Interactive Effects (from Table 9.1.17-1)	X	Coincident Diversity Factor (from Table 9.1.17-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (from Table 9.1.17-2)	X	Energy Interactive Effects (from Table 9.1.17-1)	X	Hours of Operation (from Table 9.1.17-1)

Table 9.1.17-3 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
LED lamp	$20	0	$20	$10/lamp

9.1.18 LED Recessed Down Lamps

Measure Code: BPL84

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:
- Replace 60-100W incandescent lamps

Eligibility Criteria for New Energy-Efficient Equipment:
- LED recessed downlight ≤ 18 Watts
- Lamps must be listed on the ENERGY STAR website: energystar.gov
- Minimum luminaire efficiency of 35 lumens/Watt
- Cannot be combined with purchases from the On-line store

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[18]: 16 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

[18] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_L \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_L \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Demand savings per lamp
N_L = Number of lamps being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Energy savings per lamp

Table 9.1.18-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,616	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,117	1.19	0.88	1.11
Restaurant	4,816	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,160	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,257**	**1.19**	**0.77**	**1.12**

Source: DEER database

Table 9.1.18-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Lamp Type	Base Lamp Wattage (watts)	Base Fixture Wattage (watts)	Retrofit Lamp Type	Retrofit Lamp Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
LED Recessed Down Lamp	Incandescent	75	75	LED	12	12	0.063

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (from Table 9.1.18-2)	X	Demand Interactive Effects (from Table 9.1.18-1)	X	Coincident Diversity Factor (from Table 9.1.18-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (from Table 9.1.18-2)	X	Energy Interactive Effects (from Table 9.1.18-1)	X	Hours of Operation (from Table 9.1.18-1)

Table 9.1.18-3 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
LED Recessed Down Lamp	$100	n/a	$100	$10/fixture

9.1.19 CMH Fixtures <100 Watts

Measure Code: BPL85

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	May 3, 2010
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace incandescent fixtures less than 100 watts

Eligibility Criteria for New Energy-Efficient Equipment:

- Permanently-wired fixtures
- Containing FUL or cUL listed CMH lamps and ballast

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[19]: 12 years

Revision Details: In PY3 (5-3-10) this was split into two measures – it used to include the CMH fixtures that are 100-350 watts too – that is now its own measure (BPL89)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

[19] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Saving $\Delta kW = \Delta kW_W \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_W \times N_F \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_W = Demand Savings per fixture
W_{BASE} = Baseline connected kW from current fixture
W_{EE} = Energy efficient connected kW from proposed fixture
N_F = Number of fixtures being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_W = Energy Savings per fixture

Table 9.1.19-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,616	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,117	1.19	0.88	1.11
Restaurant	4,816	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,160	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,257**	**1.19**	**0.77**	**1.12**

Source: DEER database

Demand Savings Calculation (ΔkW_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Demand Interactive Effects (from Table 9.1.19-1)	X	Coincident Diversity Factor (from Table 9.1.19-1)

Energy Savings Calculation (ΔkWh_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Energy Interactive Effects (from Table 9.1.19-1)	X	Hours of Operation (from Table 9.1.19-1)

Table 9.1.19-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
CMH fixture < 100 watts	$221	n/a	$221	$20/fixture

9.1.20 CMH Fixtures: 100-350 Watts

Measure Code: BPL89

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace incandescent fixtures 100-350 watts

Eligibility Criteria for New Energy-Efficient Equipment:

- Permanently-wired fixtures
- Containing FUL or cUL listed CMH lamps and ballast

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[20]: 12 years

Revision Details: In PY3 (5-3-10) this was split into two measures – it used to include the CMH fixtures that are 100-350 watts too – that is now its own measure (BPL89)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

[20] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_W \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_W \times N_F \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_W = Demand Savings per fixture
W_{BASE} = Baseline connected kW from current fixture
W_{EE} = Energy efficient connected kW from proposed fixture
N_F = Number of fixtures being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_W = Energy Savings per fixture

Table 9.1.20-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,616	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,117	1.19	0.88	1.11
Restaurant	4,816	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,160	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,257**	**1.19**	**0.77**	**1.12**

Demand Savings Calculation (ΔkW_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$) X Demand Interactive Effects (from Table 9.1.20-1) X Coincident Diversity Factor (from Table 9.1.20-1)

Energy Savings Calculation (ΔkWh_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)) X Energy Interactive Effects (from Table 9.1.20-1) X Hours of Operation (from Table 9.1.20-1)

Table 9.1.20-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
CMH fixture 100 <	$221	$0	$221	$35/fixture

fixture < 350 watts				

9.1.21 CMH Integral Ballast Lamps

Measure Code: BPL86

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace existing 70-100W incandescent or flood lamps

Eligibility Criteria for New Energy-Efficient Equipment:

- CMH lamps <= 25W
- CMH lamps must be UL or cUL listed
- Requires reflector lamp and integrated ballast
- Minimum 10,500 hour rated life

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[21]: 5 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

[21] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_L \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_L \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Demand savings per lamp
N_L = Number of lamps being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Energy savings per lamp

Table 9.1.21-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.00	1.00	1.00
School (K-12)	1,873	1.00	1.00	1.00
College/University	3,433	1.00	1.00	1.00
Retail/Service	4,210	1.00	1.00	1.00
Restaurant	5,278	1.00	1.00	1.00
Hotel/Motel	4,941	1.00	1.00	1.00
Medical	6,474	1.00	1.00	1.00
Grocery	5,824	1.00	1.00	1.00
Warehouse	4,160	1.00	1.00	1.00
Light Industry	4,290	1.00	1.00	1.00
Heavy Industry	4,290	1.00	1.00	1.00
Average = Miscellaneous	**4,325**	**1.00**	**1.00**	**1.00**

Table 9.1.21-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Lamp Type	Base Fixture Wattage (watts)	Retrofit Lamp Type	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
CMH Integral Ballast Lamps	Incandescent	80	CMH	35	0.045

Table 9.1.21-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Office	0.045	126
School (K-12)	0.045	84
College/University	0.045	154
Retail/Service	0.045	189
Restaurant	0.045	238
Hotel/Motel	0.045	222
Medical	0.045	291
Grocery	0.045	262
Warehouse	0.045	187
Light Industry	0.045	193
Heavy Industry	0.045	193
Average = Miscellaneous	**0.045**	**195**

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (from Table 9.1.21-2)	X	Demand Interactive Effects (from Table 9.1.21-1)	X	Coincident Diversity Factor (from Table 9.1.21-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (from Table 9.1.21-2)	X	Energy Interactive Effects (from Table 9.1.21-1)	X	Hours of Operation (from Table 9.1.21-1)

Table 9.1.21-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
CMH Integral Ballast Lamps	$20	n/a	$20	$5/lamp

9.1.22 Hard-wired CFL Fixtures ≤ 30 Watts

Measure Code: BPL87

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace incandescent with permanently-wired CFL

Eligibility Criteria for New Energy-Efficient Equipment:

- Permanently-wired fixtures with Electronic Ballast
- Up to or equal to 30 Watts

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[22]: 15 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

[22] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_F \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Demand savings
N_F = Number of fixtures being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Energy savings

Table 9.1.22-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,616	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,117	1.19	0.88	1.11
Restaurant	4,816	1.26	0.68	1.15
Hotel/Motel	6,206	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,160	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,372**	**1.19**	**0.77**	**1.12**

Source: DEER database

Table 9.1.22-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Lamp Type	Base Fixture Wattage (watts)	Retrofit Lamp Type	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
Hard-wired CFL Fixtures < 30 watts	Incandescent	77	CFL	20	0.057

Table 9.1.22-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Office	0.058	175
School (K-12)	0.030	123
College/University	0.047	225
Retail/Service	0.060	261
Restaurant	0.049	316
Hotel/Motel	0.044	404
Medical	0.053	436
Grocery	0.058	376
Warehouse	0.052	252
Light Industry	0.061	255
Heavy Industry	0.061	255
Average = Miscellaneous	**0.052**	**280**

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (from Table 9.1.22-2)	X	Demand Interactive Effects (from Table 9.1.22-1)	X	Coincident Diversity Factor (from Table 9.1.22-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (from Table 9.1.22-2)	X	Energy Interactive Effects (from Table 9.1.22-1)	X	Hours of Operation (from Table 9.1.22-1)

Table 9.1.22-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Hard-wired CFL Fixtures < 30 watts	$46	n/a	$46	$25/fixture

9.1.23 Hard-wired CFL Fixtures > 30 Watts

Measure Code: BPL88

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace incandescent with permanently-wired CFL

Eligibility Criteria for New Energy-Efficient Equipment:

- Permanently-wired fixtures Electronic Ballast
- More than 30 Watts

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[23]: 15 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

[23] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_F \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Demand savings
N_F = Number of fixtures being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Energy savings

Table 9.1.23-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,616	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,117	1.19	0.88	1.11
Restaurant	4,816	1.26	0.68	1.15
Hotel/Motel	6,206	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,160	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	**4,372**	**1.19**	**0.77**	**1.12**

Source: DEER database

Table 9.1.23-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Lamp Type	Base Fixture Wattage (watts)	Retrofit Lamp Type	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
Hard-wired CFL Fixtures > 30 watts	Incandescent	160	CFL	47	0.113

Table 9.1.23-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Office	0.114	344
School (K-12)	0.058	242
College/University	0.093	444
Retail/Service	0.118	514
Restaurant	0.096	623
Hotel/Motel	0.086	796
Medical	0.105	859
Grocery	0.114	740
Warehouse	0.103	496
Light Industry	0.120	502
Heavy Industry	0.120	502
Average = Miscellaneous	0.103	551

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (from Table 9.1.23-2)	X	Demand Interactive Effects (from Table 9.1.23-1)	X	Coincident Diversity Factor (from Table 9.1.23-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (from Table 9.1.23-2)	X	Energy Interactive Effects (from Table 9.1.23-1)	X	Hours of Operation (from Table 9.1.23-1)

Table 9.1.23-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Hard-wired CFL Fixture > 30 watts	$100	n/a	$100	$35/fixture

9.1.24 Garage Type Fixtures w/Electronic Ballasts

Measure Code: BPL50

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replacement of HID fixtures such as mercury vapor, high pressure sodium, and metal halide

Eligibility Criteria for New Energy-Efficient Equipment:

- Must have electronic ballast.
- Fixtures must be controlled by exterior photocell or time clock to qualify.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[24]: 15 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: Hours of operation (dusk to dawn, or other (specify)

[24] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_W \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_W \times N_F \times ISR$

ΔkW	= Gross customer connected load kW savings for the measure
ΔkW_W	= Demand Savings per fixture
W_{BASE}	= Baseline connected kW from current fixture
W_{EE}	= Energy efficient connected kW from proposed fixture
N_F	= Number of fixtures being replaced
ISR	= In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh	= Gross customer annual kWh savings for the measure
ΔkWh_W	= Energy Savings per fixture

Table 9.1.24-1 Energy Factor Assumptions

Building Types	Operating Hours*	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	4380	1.0	0.0	1.0
School (K-12)	4380	1.0	0.0	1.0
College/University	4380	1.0	0.0	1.0
Retail/Service	4380	1.0	0.0	1.0
Restaurant	4380	1.0	0.0	1.0
Hotel/Motel	4380	1.0	0.0	1.0
Medical	4380	1.0	0.0	1.0
Grocery	4380	1.0	0.0	1.0
Warehouse	4380	1.0	0.0	1.0
Light Industry	4380	1.0	0.0	1.0
Heavy Industry	4380	1.0	0.0	1.0
Average = Miscellaneous	**4380**	**1.0**	**0.0**	**1.0**

* Dusk-dawn controls required so annual operating hours are 8760/2 or 4380 annual hours.

Demand Savings Calculation (ΔkW_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Demand Interactive Effects (from Table 9.1.24-1)	X	Coincident Diversity Factor (from Table 9.1.24-1)

Energy Savings Calculation (ΔkWh_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Energy Interactive Effects (from Table 9.1.24-1)	X	Hours of Operation (from Table 9.1.24-1)

Table 9.1.24-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Retrofit HID Kit	$200	$0	$200.00	$0.25 watt reduced
New HID Fixture with Pulse Start and Electronic ballast	$300	$0	$300.00	$0.25 watt reduced

9.1.25 Canopy Lighting w/Electronic Ballasts

Measure Code: BPL51

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replacement of HID fixtures such as mercury vapor, high pressure sodium, and metal halide
- Must be mounted under a canopy

Eligibility Criteria for New Energy-Efficient Equipment:

- Must have electronic ballast
- Fixtures must be controlled by exterior photocell or time clock to qualify

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[25]: 15 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: Hours of operation (dusk to dawn, or other (specify)

[25] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_W \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_W \times N_F \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_W = Demand Savings per fixture
W_{BASE} = Baseline connected kW from current fixture
W_{EE} = Energy efficient connected kW from proposed fixture
N_F = Number of fixtures being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_W = Energy Savings per fixture

Table 9.1.25-1 Energy Factor Assumptions

Building Types	Operating Hours*	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	4380	1.0	0	1.0
School (K-12)	4380	1.0	0.0	1.0
College/University	4380	1.0	0.0	1.0
Retail/Service	4380	1.0	0.0	1.0
Restaurant	4380	1.0	0.0	1.0
Hotel/Motel	4380	1.0	0.0	1.0
Medical	4380	1.0	0.0	1.0
Grocery	4380	1.0	0.0	1.0
Warehouse	4380	1.0	0.0	1.0
Light Industry	4380	1.0	0.0	1.0
Heavy Industry	4380	1.0	0.0	1.0
Average = Miscellaneous	**4380**	**1.0**	**0.0**	**1.0**

* Dusk-dawn controls required so annual operating hours are 8760/2 or 4380 annual hours.

Demand Savings Calculation (ΔkW_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Demand Interactive Effects (from Table 9.1.25-1)	X	Coincident Diversity Factor (from Table 9.1.25-1)

Energy Savings Calculation (ΔkWh_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Energy Interactive Effects (from Table 9.1.25-1)	X	Hours of Operation (from Table 9.1.25-1)

Table 9.1.25-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Retrofit HID Kit	$200	$0	$200.00	$0.25 watt reduced
New HID Fixture with Pulse Start and Electronic ballast	$300	$0	$300.00	$0.25 watt reduced

9.1.26 LED Cooler/Freezer Lighting

Measure Code: BPL93

Version Date & Revision History:

Draft date: September 29, 2009
Effective date: September 29, 2009
Revised NA
End date: TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Refrigerated case lighting, replacing T-8, T-10, and or T-12 fluorescent lamps with LED lighting

Eligibility Criteria for New Energy-Efficient Equipment:

- To be installed on low- and medium-temperature main coolers and freezers; or low- and medium temperature reach-in coolers and freezers (-10 through +41 degrees F)
- Qualifying LED lighting system must replace existing five-foot equivalent fluorescent lighting in existing low-temperature or medium- temperature display cases. Minimum wattage requirement for these sources is 18 watts. The product must be tested to IES LM79 and IES LM80 by a third party DOE accredited lab and carry a warranty on the light source and power supplies for 3 years or more. The LED luminaires must have a minimum efficacy of 35 lumens per watt and have a CRI of 75 or above.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[26]: 11 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 9-10-09 Light Calcs, PECI LED Case Lighting With and Without Motion Sensors presentation dated 1-5-10, and EVALUATION OF FLUORESCENT, LED, AND FIBER OPTIC LIGHTING SYSTEMS IN LOW TEMPERATURE REACH-IN FREEZER DISPLAY CASES, Refrigeration & Thermal Test Center Design & Engineering Services, Southern California Edison, 12-4-07, and New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs, dated 10-15-10.

Bonus Incentives offered:
T12 bonus (10%) 11/16/09-1/31/10
T12 Ramp down bonus (15%) 6/15/10-12/31/10
T12 Ramp down bonus (10%) 1/1/11-TBD (5/31/11?)

Supplemental Information Collected on the Application: None

[26] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_D \times N_D$ x ISR x (1+CF/CEF)

Measure Energy Savings $\Delta kWh = \Delta kWh_D$ x N_D x ICR x (1+CF/CEF)

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_D = Demand Savings per unit
N_D = Number of doors with associated fixtures being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_D = Energy Savings per unit
h = Annual operating hours
CF/CEF = Compressor Factor /Commercial Efficiency Factor (Is equal to 0.45. Figure is arrived at by bending the figure of 0.45 for compressors and the figure of 0.45 for commercial units, estimating each represents 50% of the units encountered. The compressor factor is arrived at by blending the figure of 0.40 for refrigerators and coolers, and the figure of 0.51 for freezers.

[The factors are based on effective refrigeration compressor EER values of 6.7 (1.8 kW/ton) and 5.25 Btu/Wh (2.3 kW/ton), respectively, and the assumption that 20% of the case lighting load is not converted into a case cooling load.
Compressor Factor = 0.28 ton/kW x 1.8 kW/ton x 0.8 = 0.40 for refrigerators and coolers, and 0.28 ton/kW x 2.3 kW/ton x 0.8 = 0.51 for freezers
The commercial efficiency factor figure is arrived at by blending the figure of 0.41 for refrigerators and coolers, and the figure of 0.52 for freezers. [The factors are based on starting values of 0.51 for refrigerators and coolers and 0.65 for freezers, respectively, and the assumption that 20% of the case lighting load is not converted into a case cooling load. Commercial Efficiency Factor = 0.51 x 0.8 = 0.41 for refrigerators and coolers, and 0.65 x 0.8 = 0.52 for freezers

Table 9.1.26-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Grocery	5,824	1.0	1.0	1.0

Source: DEER database

Table 9.1.26-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
LED Cooler/freezer Lighting (per door)	81.0	42	0.039

(watts are per door)

Table 9.1.26-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Grocery (per door)	0.057	329.6

Demand Savings Calculation (ΔkW_D) =

Non-coincident Demand Savings (weighted average from Table 9.1.26-2)	X	Demand Interactive Effects (average from Table 9.1.26-1)	X	Coincident Diversity Factor (average from Table 9.1.26-1)

Energy Savings Calculation (ΔkWh_D) =

Non-coincident Demand Savings (weighted average from Table 9.1.26-2)	X	Energy Interactive Effects (average from Table 9.1.26-1)	X	Hours of Operation (average from Table 9.1.26-1)

Table 9.1.26-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
LED Refrigerated Display Case Lighting	$300/system	$25/door

9.1.27 LED Cooler/Freezer Lighting Controls

Measure Code: BPL94

Version Date & Revision History:

Draft date:	September 29, 2009
Effective date:	September 29, 2009
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- New installation or replacement of failed control

Eligibility Criteria for New Energy-Efficient Equipment:

- To be installed on low- and medium-temperature main coolers and freezers; or low- and medium temperature reach-in coolers and freezers (-10 through +41 degrees F)
- Wall, ceiling, or case- mounted controls
- Must control at least 80 watts

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[27]: 11 years

Revision Details: (None)

Referenced Documents:
PECI LED Case Lighting With and Without Motion Sensors presentation dated 1-5-10, and EVALUATION OF FLUORESCENT, LED, AND FIBER OPTIC LIGHTING SYSTEMS IN LOW TEMPERATURE REACH-IN FREEZER DISPLAY CASES, Refrigeration & Thermal Test Center Design & Engineering Services, Southern California Edison, 12-4-07, and New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs, dated 10-15-10. Still waiting on report from SCE Refrigeration Technology Center. Will keep checking with them to get report once it is complete.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

[27] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_{CTRL} \times N_{CTRL} \times ISR \times (1+CF/CEF) = 0$

Measure Energy Savings $\Delta kWh = \Delta kWh_{CTRL} \times N_{CTRL} \times ICR \times (1+CF/CEF) \times SFPHC$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_{CTRL} = Demand Savings per unit
W_{CTRL} = Watts controlled by installing control unit, found in table below
N_{CTRL} = Number of controls being installed
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
SFPHC = Sensor full-power hours coefficient. For LED lights, it is expected the sensors will turn off the lights 30% of the time. The factor is then 0.3
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_{CTRL} = Energy Savings per unit
CF/CEF = Compressor Factor /Commercial Efficiency Factor (Is equal to 0.45)
Figure is arrived at by bending the figure of 0.45 for compressors and the figure of 0.45 for commercial units, estimating each represents 50% of the units encountered. The compressor factor is arrived at by blending the figure of 0.40 for refrigerators and coolers, and the figure of 0.51 for freezers.
[The factors are based on effective refrigeration compressor EER values of 6.7 (1.8 kW/ton) and 5.25 Btu/Wh (2.3 kW/ton), respectively, and the assumption that 20% of the case lighting load is not converted into a case cooling load. Compressor Factor = 0.28 ton/kW x 1.8 kW/ton x 0.8 = 0.40 for refrigerators and coolers, and 0.28 ton/kW x 2.3 kW/ton x 0.8 = 0.51 for freezers. The commercial efficiency factor figure is arrived at by blending the figure of 0.41 for refrigerators and coolers, and the figure of 0.52 for freezers.
[The factors are based on starting values of 0.51 for refrigerators and coolers and 0.65 for freezers, respectively, and the assumption that 20% of the case lighting load is not converted into a case cooling load. Commercial Efficiency Factor = 0.51 x 0.8 = 0.41 for refrigerators and coolers, and 0.65 x 0.8 = 0.52 for freezers

Table 9.1.27-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Grocery	0	1.0	0.0	1.0

Table 9.1.27-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Watts Controlled (per door)	Non-Coincident Demand Savings (kW)
LED Cooler/Freezer Lighting Controls	42	0.057

Table 9.1.27-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Grocery	0	106.4

Demand Savings Calculation (ΔkW_{CTRL}) =

Non-coincident Demand Savings (weighted average from Table 9.1.27-2)	X	Demand Interactive Effects (average from Table 9.1.27-1)	X	Coincident Diversity Factor (average from Table 9.1.27-1)

Energy Savings Calculation (ΔkWh_{CTRL}) =

Non-coincident Demand Savings (weighted average from Table 9.1.27-2)	X	Energy Interactive Effects (average from Table 9.1.27-1)	X	Hours of Operation (average from Table 9.1.27-1)

Table 9.1.27-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
LED Refrigerated Case Lighting Controls	\$300/system	\$12/sensor

9.1.28 PSMH/CMH with Electronic Ballasts

Measure Code: BPL75

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replacement of 400W HID with 320/350W PSMH/CMH lamps and electronic ballast

Eligibility Criteria for New Energy-Efficient Equipment:

- 320/350W Pulse-Start Metal-Halide (PSMH) or Ceramic Metal-Halide (CMH) lamps and electronic ballast

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[28]: 16 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Light Calcs – FINAL ComEd.xls.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

[28] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_W \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_W \times N_F \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_W = Demand Savings per fixture
W_{BASE} = Baseline connected kW from current fixture
W_{EE} = Energy efficient connected kW from proposed fixture
N_F = Number of fixtures being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_W = Energy Savings per fixture

Table 9.1.28-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects		
Office	2,616	1.25	0.81	1.17		
School (K-12)	1,873	1.23	0.42	1.15		
College/University	3,433	1.22	0.68	1.15		
Retail/Service	4,117	1.19	0.88	1.11		
Restaurant	4,816	1.26	0.68	1.15		
Hotel/Motel	6,206	1.14	0.67	1.14		
Medical	6,474	1.26	0.74	1.18		
Grocery	5,824	1.25	0.81	1.13		
Warehouse	4,160	1.09	0.84	1.06		
Light Industry	4,290	1.08	0.99	1.04		
Heavy Industry	4,290	1.08	0.99	1.04		
Average = Miscellaneous	**4,372**	**1.19**	**0.77**	**1.12**		

Source: DEER database

Demand Savings Calculation (ΔkW_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Demand Interactive Effects (from Table 9.1.28-1)	X	Coincident Diversity Factor (from Table 9.1.28-1)

Energy Savings Calculation (ΔkWh_W) =

Non-coincident Demand Savings ($W_{BASE} - W_{EE}$)	X	Energy Interactive Effects (from Table 9.1.28-1)	X	Hours of Operation (from Table 9.1.28-1)

Table 9.1.28-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
PSMH and/or CMH lamps (250 watt	$206	n/a	$206	$40/fixture

and 320 watt)				

9.1.29 Controls for H.I.D. Systems

Measure Code: BPL77

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- May replace existing control, or new installation

Eligibility Criteria for New Energy-Efficient Equipment:

- Fixture mounted only – cannot be wall, ceiling, or switch plate mounted
- Controls for occupancy based high-low-control (Hi/Lo-HIF) or Daylight control (DDS-HIF)
- Ballast must be automatically controlled based on occupancy or daylight
- Must provide for continuous dimming or stepped dimming of at least 50%
- Integrated HID control module and passive infrared occupancy sensor
- Must control from 125 through 800 watts (over 800 watts is custom)

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[29]: 10 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. For high-occupancy buildings (offices, retails, etc.) the Time Off is 20% (source: DEER). For low-occupancy buildings (warehouses, etc) the Time Off is 50%. The Annual Operating Hours are taken from DEER's non-CFL Table, except for Guest Rooms operating hours, which have been corrected to 1,145 hrs.

Bonus Incentives offered:
T12 and controls bonus (10%) 11/16/09-1/31/10

Supplemental Information Collected on the Application: Wattage controlled, per control

[29] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times W_{CTRL} \times N_C \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times W_{CTRL} \times N_C \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Demand savings per watts controlled
W_{CTRL} = Watts controlled by HIF control
N_C = Number of controls being installed
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Energy savings per watts controlled

Table 9.1.29-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings*	kWh Savings*
Daylight Sensor, Occupancy Sensor (Hi/Lo)						
Office	2,808	1.25	0.81	1.17	0.0002025	0.66
School (K-12)	1,873	1.23	0.42	1.15	0.0001033	0.43
College/University	3,433	1.22	0.68	1.15	0.0001659	0.79
Retail/Service	4,210	1.19	0.88	1.11	0.0002094	0.93
Restaurant	5,278	1.26	0.68	1.15	0.0001714	1.21
Hotel/Motel	4,941	1.14	0.67	1.14	0.0001528	1.13
Medical	6,474	1.26	0.74	1.18	0.0001865	1.53
Grocery	5,824	1.25	0.81	1.13	0.0002025	1.32
Warehouse	4,160	1.09	0.84	1.06	0.0004578	2.20
Light Industry	4,290	1.08	0.99	1.04	0.0005346	2.23
Heavy Industry	4,290	1.08	0.99	1.04	0.0005346	2.23
Average = Miscellaneous	**4,325**	**1.19**	**0.77**	**1.12**	**0.0002656**	**1.33**

Source: DEER database
* Per Watt Controlled

Demand Savings Calculation (ΔkW_S) =

Non-coincident Demand Savings (Watts controlled – per the application)	X	Demand Interactive Effects (from Table 9.1.29-1)	X	Coincident Diversity Factor (from Table 9.1.29-1)

Energy Savings Calculation (ΔkWh_S) =

Non-coincident Demand Savings (Watts controlled – per the application)	X	Energy Interactive Effects (from Table 9.1.29-1)	X	Hours of Operation (from Table 9.1.29-1)

Table 9.1.29-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Controls for H.I.D.	$165	n/a	$165	$40/control

Systems				

9.1.30 LED Exit Signs

Measure Code: BPL78

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Retrofit of existing incandescent or fluorescent fixture only

Eligibility Criteria for New Energy-Efficient Equipment:

- LED, T-1 or Electroluminescent Exit Signs
- Signs may be one or two-sided
- Cannot be combined with purchases from the On-line store

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes[30]: 15 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the GDS Model Ameren IL Lighting dated 6-9-08. Coincident Diversity Factors, Demand Interactive Effects and Energy Interactive Effects are taken from DEER database.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

[30] Measure Life Study prepared for The Massachusetts Joint Utilities by ERS. November 17, 2005.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_F \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Demand savings
N_F = Number of fixtures being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Energy savings

Table 9.1.30-1 Energy Factor Assumptions

Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
Office	8,760	1.18	1.00	1.11	0.041	342
School (K-12)	8,760	1.18	1.00	1.11	0.041	342
College/University	8,760	1.18	1.00	1.11	0.041	342
Retail/Service	8,760	1.18	1.00	1.11	0.041	342
Restaurant	8,760	1.18	1.00	1.11	0.041	342
Hotel/Motel	8,760	1.18	1.00	1.11	0.041	342
Medical	8,760	1.18	1.00	1.11	0.041	342
Grocery	8,760	1.18	1.00	1.11	0.041	342
Warehouse	8,760	1.18	1.00	1.11	0.041	342
Light Industry	8,760	1.18	1.00	1.11	0.041	342
Heavy Industry	8,760	1.18	1.00	1.11	0.041	342
Average = Miscellaneous	**8,760**	**1.18**	**1.00**	**1.11**	**0.041**	**342**

Source: DEER database

Table 9.1.30-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Lamp Type	Base Fixture Wattage (watts)	Retrofit Lamp Type	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
LED Exit Sign	Incandescent	40	LED	5	0.035

Demand Savings Calculation (per lamp) =

Non-coincident Demand Savings (from Table 9.1.30-2)	X	Demand Interactive Effects (from Table 9.1.30-1)	X	Coincident Diversity Factor (from Table 9.1.30-1)

Energy Savings Calculation (per lamp) =

Non-coincident Demand Savings (from Table 9.1.30-2)	X	Energy Interactive Effects (from Table 9.1.30-1)	X	Hours of Operation (from Table 9.1.30-1)

Table 9.1.30-3 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
LED Exit Sign	$35	n/a	$35	$20/sign

9.1.31 Permanent Lamp Removal

Measure Code: None

Version Date & Revision History:

Draft date:	February 6, 2009
Effective date:	February 6, 2009
Revised	PY2
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Removal of linear fluorescent lamps

Eligibility Criteria for New Energy-Efficient Equipment:

- A minimum of 100,000 kWh reduced per year is required to be eligible for this Custom incentive

Revision Details: Was split out into its own measure and included in the Custom Application in PY2.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

9.2 HVAC Systems

The following measures are included in the PY3 HVAC program.

9.2 HVAC		
	Measure	**Code**
Seasonal Tune-Ups		
9.2.1	**Air Conditioner Tune-Up**	BPC21
9.2.2	**Gas Boiler Tune-Up**	BPH1
9.2.3	**Gas Forced-Air Furnace Tune-Up**	BPH2
New Cooling Equipment		
9.2.4	**AC Systems and Air Source Heat Pumps (Up to 65,000 Btuh; Minimum 14 SEER)**	BPC1
9.2.5	**AC Systems and Air Source Heat Pumps (Up to 65,000 Btuh; Minimum: 15 SEER)**	BPC2 Modified
9.2.6	**AC Systems and Air Source Heat Pumps (65,000 through 239,999 Btuh; Minimum 11.5 EER / 11.9 IPLV)**	BPC3
9.2.7	**AC Systems and Air Source Heat Pumps (65,000 through 239,999 Btuh; Minimum 12 EER / 12.4 IPLV)**	BPC4 Modified
9.2.8	**AC Systems and Air Source Heat Pumps (240,000 through 759,999 Btuh; Minimum 10.5 EER / 10.9 IPLV)**	BPC5
9.2.9	**AC Systems and Air Source Heat Pumps(240,000 through 759,999 Btuh; Minimum 10.8 EER / 12.0 IPLV)**	BPC6 Modified
9.2.10	**AC Systems and Air Source Heat Pumps (760,000 or more Btuh; Minimum 9.7 EER / 11.0 IPLV)**	BPC7
9.2.11	**AC Systems and Air Source Heat Pumps (760,000 or more Btuh; Minimum 10.2 EER / 11.0 IPLV)**	BPC8 Modified
9.2.12	**Air-Cooled Chillers**	BPC12
New Cooling Equipment		
9.2.13	**Room Air Conditioner (ENERGY STAR qualified)**	BPC13
9.2.14	**Room Air Conditioner (SEHA Tier 1)**	BPC14 Modified
9.2.15	**PTAC/PTHP**	BPC15
New Heating Equipment		
9.2.16	**Gas Boiler Replacement (≤ 300 kBtuh input; AFUE 85% minimum**	BPH3
9.2.17	**Gas Boiler Replacement (> 300 kBtuh input; Thermal Efficiency 90% minimum**	BPH4
9.2.18	**Gas Furnace Replacement (90% AFUE)**	BPH5
9.2.19	**Gas Furnace Replacement (92% AFUE)**	BPH6
9.2.20	**Gas Furnace Replacement (94% AFUE)**	BPH7
HVAC Controls		
9.2.21	**Variable Frequency Drive on HVAC Motor**	BPC20

9.2.1 Air Conditioner Tune-up

Measure Code: BPC21

Version Date & Revision History:

Draft date:	January 19, 2009
Effective date:	January 19, 2009
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Cannot have standing maintenance contract, or tune-up within the past 12 months

Eligibility Criteria for New Energy-Efficient Equipment:

- Minimum 3-ton unit
- Complete tune-up, as specified
- PRE-APPROVAL IS REQUIRED – Ameren approved technicians only

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: The measure life is three years.

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application:
Required Supplemental Documentation:

- Include a copy of contractor invoices that detail the work performed to identify tune-up items, as well as additional labor and parts to improve/repair air conditioner performance

Tune-up requirements (to be completed by an Ameren approved technician)

- Check refrigerant charge
- Identify and repair leaks if refrigerant charge is low
- Measure and record refrigerant pressures
- Measure and record temperature drop at indoor coil
- Clean condensate drain line
- Clean outdoor coil and straighten fins
- Clean and straighten indoor and outdoor fan blades
- Clean indoor coil with spray-on cleaner and straighten fins
- Repair damaged insulation – suction line
- Change air filter
- Measure and record blower amp draw
- Measure and record compressor integrity (MOhm)
- Measure and record condenser fan motor amp draw

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times T \times N_T \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times T \times N_T \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
T = Tonnage of unit being tuned
N_T = Number of units being tuned-up
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.2.1-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings Per Ton	kWh Savings Per Ton
Office	1.0	1.0	1.0	0.39	878
School (K-12)	1.0	1.0	1.0	0.39	878
College/University	1.0	1.0	1.0	0.39	878
Retail/Service	1.0	1.0	1.0	0.39	878
Restaurant	1.0	1.0	1.0	0.39	878
Hotel/Motel	1.0	1.0	1.0	0.39	878
Medical	1.0	1.0	1.0	0.39	878
Grocery	1.0	1.0	1.0	0.39	878
Warehouse	1.0	1.0	1.0	0.39	878
Light Industry	1.0	1.0	1.0	0.39	878
Heavy Industry	1.0	1.0	1.0	0.39	878
Average = Miscellaneous	**1.0**	**1.0**	**1.0**	**0.39**	**878**

Table 9.2.1-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Services Provided	Non-Coincident Demand Savings (kW)*
Air Conditioner Tune-up	As listed in the application form	1.0

Table 9.2.1-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)	Therm Savings
All	0.39	878	0

Table 9.2.1-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment*
Air Conditioner Tune-up	$35	$25/ton of cooling

*The incentive is capped at 50% of the tune-up cost, excluding replacement-part costs. Customers already under an existing service contract, or a service agreement in the past 12 months, do not qualify for incentives. Tune ups are performed by a contractor approved by Ameren Illinois Utilities.

9.2.2 Gas Boiler Tune-up

Measure Code: BPH1

Version Date & Revision History:

Draft date:	February 6, 2009
Effective date:	January 19, 2009
Revised	August 31, 2010
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Cannot have standing maintenance contract, or tune-up within the past 12 months
- Must be an Ameren Illinois Utilities gas delivery service GDS-2 customer

Eligibility Criteria for New Energy-Efficient Equipment:

- Complete tune-up, as specified
- Applicants must be a GDS-2 natural gas customer of Ameren Illinois Utilities
- PRE-APPROVAL IS REQUIRED

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 3 years

Revision Details: 8-31-10 incentive reduced from 50 cents per kBthu to 25 cents per kBtuh

Referenced Documents: HVAC Standard Measures v3.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application:
Required Supplemental Documentation:

- Include a copy of contractor invoices that detail the work performed to identify tune-up items, as well as additional labor and parts to improve/repair boiler performance

Tune-up requirements (to be completed by an Ameren approved technician)

- Clean fireside surfaces.
- Inspect all refractory. Patch and wash coat as required.
- Inspect gaskets on front and rear doors and replace as necessary.
- Seal and close front and rear doors properly.
- Clean low and auxiliary low water cut-off controls, then re-install using new gaskets.
- Clean plugs in control piping.
- Remove all hand hole and man hole plates. Flush boiler with water to remove loose scale and sediment.
- Replace all hand hole and man hole plates with new gaskets.
- Open feedwater tank manway, inspect and clean as required. Replace manway plate with new gasket.
- Clean burner and burner pilot.
- Check pilot electrode and adjust or replace.
- Clean air damper and blower assembly.
- Clean motor starter contacts and check operation.
- Make necessary adjustments to burner for proper combustion.

- Perform all flame safeguard and safety trip checks.
- Check all hand hole plates and man hole plates for leaks at normal operating temperatures and pressures.
- Troubleshoot any boiler system problems as requested by on-site personnel.

Algorithms used to calculate savings

Measure Natural Gas Savings $\Delta NG = NG_I \times T_S$

ΔNG = Gross customer annual natural gas savings for the measure, therms
NG_I = Boiler natural gas input, kbtu
T_S = Annual natural gas savings for the measure (0.572283737 therms for all gas boilers)

Table 9.2.2-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours
Office	1.0	1.0	1.0	NA
School (K-12)	1.0	1.0	1.0	NA
College/University	1.0	1.0	1.0	NA
Retail/Service	1.0	1.0	1.0	NA
Restaurant	1.0	1.0	1.0	NA
Hotel/Motel	1.0	1.0	1.0	NA
Medical	1.0	1.0	1.0	NA
Grocery	1.0	1.0	1.0	NA
Warehouse	1.0	1.0	1.0	NA
Light Industry	1.0	1.0	1.0	NA
Heavy Industry	1.0	1.0	1.0	NA
Average = Miscellaneous	**1.0**	**1.0**	**1.0**	**NA**

Table 9.2.2-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Services Provided	Non-Coincident Demand Savings (kW)*
Gas Boiler Tune-up	As listed in the application form	0

Table 9.2.2-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)	Therm Savings
All	NA	NA	0.572283737

Table 9.2.2-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment*
Gas Boiler Tune-up	$35	$0.50/kBtuh input

*The incentive is capped at 50% of the tune-up cost, excluding replacement-part costs. Customers already under an existing service contract, or a service agreement in the past 12 months, do not qualify for incentives. Tune ups are performed by a contractor approved by Ameren Illinois Utilities.

9.2.3 Gas Forced-Air Furnace Tune-up

Measure Code: BPH2

Version Date & Revision History:

Draft date: February 6, 2009
Effective date: January 19, 2009
Revised August 31, 2010
End date: TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Cannot have standing maintenance contract, or tune-up within the past 12 months
- Must be an Ameren Illinois Utilities gas delivery service GDS-2 customer

Eligibility Criteria for New Energy-Efficient Equipment:

- Complete tune-up, as specified
- PRE-APPROVAL IS REQUIRED

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 3 years

Revision Details: 8-31-10 – the incentive was reduced from 50 cents per kButh to 25 cents.

Referenced Documents: HVAC Standard Measures v3.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application:
Required Supplemental Documentation:

- Include a copy of contractor invoices that detail the work performed to identify tune-up items, as well as additional labor and parts to improve/repair boiler performance

Tune-up requirements (to be completed by an Ameren approved technician)

- Record pre-tune-up and post-tune-up measurements of boiler/furnace combustion efficiency
- Adjust draft control
- Maintain constant draft through the system to ensure complete combustion accounting for temperature and barometric changes
- Install flue restrictions in the flue stack to control flow
- Check completeness of combustion with CO and O2 sensors (Results from this testing will affect the fuel input/air input measure)
- Clean fire side of heat exchanger
- Scrub HX manually to remove buildup from combustion gases and more efficiently transfer heat from the source to the stream/water
- Seal combustion chamber with a ceramic sealant to reduce heat loss from chamber
- Optimize fuel input based on combustion completeness results

Algorithms used to calculate savings

Measure Natural Gas Savings $\Delta NG = NG_I \times T_S$

ΔNG = Gross customer annual natural gas savings for the measure, therms
NG_I = Forced-air furnace natural gas input, kbtu
T S = Annual natural gas savings for the measure (0.572283737 therms for all gas forced-air furnaces)

Table 9.2.3-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours
Office	0	1.0	1.0	NA
School (K-12)	0	1.0	1.0	NA
College/University	0	1.0	1.0	NA
Retail/Service	0	1.0	1.0	NA
Restaurant	0	1.0	1.0	NA
Hotel/Motel	0	1.0	1.0	NA
Medical	0	1.0	1.0	NA
Grocery	0	1.0	1.0	NA
Warehouse	0	1.0	1.0	NA
Light Industry	0	1.0	1.0	NA
Heavy Industry	0	1.0	1.0	NA
Average = Miscellaneous	**0**	**1.0**	**1.0**	**NA**

Table 9.2.3-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Services Provided	Non-Coincident Demand Savings (kW)
Forced Air Furnace Tune-up	As listed in the application form	0

Table 9.2.3-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)	Therm Savings
All	NA	NA	0.572283737

Table 9.2.3-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment*
Gas Forced-Air Furnace Tune-up	$35	$0.50/kBtuh input

*The incentive is capped at 50% of the tune-up cost, excluding replacement-part costs. Customers already under an existing service contract, or a service agreement in the past 12 months, do not qualify for incentives. Tune ups are performed by a contractor approved by Ameren Illinois Utilities.

9.2.4 Unitary and Split Air Conditioning Systems and Air Source Heat Pumps (up to 65,000 btuh input, minimum 14 SEER)

Measure Code: BPC1

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replacing existing unit of equivalent size

Eligibility Criteria for New Energy-Efficient Equipment:

- Up to 65,000 Btuh input
- Minimum efficiency: 14 SEER

Unitary refers to the fact that all of the components necessary to heat, cool, dehumidify, filter, and move air are included in one or more factory-made assemblies. Unitary equipment is available as single package or as split systems. Single package units include all of the necessary functions and components in one package that is installed outside the building. Split systems are made up of an indoor unit (fan and cooling/heating coils) and an outdoor unit (condenser and compressor). An air source heat pump is a type of heat pump that uses the outside air as a heat source or heat sink to heat or cool an interior space.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls. The efficiency of split systems is based on an Air Conditioning and Refrigeration Institute (ARI) reference number. Water-cooled systems, evaporative coolers, and water-source heat pumps do not qualify under this program, but may qualify under the Custom Incentive Program. Unitary and split system cooling equipment must meet ARI standards (210/240, 320 or 340/360), be UL listed, and use a minimum ozone-depleting refrigerant (e.g., HCFC or HFC). All required efficiencies are based on the Consortium for Energy Efficiency (CEE) high efficiency commercial air conditioning and heat pump specifications (www.cee1.org).

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_U \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_U \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_U = Number of units (tons capacity) being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For standard measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings,

Table 9.2.4-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings Per Ton	kWh Savings Per Ton
Office	1.0	1.0	1.0	0.30831	766.14
Medical	1.0	1.0	1.0	0.27797	1236.81
Restaurant	1.0	1.0	1.0	0.42035	1031.19
Grocery	1.0	1.0	1.0	0.35884	942.58
School/College	1.0	1.0	1.0	0.37191	749.31
Warehouse	1.0	1.0	1.0	0.26084	489.56
Retail/Service	1.0	1.0	1.0	0.37191	749.31
Mfg. Industrial	1.0	1.0	1.0	0.36222	787.24
Hotel/Motel	1.0	1.0	1.0	0.32121	1449.9
Other	1.0	1.0	1.0	0.33928	911.34

Note: Table above is based on DEER 2005 information for Sacramento/Zone 12 then adjusted to Ameren service territory based on Cooling Degree Days difference.

Table 9.2.4-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Unitary and Split Air Conditioning Systems and Air Source Heat Pumps	NA	NA	See Table 9.2.4-1

Table 9.2.4-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Office	0.30831	766.14
School/College	0.37191	749.31
Retail/Service	0.37191	749.31
Grocery	0.35884	942.58
Restaurant	0.42035	1031.19
Hotel/Motel	0.32121	1449.9
Medical	0.27797	1236.81
Warehouse	0.26084	489.56
Manufacturing/Industrial	0.36222	787.24
Other	0.33928	911.34

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.4-2)	X	Demand Interactive Effects (average from Table 9.2.4-1)	X	Coincident Diversity Factor (average from Table 9.2.4-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.4-2)	X	Energy Interactive Effects (average from Table 9.2.4-1)	X	Hours of Operation (average from Table 9.2.4-1)

Table 9.2.4-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
<65,000 Btuh Minimum SEER 14	$113	$15 per ton

9.2.5 Unitary and Split Air Conditioning Systems and Air Source Heat Pumps (up to 65,000 btuh input, minimum 15 SEER)

Measure Code: BPC2

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replacing existing unit of equivalent size

Eligibility Criteria for New Energy-Efficient Equipment:

- Up to 65,000 Btuh input
- Minimum efficiency: 15 SEER

Unitary refers to the fact that all of the components necessary to heat, cool, dehumidify, filter, and move air are included in one or more factory-made assemblies. Unitary equipment is available as single package or as split systems. Single package units include all of the necessary functions and components in one package that is installed outside the building. Split systems are made up of an indoor unit (fan and cooling/heating coils) and an outdoor unit (condenser and compressor). An air source heat pump is a type of heat pump that uses the outside air as a heat source or heat sink to heat or cool an interior space.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls. The efficiency of split systems is based on an Air Conditioning and Refrigeration Institute (ARI) reference number. Water-cooled systems, evaporative coolers, and water-source heat pumps do not qualify under this program, but may qualify under the Custom Incentive Program. Unitary and split system cooling equipment must meet ARI standards (210/240, 320 or 340/360), be UL listed, and use a minimum ozone-depleting refrigerant (e.g., HCFC or HFC). All required efficiencies are based on the Consortium for Energy Efficiency (CEE) high efficiency commercial air conditioning and heat pump specifications (www.cee1.org).

Bonus Incentives offered: Previous incentive was $30

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_U \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_U \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_U = Number of units (tons capacity) being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For standard measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings,

Table 9.2.5-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings Per Ton	kWh Savings Per Ton
Facility Type	1.0	1.0	1.0	0.36545	908.14
Office	1.0	1.0	1.0	0.33511	1491.06
Medical	1.0	1.0	1.0	0.47749	1171.37
Restaurant	1.0	1.0	1.0	0.41598	1092.68
Grocery	1.0	1.0	1.0	0.42905	864.44
School/College	1.0	1.0	1.0	0.31799	596.8
Warehouse	1.0	1.0	1.0	0.42905	864.44
Retail/Service	1.0	1.0	1.0	0.41937	911.43
Mfg. Industrial	1.0	1.0	1.0	0.37835	1707.83
Hotel/Motel	1.0	1.0	1.0	0.39643	1064.83

Note: Table above is based on DEER 2005 information for Sacramento/Zone 12 then adjusted to Ameren service territory based on Cooling Degree Days difference.

Table 9.2.5-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Unitary and Split Air Conditioning Systems and Air Source Heat Pumps	NA	NA	See Table 9.2.5-1

Table 9.2.5-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Office	0.36545	908.14
School/College	0.42905	864.44
Retail/Service	0.42905	864.44
Restaurant	0.47749	1171.37
Hotel/Motel	0.37835	1707.83
Medical	0.33511	1491.06
Grocery	0.41598	1092.68
Warehouse	0.31799	596.8
Manufacturing/Industrial	0.41937	911.43
Other	0.39643	1064.83

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.5-2)	X	Demand Interactive Effects (average from Table 9.2.5-1)	X	Coincident Diversity Factor (average from Table 9.2.5-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.5-2)	X	Energy Interactive Effects (average from Table 9.2.5-1)	X	Hours of Operation (average from Table 9.2.5-1)

Table 9.2.5-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
<65,000 Btuh Minimum SEER 15	$172	$60 per ton

9.2.6 Unitary and Split Air Conditioning Systems and Air Source Heat Pumps (65,000 thru 239,999 btuh input, minimum 11.5 EER / 11.9 IPLV)

Measure Code: BPC3

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replacing existing unit of equivalent size

Eligibility Criteria for New Energy-Efficient Equipment:

- 65,000 through 239,999 Btuh
- Minimum efficiency: 11.5 EER / 11.9 IPLV

Unitary refers to the fact that all of the components necessary to heat, cool, dehumidify, filter, and move air are included in one or more factory-made assemblies. Unitary equipment is available as single package or as split systems. Single package units include all of the necessary functions and components in one package that is installed outside the building. Split systems are made up of an indoor unit (fan and cooling/heating coils) and an outdoor unit (condenser and compressor). An air source heat pump is a type of heat pump that uses the outside air as a heat source or heat sink to heat or cool an interior space.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls. The efficiency of split systems is based on an Air Conditioning and Refrigeration Institute (ARI) reference number. Water-cooled systems, evaporative coolers, and water-source heat pumps do not qualify under this program, but may qualify under the Custom Incentive Program. Unitary and split system cooling equipment must meet ARI standards (210/240, 320 or 340/360), be UL listed, and use a minimum ozone-depleting refrigerant (e.g., HCFC or HFC). All required efficiencies are based on the Consortium for Energy Efficiency (CEE) high efficiency commercial air conditioning and heat pump specifications (www.cee1.org).

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_U \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_U \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_U = Number of units (tons capacity) being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For standard measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings,

Table 9.2.6-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings Per Ton	kWh Savings Per Ton
Office	1.0	1.0	1.0	0.33143	833.59
Medical	1.0	1.0	1.0	0.30546	1409.6
Restaurant	1.0	1.0	1.0	0.44875	1162.35
Grocery	1.0	1.0	1.0	0.37691	972.41
School/College	1.0	1.0	1.0	0.39704	865.89
Warehouse	1.0	1.0	1.0	0.29032	552.75
Retail/Service	1.0	1.0	1.0	0.37691	972.41
Mfg. Industrial	1.0	1.0	1.0	0.38984	866.37
Hotel/Motel	1.0	1.0	1.0	0.34725	1606.73
Other	1.0	1.0	1.0	0.36266	1026.9

Note: Table above is based on DEER 2005 information for Sacramento/Zone 12 then adjusted to Ameren service territory based on Cooling Degree Days difference.

Table 9.2.6-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Unitary and Split Air Conditioning Systems and Air Source Heat Pumps	NA	NA	See Table 9.2.6-1

Table 9.2.6-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Office	0.33143	833.59
School/College	0.39704	865.89
Retail/Service	0.37691	972.41
Restaurant	0.44875	1162.35
Hotel/Motel	0.34725	1606.73
Medical	0.30546	1409.6
Grocery	0.37691	972.41
Warehouse	0.29032	552.75
Manufacturing/Industrial	0.38984	866.37
Other	0.36266	1026.9

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.6-2)	X	Demand Interactive Effects (average from Table 9.2.6-1)	X	Coincident Diversity Factor (average from Table 9.2.6-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.6-2)	X	Energy Interactive Effects (average from Table 9.2.6-1)	X	Hours of Operation (average from Table 9.2.6-1)

Table 9.2.6-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
>=65,000 Btuh and <240,000 Btuh Min. 11.5 EER	$73	$15 per ton

9.2.7 Unitary and Split Air Conditioning Systems and Air Source Heat Pumps (65,000 through 239,999 btuh input, minimum 12 EER / 12.4 IPLV)

Measure Code: BPC4

Version Date & Revision History:

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Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replacing existing unit of equivalent size

Eligibility Criteria for New Energy-Efficient Equipment:

- 65,000 through 239,999 Btuh
- Minimum efficiency: 12 EER / 12.4 IPLV

Unitary refers to the fact that all of the components necessary to heat, cool, dehumidify, filter, and move air are included in one or more factory-made assemblies. Unitary equipment is available as single package or as split systems. Single package units include all of the necessary functions and components in one package that is installed outside the building. Split systems are made up of an indoor unit (fan and cooling/heating coils) and an outdoor unit (condenser and compressor). An air source heat pump is a type of heat pump that uses the outside air as a heat source or heat sink to heat or cool an interior space.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls. The efficiency of split systems is based on an Air Conditioning and Refrigeration Institute (ARI) reference number. Water-cooled systems, evaporative coolers, and water-source heat pumps do not qualify under this program, but may qualify under the Custom Incentive Program. Unitary and split system cooling equipment must meet ARI standards (210/240, 320 or 340/360), be UL listed, and use a minimum ozone-depleting refrigerant (e.g., HCFC or HFC). All required efficiencies are based on the Consortium for Energy Efficiency (CEE) high efficiency commercial air conditioning and heat pump specifications (www.cee1.org).

Bonus Incentives offered: Previous incentive was $30

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_U \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_U \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_U = Number of units (tons capacity) being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For standard measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings,

Table 9.2.7-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings Per Ton	kWh Savings Per Ton
Office	1.0	1.0	1.0	0.36941	894.81
Medical	1.0	1.0	1.0	0.33546	1517.25
Restaurant	1.0	1.0	1.0	0.4904	1247.78
Grocery	1.0	1.0	1.0	0.43094	1060.22
School/College	1.0	1.0	1.0	0.43537	925.56
Warehouse	1.0	1.0	1.0	0.32572	608.4
Retail/Service	1.0	1.0	1.0	0.43094	1060.22
Mfg. Industrial	1.0	1.0	1.0	0.4343	927.71
Hotel/Motel	1.0	1.0	1.0	0.38652	1729.24
Other	1.0	1.0	1.0	0.40434	1107.91

Note: Table above is based on DEER 2005 information for Sacramento/Zone 12 then adjusted to Ameren service territory based on Cooling Degree Days difference.

Table 9.2.7-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Unitary and Split Air Conditioning Systems and Air Source Heat Pumps	NA	NA	See Table 9.2.7-1

Table 9.2.7-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Office	0.36941	894.81
School/College	0.43537	925.56
Retail/Service	0.43094	1060.22
Restaurant	0.4904	1247.78
Hotel/Motel	0.38652	1729.24
Medical	0.33546	1517.25
Grocery	0.43094	1060.22
Warehouse	0.32572	608.4
Manufacturing/Industrial	0.4343	927.71
Other	0.40434	1107.91

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.7-2)	X	Demand Interactive Effects (average from Table 9.2.7-1)	X	Coincident Diversity Factor (average from Table 9.2.7-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.7-2)	X	Energy Interactive Effects (average from Table 9.2.7-1)	X	Hours of Operation (average from Table 9.2.7-1)

Table 9.2.7-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
>=65,000 Btuh and <240,000 Btuh Min. 12 EER	$97	$60 per ton

9.2.8 Unitary and Split Air Conditioning Systems and Air Source Heat Pumps (240,000 thru 759,999 btuh, minimum 10.5 EER / 10.9 IPLV)

Measure Code: BPC5

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replacing existing unit of equivalent size

Eligibility Criteria for New Energy-Efficient Equipment:

- 240,000 through 759,999 Btuh
- Minimum efficiency: 10.5 EER / 10.9 IPLV

Unitary refers to the fact that all of the components necessary to heat, cool, dehumidify, filter, and move air are included in one or more factory-made assemblies. Unitary equipment is available as single package or as split systems. Single package units include all of the necessary functions and components in one package that is installed outside the building. Split systems are made up of an indoor unit (fan and cooling/heating coils) and an outdoor unit (condenser and compressor). An air source heat pump is a type of heat pump that uses the outside air as a heat source or heat sink to heat or cool an interior space.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls. The efficiency of split systems is based on an Air Conditioning and Refrigeration Institute (ARI) reference number. Water-cooled systems, evaporative coolers, and water-source heat pumps do not qualify under this program, but may qualify under the Custom Incentive Program. Unitary and split system cooling equipment must meet ARI standards (210/240, 320 or 340/360), be UL listed, and use a minimum ozone-depleting refrigerant (e.g., HCFC or HFC). All required efficiencies are based on the Consortium for Energy Efficiency (CEE) high efficiency commercial air conditioning and heat pump specifications (www.cee1.org).

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_U \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_U \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_U = Number of units (tons capacity) being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For standard measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings,

Table 9.2.8-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings Per Ton	kWh Savings Per Ton
Office	1.0	1.0	1.0	0.33106	618.09
Medical	1.0	1.0	1.0	0.25409	886.22
Restaurant	1.0	1.0	1.0	0.4087	485.76
Grocery	1.0	1.0	1.0	0.34249	524.27
School/College	1.0	1.0	1.0	0.3225	553.63
Warehouse	1.0	1.0	1.0	0.2478	106.63
Retail/Service	1.0	1.0	1.0	0.34249	524.27
Mfg. Industrial	1.0	1.0	1.0	0.35207	495.54
Hotel/Motel	1.0	1.0	1.0	0.27358	1205.26
Other	1.0	1.0	1.0	0.31942	599.97

Note: Table above is based on DEER 2005 information for Sacramento/Zone 12 then adjusted to Ameren service territory based on Cooling Degree Days difference.

Table 9.2.8-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Unitary and Split Air Conditioning Systems and Air Source Heat Pumps	NA	NA	See Table 9.2.8-1

Table 9.2.8-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Office	0.33106	618.09
School/College	0.3225	553.63
Retail/Service	0.34249	524.27
Restaurant	0.4087	485.76
Hotel/Motel	0.27358	1205.26
Medical	0.254089	886.22
Grocery	0.34249	524.27
Warehouse	0.2478	106.63
Manufacturing/Industrial	0.35207	495.54
Other	0.31942	599.97

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.8-2)	X	Demand Interactive Effects (average from Table 9.2.8-1)	X	Coincident Diversity Factor (average from Table 9.2.8-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.8-2)	X	Energy Interactive Effects (average from Table 9.2.8-1)	X	Hours of Operation (average from Table 9.2.8-1)

Table 9.2.8-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
>=240,000 Btuh and <760,000 Btuh Min. 10.5 EER	$193	$15 per ton

9.2.9 Unitary and Split Air Conditioning Systems and Air Source Heat Pumps (240,000 thru 759,999 btuh, minimum 10.8 EER / 12.0 IPLV)

Measure Code: BPC6

Version Date & Revision History:

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Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replacing existing unit of equivalent size

Eligibility Criteria for New Energy-Efficient Equipment:

- 240,000 through 759,999 Btuh
- Minimum efficiency 10.8 EER / 12.0 IPLV

Unitary refers to the fact that all of the components necessary to heat, cool, dehumidify, filter, and move air are included in one or more factory-made assemblies. Unitary equipment is available as single package or as split systems. Single package units include all of the necessary functions and components in one package that is installed outside the building. Split systems are made up of an indoor unit (fan and cooling/heating coils) and an outdoor unit (condenser and compressor). An air source heat pump is a type of heat pump that uses the outside air as a heat source or heat sink to heat or cool an interior space.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls. The efficiency of split systems is based on an Air Conditioning and Refrigeration Institute (ARI) reference number. Water-cooled systems, evaporative coolers, and water-source heat pumps do not qualify under this program, but may qualify under the Custom Incentive Program. Unitary and split system cooling equipment must meet ARI standards (210/240, 320 or 340/360), be UL listed, and use a minimum ozone-depleting refrigerant (e.g., HCFC or HFC). All required efficiencies are based on the Consortium for Energy Efficiency (CEE) high efficiency commercial air conditioning and heat pump specifications (www.cee1.org).

Bonus Incentives offered: Previous incentive was $30

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_U \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_U \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_U = Number of units (tons capacity) being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For standard measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings,

Table 9.2.9-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings Per Ton	kWh Savings Per Ton
Office	1.0	1.0	1.0	0.27388	808.21
Medical	1.0	1.0	1.0	0.27925	919.19
Restaurant	1.0	1.0	1.0	0.44415	516.06
Grocery	1.0	1.0	1.0	0.37583	556.19
School/College	1.0	1.0	1.0	0.35157	575.14
Warehouse	1.0	1.0	1.0	0.27458	118.09
Retail/Service	1.0	1.0	1.0	0.37583	556.19
Mfg. Industrial	1.0	1.0	1.0	0.38471	517.59
Hotel/Motel	1.0	1.0	1.0	0.27134	1122.45
Other	1.0	1.0	1.0	0.33679	632.13

Note: Table above is based on DEER 2005 information for Sacramento/Zone 12 then adjusted to Ameren service territory based on Cooling Degree Days difference.

Table 9.2.9-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Unitary and Split Air Conditioning Systems and Air Source Heat Pumps	NA	NA	See Table 9.2.9-1

Table 9.2.9-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Office	0.27388	808.21
School/College	0.35157	575.14
Retail/Service	0.37583	556.19
Restaurant	0.44415	516.06
Hotel/Motel	0.27134	1122.45
Medical	0.27925	919.19
Grocery	0.37583	556.19
Warehouse	0.27458	118.09
Manufacturing/Industrial	0.38471	517.59
Other	0.33679	632.13

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.9-2)	X	Demand Interactive Effects (average from Table 9.2.9-1)	X	Coincident Diversity Factor (average from Table 9.2.9-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.9-2)	X	Energy Interactive Effects (average from Table 9.2.9-1)	X	Hours of Operation (average from Table 9.2.9-1)

Table 9.2.9-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
>=240,000 Btuh and <760,000 Btuh Min. 10.8 EER	$247	$60 per ton

9.2.10 Unitary and Split Air Conditioning Systems and Air Source Heat Pumps (760,00 or more btuh input, minimum 9.7 EER / 11.0 IPLV)

Measure Code: BPC7

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replacing existing unit of equivalent size

Eligibility Criteria for New Energy-Efficient Equipment:

- 760,000 or more Btuh
- Minimum efficiency 9.7 EER / 11.0 IPLV

Unitary refers to the fact that all of the components necessary to heat, cool, dehumidify, filter, and move air are included in one or more factory-made assemblies. Unitary equipment is available as single package or as split systems. Single package units include all of the necessary functions and components in one package that is installed outside the building. Split systems are made up of an indoor unit (fan and cooling/heating coils) and an outdoor unit (condenser and compressor). An air source heat pump is a type of heat pump that uses the outside air as a heat source or heat sink to heat or cool an interior space.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls. The efficiency of split systems is based on an Air Conditioning and Refrigeration Institute (ARI) reference number. Water-cooled systems, evaporative coolers, and water-source heat pumps do not qualify under this program, but may qualify under the Custom Incentive Program. Unitary and split system cooling equipment must meet ARI standards (210/240, 320 or 340/360), be UL listed, and use a minimum ozone-depleting refrigerant (e.g., HCFC or HFC). All required efficiencies are based on the Consortium for Energy Efficiency (CEE) high efficiency commercial air conditioning and heat pump specifications (www.cee1.org).

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_U \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_U \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_U = Number of units (tons capacity) being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For standard measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings,

Table 9.2.10-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings Per Ton	kWh Savings Per Ton
Office	1.0	1.0	1.0	0.19654	712.55
Medical	1.0	1.0	1.0	0.20095	200.95
Restaurant	1.0	1.0	1.0	0.32325	412.63
Grocery	1.0	1.0	1.0	0.27359	457.45
School/College	1.0	1.0	1.0	0.25193	499.47
Warehouse	1.0	1.0	1.0	0.20371	87.73
Retail/Service	1.0	1.0	1.0	0.27359	457.45
Mfg. Industrial	1.0	1.0	1.0	0.28233	448.37
Hotel/Motel	1.0	1.0	1.0	0.21853	1124.73
Other	1.0	1.0	1.0	0.24716	489.04

Note: Table above is based on DEER 2005 information for Sacramento/Zone 12 then adjusted to Ameren service territory based on Cooling Degree Days difference.

Table 9.2.10-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Unitary and Split Air Conditioning Systems and Air Source Heat Pumps	NA	NA	See Table 9.2.10-1

Table 9.2.10-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Office	0.19654	712.55
School/College	0.25193	499.47
Retail/Service	0.27359	457.45
Restaurant	0.32325	412.63
Hotel/Motel	0.21853	1124.73
Medical	0.20095	815.43
Grocery	0.27359	457.45
Warehouse	0.20371	87.73
Manufacturing/Industrial	0.28233	448.37
Other	0.24716	557.31

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.10-2) X Demand Interactive Effects (average from Table 9.2.10-1) X Coincident Diversity Factor (average from Table 9.2.10-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.10-2) X Energy Interactive Effects (average from Table 9.2.10-1) X Hours of Operation (average from Table 9.2.10-1)

Table 9.2.10-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
>=760,000 Btuh min. 9.7 EER	$167	$15 per ton

9.2.11 Unitary and Split Air Conditioning Systems and Air Source Heat Pumps (760,000 or more btuh input, minimum 10.2 EER / 11.0 IPLV)

Measure Code: BPC8

Version Date & Revision History:

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Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replacing existing unit of equivalent size

Eligibility Criteria for New Energy-Efficient Equipment:

- 760,000 or more Btuh
- Minimum efficiency 10.2 EER / 11.0 IPLV

Unitary refers to the fact that all of the components necessary to heat, cool, dehumidify, filter, and move air are included in one or more factory-made assemblies. Unitary equipment is available as single package or as split systems. Single package units include all of the necessary functions and components in one package that is installed outside the building. Split systems are made up of an indoor unit (fan and cooling/heating coils) and an outdoor unit (condenser and compressor). An air source heat pump is a type of heat pump that uses the outside air as a heat source or heat sink to heat or cool an interior space.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls. The efficiency of split systems is based on an Air Conditioning and Refrigeration Institute (ARI) reference number. Water-cooled systems, evaporative coolers, and water-source heat pumps do not qualify under this program, but may qualify under the Custom Incentive Program. Unitary and split system cooling equipment must meet ARI standards (210/240, 320 or 340/360), be UL listed, and use a minimum ozone-depleting refrigerant (e.g., HCFC or HFC). All required efficiencies are based on the Consortium for Energy Efficiency (CEE) high efficiency commercial air conditioning and heat pump specifications (www.cee1.org).

Bonus Incentives offered: Previous incentive was $30

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_U \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_U \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_U = Number of units (tons capacity) being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For standard measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings,

Table 9.2.11-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings Per Ton	kWh Savings Per Ton
Office	1.0	1.0	1.0	0.24424	769.29
Medical	1.0	1.0	1.0	0.24907	878.4
Restaurant	1.0	1.0	1.0	0.39096	470.5
Grocery	1.0	1.0	1.0	0.33727	518.41
School/College	1.0	1.0	1.0	0.30746	540.56
Warehouse	1.0	1.0	1.0	0.23028	109.61
Retail/Service	1.0	1.0	1.0	0.33727	518.41
Mfg. Industrial	1.0	1.0	1.0	0.34469	490.5
Hotel/Motel	1.0	1.0	1.0	0.24357	1080.15
Other	1.0	1.0	1.0	0.29831	597.32

Note: Table above is based on DEER 2005 information for Sacramento/Zone 12 then adjusted to Ameren service territory based on Cooling Degree Days difference.

Table 9.2.11-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Unitary and Split Air Conditioning Systems and Air Source Heat Pumps	NA	NA	See Table 9.2.11-1

Table 9.2.11-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Office	0.24424	769.29
School/College	0.30746	540.56
Retail/Service	0.33727	518.41
Restaurant	0.39096	470.5
Hotel/Motel	0.24357	1080.15
Medical	0.24907	878.4
Grocery	0.33727	518.41
Warehouse	0.23028	109.61
Manufacturing/Industrial	0.34469	490.5
Other	0.29831	597.32

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.11-2)	X	Demand Interactive Effects (average from Table 9.2.11-1)	X	Coincident Diversity Factor (average from Table 9.2.11-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.11-2)	X	Energy Interactive Effects (average from Table 9.2.11-1)	X	Hours of Operation (average from Table 9.2.11-1)

Table 9.2.11-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
>=760,000 Btuh min. 10.2 EER	$203	$60 per ton

9.2.12 Air-Cooled Chillers

Measure Code: BPC12

Version Date & Revision History:

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Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace any size existing air-cooled chiller

Eligibility Criteria for New Energy-Efficient Equipment:

- IPLV (Integrated Part Load Value) rated at less than or equal to 1.04 kW/ton
- Air-cooled only, no water-cooled chillers

The chiller efficiency rating must be based on ARI standard 550/590–2003 for IPLV conditions and not based on full-load conditions. The chillers must meet ARI standards 550/590–2003, be UL listed, and use a minimum ozone-depleting refrigerant (e.g., HCFC or HFC). The ARI net capacity value should be used to determine the chiller tons. A manufacturer specification sheet with the rated kW/ton-IPLV or COP-IPLV must accompany the application.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 20 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_U \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_U \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings table below
N_U = Number of units (tons capacity) being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.2.12-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.2.12-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Air Cooled Chiller	NA	NA	See Table 9.2.12-3

Table 9.2.12-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Grocery	0.25666	270.6
Hotel/Motel	0.2672	457.45
Manufacturing/Industrial	0.27742	259.46
Medical	0.263	360.47
Office	0.26443	295.77
Other	0.26435	307.66
Retail/Service	0.25666	270.6
School/College	0.26509	239.23

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.12-3)	X	Demand Interactive Effects (average from Table 9.2.12-1)	X	Coincident Diversity Factor (average from Table 9.2.12-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.12-3)	X	Energy Interactive Effects (average from Table 9.2.12-1)	X	Hours of Operation (average from Table 9.2.12-1)

Table 9.2.12-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
Air-Cooled Chillers	$126.70/ton	$20/ton

9.2.13 Room Air Conditioners (Tier 2)

Measure Code: BPC13

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replacing existing unit of equivalent size

Eligibility Criteria for New Energy-Efficient Equipment:

BPC13	• Less than 8000 Btuh input • 10.7 EER (ENERGY STAR® qualified)
	• 8000 through 19,9990 Btuh input • 10.8 EER (ENERGY STAR qualified)
	• 14,000 through 19,999 Btuh input • 10.7 EER (ENERGY STAR qualified)
	• 20,000 or more Btuh input • 9.4 EER (ENERGY STAR qualified)

- Room air conditioning units are through-the-wall (or built-in) self-contained units that are two tons or less.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 9 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls
A unit can either qualify under ENERGY STAR® standards or under Super Efficient Home Appliance (SEHA) Tier 1 standards. The minimum requirements and eligible equipment that meet CEE high efficiency room air conditioning specifications can be found at www.cee1.org. There are two eligible efficiency levels as listed by the CEE. These units are with and without louvered sides, without reverse cycle (i.e., heating), and casement.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_U \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_U \times ISR$

ΔkW	= Gross customer connected load kW savings for the measure
ΔkW S	= Gross customer connected load kW savings
N U	= Number of units (tons capacity) being replaced
ISR	= In service rate, or the percentage of units rebated that actually get used. For standard measures, this is assumed to be 100%
ΔkWh	= Gross customer annual kWh savings for the measure
ΔkWh_S	= Gross customer connected load kWh savings

Table 9.2.13-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.2.13-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Room Air Conditioner (Tier 2)	NA	NA	See Table 9.2.13-3

Table 9.2.13-3 Calculated Demand and Energy Savings by Type of Business

Building Type	Demand Savings (kW savings/ton)				Energy Savings (kWh savings/ton)			
	<8,000 btuh	8000 to 13,999 btuh	14,000 to 19,999 btuh	>20,000 btuh	<8,000 btuh	8000 to 13,999 btuh	14,000 to 19,999 btuh	>20,000 btuh
Grocery	0.2	0.2	0.2	0.23	912.77	904.31	912.77	1,039
Hotel/Motel	0.2	0.2	0.2	0.23	533.77	528.82	533.77	607.58
Medical	0.2	0.2	0.2	0.23	671.31	665.1	671.31	764.16
Mfg/Industrial	0.2	0.2	0.2	0.23	692.69	686.27	692.69	788.49
Office	0.2	0.2	0.2	0.23	679.82	673.53	679.82	773.84
Restaurant	0.2	0.2	0.2	0.23	822.52	814.19	822.52	936.27
Retail/Service	0.2	0.2	0.2	0.23	607.19	601.57	607.19	691.16
School/College	0.2	0.2	0.2	0.23	450.84	446.67	450.84	513.19
Warehouse	0.2	0.2	0.2	0.23	472.61	468.24	472.61	537.97
Other	0.2	0.2	0.2	0.23	450.84	446.67	450.84	513.19

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.13-3)	X	Demand Interactive Effects (average from Table 9.2.13-1)	X	Coincident Diversity Factor (average from Table 9.2.13-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.13-3)	X	Energy Interactive Effects (average from Table 9.2.13-1)	X	Hours of Operation (average from Table 9.2.13-1)

Table 9.2.13-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
Room Air Conditioner (Tier 2)	$138.53	$25/ton

9.2.14 Room Air Conditioners

Measure Code: BPC14

Version Date & Revision History:

Draft date: December 17, 2008
Effective date: December 17, 2008
Revised NA
End date: TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replacing existing unit of equivalent size

Eligibility Criteria for New Energy-Efficient Equipment:

BPC14	• Less than 8000 Btuh input • 11.2 EER (SEHA Tier 1)
	• 8000 through 13,999 Btuh input • 11.3 EER (SEHA Tier 1)
	• 14,000 through 19,999 Btuh input • 11.2 EER (SEHA Tier 1)
	• 20,000 or more Btuh input • 9.8 EER (SEHA Tier 1)

- Room air conditioning units are through-the-wall (or built-in) self-contained units that are two tons or less.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 9 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls
A unit can either qualify under ENERGY STAR® standards or under Super Efficient Home Appliance (SEHA) Tier 1 standards. The minimum requirements and eligible equipment that meet CEE high efficiency room air conditioning specifications can be found at www.cee1.org. There are two eligible efficiency levels as listed by the CEE. These units are with and without louvered sides, without reverse cycle (i.e., heating), and casement.

Bonus Incentives offered: Previous incentive was $30

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_U \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_U \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_U = Number of units (tons capacity) being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For standard measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.2.14-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.2.14-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Room Air Conditioner	NA	NA	See Table 9.2.14-3

Table 9.2.14-3 Calculated Demand and Energy Savings by Type of Business

Building Type	Demand Savings (kW savings/ton)				Energy Savings (kWh savings/ton)			
	<8,000 btuh	8000 to 13,999 btuh	14,000 to 19,999 btuh	>20,000 btuh	<8,000 btuh	8000 to 13,999 btuh	14,000 to 19,999 btuh	>20,000 btuh
Office	0.25	0.25	0.25	0.28	851.8	842.41	851.8	952.83
Medical	0.25	0.25	0.25	0.28	841.14	831.86	841.14	940.9
Restaurant	0.25	0.25	0.25	0.28	1,030.60	1,019.23	1,030.60	1,152.82
Grocery	0.25	0.25	0.25	0.28	1,143.67	1,131.06	1,143.67	1,279.31
School/College	0.25	0.25	0.25	0.28	564.89	558.66	564.89	631.89
Warehouse	0.25	0.25	0.25	0.28	592.17	585.64	592.17	662.4
Retail/Service	0.25	0.25	0.25	0.28	760.8	752.4	760.8	851.03
Mfg/Industrial	0.25	0.25	0.25	0.28	867.92	858.35	867.92	970.86
Hotel/Motel	0.25	0.25	0.25	0.28	668.8	661.42	668.8	748.11
Other	0.25	0.25	0.25	0.28	564.89	558.66	564.89	631.89

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.14-3)	X	Demand Interactive Effects (average from Table 9.2.14-1)	X	Coincident Diversity Factor (average from Table 9.2.14-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.14-3)	X	Energy Interactive Effects (average from Table 9.2.14-1)	X	Hours of Operation (average from Table 9.2.14-1)

Table 9.2.14-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
Room Air Conditioner Tier 1	$80.89	$60/ton

9.2.15 PTAC/PTHP

(Package Terminal Air Conditioner / Package Terminal Heat Pump)

Measure Code: BPC15

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Replace any size existing PTAC/PTHP units

Eligibility Criteria for New Energy-Efficient Equipment:

- EER must be greater than: 13.08 – (0.2556*Btuh Capacity/1000). All EER values must be rated at 95°F outdoor dry-bulb temperature.
- Through-the-wall self contained units that are two tons (24,000 Btuh) or less

Description: A PTAC is a packaged terminal air conditioner that cools and heats. A PTAC provides warm air through an electric resistance heater (heat strip). A PTHP is a packaged terminal heat pump. A PTHP uses its compressor year round to heat or cool. In warm weather, it efficiently captures heat from inside your building and pumps it outside for cooling. In cool weather, it captures heat from outdoor air and pumps it into your home, adding heat from electric heat strips as necessary to efficiently provide heat.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_U \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_U \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_U = Number of units (tons capacity) being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For standard measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.2.15-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.2.15-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
PTAC/PTHP	NA	NA	See Table 9.2.15-3

Table 9.2.15-3 Calculated Demand and Energy Savings by Type of Business

Description	kW Savings/ton		kWh Savings/ton	
	All Sizes, Retrofit	All Sizes, New Construction	All Sizes, Retrofit	All Sizes, New Construction
Office	0.239	0.0083	180.84	6.28
Medical	0.239	0.0083	212.51	7.38
Restaurant	0.239	0.0083	212.51	7.38
Grocery	0.239	0.0083	244.18	8.48
School/College	0.239	0.0083	102.37	3.56
Warehouse	0.239	0.0083	180.84	6.28
Retail/Service	0.239	0.0083	244.18	8.48
Mfg/Industrial	0.239	0.0083	212.51	7.38
Hotel/Motel	0.239	0.0083	212.51	7.38
Other	0.239	0.0083	212.51	7.38

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.15-3)	X	Demand Interactive Effects (average from Table 9.2.15-1)	X	Coincident Diversity Factor (average from Table 9.2.15-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.15-3)	X	Energy Interactive Effects (average from Table 9.2.15-1)	X	Hours of Operation (average from Table 9.2.15-1)

Table 9.2.15-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
PTAC/PTHP	$80	$15

9.2.16 Gas Boiler Replacement ($\leq$ 300 kBtuh input)

Measure Code: BPH3

Version Date & Revision History:

Draft date:	February 6, 2009
Effective date:	February 6, 2009
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Must replace an existing natural-gas fueled boiler
- Customer must have GDS-2 gas account

Eligibility Criteria for New Energy-Efficient Equipment:

- Hot water only (no steam)
- Less than or equal to 300 kBtuh input
- AFUE 85% minimum

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Natural Gas Savings $\Delta NG = NG_I \times T_S$

ΔNG = Gross customer annual natural gas savings for the measure, therms
NG_I = Boiler natural gas input, kbtu
T_S = Annual natural gas savings for the measure (1.216102941 therms for all gas boilers)

Table 9.2.16-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.2.16-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Gas Boiler Replacement (< 300 kBtuh input)	NA	NA	0

Table 9.2.16-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)	Therm Saving
All	NA	NA	1.216102941

Table 9.2.16-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
Gas Boiler Replacement ($\leq$300 kbtuh input)	$3,200	$1.00/kButh input

9.2.17 Gas Boiler Replacement (> 300 kBtuh Input

Measure Code: BPH4

Version Date & Revision History:

Draft date:	February 6, 2009
Effective date:	February 6, 2009
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Must replace an existing natural-gas fueled boiler
- Customer must have GDS-2 gas account

Eligibility Criteria for New Energy-Efficient Equipment:

- Hot water only (no steam)
- Greater than 300 kBtuh input
- Thermal Efficiency 90% minimum

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls

Bonus Incentives offered: 9-1-10 bonus increased by 50% (to $3.00) for the remainder of PY3

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Natural Gas Savings $\Delta NG = NG_I \times T_S$

ΔNG = Gross customer annual natural gas savings for the measure, therms
NG_I = Boiler natural gas input, kbtu
T_S = Annual natural gas savings for the measure (2.432205882 therms for all gas boilers)

Table 9.2.17-1 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Gas Boiler Replacement (> 300 kBtuh input)	NA	NA	0

Table 9.2.17-2 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)	Therm Savings
All	NA	NA	2.432205882

Table 9.2.17-3 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
Gas Boiler Replacement (>300 kBtuh input)	$5,000	$2.00/kButh input

9.2.18 Gas Furnace Replacement (90% AFUE)

Measure Code: BPH5

Version Date & Revision History:

Draft date:	February 6, 2009
Effective date:	February 6, 2009
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Must replace an existing natural-gas fueled furnace
- Customer must have GDS-2 gas account

Eligibility Criteria for New Energy-Efficient Equipment:

- ENERGY STAR qualified furnace (90% AFUE)

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Natural Gas Savings $\Delta NG = NG_I \times T_S$

ΔNG = Gross customer annual natural gas savings for the measure, therms
NG_I = Gas furnace natural gas input, kbtu
T_S = Annual natural gas savings for the measure (2.432205882 therms for all gas furnaces)

Table 9.2.18-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.2.18-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Gas Furnace Replacement (90% AFUE)	NA	NA	0

Table 9.2.18-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)	Therm savings
All	NA	NA	2.432205882

Table 9.2.18-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
Gas Furnace Replacement (90% AFUE)	$111 per 12,000 btuh of heating capacity	$2.00/kBtuh input

9.2.19 Gas Furnace Replacement (92% AFUE)

Measure Code: BPH6

Version Date & Revision History:

Draft date:	February 6, 2009
Effective date:	February 6, 2009
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:
- Must replace an existing natural gas fueled furnace
- Customer must have GDS-2 gas account

Eligibility Criteria for New Energy-Efficient Equipment:
- ENERGY STAR qualified furnace (92% AFUE)

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls

Bonus Incentives offered: 9-1-10 bonus increased by 50% (to $3.75) for the remainder of PY3

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Natural Gas Savings $\Delta NG = NG_I \times T_S$

ΔNG = Gross customer annual natural gas savings for the measure, therms
NG_I = Gas furnace natural gas input, kbtu
T_S = Annual natural gas savings for the measure (2.918647059 therms for all gas furnaces)

Table 9.2.19-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.2.19-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Gas Furnace Replacement (92% AFUE)	NA	NA	0

Table 9.2.19-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)	Therm Savings
All	NA	NA	2.918647059

Table 9.2.19-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
Gas Furnace Replacement (92% AFUE)	$111 per 12,000 btuh of heating capacity	$2.50 kBtuh input

9.2.20 Gas Furnace Replacement (94% AFUE)

Measure Code: BPH7

Version Date & Revision History:

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Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- Must replace an existing natural gas fueled furnace
- Customer must have GDS-2 gas account

Eligibility Criteria for New Energy-Efficient Equipment:

- ENERGY STAR qualified furnace (94% AFUE)

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls

Bonus Incentives offered: 9-1-10 bonus increased by 50% (to $4.50) for the remainder of PY3

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Natural Gas Savings $\Delta NG = NG_I \times T_S$

ΔNG	= Gross customer annual natural gas savings for the measure, therms
NG_I	= Gas furnace natural gas input, kbtu
T_S	= Annual natural gas savings for the measure (3.405088235 therms for all gas furnaces)

Table 9.2.20-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.2.20-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
Gas Furnace Replacement (94% AFUE)	NA	NA	0

Table 9.2.20-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)	Therm Savings
Office	NA	NA	3.405088235

Table 9.2.20-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
Gas Furnace Replacement (94% AFUE)	$111 per 12,000 of heating capacity	$3.00/kBtuh input

9.2.21 Variable Frequency Drives on HVAC Motors

Measure Code: BPC20

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- New installations only

Eligibility Criteria for New Energy-Efficient Equipment:

- Any size unit
- Used in conjunction with pumping or air handling applications
- Minimum 2,000 hours annual operation
- May not control motor over 500 hp (over 500 hp is Custom)
- Redundant/Backup units do not qualify
- NOTE – This increased incentive will be in effect for all applications received through December 31, 2010.
- A new motor with VFD.
- A variable-frequency drive (VFD) is a system for controlling the rotational speed of an alternating current (AC) electric motor by controlling the frequency of the electrical power supplied to the motor. A variable frequency drive is a specific type of adjustable-speed drive.

Loadshape: Loadshape #2 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: (None)

Referenced Documents: HVAC Standard Measures v3.xls

Bonus Incentives offered: 1-4-10 Incentive increased to $75/ hp controlled (previously $45). Originally set to return to $45 on 3-31-10, but was instead extended to 5-31-11. In addition, the cap that stated the incentive could be no more than 50% of the project cost was increased so that the incentive could be up to 75% of the project cost.

Supplemental Information Collected on the Application: Hp controlled, project cost (incentive is capped at 755 of project cost).

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_{HP} \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_{HP} \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_{HP} = Total Horse Power being controlled
ISR = In service rate, or the percentage of units rebated that actually get used. For standard measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.2.21-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.2.21-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)*
VFDs on HVAC Motors	NA	NA	**0**

Table 9.2.21-3 Calculated Demand and Energy Savings by Type of Business

Building Types	kW Savings/hp	kWh Savings/hp	kWh Savings/hp
	Motors (All Sizes)	Chilled Water Pump Applications (All Sizes)	Fan Applications (All Sizes)
Office	0	850	701
Medical	0	850	701
Restaurant	0	850	701
Grocery	0	850	701
School/College	0	850	701
Warehouse	0	850	701
Retail/Service	0	850	701
Mfg/Industrial	0	850	701
Hotel/Motel	0	850	701
Other	0	850	701

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.21-2)	X	Demand Interactive Effects (average from Table 9.2.21-1)	X	Coincident Diversity Factor (average from Table 9.2.21-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.2.21-2)	X	Energy Interactive Effects (average from Table 9.2.21-1)	X	Hours of Operation (average from Table 9.2.21-1)

Table 9.2.21-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Incremental Cost	Incentive Payment
Variable Frequency Drives on HVAC Motors	$200 per hp	$75/hp controlled (many not exceed 75% of the project cost)

9.3 Lodging

The following measures are included in the PY3 Lodging program.

9.3 LODGING		
	Measure	**Code**
	Lodging (HVAC)	
9.3.1	**Guest Room Energy Management (GREM) Controls (PTAC)**	BPLD1 NEW
9.3.2	**Guest Room Energy Management (GREM) Controls (PTHP)**	BPLD2 NEW

9.3.1 Guest Room Energy Management (PTAC)

Measure Code: BPLD1

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- New installation

Eligibility Criteria for New Energy-Efficient Equipment:

- Electric heat Package Terminal Air Conditioners (PTAC) systems only
- Occupancy control must be key activated or sense body heat or motion and must control the HVAC system serving the room.

Loadshape: TBD

Persistence: The persistence factor is assumed to be one.

Lifetimes: 14 years

Revision Details: (None)

Referenced Documents: Business Programs: Deemed Savings Manual V1.0, Energy Reduction Associated with the Installation of the Entergize Energy Control System: Pilot Installation Evaluation

Bonus Incentives offered: None

Supplemental Information Collected on the Application: Number of Guest Rooms

Algorithms used to calculate savings

Measure Demand Savings ΔkW = 0.1 (Based on vacancy)

Measure Energy Savings ΔkWh = #Rooms x 714 kWh/year

ΔkW = Gross customer connected load kW savings for the measure
ΔkWh = Gross customer annual kWh savings for the measure

Table 9.3.1-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours	Peak kW Savings Per Watt Reduced	kWh Savings Per Watt Reduced
Hotel/Motel	1.0	1.0	1.0	8,760	0	0

Table 9.3.1-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
GREM (PTAC)	1540	1540?	1.0

Table 9.3.1-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Hotel/Motel	0.1 (based on vacancy)	1,211

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.3.1-2) X Demand Interactive Effects (average from Table 9.3.1-1) X Coincident Diversity Factor (average from Table 9.3.1-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.3.1-2) X Energy Interactive Effects (average from Table 9.3.1-1) X Hours of Operation (average from Table 9.3.1-1)

Table 9.3.1-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
GREM (PTAC)	$396	$0	$396	$80/room

9.3.2 Guest Room Energy Management (PTHP)

Measure Code: BPLD2

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Baseline Equipment to be Replaced:

- New installation

Eligibility Criteria for New Energy-Efficient Equipment:

- Electric Package Terminal Heat Pumps (PTHP) systems only
- Occupancy control must be key activated or sense body heat or motion and must control the HVAC system serving the room.

Loadshape: TBD

Persistence: The persistence factor is assumed to be one.

Lifetimes: 14 years

Revision Details: (None)

Referenced Documents: Business Programs: Deemed Savings Manual V1.0, Energy Reduction Associated with the Installation of the Entergize Energy Control System: Pilot Installation Evaluation

Bonus Incentives offered: None

Supplemental Information Collected on the Application: Number of Guest Rooms

Algorithms used to calculate savings

Measure Demand Savings ΔkW = 0.1 (Based on vacancy)

Measure Energy Savings ΔkWh = #Rooms x 1211 kWh/year

ΔkW = Gross customer connected load kW savings for the measure
ΔkWh = Gross customer annual kWh savings for the measure

Table 9.3.2-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours	Peak kW Savings Per Watt Reduced	kWh Savings Per Watt Reduced
Hotel/Motel	1.0	1.0	1.0	8,760	0	0

Table 9.3.2-2 Specifications and Calculated Non-coincident Demand Savings

Measure Description	Base Unit Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
GREM (PTHP)	910	910	1.0

Table 9.3.2-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Hotel/Motel	0.1 (base on vacancy)	714

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.3.2-2)	X	Demand Interactive Effects (average from Table 9.3.2-1)	X	Coincident Diversity Factor (average from Table 9.3.2-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.3.2-2)	X	Energy Interactive Effects (average from Table 9.3.2-1)	X	Hours of Operation (average from Table 9.3.2-1)

Table 9.3.2-4 Measure Costs (Parts and Labor) and Incentive Levels

Measure Description	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
GREM (PTHP)	$396	$0	$396	$50/room

9.4 Refrigeration

The following measures are included in the PY3 Refrigeration program.

9.4 REFRIGERATION		
	Measure	**Code**
	Closers	
9.4.1	**Automatic Door Closer for Walk-In Freezer (back access door)**	BPR7 Modified
9.4.2	**Auto Closer for display case door**	BPR13 NEW
	Curtains, Doors, Anti-Sweat Heater Controls, and Gaskets	
9.4.3	**Strip Curtain on Walk-in Coolers or Freezers**	BPR1
9.4.4	**Night Curtain for Open Cooler**	BPR12 NEW
9.4.5	**Anti-Sweat Heater Control (freezer)**	BPR33 (was BPR2)
9.4.6	**Anti-Sweat Heater Control (refrigerator)**	BPR34 (was BPR3)
9.4.7	**Door Gaskets**	BPR14 NEW (Discontinued)
9.4.8	**Solid Door Freezer (up to 15 cu ft)**	BPR27 NEW
9.4.9	**Solid Door Freezer (15-30 cu ft)**	BPR28 NEW
9.4.10	**Solid Door Freezer (31-50 cu ft)**	BPR29 NEW
9.4.11	**Solid Door Freezer (51+ cu ft)**	BPR30 NEW
9.4.12	**Glass Door Freezer (31-50 cu ft)**	BPR31 NEW
9.4.13	**Glass Door Freezer (51+ cu ft)**	BPR32 NEW
9.4.14	**Evaporator Fan Controls**	BPR6
	Vending Macines and controls, and Ice Machines	
9.4.15	**ENERGY STAR Vending Machine**	BPR8
9.4.16	**Beverage Machine Control**	BPR9
9.4.17	**Snack Machine Control**	BPR10
9.4.18	**High Efficiency Ice Makers (101-200 lbs/24hr capacity)**	BPR20
9.4.19	**High Efficiency Ice Makers (201-300 lbs/24hr capacity)**	BPR21
9.4.20	**High Efficiency Ice Makers (301-400 lbs/24hr capacity)**	BPR22
9.4.21	**High Efficiency Ice Makers (401-500 lbs/24hr capacity)**	BPR23
9.4.22	**High Efficiency Ice Makers (501-1000 lbs/24hr capacity)**	BPR24
9.4.23	**High Efficiency Ice Makers (1001-1500 lbs/24hr capacity)**	BPR25
9.4.24	**High Efficiency Ice Makers (Greater than 1500 lbs/24hr capacity)**	BPR26
	EC Motors	
9.4.25	**EC Motor for Walk-In Cooler**	BPR4 Modified
9.4.26	**EC Motor for Walk-In Freezer**	BPR19 NEW
9.4.27	**EC Motor for Reach-In Cooler**	BPR5 Modified
9.4.28	**EC Motor for Reach-In Freezer**	BPR18 NEW
	Tune-up	
9.4.29	**Refrigeration Tune-up**	BPR11 NEW

9.4.1 Automatic Door Closers for Walk-In Freezers

Measure Code: BPR7

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	October 25, 2010
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- New installation or replacement of failed unit (or one which has exceeded useful life, which is defined as eight years.)
- To be installed on low- and medium-temperature main coolers and freezers; or low- and medium temperature reach-in coolers and freezers (-10 thru +41 degrees F)
- A walk-in freezer without automatic door-closers installed

Eligibility Criteria for New Equipment:

- Installed on the main opaque insulated door (back access door to the cooler in measure BPR13)
- Must firmly close door to within one inch of full closure

Loadshape: Loadshape #4 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 8 years

Revision Details: Previous incentive was $160/door - changed to $30/closer

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_D \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_D \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_D = Number of doors having automatic closers installed
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.1-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Grocery, Restaurant, and other	1.0	1.0	1.0

Table 9.4.1-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Automatic Door Closers for Walk-in Freezers	NA	NA	See Table 9.4.1-3

Table 9.4.1-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Grocery, Restaurant, and other	0.814813	2,919

Demand Savings Calculation (per door) =

Non-coincident Demand Savings (weighted average from Table 9.4.1-2)	X	Demand Interactive Effects (average from Table 9.4.1-1)	X	Coincident Diversity Factor (average from Table 9.4.1-1)

Energy Savings Calculation (per door) =

Non-coincident Demand Savings (weighted average from Table 9.4.1-2)	X	Energy Interactive Effects (average from Table 9.4.1-1)	X	Hours of Operation (average from Table 9.4.1-1)

Table 9.4.1-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Automatic Door Closer for walk-in freezer	$433	$30 per closer

9.4.2 Automatic Door Closers for Display Case Door

Measure Code: BPR13

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- New installation or replacement of failed unit (or one which has exceeded useful life, which is defined as eight years.)
- To be installed on low- and medium-temperature main coolers and freezers; or low- and medium temperature reach-in coolers and freezers (-10 through +41 degrees F)

Eligibility Criteria for New Equipment:

- Installed on the glass customer access door (front glass doors to the cooler in measure BPR7)
- Auto-closer must be able to firmly close the door when it is within one inch of full closure.
- For walk-in coolers and freezers, auto-closer device should be applied to the glass reach-in door. The reach-in door must have a minimum perimeter of 16 feet. The auto-closer must be able to firmly close the door. Useful life period for auto-closers is defined as eight years.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 8 years (for both coolers and freezers)

Revision Details: (None)

Referenced Documents: The incremental costs are from the Ameren Illinois Utilities DSM Plan, Appendix B, referenced October 20, 2009.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Coolers

Measure Demand Savings	ΔkW	= NOC x 0.16 kW/door/year
Measure Energy Savings	ΔkWh	= NOC x 1,138 kWh/door/year

ΔkW = Gross customer connected load kW savings for the measure
ΔkWh = Gross customer annual kWh savings for the measure
NOC = Number of doors

Freezers

Measure Demand Savings	ΔkW	= NOF x 0.81 kW/door/year
Measure Energy Savings	ΔkWh	= NOF x 2,919 kWh/door/year

ΔkW = Gross customer connected load kW savings for the measure
ΔkWh = Gross customer annual kWh savings for the measure
NOC = Number of doors

Table 9.4.2-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Grocery	1.0	1.0	1.0

Table 9.4.2-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
Freezer Door	NA	NA	See Table 9.4.2-3
Cooler Door	NA	NA	See Table 9.4.2-3

Table 9.4.2-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)	Demand Savings (kW)	Energy Savings (kWh)
	Reach-In Freezer		Reach-In Cooler	
Grocery	0.081	2919	0.16	1138

Demand Savings Calculation (per closer) =

Non-coincident Demand Savings (weighted average from Table 9.4.2-2)	X	Demand Interactive Effects (average from Table 9.4.2-1)	X	Coincident Diversity Factor (average from Table 9.4.2-1)

Energy Savings Calculation (per closer) =

Non-coincident Demand Savings (weighted average from Table 9.4.2-2)	X	Energy Interactive Effects (average from Table 9.4.2-1)	X	Hours of Operation (average from Table 9.4.2-1)

Table 9.4.2-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Automatic Door Closer	$160 (freezer and cooler)	$30/closer

9.4.3 Strip Curtains on Walk-in Coolers or Freezers

Measure Code: BPR1

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Cannot be installed on displays cases
- Must be new installation – cannot be replacing existing strip curtains

Eligibility Criteria for New Equipment:

- New strip curtains or clear plastic swinging doors

Loadshape: Loadshape #4 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 4 years

Revision Details: (None)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_D \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_D \times ISR$

ΔkW	= Gross customer connected load kW savings for the measure
ΔkW_S	= Gross customer connected load kW savings per lamp
N_D	= Number of doors having strip curtains installed
ISR	= In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh	= Gross customer annual kWh savings for the measure
ΔkWh_S	= Gross customer connected load kWh savings

Table 9.4.3-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Restaurant, Grocery, and Other	1.0	1.0	1.0

Table 9.4.3-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
Walk-in Cooler	NA	NA	See Table 9.4.3-3
Walk-in Freezer	NA	NA	See Table 9.4.3-3

Table 9.4.3-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)	Demand Savings (kW)	Energy Savings (kWh)
	Strip Curtains on Walk-In Cooler		Strip Curtains on Walk-In Freezer	
Restaurant	0.010313	128	0.029774	366
Grocery	0.0054965	99.5	0.021831	330.5
Other	0.00790475	113.75	0.0258025	348.25

Demand Savings Calculation (per ft^2 curtain) =

Non-coincident Demand Savings (weighted average from Table 9.4.3-2)	X	Demand Interactive Effects (average from Table 9.4.3-1)	X	Coincident Diversity Factor (average from Table 9.4.3-1)

Energy Savings Calculation (per ft^2 curtain) =

Non-coincident Demand Savings (weighted average from Table 9.4.3-2)	X	Energy Interactive Effects (average from Table 9.4.3-1)	X	Hours of Operation (average from Table 9.4.3-1)

Table 9.4.3-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Strip Curtains	$9.54	$4 per square foot of curtain

9.4.4 Night Curtain for Open Cooler

Measure Code: BPR12

Version Date & Revision History:

Draft date:	September 29, 2009
Effective date:	September 29, 2009
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Must be installed on an open case (vertical, or horizontal display case) without a cover.
- To be installed on low- and medium-temperature cases (-10 through +41 degrees F)

Eligibility Criteria for New Equipment:

- It is recommended that these film type covers have small, perforated holes to decrease moisture buildup. The cover must be applied for a period of at least six hours (during off hours) in a 24-hour period.
- Include with the project application, a copy of the internal policy document regarding nightly curtain use is required.
- Final payment approval is subject to inspection by the Ameren Illinois staff after installation.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 5 years

Revision Details: (None)

Referenced Documents: The incremental costs are from the Ameren Illinois Utilities DSM Plan, Appendix B, referenced October 20, 2009.
STRIP CURTAIN ENERGY SAVINGS, Refrigeration & Thermal Test Center, Design & Engineering Services, Southern California Edison, accessed October 20, 2009.
ALUMINUM SHIELD INCREASES DISPLAY CASE PERFORMANCE: COVER REDUCES HEAT TRANSFER, Refrigeration & Thermal Test Center, Design & Engineering Services, Southern California Edison, accessed October 20, 2009.
LABORATORY COST FOR ENERGY SAVINGS ON REFRIGERATED DAIRY CASES, Econofrost Report and Document Archive, assessed October 20, 2009.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings ΔkW = 0 (No coincident savings)

Measure Energy Savings ΔkWh = DFL x 94.5 kWh/lineal foot/year

ΔkW = Gross customer connected load kW savings for the measure
DFL = Display fixture length (in lineal feet)
ΔkWh = Gross customer annual kWh savings for the measure

Table 9.4.4-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Grocery	1.0	1.0	1.0

*Use a night curtain to help insulate open coolers during hours when the store is closed. The energy savings for this measure use a store closure period (i.e., curtains are on during this period of store closure) of four hours to calculate the energy savings.

Table 9.4.4-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
Night Curtain for Open Cooler	NA	NA	See Table 9.4.4-3

Table 9.4.4-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Grocery	0	94.5

Demand Savings Calculation (per foot of curtain) =

Non-coincident Demand Savings (weighted average from Table 9.4.4-2)	X	Demand Interactive Effects (average from Table 9.4.4-1)	X	Coincident Diversity Factor (average from Table 9.4.4-1)

Energy Savings Calculation (per foot of curtain) =

Non-coincident Demand Savings (weighted average from Table 9.4.4-2)	X	Energy Interactive Effects (average from Table 9.4.4-1)	X	Hours of Operation (average from Table 9.4.4-1)

Table 9.4.4-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Night Curtains	$38	$7 lineal foot of curtain

9.4.5 Anti-Sweat Heater Control (Freezer)

Measure Code: BPR33
(Previously BPR2 – same measure but the incentive was per foot, instead of per door, as it is now)

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	August 25, 2010
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Must be installed on an existing door that does not have ASH control, or has an ASH control that has failed

Eligibility Criteria for New Equipment:

- Must be installed on FREEZER case door
- Device must sense the relative humidity in the air outside of the display case and reduce or turn off the glass door (if applicable) and frame anti-sweat heaters at low-humidity conditions
- Technologies that can turn off anti-sweat heaters based on sensing condensation (on the inner glass pane) also qualify

Loadshape: Loadshape #5 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: 8-25-10 Changed this measure so the incentive is now a “per door” basis, rather than per lineal foot of door front (was BPR2 for the $30 lineal foot incentive).

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: Total number of display doors – by width (30”, 32”, 36” or other (specify).

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_F \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings per control
N_F = Number of doors having anti-sweat heaters installed
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per control

Table 9.4.5-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Restaurant	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Other	1.0	1.0	1.0

*There are no operating hour values for this measure.

Table 9.4.5-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Type	Non-Coincident Demand Savings (kW)
Anti-sweat Heater Control - Freezer	NA	NA	See Table 9.4.5-3

Table 9.4.5-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Grocery	0.009634	409
Restaurant	0.009634	409
Other	0.009634	409

Demand Savings Calculation (per door) =

Non-coincident Demand Savings (weighted average from Table 9.4.5-2)	X	Demand Interactive Effects (average from Table 9.4.5-1)	X	Coincident Diversity Factor (average from Table 9.4.5-1)

Energy Savings Calculation (per door) =

Non-coincident Demand Savings (weighted average from Table 9.4.5-2)	X	Energy Interactive Effects (average from Table 9.4.5-1)	X	Hours of Operation (average from Table 9.4.5-1)

Table 9.4.5-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Anti Sweat Heater Control	$34	$80 per door

9.4.6 Anti-Sweat Heater Control (Refrigeration)

Measure Code: BPR34
(Previously BPR3 – same measure but the incentive was per foot, instead of per door, as it is now)

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	August 25, 2010
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Must be installed on an existing door that does not have ASH control, or has an ASH control that has failed

Eligibility Criteria for New Equipment:

- Must be installed on REFRIGERATOR case door
- Device must sense the relative humidity in the air outside of the display case and reduce or turn off the glass door (if applicable) and frame anti-sweat heaters at low-humidity conditions
- Technologies that can turn off anti-sweat heaters based on sensing condensation (on the inner glass pane) also qualify

Loadshape: Loadshape #5 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: 8-25-10 Changed this measure so the incentive is now a "per door" basis, rather than per lineal foot of door front (was BPR3 at $30 per lineal foot.)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: Total number of display doors – by width (30", 32", 36" or other (specify).

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_F \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings per control
N_F = Number of doors having anti-sweat heaters installed
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per control

Table 9.4.6-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Restaurant	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Other	1.0	1.0	1.0

*There are no operating hour values for this measure.

Table 9.4.6-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Anti-sweat Heater Control	NA	NA	See Table 9.4.6-3

Table 9.4.6-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Grocery	0.007436	389
Restaurant	0.007436	389
Other	0.007436	389

Demand Savings Calculation (per door) =

Non-coincident Demand Savings (weighted average from Table 9.4.6-2)	X	Demand Interactive Effects (average from Table 9.4.6-1)	X	Coincident Diversity Factor (average from Table 9.4.6-1)

Energy Savings Calculation (per door) =

Non-coincident Demand Savings (weighted average from Table 9.4.6-2)	X	Energy Interactive Effects (average from Table 9.4.6-1)	X	Hours of Operation (average from Table 9.4.6-1)

Table 9.4.6-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Anti Sweat Heater Control	$34	$80 per door

9.4.7 Door Gaskets

Measure Code: BPR14
Measure was discontinued

Version Date & Revision History:

Draft date:	September 29, 2009
Effective date:	September 29, 2009
Revised	August 4, 2010
End date:	October 15, 2010 (accepted thru 11-11-10 if app was not pre-approved)

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Must replace a worn or failed gasket unit (or has exceeded useful life, which is defined as four years)
- To be installed on low- and medium-temperature coolers and freezers (-10 through +41 degrees F)

Eligibility Criteria for New Equipment:

- Replacement gasket must meet the door manufacturer's installation specifications, specifically regarding dimensions, materials, attachment method, style, compression, and magnetism.
- Must replace a worn gasket on the main insulated clear or opaque door of a walk-in cooler or freezer.
- Aisle-side door gaskets are not eligible.

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 4 years

Revision Details: 8-4-10 – the wording was revised by removing the "reach in" option, and clarified to state that only "aisle-side doors" are eligible.
10-15-10 this measures was discontinued because savings were suspect based on ComEd evaluation results.

Referenced Documents: Door Gaskets for Glass Doors of Walk-in Coolers: Southern California Edison Company Work Paper WPSCNRRN0004, Revision 1, October 15, 2007.
Door Gaskets for Main Door of Walk-in Coolers and Freezers: Southern California Edison Company Work Paper WPSCNRRN0001, Revision 1, October 15, 2007.

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Coolers

Measure Demand Savings ΔkW = NLF x 0.000878 kW/foot

Measure Energy Savings ΔkWh = NLF x 18 kWh/foot

ΔkW = Gross customer connected load kW savings for the measure

ΔkWh = Gross customer annual kWh savings for the measure

NLF = Number of lineal feet of gasket installed

Freezers

Demand Savings ΔkW = NLF x 0.002287 kW/foot

Measure Energy Savings ΔkWh = NLF x 94 kWh/foot

ΔkW = Gross customer connected load kW savings for the measure

ΔkWh = Gross customer annual kWh savings for the measure

NLF = Number of lineal feet of gasket installed

Table 9.4.7-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Grocery	1.0	1.0	1.0

Table 9.4.7-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Door Gaskets	NA	NA	See Table 9.4.7-3

Table 9.4.7-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)	Demand Savings (kW)	Energy Savings (kWh)
	Door Gaskets for Freezers		Door Gaskets for Coolers	
Grocery	0.002287	94	0.000878	18

Demand Savings Calculation (per foot of gasket) =

Non-coincident Demand Savings (weighted average from Table 9.4.7-2)	X	Demand Interactive Effects (average from Table 9.4.7-1)	X	Coincident Diversity Factor (average from Table 9.4.7-1)

Energy Savings Calculation (per foot of gasket) =

Non-coincident Demand Savings (weighted average from Table 9.4.7-2)	X	Energy Interactive Effects (average from Table 9.4.7-1)	X	Hours of Operation (average from Table 9.4.7-1)

Table 9.4.7-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Door Gaskets	$5	$3 per lineal foot of gasket

9.4.8 Solid Door Freezer (up to 15 cu ft)

Measure Code: BPR27

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replacing any size (glass or solid door) freezer

Eligibility Criteria for New Equipment:

- Solid-door freezer
- Up to 15 cubic feet
- ENERGY STAR® qualified

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: The data and calculations can be found on “AOE Commercial Kitchen Data.xls”

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings per ft^3
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per ft^3

Table 9.4.8-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
All	1.0	1.0	1.0

Table 9.4.8-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
Solid Door Freezer (up to 15 ft^3)	NA	NA	See Table 9.4.8-3

Table 9.4.8-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
All	0.0573	502

Demand Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.4.8-2)	X	Demand Interactive Effects (average from Table 9.4.8-1)	X	Coincident Diversity Factor (average from Table 9.4.8-1)

Energy Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.4.8-2)	X	Energy Interactive Effects (average from Table 9.4.8-1)	X	Hours of Operation (average from Table 9.4.8-1)

Table 9.4.8-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Replace freezer	$250	$35/freezer

9.4.9 Solid Door Freezer (15-30 cu ft)

Measure Code: BPR28

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replacing any size (glass or solid door) freezer

Eligibility Criteria for New Equipment:

- Solid-door freezer
- 15 through 30 cubic feet
- ENERGY STAR® qualified

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: The data and calculations can be found on “AOE Commercial Kitchen Data.xls”

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta\ kW_S \times ISR$

Measure Energy Savings $\Delta kWh = \Delta\ kWh_S \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings per ft^3
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per ft^3

Table 9.4.9-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
All	1.0	1.0	1.0

Table 9.4.9-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
Solid Door Freezer (15-30 ft^3)	NA	NA	See Table 9.4.9-3

Table 9.4.9-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
All	0.0992	869

Demand Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.4.9-2)	X	Demand Interactive Effects (average from Table 9.4.9-1)	X	Coincident Diversity Factor (average from Table 9.4.9-1)

Energy Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.4.9-2)	X	Energy Interactive Effects (average from Table 9.4.9-1)	X	Hours of Operation (average from Table 9.4.9-1)

Table 9.4.9-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Replace freezer	$250	$50.00/freezer

9.4.10 Solid Door Freezer (31-50 cu ft)

Measure Code: BPR29

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replacing any size (glass or solid door) freezer

Eligibility Criteria for New Equipment:

- Solid-door freezer
- 31 through 50 cubic feet
- ENERGY STAR® qualified

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: The data and calculations can be found on “AOE Commercial Kitchen Data.xls”

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings per ft^3
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per ft^3

Table 9.4.10-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
All	1.0	1.0	1.0

Table 9.4.10-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Solid Door Freezer (31-50 ft^3)	NA	NA	See Table 9-4-10-3

Table 9.4.10-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
All	0.2407	2109

Demand Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.4.10-2)	X	Demand Interactive Effects (average from Table 9.4.10-1)	X	Coincident Diversity Factor (average from Table 9.4.10-1)

Energy Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.4.10-2)	X	Energy Interactive Effects (average from Table 9.4.10-1)	X	Hours of Operation (average from Table 9.4.10-1)

Table 9.4.10-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Replace freezer	$250	$100.00/freezer

9.4.11 Solid Door Freezer (51+ cu ft)

Measure Code: BPR30

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replacing any size (glass or solid door) freezer

Eligibility Criteria for New Equipment:

- Solid-door freezer
- 51 cubic feet or more
- ENERGY STAR® qualified

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: The data and calculations can be found on “AOE Commercial Kitchen Data.xls”

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings per ft^3
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per ft^3

Table 9.4.11-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
All	1.0	1.0	1.0

Table 9.4.11-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
Solid Door Freezer (51+ ft^3)	NA	NA	See Table 9.4.11-3

Table 9.4.11-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
All	0.4773	4181

Demand Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.4.11-2)	X	Demand Interactive Effects (average from Table 9.4.11-1)	X	Coincident Diversity Factor (average from Table 9.4.11-1)

Energy Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.4.11-2)	X	Energy Interactive Effects (average from Table 9.4.11-1)	X	Hours of Operation (average from Table 9.4.11-1)

Table 9.4.11-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Replace freezer	$250	$200.00/freezer

9.4.12 Glass Door Freezer (31-50 cu ft)

Measure Code: BPR31

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replacing any size (glass or solid door) freezer

Eligibility Criteria for New Equipment:

- Glass-door freezer
- 31 through 50 cubic feet
- ENERGY STAR® qualified

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: The data and calculations can be found on “AOE Commercial Kitchen Data.xls”

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings per ft^3
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per ft^3

Table 9.4.12-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
All	1.0	1.0	1.0

Table 9.4.12-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Glass Door Freezer (31-50 ft^3)	NA	NA	See Table 9.4.12-3

Table 9.4.12-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
All	0.5333	4672

Demand Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.4.12-2)	X	Demand Interactive Effects (average from Table 9.4.12-1)	X	Coincident Diversity Factor (average from Table 9.4.12-1)

Energy Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.4.12-2)	X	Energy Interactive Effects (average from Table 9.4.12-1)	X	Hours of Operation (average from Table 9.4.12-1)

Table 9.4.12-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Replace freezer	$250	$300.00/freezer

9.4.13 Glass Door Freezer (51+ cu ft)

Measure Code: BPR32

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replacing any size (glass or solid door) freezer

Eligibility Criteria for New Equipment:

- Glass-door freezer
- 51 cubic feet or more
- ENERGY STAR® qualified

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: The data and calculations can be found on "AOE Commercial Kitchen Data.xls"

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings per ft^3
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per ft^3

Table 9.4.13-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
All	1.0	1.0	1.0

Table 9.4.13-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
Glass Door Freezer (51+ ft3)	NA	NA	See Table 9.4.13-3

Table 9.4.13-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
All	0.8725	7643

Demand Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.4.13-2)	X	Demand Interactive Effects (average from Table 9.4.13-1)	X	Coincident Diversity Factor (average from Table 9.4.13-1)

Energy Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.4.13-2)	X	Energy Interactive Effects (average from Table 9.4.13-1)	X	Hours of Operation (average from Table 9.4.13-1)

Table 9.4.13-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Replace freezer	$250	$500.00/freezer

9.4.14 Evaporator Fan Controls

Measure Code: BPR6

Version Date & Revision History:

Draft date: December 17, 2008
Effective date: December 17, 2008
Revised NA
End date: TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Must be installed in an existing cooler that does not have evaporator fan controls, or has evaporator fan controls that have failed

Eligibility Criteria for New Equipment:

- Installation in medium-temperature walk-in coolers
- Must control at least 1/20 hp
- Must reduce fan power by at least 75% during the off-cycle
- Cannot be used if applying for an EC Motor incentive (BPR4 or BPR5)
- This measure is not applicable if any of the following conditions apply:
  1) The compressor runs all the time with high duty cycle
  2) The evaporator fan already cycles
  3) The evaporator fan motor runs on poly-phase power
  4) The evaporator fan motor is not shaded-pole or permanent split capacitor (PSC)
  5) Evaporator does not use off-cycle or time-off defrost

Loadshape: Loadshape #5 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 16 years

Revision Details: (None)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of evaporator fan motors being controlled
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.14-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.4.14-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
Evaporator Fan Controls	NA	NA	See Table 9.4.14-3

Table 9.4.14-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Grocery	0.06963	523
Restaurant	0.06963	523
Other	0.06963	523

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.14-2)	X	Demand Interactive Effects (average from Table 9.4.14-1)	X	Coincident Diversity Factor (average from Table 9.4.14-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.14-2)	X	Energy Interactive Effects (average from Table 9.4.14-1)	X	Hours of Operation (average from Table 9.4.14-1)

Table 9.4.14-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Evaporator Fan Controls	$146	$60 per motor

9.4.15 ENERGY STAR® Vending Machine

Measure Code: BPR8

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- New Installations only

Eligibility Criteria for New Equipment:

- Must be ENERGY STAR qualified and listed

Loadshape: Loadshape #5 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 14 years

Revision Details: (None)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of machines that are ENERGY STAR®-rated
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.15-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.4.15-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
ENERGY STAR Vending Machine	NA	NA	See Table 9.4.15-3

Table 9.4.15-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
All	0	1,576

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4-15-2)	X	Demand Interactive Effects (average from Table 9-4-15-1)	X	Coincident Diversity Factor (average from Table 9-4-15-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9-4-15-2)	X	Energy Interactive Effects (average from Table 9-4-15-1)	X	Hours of Operation (average from Table 9-4-15-1)

Table 9.4.15-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
ENERGY STAR Vending Machine	$3,500	$3,000	$500	$100 per unit

9.4.16 Beverage Machine Control

Measure Code: BPR9

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- May be an add-on to a new beverage machine or an existing beverage machine without controls

Eligibility Criteria for New Equipment:

- Installed on a refrigerated vending machine that contains only non-perishable bottled and canned beverages
- Must have passive infrared sensor to turn off lights after 15-minutes of unoccupied time
- The control logic should power up the machine at two-hour intervals to maintain product temperature and provide compressor protection.
- Cannot be combined with purchases from the On-line store

Loadshape: Loadshape #5 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 8 years

Revision Details: (None)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of machines that have controls
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.16-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9-4-16-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Beverage Machine Control	NA	NA	See Table 9.4.16-3

Table 9-4-16-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Restaurant, Grocery, and Other	0	1,612

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.16-2)	X	Demand Interactive Effects (average from Table 9.4.16-1)	X	Coincident Diversity Factor (average from Table 9.4.16-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.16-2)	X	Energy Interactive Effects (average from Table 9.4.16-1)	X	Hours of Operation (average from Table 9.4.16-1)

Table 9-4-16-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Beverage Machine Control	$216	$100 per unit

(Cannot be combined with Act On Energy On-line store purchase)

9.4.17 Snack Machine Control

Measure Code: BPR10

Version Date & Revision History:

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Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- May be an add-on to a new snack machine or an existing snack machine.

Eligibility Criteria for New Equipment:

- Must have passive infrared sensor to turn off lights after 15-minutes of unoccupied time
- Cannot be combined with purchases from the On-line store

Loadshape: Loadshape #5 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 8 years

Revision Details: (None)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of machines that have controls
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.17-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.4.17-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
Snack Machine Control	NA	NA	See Table 9.4.17-3

Table 9.4.17-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Lodging	0	387

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.17-2)	X	Demand Interactive Effects (average from Table 9.4.17-1)	X	Coincident Diversity Factor (average from Table 9.4.17-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.17-2)	X	Energy Interactive Effects (average from Table 9.4.17-1)	X	Hours of Operation (average from Table 9.4.17-1)

Table 9.4.17-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost ($)	Incentive Payment ($)
Snack Machine Control	$108	$30 per unit

(Cannot be combined with Act On Energy On-line store purchase)

9.4.18 High Efficiency Ice Makers

Measure Code: BPR20

Version Date & Revision History:

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Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- May be a new installation or replacement of an existing unit

Eligibility Criteria for New Equipment:

- 101-200 lbs/24hr capacity
- Maximum 8.5 kWh per 100 lbs ice

Loadshape: Loadshape #4 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of high-efficiency ice makers
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.18-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.4.18-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Ice Maker (101-200#)	NA	NA	See Table 9.4.18-3

Table 9.4.18-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Restaurant, Grocery, and Other	0.41	3,614

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.18-2)	X	Demand Interactive Effects (average from Table 9.4.18-1)	X	Coincident Diversity Factor (average from Table 9.4.18-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.18-2)	X	Energy Interactive Effects (average from Table 9.4.18-1)	X	Hours of Operation (average from Table 9.4.18-1)

Table 9.4.18-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Ice Maker	$296	$100 per ice maker

9.4.19 High Efficiency Ice Makers

Measure Code: BPR21

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- May be a new installation or replacement of an existing unit

Eligibility Criteria for New Equipment:

- 201-300 lbs/24hr capacity
- Maximum 7.7 kWh per 100 lbs ice

Loadshape: Loadshape #4 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of high-efficiency ice makers
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.19-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.4.19-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Ice Maker (201-300#)	NA	NA	See Table 9.4.19-3

Table 9.4.19-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Restaurant, Grocery, and Other	0.26	2,281

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.19-2)	X	Demand Interactive Effects (average from Table 9.4.19-1)	X	Coincident Diversity Factor (average from Table 9.4.19-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.19-2)	X	Energy Interactive Effects (average from Table 9.4.19-1)	X	Hours of Operation (average from Table 9.4.19-1)

Table 9.4.19-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Ice Maker	$312	$150 per ice maker

9.4.20 High Efficiency Ice Makers

Measure Code: BPR22

Version Date & Revision History:

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Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- May be a new installation or replacement of an existing unit

Eligibility Criteria for New Equipment:

- 301-400 lbs/24hr capacity
- Maximum 6.5 kWh per 100 lbs ice

Loadshape: Loadshape #4 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of high-efficiency ice makers
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.20-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.4.20-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Ice Maker (301-400#)	NA	NA	See Table 9.4.2-3

Table 9.4.20-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Restaurant, Grocery, and Other	0.19	1,661

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.20-2)	X	Demand Interactive Effects (average from Table 9.4.20-1)	X	Coincident Diversity Factor (average from Table 9.4.20-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.20-2)	X	Energy Interactive Effects (average from Table 9.4.20-1)	X	Hours of Operation (average from Table 9.4.20-1)

Table 9.4.20-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Ice Maker	$559	$150 per ice maker

9.4.21 High Efficiency Ice Makers

Measure Code: BPR23

Version Date & Revision History:

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Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- May be a new installation or replacement of an existing unit

Eligibility Criteria for New Equipment:

- 401-500 lbs/24hr capacity
- Maximum 5.5 kWh per 100 lbs ice

Loadshape: Loadshape #4 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of high-efficiency ice makers
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.21-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.4.21-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Ice Maker (401-500#)	NA	NA	See Table 9.4.21-3

Table 9.4.21-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Restaurant, Grocery, and Other	0.28	2,464

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.21-2)	X	Demand Interactive Effects (average from Table 9.4.21-1)	X	Coincident Diversity Factor (average from Table 9.4.21-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.21-2)	X	Energy Interactive Effects (average from Table 9.4.21-1)	X	Hours of Operation (average from Table 9.4.21-1)

Table 9.4.21-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Ice Maker	$981	$175 per ice maker

9.4.22 High Efficiency Ice Makers

Measure Code: BPR24

Version Date & Revision History:

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End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- May be a new installation or replacement of an existing unit

Eligibility Criteria for New Equipment:

- 501-1000 lbs/24hr capacity
- Maximum 5.2 kWh per 100 lbs ice

Loadshape: Loadshape #4 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of high-efficiency ice makers
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.22-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.4.22-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Ice Maker (501-1000#)	NA	NA	See Table 9.4.22-3

Table 9.4.22-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Restaurant, Grocery, and Other	0.34	3,011

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.22-2)	X	Demand Interactive Effects (average from Table 9.4.22-1)	X	Coincident Diversity Factor (average from Table 9.4.22-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.22-2)	X	Energy Interactive Effects (average from Table 9.4.22-1)	X	Hours of Operation (average from Table 9.4.22-1)

Table 9.4.22-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Ice Maker	$1,485	$225 per ice maker

9.4.23 High Efficiency Ice Makers

Measure Code: BPR25

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- May be a new installation or replacement of an existing unit

Eligibility Criteria for New Equipment:

- 1001-1500 lbs/24hr capacity
- Maximum 5.0 kWh per 100 lbs ice

Loadshape: Loadshape #4 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of high-efficiency ice makers
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.23-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.4.23-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Ice Maker (1001-1500#)	NA	NA	See Table 9.4.23-3

Table 9.4.23-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Restaurant, Grocery, and Other	0.47	4,106

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.23-2)	X	Demand Interactive Effects (average from Table 9.4.23-1)	X	Coincident Diversity Factor (average from Table 9.4.23-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.23-2)	X	Energy Interactive Effects (average from Table 9.4.23-1)	X	Hours of Operation (average from Table 9.4.23-1)

Table 9.4.23-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Ice Maker	$1,821	$350 per ice maker

9.4.24 High Efficiency Ice Makers

Measure Code: BPR26

Version Date & Revision History:

Draft date: December 17, 2008
Effective date: December 17, 2008
Revised NA
End date: TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- May be a new installation or replacement of an existing unit

Eligibility Criteria for New Equipment:

- Greater than 1500 lbs/24hr capacity
- Maximum 4.6 kWh per 100 lbs ice

Loadshape: Loadshape #4 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of high-efficiency ice makers
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.24-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.4.24-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Ice Maker (1500# +)	NA	NA	See Table 9.4.24-3

Table 9.4.24-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Restaurant, Grocery, and Other	0.5	4,380

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.24-2)	X	Demand Interactive Effects (average from Table 9.4.24-1)	X	Coincident Diversity Factor (average from Table 9.4.24-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.24-2)	X	Energy Interactive Effects (average from Table 9.4.24-1)	X	Hours of Operation (average from Table 9.4.24-1)

Table 9.4.24-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Ice Maker	$2,194	$350 per ice maker

9.4.25 EC Motor for Walk-In Cooler

Measure Code: BPR4

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	June 1, 2009, and May 2010
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- For replacement of existing standard efficiency shaded-pole evaporator fan motor with Electrically Commutated motor in refrigerated display cases or fan coil in walk-ins

Eligibility Criteria for New Equipment:

- This measure cannot be used in conjunction with the Evaporator Fan Control measure (BPR6)
- Incentives are available for ECM (electronically commutated motor) and PSC (permanent split capacitor) fan motor retrofits in existing refrigerated display cases. New PSC motors must replace shaded pole (S-P) motors. New ECM motors may replace either S-P motors or PSC motors.

Loadshape: Loadshape #5 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details:
6-1-09 – incentive was $50/motor, reduced to $25/motor
5-2010 Split into two measures (BPR4 and BPR19 – previously both measures were encompassed in BPR4)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of motors being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.25-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	1.0	1.0	1.0

Table 9.4.25-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
EC Motor for Walk-in Cooler	NA	NA	See Table 9.4.25-3

Table 9.4.25-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
	Walk-in Cooler	
Grocery	0.056556	398
Restaurant	0.033981	399
Other	0.0452685	398.5

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.25-2)	X	Demand Interactive Effects (average from Table 9.4.25-1)	X	Coincident Diversity Factor (average from Table 9.4.25-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.25-2)	X	Energy Interactive Effects (average from Table 9.4.25-1)	X	Hours of Operation (average from Table 9.4.25-1)

Table 9.4.25-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
EC Motor for Walk-in Cooler	$50	$25/motor

9.4.26 EC Motor for Walk-In Freezer

Measure Code: BPR19

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	May 2010
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- For replacement of existing standard efficiency shaded-pole evaporator fan motor with Electrically Commutated motor in refrigerated display cases or fan coil in walk-ins

Eligibility Criteria for New Equipment:

- This measure cannot be used in conjunction with the Evaporator Fan Controller measure (BPR6)
- Incentives are available for ECM (electronically commutated motor) and PSC (permanent split capacitor) fan motor retrofits in existing refrigerated display cases. New PSC motors must replace shaded pole (S-P) motors. New ECM motors may replace either S-P motors or PSC motors.

Loadshape: Loadshape #5 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: Split into two measures (BPR4 and BPR19 – previously both measures were encompassed in BPR4)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of motors being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.26-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.4.26-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
EC Motor for Walk-in Freezer	NA	NA	See Table 9.4.26-3

Table 9.4.26-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
	Walk-in Freezer	
Grocery	0.068665	631
Restaurant	0.038503	748
Other	0.053584	689.5

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.26-2)	X	Demand Interactive Effects (average from Table 9.4.26-1)	X	Coincident Diversity Factor (average from Table 9.4.26-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.26-2)	X	Energy Interactive Effects (average from Table 9.4.26-1)	X	Hours of Operation (average from Table 9.4.26-1)

Table 9.4.26-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
EC Motor for Walk-in Freezer	$50	$35/motor

9.4.27 EC Motor for Reach-In Cooler

Measure Code: BPR5

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	June 1, 2009, and May 2010
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- For replacement of standard efficiency shaded-pole motor with Electrically Commutated motor

Eligibility Criteria for New Equipment:

- This measure cannot be used in conjunction with the Evaporator Fan Controller measure (BPR6)
- Incentives are available for ECM (electronically commutated motor) and PSC (permanent split capacitor) fan motor retrofits in existing refrigerated display cases. New PSC motors must replace shaded pole (S-P) motors. New ECM motors may replace either S-P motors or PSC motors.

Loadshape: Loadshape #5 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details:
6-1-09 – incentive was $35/ motor, reduced to $25/motor
5-2010 - Split into two measures (BPR5 and BPR18 – previously both measures were encompassed in BPR5)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of motors being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.27-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.4.27-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
EC Motor for Reach-in Cooler	NA	NA	See Table 9.4.27-3

Table 9.4.27-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Grocery	0.033771	350
Restaurant	0.033771	350
Other	0.033771	350

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.27-2)	X	Demand Interactive Effects (average from Table 9.4.27-1)	X	Coincident Diversity Factor (average from Table 9.4.27-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.27-2)	X	Energy Interactive Effects (average from Table 9.4.27-1)	X	Hours of Operation (average from Table 9.4.27-1)

Table 9.4.27-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
EC Motor for Reach-in Cooler	$89	$25/motor

9.4.28 EC Motor for Reach-In Freezer

Measure Code: BPR18

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	May 2010
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- For replacement of standard efficiency shaded-pole motor with Electrically Commutated motor

Eligibility Criteria for New Equipment:

- This measure cannot be used in conjunction with the Evaporator Fan Controller measure (BPR6)
- Incentives are available for ECM (electronically commutated motor) and PSC (permanent split capacitor) fan motor retrofits in existing refrigerated display cases. New PSC motors must replace shaded pole (S-P) motors. New ECM motors may replace either S-P motors or PSC motors.

Loadshape: Loadshape #5 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: Split into two measures (BPR5 and BPR18 – previously both measures were encompassed in BPR5)

Referenced Documents: Refrigeration Standard Measuresv1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_M \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings
N_M = Number of motors being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings

Table 9.4.28-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	1.0	1.0	1.0
School (K-12)	1.0	1.0	1.0
College/University	1.0	1.0	1.0
Retail/Service	1.0	1.0	1.0
Restaurant	1.0	1.0	1.0
Hotel/Motel	1.0	1.0	1.0
Medical	1.0	1.0	1.0
Grocery	1.0	1.0	1.0
Warehouse	1.0	1.0	1.0
Light Industry	1.0	1.0	1.0
Heavy Industry	1.0	1.0	1.0
Average = Miscellaneous	**1.0**	**1.0**	**1.0**

Table 9.4.28-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
EC Motor for Reach-In Freezer	NA	NA	See Table 9.4.28-3

Table 9.4.28-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Grocery	0.036276	462
Restaurant	0.036276	462
Other	0.036276	462

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.28-2)	X	Demand Interactive Effects (average from Table 9.4.28-1)	X	Coincident Diversity Factor (average from Table 9.4.28-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.4.28-2)	X	Energy Interactive Effects (average from Table 9.4.28-1)	X	Hours of Operation (average from Table 9.4.28-1)

Table 9.4.28-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
EC Motor for Reach-In Freezer	$89	$35/motor

9.4.29 Refrigeration Tune Up

Measure Code: BPR11

Version Date & Revision History:

Draft date:	September 29, 2009
Effective date:	September 29, 2009
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Cannot have had tune-up or service agreement within the past 12 months

Eligibility Criteria for New Equipment:

- Commercial and industrial grade (non-residential grade) self-contained and non-self contained freezers and coolers (See Table 4a for the checklist of what must be done during the tune-up.)
- Tune-ups may be completed by internal staff, **ONLY** if approval is granted by Ameren prior to submitting this application.
- “Service Cost” includes standard tune-up labor and parts, but does not include repair parts and labor
- Any business that has had a service contract in the prior 12 months are not eligible for this incentive
- If a new service agreement is established, only the first tune-up is eligible for this incentive
- Pre-approval is required for this measure (even if the incentive request is less than $5,000)

Loadshape: Loadshape #1 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 4 years

Revision Details: None

Referenced Documents: The incremental costs are from the Ameren Illinois Utilities DSM Plan, Appendix B, referenced October 20, 2009. 2004-2005 Database for Energy Efficiency Resources (CA DEER database; 2004-05).

Bonus Incentives offered: None

Supplemental Information Collected on the Application:
COMMERCIAL REFRIGERATION TUNE-UP REQUIREMENTS CHECKLIST COMPLETED AND SUBMITTED WITH THE APPLICATION. In addition, the tune-up service fees must be included (the incentive is capped at 50% of the service cost)
Refrigeration service must include the following normal maintenance items (as applicable):

- ☐ Clean condensor coils
- ☐ Clean evaporator coils
- ☐ Clean drain pan
- ☐ Inspect/clean fans
- ☐ Inspect/repair door seals
- ☐ Check/replace belts and bearings
- ☐ Check suction pressure & temperature

- ☐ Adjust head pressure controls
- ☐ Check/adjust refrigerant level
- ☐ Check oil level, pressure, cleanliness
- ☐ Check sub-cooling & super heat
- ☐ Check liquid line temperature
- ☐ Inspect/adjust heat reclaim operation
- ☐ Tighten all line voltage connections
- ☐ Verify proper operation of defrost heaters
- ☐ Check defrost heater amperage draw
- ☐ Compressor motor amp draw
- ☐ Condenser fan amp draw
- ☐ Verify proper box/product temperature

Algorithms used to calculate savings

Measure Demand Savings ΔkW = NTS x 0.05 kW/ton/year

Measure Energy Savings ΔkWh = NTS x 552 kWh/ton/year

ΔkW = Gross customer connected load kW savings for the measure
NTS = Number of tons served
ΔkWh = Gross customer annual kWh savings for the measure

Table 9.4.29-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Grocery	1.0	1.0	1.0

Table 9.4.29-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Wattage (watts)	Post Tune-up Wattage (watts)	Non-Coincident Demand Savings (kW)
Refrigeration Tune up	NA	NA	See Table 9.4.29-3

Table 9.4.29-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Grocery	0.05	552

Demand Savings Calculation (per tune-up) =

Non-coincident Demand Savings (weighted average from Table 9.4.29-2)	X	Demand Interactive Effects (average from Table 9.4.29-1)	X	Coincident Diversity Factor (average from Table 9.4.29-1)

Energy Savings Calculation (per tune up) =

Non-coincident Demand Savings (weighted average from Table 9.4.29-2)	X	Energy Interactive Effects (average from Table 9.4.29-1)	X	Hours of Operation (average from Table 9.4.29-1)

Table 9.4.29-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment
Refrigeration Tune-up	$35	The lesser of ($20/hp for self-contained units and $20/ton for all other units) **OR** 50% of the service cost

9.5 Motors

The following measures are included in the PY3 Motors program.

9.5 MOTORS		
MOTORS		
9.5.1	**Efficient Motors (ODP and TEFC) - 1-200 hp**	
VFD		
9.5.2	**Variable Frequency Drives (non-HVAC)**	BPM1B

9.5.1 Efficient Motors

Measure Code: N/A

Version Date & Revision History:

Draft date: December 17, 2008
Effective date: December 17, 2008
Revised NA
End date: December 31, 2010 (estimated, as stated on application) – actually removed from the app/web site on 1-14-11

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Only new or replacement of failed motors are eligible – "stocked" motors are not eligible

Eligibility Criteria for New Equipment:

- An existing open drip-proof or totally enclosed fan-cooled motor 200 hp or less in size. Motors exceeding 200 hp can utilize the Custom Program.
- High-efficiency motors must be three-phase ODP (Open Drip Proof) or TEFC (Totally Enclosed Fan Cooled) motors that have nominal speeds of 1200, 1800, or 3600 RPM.
- Only NEMA Premium Efficiency motors are eligible. (Customer-provided "NEMA Nominal Efficiency" is used for savings calculations.)
- See Table below for efficiency minimum requirements

MOTOR MINIMUM EFFICIENCIES REQUIREMENTS							
OPEN DRIP-PROOF MOTORS (ODP)				TOTALLY ENCLOSED FAN-COOLED MOTORS (TEFC)			
Size (hp)	Speed (RPM)			Size (hp)	Speed (RPM)		
	1200	1800	3600		1200	1800	3600
	NEMA Nominal Efficiency				NEMA Nominal Efficiency		
1	82.5%	85.5%	77.0%	1	82.5%	85.5%	77.0%
1.5	86.5%	86.5%	84.0%	1.5	87.5%	86.5%	84.0%
2	87.5%	86.5%	85.5%	2	88.5%	86.5%	85.5%
3	88.5%	89.5%	85.5%	3	89.5%	89.5%	86.5%
5	89.5%	89.5%	86.5%	5	89.5%	89.5%	88.5%
7.5	90.2%	91.0%	88.5%	7.5	91.0%	91.7%	89.5%
10	91.0%	91.7%	89.5%	10	91.0%	91.7%	90.2%
15	91.7%	93.0%	90.2%	15	91.7%	92.4%	91.0%
20	92.4%	93.0%	91.0%	20	91.7%	93.0%	91.0%
25	93.0%	93.6%	91.7%	25	93.0%	93.6%	91.7%
30	93.6%	94.1%	91.7%	30	93.0%	93.6%	91.7%
40	94.1%	94.1%	92.4%	40	94.1%	94.1%	92.4%
50	94.1%	94.5%	93.0%	50	94.1%	94.5%	93.0%
60	94.5%	95.0%	93.6%	60	94.5%	95.0%	93.6%
75	94.5%	95.0%	93.6%	75	94.5%	95.4%	93.6%
100	95.0%	95.4%	93.6%	100	95.0%	95.4%	94.1%
125	95.0%	95.4%	94.1%	125	95.0%	95.4%	95.0%
150	95.4%	95.8%	94.1%	150	95.8%	95.8%	95.0%
200*	95.4%	95.8%	95.0%	200*	95.8%	96.2%	95.4%

*Motors over 200 hp may be eligible for incentives through the Custom program.

Loadshape: Loadshape #2 (Table 6.0-1).

Persistence: The persistence factor is assumed to be one.

Lifetimes: 15 years

Revision Details: 1-14-11 this program was removed, now that NEMA premium motors are the standard – they are no longer considered energy-efficient.

Referenced Documents: Motors Standard Measures v1.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: In addition to motor specifications the application also requests: Motor Function, Motor Location, and Weekly Hours of Equipment Operation.

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_M \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kW_S \times N_M \times ISR \times Hours$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings, based on the motor size and type
N_U = Number of units being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings, based on the motor size and type
Hours = Weekly hours of use as reported on application times 52 (weeks per year)

Table 9.5.1-1 Energy Factor Assumptions

Open Drip-proof Motor (ODP)				
Size (HP)	**Demand Interactive Effects**	**Coincident Diversity Factors**	**Energy Interactive Effects**	**Annual kW Coincident Peak Savings (kW)**
1	1	1	1	0.04
1.5	1	1	1	0.04
2	1	1	1	0.06
3	1	1	1	0.08
5	1	1	1	0.11
7.5	1	1	1	0.25
10	1	1	1	0.39
15	1	1	1	0.53
20	1	1	1	0.66
25	1	1	1	0.98
30	1	1	1	0.99
40	1	1	1	1.33
50	1	1	1	1.36
60	1	1	1	1.57
75	1	1	1	1.95
100	1	1	1	2.54
125	1	1	1	3.02
150	1	1	1	3.49
200	1	1	1	4.42

Table 9.5.1-1 Energy Factor Assumptions (cont.)

Totally Enclosed Fan-cooled Motors (TEFC)				
Size (HP)	**Demand Interactive Effects**	**Coincident Diversity Factors**	**Energy Interactive Effects**	**Annual kW Coincident Peak Savings (kW)**
1	1	1	1	0.04
1.5	1	1	1	0.05
2	1	1	1	0.06
3	1	1	1	0.08
5	1	1	1	0.12
7.5	1	1	1	0.26
10	1	1	1	0.41
15	1	1	1	0.56
20	1	1	1	0.65
25	1	1	1	0.90
30	1	1	1	0.90
40	1	1	1	1.19
50	1	1	1	1.19
60	1	1	1	1.43
75	1	1	1	1.79
100	1	1	1	2.39
125	1	1	1	2.85
150	1	1	1	3.31
200	1	1	1	4.31

Demand Savings Calculation (per motor) =

Non-coincident Demand Savings (weighted average from Table 9.5.1-1)	X	Demand Interactive Effects (average from Table 9.5.1-1)	X	Coincident Diversity Factor (average from Table 9.5.1-1)

Energy Savings Calculation (per motor) =

Non-coincident Demand Savings (weighted average from Table 9.5.1-1)	X	Energy Interactive Effects (average from Table 9.5.1-1)	X	Hours of Operation (from application form X 52 weeks per year)

Table 9.5.1-2 Measure Costs (Parts and Labor) and Incentive Levels

Size (HP)	Incremental Cost	Incentive Payment	Incremental Cost	Incentive Payment
	Open Drip-proof Motor (ODP)		Totally Enclosed Fan-cooled Motors (TEFC)	
1	$32	$7	$54	$7
1.5	$33	$9	$53	$9
2	$43	$11	$71	$11
3	$44	$16	$69	$16
5	$55	$20	$85	$20
7.5	$158	$35	$209	$35
10	$260	$45	$334	$45
15	$298	$60	$508	$60
20	$457	$75	$636	$75
25	$678	$80	$1,113	$80
30	$764	$90	$1,316	$90
40	$1,019	$100	$1,755	$100
50	$1,192	$125	$2,162	$125
60	$1,509	$150	$3,088	$150
75	$1,918	$175	$4,065	$175
100	$2,644	$250	$5,969	$250
125	$3,980	$275	$7,581	$275
150	$5,315	$325	$9,194	$325
200	$8,182	$450	$10,969	$450

9.5.2 Variable Frequency Drives (non-HVAC)

Measure Code: BPM1B

Version Date & Revision History:

Draft date:	December 17, 2008
Effective date:	December 17, 2008
Revised	NA
End date:	December 31, 2010 (estimated)

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Any size

Eligibility Criteria for New Equipment:

- Must be used in conjunction with pumping or air-handling applications
- Minimum equipment operating hours 2,000/year
- Must be installed on an AC motor (DC motors are not eligible)
- May not exceed 500 hp (over 500hp may be eligible under the custom program)
- Redundant/backup units do not qualify
- Routine replacements of existing VFDs do not qualify
- System must be controlled by differential pressure, flow, temperature, or other control variable
- Application must have significant load diversity. Applications meant for power conditioning and other non-varying loads are not eligible
- VFDs must be functional (installed and ready to operate) by May 31, 2011
- External labor may be included in the project cost (but not internal labor)

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: EM&V memo dated December 14, 2010 (ODC Memo Regarding Motors Dated 10-14-10.doc). Toshiba Energy Saving Software (Motors and Drives) CD.

Bonus Incentives offered: 1-4-10 Incentive increased to $75/ hp controlled (previously $45) – renamed “BPM1B”. Originally set to return to $45 on 3-31-10, but was instead extended to 5-31-11. In addition, the cap that stated the incentive could be no more than 50% of the project cost was increased so that the incentive could be up to 75% of the project cost.

Supplemental Information Collected on the Application

VFD Use (pick one)	Control before VFD	Manufacturer and Model Number of VFD	Cost of VFD/ External labor	Annual Operating Hours	HP Controlled by VFD
☐ Process Fan ☐ HVAC Fan ☐ Cooling Tower Fan ☐ Boiler Draft Fan ☐ HVAC Heating Pump ☐ Chilled Water Distribution Pump ☐ Process Pump ☐ Drive System (Specify): ________________ ☐ Other (specify): ____________	☐ Outlet Control Valve ☐ Bypass Valve ☐ Discharge Damper ☐ Inlet Guide Vanes ☐ Other (specify): ______________________		$ ____________ (VFD cost) $ ____________ (External labor cost) **<u>The incentive may not be more than 75% of these combined costs</u>**	________ (must be at least 2,000 hrs)	____________ (500 hp maximum per VFD)

Algorithms used to calculate savings

Measure Demand Savings NA

Measure Energy Savings $\Delta kWh = \Delta\ kWh_S \times N_L \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
N_L = Number of vfds being installed
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per vfd

9.5.2-1 Calculated Energy Savings

Per the EM&V memo dated 12/14/2010:

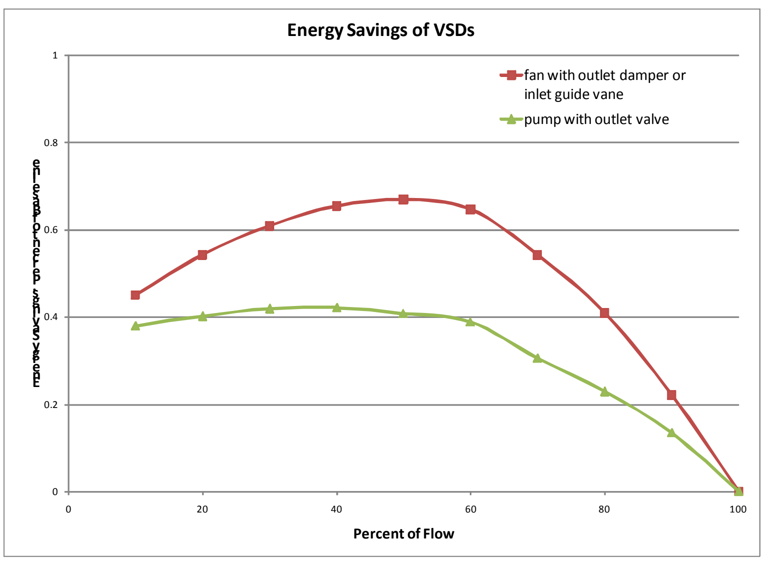
> If load profiles are not available (which will most often to be the case), we propose setting a limit on savings of 67% of the baseline energy use for fan VSDs, 42% for pump VSDs, and 67% on all “other” types of VFD use. The graph below illustrates the reason why we chose these limits. To create this figure, we used the Toshiba software to calculate how much the percentage energy savings changes as all hours in the VSD load profile are set to 90% flow, 80%, 70%...down to 10% flow. The energy savings of a VSD is plotted, compared motors driving fans with outlet dampers or inlet guide vanes (Toshiba results are the same for these), and motors driving pumps controlled by outlet valves. This demonstrates that the upper limit on savings for fans is 67%, and for pumps it is 42%.

And the baseline energy use calculated as described below in the evaluation report:

> Baseline usage was estimated assuming non-HVAC motors are standard efficiency, 1800 rpm TEFC motors with a load factor of 0.75, drawing our motor efficiency data from the Ameren PY2 TRM, with operating hours as shown in AIB tracking data.

So, the annual energy savings to be reported in AIB for PY3 and going forward would be the minimum of the following:

> *Baseline annual energy use times 42% for pump applications*
> *Baseline annual energy use times 67% for fan applications*



Toshiba energy calculator using site-specific information

Source: *ODC Memo Regarding Motors Dated 10-14-10.doc)*

Table 9.5.2-2 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
VFD (non-HVAC)	$125	$0	$125	$75*

*(incentive may not exceed 75% of the project cost)

9.6 Water Heaters

The following measures are included in the PY3 Water Heater program.

9.6 WATER HEATERS		
	Measure	**Code**
9.6.1	**High Efficiency Tanked Water heater (electric)**	BPWH1 NEW
9.6.2	**High Efficiency Tankless Water Heater (electric)**	BPWH2 NEW
9.6.3	**High Efficiency Tankless Water Heater (gas)**	BPWH3 NEW
9.6.4	**High Efficiency Condensing Tanked Water Heater (gas)**	BPWH4 NEW
9.6.5	**High Efficiency Tanked Water Heater (gas)**	BPWH5 NEW

9.6.1 High Efficiency Tanked Water Heater (electric)

Measure Code: BPWH1

Version Date & Revision History:

Draft date:	May 24, 2010
Effective date:	May 24, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replace ELECTRIC commercial-grade tanked water heater with 50 or more gallon storage capacity and input wattage between 12 and 54kW
- Energy factor less than or equal to 0.90, or water heater is five or more years old

Eligibility Criteria for New Equipment:

- New Equipment must be electric powered
- Energy factor greater than or equal to 0.95
- Minimum Thermal Efficiency of 0.98
- Less than 3% standby loss (standby loss is calculated as percentage of annual energy usage)
- Equivalent storage capacity to unit being replaced
- Qualified units must be GAMA/AHRI efficiency rating certified (the certified reference number must be provided and a copy of the certificate of product performance must be included with the application.)

Loadshape: Loadshape #5

Persistence: The persistence factor is assumed to be one.

Lifetimes: 5 years

Revision Details: (None)

Referenced Documents: Food Service Technology Center Reports (5011.07.04 & 5011.07.19)
AOE Calculations, Commercial Electric Water Heaters.xlsx
Air-Conditioning, Heating and Refrigeration Institute (AHRI) Certified Product Performance
<http://cafs.ahrinet.org/gama_cafs/sdpsearch/search.jsp?table=CWH> accessed 4/1/2010

Bonus Incentives offered: None

Supplemental Information Collected on the Application: Capacity of the new heater (50-79 gallons, 80-99 gallons, or 100+ gallons)

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kWh_S \times N_{WH} / H \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_{WH} \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load KW savings per water heater
N_{WH} = Number of water heaters being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per unit = $(kWh_B / EF_O) – (kWh_B / EF_N)$
kWh_B = Estimated typical annual energy usage of ideal unit (EF assumed to be 1)
H = Hours of operation (assumed to be 8760)
EF_O = Energy factor of old unit (~0.9)
EF_N = Energy factor of new unit (~0.95)

Table 9.6.1-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
All	1	1	1

*Hours are assumed to be 8760 due to that storage water heaters are designed to keep water at a set temp and total usage is averaged over a one year period.

Table 9.6.1-2 Specifications and Calculated Non-coincident Demand Savings

Typical Tank Size (gal)	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Typical 50	3.76	3.55	0.20
Typical 80	10.11	9.55	0.57
Typical 100	16.48	15.53	0.94

Table 9.6.1-3 Calculated Demand and Energy Savings by Type of Business

Typical Tank Size (gal)	Demand Savings (kW)	Energy Savings (kWh)
Typical 50	0.20	1,780.85
Typical 80	0.57	4,962.69
Typical 100	0.94	8,273.63

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.6.1-2)	X	Demand Interactive Effects (average from Table 9.6.1-1)	X	Coincident Diversity Factor (average from Table 9.6.1-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.6.1-2)	X	Energy Interactive Effects (average from Table 9.6.1-1)	X	Hours of Operation (average from Table 9.6.1-1)

Table 9.6.1-4 Measure Costs (Parts and Labor) and Incentive Levels

Typical Tank Size (gal)	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Typical 50	$1,800	$750	$1,050	$150
Typical 80	$2,250	$1,200	$1,050	$150
Typical 100	$3,750	$1,800	$1,950	$150

9.6.2 High Efficiency Tankless Water Heater (electric)

Measure Code: BPWH2

Version Date & Revision History:

Draft date:	May 24, 2010
Effective date:	May 24, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replace ELECTRIC commercial-grade tanked water heater 50 or more gallon storage capacity
- Energy factor less than or equal to 0.90, or water heater is five or more years old

Eligibility Criteria for New Equipment:

- New Equipment must be electric powered
- Energy factor greater than or equal to 0.98
- Instantaneous water heater with greater than or equal to 5 GPM output at 70° F temperature rise

Loadshape: Loadshape #5

Persistence: The persistence factor is assumed to be one.

Lifetimes: 5 years

Revision Details: (None)

Referenced Documents: Food Service Technology Center Reports (5011.07.04 & 5011.07.19)
AOE Calculations, Commercial Electric Water Heaters.xlsx
Air-Conditioning, Heating and Refrigeration Institute (AHRI) Certified Product Performance
<http://cafs.ahrinet.org/gama_cafs/sdpsearch/search.jsp?table=CWH> accessed 4/1/2010

Bonus Incentives offered: None

Supplemental Information Collected on the Application: Capacity of the new heater

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kWh_S \times N_{WH} / H \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_{WH} \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load KW savings per water heater
N_{WH} = Number of water heaters being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per unit = $(kWh_B / EF_O) - (kWh_B / EF_N)$
kWh_B = Estimated typical annual energy usage of ideal unit (EF assumed to be 1)
H = Hours of operation (assumed to be 8760)
EF_O = Energy factor of old unit (~0.9)
EF_N = Energy factor of new unit (~0.95 to 0.99)

Table 9.6.2-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
All	1	1	1

*Hours are assumed to be 8760 due to that storage water heaters are designed to keep water at a set temp and total usage is averaged over a one year period.

Table 9.6.2-2 Specifications and Calculated Non-coincident Demand Savings

Output (gpm) at delta T 70	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
5.0	3760	3420	0.34
10.0	10110	9210	0.90
15.0	16480	15010	1.47

Table 9.6.2-3 Calculated Demand and Energy Savings by Type of Business

Output (gpm) at delta T 70	Demand Savings (kW)	Energy Savings (kWh)
5.0	0.34	2,991.98
10.0	0.90	7,904.82
15.0	1.47	12,878.51

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.6.2-2)	X	Demand Interactive Effects (average from Table 9.6.2-1)	X	Coincident Diversity Factor (average from Table 9.6.2-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.6.2-2)	X	Energy Interactive Effects (average from Table 9.6.2-1)	X	Hours of Operation (average from Table 9.6.2-1)

Table 9.6.2-4 Measure Costs (Parts and Labor) and Incentive Levels

Output (gpm) at delta T 70	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
5.0	$1,800.00	$750.00	$1,050.00	$300/heater
10.0	$2,250.00	$1,200.00	$1,050.00	$300/heater
15.0	$3,750.00	$1,800.00	$1,950.00	$300/heater

9.6.3 High Efficiency Tankless Water Heater (gas)

Measure Code: BPWH3

Version Date & Revision History:

Draft date:	May 24, 2010
Effective date:	May 24, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replace GAS commercial-grade tanked water heater 50 or more gallon storage capacity
- Energy factor less than or equal to 0.60, or water heater is five or more years old
- Must have an Ameren Illinois Gas Delivery Service Rate of GDS2 to be eligible.

Eligibility Criteria for New Equipment:

- New equipment must be gas powered
- Energy factor greater than or equal to 0.82
- Instantaneous water heater with 5 or more GPM output at 70° F temperature rise

Loadshape: Loadshape #5

Persistence: The persistence factor is assumed to be one.

Lifetimes: 5 years

Revision Details: (None)

Referenced Documents: Food Service Technology Center Reports (5011.07.04 & 5011.07.19)

Bonus Incentives offered: None

Supplemental Information Collected on the Application: Capacity of the new heater
AOE Calculations, Commercial Electric Water Heaters.xlsx
Air-Conditioning, Heating and Refrigeration Institute (AHRI) Certified Product Performance
<http://cafs.ahrinet.org/gama_cafs/sdpsearch/search.jsp?table=CWH> accessed 4/1/2010

Algorithms used to calculate savings

Measure Demand Savings ΔkW = not evaluated for gas units

Measure Energy Savings Δtherms = Δtherms $_S$ x N x ISR

ΔkW = Gross customer connected load kW savings for the measure
Δtherms = Gross customer annual therms savings for the measure
N = Number of units being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔTherms $_S$ = Gross customer therm savings per unit = ($therms_B$ / EF_O) – ($therms_B$ / EF_N)
$Therms_B$ = Estimated typical annual energy usage of ideal unit (EF assumed to be 1)
EF_O = Energy factor of old unit (~0.6)
EF_N = Energy factor of new unit (~0.82 to 0.85)

Table 9.6.3-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
All	1	1	1

*Hours are assumed to be 8760 due to that storage water heaters are designed to keep water at a set temp and total usage is averaged over a one year period.

Table 9.6.3-2 Specifications and Calculated Savings

Output (gpm) at delta T 70	Base Unit Therms	Retrofit Unit Therms
5.0	1,684.92	1,232.87
10.0	4,543.95	3,324.84
15.0	7,402.99	5,416.82

Table 9.6.3-3 Calculated Demand and Energy Savings by Output

Output (gpm) at delta T 70	Energy Savings (therms)
5.0	452.05
10.0	1,219.11
15.0	1,986.17

Table 9.6.3-4 Measure Costs (Parts and Labor) and Incentive Levels

Output (gpm) at delta T 70	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
5.0	$2,250	$750	$1,500	$300/heater
10.0	$2,700	$1,200	$1,500	$300/heater
15.0	$4,200	$1,800	$2,400	$300/heater

9.6.4 High Efficiency Condensing Tanked Water Heater (gas)

Measure Code: BPWH4

Version Date & Revision History:

Draft date:	May 24, 2010
Effective date:	May 24, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replace GAS commercial–grade tanked water heater 50 or more gallon storage capacity
- Energy factor less than or equal to 0.60, or water heater is five or more years old
- Input greater than or equal to 75 MBTUH
- Must have an Ameren Illinois Gas Delivery Service Rate of GDS2 to be eligible.

Eligibility Criteria for New Equipment:

- New equipment must be gas powered
- Energy factor greater than or equal to 0.80
- Equivalent storage capacity to the unit being replaced

Loadshape: Loadshape #5

Persistence: The persistence factor is assumed to be one.

Lifetimes: 5 years

Revision Details: (None)

Referenced Documents: Food Service Technology Center Reports (5011.07.04 & 5011.07.19)

Bonus Incentives offered: None

Supplemental Information Collected on the Application: Capacity of the new heater (50-79 gallons, 80-99 gallons, or 100+ gallons)
AOE Calculations, Commercial Electric Water Heaters.xlsx
Air-Conditioning, Heating and Refrigeration Institute (AHRI) Certified Product Performance
<http://cafs.ahrinet.org/gama_cafs/sdpsearch/search.jsp?table=CWH> accessed 4/1/2010

Algorithms used to calculate savings

Measure Demand Savings ΔkW = not evaluated for gas units

Measure Energy Savings Δtherms = Δtherms $_S$ x N x ISR

ΔkW = Gross customer connected load kW savings for the measure
Δtherms = Gross customer annual therms savings for the measure
N = Number of units being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔTherms $_S$ = Gross customer therm savings per unit = (therms$_B$ / EF$_O$) – (therms$_B$ / EF$_N$)
Therms$_B$ = Estimated typical annual energy usage of ideal unit (EF assumed to be 1)
EF$_O$ = Energy factor of old unit (~0.6)
EF$_N$ = Energy factor of new unit (~0.80 to 0.85)

Table 9.6.4-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
All	1	1	1

*Hours are assumed to be 8760 due to that storage water heaters are designed to keep water at a set temp and total usage is averaged over a one year period.

Table 9.6.4-2 Specifications and Calculated Savings

Typical Tank Size (gal)	Base Unit Therms	Retrofit Unit Therms
Typical 50	1,684.92	1,225.82
Typical 80	4,543.95	3,425.47
Typical 100	7,402.99	5,241.83

Table 9.6.4-3 Calculated Demand and Energy Savings by Type of Business

Typical Tank Size (gal)	Energy Savings (therms)
Typical 50	459.10
Typical 80	1,118.48
Typical 100	2,161.16

Table 9.6.4-4 Measure Costs (Parts and Labor) and Incentive Levels

Typical Tank Size (gal)	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Typical 50	$1,800.00	$750.00	$1,050.00	$300/heater
Typical 80	$2,250.00	$1,200.00	$1,050.00	$300/heater
Typical 100	$3,750.00	$1,800.00	$1,950.00	$300/heater

9.6.5 High Efficiency Tanked Water Heater (gas)

Measure Code: BPWH5

Version Date & Revision History:

Draft date:	May 24, 2010
Effective date:	May 24, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replace GAS commercial-grade tanked water heater 50 or more gallon storage capacity
- Energy factor less than or equal to 0.60, or water heater is five or more years old
- Input greater than or equal to 75 MBTUH
- Must have an Ameren Illinois Gas Delivery Service Rate of GDS2 to be eligible.

Eligibility Criteria for New Equipment:

- New equipment must be gas powered
- Energy factor greater than or equal to 0.65
- Equivalent storage capacity to unit being replaced
- Qualified units must be GAMA/AHRI efficiency rating certified (the certified reference number must be provided and a copy of the certificate of product performance must be included with the application.)

Loadshape: Loadshape #5

Persistence: The persistence factor is assumed to be one.

Lifetimes 5 years

Revision Details: (None)

Referenced Documents: Food Service Technology Center Reports (5011.07.04 & 5011.07.19)

Bonus Incentives offered: None

Supplemental Information Collected on the Application: Capacity of the new heater (50-79 gallons, 80-99 gallons, or 100+ gallons)
AOE Calculations, Commercial Electric Water Heaters.xlsx
Air-Conditioning, Heating and Refrigeration Institute (AHRI) Certified Product Performance <http://cafs.ahrinet.org/gama_cafs/sdpsearch/search.jsp?table=CWH> accessed 4/1/2010

Algorithms used to calculate savings

Measure Demand Savings ΔkW = not evaluated for gas units

Measure Energy Savings $\Delta therms = \Delta therms_S \times N \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
$\Delta therms$ = Gross customer annual therms savings for the measure
N = Number of units being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
$\Delta Therms_S$ = Gross customer therm savings per unit = $(therms_B / EF_O) - (therms_B / EF_N)$
$Therms_B$ = Estimated typical annual energy usage of ideal unit (EF assumed to be 1)
EF_O = Energy factor of old unit (~0.6)
EF_N = Energy factor of new unit (~0.65 to 0.7)

Table 9.6.5-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
All	1	1	1

*Hours are assumed to be 8760 due to that storage water heaters are designed to keep water at a set temp.

Table 9.6.5-2 Specifications and Calculated Savings

Typical Tank Size (gal)	Base Fixture Wattage (therms)	Retrofit Fixture Wattage (therms)
Typical 50	1,684.92	1,555.31
Typical 80	4,543.95	4,194.42
Typical 100	7,402.99	6,833.53

Table 9.6.5-3 Calculated Demand and Energy Savings by Type of Business

Typical Tank Size (gal)	Demand Savings (therms)
Typical 50	129.61
Typical 80	349.53
Typical 100	569.46

Table 9.6.5-4 Measure Costs (Parts and Labor) and Incentive Levels

Typical Tank Size (gal)	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Typical 50	$1,800.00	$750.00	$1,050.00	$150/heater
Typical 80	$2,250.00	$1,200.00	$1,050.00	$150/heater
Typical 100	$3,750.00	$1,800.00	$1,950.00	$150/heater

9.6.6 Supplemental Plumbing Measures

Measure Code: None

Version Date & Revision History:

Draft date:	September 2010
Effective date:	September, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replacing failed equipment or new installation

Eligibility Criteria for New Equipment:

- Must be GDS-2 customer

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: TBD

Revision Details: (None)

Referenced Documents: Summit Blue Illinois Potential Study

These incentives and savings are entered directly into AIB, and are based on the numbers below:

Measure	Amount paid to contractors*	Therm savings	kW savings	kWh savings	Lifetime
Faucet Aerator	$10 each	6.1	0	82	15 years
Pipe Insulation	$10 per water heater	8.1	0	109	15 years
Low-Flow Shower Head	$10 each	15.2	0	204	9 years

*parts are not supplied by Act On energy

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

9.7 Commercial Kitchen Equipment

The following measures are included in the PY3 Commercial Kitchen program.

9.7 COMMERCIAL KITCHEN EQUIPMENT		
	Measure	**Code**
Kitchen Equipment		
9.7.1	**Steamer (3 pan)**	BPCK1 NEW
9.7.2	**Steamer (4 pan)**	BPCK2 NEW
9.7.3	**Steamer (5 pan)**	BPCK3 NEW
9.7.4	**Steamer (6 pan)**	BPCK4 NEW
9.7.5	**Hot Holding Cabinet (half)**	BPCK5 NEW
9.7.6	**Hot Holding Cabinet (3/4)**	BPCK6 NEW
9.7.7	**Hot Holding Cabinet (full)**	BPCK7 NEW
9.7.8	**Griddle**	BPCK8 NEW
9.7.9	**5-pan Steamer (gas)**	BPCK9 NEW
9.7.10	**6-pan Steamer (gas)**	BPCK10 NEW
9.7.11	**Griddle (gas)**	BPCK11 NEW
9.7.12	**Fryer (gas)**	BPCK12 NEW
9.7.13	**Dishwasher - High Temperature (includes booster heater)**	BPCK13 NEW
9.7.14	**Dishwasher - Low Temperature (no booster heater)**	BPCK14 NEW
9.7.15	**Green Nozzle**	NA

9.7.1 Steamer (3-Pan)

Measure Code: BPCK1

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- 3-, 4-, 5-, or 6-pan electric steamer

Eligibility Criteria for New Equipment:

- Electric 3 Pan Steamer
- ENERGY STAR® qualified

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: The data and calculations can be found on “AOE Commercial Kitchen Data.xls”

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW = Gross customer connected load kW savings per unit
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh = Gross customer connected load kWh savings

Table 9.7.1-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Commercial Kitchen	1.0	1.0	1.0

Table 9.7.1-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
3-Pan Steamer	NA	NA	See Table 9.7.1-3

Table 9.7.1-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Commercial Kitchen	1	4,419

Source: AOE Commercial Kitchen Data.xls

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.7.1-2)	X	Demand Interactive Effects (average from Table 9.7.1-1)	X	Coincident Diversity Factor (average from Table 9.7.1-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.7.1-2)	X	Energy Interactive Effects (average from Table 9.7.1-1)	X	Hours of Operation (average from Table 9.7.1-1)

Table 9.7.1-4 Measure Costs (Parts and Labor) and Incentive Levels

Steamer	Incremental Cost	Incentive Payment
3-pan Steamer	$2,490	$300/steamer

9.7.2 Steamer (4-Pan)

Measure Code: BPCK2

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- 4-, 5-, or 6-pan electric steamer

Eligibility Criteria for New Equipment:

- Electric 4 Pan Steamer
- ENERGY STAR® qualified

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: The data and calculations can be found on “AOE Commercial Kitchen Data.xls”

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW = Gross customer connected load kW savings per unit
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh = Gross customer connected load kWh savings

Table 9.7.2-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Commercial Kitchen	1.0	1.0	1.0

Table 9.7.2-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
4-Pan Steamer	NA	NA	See Table 9.7.2-3

Table 9.7.2-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Commercial Kitchen	1.2	5277

Source: AOE Commercial Kitchen Data.xls

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.7.2-2) X Demand Interactive Effects (average from Table 9.7.2-1) X Coincident Diversity Factor (average from Table 9.7.2-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.7.2-2) X Energy Interactive Effects (average from Table 9.7.2-1) X Hours of Operation (average from Table 9.7.2-1)

Table 9.7.2-4 Measure Costs (Parts and Labor) and Incentive Levels

Steamer	Incremental Cost	Incentive Payment
4-pan Steamer	$2,490	$350/steamer

9.7.3 Steamer (5-Pan)

Measure Code: BPCK3

Version Date & Revision History:

Draft date: May 3, 2010
Effective date: May 3, 2010
Revised NA
End date: TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- 5-, or 6-pan electric steamer

Eligibility Criteria for New Equipment:

- Electric 5 Pan Steamer
- ENERGY STAR® qualified

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: The data and calculations can be found on “AOE Commercial Kitchen Data.xls”

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times ISR$

ΔkW	= Gross customer connected load kW savings for the measure
ΔkW	= Gross customer connected load kW savings per unit
ISR	= In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh	= Gross customer annual kWh savings for the measure
ΔkWh	= Gross customer connected load kWh savings

Table 9.7.3-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Commercial Kitchen	1.0	1.0	1.0

Table 9.7.3-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
5-Pan Steamer	NA	NA	See Table 9.7.3-3

Table 9.7.3-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Commercial Kitchen	1.4	6135

Source: AOE Commercial Kitchen Data.xls

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.7.3-2)	X	Demand Interactive Effects (average from Table 9.7.3-1)	X	Coincident Diversity Factor (average from Table 9.7.3-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.7.3-2)	X	Energy Interactive Effects (average from Table 9.7.3-1)	X	Hours of Operation (average from Table 9.7.3-1)

Table 9.7.3-4 Measure Costs (Parts and Labor) and Incentive Levels

Steamer	Incremental Cost	Incentive Payment
5-pan Steamer	$2,490	$400/steamer

9.7.4 Steamer (6-Pan)

Measure Code: BPCK4

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- 6-pan electric steamer

Eligibility Criteria for New Equipment:

- Electric 6 Pan Steamer
- ENERGY STAR® qualified

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: The data and calculations can be found on “AOE Commercial Kitchen Data.xls”

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times ISR$

ΔkW	= Gross customer connected load kW savings for the measure
ΔkW	= Gross customer connected load kW savings per unit
ISR	= In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh	= Gross customer annual kWh savings for the measure
ΔkWh	= Gross customer connected load kWh savings

Table 9.7.4-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Commercial Kitchen	1.0	1.0	1.0

Table 9.7.4-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
6-Pan Steamer	NA	NA	See Table 9.7.4-3

Table 9.7.4-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Commercial Kitchen	1.6	6993

Source: AOE Commercial Kitchen Data.xls

Demand Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.7.4-2)	X	Demand Interactive Effects (average from Table 9.7.4-1)	X	Coincident Diversity Factor (average from Table 9.7.4-1)

Energy Savings Calculation (per unit) =

Non-coincident Demand Savings (weighted average from Table 9.7.4-2)	X	Energy Interactive Effects (average from Table 9.7.4-1)	X	Hours of Operation (average from Table 9.7.4-1)

Table 9.7.4-4 Measure Costs (Parts and Labor) and Incentive Levels

Steamer	Incremental Cost	Incentive Payment

6-pan Steamer	$2,490	$450/steamer

9.7.5 Hot Holding Cabinet (Half)

Measure Code: BPCK5

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Electric hot holding cabinet

Eligibility Criteria for New Equipment:

- Electric – Half-Size Cabinet (< 10cu ft)
- ENERGY STAR qualified

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: The data and calculations can be found on “AOE Commercial Kitchen Data.xls”

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta\ kW_S \times ISR$

Measure Energy Savings $\Delta kWh = \Delta\ kWh_S \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings per ft^3
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per ft^3

Table 9.7.5-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Commercial Kitchen	1.0	1.0	1.0

Table 9.7.5-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Hot Holding Cabinet (Half)	NA	NA	See Table 9.7.5-3

Table 9.7.5-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Commercial Kitchen	0.5464	2993

Source: AOE Commercial Kitchen Data.xls

Demand Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.7.5-2)	X	Demand Interactive Effects (average from Table 9.7.5-1)	X	Coincident Diversity Factor (average from Table 9.7.5-1)

Energy Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.7.5-2)	X	Energy Interactive Effects (average from Table 9.7.5-1)	X	Hours of Operation (average from Table 9.7.5-1)

Table 9.7.5-4 Measure Costs (Parts and Labor) and Incentive Levels

Hot Holding Cabinet	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment

Half Size	$2,069	$3,782	$1,713	$200/cabinet

9.7.6 Hot Holding Cabinet (3/4)

Measure Code: BPCK6

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Three quarter or full size electric hot holding cabinet

Eligibility Criteria for New Equipment:

- Electric – Three-Quarter Cabinet (10 < 16 cu ft)
- ENERGY STAR qualified

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: The data and calculations can be found on “AOE Commercial Kitchen Data.xls”

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings per ft^3
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per ft^3

Table 9.7.6-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Commercial Kitchen	1.0	1.0	1.0

*5,475 hours a years; based on 15 hours a day, 365 days a year

Table 9.7.6-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Hot Holding Cabinet (3/4)	NA	NA	See Table 9.7.6-3

Table 9.7.6-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Commercial Kitchen	0.8196	4489.5

Source: AOE Commercial Kitchen Data.xls

Demand Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.7.6-2) X Demand Interactive Effects (average from Table 9.7.6-1) X Coincident Diversity Factor (average from Table 9.7.6-1)

Energy Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.7.6-2) X Energy Interactive Effects (average from Table 9.7.6-1) X Hours of Operation (average from Table 9.7.6-1)

Table 9.7.6-4 Measure Costs (Parts and Labor) and Incentive Levels

Hot Holding Cabinet	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment

Three Quarter Size	$2,069	$3,782	$1,713	$300/cabinet

9.7.7 Hot Holding Cabinet (full)

Measure Code: BPCK7

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:
- Full size electric hot holding cabinet

Eligibility Criteria for New Equipment:
- Electric – Full-Size Cabinet (> 16 cu ft)
- ENERGY STAR qualified

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: The data and calculations can be found on "AOE Commercial Kitchen Data.xls"

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings per ft^3
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per ft^3

Table 9.7.7-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Commercial Kitchen	1.0	1.0	1.0

*5,475 hours a years; based on 15 hours a day, 365 days a year

Table 9.7.7-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
Hot Holding Cabinet (full)	NA	NA	See Table 9.7.7-3

Table 9.7.7-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Commercial Kitchen	1.366	7,482.5

Source: AOE Commercial Kitchen Data.xls

Demand Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.7.7-2) X Demand Interactive Effects (average from Table 9.7.7-1) X Coincident Diversity Factor (average from Table 9.7.7-1)

Energy Savings Calculation (per ft^3) =

Non-coincident Demand Savings (weighted average from Table 9.7.7-2) X Energy Interactive Effects (average from Table 9.7.7-1) X Hours of Operation (average from Table 9.7.7-1)

Table 9.7.7-4 Measure Costs (Parts and Labor) and Incentive Levels

Hot Holding Cabinet	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment

Full Size	$2,069	$3,782	$1,713	$500/cabinet

9.7.8 Griddle

Measure Code: BPCK8

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Electric griddle
- Same size or smaller than the existing griddle
- ENERGY STAR qualified

Eligibility Criteria for New Equipment:

- $40/linear foot (width)

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 12 years

Revision Details: (None)

Referenced Documents: The data and calculations can be found on "AOE Commercial Kitchen Data.xls"

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta\ kW_S \times ft \times ISR$

Measure Energy Savings $\Delta kWh = \Delta\ kWh_S \times ft \times ISR$

ΔkW = Gross customer connected load kW savings for the measure
ΔkW_S = Gross customer connected load kW savings per ft[3]
ft = Linear Ft of Griddle across its width
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per ft[3]

Table 9.7.8-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Commercial Kitchen	1.0	1.0	1.0

*4380 hours a years; based on 12 hours a day, 365 days a year

Table 9.7.8-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Griddle	NA	NA	See Table 9.7.8-3

Table 9.7.8-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW) Per linear foot	Energy Savings (kWh) Per linear foot
Commercial Kitchen	0.149	651

Source: AOE Commercial Kitchen Data.xls

Demand Savings Calculation (per lineal foot) =

Non-coincident Demand Savings (weighted average from Table 9.7.8-2)	X	Demand Interactive Effects (average from Table 9.7.8-1)	X	Coincident Diversity Factor (average from Table 9.7.8-1)

Energy Savings Calculation (per lineal foot) =

Non-coincident Demand Savings (weighted average from Table 9.7.8-2)	X	Energy Interactive Effects (average from Table 9.7.8-1)	X	Hours of Operation (average from Table 9.7.8-1)

Table 9.7.8-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Incremental Cost	Incentive Payment

Electric Griddle	$800*	$40.00 per lineal foot

*Incremental cost for a three-foot griddle

9.7.15 Green Nozzle

Measure Code: NA

Version Date & Revision History:

Draft date: June 9, 2009
Effective date: June 9, 2009
Revised September 17, 2009
End date: TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Must be an Ameren Illinois GDS-2 gas delivery customer
- It must replace industrial pre-rinse dishwashing spray valves that are connected to gas-fueled water heaters.

Eligibility Criteria for New Equipment:

- The nozzle is offered FREE of charge (a $100 retail value) with a self install.
- After receipt of a completed and approved application, the nozzle will be shipped directly to the customer. After installation by the customer a photo of the installed nozzle must be sent to Act On Energy staff, to verify installation.

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 5 years

Revision Details: 9-17-09, changed to self install program

Referenced Documents: Fisher Nickel Food Service Testing Center (www.fishnick.com)

Bonus Incentives offered: None

Supplemental Information Collected on the Application: Survey conducted while technicians were at a facility installing nozzles. The goal was to determine potential CK projects/interest.

Algorithms used to calculate savings
Manually entered into AIB – each nozzle is credited with 493 net therms of annual savings.

Table 9.7.15-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Commercial Kitchen	1.0	1.0	1.0

*assumed at 3 hours a day, for 365 days

Table 9.7.15-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Baseline Nozzle (therms used annually)	Efficient Nozzle (therms used annually)	Annual Therms Saved
Pre-rinse Spray Nozzle	876	383	493

Table 9.7.15-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Annual therms saved
Commercial Kitchen	493

Table 9.7.15-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Pre-rinse spray nozzle	NA	NA	NA	None – the product is sent free of charge to the customer ($100 retail value)

9.8 Agricultural Equipment

The following measures are included in the PY3 Agricultural program.

9.8 AGRICULTURAL EQUIPMENT		
	Measure	**Code**
Fans		
9.8.1	**High Efficiency High Speed Exhaust/ Ventilation Fans (24-35" diameter)**	BPA1 NEW
9.8.2	**High Efficiency High Speed Exhaust/ Ventilation Fans (36-47" diameter)**	BPA2 NEW
9.8.3	**High Efficiency High Speed Exhaust/ Ventilation Fans (48-71" diameter)**	BPA3 NEW
9.8.4	**High Efficiency Circulation Fans (24-35 " diameter)**	BPA4 NEW
9.8.5	**High Efficiency Circulation Fans (36-47" diameter)**	BPA5 NEW
9.8.6	**High Efficiency Circulation Fans (48-71" diameter)**	BPA6 NEW
9.8.7	**High Volume Low Speed (HVLS) Fans**	BPA7 NEW
Heater Timers and Waterers		
9.8.8	**Equipment Heater Timers**	BPA8 NEW
9.8.9	**Live Stock Waterer (Electrically heated)**	BPA9 NEW
9.8.10	**Live Stock Waterer (ground source heated (non-electrical))**	BPA10 NEW

9.8.1 High Speed Exhaust/Ventilation Fan (24-35” diameter)

Measure Code: BPA1

Version Date & Revision History:

Draft date: May 3, 2010
Effective date: May 3, 2010
Revised NA
End date: TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replacing failed units (end of useful life)

Eligibility Criteria for New Equipment:

- 24 through 35 inch diameter fan
- minimum 14 cfm/W at 0.10” static pressure
- diffuser equipped

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 7 years

Revision Details: (None)

Referenced Documents:
Hong Li, et al., “Determination of ventilation rates for a Manure-Belt Laying Hen House Using Co2 Balance”
NASS Fact finder for Agriculture, “Quarterly Hogs and Pigs.”
AOE Fan Calculations, Exhaust or Ventilation Fans.xlsx
Bioenvironmental and Structural Systems Laboratory (BESS Labs) Performance tests http://bess.illinois.edu/type.asp accessed 3-30-2010

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_F \times ISR$

ΔkW = Customer connected load kW savings for the measure
ΔkW_S = Customer connected load kW savings per fan = (CFM_N / VER_N - CFM_B / VER_B)
N_F = Number of fans being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
CFM_B = Baseline unit flow @ 0.10 SP
CFM_N = New efficient unit flow @ 0.10 SP
VER_B = Baseline unit Ventilating Efficiency ratio (cfm/Watt) @ 0.10 SP
VER_N = New efficient unit Ventilating Efficiency ratio (cfm/Watt) @ 0.10 SP
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per fan = $\Delta kW_S \times H$
H = Fan/Facility operation hours

Table 9.8.1-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours
Farrowing Pin	1.0	1.0	1.0	4018
Solid Floor Market Pin	1.0	1.0	1.0	2432
Partly Slotted Pit floor Pin	1.0	1.0	1.0	3295
Layer Cage House	1.0	1.0	1.0	4600
Free Stall Barn	1.0	1.0	1.0	2432
Turkey tunnel	1.0	1.0	1.0	4600
Average = Miscellaneous	1.0	1.0	1.0	**2935**

Table 9.8.1-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Svings (kW)
24-35" diameter fan	450	410	0.04

Table 9.8.1-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
All	0.118	372.14

Demand Savings Calculation (per fan) =

Non-coincident Demand Savings (weighted average from Table 9.8.1-2)	X	Demand Interactive Effects (average from Table 9.8.1-1)	X	Coincident Diversity Factor (average from Table 9.8.1-1)

Energy Savings Calculation (per fan) =

Non-coincident Demand Savings (weighted average from Table 9.8.1-2)	X	Energy Interactive Effects (average from Table 9.8.1-1)	X	Hours of Operation (average from Table 9.8.1-1)

Table 9.8.1-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
24-35" diameter fan	$600	$450	$150	$25

9.8.2 High Speed Exhaust/Ventilation Fan (36-47" diameter)

Measure Code: BPA2

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replacing failed units (end of useful life)

Eligibility Criteria for New Equipment:

- 36 through 47 inch diameter fan
- minimum 17.1 cfm/W at 0.10" static pressure
- diffuser equipped

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 7 years

Revision Details: (None)

Referenced Documents:

Hong Li, et al., "Determination of ventilation rates for a Manure-Belt Laying Hen House Using Co2 Balance"
NASS Fact finder for Agriculture, "Quarterly Hogs and Pigs."
AOE Fan Calculations, Exhaust or Ventilation Fans.xlsx
Bioenvironmental and Structural Systems Laboratory (BESS Labs) Performance tests http://bess.illinois.edu/type.asp accessed 3-30-2010

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_F \times ISR$

ΔkW	= Customer connected load kW savings for the measure
ΔkW_S	= Customer connected load kW savings per fan = $(CFM_N / VER_N - CFM_B / VER_B)$
N_F	= Number of fans being replaced
ISR	= In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
CFM_B	= Baseline unit flow @ 0.10 SP
CFM_N	= New efficient unit flow @ 0.10 SP
VER_B	= Baseline unit Ventilating Efficiency ratio (cfm/Watt) @ 0.10 SP
VER_N	= New efficient unit Ventilating Efficiency ratio (cfm/Watt) @ 0.10 SP
ΔkWh	= Gross customer annual kWh savings for the measure
ΔkWh_S	= Gross customer connected load kWh savings per fan = $\Delta kW_S \times H$
H	= Fan/Facility operation hours

Table 9.8.2-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours
Farrowing Pin	1.0	1.0	1.0	4018
Solid Floor Market Pin	1.0	1.0	1.0	2432
Partly Slotted Pit floor Pin	1.0	1.0	1.0	3295
Layer Cage House	1.0	1.0	1.0	4600
Free Stall Barn	1.0	1.0	1.0	2432
Turkey tunnel	1.0	1.0	1.0	4600
Average = Miscellaneous	1.0	1.0	1.0	**2935**

Table 9.8.2-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
36-47" diameter fan	620	520	0.1

Table 9.8.2-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
All	0.198	625.23

Demand Savings Calculation (per fan) =

Non-coincident Demand Savings (weighted average from Table 9.8.2-2)	X	Demand Interactive Effects (average from Table 9.8.2-1)	X	Coincident Diversity Factor (average from Table 9.8.2-1)

Energy Savings Calculation (per fan) =

Non-coincident Demand Savings (weighted average from Table 9.8.2-2)	X	Energy Interactive Effects (average from Table 9.8.2-1)	X	Hours of Operation (average from Table 9.8.2-1)

Table 9.8.2-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
36-47" diameter fan	$675	$525	$150	$50

9.8.3 High Speed Exhaust/Ventilation Fan (48-71” diameter)

Measure Code: BPA3

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replacing failed units (end of useful life)

Eligibility Criteria for New Equipment:

- 48 through 71 inch diameter fan
- minimum 20.3 cfm/W at 0.10” static pressure
- diffuser equipped

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 7 years

Revision Details: (None)

Referenced Documents:

Hong Li, et al., “Determination of ventilation rates for a Manure-Belt Laying Hen House Using Co2 Balance”
NASS Fact finder for Agriculture, “Quarterly Hogs and Pigs.”
AOE Fan Calculations, Exhaust or Ventilation Fans.xlsx
Bioenvironmental and Structural Systems Laboratory (BESS Labs) Performance tests http://bess.illinois.edu/type.asp accessed 3-30-2010

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_F \times ISR$

ΔkW = Customer connected load kW savings for the measure
ΔkW_S = Customer connected load kW savings per fan = $(CFM_N / VER_N - CFM_B / VER_B)$
N_F = Number of fans being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
CFM_B = Baseline unit flow @ 0.10 SP
CFM_N = New efficient unit flow @ 0.10 SP
VER_B = Baseline unit Ventilating Efficiency ratio (cfm/Watt) @ 0.10 SP
VER_N = New efficient unit Ventilating Efficiency ratio (cfm/Watt) @ 0.10 SP
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per fan = $\Delta kW_S \times H$
H = Fan/Facility operation hours

Table 9.8.3-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours
Farrowing Pein	1.0	1.0	1.0	4018
Solid Floor Market Pin	1.0	1.0	1.0	2432
Partly Slotted Pit floor Pin	1.0	1.0	1.0	3295
Layer Cage House	1.0	1.0	1.0	4600
Free Stall Barn	1.0	1.0	1.0	2432
Turkey tunnel	1.0	1.0	1.0	4600
Average = Miscellaneous	1.0	1.0	1.0	**2935**

Table 9.8.3-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
48-71” diameter fan	1160	980	0.18

Table 9.8.3-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
All	0.356	1,122.36

Demand Savings Calculation (per fan) =

Non-coincident Demand Savings (weighted average from Table 9.8.3-2)	X	Demand Interactive Effects (average from Table 9.8.3-1)	X	Coincident Diversity Factor (average from Table 9.8.3-1)

Energy Savings Calculation (per fan) =

Non-coincident Demand Savings (weighted average from Table 9.8.3-2)	X	Energy Interactive Effects (average from Table 9.8.3-1)	X	Hours of Operation (average from Table 9.8.3-1)

Table 9.8.3-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
48-71” diameter fan	$750	$600	$150	$100

9.8.4 Circulation Fan (24-35" diameter)

Measure Code: BPA4

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replacing failed units (end of useful life)

Eligibility Criteria for New Equipment:

- 24 through 35 inch diameter fan
- minimum 12.5 lbf/kW

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 7 years

Revision Details: (None)

Referenced Documents:

Hong Li, et al., "Determination of ventilation rates for a Manure-Belt Laying Hen House Using Co2 Balance"
NASS Fact finder for Agriculture, "Quarterly Hogs and Pigs."
AOE Fan Calculations, Exhaust or Ventilation Fans.xlsx
Bioenvironmental and Structural Systems Laboratory (BESS Labs) Performance tests http://bess.illinois.edu/type.asp accessed 3-30-2010

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta\ kW_S \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta\ kWh_S \times N_F \times ISR$

ΔkW	= Customer connected load kW savings for the measure
ΔkW_S	= Customer connected load kW savings per fan = $(CFM_N / VER_N - CFM_B / VER_B)$
N_F	= Number of fans being replaced
ISR	= In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
CFM_B	= Baseline unit flow @ 0.10 SP
CFM_N	= New efficient unit flow @ 0.10 SP
VER_B	= Baseline unit Ventilating Efficiency ratio (cfm/Watt) @ 0.10 SP
VER_N	= New efficient unit Ventilating Efficiency ratio (cfm/Watt) @ 0.10 SP
ΔkWh	= Gross customer annual kWh savings for the measure
ΔkWh_S	= Gross customer connected load kWh savings per fan = $\Delta\ kW_S \times H$
H	= Fan/Facility operation hours

Table 9.8.4-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours
Farrowing Pin	1.0	1.0	1.0	4,018
Solid Floor Market Pin	1.0	1.0	1.0	2,432
Partly Slotted Pit floor Pin	1.0	1.0	1.0	3,295
Layer Cage House	1.0	1.0	1.0	4,600
Free Stall Barn	1.0	1.0	1.0	2,432
Turkey tunnel	1.0	1.0	1.0	4,600
Average = Miscellaneous	1.0	1.0	1.0	**2,935**

Table 9.8.4-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
24-35” diameter fan	450	410	0.04

Table 9.8.4-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
All	0.118	372.14

Demand Savings Calculation (per fan) =

Non-coincident Demand Savings (weighted average from Table 9.8.4-2)	X	Demand Interactive Effects (average from Table 9.8.4-1)	X	Coincident Diversity Factor (average from Table 9.8.4-1)

Energy Savings Calculation (per fan) =

Non-coincident Demand Savings (weighted average from Table 9.8.4-2)	X	Energy Interactive Effects (average from Table 9.8.4-1)	X	Hours of Operation (average from Table 9.8.4-1)

Table 9.8.4-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
24-35" fan	$600	$450	$150	$25/fan

9.8.5 Circulation Fan (36-47” diameter)

Measure Code: BPA5

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replacing failed units (end of useful life)

Eligibility Criteria for New Equipment:

- 36 through 47 inch diameter fan
- minimum 18.2 lbf/kW

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 7 years

Revision Details: (None)

Referenced Documents:
Hong Li, et al., “Determination of ventilation rates for a Manure-Belt Laying Hen House Using Co2 Balance”
NASS Fact finder for Agriculture, “Quarterly Hogs and Pigs.”
AOE Fan Calculations, Exhaust or Ventilation Fans.xlsx
Bioenvironmental and Structural Systems Laboratory (BESS Labs) Performance tests http://bess.illinois.edu/type.asp accessed 3-30-2010

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_F \times ISR$

ΔkW	= Customer connected load kW savings for the measure
ΔkW_S	= Customer connected load kW savings per fan = $(CFM_N / VER_N - CFM_B / VER_B)$
N_F	= Number of fans being replaced
ISR	= In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
CFM_B	= Baseline unit flow @ 0.10 SP
CFM_N	= New efficient unit flow @ 0.10 SP
VER_B	= Baseline unit Ventilating Efficiency ratio (cfm/Watt) @ 0.10 SP
VER_N	= New efficient unit Ventilating Efficiency ratio (cfm/Watt) @ 0.10 SP
ΔkWh	= Gross customer annual kWh savings for the measure
ΔkWh_S	= Gross customer connected load kWh savings per fan = $\Delta kW_S \times H$
H	= Fan/Facility operation hours

Table 9.8.5-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours
Farrowing Pin	1.0	1.0	1.0	4,018
Solid Floor Market Pin	1.0	1.0	1.0	2,432
Partly Slotted Pit floor Pin	1.0	1.0	1.0	3,295
Layer Cage House	1.0	1.0	1.0	4,600
Free Stall Barn	1.0	1.0	1.0	2,432
Turkey tunnel	1.0	1.0	1.0	4,600
Average = Miscellaneous	**1.0**	**1.0**	**1.0**	**2,935**

Table 9.8.5-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
36-47" diameter fan	620	520	0.1

Table 9.8.5-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
All	0.198	625.23

Demand Savings Calculation (per fan) =

Non-coincident Demand Savings (weighted average from Table 9.8.5-2)	X	Demand Interactive Effects (average from Table 9.8.5-1)	X	Coincident Diversity Factor (average from Table 9.8.5-1)

Energy Savings Calculation (per fan) =

Non-coincident Demand Savings (weighted average from Table 9.8.5-2)	X	Energy Interactive Effects (average from Table 9.8.5-1)	X	Hours of Operation (average from Table 9.8.5-1)

Table 9.8.5-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
36-47” fan	$675	$525	$150	$50/fan

9.8.6 Circulation Fan (48-71" diameter)

Measure Code: BPA6

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replacing failed units (end of useful life)

Eligibility Criteria for New Equipment:

- 48 though 71 inch diameter fan
- minimum 23 lbf/kW

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 7 years

Revision Details: (None)

Referenced Documents:

Hong Li, et al., "Determination of ventilation rates for a Manure-Belt Laying Hen House Using Co2 Balance"
NASS Fact finder for Agriculture, "Quarterly Hogs and Pigs."
AOE Fan Calculations, Exhaust or Ventilation Fans.xlsx
Bioenvironmental and Structural Systems Laboratory (BESS Labs) Performance tests http://bess.illinois.edu/type.asp accessed 3-30-2010

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_F \times ISR$

ΔkW	= Customer connected load kW savings for the measure
ΔkW_S	= Customer connected load kW savings per fan = $(CFM_N / VER_N - CFM_B / VER_B)$
N_F	= Number of fans being replaced
ISR	= In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
CFM_B	= Baseline unit flow @ 0.10 SP
CFM_N	= New efficient unit flow @ 0.10 SP
VER_B	= Baseline unit Ventilating Efficiency ratio (cfm/Watt) @ 0.10 SP
VER_N	= New efficient unit Ventilating Efficiency ratio (cfm/Watt) @ 0.10 SP
ΔkWh	= Gross customer annual kWh savings for the measure
ΔkWh_S	= Gross customer connected load kWh savings per fan = $\Delta kW_S \times H$
H	= Fan/Facility operation hours

Table 9.8.6-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours
Farrowing Pin	1.0	1.0	1.0	4,018
Solid Floor Market Pin	1.0	1.0	1.0	2,432
Partly Slotted Pit floor Pin	1.0	1.0	1.0	3,295
Layer Cage House	1.0	1.0	1.0	4,600
Free Stall Barn	1.0	1.0	1.0	2,432
Turkey tunnel	1.0	1.0	1.0	4,600
Average = Miscellaneous	**1.0**	**1.0**	**1.0**	**2,935**

Table 9.8.6-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
48-71" diameter fan	1160	980	0.18

Table 9.8.6-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
All	0.356	1,122.36

Demand Savings Calculation (per fan) =

Non-coincident Demand Savings (weighted average from Table 9.8.6-2)	X	Demand Interactive Effects (average from Table 9.8.6-1)	X	Coincident Diversity Factor (average from Table 9.8.6-1)

Energy Savings Calculation (per fan) =

Non-coincident Demand Savings (weighted average from Table 9.8.6-2)	X	Energy Interactive Effects (average from Table 9.8.6-1)	X	Hours of Operation (average from Table 9.8.6-1)

Table 9.8.6-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
48-71” fan	$750	$600	$150	$100/fan

9.8.7 High Volume Low Speed (HVLS) Fan

Measure Code: BPA7

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replacing multiple non-HVLS fans

Eligibility Criteria for New Equipment:

- Horizontally mounted ceiling-type fan
- 20-24 ft diameter fan
- motor must have VFD controls

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 10 years

Revision Details: (None)

Referenced Documents:
David W. Kammel, et al.,"Design of High Volume Low Speed Fan Supplemental Cooling System in Freestall Barns."
Hong Li, et al., "Determination of ventilation rates for a Manure-Belt Laying Hen House Using Co2 Balance"
NASS Fact finder for Agriculture, "Quarterly Hogs and Pigs."
AOE Fan Calculations, HVLS Fans.xls

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta\ kW_S \times N_F \times ISR$

Measure Energy Savings $\Delta kWh = \Delta\ kWh_S \times N_F \times ISR$

ΔkW = Customer connected load kW savings for the measure
ΔkW_S = Customer connected load kW savings per fan = (lbf_N / VER_N - CFM_B / VER_B)
N_F = Number of fans being replaced
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
CFM_B = Baseline unit flow @ 0.10 SP
CFM_N = New efficient unit flow @ 0.10 SP
VER_B = Baseline unit Ventilating Efficiency ratio (cfm/Watt) @ 0.10 SP
VER_N = New efficient unit Ventilating Efficiency ratio (cfm/Watt) @ 0.10 SP
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per fan = $\Delta\ kW_S \times H$
H = Fan/Facility operation hours

Table 9.8.7-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours
Solid Floor Market Pen	1.0	1.0	1.0	2,432
Partly Slotted Pit floor Pen	1.0	1.0	1.0	3,295
Free Stall Barn	1.0	1.0	1.0	2,432
Average = Miscellaneous	**1.0**	**1.0**	**1.0**	**2,731**

Table 9.8.7-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Fixture Wattage (watts)	Retrofit Fixture Wattage (watts)	Non-Coincident Demand Savings (kW)
HVLS fan	4560	1490	3.07

Table 9.8.7-3 Calculated Demand and Energy Savings by fan Size

Fan Size (diameter)	Demand Savings (kW)	Energy Savings (kWh)
20'	2.408	6,576.85
22'	3.128	8,543.34
24'	3.668	10,018.22

Demand Savings Calculation (per fan) =

Non-coincident Demand Savings (weighted average from Table 9.8.7-2)	X	Demand Interactive Effects (average from Table 9.8.7-1)	X	Coincident Diversity Factor (average from Table 9.8.7-1)

Energy Savings Calculation (per fan) =

Non-coincident Demand Savings (weighted average from Table 9.8.7-2)	X	Energy Interactive Effects (average from Table 9.8.7-1)	X	Hours of Operation (average from Table 9.8.7-1)

Table 9.8.7-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
HVLS Fan – 20"	$5,750	$1,600	$4,150	$1,000
HVLS Fan – 22"	$5,980	$1,800	$4,180	$1,000
HVLS Fan – 24"	$6,325	$2,100	$4,225	$1,000

"The incremental savings and costs are from a comparison between seven typical sized (about 48 inches in diameter) industrial low volume low speed (LVLS) fans and one high-volume low-speed fan. There are three HVLS manufactures Big Ass Fans, Rite Hite, Macro-Air. Manufacture averaged costs range from $5,750.00 to $6,325.00 depending on the fan size and the controls installed. LVLS fans are much more common than HVLS fans as of date so both cost and sizes can vary significantly. The assumptions used in this comparison are based on the most common LVLS fans. Industrial LVLS fan costs range from $230.00 to $300.00 each ($1,600.00 to $2,100.00 for 7 fans) depending on size and manufacture."

9.8.8 Equipment Heater Timers

Measure Code: BPA8

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Tractor Engine Block Heater with no Timer

Eligibility Criteria for New Equipment:

- UL-Listed Outdoor timer rated for minimum of 15 amps continuous duty
- Max of 4 hour heating prior to use
- Maximum of two timers/facility
- Electrical timers with Thermostat – this verbiage was in CD's document, but we don't' say this on the application
- A simple high amperage timer to control the engine block heaters.

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 5 years

Revision Details: (None)

Referenced Documents:
Manitoba Hydro Power Smart "Car warmers, block heaters and energy controls."
AOE Calculations, Engine Block Heater Timers.xlsx

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings ΔkW = n/a

Measure Energy Savings ΔkWh = Δ kWh_S x N_F x ISR

ΔkW = Customer connected load kW savings for the measure
ΔkW_S = Customer connected load kW savings per timer
N_T = Number of timers
ISR = In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
kW_{BH} = Name plate load of heating elements for block heater, assumed as 1 kW.
kW_N = Name plate load of heating element for new efficient unit (= 0 for ground source units)
ΔkWh = Gross customer annual kWh savings for the measure
ΔkWh_S = Gross customer connected load kWh savings per timer = kW_{BH} x H_S
H_s = Heater operation hour Savings (assumed to be 532 hours, 6 hour reduction during days below 32F)

Table 9.8.8-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours
Farm	1.0	1.0	1.0	2,216*

*Operating Hours - 2126 hours possible operation time when temp drop below 32F

Table 9.8.8-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts – without timer)	Retrofit Unit Wattage (watts – with timer)	Non-Coincident Demand Savings (kW)
Engine Block Heater Timer	1063	531.5	0.53

Table 9.8.8-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Farm	0.00	531.50

Demand Savings Calculation (per timer) =

Non-coincident Demand Savings (weighted average from Table 9.8.8-2)	X	Demand Interactive Effects (average from Table 9.8.8-1)	X	Coincident Diversity Factor (average from Table 9.8.8-1)

Energy Savings Calculation (per timer) =

Non-coincident Demand Savings (weighted average from Table 9.8.8-2)	X	Energy Interactive Effects (average from Table 9.8.8-1)	X	Hours of Operation (average from Table 9.8.8-1)

Table 9.8.8-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Engine Block Heater Timer	$50	$0	$50	$10/timer

9.8.9 Live Stock Waterer (Electrically Heated)

Measure Code: BPA9

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replace open waterers with sinking or floating water heater

Eligibility Criteria for New Equipment:

- Electrically heated thermally insulated waterer
- Minimum 2" insulation
- Thermostat required on units with heating element >250 Watt
- Equivalent herd size watering capacity of old unit

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 10 years

Revision Details: (None)

Referenced Documents:
Prairie Agricultural Machinery Institute Research Update 706, "Energy Free Water Fountains"
AOE Calculations, Livestock Water Tanks.xlsx

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_T \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_T \times ISR$

ΔkW	= Customer connected load kW savings for the measure
ΔkW_S	= Customer connected load kW savings per tank = kW B – kW_N
N_T	= Number of Tanks being replaced
ISR	= In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
kW_B	= Name plate load of heating elements for baseline unit
kW_N	= Name plate load of heating element for new efficient unit (= 0 for ground source units)
ΔkWh	= Gross customer annual kWh savings for the measure
ΔkWh_S	= Gross customer connected load kWh savings per tank = $\Delta kW_S \times H$
H	= Heater operation hours (assumed to be 3034 hours)

Table 9.8.9-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours
Farm	1.0	1.0	1.0	3,040

Table 9.8.9-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Waterer (electric)	1,100	575	0.525

Table 9.8.9-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Farm	0.525	1,592.85

Demand Savings Calculation (per waterer) =

Non-coincident Demand Savings (weighted average from Table 9.8.9-2)	X	Demand Interactive Effects (average from Table 9.8.9-1)	X	Coincident Diversity Factor (average from Table 9.8.9-1)

Energy Savings Calculation (per waterer) =

Non-coincident Demand Savings (weighted average from Table 9.8.9-2)	X	Energy Interactive Effects (average from Table 9.8.9-1)	X	Hours of Operation (average from Table 9.8.9-1)

Table 9.8.9-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Live Stock Waterer (Electrically Heated)	$787.50	$0	$787.50	$75/waterer

9.8.10 Live Stock Waterer (Ground Source Heated (non-electrical))

Measure Code: BPA10

Version Date & Revision History:

Draft date:	May 3, 2010
Effective date:	May 3, 2010
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- Replace open waterers with sinking or floating water heater

Eligibility Criteria for New Equipment:

- Frost free, energy free, or ground source heated units with no electrical heating element
- Minimum 2" insulation
- Drinking access closes automatically
- Water connection housed in a heat pipe riser
- Equivalent herd size watering capacity of old unit

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: 10 years

Revision Details: (None)

Referenced Documents:
Prairie Agricultural Machinery Institute Research Update 706, "Energy Free Water Fountains"
AOE Calculations, Livestock Water Tanks.xlsx

Bonus Incentives offered: None

Supplemental Information Collected on the Application: None

Algorithms used to calculate savings

Measure Demand Savings $\Delta kW = \Delta kW_S \times N_T \times ISR$

Measure Energy Savings $\Delta kWh = \Delta kWh_S \times N_T \times ISR$

ΔkW	= Customer connected load kW savings for the measure
ΔkW_S	= Customer connected load kW savings per tank = kW B – kW_N
N_T	= Number of Tanks being replaced
ISR	= In service rate, or the percentage of units rebated that actually get used. For prescriptive measures, this is assumed to be 100%
kW_B	= Name plate load of heating elements for baseline unit
kW_N	= Name plate load of heating element for new efficient unit (= 0 for ground source units)
ΔkWh	= Gross customer annual kWh savings for the measure
ΔkWh_S	= Gross customer connected load kWh savings per tank = $\Delta kW_S \times H$
H	= Heater operation hours (assumed to be 3034 hours)

Table 9.8.10-1 Energy Factor Assumptions

Building Types	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Annual Operating Hours
Farm	1.0	1.0	1.0	3,040

Table 9.8.10-2 Specifications and Calculated Non-coincident Demand Savings

Configuration	Base Unit Wattage (watts)	Retrofit Unit Wattage (watts)	Non-Coincident Demand Savings (kW)
Waterer (non-electrical)	1,100	0	1.1

Table 9.8.10-3 Calculated Demand and Energy Savings by Type of Business

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Farm	1.10	3,337.40

Demand Savings Calculation (per waterer) =

Non-coincident Demand Savings (weighted average from Table 9.8.10-2)	X	Demand Interactive Effects (average from Table 9.8.10-1)	X	Coincident Diversity Factor (average from Table 9.8.10-1)

Energy Savings Calculation (per waterer) =

Non-coincident Demand Savings (weighted average from Table 9.8.10-2)	X	Energy Interactive Effects (average from Table 9.8.10-1)	X	Hours of Operation (average from Table 9.8.10-1)

Table 9.8.10-4 Measure Costs (Parts and Labor) and Incentive Levels

Fixture Technology	Installed Cost: High Performance	Installed Cost: Standard Practice	Incremental Cost	Incentive Payment
Live Stock Waterer (Ground Source Heated)	$1,450	$0	$1,450	$100/waterer

9.9 On-line Store

9.9.1-9.9.26 Items for Sale through the On-line Store

Measure Code: NA

Version Date & Revision History:

Draft date:	March 2009
Effective date:	March 2009
Revised	NA
End date:	TBD

Eligibility Criteria

Eligibility Criteria for Equipment to be Replaced:

- None

Eligibility Criteria for New Equipment:

- Customers must be DS-2 delivery service
- Products ordered are assumed to be installed immediately at the address associated with the account number used to purchase the items

Loadshape: NA

Persistence: The persistence factor is assumed to be one.

Lifetimes: NA

Revision Details: (None)

Referenced Documents:
Illinois Commerce Commission ICC Docket No. 07-0539
EFI Product Sheet V10 8-27-09

Bonus Incentives offered:

- Reduced pricing Jan 4 – March 31, 2010 (everything 50% off (except for Smart strips and LED down lights), added three free CFOs offer, free shipping)
- Free shipping continued into PY3
- Reduced pricing Jan 4 – May 31, 2011 (everything 50% off (except for Smart strips), added three free CFOs offer, free shipping continued)

Supplemental Information Collected on the Application:
Products are paid for with a credit card by the customer and drop shipped directly to the customer by EFI. This information is collected through the EFI web site.

The following table lists the products offered, the cost to customers (and the current sale price) and the kWh savings per item.

9.9 On-line Store				
	Measure	**Cost to customer (regular price)**	**Cost to customer (sale price) 1-?-11 thru 5-31-11**	**Savings Claimed (kWh)**
Free CFL offer				
9.9.1	3-pack (15/20/25W)	$6.52	$0	558.60
9.9.2	3-pack (25W)	$6.00	$0	614.4
CFLs				
9.9.3	15W 975 lumens (mini)	$2.25	$0.50	167.60
9.9.4	15W 1000 lumens	$3.75	$0.50	167.6
9.9.5	20W 1300 lumens	$4.00	$0.50	186.20
9.9.6	20W 1400 lumens	$2.75	$0.50	186.20
9.9.7	25W 1725 lumens	$2.25	$0.50	204.80
9.9.8	25W1800 lumens (micro max)	$3.95	$0.50	204.80
9.9.9	30W 2050 lumens	$3.75	$1.00	206.70
9.9.10	15W flood 750 lumens	$6.50	$1.75	167.60
9.9.11	23W flood 1300 lumens	$6.50	$1.75	286.70
9.9.12	14W globe 800 lumens	$5.50	$1.75	171.30
9.9.13	15 flood (dimmable) 720 lumens	$13.50	$4.98	167.60
LED Down Lights				
9.9.14	12W 650 lumens (module)	$125.00	$74.00	301.00
LED Exit Signs				
9.9.15	2W, double sided with battery backup	$25.75	$6.88	342.00
9.9.16	2.7W exit-sign bulbs	$17.00	$3.75	342.00
Power Strips				
9.9.17	10 outlet “Smart Strip”	$32.50	NA	0.00
T8 Lamps and Ballasts				
9.9.18	32W, 1-2 lamp configuration	$18.75	$6.25	NA
9.9.19	32W, 2-3 lamp configuration	$22.10	$6.25	NA
9.9.20	32W, 3-4 lamp configuration	$24.00	$6.25	NA
9.9.21	32W T8 lamp 4’ (case of 36)	$120.00	$108.00	61.25/lamp*
Vending Machine Controls				
9.9.22	Snack Miser (non-refrigerated) – wall mounted	$79.00	$24.50	387.00*
9.9.23	Snack Miser EZ (non-refrigerated) – machine mounted	$79.00	$24.50	387.00*
9.9.24	Vending Miser (refrigerated) – wall mounted	$179.00	$39.50	1,612.00*
9.9.25	Vending Miser EZ (refrigerated) – machine mounted	$179.00	$39.50	1,612.00*
Occupancy Sensor				
9.9.26	Wall-switch (PIR, controls 0-800W)	$40.00	$10.00	186.00

*savings information taken from the standard lighting program.

Shipping expenses

Order amount	**Shipping total**
under $20	$5.00
$20.01 - $40.00	$7.50
$40.01 - $75.00	$9.00
$75.01 - $125.00	$12.00
$125.01 - $200.00	$15.00
$200.01+	$18.00

Appendix A - Application Processing Checklist

Pre-Approval Procedures:

1. **Jenny Bethel** (Administrative Assistant) - Receive application via mail, fax, e-mail, or on-line application (ALL applications initiate the process shown below in the Ameren office in Peoria). Applications that come in as a result of communications between the customer/ally and SAIC or GDS program staff located outside Peoria must be forwarded to Jenny Bethel with a copy to **Lance Escue** (Program Manager) immediately upon receipt along with a summary of any communications with the customer/ally prior to receipt of the incentive application.
2. **Jenny** - Conduct initial brief review for complete customer and facility information (e-mails, signatures, hours of operations, etc). If application is incomplete, send an e-mail request or call to obtain missing information.
3. **Jenny** - Verify customer eligibility with account number using AIB (**A**meren **I**llinois **B**usiness database). If the project is eligible and paperwork is complete, then input the project into AIB and assign a TR (technical reviewer) as appropriate. File application on the P: drive in appropriate customer folder. If it is a publicly funded business or ComEd customer, notify the customer/program ally of their ineligibility status by e-mail and cc ComEd or DCEO (whichever is appropriate). Contact info for ComEd is comedsmartideas@kema.com and for DCEO is andrea.reiff@illinois.gov.
4. **Jenny -** Send "Confirmation of Receipt" e-mail to customer and contractor/program ally (if applicable). Copy Jon Carls (Key Account Executive Manager) and the KAE (Key Account Executive) on acknowledgement e-mail (if applicable). Also BCC ActOnEnergyProjects, David Gibson, and Margie Yankowski (Call Center) on all acknowledgment e-mails.
5. **Jenny -** Review incentive amount. If it is any type of project with an incentive request of $25K or more the <u>customer</u> will need to complete the Large Incentive Request Form (LIRF). E-mail this form to the customer if the customer has not sent it along with the application. When LIRF is received, forward to Lance for review and approval. Once approved, notify the TR and upload the signed LIRF into AIB.

On-Line Lighting Applications:

The process for applications received via the on-line application option is very similar to that listed above, except rather than receiving a fax, hard copy, or electronic copy of the application, a notice will appear on **Jenny's** dashboard indicating that an on-line application has been submitted. The link to the application is opened and the process outlines above is completed.

AIB and Project Tracking Log Entries -

1. Initial entries to AIB and Project Tracking Log: Jenny is the only one making initial entries into AIB and the Project Tracking Log.
2. Modifications to AIB: Jenny will make most AIB modifications such as project status change, customer/program ally updates and Estimated Completion Dates. TRs complete updates to the measures section.
3. Modifications to Project Tracking Log: Jenny will make ALL modifications to the Project Tracking Log.

TR responsibilities -

1. Review the application for missing and additional information requirements.
2. Continue communications with customer/ally via email with a cc to Jenny. Follow up with customer/ally by phone if necessary to resolve any open issues. Upload any correspondence in the "Notes" to record the results of any phone conversations with customer/ally.
3. Enter measure updates into AIB as required

4. For all applications assigned to Scott Schultz (mostly Grocery and Lighting) and Andy Vaughn (mostly Lighting and a few Grocery), secondary are to be sent for to Chris Durand for review. Scott may recommend pre-approval (without a secondary review) if the project has the incentive of $500 or less. Projects assigned to Rod Rhoads(all HVAC and some lighting) do not require a secondary review if the project incentive is less than $5,000. Applications assigned to Chris Durand(VFD and lighting), Dave Kilgore (Custom, VFD, HVAC, Lighting), Rob Miller, David Gibson to do require a secondary review unless the project incentive is over $5,000.
5. All projects over $5K require secondary review. Rod Rhoads sends all secondary reviews to Dave Kilgore. Dave Kilgore and Chris Durand sends secondary reviews to Rob Miller. Rob Miller sends secondary reviews to David Gibson, Chris Durand or David Kilgore. David Gibson sends secondary review to Rob Miller. **Projects assigned to David Gibson (as primary) are by request only.
6. Technical review duration should be NO MORE than 10 business days once all required technical information has been provided by the customer.

Pre-approval Letters and TR Communications

1. Jenny – When the TR and the secondary reviewer have made their recommendation, the project will show up on Jenny/Meaghan's dashboard to prepare and send pre-approval letter to customer/program ally. Also BCC: Selected TR, David Gibson, Cheryl Miller (AIU EE Business Program Manager), ActOnEnergyProjects and Margie Yankowski. Also, CC: Jon Carls and KAE (when applicable).
2. **Jenny** - Update AIB to reflect re-approval status and upload letter into the projects files.
3. **TRs** – As project completion dates are passed and no final paperwork has been submitted, the corresponding TRs are to follow for updated ECD, or request final paperwork.

Final Application Approval Procedures:

1. **Jenny -** Receive application for payment via mail, fax, or email (ALL applications initiate the process shown below in the Ameren office in Peoria). *Applications which come in as a result of communications between the customer/ally and SAIC or GDS program staff located outside Peoria must be forwarded to Jenny Bethel immediately upon receipt along with a summary of any communications with the customer/ally prior to receipt of the incentive application.*
2. **Jenny -** Send "Confirmation of Receipt" email to customer and contractor/program ally (if applicable). Copy Jon Carls and the KAE on acknowledgement email (if applicable). Also copy ActOnEnergyProjects, David Gibson, and Margie Yankowski on all acknowledgment emails.
3. **Jenny -**
   a. If the application is for payment has **SKIPPED** pre-approved, confirm the eligibility of the project and then follow steps 2, 3, 5, 6 from above.
      i. **Ineligible projects include: custom projects, HVAC Tune-Up Projects and all projects $5K or more.**
      ii. **TRs will have an additional 10 day time frame for final approval recommendation**
   b. If the application is for payment and **HAS** previously received a pre-approval letter: follow the next steps.
4. **Selected Technical Reviewer (TR) –**
   a. Review invoices and measures.
   b. If measures and amounts differ from the pre-approval, make notes in AIB when making recommendation and include the details of why it changed. (project scope and/or bonus)
   c. For all applications assigned to Scott Schultz (mostly Grocery and Lighting) and Andy Vaughn (mostly Lighting and a few Grocery), secondary are to be sent for to Chris Durand for review. Scott may recommend approval (without

   d. All projects over $5K require secondary review. Rod Rhoads sends all secondary reviews to Dave Kilgore. Dave Kilgore and Chris Durand send secondary reviews to Rob Miller. Rob Miller sends secondary reviews to David Gibson, Chris Durand or David Kilgore. David Gibson sends secondary reviews to Rob Miller

5. **Jenny** – Update AIB reflecting the “Approved” status
6. **Jenny –** Once recommendations’ are complete, Lane Escue will give final approval on each project and Approval for Payment letter is to customer and ally/contractor (if applicable). Also BCC: Selected TR, David Gibson, Cheryl Miller, ActOnEnergyProjects and Margie Yankowski. Also, CC: Jon Carls and KAE (if applicable).

REMINIDERS:

- **When dealing with AIB, Technical Reviewers are limited to updating measures only (DO NOT click the pre-approved or approved buttons).**
- **When dealing with the Project Tracking Log, Jenny will be the only one making changes.**

Appendix B – Program-Year One and -Two Chronology

YEAR ONE

Program Launch (June 23, 2008)

- Standard HVAC, Lighting, Refrigeration, and Motors
- Standard offering set to mirror ComEd's measure list and incentive levels.
- Custom (5 cents/kwh, 1.5-7 years payback, 10-50% incremental cost)
- Pre-approval required for all custom projects and for standard projects over $25k incentive level
- Large incentive request form required for custom projects over $25k incentive level

Large Incentive Request Form Requirement Modified (August 1, 2008)

- Large incentive request form required for all standard and custom projects over $25k incentive level

Standard Program Fully Subscribed (September 11, 2008)

- All projects reviewed under custom program
- All projects must be pre-approved
- Eligibility criteria for standard measures still apply
- Standard measures incentivized at greater than 5 cents/kwh adjusted to 5 cents/kwh
- Standard measures incentivized at less than 5 cents/kwh remain at standard incentive level

Minimum Payback Threshold Reduced to 1.0 Year (December 8, 2008)

- Minimum payback threshold reduced from 1.5 to 1.0 year for custom program due to economic slowdown

Analysis of Previously Denied or Incentive Capped Projects at 1.5 Year Payback (December 8, 2008)

- Review of projects which were previously denied due to payback less than 1.5 years or deferred due to incentive cap at 1.5 year minimum payback
- Projects already implemented or implementation in progress not eligible
- Pre-approval of projects no longer denied nor incentive capped due to relaxation to 1.0 year payback

Incentive Cap Per Facility Per Program Year Increased (January 1, 2009)

- Incentive cap per facility per program year increased from $100k to $200k to allow large firms to implement additional projects
- Incentive cap per project per facility per program year limited to $100k

Analysis of Previously Denied Projects (January 5, 2009)

- Analysis of projects previously denied to re-assess eligibility and consider granting one time exceptions with the submittal of a large incentive request form
- Projects already implemented or implementation in progress not eligible
- Pre-approval of limited projects based on this analysis effort.

Incentive Bonus Program Launched (January 8, 2009)

- Incentive bonus of 10% of calculated incentive level provided for all new incentive applications received after effective date until PY1 incentive funds are exhausted to encourage submission of applications to meet PY1 goals.

Program Ally Gift Card Program Launched (January 13, 2009)

- $500 VISA gift card to be awarded to program ally for the first 25 projects with incentive level greater than $10k to encourage submission of applications to meet PY1 goals.
- Gift card awarded to ally when incentive to customer is approved for payment

Small Business HVAC Tune-Up Program Launched (January 19, 2009)

- Standard program developed for GDS-2 (small commercial gas) customers that included incentives for energy efficient boilers and forced-air furnaces, as well as boiler/furnace tune-ups for existing systems
- Incentives for air conditioner tune-ups were also included to encourage bundling of services with the boiler/furnace tune-ups

Enhanced Custom Application Released (January 20, 2009)

- Enhanced custom application released to include pre-calculated incentive levels at 5 cents/kwh for 8 of the most active standard lighting measures to streamline the custom application process.

YEAR TWO

Program Year 2 Launch (May 1, 2009)

- Standard lighting and custom applications appear on ActOnEnergy.com
- Custom incentive 5 cents/kwh for lighting, 7 cents/kwh for non-lighting. 1-7 years payback, 10-50% incremental cost
- Pre-approval required for all projects
- Started accepting applications for PY2 on May 1, 2009
- Large incentive request form required for custom projects over $25k incentive level
- Standard motors, refrigeration and HVAC uploaded to the website June 2, 2009

Green Nozzle Program (Launched June 9, 2009)

- Interns installed pre-rinse nozzles in food service/commercial kitchens (nozzles save 493 gross therms each)
- Nozzles provided to customers at no cost
- Installers conducted a survey within the kitchen to help develop the commercial kitchens program in PY3

E-Smart Programmable Thermostat (Triad Offer launched July 29, 2009)

- Sent 5,000 mailers to electric and gas customers offering them free air-conditioning and furnace tune-up along, along with a free programmable thermostat.
- Worked with local HVAC contractors to perform these services and install E-Smart thermostat at no cost to customer
- Limited to the first 400 people who registered for the program
- Actual install of thermostats commenced on 9-17-09
- Initially rolled out in Peoria area only

Online Lighting Application (Launched July 31,2009)

- Functionality added to ActOnEnergy.com which allows lighting projects to be submitted online

Green Nozzle Program via Mail (Launched September 17, 2009)

- Sent nozzles via mail to a customer instead of a direct install
- Allowed for customers to participate in more rural areas
- Customers required to send picture of installed nozzle

Co-branding Opportunities for Program Allies (Launched September 25, 2009)

- AOE developed brochures include Program Overview, Lighting, HVAC, Refrigeration and Custom
- Brochures designed to be co-branded with Program Ally logo, phone number, website, and email address

Grocery/Convenience Store Program (Launched September 29, 2009)
- Application created incorporating measures commonly used by grocery/convenience stores
- Included new incentives for:
    - LED lighting
    - LED lighting controls
    - Gaskets
    - Refrigeration or freezer tune-ups
    - Night curtains for open cases

E-Smart Thermostat Rolled-out to Champaign, Decatur and Metro East (November 3, 2009)
- Mailers sent-out to zip codes within 30 mile radius of Champaign and Metro East St. Louis Area along with a 10 mile radius around Decatur
- Thermostat install only (Triad offer expired)

T12 Special Incentive (Launched November 16, 2009)
- 10% bonus incentive for qualifying applications submitted by January 31, 2010
- Upgrade T12 lamps to high-efficiency T8 or T5 lamps.
- Install lighting controls – such as occupancy sensors and daylight dimming systems that automatically turn lights off when they are not needed.
- Replace high bay (HID-type) fixtures with high-efficiency T8 or T5 lights.

VFD Incentive Increase (Launched January 4, 2010)
- Incentive increased from $45 to $75 per HP controlled for HVAC & Motor VFDs
- Valid for VFD project applications submitted between January 4, 2010 and March 31, 2010
- Increased percent of project covered by incentive from 50% to 75%

E-Smart Thermostat Rolled-out to Bloomington-Normal (January 4, 2010)
- Mailers sent-out to zip codes within a 30 mile radius of Bloomington
- Thermostat install only (Triad offer expired)

Small Business Online Store (Promotion launched January 4, 2010)
- Discounted cost of all products (except recessed LED lighting) by 50% for all purchases through March 31, 2010
- Offered choice of three free 23 watt bulbs or a free 13/18/23 watt pack, one per account through March 31, 2010
- Created Chamber Challenge with gave credit to chamber for each product their member purchased - winning chamber received $1,000

Across the Board Incentive Bonus (Launched February 2, 2010)
- 15% bonus incentive added to all new applications received after effective date until PY2 incentive funds exhausted (to encourage submission of applications to meet PY2 goals)
- T12 Special Incentive was rolled into this offer

Program Ally Gift Card Program (Launched February 2, 2010)
- $500 VISA gift card for each program ally who submits project application with incentive of $10K or greater thru end of February (project must be completed in PY2)
- Gift card actually awarded to eligible allies at final close-out of PY2

E-Smart Thermostat $50 Customer/Contractor Bonus (Launched January 4, 2010)

- $50 per thermostat bonus offered to customers who directly applied for E-Smart Program
- $500 bonus offered to contractors who installed at least 100 thermostats

VFD Incentive Extended (March 23, 2010)

- VFD $75 incentive extended until May 31, 2011

Program Year 3 – Customer Incentive Changes, by Effective Date

Bonus offerings are indicated in Blue
Measure changes are shown in Red
Other application changes shown in Green

- **5/3/2010** – Program Year 3 applications released.
- **6/15/2010** – T12 Phase-Out Bonus; 15% bonus; Applies to measures BPL40, BPL41, BPL42, BPL43, BPL60, BPL62, BPL63, BPL64, BPL65, BPL93, and T12 custom projects[31]; Applies retroactively and to all Program Year 3 applications submitted on or before 12/31/2010; Project must be completed by 5/31/2011; Final paperwork must be received by 6/30/2011.[32]
- **6/22/2010** – Elmwood, IL Tornado Bonus; 50% bonus on electric incentives (gas incentives do not apply for the bonus); Initial application must be submitted on or after 6/22/2010 and the last day to submit is 6/30/2011; No restrictions on project completion date.
- **7/20/2010** - New applications posted with updated requirements for BPL40 and BPL43. Please see application editing notes for more specifics.
- **8/1/2010** – Symposium Coupon Bonus; 15% bonus; Initial application must be submitted on or after 8/1/2010 and the last day to submit is 12/31/2010; No restrictions on project completion date.
- **8/25/2010** – Anti-Sweat Heater Control; Unit incentive changed from $30 per lineal foot to $80 per door; This changed measures BPR2 and BPR3 to BPR 33 and BPR34, respectively; Change applied immediately and extends through the remainder of the program year.
- **8/31/2010** – Gas Boiler and Forced-Air Furnace Tune-Up; Unit incentive reduced from $0.50 to $0.25 per kBtuh input; Applies to BPH1 and BPH2; Reduction applied immediately and extends through the remainder of the program year.
- **9/1/2010** – Energy-Efficient Heating Upgrades Bonus; 50% bonus; Applies to measures BPH4, BPH6, and BPH7; Initial application must be submitted on or after 9/1/2010; The bonus will end at the end of Program Year 3 or after 400 heaters/boilers are approved, whichever is first; Project must be completed by 5/31/2011; Final paperwork must be received by 6/30/2011.[33]
- **9/27/2010** – New applications posted with updated requirements for water heaters. Please see application editing notes for more specifics.

[31] T12 custom projects using the T12 Phase-Out Bonus cannot use any of the other bonuses.
[32] Projects that had pre-approval prior to 10/6/2010 and an Estimated Completion Date (ECD) later than 4/30/2011 will have 60 days to submit their final paperwork. This puts them past the 6/30/2011 requirement.
[33] *Ibid*.

- **10/12/2010** – Door Gaskets; BPR14 removed from application on 10/15/2010; Customers without pre-approval have until 11/11/2010 (30 days) to submit final applications for door gaskets.
- **10/20/2010** – Custom Projects; $0.02/kWh bonus for projects completed by 3/31/2011 and final paperwork submitted by 4/30/2011, $0.01/kWh bonus for projects completed by 4/30/2011 and final paperwork submitted by 5/31/2011; Initial application must be submitted on or after 10/20/2010; The bonus will end at the end of Program Year 3 or when additional bonus money is exhausted, whichever is first.
- **10/20/2010** – High-Bay Lighting; $0.055 bonus for projects completed by 3/31/2011 and final paperwork submitted by 4/30/2011, $0.045 bonus for projects completed by 4/30/2011 and final paperwork submitted by 5/31/2011; Initial application must be submitted on or after 10/20/2010; The bonus will end at the end of Program Year 3 or when additional bonus money is exhausted, whichever is first.
- **10/20/2010** – Compressed Air and Healthcare Retro Commissioning; $0.02/kWh bonus for projects completed by 3/31/2011 and final paperwork submitted by 4/30/2011, $0.01/kWh bonus for projects completed by 4/30/2011 and final paperwork submitted by 5/31/2011; Applies to savings up to 2 million kWh above minimum kWh commitment. For savings over 2 million kWh above minimum kWh commitment, bonus is paid out at 50%; Applies retroactively to all Program Year 3 applications; The bonus will end at the end of Program Year 3 or when additional bonus money is exhausted, whichever is first.
- **10/25/2010** – Automatic Door Closer for Walk-In Freezer/Cooler; BPR7 unit incentive reduced from $160 to $30 per door; Customers without pre-approval have until 11/24/2010 (30 days) to submit final applications for $160 incentive.
- **10/25/2010** – New applications posted with updated requirements for T5 lighting, LED lighting, Anti-Sweat Heater Controls, and Automatic Door Closers. Please see application editing notes for more specifics.
- **11/11/2010** – BPL63 requirement change; BPL63 now requires completely new fixtures, retrofit kits do not apply; Customers and allies without pre-approval have until 12/11/2010 (30 days) to submit final applications based on the old understanding of this measure. We have contacted allies who have frequently used this measure in this manner in the past and let them know of the change.
- **1/1/2011** – T12 Phase-Out Bonus; 10% bonus; Applies to measures BPL40, BPL41, BPL42, BPL43, BPL60, BPL62, BPL63, BPL64, BPL65, BPL93, and T12 custom projects[34]; Applies to all Program Year 3 applications submitted on or after 1/1/2011; Project must be completed by 5/31/2011; Final paperwork must be received by 6/30/2011.

[34] T12 custom projects using the T12 Phase-Out Bonus cannot use any of the other bonuses.

Appendix C – Custom and Standard Revised Technical Review Process

1. Application intake review criteria: *once these criteria are verified an e-mail is issued to the customer informing them their application has been received.* The application must include:

- Company name
- Ameren Utility account number
- Customer contact name and e-mail/phone info (e-mail required for notifications of application receipt, pre-approval, final approval, etc.)
- Contractor/Ally contact name and info
- Requested incentive amount
- Estimated Completion Date (ECD)-date is checked to insure it is within 90 days of pre-approval (standard incentives) or within the program year (custom incentives)
- Customer Signature-verifies they understand terms and conditions
- Landlord authorization-if required
- Payment Release Authorization form-if incentive will be paid to party other than customer installing the energy efficiency upgrades.
- Large Incentive Request Form (LIRF)-required for incentive requests larger than $25,000

  LIRF must be reviewed and approved by the program manager to insure the customer's request for Act on Energy funds is due to a justified need. Examples of a justified need are: Customer/company requires projects to have a minimum payback and the proposed project will not meet this minimum without an incentive. Capital is limited and incentive will allow for energy improvement project to proceed by reducing the impact on the capital budget. Utility energy costs are high and energy efficiency improvements will offer significant operating cost reductions.

2. Application technical pre-approval review criteria: *once these criteria are verified an e-mail is issued to the customer informing them their application has been pre-approved.*

- Customer submission of baseline energy usage: This information can be submitted in one of several forms. Technical reviewers examine the information and verify supporting documentation has been supplied by the customer or ally.
  - Custom application-actual energy usage as shown on previous utility bills or estimates based on energy studies or calculated from exiting equipment name plates and cut sheets.
  - Standard application calculated measures-Customer supplies exiting equipment energy usage values. Act On Energy staff perform a check to verify that the submitted values are in line with typical values.
  - Standard application deemed Measures -Customer indicates a specific type of upgrade and an assumed baseline value is used by Act on Energy. These baseline values are determined from industry accepted values and coded into the Act on Energy database.
- Customer submission of proposed upgrade energy usage: This information can be submitted in one of several forms. Technical reviewers examine the information and verify supporting documentation has been supplied by the customer or ally.
  - Custom application-proposed energy usage as estimated based on equipment name plates and cut sheets.

  - Standard deemed measures-Customer indicates a specific type of upgrade and an assumed baseline value is used by Act on Energy. These baseline values are determined from industry accepted values and coded into the Act on Energy database.
- Calculation of energy savings: Savings are calculated based on the difference between the baseline energy value and the proposed system energy value.

3. Application Incentive pre-approval review criteria

Almost all incentives are calculated based on the energy saved. However, some of the incentive rates presented to customers are deemed to reduce the calculations associated with a review. Deemed incentive rates are typically on a per unit basis (lamps, motors, controllers, etc) or per length (fan diameter, etc.) Deemed values are calculated and tabulated for each measured and outlined under each measure description in this TRM.

4. Facility pre-approval inspection criteria:

- Incentive requests of $100,000 or larger require a facility inspection prior to issuance of pre-approval.
- Incentive request of $50,000 or larger and within 60 miles of an inspector's office require a facility inspection prior to issuance of pre-approval.

5. Application final approval for payment review: *once these criteria are verified an e-mail is issued to the customer informing them their application has approved for payment and a check will be sent via mail.*

- Final application is reviewed to insure completion date is listed and prior to ECD listed in pre-approval
- Customer signature is verified
- Invoices are reviewed to assure orders were placed after pre-approval was given, equipment that was pre-approved was ordered, all equipment was ordered and installed as described in initial application.
- Final requested incentive amount is verified as equal to or below the value pre-approved.
- Verification that final installation inspection was satisfactorily completed.

6. Facility final installation inspection criteria:

- Incentive requests of $25,000 or larger require a facility inspection prior to issuance of final approval.
- Incentive request of greater than $10,000 but less than $25,000 and within 60 miles of an inspector's office requires a facility inspection prior to issuance of final approval.

7. Incentive payment process/Check issuance

- Project submitted to Program Manager for final review
- Once approved, check requested from check issuer
- Upon receipt of check from issuer, check sent to client using USPS Registered Mail

Table of Contents

Lighting

Most lighting measures presented in these work papers use the same methodology. The following provides the assumptions and methods used for calculating energy savings.

Baseline and retrofit equipment assumptions, i.e. wattages, are specific to the measure. Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed.

Savings are calculated by building type, since building types typically define the operating hours and other parameters that define the energy savings. These workpapers base the energy savings methodology on the California 2005 DEER Study[1] assumptions. The DEER database is a tool that was jointly developed by the California Public Utilities Commission (CPUC) and the California Energy Commission with support and input from the Investor-Owned Utilities and other interested stakeholders. Since DEER disaggregates building types to a higher level of detail than the ComEd Smart Ideas Program, a building-type mapping was performed. This mapping defines the group of DEER building types that are averaged to result in the ComEd building type factors used for calculating lighting savings. The following table shows the mapping results.

Table 1: DEER and Smart Ideas Building Types

DEER	Smart Ideas Program
Education - Primary School	K-12 School
Education - Secondary School	
Education - Community College	College/University
Education - University	
Grocery	Grocery
Health/Medical - Hospital	Medical
Health/Medical - Nursing Home	
Lodging - Hotel	Hotel/Motel
Lodging - Motel	
Lodging – Guest Room	
Manufacturing - Light Industrial	Light Industry
Office - Large	Office
Office - Small	
Restaurant - Sit-Down	Restaurant
Restaurant - Fast-Food	
Retail - 3-Story Large	Retail/Service
Retail - Single-Story Large	
Retail - Small	
Storage - Conditioned	Warehouse
Storage - Unconditioned	

[1] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Warehouse - Refrigerated	

Annual energy savings and the peak coincident demand savings were calculated using the equations below:

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are based on the difference between baseline and efficient equipment connected wattage and annual operating hours, according to the following formula:

kWh Reduction = (kW of existing equipment - kW of replacement equipment) * (Annual operating hours)*(Energy Interactive Effects)

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Interactive factors account for savings that the measures achieve through avoided air conditioning load because of reduced internal heat gains from energy-efficient lighting. The interactive effects do not apply to exterior lighting.

The annual operation hours, the coincidence factors, and the interactive effect factors are all derived from DEER figures. Since the Smart Ideas Program building types do not match DEER's exactly, as described, the DEER building types were mapped by combining and averaging similar building types. These figures apply to all lighting measures. The following tables list DEER values. Compact fluorescent lamps (CFLs), LED lighting (unless otherwise noted), and integrated ballast ceramic metal halides have CFL lighting operating hours. Other lighting has different operating hours as shown below.

Table 2: Interactive Effects by Building Type from DEER

DEER Market Sector	Demand Interactive Effects	Energy Interactive Effects
Education - Primary School	1.23	1.15
Education - Secondary School	1.23	1.15
Education - Community College	1.22	1.15
Education - University	1.22	1.15
Grocery	1.25	1.13
Medical - Hospital	1.26	1.18
Medical - Clinic	1.26	1.18
Lodging Hotel	1.14	1.14
Lodging Motel	1.14	1.14
Lodging - Guest Rooms	1.14	1.14
Manufacturing - Light Industrial	1.08	1.04
Office- Large	1.25	1.17
Office-Small	1.25	1.17

Restaurant - Sit-Down	1.26	1.15
Restaurant - Fast-Food	1.26	1.15
Retail – 3-Story Large	1.19	1.11
Retail - Single-Story Large	1.19	1.11
Retail - Small	1.19	1.11
Storage Conditioned	1.09	1.06
Storage Unconditioned	1.09	1.06
Warehouse	1.09	1.06
Average = Miscellaneous	1.19	1.13

Table 3: Coincident Diversity Factors from DEER

DEER Market Sector	Coincident Diversity Factors
Education - Primary School	0.42
Education - Secondary School	0.42
Education - Community College	0.68
Education - University	0.68
Grocery	0.81
Medical - Hospital	0.74
Medical - Clinic	0.74
Lodging Hotel	0.67
Lodging Motel	0.67
Lodging - Guest Rooms	0.67
Manufacturing - Light Industrial	0.99
Office- Large	0.81
Office-Small	0.81
Restaurant - Sit-Down	0.68
Restaurant - Fast-Food	0.68
Retail - 3-Story Large	0.88
Retail - Single-Story Large	0.88
Retail - Small	0.88
Storage Conditioned	0.84
Storage Unconditioned	0.84
Warehouse	0.84
Average = Miscellaneous	0.74

Table 4: Annual Operating Hours from DEER

DEER Market Sector	CFL Annual Operating Hours	Other Lighting Annual Operating Hours
Education - Primary School	1,440	1,440
Education - Secondary School	2,305	2,305
Education - Community College	3,792	3,792
Education – University	3,073	3,073
Grocery	5,824	5,824
Medical – Hospital	8,736	8,736
Medical - Clinic*	4,212	4,212
Lodging Hotel	8,736	8,736
Lodging Motel	8,736	8,736
Lodging - Guest Rooms	1,145	NA
Manufacturing - Light Industrial*	4,290	4,290
Office- Large	2,739	2,808
Office-Small	2,492	2,808
Restaurant - Sit-Down	3,444	4,368
Restaurant - Fast-Food	6,188	6,188
Retail - 3-Story Large	4,259	4,259
Retail – Single-Story Large	4,368	4,368
Retail – Small	3,724	4,004
Storage Conditioned	2,860	2,860
Storage Unconditioned	2,860	2,860
Warehouse	2,600	2,600
Average = Miscellaneous	4,380	4,242

* Not from DEER

Table 5 below provides the above data mapped to ComEd building types. The miscellaneous category is an average of the building types.

Industrial operating hours are assumed based on the following sources:

- DEER estimates hours to be 2,860.
- Efficiency Vermont Technical Reference User Manual's (No. 2004-29) estimates 5,913 hours .
- the 2004-2005 PG&E workpapers assumed 6,650 hours for process industrial and 4,400 for assembly industrial.

DEER's estimated hours are far lower than figures other sources have provide and so we have increased the DEER values by 50% or to 4,290 hours. This value is reasonable and on the conservative side of the averages. We will use this conservative value until more data is available for the ComEd territory.

Similarly, we believe that the DEER storage and warehouse operating hours are low as well. Current ComEd data show that warehouses average 4859 in operating hours. This is the average operating hours recorded for 55 inspected warehouse projects where this information was available. DEER operating hours for conditioned, unconditioned storage areas, and warehouses range from only 2600-2860. ComEd program data suggests that operating hours are significantly higher. We believe that 4,859 is a better estimate of deemed operating hours since it derives from actual ComED customers.

DEER has set Medical-Hospital operating hours at 8,736. We have lowered this value for the purposes of calculating our average by using operating hours 50% above that of offices or 4,212 hours (Medical-Clinic operating hours). This is to account for areas in medical facilities that behave more like offices and do not operate around the clock. ComEd medical operating hours is the average of the DEER Hospital the revised clinic operating hours.

Hotel/Motel operating hours are the average of guest room hours and either hotel or motel operating hours since a facility can only be one or the other. ComEd hotel hours and motel hours are equivalent (average of 8,736 and 1,145).

Table 5: Mapped Lighting Factors

ComEd Building Types	CFL Annual Operating Hours	Other Lighting Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,616	2,808	1.25	0.81	1.17
School (K-12)	1,873	1,873	1.23	0.42	1.15
College/University	3,433	3,433	1.22	0.68	1.15
Retail/Service	4,117	4,210	1.19	0.88	1.11
Restaurant	4,816	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	4,941	1.14	0.67	1.14
Medical	6,474	6,474	1.26	0.74	1.18
Grocery	5,824	5,824	1.25	0.81	1.13
Warehouse	4,859	4,859	1.09	0.84	1.06
Light Industry	4,290	4,290	1.08	0.99	1.04
Heavy Industry	4,290	4,290	1.08	0.99	1.04
Average = Miscellaneous	4,321	4,389	1.19	0.77	1.12

T5 Lamp and Ballast	
Measure Description	This measure consists of replacing 4 foot T12 lamps and magnetic ballasts with T5 lamps and electronic ballast. The T5 lamps must have a color rendering index (CRI) ≥ 80. The electronic ballast must be high frequency (≥20 kHz), UL listed, and warranted against defects for 5 years. Ballasts must have a power factor (PF) ≥ 0.90 and a total harmonic distortion (THD) ≤20 percent at full light output.
Units	Per Lamp
Base Case Description	T12 lamps with magnetic ballasts.
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: KEMA
Effective Useful Life	Source: DEER 11 years

This measure consists of replacing 4 foot T12 lamps and magnetic ballasts with T5 lamps and electronic ballast. The T5 lamps must have a color rendering index (CRI) ≥ 80. The electronic ballast must be high frequency (≥20 kHz), UL listed, and warranted against defects for 5 years. Ballasts must have a power factor (PF) ≥ 0.90 and a total harmonic distortion (THD) ≤20 percent at full light output.

Measure Savings
The savings are provided by building type in the following table. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database.[2] Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the introduction). The miscellaneous category is an average of the building types.

[2] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Table 6: T12 to T5 Fluorescent Fixtures per Lamp

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak Watt Savings	kWh Savings
Office	2,808	1.25	0.81	1.17	0.013	43.5
School (K-12)	1,873	1.23	0.42	1.15	0.007	28.5
College/University	3,433	1.22	0.68	1.15	0.011	52.3
Retail/Service	4,210	1.19	0.88	1.11	0.014	61.9
Restaurant	5,278	1.26	0.68	1.15	0.011	80.4
Hotel/Motel	4,941	1.14	0.67	1.14	0.010	74.6
Medical	6,474	1.26	0.74	1.18	0.012	101.2
Grocery	5,824	1.25	0.81	1.13	0.013	87.2
Warehouse	4,859	1.09	0.84	1.06	0.012	68.2
Light Industry	4,290	1.08	0.99	1.04	0.014	59.1
Heavy Industry	4,290	1.08	0.99	1.04	0.014	59.1
Average = Miscellaneous	4,389	1.19	0.77	1.12	0.012	65.1

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = No-Coincident kW Savings * Annual Operating Hours * Energy Interactive Effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = Non-Coincident kW Savings * Coincidence Factor * Demand Interactive Effect

Baseline and retrofit equipment assumptions are listed in the table below.

Table 7: Baseline and Retrofit Wattages for T12 to T5 Fixture Retrofits

Baseline Configuration	Base Fixture Wattage	Retrofit Configuration	Retrofit Fixture Wattage	Demand Savings per lamp (kW)	Weight Percentages
4ft 4-lamp T12	270	4ft T5 4lamp HO	234	0.009	13%
4ft 4-lamp T12	164	4ft T5 4lamp	128	0.009	13%
4ft 3-lamp T12	230	4ft T5 3 Lamp HO	179	0.017	13%
4ft 3-lamp T12	133	4ft T5 3 Lamp	97	0.012	13%
4ft 2-lamp T12	145	4ft T5 2 Lamp HO	117	0.014	13%
4ft 2-lamp T12	82	4ft T5 2 Lamp	64	0.009	13%
4ft 1-lamp T12	80	4ft T5 1 Lamp HO	62	0.018	13%
4ft 1-lamp T12	51	4ft T5 1 Lamp	33	0.018	13%
Weighted Average				0.013	

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. In this case, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 8: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	11	DEER
Incremental Measure Cost	$18.54	KEMA

High Performance and Reduced Wattage 4-foot T8 Lamps and Ballast	
Measure Description	This measure consists of replacing existing T12 4' lamps and magnetic ballasts with high performance 32W T8 lamps or reduced wattage 28W or 25W lamps and electronic ballasts. Both the lamp and ballast must meet the Consortium for Energy Efficiency (CEE) high performance or reduced wattage T8 specification (www.cee1.org) and summarized below.
Units	Per lamp
Base Case Description	T12 lamp and magnetic ballasts
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: ICF Portfolio
Effective Useful Life	Source: DEER 11 years

This measure consists of replacing existing T12 lamps and magnetic ballasts with high-performance T8 lamps or reduced wattage (28 or 25W) T8 lamps and electronic ballasts. This measure is based on the Consortium for Energy Efficiency (CEE) high-performance T8 or reduced wattage specification (www.cee1.org) and is summarized below. A list of qualified lamps and ballasts can be found at: http://www.cee1.org/com/com-lt/com-lt-main.php3. Both the lamp and ballast must meet the specification to qualify for an incentive. The incentive is calculated based on the number of lamps installed. A manufacturer's specification sheet must accompany the application.

For reduced wattage 4-foot T8 lamps, the nominal wattage must be 28 W (≥2,585 Lumens) or 25 W (≥2,400 Lumens) to qualify. The mean system efficacy must be ≥ 90 MLPW, CRI ≥80, and lumen maintenance at 94 percent. Other requirements can be found on the CEE website using the links above.

The table below provides the specification for high performance systems.

Table 9: High-Performance T8 Specifications

<table>
<tr><th colspan="5">Performance Characteristics for Systems</th></tr>
<tr><td rowspan="2">Mean system efficacy</td><td colspan="4">≥ 90 Mean Lumens per Watt (MLPW) for Instant Start Ballasts</td></tr>
<tr><td colspan="4">≥ 88 MLPW for Programmed Rapid Start Ballasts</td></tr>
<tr><th colspan="5">Performance Characteristics for Lamps</th></tr>
<tr><td>Color Rendering Index (CRI)</td><td colspan="4">≥ 80</td></tr>
<tr><td>Minimum initial lamp lumens</td><td colspan="4">≥ 3100 Lumens[3]</td></tr>
<tr><td>lamp life</td><td colspan="4">≥ 24,000 hours</td></tr>
<tr><td>Lumen maintenance or minimum mean lumens</td><td colspan="4">≥ 90% or
≥ 2,900 Mean Lumens</td></tr>
<tr><th colspan="5">Performance Characteristics for Ballasts</th></tr>
<tr><td rowspan="12">Ballast Efficacy Factor (BEF)

BEF = (BF x 100) / Ballast Input Watts</td><th colspan="4">Instant-Start Ballast (BEF)</th></tr>
<tr><td>Lamps</td><td>Low BF ≤ 0.85</td><td>Norm 0.85 < BF ≤ 1.0</td><td>High BF ≥ 1.01</td></tr>
<tr><td>1</td><td>> 3.08</td><td>> 3.11</td><td>NA</td></tr>
<tr><td>2</td><td>> 1.60</td><td>> 1.58</td><td>>1.55</td></tr>
<tr><td>3</td><td>≥ 1.04</td><td>≥ 1.05</td><td>≥ 1.04</td></tr>
<tr><td>4</td><td>≥ 0.79</td><td>≥ 0.80</td><td>≥ 0.77</td></tr>
<tr><th colspan="4">Programmed Rapid Start Ballast (BEF)</th></tr>
<tr><td>1</td><td>≥ 2.84</td><td>≥ 2.84</td><td>NA</td></tr>
<tr><td>2</td><td>≥ 1.48</td><td>≥ 1.47</td><td>≥ 1.51</td></tr>
<tr><td>3</td><td>≥ 0.97</td><td>≥ 1.00</td><td>≥ 1.00</td></tr>
<tr><td>4</td><td>≥ 0.76</td><td>≥ 0.75</td><td>≥ 0.75</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>Ballast Frequency</td><td colspan="4">20 to 33 kHz or ≥ 40 kHz</td></tr>
<tr><td>Power Factor</td><td colspan="4">≥ 0.90</td></tr>
<tr><td>Total Harmonic Distortion</td><td colspan="4">≤ 20%</td></tr>
</table>

Measure Savings

Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit the program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the introduction). The coincident kW and kWh savings are provided by building type in the following tables.

Table 10: Measure Savings for High-Performance or Reduced Wattage 4-foot Lamp and Ballast (per lamp)

[3] For lamps with temperature ≥4500K, 2,950 minimum initial lamp lumens are specified.

ComEd Building Types	Coincident Demand Savings (kW)	Energy Savings (kWh)
Office	0.013	41.4
School (K-12)	0.007	27.2
College/University	0.010	49.8
Retail/Service	0.013	58.9
Restaurant	0.011	76.5
Hotel/Motel	0.010	71.0
Medical	0.012	96.3
Grocery	0.013	83.0
Warehouse	0.012	65.0
Light Industry	0.013	56.3
Heavy Industry	0.013	56.3
Average = Miscellaneous	0.012	62.0

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database and shown in the following table. However, DEER building types were mapped to fit that of ours.

Table 11: Factors used for Calculating Lighting Savings

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,210	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,859	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	4,389	1.19	0.77	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are presented in the table below.

Table 12: Baseline and Retrofit Wattages for High-Performance or Reduced Wattage Fixture Retrofits

	T8, 4-foot Configuration	Base Fixture Wattage	Retrofit Lamp Wattage	Retrofit Fixture Wattage	Demand Savings per fixture (kW)	Demand Savings per lamp (kW)	Weight Percentages
High	4-lamp	144	32	108	0.036	0.009	9%
	3-lamp	103	32	83	0.02	0.007	4%
	2-lamp	72	32	54	0.018	0.009	8%
	1-lamp	43	32	28	0.015	0.015	4%
Med	4-lamp	144	28	96	0.048	0.012	15%
	3-lamp	103	28	72	0.031	0.010	10%
	2-lamp	72	28	48	0.024	0.012	15%
	1-lamp	43	28	25	0.018	0.018	10%
Low	4-lamp	144	25	85	0.059	0.015	9%
	3-lamp	103	25	66	0.037	0.012	4%
	2-lamp	72	25	44	0.028	0.014	8%
	1-lamp	43	25	22	0.021	0.021	4%
	Weighted Average					0.0126	

Measure Life and Incremental Measure Cost

The table below provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case the lighting measures, the IMC is equal to the full measure cost since cost of the less efficient option.

Table 13: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	Lamp and Ballast	11	DEER
Incremental Measure Cost	4 Foot Lamp and Ballast	$16.50	ICF Portfolio Plan

Reduced Wattage 4-foot Lamp Only	
Measure Description	This measure consists of replacing existing standard T8 4' lamps and electronic ballasts with reduced wattage T8 lamps. The lamp must meet the Consortium for Energy Efficiency (CEE) reduced wattage T8 specification (www.cee1.org). The nominal wattage for 4 foot lamps must be 28W (≥2585 Lumens) or 25W (≥2400 Lumens) to qualify. The mean system efficacy must be ≥ 90 MLPW, CRI ≥ 80, and lumen maintenance at 94%. A manufacturer's specification sheet must accompany the application.
Units	Per lamp
Base Case Description	Standard T8 fixtures.
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: ICF Portfolio
Effective Useful Life	Source: KEMA 3 years

Incentives are available for when replacing standard 32-Watt T8 lamps with reduced-wattage T8 lamps when an electronic ballast is already present. The lamps must be reduced wattage in accordance with the Consortium for Energy Efficiency (CEE) specification (www.cee1.org). Qualified products can be found at http://www.cee1.org/com/com-lt/com-lt-main.php3. The nominal wattage must be 28 W (≥2,585 Lumens) or 25 W (≥2,400 Lumens) to qualify. The mean system efficacy must be ≥ 90 MLPW, CRI ≥80, and lumen maintenance at 94 percent. A manufacturer's specification sheet must accompany the application.

Measure Savings

Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit the program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the introduction). The coincident kW and kWh savings are provided by building type in the following table.

Table 14: Measure Savings for Reduced-Wattage 4-foot Lamp Only

ComEd Building Types	Coincident Demand Savings (kW)	Energy Savings (kWh)
Office	0.006	19.3
School (K-12)	0.003	12.6
College/University	0.005	23.1
Retail/Service	0.006	27.4
Restaurant	0.005	35.6
Hotel/Motel	0.004	33.0
Medical	0.005	44.8
Grocery	0.006	38.6
Warehouse	0.005	30.2
Light Industry	0.006	26.2
Heavy Industry	0.006	26.2

Average = Miscellaneous	0.005	28.8

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database and shown in the next table. However, DEER building types were mapped to fit that of the ComEd Program.

Table 15: Factors used for Calculating Lighting Savings

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,210	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,859	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	4,389	1.19	0.77	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are presented in the next table.

Table 16: Baseline and Retrofit Wattages for 4-foot T8 Lamp Only

T8 Configuration	Base Lamp Wattage	Base Fixture Wattage	Retrofit Lamp Wattage	Retrofit Fixture Wattage	Demand Savings per fixture (kW)	Demand Savings per lamp (kW)	Weight Percentages
4 ft, 4-lamp	32	112	28	96	0.016	0.004	18%
4 ft, 3-lamp	32	85	28	72	0.013	0.004	13%
4 ft, 2-lamp	32	58	28	48	0.01	0.005	15%
4 ft ,1-lamp	32	32	28	25	0.007	0.007	5%
4 ft, 4-lamp	32	112	25	85	0.027	0.007	18%
4 ft, 3-lamp	32	85	25	66	0.019	0.006	13%
4 ft, 2-lamp	32	58	25	44	0.014	0.007	15%
4 ft ,1-lamp	32	32	25	22	0.01	0.010	5%
Weighted Average						0.006	

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is the cost difference between the energy-efficient equipment and the less efficient option. In this case, lighting measures, the IMC is equal to the full measure cost for lamp and ballast retrofit and incremental for lamp only. The lamp and ballast retrofit is a change in technology.

Table 17: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	Lamp Only	3	KEMA
Incremental Measure Cost	4 Foot Lamp Only	$2.10	ICF Portfolio Plan

Reduced Wattage 8-foot	
Measure Description	This measure consists of replacing existing T12 8' lamps and magnetic ballasts with reduced wattage T8 lamps and electronic ballasts. Both the lamp and ballast must meet the Consortium for Energy Efficiency (CEE) high performance or reduced wattage T8 specification (www.cee1.org). Eight foot lamps must have a minimum MLPW of 90 and must have a nominal wattage of less than 57W. A manufacturer's specification sheet must accompany the application. High wattage T8 (59W) can be replaced with reduced wattage lamps without replacing the ballast. The lamps must also meet CEE standards for reduced wattage.
Units	Per lamp
Base Case Description	T12 lamp and magnetic ballasts or high watt T8 fixtures (for reduced wattage lamp only replacements).
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: ICF Portfolio
Effective Useful Life	Source: KEMA and DEER

This measure consists of replacing existing T12 lamps and magnetic ballasts with reduced wattage lamp and electronic ballast systems. The lamps and ballasts must meet the Consortium for Energy Efficiency (CEE) specification (www.cee1.org). Qualified lamps and ballast products can be found at http://www.cee1.org/com/com-lt/com-lt-main.php3. Incentives are also available for when replacing 59-Watt T8 lamps with reduced-wattage T8 lamps when an electronic ballast is already present. Eight-foot lamps must have a minimum MLPW of 90 and must have a nominal wattage of less than 57 W. A manufacturer's specification sheet must accompany the application.

Measure Savings

Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit the program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the introduction). The coincident kW and kWh savings are provided by building type in the following tables.

Table 18: Measure Savings for Reduced-Wattage 8-foot Lamp and Ballast

ComEd Building Types	Coincident Demand Savings (kW)	Energy Savings (kWh)
Office	0.016	52.6
School (K-12)	0.008	34.5
College/University	0.013	63.2
Retail/Service	0.017	74.8
Restaurant	0.014	97.1
Hotel/Motel	0.012	90.1
Medical	0.015	122.2
Grocery	0.016	105.3
Warehouse	0.015	82.4
Light Industry	0.017	71.4
Heavy Industry	0.017	71.4
Average = Miscellaneous	0.015	78.7

Table 19: Measure Savings for Reduced-Wattage 8-foot Lamp Only

ComEd Building Types	Coincident Demand Savings (kW)	Energy Savings (kWh)
Office	0.005	16.4
School (K-12)	0.003	10.8
College/University	0.004	19.7
Retail/Service	0.005	23.4
Restaurant	0.004	30.3
Hotel/Motel	0.004	28.2
Medical	0.005	38.2
Grocery	0.005	32.9
Warehouse	0.005	25.8
Light Industry	0.005	22.3
Heavy Industry	0.005	22.3
Average = Miscellaneous	0.005	24.6

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database and shown in the table below. However, DEER building types were mapped to fit that of the ComEd Program.

Table 20: Factors used for Calculating Lighting Savings

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,210	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,859	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	4,389	1.19	0.77	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are presented in the next table.

Table 21: Baseline and Retrofit Wattages for 8-foot

	Configuration	Base Lamp Wattage	Base Fixture Wattage	Retrofit Lamp Wattage	Retrofit Fixture Wattage	Demand Savings per fixture (kW)	Demand Savings per lamp (kW)	Weight Percentages
Lamp and Ballast	8ft, 2 lamp	60	132	57	102	0.030	0.015	50%
	8ft, 1-lamp	60	77	57	60	0.017	0.017	50%
	Weighted Average						0.016	
Lamp Only	8ft, 2 lamp	59	106	57	102	0.004	0.002	50%
	8ft, 1-lamp	59	68	57	60	0.008	0.008	50%
	Weighted Average						0.005	

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is the cost difference between the energy-efficient equipment and the less efficient option. In this case, lighting measures, the IMC is equal to the full measure cost for lamp and ballast retrofit and incremental for lamp only. The lamp and ballast retrofit is a change in technology.

Table 22: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	Lamp and Ballast	11	DEER
Measure Life	Lamp Only	3	KEMA
Incremental Measure Cost	8 Foot Lamp and Ballast	$38.00	ICF Portfolio Plan
Incremental Measure Cost	8 Foot Lamp Only	$5.50	ICF Portfolio Plan

U-Tube T8 Lamps and Ballast	
Measure Description	This measure consists of replacing existing T12 U-tube lamps and magnetic ballasts with T8 U-tube lamps and electronic ballasts.
Units	Per lamp
Base Case Description	U-tube T12 lamps and magnetic ballast
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: DEER
Effective Useful Life	Source: DEER 11 years

This measure consists of replacing existing U-tube T12 lamps and magnetic ballasts with U-tube T8 lamps and electronic ballasts. The lamp must have a color rendering index (CRI) ≥ 80 and the ballast must have a total harmonic distortion (THD) ≤ 20% at full light output and power factor (PF) ≥ 90. Ballasts must also be warranted against defect for 5 years. The incentive is calculated based on the number of lamps installed. A manufacturer's specification sheet must accompany the application.

Measure Savings
The coincident kW and kWh savings are provided by building type in the following table.

Table 23: Measure Savings for U-tube Lamp and Ballast (per lamp)

ComEd Building Types	Coincident Demand Savings (kW)	Energy Savings (kWh)
Office	0.009	30.4
School (K-12)	0.005	19.9
College/University	0.008	36.5
Retail/Service	0.010	43.2
Restaurant	0.008	56.1
Hotel/Motel	0.007	52.1
Medical	0.009	70.7
Grocery	0.009	60.9
Warehouse	0.008	47.6
Light Industry	0.010	41.3
Heavy Industry	0.010	41.3
Average = Miscellaneous	0.008	45.5

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database and shown in the following table.[4] Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit the program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the introduction).

Table 24: Factors used for Calculating Lighting Savings

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,210	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,859	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	4,389	1.19	0.77	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

[4] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Baseline and retrofit equipment assumptions are presented in Table 38. The wattages were collected from PG&E's Non-residential retrofit standard wattages table.

Table 25: Baseline and Retrofit Wattages for U-tube lamps

T8 Configuration	Base Lamp Wattage	Base Fixture Wattage	Retrofit Lamp Wattage	Retrofit Fixture Wattage	Demand Savings per fixture (kW)	Demand Savings per lamp (kW)	Weight Percentages
U-tube, 2 lamp	35	72	32	59	0.013	0.007	50%
U-tube, 1 lamp	35	43	32	31	0.012	0.012	50%
Weighted Average						0.009	

Measure Life and Incremental Measure Cost

The table below provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case the lighting measures, the IMC is equal to the full measure cost since cost of the less efficient option. For U-tubes, it is assumed that the cost is the same as a high performance 4-foot T8 lamp (DEER measure ID D03-852).

Table 26: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	Lamp and Ballast	11	DEER
Measure Life	Lamp Only	3	KEMA
Incremental Measure Cost	U-Tube Lamp and Ballast	$11.71	DEER

2-foot & 3-foot T8 Lamps and Ballast	
Measure Description	This measure consists of replacing existing T12 2-foot and 3-foot lamps and magnetic ballasts with 17W, 2-foot, and 25W, 3-foot, T8 lamps and electronic ballasts.
Units	Per lamp
Base Case Description	T12 lamps and magnetic ballast
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: PG& E 2006 Work papers
Effective Useful Life	Source: DEER 11 years

This measure consists of replacing existing T12 lamps and magnetic ballasts with T8 lamps and electronic ballasts. The lamp must have a color rendering index (CRI) ≥ 80 and the ballast must have a total harmonic distortion (THD) ≤ 32% at full light output and power factor (PF) ≥ 0.90. Ballasts must also be warranted against defect for 5 years. The incentive is calculated based on the number of lamps installed. A manufacturer's specification sheet must accompany the application.

Measure Savings
The coincident kW and kWh savings are provided by building type in the following table:

Table 27: Measure Savings for 2-foot and 3-foot Lamp and Ballast (per lamp)

	2-foot Lamp fixtures		3-foot Lamp fixtures	
ComEd Building Types	**Coincident Demand Savings (kW)**	**Energy Savings (kWh)**	**Coincident Demand Savings (kW)**	**Energy Savings (kWh)**
Office	0.011	34.5	0.014	46.5
School (K-12)	0.005	22.6	0.007	30.5
College/University	0.009	41.5	0.012	55.9
Retail/Service	0.011	49.1	0.015	66.1
Restaurant	0.009	63.7	0.012	85.9
Hotel/Motel	0.008	59.2	0.011	79.7
Medical	0.010	80.2	0.013	108.1
Grocery	0.011	69.1	0.014	93.1
Warehouse	0.010	54.1	0.013	72.9
Light Industry	0.011	46.9	0.015	63.1
Heavy Industry	0.011	46.9	0.015	63.1
Average = Miscellaneous	0.010	51.6	0.013	69.5

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database and shown in the following table. Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit the program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the introduction).

Table 28: Factors used for Calculating Lighting Savings

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,210	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,859	1.09	0.84	1.06

Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	4,389	1.19	0.77	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are presented in the tables below. The fixture wattages were collected from PG&E's Non-residential Retrofit Program standard fixture wattage table.

Table 29: Baseline and Retrofit Wattages for 2-foot lamps

T8 Configuration	Base Lamp Wattage	Base Fixture Wattage	Retrofit Lamp Wattage	Retrofit Fixture Wattage	Demand Savings per fixture (kW)	Demand Savings per lamp (kW)	Weight Percentages
2 ft, 4-lamp	20	112	17	61	0.051	0.013	2.5%
2 ft, 3-lamp	20	84	17	47	0.037	0.012	2.5%
2 ft, 2-lamp	20	56	17	33	0.023	0.012	65%
2 ft ,1-lamp	20	28	17	20	0.008	0.008	30%
Weighted Average						0.0105	

Table 30: Baseline and Retrofit Wattages for 3-foot lamps

T8 Configuration	Base Lamp Wattage	Base Fixture Wattage	Retrofit Lamp Wattage	Retrofit Fixture Wattage	Demand Savings per fixture (kW)	Demand Savings per lamp (kW)	Weight Percentages
3 ft, 4-lamp	30	152	25	87	0.065	0.0163	2.5%
3 ft, 3-lamp	30	114	25	67	0.047	0.0157	2.5%
3 ft, 2-lamp	30	76	25	46	0.030	0.0150	65%
3 ft ,1-lamp	30	38	25	26	0.012	0.0120	30%

Weighted Average						0.0141	

Measure Life and Incremental Measure Cost

The table below provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case the lighting measures, the IMC is equal to the full measure cost since cost of the less efficient option.

Table 31: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	Lamp and Ballast	11	DEER
Measure Life	Lamp Only	3	KEMA
Incremental Measure Cost	2 Foot Lamp and Ballast	$10.50	PG&E 2006 Work Paper
Incremental Measure Cost	3 Foot Lamp and Ballast	$21	PG&E 2006 Work Paper

Ceramic Metal Halide Integral Ballast Lamp	
Measure Description	This measure consists of replacing incandescent lamps with an integrated electronic self-ballasted Ceramic Metal Halide lamp.
Units	Per lamp
Base Case Description	Incandescent lamps
Measure Savings	Source: PG&E Work papers
Measure Incremental Cost	Source: PG&E Work papers
Effective Useful Life	Source: PG&E Work papers 8 years

Qualifying lamps are 25 watt or less integrated ballast ceramic metal halide PAR lamps with a rated life 10,500 hours or greater.

Measure Savings
The coincident kW and kWh savings are provided by building type in the following table.

Table 32: Integrated Electronic Self-Ballasted Ceramic Metal Halide lamp Savings

ComEd Building Types	Coincident Demand Savings (kW)	Energy Savings (kWh)
Office	0.050	152.3
School (K-12)	0.026	107.2
College/University	0.041	196.4
Retail/Service	0.052	227.4
Restaurant	0.043	275.5
Hotel/Motel	0.038	280.2
Medical	0.046	380.1
Grocery	0.050	327.4
Warehouse	0.046	256.2
Light Industry	0.053	222.0
Heavy Industry	0.053	222.0
Average = Miscellaneous	0.046	240.8

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database and shown in the following table.[5] Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit the program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the introduction).

Table 33: Factors used for Calculating Lighting Savings

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,616	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,117	1.19	0.88	1.11
Restaurant	4,816	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,859	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	4,321	1.19	0.77	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are presented in the table below. Calculations assume that a PAR 38 halogen (45-90W) lamp is replaced with an integrated electronic self-ballasted 25W Ceramic Metal Halide lamp.

[5] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Table 34: Baseline and Retrofit Wattages for Ceramic Metal Halide lamps

Base Lamp Wattage	Retrofit Lamp Wattage	Demand Savings per fixture	Weight Percentages
45	25	0.020	15%
60	25	0.035	30%
75	25	0.050	10%
90	25	0.065	25%
100	25	0.075	20%
Weighted Average		0.050	

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data. The measure life varies by market segment, hence dependent on operating hours. The average calculated life is 3 years.

Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. The full measure cost is applicable since the measure is a retrofit with a new technology.

Table 35: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	Lamp and Ballast	8	PG&E Workpaper
Incremental Measure Cost	Ceramic Metal Halide lamps	$60	PG&E Workpaper

Ceramic Metal Halides or Pulse Start Metal Halides	
Measure Description	This measure applies to retrofits of high intensity discharge fixtures with either pulse start metal halide or ceramic metal halide fixtures. The new fixture must replace a higher wattage existing fixture.
Units	Per Fixture
Base Case Description	High wattage HID fixtures
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: KEMA
Effective Useful Life	Source: DEER 16 years

This incentive applies to retrofits of high-intensity discharge fixtures with either pulse-start metal halide or ceramic metal halide fixtures. Total replacement wattage must be lower than existing wattage to ensure energy savings. This measure is subject to possible pre-inspection. Retrofit kits may be used on existing mercury vapor, standard metal halide or high-pressure sodium fixtures only.

Measure Savings
The table below provides the non-coincident savings.

Table 36 : Wattage Reduction

Wattage Category	Average Wattage Reduction
100W or Less	48
101W-200W	65
201-350W	126

The coincident kW and kWh savings are provided by building type below. Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit the program. Some savings values have been combined to fit program needs. The miscellaneous category is an average of the building types (see detailed description of the methodology in the introduction).

Table 37: Measure Savings for ≤100W MH

ComEd Building Types	Annual Operating Hours	Peak kW Savings	kWh Savings
Office	2,808	0.049	158.8
School (K-12)	1,873	0.025	104.1
College/University	3,433	0.040	190.8
Retail/Service	4,210	0.051	225.9
Restaurant	5,278	0.041	293.4
Hotel/Motel	4,941	0.037	272.2
Medical	6,474	0.045	369.2
Grocery	5,824	0.049	318.1
Warehouse	4,859	0.041	234.9
Light Industry	4,290	0.048	207.4
Heavy Industry	4,290	0.048	207.4
Average = Miscellaneous	4,389	0.044	234.9

Table 38: Measure Savings for 101W-200W MH

ComEd Building Types	Annual Operating Hours	Peak kW Savings	kWh Savings
Office	2,808	0.066	213.5
School (K-12)	1,873	0.034	140.0
College/University	3,433	0.054	256.6
Retail/Service	4,210	0.068	303.8
Restaurant	5,278	0.056	394.5
Hotel/Motel	4,941	0.050	366.1
Medical	6,474	0.061	496.6
Grocery	5,824	0.066	427.8
Warehouse	4,859	0.055	315.8
Light Industry	4,290	0.064	278.9
Heavy Industry	4,290	0.064	278.9
Average = Miscellaneous	4,389	0.059	315.9

Table 39: Measure Savings for >200W-350W MH

ComEd Building Types	Annual Operating Hours	Peak kW Savings	kWh Savings
Office	2,808	0.130	420.5
School (K-12)	1,873	0.066	275.7
College/University	3,433	0.106	505.3
Retail/Service	4,210	0.134	598.2
Restaurant	5,278	0.110	776.9
Hotel/Motel	4,941	0.098	721.0
Medical	6,474	0.119	977.8
Grocery	5,824	0.130	842.4
Warehouse	4,859	0.108	622.0
Light Industry	4,290	0.127	549.1
Heavy Industry	4,290	0.127	549.1
Average = Miscellaneous	4,389	0.115	622.1

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database. However, DEER building types were mapped to fit the ComEd Program.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

For this measure, it is assumed that the lighting placed in Warehouse, Light Industry, and Heavy Industry building types exist in non-conditioned areas so the energy and demand interactive effects are 1.0.

Baseline and retrofit equipment assumptions are presented in the following table. Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed. The table shows the wattages used for the savings calculations.

Table 40: Baseline and Retrofit Wattages[6]

Measures	Base Wattage	Retrofit Wattage	Wattage Reduction
100W or Less			
Basecase -> Metal Halide (<39W)	57	22	35
Basecase -> Metal Halide (<39W)	83	46	37
Basecase (100W) -> Ceramic MH (25W lamp)	100	27	73
Average			**48.3**
101W-200W			
Basecase (250W lamp) -> Metal Halide (175W lamp)	295	208	87
Basecase (175W lamp) -> Metal Halide (150W lamp)	208	185	23
Metal Halide (250W) -> Pulse Start Metal Halide (175W)			85
Average			**65.0**
201-350W			
Basecase (400W lamp) -> Metal Halide (320W lamp)	458	365	93
Mercury Vapor (400W) -> Pusle Start Metal Halide (250W)	458	295	163
Average			**128.0**

Measure Life and Incremental Measure Cost

The next table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case, lighting measures, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 41: Measure Life and Incremental Measure Cost

Wattage Category		Value	Source
All	Measure Life	16	DEER
100W or Less	Incremental Measure Cost	$95	SCE WP[7]
101W-200W	Incremental Measure Cost	$170	PG&E WP[8]
201-350W	Incremental Measure Cost	$266	SCE WP[9]

[6]2006 PG&E Interior Pulse Start Metal Halide Workpaper, PG&E Directional Lighting CMH Workpaper, SCE Ceramic Metal Halide Workpaper (WPSCNRLG0054.1), 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures.

[7] WPSCNRLG0054.1 Ceramic Metal Halide Fixtures, Southern California Edison Workpaper, 2008.

[8] 2006 PG&E Interior Pulse Start Metal Halide Workpaper

[9] WPSCNRLG0046.1 Interior Pulse Start Metal Halide Fixtures 251 -400W, Southern California Edison Workpaper, 2008.

New T5/T8 Fluorescent Fixtures	
Measure Description	This measure consists of replacing one or more existing fixtures with new fixtures containing T8 or T5 lamps and electronic ballasts. The T8 or T5 lamps must have a color rendering index (CRI) ≥ 80. The electronic ballast must be high frequency (≥20 kHz), NRTL listed, and warranted against defects for 5 years. Ballasts must have a power factor (PF) ≥ 0.90. Ballasts for 4-foot lamps must have total harmonic distortion (THD) ≤20 percent at full light output. For 2- and 3-foot lamps, ballasts must have THD ≤32% at full light output.
Units	Per Watt reduced
Base Case Description	Typically high wattage HID fixtures
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: KEMA
Effective Useful Life	Source: DEER 11 years

This measure consists of replacing one or more existing fixtures with new fixtures containing T8 or T5 lamps and electronic ballasts. The T8 or T5 lamps must have a color rendering index (CRI) ≥ 80. The electronic ballast must be high frequency (≥20 kHz), NRTL listed, and warranted against defects for 5 years. Ballasts must have a power factor (PF) ≥ 0.90. Ballasts for 4-foot lamps must have total harmonic distortion (THD) ≤20 percent at full light output. For 2- and 3-foot lamps, ballasts must have THD ≤32 percent at full light output.

Measure Savings

The savings are provided by building type in the following table. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database.[10] Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the introduction). The miscellaneous category is an average of the building types.

[10] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Table 42: Measure Savings for New T8/T5 Fluorescent Fixtures per Watt Reduced

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak Watt Savings	kWh Savings
Office	2,808	1.25	0.81	1.17	0.00101	3.285
School (K-12)	1,873	1.23	0.42	1.15	0.00052	2.154
College/University	3,433	1.22	0.68	1.15	0.00083	3.948
Retail/Service	4,210	1.19	0.88	1.11	0.00105	4.673
Restaurant	5,278	1.26	0.68	1.15	0.00086	6.070
Hotel/Motel	4,941	1.14	0.67	1.14	0.00076	5.633
Medical	6,474	1.26	0.74	1.18	0.00093	7.639
Grocery	5,824	1.25	0.81	1.13	0.00101	6.581
Warehouse	4,859	1.09	0.84	1.06	0.00084	4.859
Light Industry	4,290	1.08	0.99	1.04	0.00099	4.290
Heavy Industry	4,290	1.08	0.99	1.04	0.00099	4.290
Average = Miscellaneous	4,389	1.19	0.77	1.12	0.00090	4.860

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = no-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are variable. Because we define this measure as in the number of watts reduced, the non-coincident demand savings will be one watt by definition.

For this measure, it is assumed that the lighting placed in Warehouse, Light Industry, and Heavy Industry building types exist in non-conditioned areas so the energy and demand interactive effects are 1.0.

Measure Life and Incremental Measure Cost
The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. In this case the lighting measures, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 43: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	11	DEER
Incremental Measure Cost[11]	$0.75	KEMA

[11] Based on the assessment of active projects in the 2008-09 ComEd Smart Ideas Program.

Exit Signs	
Measure Description	High-efficiency exit signs must replace or retrofit an existing incandescent or fluorescent exit sign. Electroluminescent, photoluminescent, T1 and light-emitting diode (LED) exit signs are eligible under this category. Remote exit signs are not eligible. All new exit signs or retrofit exit signs must be NRTL listed, have a minimum lifetime of 10 years, and have an input wattage ≤5 Watts or be ENERGY STAR qualified.
Units	Per Sign
Base Case Description	Incandescent Exit Signs
Measure Savings	Source: ENERGY STAR
Measure Incremental Cost	Source: ICF Portfolio Plan
Effective Useful Life	Source: DEER 16 years

High-efficiency exit signs must replace or retrofit an existing incandescent exit sign. Electroluminescent, photoluminescent, T1 and light-emitting diode (LED) exit signs are eligible under this category. Remote exit signs are not eligible. All new exit signs or retrofit exit signs must be NRTL listed, have a minimum lifetime of 10 years, and have an input wattage ≤5 Watts or be ENERGY STAR qualified.

Measure Savings
Baseline and retrofit equipment assumptions are presented in the next table. Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed. The table shows the wattages used for the savings calculations.

Table 44: Baseline and Retrofit Wattages

Measure	Weighting	Base Wattage	Retrofit Wattage	Wattage Reduction
Two Incandescent Bulbs (20W each) -> LED EXIT Sign (5W)	70%	40	5	35
Two Fluorescent Bulbs (9W each) -> LED EXIT Sign (5W)	30%	18	5	13
Average		**33.4**	**5**	**28.4**

The measure savings use the above non-coincident savings.

Table 45: Exit Sign Savings

ComEd Building Types	Peak kW Savings	kWh Savings
Office	0.036	291.1
School (K-12)	0.035	286.1
College/University	0.035	286.1
Retail/Service	0.034	276.2
Restaurant	0.036	286.1
Hotel/Motel	0.032	283.6
Medical	0.036	293.6
Grocery	0.036	281.1
Warehouse	0.031	263.7
Light Industry	0.031	258.7
Heavy Industry	0.031	258.7
Average = Miscellaneous	0.034	278.6

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below. The coincident diversity factor is 1.0 since the sign is on all the time. The operating hours are 8,760 hours per year.[12]

[12] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Table 46: Factors used for Calculating Savings

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	8,760	1.25	1.00	1.17
School (K-12)	8,760	1.23	1.00	1.15
College/University	8,760	1.22	1.00	1.15
Retail/Service	8,760	1.19	1.00	1.11
Restaurant	8,760	1.26	1.00	1.15
Hotel/Motel	8,760	1.14	1.00	1.14
Medical	8,760	1.26	1.00	1.18
Grocery	8,760	1.25	1.00	1.13
Warehouse	8,760	1.09	1.00	1.06
Light Industry	8,760	1.08	1.00	1.04
Heavy Industry	8,760	1.08	1.00	1.04
Average = Miscellaneous	8,760	1.19	1.00	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect.

Measure Life and Incremental Measure Cost

The following table provides the measure life and incremental measure cost (IMC) documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. In this case the lighting measures, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 47: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	16	DEER
Incremental Measure Cost	$81	ICF Portfolio Study

LED Lamps	
Measure Description	LED recessed down lamps or screw-in base lamps qualify. The LED recessed downlight must be ≤ 18 Watts and have a minimum efficacy of 35 lumens per Watt. The product must meet Energy Star Criteria. For screw-in base LED lamps, the wattage must be < 8 Watts.
Units	Per lamp
Base Case Description	100 Watt or less incandescent
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: PG& E 2006 Work papers
Effective Useful Life	Source: PG& E 2006 Work papers 16 years

LED recessed down lamps or screw-in base lamps qualify. The LED recessed downlight must be ≤ 18 Watts and have a minimum efficacy of 35 lumens per Watt. The product must meet Energy Star Criteria. For screw-in base LED lamps, the wattage must be < 8 Watts.

Measure Savings
The coincident kW and kWh savings are provided by building type in the following table.

Table 48: Measure Savings for LED (per lamp)

ComEd Building Types	Coincident Demand Savings (kW)	Annual Energy Savings (kWh)
Office	0.034	101.8
School (K-12)	0.017	71.6
College/University	0.028	131.3
Retail/Service	0.035	151.9
Restaurant	0.028	184.2
Hotel/Motel	0.025	187.3
Medical	0.031	254.0
Grocery	0.034	218.8
Warehouse	0.030	171.3
Light Industry	0.036	148.3
Heavy Industry	0.036	148.3
Average = Miscellaneous	0.030	160.9

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database and shown in the following table.[13] Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit the program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the introduction).

Table 49: Factors used for Calculating Lighting Savings

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,616	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,117	1.19	0.88	1.11
Restaurant	4,816	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,859	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	4,321	1.19	0.77	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

[13] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Baseline and retrofit equipment assumptions are presented in the table below. The fixture wattages were collected from PG&E's Non-residential Retrofit Program standard fixture wattage table.

Table 50: Baseline and Retrofit Wattages for LED Lamps

Base Case lamps	Base Lamp Wattage	Retrofit Lamp Wattage	Demand Savings per lamp (kW)	Weight Percentages
100 W incandescent	100	8	0.092	5%
75 W incandescent	75	8	0.067	15%
60 W incandescent	60	8	0.052	15%
40 W incandescent	40	8	0.032	15%
25 W incandescent	25	8	0.017	25%
15 W incandescent	15	8	0.007	25%
Weighted Average			0.033	

Measure Life and Incremental Measure Cost

The next table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case the lighting measures, the IMC is equal to the full measure cost since cost of the less efficient option is $0. For LED lighting, the IMC was calculated as the average price of 8 LED bulbs ranging from 0.85 to 4.7 W.

The measure life for the LED bulbs is taken from the PG&E work paper on LED open signs and is 16 years.

Table 51: Measure Life and Incremental Measure Cost

Measure Category	Lamp	Value	Source
Measure Life	LED	16 years	PG&E LED Open sign Work paper
Incremental Measure Cost	LED	$30	Average of 8 LED bulbs sold at CCrane.com

LED Refrigerated Case Lighting	
Measure Description	Replace fluorescent refrigerated case lighting with light emitting diode (LED) source illumination. Fluorescent lamps, ballasts, and associated hardware are typically replaced with pre-fabricated LED light bars and driver units.
Units	Per door
Base Case Description	Fluorescent refrigerated case lighting
Measure Savings	Source: PG&E LED Refrigerated Case Lighting Workpaper
Measure Incremental Cost	Source: PG&E LED Refrigerated Case Lighting Workpaper
Effective Useful Life	Source: PG&E LED Refrigerated Case Lighting Workpaper 16 years

Replace fluorescent refrigerated case lighting with light emitting diode (LED) source illumination. Fluorescent lamps, ballasts, and associated hardware are typically replaced with pre-fabricated LED light bars and LED driver units. The two LED lamp products, 5' light bars and 6' light bars are eligible.

Measure Savings Analysis
The coincident demand savings is 0.061KW per door and annual energy savings is 375 kWh per door.

Measure Savings Analysis
The energy and demand savings are derived from an Emerging Technologies (ET) study of the refrigerated case lighting done by PG&E.

The electricity use (kWh) savings and gross summer peak demand (kW) reduction comprises two factors: reduced lighting load and reduced refrigeration requirements due to reduced heat gain. Reductions in lighting load occur continuously over the expected annual operating period, which includes the summer peak period. Savings due to reduced heat gain are computed assuming those reduced effects occur during the period in which the lighting systems operate, in consideration of the refrigeration compressor COP and the reduced cooling load, under normal operation (i.e., doors closed). Baseline and retrofit equipment assumptions are presented in the next table.

Table 52: Baseline and Retrofit Wattages LED refrigeration Lighting (per door)

	Estimated Energy Savings kWh/yr/door	Estimated Demand Savings kW/door	Weight Percentages
5' LED Light Bar			
Premium Tier	341	0.055	25%
Standard Tier	292	0.047	25%
6' LED Light Bar			
Premium Tier	465	0.075	25%
Standard Tier	403	0.065	25%
Weighted Average	375	0.061	

Measure Life and Incremental Measure Cost

The table below provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case the lighting measures, the IMC is equal to the full measure cost since cost of the less efficient option is $0.

The EUL for an LED exit sign or retrofit kit is estimated to be 16 years (over 140,000 hours), according to DEER. The core technology, LED sources and driver, are similar for both the established application (exit sign lighting) and the emerging technology (refrigeration case lighting). LED Power (LED equipment manufacturer) provided an expected life of 50,000 hours for the LED low-temperature case lighting, which is much less than the DEER estimate of 16 years for LED exit sign technology. It is well documented that LED life is extended in a low-temperature environment; therefore the expected useful life of 50,000 hours assumed for this application is probably conservative. Based on the fixture run-time of 6,205 hours annually for the facility in the study, the expected life calculates to 8 years.

Table 53: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	Fixture life	16	PG&E Work paper
Incremental Measure Cost	LED Refrigerated Case Lighting	$266	PG&E Work paper

LED Open Signs	
Measure Description	Light-emitting diodes (LED) open signs are eligible under this category.
Units	Per Sign
Base Case Description	Neon open sign
Measure Savings	Source: PG&E work paper
Measure Incremental Cost	Source: PG&E work paper
Effective Useful Life	Source: PG&E work paper 16 years

LED open signs must replace an existing neon open sign. LED drivers can be either electronic switching or linear magnetic, with the electronic switching supplies being the most efficient. The on-off power switch may be found on either the power line or load side of the driver, with the line side location providing significantly lower standby losses when the sign is turned off and is not operating.

Measure Savings
The coincident kW and kWh savings are provided by building type in the following table. Many of these buildings types may not have open signs. Open signs are assumed to be on during the typical operating hours of these buildings.

Table 54: Measure Savings for LED Open Signs (per sign)

ComEd Building Types	Coincident Demand Savings (kW)	Energy Savings (kWh)
Office	0.160	519.1
School (K-12)	0.082	340.3
College/University	0.131	623.8
Retail/Service	0.165	738.3
Restaurant	0.135	959.0
Hotel/Motel	0.121	890.0
Medical	0.147	1207.0
Grocery	0.160	1039.8
Warehouse	0.145	813.8
Light Industry	0.169	704.9
Heavy Industry	0.169	704.9
Average = Miscellaneous	0.145	776.7

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database and shown in the following table.[14] Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit the program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the introduction).

Table 55: Factors used for Calculating Lighting Savings

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,210	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,859	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	4,389	1.19	0.77	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

[14] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

The following table provides the sample retrofit options and demand reduction assumptions used.

Table 56: Demand Reduction for Open Signs

	Demand Savings per Sign	Weight Percentages
Replacement of Neon-Large Neon-Like Appearance	0.169	33%
Replacement of Neon-Small Dot Pattern	0.125	33%
Replacement of Neon-Large Oblong Dot Pattern	0.180	33%
Weighted Average	0.158	

Measure Life and Incremental Measure Cost
The following table provides the measure life and incremental measure cost (IMC) documented for this measure as well as the source of the data. The measure life is assumed to be the same as that of an LED exit sign.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. In this case the lighting measures, the IMC is equal to the full measure cost since cost of the less efficient option, i.e., of not conducting the retrofit is $0.

The actual incremental cost of LED technology over new neon technology with electronic ballasts is about $50 to 100 per sign, or $75, on average.

Table 57: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	16	PG&E work paper
Incremental Measure Cost	$75	PG&E work paper

LED Channel Signs, Indoor	
Measure Description	Retrofit and replacement of inefficient neon and argon-mercury channel letter signs with efficient LED channel letter signs.
Units	Per letter
Base Case Description	Existing signage– Neon (red) channel letter signs and argon-mercury (white) channel letter signs.
Measure Savings	Source: PG&E workpaper
Measure Incremental Cost	Source: PG&E workpaper
Effective Useful Life	16 years Source: PG&E workpaper

LED channel sign incentive is available for retrofitting or replacing incandescent, HID, argon-mercury or neon-lighted channel letter signs. Replacement signs can not use more than 20% of the actual input power of the sign that is replaced.

Measure Savings[15]

The following table summarizes the savings for LED channel signs.

Table 58: Savings for LED Channel Signs

Location	Hours of Operation	Sign Height	Annual Energy Savings kWh/letter	Demand Savings kW/letter	Peak Demand Savings kW/letter
Indoor	4375	≤ 2 ft	147	0.034	0.034
		>2 ft	378	0.086	0.086

Measure Savings Analysis

The calculation methodology used by PG&E in the LED Channel Sign workpaper is outlined below. All the supporting documentation and spreadsheets are shown in the PG&E workpaper.

(1) Collected letter schematics showing linear feet of tubing and number of LED modules for each letter of the alphabet, both uppercase and lowercase, for 24 inch high letters and 36 inch high letters.
(2) The base case wattage (W/ft) and the energy efficient case wattage (W/module) input values were collected for each specific letter.
(3) A probability table, showing the frequency each letter appears in the English language, was integrated into the spreadsheet. By multiplying the wattage for each specific letter by the probability, a weighted average wattage per letter was obtained. This single

[15] PGE LED Channel Sign work paper

value represents all 26 letters of that height and will be accurate over a range of signs with a weighted average watts/letter for red and white for uppercase and lowercase letters.

(4) This spreadsheet was then modified to account for the average height of signs in each category. (According to sign industry sources, the average height of a sign in the 2 feet or less category is 21 inches. The average height of a sign in the greater than 2 feet high category is 27 inches).

(5) The watts/letter values were then weighted assuming 70% of letters are uppercase and 30% of letters are lowercase, as well as 50% are red signs and 50% are white signs.

Measure Life and Incremental Measure Cost

Measure life is assumed to be 16 years for the signs. LEDs have a lifetime of 25,000 hours for LEDs. However, to be consistent, DEER uses 16 years for LED exit signs, hence all LEDs are assumed to have a 16 year life.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. The incremental cost for the retrofit case is the full cost of the LED-lighted sign because the retrofit case assumes the existing lighting is working properly and does not need to be replaced. The incremental cost for the replacement case is the difference between the base case and the energy-efficient alternative. The incremental costs were weighted assuming that 30% of the channel signs will be retrofit and 70% of the channel signs will be new or replacement. Therefore, the incremental cost for signs less than or equal to 2 ft. high is $35/letter and the incremental cost for signs greater than 2 ft. high is $154/letter.

Induction Fixtures	
Measure Description	This measure consists of replacing Mercury Vapor, T12/High Output Fluorescent, T12/Very High Output Fluorescent, Standard Metal Halide, or High Pressure Sodium fixtures with induction fixtures.
Units	Per fixture
Base Case Description	Mercury Vapor, T12/High Output Fluorescent, T12/Very High Output Fluorescent, Standard Metal Halide, or High Pressure Sodium fixtures
Measure Savings	Source: PG&E 2006 Workpapers
Measure Incremental Cost	Source: PG&E 2006 Workpapers
Effective Useful Life	Source: PG&E 2006 Workpapers 16 years

Only new, hard-wired induction fixtures qualify. New fixtures must replace, one for one, existing Incandescent, Mercury Vapor, T12/High Output Fluorescent, T12/Very High Output Fluorescent, Standard Metal Halide, or High Pressure Sodium fixtures in interior installations. The new fixtures must not exceed the maximum Wattage listed in the table below for each range of lamp Wattage being replaced.

Table 59: Wattage Criteria for Induction Lighting Replacement

Basecase Wattage	Replacement Fixture Wattage (Maximum)
≥ 400 Watt	360W
176-399 Watt	180W
101-175 Watt	160W
≤100 Watt	95W

Measure Savings
The coincident kW and kWh savings are provided by building type in the following table.

Table 60: Measure Savings for Induction Fixtures

ComEd Building Types	Coincident Demand Savings (kW)	Energy Savings (kWh)
Office	0.070	225.7
School (K-12)	0.035	148.0
College/University	0.057	271.2
Retail/Service	0.072	321.0
Restaurant	0.059	417.0
Hotel/Motel	0.052	387.0
Medical	0.064	524.8
Grocery	0.070	452.1
Warehouse	0.063	353.8
Light Industry	0.073	306.5
Heavy Industry	0.073	306.5
Average = Miscellaneous	0.063	337.7

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database and shown in the following table.[16] Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit the program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the introduction).

[16] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Table 61: Factors used for Calculating Lighting Savings

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	1.25	0.81	1.17
School (K-12)	1,873	1.23	0.42	1.15
College/University	3,433	1.22	0.68	1.15
Retail/Service	4,210	1.19	0.88	1.11
Restaurant	5,278	1.26	0.68	1.15
Hotel/Motel	4,941	1.14	0.67	1.14
Medical	6,474	1.26	0.74	1.18
Grocery	5,824	1.25	0.81	1.13
Warehouse	4,859	1.09	0.84	1.06
Light Industry	4,290	1.08	0.99	1.04
Heavy Industry	4,290	1.08	0.99	1.04
Average = Miscellaneous	4,389	1.19	0.77	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are presented in the table below.

Table 62: Baseline and Retrofit Wattages for Induction Lighting

	Base Lamp Wattage	Base Fixture Wattage	Retrofit Lamp Wattage	Retrofit Fixture Wattage	Demand Savings per fixture	Weight Percentages
400 Watt lamp basecase, up to 360 Watt replacement fixture	400	458	330	354	0.104	40%
176-399 Watt lamp basecase, up to 180 Watt replacement fixture	250	295	165	177	0.118	10%
101-175 Watt lamp basecase, up to 160 Watt replacement fixture	150	190	150	160	0.030	40%
100 Watt lamp basecase, up to 95 Watt replacement fixture	100	128	85	95	0.033	10%
Weighted Average					0.069	

Measure Life and Incremental Measure Cost

The next table provides the measure life and IMC documented for this measure as well as the source of the data. The measure life is assumed to be the same as that for HID lighting. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case the lighting measures, the IMC is equal to the full measure cost since cost of the less efficient option.

Table 63: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	All	16	PG&E Work paper
Incremental Measure Cost	All	$290	PG&E Work paper

Compact Fluorescent Fixtures, Hardwired	
Measure Description	New fixtures or modular retrofits with hardwired electronic ballasts qualify. The CFL ballast must be programmed start or programmed rapid start with a PF ≥90 and THD ≤20%.
Units	Per fixture
Base Case Description	Incandescent or HID lamps.
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: KEMA
Effective Useful Life	Source: DEER 12 years

Hardwired CFL incentives apply only to complete new fixtures or modular (pin-based) retrofits with hardwired electronic ballasts. The CFL ballast must be programmed 'start' or programmed 'rapid start' with a PF ≥90 and THD ≤20 percent.

Measure Savings
Baseline and retrofit equipment assumptions are presented in the table below. Most lighting retrofits assume early replacement of existing technologies where the baseline represents the equipment removed. The following table shows the wattages used for the savings calculations.

Table 64: Baseline and Retrofit Wattages

Measure	Base Wattage	Retrofit Wattage	kW Reduction
29W or Less	100	28	0.072
29W or Less	125	27	0.098
29W or Less	110	27	0.083
29W or Less	100	26	0.074
29W or Less	75	26	0.049
29W or Less	100	25	0.075
29W or Less	75	25	0.05
29W or Less	100	23	0.077
29W or Less	75	20	0.055
29W or Less	75	19	0.056
29W or Less	75	18	0.057
29W or Less	60	18	0.042
29W or Less	60	16	0.044
29W or Less	60	15	0.045
29W or Less	60	14	0.046
29W or Less	60	13	0.047
29W or Less	40	13	0.027

Measure	Base Wattage	Retrofit Wattage	kW Reduction
29W or Less	40	9	0.031
30W or Greater	120	30	0.09
30W or Greater	120	40	0.08
30W or Greater	200	55	0.145
30W or Greater	200	65	0.135

Table 65: Wattage Reduction

Wattage Category	Average Wattage Reduction
≤29	57
≥30W	113

The following tables provide the measure savings using the above wattage reduction assumptions. The savings are provided by building type. The miscellaneous category is an average of the building types.

Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit the program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the Appendix introduction).

Table 66: Measure Savings for 29W or less

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
Office	2,616	1.25	0.81	1.17	0.058	174.5
School (K-12)	1,873	1.23	0.42	1.15	0.029	122.8
College/University	3,433	1.22	0.68	1.15	0.047	225.0
Retail/Service	4,117	1.19	0.88	1.11	0.060	260.5
Restaurant	4,816	1.26	0.68	1.15	0.049	315.7
Hotel/Motel	4,941	1.14	0.67	1.14	0.044	321.1
Medical	6,474	1.26	0.74	1.18	0.053	435.4
Grocery	5,824	1.25	0.81	1.13	0.058	375.1
Warehouse	4,859	1.09	0.84	1.06	0.052	293.6
Light Industry	4,290	1.08	0.99	1.04	0.061	254.3
Heavy Industry	4,290	1.08	0.99	1.04	0.061	254.3
Average = Miscellaneous	4,321	1.19	0.77	1.12	0.052	275.9

Table 67: Measure Savings for ≥30W

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
Office	2,616	1.25	0.81	1.17	0.114	345.9
School (K-12)	1,873	1.23	0.42	1.15	0.058	243.4
College/University	3,433	1.22	0.68	1.15	0.094	446.1
Retail/Service	4,117	1.19	0.88	1.11	0.118	516.4
Restaurant	4,816	1.26	0.68	1.15	0.097	625.8
Hotel/Motel	4,941	1.14	0.67	1.14	0.086	636.5
Medical	6,474	1.26	0.74	1.18	0.105	863.2
Grocery	5,824	1.25	0.81	1.13	0.114	743.7
Warehouse	4,859	1.09	0.84	1.06	0.103	582.0
Light Industry	4,290	1.08	0.99	1.04	0.121	504.2
Heavy Industry	4,290	1.08	0.99	1.04	0.121	504.2
Average = Miscellaneous	4,321	1.19	0.77	1.12	0.104	546.9

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database.[17] However, DEER building types were mapped to fit that of the ComEd Program. Industrial and warehouse operating hours were increased based on experience.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Measure Life and Incremental Measure Cost

[17] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

The table below provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is the cost difference between the energy-efficient equipment and the less efficient option. In this case, lighting measures, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 68: Measure Life and Incremental Measure Cost

Wattage Category		Value	Source
All	Measure Life	12	ICF Portfolio Study
≤29	Incremental Measure Cost	$95	KEMA
≥30W	Incremental Measure Cost	$132	KEMA

High Wattage Screw-In CFLs	
Measure Description	High Wattage Scew-In CFLs must be greater than 40W and must replace HIDs or incandescent lamps. CFLs must have lamp/ballast efficacy of ≥ 40 lumens per watt.
Units	Per Lamp
Base Case Description	Incandescent or HID lamps.
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: KEMA
Effective Useful Life	Source: DEER 2.5 years

This incentive applies to screw-in lamps and applies only if an incandescent or high-intensity discharge (HID) lamp is being replaced. Lamp/ballast combination must have an efficacy ≥40 lumens per Watt (LPW).

Measure Savings

Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed. The table shows the wattage reductions used for the savings calculations. Since incandescent lamps produce lower lumens per watt compared to HIDs, they tend to have higher wattage for a given application. Savings are therefore greater in the incandescent case.

Table 69: High Wattage Screw-in CFLs Wattage Reduction

Measure	Wattage Reduction
Incandescent Baseline	214
HID Baseline	102

Table 70: High Wattage Screw-in CFL Savings for Incandescent Baseline

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
Office	2,616	1.25	0.81	1.17	0.217	655.0
School (K-12)	1,873	1.23	0.42	1.15	0.111	460.9
College/University	3,433	1.22	0.68	1.15	0.178	844.9
Retail/Service	4,117	1.19	0.88	1.11	0.224	978.0
Restaurant	4,816	1.26	0.68	1.15	0.183	1,185.2

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
Hotel/Motel	4,941	1.14	0.67	1.14	0.163	1,205.4
Medical	6,474	1.26	0.74	1.18	0.200	1,634.8
Grocery	5,824	1.25	0.81	1.13	0.217	1,408.4
Warehouse	4,859	1.09	0.84	1.06	0.196	1,102.2
Light Industry	4,290	1.08	0.99	1.04	0.229	954.8
Heavy Industry	4,290	1.08	0.99	1.04	0.229	954.8
Average = Miscellaneous	4,321	1.19	0.77	1.12	0.196	1,035.7

Table 71: High Wattage Screw-in CFL Savings for HID Baseline

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
Office	2,616	1.25	0.81	1.17	0.103	311.0
School (K-12)	1,873	1.23	0.42	1.15	0.052	218.8
College/University	3,433	1.22	0.68	1.15	0.084	401.1
Retail/Service	4,117	1.19	0.88	1.11	0.106	464.3
Restaurant	4,816	1.26	0.68	1.15	0.087	562.7
Hotel/Motel	4,941	1.14	0.67	1.14	0.078	572.3
Medical	6,474	1.26	0.74	1.18	0.095	776.2
Grocery	5,824	1.25	0.81	1.13	0.103	668.6
Warehouse	4,859	1.09	0.84	1.06	0.093	523.3
Light Industry	4,290	1.08	0.99	1.04	0.109	453.3
Heavy Industry	4,290	1.08	0.99	1.04	0.109	453.3
Average = Miscellaneous	4,321	1.19	0.77	1.12	0.093	491.7

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = Non-Coincident kW Savings * Annual Operating Hours * Energy Interactive Effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = Non-Coincident kW Savings * Coincidence Factor * Demand Interactive Effect

For this measure, it is assumed that the lighting is placed in non-conditioned areas so the energy and demand interactive effects are 1.0.

Baseline and retrofit equipment assumptions are presented in the following table. Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed. The table shows the wattages used for the savings calculations.

Table 72: High Wattage Screw-in CFL Baseline and Retrofit Wattages

Baseline	Base Wattage (Watts)	Retrofit Wattage (Watts)	kW Reductions (kW)
75 MH	85	42	0.043
150 MH	165	68	0.097
175 MH	188	68	0.12
175 MH	203	100	0.103
250 MH	295	150	0.145
HID Average			**0.1016**
200 Inc	200	55	0.145
250 Inc	250	68	0.182
400 Inc	400	85	0.315
Incandescent Average			**0.214**

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. In this case, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 73: Measure Life and Incremental Measure Cost

Measure Category		Value	Source
All	Measure Life	2.5	DEER
Incandescent Baseline	Incremental Measure Cost	$28	KEMA
HID Baseline	Incremental Measure Cost	$38	KEMA

Cold Cathode	
Measure Description	All cold cathode fluorescent lamps (CCFLs) must replace incandescent lamps of at least 10 W and not greater than 40 W. Cold cathode lamps may be medium (Edison) or candelabra base. Product must be rated for at least 18,000 average life hours.
Units	Per lamp
Base Case Description	Incandescent
Measure Savings	Source: KEMA, SCE
Measure Incremental Cost	Source: PG&E $9.68
Effective Useful Life	Source: SCE 5 years

All cold cathode fluorescent lamps (CCFLs) must replace incandescent lamps of at least 10 W and not greater than 40 W. Cold cathode lamps may be medium (Edison) or candelabra base. The product must be rated for at least 18,000 average life hours.

Measure Savings

Baseline and retrofit equipment assumptions are presented in table below. Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed. The table shows the wattages used for the savings calculations from SCE and KEMA research of cold cathode manufacturers.

Table 74: Baseline and Retrofit Wattages

Measures[18]	Base Wattage (Watts)	Retrofit Wattage (Watts)	Wattage Reduction (Watt)
Incandescent (15W) -> Cold Cathode FL (5W)	15	5	10
Incandescent (30W) -> Cold Cathode FL (5W)	30	5	25
Incandescent (40W) -> Cold Cathode FL (8W)	40	8	32
Average			22

The following table provides the measure savings using the above non-coincident savings. The savings are provided by building type. The miscellaneous category is an average of the building types. Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the introduction).

[18] Southern California Edison Company, Cold Cathode Fluorescent Lamp Workpaper WPSCNRLG0063. 2007.

Table 75: Measure Savings

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
Office	2,616	1.25	0.81	1.17	0.023	68.4
School (K-12)	1,873	1.23	0.42	1.15	0.012	48.1
College/University	3,433	1.22	0.68	1.15	0.019	88.2
Retail/Service	4,117	1.19	0.88	1.11	0.023	102.1
Restaurant	4,816	1.26	0.68	1.15	0.019	123.7
Hotel/Motel	4,941	1.14	0.67	1.14	0.017	125.8
Medical	6,474	1.26	0.74	1.18	0.021	170.6
Grocery	5,824	1.25	0.81	1.13	0.023	147.0
Warehouse	4,859	1.09	0.84	1.06	0.020	115.0
Light Industry	4,290	1.08	0.99	1.04	0.024	99.6
Heavy Industry	4,290	1.08	0.99	1.04	0.024	99.6
Average = Miscellaneous	4,321	1.19	0.77	1.12	0.020	108.1

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database. Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit program. Some savings values have been combined to fit program needs. The miscellaneous category is an average of the building types.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is equal to the full measure cost since it is considered to be a retrofit measure.

Table 76: Measure Life and Incremental Measure Cost[19]

	Value	Source
Measure Life	5	SCE WP
Incremental Measure Cost	$9.68	PG&E WP

[19] Southern California Edison Company, Cold Cathode Fluorescent Lamp Workpaper WPSCNRLG0063. 2007, Pacific Gas & Electric, Lighting WP.doc, 2006.

Permanent Lamp Removal	
Measure Description	Incentives are for the permanent removal of existing 8' and 4', 3' and 2' fluorescent lamps. (U tube lamps are eligible for this measure and will be considered as a 4' lamp.) Unused lamps, lamp holders, and ballasts must be permanently removed from the fixture. This measure is applicable when retrofitting from T12 lamps to T8 lamps or simply removing lamps from a T8 fixture. Removing lamps from a T12 fixture that is not being retrofitted with T8 lamps are not eligible for this incentive.
Units	Per lamp
Base Case Description	Various configurations of fluorescent fixtures before removal of lamps.
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: ICF Portfolio
Effective Useful Life	Source: DEER 11 years

Incentives are paid for the permanent removal of existing fluorescent lamps resulting in a net reduction of the number of lamps. Customers are responsible for determining whether or not to use reflectors in combination with lamp removal in order to maintain adequate lighting levels. U tube lamps are eligible for this measure and will be considered as a 4' lamp. Unused lamps, lamp holders, and ballasts must be permanently removed from the fixture. This measure is applicable when retrofitting from T12 lamps to T8 lamps or simply removing lamps from a T8 fixture. Removing lamps from a T12 fixture that is not being retrofitted with T8 lamps are not eligible for this incentive. A Pre-approval Application is required for lamp removal projects in order for Com Ed to conduct a pre-retrofit inspection.

Measure Savings
Non-coincident demand saving is summarized by the following table:

Table 77: Permanent Lamp Removal Wattage Reduction

Category	Average Wattage Reduction
8 Foot Lamp Removal	68
4 Foot Lamp Removal	35
3 Foot Lamp Removal	31
2 Foot Lamp Removal	21

Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the introduction).

Table 78: Measure Savings for 8-Foot Lamp Removal

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	8-foot Lamp Peak Savings (kW)	8-foot Savings (kWh)
Office	2,808	1.25	0.81	1.17	0.069	223.4
School (K-12)	1,873	1.23	0.42	1.15	0.035	146.5
College/University	3,433	1.22	0.68	1.15	0.056	268.5
Retail/Service	4,210	1.19	0.88	1.11	0.071	317.8
Restaurant	5,278	1.26	0.68	1.15	0.058	412.7
Hotel/Motel	4,941	1.14	0.67	1.14	0.052	383.0
Medical	6,474	1.26	0.74	1.18	0.063	519.5
Grocery	5,824	1.25	0.81	1.13	0.069	447.5
Warehouse	4,859	1.09	0.84	1.06	0.062	350.2
Light Industry	4,290	1.08	0.99	1.04	0.073	303.4
Heavy Industry	4,290	1.08	0.99	1.04	0.073	303.4
Average = Miscellaneous	4,389	1.19	0.77	1.12	0.062	334.3

Table 79: Measure Savings for 4-Foot Lamp Removal

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	4-foot Lamp Peak Savings (kW)	4-foot Savings (kWh)
Office	2,808	1.25	0.81	1.17	0.035	115.0
School (K-12)	1,873	1.23	0.42	1.15	0.018	75.4
College/ University	3,433	1.22	0.68	1.15	0.029	138.2
Retail/Service	4,210	1.19	0.88	1.11	0.037	163.6
Restaurant	5,278	1.26	0.68	1.15	0.030	212.4
Hotel/Motel	4,941	1.14	0.67	1.14	0.027	197.1
Medical	6,474	1.26	0.74	1.18	0.033	267.4
Grocery	5,824	1.25	0.81	1.13	0.035	230.3
Warehouse	4,859	1.09	0.84	1.06	0.032	180.3
Light Industry	4,290	1.08	0.99	1.04	0.037	156.2
Heavy Industry	4,290	1.08	0.99	1.04	0.037	156.2
Average = Miscellaneous	4,389	1.19	0.77	1.12	0.032	172.1

Table 80: Measure Savings for 3-Foot Lamp Removal

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	3-foot Lamp Peak Savings (kW)	3-foot Savings (kWh)
Office	2,808	1.25	0.81	1.17	0.031	101.8
School (K-12)	1,873	1.23	0.42	1.15	0.016	66.8
College/ University	3,433	1.22	0.68	1.15	0.026	122.4
Retail/Service	4,210	1.19	0.88	1.11	0.032	144.9
Restaurant	5,278	1.26	0.68	1.15	0.027	188.2
Hotel/Motel	4,941	1.14	0.67	1.14	0.024	174.6
Medical	6,474	1.26	0.74	1.18	0.029	236.8
Grocery	5,824	1.25	0.81	1.13	0.031	204.0
Warehouse	4,859	1.09	0.84	1.06	0.028	159.7
Light Industry	4,290	1.08	0.99	1.04	0.033	138.3
Heavy Industry	4,290	1.08	0.99	1.04	0.033	138.3
Average = Miscellaneous	4,389	1.19	0.77	1.12	0.028	152.4

Table 81: Measure Savings for 2-Foot Lamp Removal

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	2-foot Lamp Peak Savings (kW)	2-foot Savings (kWh)
Office	2,808	1.25	0.81	1.17	0.022	69.9
School (K-12)	1,873	1.23	0.42	1.15	0.011	45.8
College/ University	3,433	1.22	0.68	1.15	0.018	84.0
Retail/Service	4,210	1.19	0.88	1.11	0.022	99.4
Restaurant	5,278	1.26	0.68	1.15	0.018	129.2
Hotel/Motel	4,941	1.14	0.67	1.14	0.016	119.9
Medical	6,474	1.26	0.74	1.18	0.020	162.6
Grocery	5,824	1.25	0.81	1.13	0.022	140.0
Warehouse	4,859	1.09	0.84	1.06	0.019	109.6
Light Industry	4,290	1.08	0.99	1.04	0.023	94.9
Heavy Industry	4,290	1.08	0.99	1.04	0.023	94.9
Average = Miscellaneous	4,389	1.19	0.77	1.12	0.020	104.6

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database.[20] However, DEER building types were mapped to fit that of ours. Industrial and warehouse operating hours were increase based on experience.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline assumptions are presented in the next table. Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed. The table shows the wattages used for the savings calculations. Weighted average savings values are used when determining deemed savings for each lamp permanently removed.

Table 82: Wattages for Eight-foot Lamps

Baseline	Base Wattage	Lamp Removed Wattage	Weight Percentages
Two 8' T12 (60W/75W)	140	70	85%
Two 8' T8 (59W)	111	56	15%
Total Weighted Average		68	

Table 83: Wattages for Four-foot Lamps

Baseline	Base Wattage	Lamp Removed Wattage	Weight Percentages
Two 4' T8 (32W)	65	36	3%
Two 4' T12 (34W/40W)	72	36	8%
Three 4' T8 (32W)	92	31	7%

[20] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Baseline	Base Wattage	Lamp Removed Wattage	Weight Percentages
Three 4' T12 (34W/40W)	115	38	22%
Four 4' T8 (32W)	118	30	15%
Four 4' T12 (34W/40W)	144	36	45%
Total Weighted Average		**35**	

Table 84: Wattages for Three-foot Lamps

Baseline	Base Wattage	Lamp Removed Wattage	Weight Percentages
Two 3' T12 (30W/50W)	76	38	50%
Two 3' T8 (25W)	48	24	50%
Total Weighted Average		31	

Table 85: Wattages for Two-foot Lamps

Baseline	Base Wattage	Lamp Removed Wattage	Weight Percentages
Two 2' T8 (17W)	31	15	40%
Two 2' T12 (20W)	56	28	40%
Three 2' T8 (17W)	46	16	5%
Three 2' T12 (20W)	62	21	5%
Four 2' T8 (17W)	60	15	5%
Four 2' T12 (20W)	112	28	5%
Total Weighted Average		**21**	

Measure Life and Incremental Measure Cost
The following table provides the measure life and incremental measure cost (IMC) documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. In this case, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 86: Measure Life and Incremental Measure Cost

Category		Value	Source
All	Measure Life	11	DEER 2005
8-Foot Lamp Removal w/ Reflector	Incremental Measure Cost	$36	KEMA[21]
4-Foot Lamp Removal w/ Reflector	Incremental Measure Cost	$36	KEMA
3-Foot Lamp Removal w/ Reflector	Incremental Measure Cost	$36	KEMA
2-Foot Lamp Removal w/ Reflector	Incremental Measure Cost	$36	KEMA
8-Foot Lamp Removal	Incremental Measure Cost	$25.91	ICF Portfolio Study
4-Foot Lamp Removal	Incremental Measure Cost	$25.70	ICF Portfolio Study
3-Foot Lamp Removal	Incremental Measure Cost	$25	Assume to be similar to 4 and 8 foot lamp removal
2-Foot Lamp Removal	Incremental Measure Cost	$25	Assume to be similar to 4 and 8 foot lamp removal

[21] Assumes the cost of $19 for a reflector per fixture installed in a two-lamp fixture.

Occupancy Sensors	
Measure Description	Passive infrared, ultrasonic detectors and fixture-integrated sensors or sensors with a combination thereof are eligible. All sensors must be hard-wired and control interior lighting fixtures. The incentive is per Watt controlled.
Units	Per Connected Watt
Base Case Description	No Sensor
Measure Savings	Source: DEER 2005
Measure Incremental Cost	Source: DEER 2008
Effective Useful Life	Source: DEER 2008 8 years

Passive infrared, ultrasonic detectors and fixture-integrated sensors or sensors with a combination thereof are eligible. All sensors must be hard-wired and control interior lighting fixtures. The incentive is per Watt controlled.

Measure Savings
The savings are provided by building type. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database. Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit program. Some savings values have been combined to fit program needs. The miscellaneous category is an average of the building types (see detailed description of the methodology in the introduction).

Table 87 : Measure Savings for Occupancy Sensor per Connected Watt

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak Watt Savings	kWh Savings
Office	2,808	1.25	0.81	1.17	0.00020	0.657
School (K-12)	1,873	1.23	0.42	1.15	0.00010	0.431
College/University	3,433	1.22	0.68	1.15	0.00017	0.790
Retail/Service	4,210	1.19	0.88	1.11	0.00021	0.935
Restaurant	5,278	1.26	0.68	1.15	0.00017	1.214
Hotel/Motel	4,941	1.14	0.67	1.14	0.00015	1.127
Medical	6,474	1.26	0.74	1.18	0.00019	1.528
Grocery	5,824	1.25	0.81	1.13	0.00020	1.316
Warehouse	4,859	1.09	0.84	1.06	0.00042	2.430
Light Industry	4,290	1.08	0.99	1.04	0.00050	2.145
Heavy Industry	4,290	1.08	0.99	1.04	0.00050	2.145
Average = Miscellaneous	4,389	1.16	0.77	1.11	0.00025	1.338

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below.

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = Connected wattage/1000 * Occupancy Off Rate *Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = Connected wattage/1000 * Occupancy Off Rate * Coincidence Factor * Demand interactive effect

The baseline for this measure is fixtures that do not include any automatic controls, i.e., manual switches. Since the unit is defined as per connected Watt, the baseline demand is one Watt. Demand savings depend on whether areas are high or low occupancy. DEER states that occupancy time off rates are at 20 percent for high-occupancy building types and 50 percent for low-occupancy building types.[22] Therefore, the table below shows the assumed range of occupancy off rates.

For this measure, it is assumed that the occupancy sensors placed in Warehouse, Light Industry, and Heavy Industry building types exist in non-conditioned areas so the energy and demand interactive effects are 1.0.

[22] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Table 88: Occupancy Off Rate

ComEd Building Types	Occupancy Sensor Off Rate
Office	20%
School (K-12)	20%
College/University	20%
Retail/Service	20%
Restaurant	20%
Hotel/Motel	20%
Medical	20%
Grocery	20%
Warehouse	50%
Light Industry	50%
Heavy Industry	50%
Average = Miscellaneous	28%

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. In this case the lighting measures, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 89: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	8	DEER 2008
Incremental Measure Cost	$0.32	KEMA, DEER 2008

Plug Load Occupancy Sensors	
Measure Description	Installation of an occupancy sensor on a plug load.
Units	Per sensor
Base Case Description	50W of task lighting and a computer monitor with no controls
Measure Savings	Source: DEER
Measure Incremental Cost	Source: DEER
Effective Useful Life	Source: DEER 8 years

This rebate applies to passive infrared and/or ultrasonic detectors only. Plug-load sensors must control electricity using equipment in offices or cubicles, including shared copiers and/or printers.

Measure Savings
The coincident demand savings is 0.091 kW and annual energy savings is 258 kWh per application. The savings are provided for the Office building type (interactive effects are Included in the savings).

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database and shown in the following table.23 The occupancy sensor is assumed to turn off equipment for 2,450 hours/year. The factors used are for office building.

Table 90: Office Building Factors

Hours	Energy Interactive Effect	Demand Interactive Effects	Coincidence Factor
2,450	1.17	1.25	0.81

[23] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula. The non-coincident demand reduction is 90W in this calculation.

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Measure Life and Incremental Measure Cost

The following table provides the measure life and incremental measure cost (IMC) documented for this measure as well as the source of the data. The full measure cost is the cost applicable for this measure.

Table 91: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	8	DEER
Incremental Measure Cost	$20	DEER

Daylighting Controls	
Measure Description	This measure consists of the installation of daylighting controls.
Units	Per controlled watt
Base Case Description	No lighting controls
Measure Savings	Source: KEMA, Michigan CI Technologies Workpaper FES-L12
Measure Incremental Cost	Source: Michigan CI Technologies Workpaper FES-L12
Effective Useful Life	Source: DEER 2008 8 years

This measure consists of the installation of daylighting controls. These systems use photoelectric controls to take advantage of available daylight in interior building spaces. These controls can be used to turn lights off/on, A-B switching, or continuous dimming.

Measure Savings

Installation of daylighting controls is assumed to result in 30% savings for most perimeter and open space applications. Assumed average lighting density is 1.3 watts per square foot.

$$Annual\ kWh\ Savings = \frac{(30\%\ savings) \times (Annual\ Operating\ Hours) \times (Energy\ Interactive\ Effects)}{1000}$$

$$Peak\ Savings = \frac{(30\%\ savings) \times (Coincidence\ Factor) \times (Diversity\ Factor) \times (0.35)}{1000}$$

The savings are provided by building type. The annual operation hours, the coincidence factors, and the interactive effect factors were all obtained from the DEER database. Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit program. Some savings values have been combined to fit program needs. The miscellaneous category is an average of the building types (see detailed description of the methodology in the introduction).

Table 92 : Measure Savings for Daylighting Controls, per Watt Controlled

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings per Watt Controlled	kWh Savings per Watt Controlled
Office	2,808	1.25	0.81	1.17	0.00011	0.986
School (K-12)	1,873	1.23	0.42	1.15	0.00005	0.646
College/University	3,433	1.22	0.68	1.15	0.00009	1.184
Retail/Service	4,210	1.19	0.88	1.11	0.00011	1.402
Restaurant	5,278	1.26	0.68	1.15	0.00009	1.821
Hotel/Motel	4,941	1.14	0.67	1.14	0.00008	1.690
Medical	6,474	1.26	0.74	1.18	0.00010	2.292
Grocery	5,824	1.25	0.81	1.13	0.00011	1.974
Warehouse	4,859	1.09	0.84	1.06	0.00009	1.458
Light Industry	4,290	1.08	0.99	1.04	0.00010	1.287
Heavy Industry	4,290	1.08	0.99	1.04	0.00010	1.287
Average = Miscellaneous	4,389	1.19	0.77	1.12	0.00009	1.458

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy efficient equipment and the less efficient option. In this case, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

The cost assumes a space of 3000 sq ft. Material cost is $3,000, and installation cost is estimated at $1,000. Converted to per Watt controlled, the incremental costs from the Michigan Workpapers are divided by 1.3.

Table 93: Measure Life and Incremental Measure Cost, per Watt Controlled

	Value	Source
Measure Life	8	DEER 2008
Incremental Measure Cost	$1.02	Michigan CI Technologies Workpaper FES-L12

Bi-level Stairwell/Hall/Garage Light Fixtures	
Measure Description	This measure consists of replacing 2-lamp T12 fixture (full level output only) with a 2-lamp T8 bi-level fixture.
Units	Fixture
Base Case Description	2-lamp T12 fixture (full level output only)
Measure Savings	Source: PG&E 2006 Work papers
Measure Incremental Cost	Source: PG&E 2006 Work papers and KEMA
Effective Useful Life	Source: DEER 11 years

Existing fixtures must be a two-lamp T12 fixture. Eligible fixtures are hardwired (including linear) two-lamp T8 fluorescent fixtures with electronic ballasts and manufacturer integrated occupancy sensors used in areas where code requires lighting 24 hours a day (such as stairwells, halls, and garages). Fixtures with manual on override are not eligible. During occupied periods, the fixture should operate at full light output. During unoccupied periods, the fixture should operate at lower light output and wattage. This measure is not also eligible for the occupancy sensor or T12 to T8 incentive.

Measure Savings

Average annual energy savings is 340 kWh and 0.039 kW savings. Peak demand savings are assumed to be zero. Fixtures are assumed to be in unconditioned spaces so interactive energy and demand effects are not claimed.

Measure Savings Analysis

This measure assumes that an existing 2-lamp T12 fixture (full level output only) will be replaced with a 2-lamp T8 bi-level fixture. At full level output, the existing is at 72 W/fixture and bi-level fixtures consume 58 W. Based on a survey of market-available bi-level fixtures, at low level output, the bi-level fixture would, on average, consume 22 W.

Based on the Final Report of Bi-level Stairwell Fixtures from a California Energy Commission Lighting Research Project, the percentage of time in the low output mode ranged from 62% to 82% on weekdays and 85% to 97% on weekends. Therefore, a conservative calculation of the percentage of time in the low output mode = [(5)(62%)+(2)(85%)]/7 = 69%.

Average demand of the bi-level fixture is (58 W)(0.31) + (22 W)(0.69) = 33 W, or 0.033 kW.
Average demand savings = 0.072 kW – 0.033 kW = 0.039 kW per fixture.

Annual energy savings = (0.039 kW per fixture)(8,760 hours per year) = 340 kWh per fixture.

Measure Life and Incremental Measure Cost

The next table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case the lighting measures, the IMC is equal to the full measure cost since cost of the less efficient option.

Table 94: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	Lamp and Ballast	11	DEER
Incremental Measure Cost	2 Lamp System	$150	PG&E workpaper/ KEMA

Sensor Controlled Parking Lot Bi-Level Fixture	
Measure Description	This measure consists of the replacement of a 150W Metal Halide fixture with a 60-lamp SMART LED Bi-Level Fixture
Units	Per fixture
Base Case Description	150W Metal Halide, (system wattage=190W)
Measure Savings	Source: CLTC, PG&E Workpaper – PGECOLTG101.1 – Bi-Level Light Fixture
Measure Incremental Cost	Source: California Lighting Technology Center (CLTC) http://cltc.ucdavis.edu/content/view/354/287/. "UC / CSU case study: Bi-level Smart Parking Garage Fixture" $975
Effective Useful Life	Source: DEER 2008 (same as occupancy sensors) 8 years

Fixture is integrated with occupancy sensor that allows the light to switch between high and low levels based on the presence of vehicle or pedestrian traffic. Switching between high and low light levels based on occupancy maintains sufficient light for security and way-finding while maximizing energy savings. New fixture must be pulse start metal halide, induction, or LED and have lower nominal wattage than existing fixture.

Measure Savings and Analysis
This measure assumes that an existing 150W Metal Halide fixture (190W connected) will be replaced by a 60-lamp Bi-Level SMART LED Fixture. At full output, the bi-level fixture is assumed to consume 110W, while at low light level the fixture consumes 35W. The bi-level fixtures are assumed to be in low output mode 50% of the time.

The demand savings are calculated as follows:

ΔWatts/unit = Pre-Retrofit Wattage - Bi-Level Fixture Wattage

Bi-Level Fixture Wattage is calculated by a time-weighted average as follows:
(0.5*35W) + (0.5*110W) = 72.5W

Demand Savings= 190W – 72.5W

= 117.5 W

$$\textbf{Energy Savings [kWh/Unit]} = \frac{(\Delta\text{Watts/unit}) \times (\text{hours/day}) \times (\text{days/year})}{1{,}000 \text{ Watts / kW}}$$

=(117.5 W)x(4,100/yr)/(1,000W/kW)

= **482 kWh**

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is the cost difference between the energy-efficient equipment and the less efficient option.

Table 95: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	8 (same as occupancy sensors)	DEER 2008
Full Measure Cost	$975	CLTC
Incremental Measure Cost	$975	CLTC

Sensor Controlled Wall Pack Fixtures	
Measure Description	This measure consists of the replacement of a 150W Metal Halide fixture with a 60-lamp SMART LED Bi-Level Fixture
Units	Per fixture
Base Case Description	150W Metal Halide, (system wattage=190W)
Measure Savings	Source: CLTC, PG&E Workpaper – PGECOLTG101.1 – Bi-Level Light Fixture
Measure Incremental Cost	Source: California Lighting Technology Center (CLTC) http://cltc.ucdavis.edu/content/view/354/287/. "UC / CSU case study: Bi-level Smart Parking Garage Fixture" $975
Effective Useful Life	Source: DEER 2008 (same as occupancy sensors) 8 years

Bi-level fixtures are typically found in hallways, stairwells, and garages. These fixtures are intended for use in levels where high lighting levels are required when occupied, but are actually unoccupied for the majority of the time. These fixtures employ a motion sensor-type lighting switch to provide lower levels of light while unoccupied, and full illumination while occupied.

These particular fixtures also feature LED lighting sources, which typically require less energy demand than typical HID sources. These fixtures can also incorporate a fully integrated LED night light for illumination during low-output mode.

Measure Savings and Analysis
This measure assumes that an existing 150W Metal Halide fixture (190W connected) will be replaced by a 60-lamp Bi-Level SMART LED Fixture. At full output, the bi-level fixture is assumed to consume 110W, while at low light level the fixture consumes 35W. The bi-level fixtures are assumed to be in low output mode 75% of the time.

The demand savings are calculated as follows:

$\underline{\Delta\text{Watts/unit}}$ = Pre-Retrofit Wattage - Bi-Level Fixture Wattage

Bi-Level Fixture Wattage is calculated by a time-weighted average as follows:
(0.75*35W) + (0.25*110W) = 53.75W

Demand Savings= 190W – 53.75W

= 136.25 W

$$\textbf{Energy Savings [kWh/Unit]} = \frac{(\Delta\text{Watts/unit}) \times (\text{hours/day}) \times (\text{days/year})}{1{,}000 \text{ Watts / kW}}$$

=(136.25 W)x(8760/yr)/(1,000W/kW)

= **1194 kWh**

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is the cost difference between the energy-efficient equipment and the less efficient option.

Table 96: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	8 (same as occupancy sensors)	DEER 2008
Incremental Measure Cost	$975	CLTC

Exterior and Garage LED and Induction Lighting	
Measure Description	Light emitting diodes and induction lighting can be use for street lighting, and parking lots with significant energy savings compared to HID fixtures. These technologies also have longer useful lives and lower maintenance costs when compared to HIDs.
Units	Per Fixture
Base Case Description	High wattage HID fixtures
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: KEMA
Effective Useful Life	Source: DEER 2005 16 years

This measure applies to the retrofit of high wattage HID or incandescent outdoor light fixtures to LED or Inductions lamps. Both LED and induction lamps offer significant energy savings over their HID options and have longer life spans. The downside of this technology is cost. Prices for LED and induction are still high. Operating hours for exterior lighting may not as high as interior operating hours. There is also no benefit in heat reduction since there is no conditioned space to speak of. The payback period on this measure, as a result is also relatively high.

Measure Savings
The tables below provides the baseline and replacement wattages for induction and LED lamps.

Table 97: Exterior Fixture Wattage Reduction

	Peak kW Reduction	Induction kWh Savings	LED kWh Savings	Average kWh Savings
250-400W HID	0	483.8	483.8	483.8
175-250W HID	0	205.0	344.4	274.7
≤175W HID	0	135.3	209.9	172.6

Table 98: Interior Garage Fixture Wattage Reduction

	Induction Peak kW Reduction	LED Peak kW Reduction	Induction kWh Savings	LED kWh Savings	Average kW Reduction	Average kWh Savings
250-400W HID	0.118	0.118	1033.7	1033.7	0.118	1033.7
175-250W HID	0.050	0.084	438.0	735.8	0.067	586.9

≤175W HID	0.033	0.051	289.1	448.5	0.042	368.8

There is no coincident kW savings in this case since lamps are assumed to be off during peak hour in both the base and retrofit conditions. Exterior kWh savings are calculated with annual operating hours of 4,100, equating to a 12 hour daily use during non-summer days and 9 hour use during summer days. Garage kWh savings are calculated with annual operating hours of 8760, assuming these are on all the time. No interactive effects are used.

Measure Savings Analysis
Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

For this measure, it is assumed that the lighting is placed in non-conditioned areas so the energy and demand interactive effects are 1.0. Operating hours are 4,100 hours for exterior and 8760 hours for interior usage annually.

Exterior coincident kW savings are 0 since both baseline and retrofit lamps are off during peak hours. Interior garage lighting is on all the time and so coincident kW savings are calculated with a coincident factor of 1.

The following table shows the wattage reduction assumed for induction lighting retrofits.

Table 99: Induction Wattage Reduction

	Base Fixture Wattage	Retrofit Fixture Wattage	Non-Coincident kW Reduction
≤175W HID to Induction	128	95	0.033
175-250W HID to Induction	210	160	0.05
250-400W HID to Induction	295	177	0.118
400W+ HID to Induction	458	354	0.104

The following table summarizes exterior LED retrofits from 3 LED manufacturers.

Table 100: Manufacturer's LED Wattage Reduction[24]

	Manufacturer	Base Fixture Wattage	Retrofit Fixture Wattage
100W HID to LED	Ledtronics	130	25
100W HID to LED	LuxBright	130	42
100W HID to LED	MoonCell	130	55

These figures suggest energy savings of 60– 80%. Forty percent energy savings is also often cited in various publications.

We will use the more conservative 40% here but note that savings may actually be greater depending on the application.

Table 101: LED Energy Reduction

	Base Fixture Wattage	kW Reduction
≤175W HID to LED	128	0.051
175-250W HID to LED	210	0.084
250-400W HID to LED	295	0.118
400W+ HID to LED	458	0.183

Measure Life and Incremental Measure Cost
The following table provides the measure life and IMC documented for this measure as well as the source of the data.

[24] "Technology Assessment of Light Emitting Diodes (LED) for Street and Parking Lot Lighting Applications" Prepared for San Diego Regional Energy Office, Public Agency Energy Partnership Program. Prepared by Tetra Tech EM Inc. Aug 2003.

Table 102: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Induction Measure Life	All	16	PG&E Lighting Work paper
Induction IMC	All	$290	PG&E Lighting Work paper
LED Measure Life	Incremental Measure Cost	16	DEER 2005 (LED Exit Signs)
LED IMC	Incremental Measure Cost	$265- $799	KEMA

Exterior/Garage New T5/T8 Fluorescent Fixtures	
Measure Description	This measure consists of replacing one or more existing fixtures with new fixtures containing T8 or T5 lamps and electronic ballasts specifically in interior and exterior garages. The T8 or T5 lamps must have a color rendering index (CRI) ≥ 80. The electronic ballast must be high frequency (≥20 kHz), UL listed, and warranted against defects for 5 years. Ballasts must have a power factor (PF) ≥ 0.90. Ballasts for 4-foot lamps must have total harmonic distortion (THD) ≤20 percent at full light output. For 2- and 3-foot lamps, ballasts must have THD ≤32% at full light output.
Units	Per Watt reduced
Base Case Description	Typically high wattage HID fixtures at interior and exterior garages.
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: KEMA
Effective Useful Life	Source: DEER 11 years

This measure consists of replacing one or more existing fixtures with new fixtures containing T8 or T5 lamps and electronic ballasts. The T8 or T5 lamps must have a color rendering index (CRI) ≥ 80. The electronic ballast must be high frequency (≥20 kHz), UL listed, and warranted against defects for 5 years. Ballasts must have a power factor (PF) ≥ 0.90. Ballasts for 4-foot lamps must have total harmonic distortion (THD) ≤20 percent at full light output. For 2- and 3-foot lamps, ballasts must have THD ≤32 percent at full light output.

This section only applies to interior and exterior parking areas and is presented separately from other building types due to the drastic difference in operating hours. We define interior as parking areas that are enclosed where it is reasonable to assume that all lighting fixtures operate 24 hours per day, 7 days a week.[25] This will include underground parking structures and also stand alone parking structures that may be semi-enclosed. Exterior parking areas are outdoor parking lots where light fixtures do not operate during the day. For other building types refer to savings numbers in the New T5/T8 fluorescent fixture section.

Measure Savings

The savings are provided for interior and exterior parking areas.

[25] PG&E Lighting WP 2006

Table 103: Parking Garage Savings for New T8/T5 Fluorescent Fixtures per Watt Reduced

Parking Area Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak Watt Savings	kWh Savings
Interior	8,760	1	1	1	0.00100	8.760
Exterior	4,100	1	0	1	0	4.100
Average/ Miscellaneous	6,430	1	0.5	1	0.00050	6.430

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = no-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are variable. Because we define this measure with the number of watts reduced, the non-coincident demand savings will be one watt by definition.

Operating hours vary depending on the parking structure type. Interior garages keep lights on at all times while exterior parking lots operate daily at 12 hours per day, except during the summer when lights are on 3 hours less. These operating hours imply that coincident factors are 1 for interior parking (lights are always in operation) and 0 for exterior parking (lights are only in operation at night). Since parking structures are not conditioned space, interactive effects are set to 1.

Measure Life and Incremental Measure Cost
The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. In this case the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 104: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	11	DEER
Incremental Measure Cost[26]	$0.75	KEMA

[26] Based on the assessment of active projects in the 2008-09 ComEd Smart Ideas Program.

Exterior/Garage High Wattage Screw-In CFLs	
Measure Description	High Wattage Scew-In CFLs must be greater than 40W and must replace HIDs or incandescent lamps. CFLs must have lamp/ballast efficacy of ≥ 40 lumens per watt.
Units	Per Lamp
Base Case Description	Incandescent or HID lamps.
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: KEMA
Effective Useful Life	Source: DEER 2.5 years

This incentive applies to screw-in lamps and applies only if an incandescent or high-intensity discharge (HID) lamp is being replaced. Lamp/ballast combination must have an efficacy ≥40 lumens per Watt (LPW).

Measure Savings

Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed. The table shows the wattage reductions used for the savings calculations. Since incandescent lamps produce lower lumens per watt compared to HIDs, they tend to have higher wattage for a given application. Savings are therefore greater in the incandescent case.

Table 105: High Wattage Screw-in CFLs Wattage Reduction

Measure	Wattage Reduction
Incandescent Baseline	214
HID Baseline	102

The coincident kW and kWh savings are provided by parking structure type below. Interior parking garages will have annual operating hours of 8,760 (24/7) and exterior parking lots will have annual operating hours of 3,640 (10/7). This implies that interior coincidence factors are assumed to be 1 since the lights operate at all times. Similarly, exterior coincidence factors are assumed to be 0 since lights do not operate during daylight.

Table 106: High Wattage Screw-in CFL Savings for Incandescent Baseline

DEER Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
Interior Parking Garage	8,760	1.00	1	1	0.214	1874.6
Exterior Parking Garage	4,100	1.00	0	1	0.000	877.4
Average/Miscellaneous	6,430	1.00	0.50	1	0.107	1376.0

Table 107: High Wattage Screw-in CFL Savings for HID Baseline

DEER Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
Interior Parking Garage	8,760	1.00	1	1	0.102	890.0
Exterior Parking Garage	4,100	1.00	0	1	0.000	416.6
Average/Miscellaneous	6,430	1.00	0.50	1	0.051	653.3

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = Non-Coincident kW Savings * Annual Operating Hours * Energy Interactive Effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = Non-Coincident kW Savings * Coincidence Factor * Demand Interactive Effect

For this measure, it is assumed that the lighting is placed in non-conditioned areas so the energy and demand interactive effects are 1.0.

Baseline and retrofit equipment assumptions are presented in the following table. Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed. The table shows the wattages used for the savings calculations.

Table 108: High Wattage Screw-in CFL Baseline and Retrofit Wattages

Baseline	Base Wattage (Watts)	Retrofit Wattage (Watts)	kW Reductions (kW)
75 MH	85	42	0.043
150 MH	165	68	0.097
175 MH	188	68	0.12
175 MH	203	100	0.103

Baseline	Base Wattage (Watts)	Retrofit Wattage (Watts)	kW Reductions (kW)
250 MH	295	150	0.145
HID Average			**0.1016**
200 Inc	200	55	0.145
250 Inc	250	68	0.182
400 Inc	400	85	0.315
Incandescent Average			**0.214**

Measure Life and Incremental Measure Cost
The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. In this case, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 109: Measure Life and Incremental Measure Cost

Measure Category		Value	Source
All	Measure Life	2.5	DEER
Incandescent Baseline	Incremental Measure Cost	$28	KEMA
HID Baseline	Incremental Measure Cost	$38	KEMA

Exterior/Garage Compact Fluorescent Fixtures, Hardwired	
Measure Description	New fixtures or modular retrofits with hardwired electronic ballasts qualify. The CFL ballast must be programmed start or programmed rapid start with a PF ≥90 and THD ≤20%.
Units	Per fixture
Base Case Description	Incandescent or HID lamps.
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: KEMA
Effective Useful Life	Source: DEER 12 years

Hardwired CFL incentives apply only to complete new fixtures or modular (pin-based) retrofits with hardwired electronic ballasts. The CFL ballast must be programmed 'start' or programmed 'rapid start' with a PF ≥90 and THD ≤20 percent. The lamp must be rated to -20° Fahrenheit.

Measure Savings
Baseline and retrofit equipment assumptions are presented in the table below. Most lighting retrofits assume early replacement of existing technologies where the baseline represents the equipment removed. The following table shows the wattages used for the savings calculations.

Table 110: Baseline and Retrofit Wattages

Measure	Base Wattage	Retrofit Wattage	kW Reduction
29W or Less	100	28	0.072
29W or Less	125	27	0.098
29W or Less	110	27	0.083
29W or Less	100	26	0.074
29W or Less	75	26	0.049
29W or Less	100	25	0.075
29W or Less	75	25	0.05
29W or Less	100	23	0.077
29W or Less	75	20	0.055
29W or Less	75	19	0.056
29W or Less	75	18	0.057
29W or Less	60	18	0.042
29W or Less	60	16	0.044
29W or Less	60	15	0.045
29W or Less	60	14	0.046
29W or Less	60	13	0.047
29W or Less	40	13	0.027
29W or Less	40	9	0.031

Measure	Base Wattage	Retrofit Wattage	kW Reduction
30W or Greater	120	30	0.09
30W or Greater	120	40	0.08
30W or Greater	200	55	0.145
30W or Greater	200	65	0.135

Table 111: Wattage Reduction

Wattage Category	Average Wattage Reduction
≤29	57
≥30W	113

The following tables provide the measure savings using the above wattage reduction assumptions. Savings are provided by building type. The miscellaneous category is an average of the building types.

Since DEER building types differ from those used in the ComEd Smart Ideas Program, they are mapped to fit the program. Some savings values have been combined to fit program needs (see detailed description of the methodology in the Appendix introduction).

Table 112: Measure Savings for 29W or less

ComEd Building Types	Annual Operating Hours	Peak kW Savings	kWh Savings
Interior Parking Garage	8,760	0.057	499.3
Exterior	4,100	0.000	233.7
Average Garage/Exterior	6,430	0.029	366.5

Table 113: Measure Savings for ≥30W

ComEd Building Types	Annual Operating Hours	Peak kW Savings	kWh Savings
Interior Parking Garage	8,760	0.113	989.9
Exterior	4,100	0.000	463.3
Average Garage/Exterior	6,430	0.033	726.6

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings are calculated using the equations below.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

For this measure, it is assumed that the lighting is placed in non-conditioned areas so the energy and demand interactive effects are 1.0.

Measure Life and Incremental Measure Cost

The table below provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is the cost difference between the energy-efficient equipment and the less efficient option. In this case, lighting measures, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 114: Measure Life and Incremental Measure Cost

Wattage Category		Value	Source
All	Measure Life	12	ICF Portfolio Study
≤29	Incremental Measure Cost	$95	KEMA
≥30W	Incremental Measure Cost	$132	KEMA

Exterior/Garage Ceramic Metal Halides or Pulse Start Metal Halides	
Measure Description	This measure applies to retrofits of high intensity discharge fixtures with either pulse start metal halide or ceramic metal halide fixtures in parking lots or garages. The new fixture must replace a higher wattage existing fixture.
Units	Per Fixture
Base Case Description	High wattage HID fixtures
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: KEMA
Effective Useful Life	Source: DEER 16 years

This incentive applies to retrofits of high-intensity discharge fixtures with either pulse-start metal halide or ceramic metal halide fixtures in parking lots or garages. Total replacement wattage must be lower than existing wattage to ensure energy savings. This measure is subject to possible pre-inspection. Retrofit kits may be used on existing mercury vapor, standard metal halide or high-pressure sodium fixtures only.

Measure Savings

The table below provides the non-coincident savings.

Table 115: Metal Halides Wattage Reduction

Wattage Category	Average Wattage Reduction
100W or Less	48
101W-200W	65
201-350W	128

The coincident kW and kWh savings are provided by parking structure type below. Interior parking garages will have an annual operating hours of 8,760 (24/7) and exterior parking lots will have an annual operating hours of 4,100 (12/7 Non-Summer, 9/7 Summer). This implies that interior coincidence factors are assumed to be 1 since the lights operate at all times. Similarly, exterior coincidence factors are assumed to be 0 since lights do not operate during daylight hours.

Table 116: Metal Halides Savings for ≤100W MH

ComEd Building Types	Annual Operating Hours	Peak kW Savings	kWh Savings
Garage	8,760	0.048	423.4
Exterior	4,100	0.000	198.2
Average Garage/Exterior	6,430	0.024	310.8

Table 117: Metal Halides Savings for 101W-200W MH

ComEd Building Types	Annual Operating Hours	Peak kW Savings	kWh Savings
Garage	8,760	0.065	569.4
Exterior	4,100	0.000	266.5
Average Garage/Exterior	6,430	0.033	418.0

Table 118: Metal Halides Savings for 201W-350W MH

ComEd Building Types	Annual Operating Hours	Peak kW Savings	kWh Savings
Garage	8,760	0.128	1121.3
Exterior	4,100	0.000	524.8
Average Garage/Exterior	6,430	0.064	823.0

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

For this measure, it is assumed that the lighting is placed in non-conditioned areas so the energy and demand interactive effects are 1.0.

Baseline and retrofit equipment assumptions are presented in the following table. Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed. The table shows the wattages used for the savings calculations.

Table 1192: Metal Halide Baseline and Retrofit Wattages[27]

Measures	Base Wattage	Retrofit Wattage	Wattage Reduction
100W or Less			
Base case => Ceramic MH (20W lamp)	57	22	35
Base case => Ceramic MH (39W lamp)	83	46	37
Base case (100W) => Ceramic MH (25W lamp)	100	27	73
Average			**48**
101W-200W			
Base case (250W lamp) => Metal Halide (175W lamp)	295	208	87
Base case (175W lamp) => Metal Halide (150W lamp)	208	185	23
Metal Halide (250W) => Pulse Start Metal Halide (175W)			85
Average			**65**
201-350W			
Base case (400W lamp) => Metal Halide (320W lamp)	458	365	93
Mercury Vapor (400W) => Pulse Start Metal Halide (250W)	458	295	163
Average			**128**

Measure Life and Incremental Measure Cost
The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. In this case the lighting measures, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

[27] 2006 PG&E Interior Pulse Start Metal Halide Workpaper, PG&E Directional Lighting CMH Workpaper, SCE Ceramic Metal Halide Workpaper (WPSCNRLG0054.1), 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures.

Table 120: Measure Life and Incremental Measure Cost

Wattage Category		Value	Source
All	Measure Life	16	DEER
100W or Less	Incremental Measure Cost	$95	SCE WP[28]
101-200W	Incremental Measure Cost	$170	PG&E WP[29]
201-350W	Incremental Measure Cost	$266	SCE WP[30]

[28] WPSCNRLG0054.1 Ceramic Metal Halide Fixtures, Southern California Edison Workpaper, 2008.
[29] 2006 PG&E Interior Pulse Start Metal Halide Workpaper
[30] WPSCNRLG0046.1 Interior Pulse Start Metal Halide Fixtures 251 -400W, Southern California Edison Workpaper, 2008.

LED Channel Signs, Outdoor	
Measure Description	Retrofit and replacement of inefficient neon and argon-mercury channel letter signs with efficient LED channel letter signs.
Units	Per letter
Base Case Description	Existing signage– Neon (red) channel letter signs and argon-mercury (white) channel letter signs.
Measure Savings	Source: PG&E workpaper
Measure Incremental Cost	Source: PG&E workpaper
Effective Useful Life	16 years Source: PG&E workpaper

LED channel sign incentive is available for retrofitting or replacing incandescent, HID, argon-mercury or neon-lighted channel letter signs. Replacement signs can not use more than 20% of the actual input power of the sign that is replaced.

Measure Savings[31]
The following table summarizes the savings for LED channel signs.

Table 121 Savings for LED Channel Signs

Location	Hours of Operation	Sign Height	Annual Energy Savings kWh/letter	Demand Savings kW/letter	Peak Demand Savings kW/letter
Outdoor	2750	≤ 2 ft	93	0.034	0
		>2 ft	237	0.086	0

Measure Savings Analysis
The calculation methodology used by PG&E in the LED Channel Sign workpaper is outlined below. All the supporting documentation and spreadsheets are shown in the PG&E workpaper.

[31] PGE LED Channel Sign work paper

(6) Collected letter schematics showing linear feet of tubing and number of LED modules for each letter of the alphabet, both uppercase and lowercase, for 24 inch high letters and 36 inch high letters.
(7) The base case wattage (W/ft) and the energy efficient case wattage (W/module) input values were collected for each specific letter.
(8) A probability table, showing the frequency each letter appears in the English language, was integrated into the spreadsheet. By multiplying the wattage for each specific letter by the probability, a weighted average wattage per letter was obtained. This single value represents all 26 letters of that height and will be accurate over a range of signs with a weighted average watts/letter for red and white for uppercase and lowercase letters.
(9) This spreadsheet was then modified to account for the average height of signs in each category. (According to sign industry sources, the average height of a sign in the 2 feet or less category is 21 inches. The average height of a sign in the greater than 2 feet high category is 27 inches).
(10) The watts/letter values were then weighted assuming 70% of letters are uppercase and 30% of letters are lowercase, as well as 50% are red signs and 50% are white signs.

Measure Life and Incremental Measure Cost

Measure life is assumed to be 16 years for the signs. LEDs have a lifetime of 25,000 hours for LEDs. However, to be consistent, DEER uses 16 years for LED exit signs, hence all LEDs are assumed to have a 16 year life.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. The incremental cost for the retrofit case is the full cost of the LED-lighted sign because the retrofit case assumes the existing lighting is working properly and does not need to be replaced. The incremental cost for the replacement case is the difference between the base case and the energy-efficient alternative. The incremental costs were weighted assuming that 30% of the channel signs will be retrofit and 70% of the channel signs will be new or replacement. Therefore, the incremental cost for signs less than or equal to 2 ft. high is $35/letter and the incremental cost for signs greater than 2 ft. high is $154/letter.

Photocells	
Measure Description	Photocells can be used to control both outdoor and indoor lamps. When there is enough day lighting, lights are automatically turned off. This workpaper will only apply to outdoor lighting. The primary use is to shut off lights at dawn and on at dusk.
Units	Per Watt Controlled
Base Case Description	High pressure sodium exterior lamps with time clock.
Measure Savings	DEER 2005
Measure Incremental Cost	DEER 2005
Effective Useful Life	8 years (DEER 2008), assumed to be the same as a timeclock or daylighting controls.

Photocells control lighting fixtures by sensing the amount of sunlight in the area and switching lights off when enough sunlight is present. The measure assumes that the existing exterior lights are controlled by a time clock and the measure retrofits those with a new photocell. With a photocell, exterior lights operate approximately 4,100 hours per year. Without the photocell, the lights would operate an additional 280 hours per year (approximately 3 months at 3 hours per day). For this calculation, the photocell controls four 70-watt high-pressure sodium exterior lamps with an effective 95 watts including the ballast.

Measure Savings

Table 122: Photocell Measure Savings

Peak kW Savings	Annual kWh Savings
0	0.280

Measure Savings Analysis
We assume in our calculations that lighting systems with time clocks only will be on 12 hours a day or 4,380 hours annually. Due to seasonal shifts, photocells will shut off an additional 3 hours per day for 3 months. This equates to annual savings of 280 hours.

DEER assumes that each photocell will control 4 lamps at 95W each, effectively 380W per photocell.

Since no interactive effects are considered for exterior lighting, annual kWh savings per photocell is calculated to be 106.4kWh. On average, the demand in this period will be 0 in both the retrofit and base case.

Measure Life and Incremental Measure Cost
Measure life is assumed to be the same as a timeclock or daylighting controls as listed in DEER.

Table 123: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	8	DEER 2008
Incremental Measure Cost	$59.81	DEER 2005

Time Clocks for Lighting	
Measure Description	Time clocks are an electrical device that control lighting equipment by turning the equipment on and off according to a set schedule. This measure applies to external lighting. The timeclocks must be installed with a 3 hour battery pack and astronomical controls.
Units	Per Watt Controlled
Base Case Description	High pressure sodium exterior lamps with no control system
Measure Savings	DEER 2005
Measure Incremental Cost	DEER 2005
Effective Useful Life	8 years (DEER 2008)

Time clocks are an electrical device that control lighting equipment by turning the equipment on and off according to a set schedule. This measure applies to external lighting. These clocks can program lights to switch off during weekends, for example. The time clocks must be installed with a 3 hour battery pack so that schedule information do not get wiped out during any power outages. Time clocks should also include astronomical controls, to adjust the schedule to the appropriate season.

Measure Savings

Table 124: Timeclock Measure Savings

Peak kW Savings	Annual kWh Savings
0	1.248

Measure Savings Analysis

DEER assumes that each time clock will control 4, 70W high pressure sodium lamps. Including the ballast, each lamp has a demand of 95W or 380W total.

We assume in our calculations that lighting systems without time clocks will be on 12 hours a day during weekends. This measure would eliminate weekend operation which equates to 1,248 hours annually.

Since no interactive effects are considered for exterior lighting, energy saving is calculated by multiplying 1,248 hours and 380W. There is no peak demand savings associated with this measure since peak usage are not impacted by time clocks.

Measure Life and Incremental Measure Cost

Table 125: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	8	DEER 2008
Incremental Measure Cost	$102.78	DEER 2005

Cooling

Unitary or Split Air Conditioning Systems and Air Source Heat Pumps	
Measure Description	New unitary air conditioning units or air source heat pumps that meet or exceed the qualifying cooling efficiency are eligible for an incentive. They can be either split systems or single package units. Water-cooled systems, evaporative coolers, and water source heat pumps do not qualify under this program but may qualify under the Custom Incentive Program.
Units	Ton
Base Case Description	Federal Minimum or ASHRAE 90.1-2007 Minimum Standard for Unitary or Split AC
Measure Savings	Source: KEMA
Incremental Measure Cost	Source: Updated DEER
Effective Useful Life	Source: DEER 15 years

New unitary air conditioning units or air source heat pumps that meet or exceed the qualifying cooling efficiency shown in the table below are eligible for an incentive. They can be either split systems or single package units. Efficiencies of split systems are based on ARI reference numbers. Water-cooled systems, evaporative coolers, and water source heat pumps do not qualify under this program but may qualify under the Custom Incentive Program. All unitary and split-system cooling equipment must meet Air Conditioning and Refrigeration Institute (ARI) standards (210/240, 320 or 340/360), be UL listed, and utilize a minimum ozone-depleting refrigerant (e.g., HCFC or HFC). All required efficiencies are based on the Consortium for Energy Efficiency (CEE) high-efficiency commercial air conditioning and heat pump specifications (www.cee1.org)[32]. A manufacturer's specification sheet indicating the system efficiency must accompany the application. Disposal of the existing unit must comply with local codes and ordinances.

[32] This website also has a list of eligible systems.

Table 126: Program Qualifying Efficiencies

	Unit Size	Minimum Efficiency	
Less than or equal 5 tons	< 65,000 Btuh	Tier 1	14 SEER
		Tier 2	15 SEER
More than 5 tons	≥ 65,000 Btuh and <240,000 Btuh	12 EER	
	≥240,000 Btuh and <760,000 Btuh	10.8 EER	
	≥ 760,000 Btuh	10.2 EER	

Measure Savings

The coincident kW and the annual kWh savings per ton of installed cooling system are provided below.

Table 127: Measure Savings for Unitary or Split Air Conditioning Systems (per ton)

Unit Size	Business Type	CEE Tier	Peak Demand Reduction	Annual Energy Savings
5 or less	College/University	1	0.067	49.1
5 or less	Grocery	1	0.068	87.8
5 or less	Heavy Industry	1	0.066	40.4
5 or less	Hotel/Motel	1	0.07	87.3
5 or less	Light Industry	1	0.068	41.5
5 or less	Medical	1	0.068	96.7
5 or less	Office	1	0.07	41.2
5 or less	Restaurant	1	0.068	54.4
5 or less	Retail/Service	1	0.069	65
5 or less	School (K-12)	1	0.066	20.7
5 or less	Warehouse	1	0.07	36
5 or less	Miscellaneous	1	0.068	56.4
5 or less	College/University	2	0.126	91.6
5 or less	Grocery	2	0.128	163.9
5 or less	Heavy Industry	2	0.124	75.5
5 or less	Hotel/Motel	2	0.203	162.9
5 or less	Light Industry	2	0.127	77.4
5 or less	Medical	2	0.126	180.5
5 or less	Office	2	0.13	76.8
5 or less	Restaurant	2	0.126	101.5
5 or less	Retail/Service	2	0.128	121.4
5 or less	School (K-12)	2	0.122	38.6
5 or less	Warehouse	2	0.131	67.1
5 or less	Miscellaneous	2	0.134	105.2

Unit Size	Business Type	CEE Tier	Peak Demand Reduction	Annual Energy Savings
5 to 10	College/University	2	0.088	64
5 to 10	Grocery	2	0.089	114.4
5 to 10	Heavy Industry	2	0.086	52.6
5 to 10	Hotel/Motel	2	0.091	113.7
5 to 10	Light Industry	2	0.089	54.1
5 to 10	Medical	2	0.095	138.8
5 to 10	Office	2	0.091	53.6
5 to 10	Restaurant	2	0.088	70.84
5 to 10	Retail/Service	2	0.089	84.74
5 to 10	School (K-12)	2	0.085	27
5 to 10	Warehouse	2	0.092	46.8
5 to 10	Miscellaneous	2	0.089	74.6
10 to 20	College/University	2	0.112	71.3
10 to 20	Grocery	2	0.114	126.6
10 to 20	Heavy Industry	2	0.11	65.4
10 to 20	Hotel/Motel	2	0.117	122.5
10 to 20	Light Industry	2	0.113	68.9
10 to 20	Medical	2	0.113	125.5
10 to 20	Office	2	0.116	60.7
10 to 20	Restaurant	2	0.112	82.9
10 to 20	Retail/Service	2	0.114	92.3
10 to 20	School (K-12)	2	0.109	31.3
10 to 20	Warehouse	2	0.117	58
10 to 20	Miscellaneous	2	0.113	82.3
20 to 60	College/University	2	0.104	66.1
20 to 60	Grocery	2	0.105	117.2
20 to 60	Heavy Industry	2	0.102	61.9
20 to 60	Hotel/Motel	2	0.108	113.5
20 to 60	Light Industry	2	0.105	63.9
20 to 60	Medical	2	0.104	116.2
20 to 60	Office	2	0.107	56.2
20 to 60	Restaurant	2	0.104	76.7
20 to 60	Retail/Service	2	0.106	90.5
20 to 60	School (K-12)	2	0.101	28.9
20 to 60	Warehouse	2	0.108	53.8
20 to 60	Miscellaneous	2	0.105	76.8
≥ 60	College/University	2	0.079	50.5
≥ 60	Grocery	2	0.08	89.7
≥ 60	Heavy Industry	2	0.078	47.3

Unit Size	Business Type	CEE Tier	Peak Demand Reduction	Annual Energy Savings
≥ 60	Hotel/Motel	2	0.083	86.9
≥ 60	Light Industry	2	0.08	48.9
≥ 60	Medical	2	0.08	88.9
≥ 60	Office	2	0.082	42.4
≥ 60	Restaurant	2	0.079	58.7
≥ 60	Retail/Service	2	0.081	69.3
≥ 60	School (K-12)	2	0.077	22.1
≥ 60	Warehouse	2	0.083	41.1
≥ 60	Miscellaneous	2	0.08	58.7

Measure Savings Analysis
Savings values are determined for efficiency levels listed for the CEE commercial AC systems. HVAC EER values used in the analysis are provided in the table below. It is important to note that the baseline efficiency listed here is significantly higher than the baselines used in the previous version, with the exception of unit 5 tons or less. These numbers are in accordance with ASHRAE 90.1-2007 (as of 1/1/10) standards instead of ASHRAE 2004. As a result, we will no longer include CEE tier 1 units unless the unit is 5 tons or less (14 SEER).

Table 128: Demand Savings and Efficiency Assumptions

Size (Tons)	Base (S)EER	Tier 2 (S)EER	SEER or EER
5 or less	13	15[33]	SEER
5 to 10	11	12	EER
10 to 20	10.8	12	EER
20 to 60	9.8	10.8	EER
≥ 60	9.5	10.2	EER

Savings calculations were performed by utilizing DOE-2 models generated with eQUEST software. The models are the same used to generate California's DEER with modifications pertinent to Chicago, regarding climate zone and building construction, as outlined below:

1) Representative models for all building types were obtained from the group that developed DEER.

2) The climate zone was changed to Chicago, which is a feature added to the latest version of eQUEST (version 3.63). Previous versions of eQUEST only included California and Seattle climate zones.

[33] Tier 1 is 14 SEER

3) Building shell characteristics and lighting power density were changed per ComEd's 2008-2010 Energy Efficiency and Demand Response Plan, Appendix B. The primary building shell characteristics that affect weather sensitive measures include insulation levels and window SHGC and U-value.

4) For each building type, a baseline model included the baseline EER or SEER for the HVAC units.

5) Retrofit cases were determined using the Tier 1 or 2 EER or SEER for the HVAC units.

6) Savings was determined by subtracting the retrofit HVAC energy usage from the baseline usage. Similarly peak demand reductions were determined in the same fashion.

7) All units with capacities greater than or equal to 10 tons were assumed to be equipped with economizers for both the baseline and retrofit cases. Units smaller than 10 tons were assumed to not have economizers.

The savings values presented are not direct outputs from eQuest. The models still use ASHRAE 2004 baselines. To calculate new savings values, we applied the ratio of efficiency improvements in both cases to the old savings values as described in the following equation.

$$Savings_{NEWBaseline} = \frac{\Delta Efficiency_{NEWBaseline}}{\Delta Efficiency_{OLDBaseline}} Savings_{OLDBaseline}$$

Measure Life and Incremental Measure Cost

The measure life for packaged units is 15 years according to DEER 2005.

The next table provides incremental measure cost (IMC) documented for this measure. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option.

Table 129: Package Units Incremental Measure Cost[34]

Measure	Cost
65,000 Btuh or less - Tier 1	$113
65,000 Btuh or less - Tier 2	$172
65,000 to 240,000 tons - Tier 2	$97
240,000 to 760,000 Btuh - Tier 2	$247
760,000 Btuh or more - Tier 2	$203

[34] 2008 DEER, www.deeresources.com

Water-Cooled Chillers and Air-Cooled Chillers	
Measure Description	Chillers are eligible for an incentive if they have a rated kW/ton for the Integrated Part Load Value (IPLV) that is either 80 or 90 percent of the applicable standard. The chiller efficiency rating must be based on ARI Standard 550/590-2003 for IPLV conditions and not based on full-load conditions. The chillers must meet ARI standards 550/590-2003, be NRTL listed, and use a minimum ozone-depleting refrigerant (e.g., HCFC or HFC). The ARI net capacity value should be used to determine the chiller tons.
Units	Per Ton
Base Case Description	Chillers at IECC 2009 IPLV standards
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: 2008 DEER
Effective Useful Life	Source: DEER 20 years

Chillers are eligible for an incentive if they have a rated kW/ton for the integrated part-load value (IPLV) that is either 80 or 90 percent of the applicable standard. The chiller efficiency rating must be based on ARI Standard 550/590-2003 for IPLV conditions and not based on full-load conditions. The chillers must meet ARI standards 550/590-2003, be NRTL listed, and use a minimum ozone-depleting refrigerant (e.g., HCFC or HFC). The ARI net capacity value should be used to determine the chiller tons. A manufacturer's specification sheet with the rated kW/Ton-IPLV or COP-IPLV must accompany the application. Qualifying efficiencies for chillers are summarized below:

Table 130: Efficiency Levels for Chillers

Chiller Type	Size (Tons)	Level 1 kW/ton IPLV	Level 2 kW/ton IPLV
Scroll or Helical-Rotary	<75	0.57	0.50
	75 to 149	0.55	0.49
	150 to 299	0.52	0.46
	≥ 300	0.49	0.43
Centrifugal	< 300	0.54	0.48
	300 to 599	0.49	0.44
	≥ 600	0.49	0.43
Reciprocating	<75	0.57	0.50
	75 to 149	0.55	0.49
	150 to 299	0.52	0.46
	≥ 300	0.49	0.43
Air Cooled	<150	0.86	0.77
	≥ 150	0.85	0.75

Measure Savings
Qualifying air cooled chillers must have a kW/ton IPLV that is 10 percent below the IECC 2009 standards.

The coincident kW and the annual kWh savings per ton of installed chiller are provided below.

Table 131: Measure Savings for Chillers

Measure Description	Unit Size	Business Type	Tier Level	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Air Cooled	< 150	College/University	1	0.130	125.5
Air Cooled	< 150	Grocery	1	0.140	153.6
Air Cooled	< 150	Heavy Industry	1	0.130	103.9
Air Cooled	< 150	Hotel/Motel	1	0.141	175.2
Air Cooled	< 150	Light Industry	1	0.142	77.0
Air Cooled	< 150	Medical	1	0.141	169.5
Air Cooled	< 150	Office	1	0.150	89.0
Air Cooled	< 150	Restaurant	1	0.138	127.9
Air Cooled	< 150	Retail/Service	1	0.134	118.9
Air Cooled	< 150	School (K-12)	1	0.125	63.7
Air Cooled	< 150	Warehouse	1	0.134	87.3
Air Cooled	< 150	Miscellaneous	1	0.088	76.0
Air Cooled	< 150	Average Building	1	0.133	114.0
Air Cooled	≥ 150	College/University	1	0.127	122.9
Air Cooled	≥ 150	Grocery	1	0.137	150.4
Air Cooled	≥ 150	Heavy Industry	1	0.127	101.8
Air Cooled	≥ 150	Hotel/Motel	1	0.138	171.5
Air Cooled	≥ 150	Light Industry	1	0.143	90.8
Air Cooled	≥ 150	Medical	1	0.138	166.0
Air Cooled	≥ 150	Office	1	0.147	87.2
Air Cooled	≥ 150	Restaurant	1	0.135	125.3
Air Cooled	≥ 150	Retail/Service	1	0.132	120.2
Air Cooled	≥ 150	School (K-12)	1	0.122	62.4
Air Cooled	≥ 150	Warehouse	1	0.132	89.6
Air Cooled	≥ 150	Miscellaneous	1	0.087	75.8
Air Cooled	≥ 150	Average Building	1	0.130	113.6
Air Cooled	< 150	College/University	2	0.260	251.0

Measure Description	Unit Size	Business Type	Tier Level	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Air Cooled	< 150	Grocery	2	0.279	307.2
Air Cooled	< 150	Heavy Industry	2	0.260	207.9
Air Cooled	< 150	Hotel/Motel	2	0.281	350.3
Air Cooled	< 150	Light Industry	2	0.285	153.9
Air Cooled	< 150	Medical	2	0.283	339.0
Air Cooled	< 150	Office	2	0.300	178.0
Air Cooled	< 150	Restaurant	2	0.276	255.9
Air Cooled	< 150	Retail/Service	2	0.269	237.7
Air Cooled	< 150	School (K-12)	2	0.250	127.4
Air Cooled	< 150	Warehouse	2	0.267	174.5
Air Cooled	< 150	Miscellaneous	2	0.176	152.0
Air Cooled	< 150	Average Building	2	0.265	227.9
Air Cooled	≥ 150	College/University	2	0.255	245.8
Air Cooled	≥ 150	Grocery	2	0.273	300.8
Air Cooled	≥ 150	Heavy Industry	2	0.255	203.6
Air Cooled	≥ 150	Hotel/Motel	2	0.275	343.0
Air Cooled	≥ 150	Light Industry	2	0.285	181.5
Air Cooled	≥ 150	Medical	2	0.277	331.9
Air Cooled	≥ 150	Office	2	0.294	174.3
Air Cooled	≥ 150	Restaurant	2	0.270	250.6
Air Cooled	≥ 150	Retail/Service	2	0.263	240.5
Air Cooled	≥ 150	School (K-12)	2	0.244	124.8
Air Cooled	≥ 150	Warehouse	2	0.263	179.3
Air Cooled	≥ 150	Miscellaneous	2	0.174	151.6
Air Cooled	≥ 150	Average Building	2	0.261	227.3
Centrifugal	< 300	College/University	1	0.075	87.7
Centrifugal	< 300	Grocery	1	0.087	138.8
Centrifugal	< 300	Heavy Industry	1	0.082	84.0
Centrifugal	< 300	Hotel/Motel	1	0.098	126.4
Centrifugal	< 300	Light Industry	1	0.083	64.2
Centrifugal	< 300	Medical	1	0.082	110.4
Centrifugal	< 300	Office	1	0.085	55.3
Centrifugal	< 300	Restaurant	1	0.082	108.2
Centrifugal	< 300	Retail/Service	1	0.078	82.5
Centrifugal	< 300	School (K-12)	1	0.078	46.8

Measure Description	Unit Size	Business Type	Tier Level	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Centrifugal	< 300	Warehouse	1	0.142	57.7
Centrifugal	< 300	Miscellaneous	1	0.089	87.5
Centrifugal	< 300	Average Building	1	0.088	87.5
Centrifugal	< 300	College/University	2	0.109	125.8
Centrifugal	< 300	Grocery	2	0.126	199.1
Centrifugal	< 300	Heavy Industry	2	0.117	120.5
Centrifugal	< 300	Hotel/Motel	2	0.141	181.4
Centrifugal	< 300	Light Industry	2	0.120	88.5
Centrifugal	< 300	Medical	2	0.117	158.5
Centrifugal	< 300	Office	2	0.122	79.3
Centrifugal	< 300	Restaurant	2	0.118	155.3
Centrifugal	< 300	Retail/Service	2	0.111	117.9
Centrifugal	< 300	School (K-12)	2	0.111	67.1
Centrifugal	< 300	Warehouse	2	0.150	82.1
Centrifugal	< 300	Miscellaneous	2	0.122	125.1
Centrifugal	< 300	Average Building	2	0.122	125.0
Centrifugal	300-599	College/University	1	0.057	67.1
Centrifugal	300-599	Grocery	1	0.068	106.2
Centrifugal	300-599	Heavy Industry	1	0.063	64.3
Centrifugal	300-599	Hotel/Motel	1	0.075	96.7
Centrifugal	300-599	Light Industry	1	0.064	54.3
Centrifugal	300-599	Medical	1	0.063	84.5
Centrifugal	300-599	Office	1	0.065	42.2
Centrifugal	300-599	Restaurant	1	0.063	82.9
Centrifugal	300-599	Retail/Service	1	0.060	68.2
Centrifugal	300-599	School (K-12)	1	0.060	35.7
Centrifugal	300-599	Warehouse	1	0.067	48.2
Centrifugal	300-599	Miscellaneous	1	0.064	68.2
Centrifugal	300-599	Average Building	1	0.064	68.2
Centrifugal	300-599	College/University	2	0.099	114.3
Centrifugal	300-599	Grocery	2	0.115	181.2
Centrifugal	300-599	Heavy Industry	2	0.107	109.6
Centrifugal	300-599	Hotel/Motel	2	0.128	164.8
Centrifugal	300-599	Light Industry	2	0.109	92.5
Centrifugal	300-599	Medical	2	0.107	143.9

Measure Description	Unit Size	Business Type	Tier Level	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Centrifugal	300-599	Office	2	0.111	72.1
Centrifugal	300-599	Restaurant	2	0.107	141.2
Centrifugal	300-599	Retail/Service	2	0.115	116.3
Centrifugal	300-599	School (K-12)	2	0.101	61.0
Centrifugal	300-599	Warehouse	2	0.115	82.2
Centrifugal	300-599	Miscellaneous	2	0.110	116.3
Centrifugal	300-599	Average Building	2	0.110	116.3
Centrifugal	≥ 600	College/University	1	0.048	56.6
Centrifugal	≥ 600	Grocery	1	0.058	89.6
Centrifugal	≥ 600	Heavy Industry	1	0.053	54.3
Centrifugal	≥ 600	Hotel/Motel	1	0.063	81.6
Centrifugal	≥ 600	Light Industry	1	0.054	45.8
Centrifugal	≥ 600	Medical	1	0.053	71.3
Centrifugal	≥ 600	Office	1	0.055	35.6
Centrifugal	≥ 600	Restaurant	1	0.053	69.9
Centrifugal	≥ 600	Retail/Service	1	0.050	57.6
Centrifugal	≥ 600	School (K-12)	1	0.050	30.1
Centrifugal	≥ 600	Warehouse	1	0.057	40.7
Centrifugal	≥ 600	Miscellaneous	1	0.054	57.6
Centrifugal	≥ 600	Average Building	1	0.054	57.5
Centrifugal	≥ 600	College/University	2	0.097	112.3
Centrifugal	≥ 600	Grocery	2	0.113	177.9
Centrifugal	≥ 600	Heavy Industry	2	0.105	107.6
Centrifugal	≥ 600	Hotel/Motel	2	0.126	161.8
Centrifugal	≥ 600	Light Industry	2	0.107	90.8
Centrifugal	≥ 600	Medical	2	0.105	141.3
Centrifugal	≥ 600	Office	2	0.109	70.8
Centrifugal	≥ 600	Restaurant	2	0.105	138.7
Centrifugal	≥ 600	Retail/Service	2	0.113	114.2
Centrifugal	≥ 600	School (K-12)	2	0.099	59.9
Centrifugal	≥ 600	Warehouse	2	0.113	80.7
Centrifugal	≥ 600	Miscellaneous	2	0.108	114.2
Centrifugal	≥ 600	Average Building	2	0.108	114.2
Reciprocating	< 75	College/University	1	0.056	53.8
Reciprocating	< 75	Grocery	1	0.067	71.1

Measure Description	Unit Size	Business Type	Tier Level	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Reciprocating	< 75	Heavy Industry	1	0.060	44.2
Reciprocating	< 75	Hotel/Motel	1	0.060	77.5
Reciprocating	< 75	Light Industry	1	0.062	33.4
Reciprocating	< 75	Medical	1	0.061	72.1
Reciprocating	< 75	Office	1	0.072	38.1
Reciprocating	< 75	Restaurant	1	0.064	54.3
Reciprocating	< 75	Retail/Service	1	0.082	66.9
Reciprocating	< 75	School (K-12)	1	0.058	27.5
Reciprocating	< 75	Warehouse	1	0.065	41.7
Reciprocating	< 75	Miscellaneous	1	0.064	52.8
Reciprocating	< 75	Average Building	1	0.064	52.8
Reciprocating	< 75	College/University	2	0.110	104.6
Reciprocating	< 75	Grocery	2	0.129	138.2
Reciprocating	< 75	Heavy Industry	2	0.117	85.9
Reciprocating	< 75	Hotel/Motel	2	0.117	150.6
Reciprocating	< 75	Light Industry	2	0.121	65.0
Reciprocating	< 75	Medical	2	0.118	140.1
Reciprocating	< 75	Office	2	0.131	74.0
Reciprocating	< 75	Restaurant	2	0.137	105.5
Reciprocating	< 75	Retail/Service	2	0.164	114.7
Reciprocating	< 75	School (K-12)	2	0.114	53.4
Reciprocating	< 75	Warehouse	2	0.180	81.1
Reciprocating	< 75	Miscellaneous	2	0.131	101.2
Reciprocating	< 75	Average Building	2	0.131	101.2
Reciprocating	75 - 149	College/University	1	0.055	52.6
Reciprocating	75 - 149	Grocery	1	0.065	69.4
Reciprocating	75 - 149	Heavy Industry	1	0.059	43.1
Reciprocating	75 - 149	Hotel/Motel	1	0.059	75.7
Reciprocating	75 - 149	Light Industry	1	0.061	32.6
Reciprocating	75 - 149	Medical	1	0.060	70.4
Reciprocating	75 - 149	Office	1	0.070	37.2
Reciprocating	75 - 149	Restaurant	1	0.062	53.0
Reciprocating	75 - 149	Retail/Service	1	0.080	65.3
Reciprocating	75 - 149	School (K-12)	1	0.057	26.8
Reciprocating	75 - 149	Warehouse	1	0.063	40.7

Measure Description	Unit Size	Business Type	Tier Level	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Reciprocating	75 - 149	Miscellaneous	1	0.062	51.5
Reciprocating	75 - 149	Average Building	1	0.063	51.5
Reciprocating	75 - 149	College/University	2	0.108	102.1
Reciprocating	75 - 149	Grocery	2	0.126	134.9
Reciprocating	75 - 149	Heavy Industry	2	0.114	83.8
Reciprocating	75 - 149	Hotel/Motel	2	0.114	147.0
Reciprocating	75 - 149	Light Industry	2	0.118	63.5
Reciprocating	75 - 149	Medical	2	0.115	136.7
Reciprocating	75 - 149	Office	2	0.128	72.3
Reciprocating	75 - 149	Restaurant	2	0.134	103.0
Reciprocating	75 - 149	Retail/Service	2	0.160	112.0
Reciprocating	75 - 149	School (K-12)	2	0.111	52.1
Reciprocating	75 - 149	Warehouse	2	0.175	79.1
Reciprocating	75 - 149	Miscellaneous	2	0.128	98.8
Reciprocating	75 - 149	Average Building	2	0.128	98.8
Reciprocating	150-299	College/University	1	0.052	49.6
Reciprocating	150-299	Grocery	1	0.062	65.5
Reciprocating	150-299	Heavy Industry	1	0.055	40.7
Reciprocating	150-299	Hotel/Motel	1	0.055	71.4
Reciprocating	150-299	Light Industry	1	0.057	33.3
Reciprocating	150-299	Medical	1	0.056	66.3
Reciprocating	150-299	Office	1	0.066	35.1
Reciprocating	150-299	Restaurant	1	0.059	50.0
Reciprocating	150-299	Retail/Service	1	0.057	47.3
Reciprocating	150-299	School (K-12)	1	0.054	25.3
Reciprocating	150-299	Warehouse	1	0.060	35.6
Reciprocating	150-299	Miscellaneous	1	0.057	47.3
Reciprocating	150-299	Average Building	1	0.057	47.3
Reciprocating	150-299	College/University	2	0.102	96.3
Reciprocating	150-299	Grocery	2	0.119	127.3
Reciprocating	150-299	Heavy Industry	2	0.107	79.1
Reciprocating	150-299	Hotel/Motel	2	0.107	138.6
Reciprocating	150-299	Light Industry	2	0.112	64.7
Reciprocating	150-299	Medical	2	0.108	129.0
Reciprocating	150-299	Office	2	0.120	68.2

Measure Description	Unit Size	Business Type	Tier Level	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Reciprocating	150-299	Restaurant	2	0.126	97.2
Reciprocating	150-299	Retail/Service	2	0.132	91.9
Reciprocating	150-299	School (K-12)	2	0.105	49.1
Reciprocating	150-299	Warehouse	2	0.116	69.2
Reciprocating	150-299	Miscellaneous	2	0.114	91.9
Reciprocating	150-299	Average Building	2	0.114	91.9
Reciprocating	≥ 300	College/University	1	0.048	46.1
Reciprocating	≥ 300	Grocery	1	0.057	61.0
Reciprocating	≥ 300	Heavy Industry	1	0.052	37.9
Reciprocating	≥ 300	Hotel/Motel	1	0.052	66.4
Reciprocating	≥ 300	Light Industry	1	0.053	31.0
Reciprocating	≥ 300	Medical	1	0.052	61.8
Reciprocating	≥ 300	Office	1	0.061	32.6
Reciprocating	≥ 300	Restaurant	1	0.055	46.6
Reciprocating	≥ 300	Retail/Service	1	0.053	44.8
Reciprocating	≥ 300	School (K-12)	1	0.050	23.6
Reciprocating	≥ 300	Warehouse	1	0.056	33.6
Reciprocating	≥ 300	Miscellaneous	1	0.053	44.1
Reciprocating	≥ 300	Average Building	1	0.054	44.1
Reciprocating	≥ 300	College/University	2	0.095	89.7
Reciprocating	≥ 300	Grocery	2	0.110	118.5
Reciprocating	≥ 300	Heavy Industry	2	0.100	73.6
Reciprocating	≥ 300	Hotel/Motel	2	0.100	129.0
Reciprocating	≥ 300	Light Industry	2	0.104	60.3
Reciprocating	≥ 300	Medical	2	0.101	120.1
Reciprocating	≥ 300	Office	2	0.112	63.5
Reciprocating	≥ 300	Restaurant	2	0.118	90.5
Reciprocating	≥ 300	Retail/Service	2	0.123	87.0
Reciprocating	≥ 300	School (K-12)	2	0.098	45.7
Reciprocating	≥ 300	Warehouse	2	0.109	65.4
Reciprocating	≥ 300	Miscellaneous	2	0.106	85.8
Reciprocating	≥ 300	Average Building	2	0.106	85.8
Scroll or Helical Rotary	< 75	College/University	1	0.057	53.0
Scroll or Helical Rotary	< 75	Grocery	1	0.069	78.8
Scroll or Helical Rotary	< 75	Heavy Industry	1	0.059	45.4

Measure Description	Unit Size	Business Type	Tier Level	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Scroll or Helical Rotary	< 75	Hotel/Motel	1	0.068	76.3
Scroll or Helical Rotary	< 75	Light Industry	1	0.065	34.0
Scroll or Helical Rotary	< 75	Medical	1	0.065	71.6
Scroll or Helical Rotary	< 75	Office	1	0.065	38.7
Scroll or Helical Rotary	< 75	Restaurant	1	0.077	55.8
Scroll or Helical Rotary	< 75	Retail/Service	1	0.063	52.1
Scroll or Helical Rotary	< 75	School (K-12)	1	0.058	28.0
Scroll or Helical Rotary	< 75	Warehouse	1	0.065	38.0
Scroll or Helical Rotary	< 75	Miscellaneous	1	0.065	52.0
Scroll or Helical Rotary	< 75	Average Building	1	0.065	52.0
Scroll or Helical Rotary	< 75	College/University	2	0.112	103.0
Scroll or Helical Rotary	< 75	Grocery	2	0.132	153.4
Scroll or Helical Rotary	< 75	Heavy Industry	2	0.115	88.3
Scroll or Helical Rotary	< 75	Hotel/Motel	2	0.132	148.3
Scroll or Helical Rotary	< 75	Light Industry	2	0.126	66.0
Scroll or Helical Rotary	< 75	Medical	2	0.126	139.2
Scroll or Helical Rotary	< 75	Office	2	0.127	75.2
Scroll or Helical Rotary	< 75	Restaurant	2	0.137	108.5
Scroll or Helical Rotary	< 75	Retail/Service	2	0.145	101.4
Scroll or Helical Rotary	< 75	School (K-12)	2	0.113	54.4
Scroll or Helical Rotary	< 75	Warehouse	2	0.126	73.8
Scroll or Helical Rotary	< 75	Miscellaneous	2	0.127	101.1
Scroll or Helical Rotary	< 75	Average Building	2	0.127	101.1
Scroll or Helical Rotary	75 - 149	College/University	1	0.056	51.7
Scroll or Helical Rotary	75 - 149	Grocery	1	0.067	77.0
Scroll or Helical Rotary	75 - 149	Heavy Industry	1	0.058	44.4
Scroll or Helical Rotary	75 - 149	Hotel/Motel	1	0.066	74.5
Scroll or Helical Rotary	75 - 149	Light Industry	1	0.063	33.2
Scroll or Helical Rotary	75 - 149	Medical	1	0.063	69.9
Scroll or Helical Rotary	75 - 149	Office	1	0.063	37.7
Scroll or Helical Rotary	75 - 149	Restaurant	1	0.075	54.5
Scroll or Helical Rotary	75 - 149	Retail/Service	1	0.061	50.9
Scroll or Helical Rotary	75 - 149	School (K-12)	1	0.057	27.3
Scroll or Helical Rotary	75 - 149	Warehouse	1	0.063	37.1
Scroll or Helical Rotary	75 - 149	Miscellaneous	1	0.063	50.8

Measure Description	Unit Size	Business Type	Tier Level	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Scroll or Helical Rotary	75 - 149	Average Building	1	0.063	50.7
Scroll or Helical Rotary	75 - 149	College/University	2	0.109	100.6
Scroll or Helical Rotary	75 - 149	Grocery	2	0.129	149.8
Scroll or Helical Rotary	75 - 149	Heavy Industry	2	0.112	86.2
Scroll or Helical Rotary	75 - 149	Hotel/Motel	2	0.129	144.8
Scroll or Helical Rotary	75 - 149	Light Industry	2	0.123	64.4
Scroll or Helical Rotary	75 - 149	Medical	2	0.123	135.9
Scroll or Helical Rotary	75 - 149	Office	2	0.124	73.4
Scroll or Helical Rotary	75 - 149	Restaurant	2	0.134	105.9
Scroll or Helical Rotary	75 - 149	Retail/Service	2	0.141	99.0
Scroll or Helical Rotary	75 - 149	School (K-12)	2	0.110	53.1
Scroll or Helical Rotary	75 - 149	Warehouse	2	0.123	72.1
Scroll or Helical Rotary	75 - 149	Miscellaneous	2	0.124	98.7
Scroll or Helical Rotary	75 - 149	Average Building	2	0.124	98.7
Scroll or Helical Rotary	150-299	College/University	1	0.053	48.5
Scroll or Helical Rotary	150-299	Grocery	1	0.063	72.2
Scroll or Helical Rotary	150-299	Heavy Industry	1	0.054	41.6
Scroll or Helical Rotary	150-299	Hotel/Motel	1	0.062	69.9
Scroll or Helical Rotary	150-299	Light Industry	1	0.060	34.4
Scroll or Helical Rotary	150-299	Medical	1	0.059	65.5
Scroll or Helical Rotary	150-299	Office	1	0.060	35.4
Scroll or Helical Rotary	150-299	Restaurant	1	0.058	51.1
Scroll or Helical Rotary	150-299	Retail/Service	1	0.083	48.2
Scroll or Helical Rotary	150-299	School (K-12)	1	0.053	25.6
Scroll or Helical Rotary	150-299	Warehouse	1	0.059	35.6
Scroll or Helical Rotary	150-299	Miscellaneous	1	0.060	48.0
Scroll or Helical Rotary	150-299	Average Building	1	0.060	48.0
Scroll or Helical Rotary	150-299	College/University	2	0.103	94.5
Scroll or Helical Rotary	150-299	Grocery	2	0.122	140.8
Scroll or Helical Rotary	150-299	Heavy Industry	2	0.106	81.0
Scroll or Helical Rotary	150-299	Hotel/Motel	2	0.121	136.1
Scroll or Helical Rotary	150-299	Light Industry	2	0.116	67.0
Scroll or Helical Rotary	150-299	Medical	2	0.116	127.8
Scroll or Helical Rotary	150-299	Office	2	0.117	69.1
Scroll or Helical Rotary	150-299	Restaurant	2	0.114	99.6

Measure Description	Unit Size	Business Type	Tier Level	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Scroll or Helical Rotary	150-299	Retail/Service	2	0.133	93.9
Scroll or Helical Rotary	150-299	School (K-12)	2	0.104	50.0
Scroll or Helical Rotary	150-299	Warehouse	2	0.174	69.4
Scroll or Helical Rotary	150-299	Miscellaneous	2	0.121	93.5
Scroll or Helical Rotary	150-299	Average Building	2	0.121	93.5
Scroll or Helical Rotary	≥ 300	College/University	1	0.046	42.3
Scroll or Helical Rotary	≥ 300	Grocery	1	0.055	63.0
Scroll or Helical Rotary	≥ 300	Heavy Industry	1	0.048	36.3
Scroll or Helical Rotary	≥ 300	Hotel/Motel	1	0.054	60.9
Scroll or Helical Rotary	≥ 300	Light Industry	1	0.052	30.0
Scroll or Helical Rotary	≥ 300	Medical	1	0.052	57.2
Scroll or Helical Rotary	≥ 300	Office	1	0.052	31.0
Scroll or Helical Rotary	≥ 300	Restaurant	1	0.051	44.6
Scroll or Helical Rotary	≥ 300	Retail/Service	1	0.057	50.4
Scroll or Helical Rotary	≥ 300	School (K-12)	1	0.047	22.4
Scroll or Helical Rotary	≥ 300	Warehouse	1	0.056	31.9
Scroll or Helical Rotary	≥ 300	Miscellaneous	1	0.051	42.8
Scroll or Helical Rotary	≥ 300	Average Building	1	0.052	42.7
Scroll or Helical Rotary	≥ 300	College/University	2	0.093	85.4
Scroll or Helical Rotary	≥ 300	Grocery	2	0.111	127.2
Scroll or Helical Rotary	≥ 300	Heavy Industry	2	0.096	73.2
Scroll or Helical Rotary	≥ 300	Hotel/Motel	2	0.110	123.0
Scroll or Helical Rotary	≥ 300	Light Industry	2	0.105	60.5
Scroll or Helical Rotary	≥ 300	Medical	2	0.105	115.5
Scroll or Helical Rotary	≥ 300	Miscellaneous	2	0.109	85.3
Scroll or Helical Rotary	≥ 300	Office	2	0.106	62.5
Scroll or Helical Rotary	≥ 300	Restaurant	2	0.103	90.0
Scroll or Helical Rotary	≥ 300	Retail/Service	2	0.104	91.9
Scroll or Helical Rotary	≥ 300	School (K-12)	2	0.094	45.1
Scroll or Helical Rotary	≥ 300	Warehouse	2	0.176	64.3
Scroll or Helical Rotary	≥ 300	Average Building	2	0.109	85.3

Measure Savings Analysis

Savings values are calculated for both Level 1 and Level 2 efficiency levels with IECC 2006 efficiency standards as the baseline. The same calculation methodology used for "Unitary or Split Air Conditioning Systems and Air Source Heat Pumps" was used with the following additional assumptions:

1) Air handler units were assumed to be Variable Air Volume (VAV) systems with hot water reheat.

2) VAV units include economizers and supply temperature reset controls based on outside air.

3) Condenser water temperature was set to 75° F.

4) All chillers for pre and post cases were assumed to be constant speed.

5) All measure cases assumed the same type of chiller (screw, centrifugal, etc.) pre and post.

The savings values presented are not direct outputs from eQuest. The models still use IECC 2006 baselines. To calculate new savings values, we applied the ratio of efficiency improvements in both cases to the old savings values as described in the following equation.

$$Savings_{NEWBaseline} = \frac{\Delta Efficiency_{NEWBaseline}}{\Delta Efficiency_{OLDBaseline}} Savings_{OLDBaseline}$$

Measure Life and Incremental Measure Cost

The measure life for packaged units is 20 years according to DEER[35].

The following table provides IMC documented for this measure. Incremental cost is cost difference between the energy efficient equipment and the less efficient option.

Table 132: Chiller Incremental Measure Cost[36]

Measure Name	Level 1	Level 2
Water Cooled Chiller - Scroll or Helical Rotary <75 tons	$ 132.23	$ 195.52
Water Cooled Chiller - Scroll or Helical Rotary 75-149 tons	$129.08	$190.87
Water Cooled Chiller - Scroll or Helical Rotary 150-299 tons	$20.73	$160.89
Water Cooled Chiller - Scroll or Helical Rotary >300 tons	$19.30	$42.41
Water Cooled Chiller - Centrifugal <150 tons	$86.09	$195.01

[35] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report
[36] 2008 DEER, www.deeresources.com

Measure Name	Level 1	Level 2
Water Cooled Chiller - Centrifugal 151-299	$147.19	$216.86
Water Cooled Chiller - Centrifugal 300-599 tons	$23.61	$50.24
Water Cooled Chiller – Centrifugal ≥600 tons	19.92	$49.32
Water Cooled Chiller – Reciprocating <75 tons	$76.75	$134.98
Water Cooled Chiller – Reciprocating 75-149 tons	$74.92	$131.76
Water Cooled Chiller – Reciprocating 150-299 tons	$70.65	$124.27
Water Cooled Chiller – Reciprocating ≥300 tons	$65.78	$115.70
Air Cooled Chiller <150 tons	$110.57	$221.15
Air Cooled Chiller ≥150 tons	$107.05	$216.54

$$IncrementalCost_{NEWBaseline} = \frac{\Delta Efficiency_{NEWBaseline}}{\Delta Efficiency_{OLDBaseline}} IncrementalCost_{OLDBaseline}$$

Room Air Conditioners	
Measure Description	Room air conditioning units are through-the-wall (or built-in) self-contained units that are 2 tons or less. A unit must qualify under Super Efficient Home Appliance (SEHA) Tier 1 standards. These units are with and without louvered sides, without reverse cycle (i.e., heating), and casement.
Units	Per Ton
Base Case Description	Variable. See table
Measure Savings	Source: ENERGY STAR, CEE
Measure Incremental Cost	Source: 2009 PG&E Workpaper – PGECOHVC109.1 – ENERGY STAR Room Air Conditioner Non-Residential
Effective Useful Life	Source: ENERGY STAR 9 years

Room air conditioning units are through-the-wall (or built-in), self-contained units that are 2 tons or less. This measure consists of the installation of a Room Air Conditioner that falls under Super Efficient Home Appliance (SEHA) Tier 1 standards. The minimum requirements and eligible equipment are listed CEE high-efficiency room air conditioning specifications (www.cee1.org)[37]. These units are with and without louvered sides, without reverse cycle (i.e., heating), and casements. The qualifying efficiencies for both levels are provided below. Disposal of existing unit must comply with local codes and ordinances.

Table 133: Qualifying Efficiencies

Size (Btuh)	October 2000 Federal Standard (EER) Baseline	SEHA Tier 1 Retrofit (EER)
< 8,000	9.7	11.2
8000 to 13,999	9.8	11.3
14,000 to 19,999	9.7	11.2
>= 20,000	8.5	9.8

[37] This website also has a list of eligible units.

Measure Savings

Below are the coincident kW and the annual kWh savings per ton of installed cooling system.

Table 134: Room A/C Savings (per ton)

Size (Btuh)	Demand Difference, kW	Annual Electric Savings, kWh	Demand Reduction, kW
< 8,000	0.166	116	0.149
8000 to 13,999	0.163	114	0.146
14,000 to 19,999	0.166	116	0.149
>= 20,000	0.187	131	0.169

Measure Savings Analysis

Savings values are calculated with the baseline efficiencies shown above, since efficiency levels depend on the size of the unit. The assumed operating hours is 700, which is an average of ENERGY STAR Full-Load Cooling Hours for Chicago and Rockford. The Diversity/Duty Cycle factor is 0.90[38]. The following is the calculation for daily energy consumption per the PG&E workpapers.

∆Watts/unit

The demand difference (watts per unit) is the difference between the electric demand of the base unit and the electric demand of the energy efficient unit.

∆Watts/ton= Base Watts/ AC Unit - Energy Efficient Unit Watts/ AC Unit

= (12/Baseline EER – 12/Replacement EER)

Annual Electric Savings

Energy Savings [kWh/ton] = (∆kW/ton) x (Op Hrs)

Demand Reduction

Demand Reduction [kW/ton] = (∆kW/ton) x (Diversity/Duty Cycle)

[38] 2009 PG&E Workpaper – PGECOHVC109.1

Measure Life and Incremental Measure Cost
The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is the cost difference between the energy-efficient equipment and the less efficient option.

The measure costs for this measure are assumed to be the same as those for packaged terminal air conditioning units of the same capacity. The figures from DEER 2008 were multiplied by the average capacity of available ENERGY STAR® room air conditioners in tons to arrive at the figures below.[39]

The IMC documented for this measure is the cost difference between the energy efficient equipment and the less efficient option at $157.12 per unit.

Table 135: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	9	ENERGY STAR
Incremental Measure Cost	$157.12	PG&E, DEER 2008

[39] 2009 PG&E Workpaper – PGECOHVC109.1

Package Terminal Air Conditioners/Heat Pumps	
Measure Description	Package terminal air conditioners and heat pumps are through-the-wall self contained units that are 2 tons (24,000 Btuh) or less. Only units that have an EER greater than or equal to 13.08 – (0.2556 * Capacity / 1000), where capacity is in Btuh, qualify for the incentive. All EER values must be rated at 95 °F outdoor dry-bulb temperature.
Units	Per Ton
Base Case Description	IECC 2006 EER Efficiencies
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: 2008 DEER $84/ton
Effective Useful Life	Source: DEER 15 years

Package terminal air conditioners and heat pumps are through-the-wall self contained units that are 2 tons (24,000 Btuh) or less. Only units that have an EER greater than or equal to 13.08 – (0.2556 X Capacity / 1000), where capacity is in Btuh, qualify for the incentive. All EER values must be rated at 95 °F outdoor dry-bulb temperature.

Measure Savings

Below are the coincident kW and the annual kWh savings per ton of installed cooling system..The savings are based on efficiencies 20 percent higher than the IECC 2006 minimum efficiency.

Table 136: Measure Savings for PTAC/HP (per ton)

Business Type	Peak Demand Reduction (kW/ton)	Annual Savings (kWh/ton)
Office	0.22	136
School (K-12)	0.22	105
College/University	0.22	211
Retail/Service	0.22	216
Restaurant	0.22	288
Hotel/Motel	0.22	328
Medical	0.22	315
Grocery	0.22	301
Warehouse	0.22	148
Light Industry	0.22	147
Heavy Industry	0.22	147
Average = Miscellaneous	0.22	219

Measure Savings Analysis

Savings values are calculated for qualifying PTAC/HPs with IECC 2006 efficiency standards as the baseline. Both qualifying efficiency levels and baseline efficiencies are based on the capacity of the unit but, for purposes of calculating savings, we have assumed a baseline of 8.3 EER and a replacement efficiency of 10 EER on average, the efficiencies for a 12,000 Btuh (1-ton) unit. The following table provides the efficiencies for a range of PTAC/HP sizes.

Table 137: PTAC/HP Efficiencies

PTAC size	Federal standard	IECC 2006	Qualifying EER
6000	9.0	9.6	11.5
7000	8.9	9.4	11.3
8000	8.7	9.2	11.0
9000	8.6	9.0	10.8
10000	8.4	8.8	10.5
11000	8.2	8.6	10.3
12000	8.1	8.3	10.0
13000	7.9	8.1	9.8
14000	7.8	7.9	9.5
15000	7.6	7.7	9.2
16000	7.4	7.5	9.0
17000	7.3	7.3	8.7
18000	7.1	7.1	8.5

The same calculation methodology used for "Unitary or Split Air Conditioning Systems and Air Source Heat Pumps" was used with one exception. The coincident kW savings have been calculated using the following equation. The coincident factor assumed for this measure is 0.90.

kW Savings per ton = (12/Baseline EER – 12/Replacement EER)

Coincident kW Savings = kW Savings x Coincidence Factor

Measure Life and Incremental Measure Cost

The measure life for packaged units is 15 years according to DEER[40].

The IMC documented for this measure is $84 per ton[41], which is the cost difference between the energy-efficient equipment and the less efficient option.

[40] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report

[41] 2008 DEER, www.deeresources.com

Lodging – Guest Room Energy Management System (GREM)	
Measure Description	GREM is a control device designed to control lighting and HVAC unit in hotel guestrooms.
Units	Per room controller
Base Case Description	Manual Heating/Cooling Temperature Setpoint and Fan On/Off/Auto Thermostat
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: PY1 and PY2 custom projects[42] $260/Unit
Effective Useful Life	Source: DEER 2008 15 years

Guest room temperature set point must be controlled by automatic occupancy detectors or key-card that indicates the occupancy status of the room. During unoccupied periods the default setting for controlled units differs by at least 5 degrees from the operating set point. The control system may also be tied into other electric loads, such as lighting and plug loads to shut them off when occupancy is not sensed. The incentive is per guestroom controlled, rather than per sensor, for multi-room suites. The incentive is per room controlled. Replacement or upgrades of existing occupancy-based controls are not eligible for an incentive.

The savings are achieved based on GREM's ability to automatically adjust the guest room's set temperatures and control the HVAC unit for various occupancy modes.

Measure Savings
Below are the annual kWh savings per installed EMS for different sizes and types of HVAC units. The savings are achieved based on GREM's ability to automatically adjust the guest room's set temperatures and control the HVAC unit to maintain set temperatures for various occupancy modes. These values are from the Michigan savings database using Michigan's 574 annual CDD and 6,676 annual HDD, which are conservative when compared to 857 CDD and 6,418 HDD in Chicago.

Table 89: Measure Savings for GREM

Cooling Type	**Cooling kWh**		**Heating (kWh & Therms)**		**Total kWh**	
	3/4 ton	**1 ton**	**3/4 ton**	**1 ton**	**3/4 ton**	**1 ton**
PTAC	208	287	1,234 kWh	1,645 kWh	1,441	1,932
PTHP	181	263	721 kWh	988 kWh	902	1,251
FCU with Gas Heat/Elec Cool	407	542	53 Therms	70 Therms	407	542

[42] Custom GREM projects from Smart Ideas for Your Business Incentive Program Year 1 & 2

On average, the annual kWh saving for a 0.75 ton and 1 ton HVAC unit with electric cooling and electric heating is 1,117 kWh per room. For non-electric heating, it is assumed the savings are approximately one third at 334 kWh per room. The average between 0.75 and 1 tons is used for a conservative estimate. However, it is assumed that most PTAC units in hotel rooms are sized to 1 ton.

The coincident kW impacts for this measure have not been sufficiently studied or modeled to provide a confident estimate. In the meantime the following kW impacts are estimated for systems that control cooling operation.

kW Savings per ton = (12/HVAC EER) x average on peak uncontrolled load factor of 50% (estimated from anecdotal observations by KEMA for NV Energy) x estimated cycling reduction of 30% (estimated by KEMA from empirical observations and logging from manufacturers for NV Energy)

kW = (12/8.344) x 0.5 x 0.3 = 1.25 kW per ton or room

where,

HVAC EER = is based on a 1 ton unit at code baseline efficiency of PTAC, defined as EER = 10.9 – (0.213 x 12000 btu/hr/1000) = 8.344

In addition, a coincident factor for cooling needs to be included to consider that not all room PTAC units are operating at the same. It is estimated as 0.67 (Ref: Pennsylvania Technical Resource Manual (12/23/09 version) for HVAC Measures, Table 6.17 p 55) This factor will be used pending further study.

Coincident kW Savings = 1.25 x 0.67 = 0.84 kW per unit-ton or per room

Measure Savings Analysis
Savings estimate shall be verified using an eQuest model. The Michigan workpaper assumes a 30% savings with the GREM. The model outputs will be validated by actual monitored projects, as they become available. Once the model is calibrated, its outputs will be used to update the workpaper. The inputs for simulating average occupancy and setback temperatures are as follows (90% occupancy rate is assumed):

Base case: 72°F all the time

Proposed case:

Occupied Rooms
Heating - 72°F 6pm-11pm
65°F 11pm- 7am
72°F 7am- 9am
65°F 9am- 6pm

Cooling - 72°F 6pm-11pm

78°F 11pm- 7am
72°F 7am- 9am
78°F 9am- 6pm

Unoccupied rooms
Heating – 65°F
Cooling – 85°F

Measure Life and Incremental Measure Cost
The measure life for GREM is 15 years according to DEER 2008 value for energy management systems.

The IMC documented for this measure is $260 per room HVAC controller, which is the cost difference between a non-programmable thermostat and a GREM. This value was extracted from Smart Ideas projects in PY1 and PY2.

Variable-Speed Drives for HVAC Applications	
Measure Description	Variable-speed drives (VSDs) which are installed on existing chillers, HVAC fans, or HVAC pumps are eligible for this incentive. New chillers with integrated VSDs are eligible under the chiller incentive. The installation of a VSD must accompany the permanent removal or disabling of any throttling devices such as inlet vanes, bypass dampers, and throttling valves. VSDs for non-HVAC applications may be eligible for a custom incentive.
Units	Per HP
Base Case Description	No VSD installed.
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: DEER and KEMA
Effective Useful Life	Source: DEER 15 years

Variable-speed drives (VSDs) which are installed on existing chillers, HVAC fans, or HVAC pumps are eligible for this incentive. New chillers with integrated VSDs are eligible under the chiller incentive. The installation of a VSD must accompany the permanent removal or disabling of any throttling devices such as inlet vanes, bypass dampers, and throttling valves. VSDs for non-HVAC applications may be eligible for a custom incentive.

Measure Savings

Provided below are the coincident kW savings and the annual kWh savings per hp of installed motor. The coincident kW savings are the same across all building and application types. The annual kWh savings are dependent on building type and application type.

Table 138: VSD for HVAC Demand Savings (per HP)

Cooling Measure Name	kW Savings	Coin kW Savings
VSD for HVAC chillers, fans, and pumps	0.123	0.025

Table 139: VSD for HVAC Motors (Per HP)

Building Type	Pumps and Fans Annual kWh Savings	Chillers Annual kWh Savings
College/University	517	429
Grocery	716	716
Heavy Industry	440	537
Hotel/Motel	842	413
Light Industry	302	369
Medical	842	325
Office	216	150
Restaurant	571	649
Retail/Service	421	412
School (K-12)	270	232
Warehouse	395	396
Average = Miscellaneous	503	421

Measure Savings Analysis
Savings values are calculated with an estimate of a 19 percent savings[43]. The motors are assumed to have a load factor of 80 percent and an efficiency of 92.5 percent for calculating the equipment kW.

$$\text{kW reduction} = 0.19 \times (\text{ kW of existing equipment})$$

Where kW of equipment is calculated using:

$$\frac{(\text{Motor HP}) \times (0.746\ \text{kW/HP}) \times (\text{Load Factor})}{\text{Motor Efficiency}}.$$

The coincident kW savings are calculated using the following equation. The coincidence factor is assumed to be 0.20.

$$\text{Coincident kW reduction} = \text{kW reduction} \times \text{coincidence factor}$$

Annual energy savings values were calculated based on run hours for each building type as modeled in our chillers section. Here run hours were obtained from building simulation runs for 150-300 ton centrifugal chillers at baseline efficiencies. Simulations results yield run times for fans, chilled water pumps, hot water pumps, and chillers. Average of fan and pump hours are listed in the table below as well as the chiller run hours.

$$\text{Annual kWh Savings} = \text{kW Savings} \times \text{Run Hours}$$

[43] This percentage is a conservative estimate. DEER on average calculated over 30% savings for installing a VSD.

Table 140: Annual Operating Hours

Building Type	Chillers	Pumps and Fans
College/University	3498	4216
Grocery	5840	5840
Heavy Industry	4380	3585
Hotel/Motel	3370	6872
Light Industry	3012	2465
Medical	2654	6871
Office	1221	1766
Restaurant	5293	4654
Retail/Service	3357	3438
School (K-12)	1889	2203
Warehouse	3227	3222
Average = Miscellaneous	3431	4103

Measure Life and Incremental Measure Cost
The measure life for packaged units is 15 years according to DEER[44].

The IMC documented for this measure is $90 per horsepower and $150 per horsepower for chiller and pump/fan applications respectively[45].

[44] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report
[45] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report from assessment of several measures that include a VSD retrofit.

Commercial Kitchen Demand Ventilation Controls	
Measure Description	Installation of commercial kitchen demand ventilation controls that vary the ventilation based on cooking load and/or time of day.
Units	Per exhaust fan horsepower
Base Case Description	Exhaust and makeup fans that operate at 100% speed
Measure Savings	Source: PG&E 2006 Workpapers
Measure Incremental Cost	Source: PG&E 2006 Workpapers
Effective Useful Life	Source: California Energy Efficiency Policy Manual (EEPM) Table 4.1 15 years

The measure consists of installing a control system that varies the exhaust rate of kitchen ventilation (exhaust and/or makeup air fans) based on the energy and effluent output from the cooking appliances (i.e., the more heat and smoke/vapors generated, the more ventilation needed). This involves installing a temperature sensor in the hood exhaust collar and/or an optic sensor on the end of the hood that sense cooking conditions which allows the system to automatically vary the rate of exhaust to what is needed by adjusting the fan speed accordingly.

Measure Savings

The following table provides the savings for this measure.

Table 141: Demand and Energy Savings for Demand Ventilation Control (per exhaust horsepower)

Measure Name	Coincident Peak Demand Reduction (kW)	Annual Energy Savings Per Unit (kWh)
DVC Control Retrofit	0.76	4,486
DVC Control New	0.76	4,486

Measure Savings Analysis

Annual energy use was based on monitoring results from five different types of sites, as summarized in PG&E Food Service Equipment workpaper.

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data. The measure life is assumed to be the same as that of variable speed drives. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In the retrofit case, the IMC is equal to the full measure cost since cost of the less efficient option is $0.   The cost for the new system is the incremental (difference in) cost of installing ventilation with and without controls.

Table 142: Measure Life and Incremental Measure Cost

Measure Category		Value	Source
DVC Control Retrofit & New	Measure Life	15	EEPM
DVC Control Retrofit	Incremental Measure Cost	$1,988	PG&E Work paper
DVC Control New	Incremental Measure Cost	$1,000	PG&E Work paper

Premium Motors

NEMA® Premium-Efficiency Motors	
Measure Description	Motors eligible for an incentive are three-phase AC induction motors, 1-200 hp, of open drip-proof (open) and totally enclosed fan-cooled (closed) classifications. Rewound motors do not qualify. Incentives are based on the motor's nominal full-load efficiencies that meet or exceed the NEMA premium-efficiency standards. The application must include the manufacturer's performance data sheet that at least shows equipment type, equipment size, model number, and efficiency rating.
Units	Per motor
Base Case Description	Minimum efficiency under EPACT-92
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: SCE workpapers
Effective Useful Life	Source: DEER 15 years

Motors eligible for an incentive are three-phase AC induction motors, 1-200 hp, of open drip-proof (open) and totally enclosed fan-cooled (closed) classifications. Rewound motors do not qualify. Incentives are based on the motor's nominal full-load efficiencies, tested in accordance with IEEE (Institute of Electrical and Electronics Engineers) Standard 112, method B, that meet or exceed the NEMA premium-efficiency standards on the Motors Incentive Worksheet. The application must include the manufacturer's performance data sheet that at least shows equipment type, equipment size, model number, and efficiency rating. Customers should consider matching water or air flows (GPM, CFM) of the existing pump or fan when installing energy-efficient motors that inherently have higher speeds (less slip), which may increase energy savings.

Measure Savings

The following table provides the measure savings for NEMA premium motors.

Table 143: Measure Coincident kW Savings

	1200 RPM		1800 RPM		3600 RPM	
MOTOR HORSEPOWER	ODP	TEFC	ODP	TEFC	ODP	TEFC
1	0.016	0.016	0.018	0.018		0.011
1.5	0.021	0.017	0.021	0.021	0.013	0.013
2	0.022	0.022	0.028	0.028	0.017	0.017
3	0.032	0.032	0.048	0.032	0.026	0.017
5	0.053	0.053	0.053	0.053	0.028	0.027
7.5	0.066	0.057	0.096	0.083	0.040	0.039
10	0.075	0.076	0.111	0.111	0.052	0.036
15	0.113	0.113	0.147	0.103	0.054	0.061
20	0.138	0.150	0.196	0.196	0.081	0.081
25	0.158	0.158	0.229	0.144	0.087	0.087
30	0.172	0.189	0.243	0.172	0.104	0.104
40	0.208	0.208	0.208	0.208	0.137	0.137
50	0.260	0.260	0.353	0.353	0.145	0.145
60	0.253	0.253	0.391	0.391	0.171	0.171
75	0.316	0.316	0.313	0.450	0.214	0.214
100	0.417	0.417	0.600	0.413	0.285	0.235
125	0.521	0.521	0.517	0.517	0.294	0.288
150	0.620	0.546	0.546	0.546	0.353	0.346
200	0.827	0.728	0.728	1.087	0.461	0.365

Table 144: Measure kWh Savings

MOTOR HORSEPOWER	1200 RPM ODP	1200 RPM TEFC	1800 RPM ODP	1800 RPM TEFC	3600 RPM ODP	3600 RPM TEFC
1	58	58	65	65		40
1.5	79	62	79	79	50	50
2	82	80	106	106	64	64
3	120	118	179	118	96	62
5	196	196	196	196	104	99
7.5	303	262	442	381	184	180
10	344	349	509	509	240	165
15	516	516	673	474	247	277
20	632	688	897	897	370	370
25	867	867	1,259	789	477	477
30	947	1,041	1,335	947	573	573
40	1,144	1,144	1,144	1,144	752	752
50	1,430	1,430	1,942	1,942	794	794
60	1,820	1,820	2,817	2,817	1,233	1,233
75	2,275	2,275	2,251	3,238	1,541	1,541
100	3,002	3,002	4,318	2,977	2,055	1,693
125	3,661	3,661	3,631	3,631	2,065	2,025
150	4,357	3,836	3,836	3,836	2,477	2,431
200	5,809	5,115	5,115	7,640	3,241	2,568

Measure Savings Analysis

The two types of capacity savings estimates discussed here are connected-load reduction achieved by the measure (non-coincident) and demand reduction coincident with the utility's system peak. The non-coincident demand reduction achieved by the measure is estimated from engineering analyses using the following formula:

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Where kW is calculated using $\dfrac{(\text{Motor HP}) \times (0.746\ \text{kW/HP}) \times (\text{Load Factor})}{\text{Motor Efficiency}}$.

Generally motors are oversized and so the load factor is assumed to be 75 percent.[46]

Energy savings are based on the difference between baseline and efficient equipment connected wattage and annual operating hours, according to the following formula:

[46] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

kWh Reduction = (kW of existing equipment - kW of replacement equipment) * (Annual operating hours)

To determine coincident demand reduction, engineering estimates of savings are multiplied by a coincident diversity factor. Coincident diversity factors have been estimated to be 0.74[47].

Coincident kW Reduction = Coincident Diversity Factor * Non-coincident reduction with Demand Interactive Effects

DEER uses the most recent data is from a study for the Department of Energy completed in 1998[48]. The data for Overall Manufacturing, SIC 20 through 39, is used as for the operating hours to represent the industrial market sector. These hours are assumed reasonable for use with all market sectors.

Table 145: Annual Operating Hours[49]

	Operating Hours.
1 to 5 hp	2,745
6 to 20 hp	3,391
21 to 50 hp	4,067
51 to 100 hp	5,329
101 to 200 hp	5,200

[47] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

[48] Xenergy, United States Industrial Electric Motor Systems Market Opportunities Assessment. Burlington, MA, 1998. Hours are from Page B-2 for Overall Manufacturing (SIC 20-39).

[49] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures referencing the Xenergy study.

Baseline and retrofit equipment assumptions are presented in the next table. Motor replacement is considered to be a replace on burn-out measure. The baseline represents the nonenergy-efficient equipment that would be purchased, which is set at the full-load nominal efficiency as set by the Energy Policy Act of 1992 (EPACT92). This table shows the standard efficiencies used for the savings calculations.

Table 146: Baseline Efficiencies Standard Motors

	1200 RPM		1800 RPM		3600 RPM	
MOTOR HORSEPOWER	ODP	TEFC	ODP	TEFC	ODP	TEFC
1	0.800	0.800	0.825	0.825	Not Avail.	0.755
1.5	0.840	0.855	0.840	0.840	0.825	0.825
2	0.855	0.865	0.840	0.840	0.840	0.840
3	0.865	0.875	0.865	0.875	0.840	0.855
5	0.875	0.875	0.875	0.875	0.855	0.875
7.5	0.885	0.895	0.885	0.895	0.875	0.885
10	0.902	0.895	0.895	0.895	0.885	0.895
15	0.902	0.902	0.910	0.910	0.895	0.902
20	0.910	0.902	0.910	0.910	0.902	0.902
25	0.917	0.917	0.917	0.924	0.910	0.910
30	0.924	0.917	0.924	0.924	0.910	0.910
40	0.930	0.930	0.930	0.930	0.917	0.917
50	0.930	0.930	0.930	0.930	0.924	0.924
60	0.936	0.936	0.936	0.936	0.930	0.930
75	0.936	0.936	0.941	0.941	0.930	0.930
100	0.941	0.941	0.941	0.945	0.930	0.936
125	0.941	0.941	0.945	0.945	0.936	0.945
150	0.945	0.950	0.950	0.950	0.936	0.945
200	0.945	0.950	0.950	0.950	0.945	0.950

Table 147: NEMA Premium Efficiencies

	1200 RPM		1800 RPM		3600 RPM	
MOTOR HORSEPOWER	**ODP**	**TEFC**	**ODP**	**TEFC**	**ODP**	**TEFC**
1	0.825	0.825	0.855	0.855	0.770	0.770
1.5	0.865	0.875	0.865	0.865	0.840	0.840
2	0.875	0.885	0.865	0.865	0.855	0.855
3	0.885	0.895	0.895	0.895	0.855	0.865
5	0.895	0.895	0.895	0.895	0.865	0.885
7.5	0.902	0.910	0.91	0.917	0.885	0.895
10	0.917	0.910	0.917	0.917	0.895	0.902
15	0.917	0.917	0.93	0.924	0.902	0.910
20	0.924	0.917	0.93	0.93	0.910	0.910
25	0.930	0.930	0.936	0.936	0.917	0.917
30	0.936	0.930	0.941	0.936	0.917	0.917
40	0.941	0.941	0.941	0.941	0.924	0.924
50	0.941	0.941	0.945	0.945	0.930	0.930
60	0.945	0.945	0.950	0.950	0.936	0.936
75	0.945	0.945	0.950	0.954	0.936	0.936
100	0.950	0.950	0.954	0.954	0.936	0.941
125	0.950	0.950	0.954	0.954	0.941	0.950
150	0.954	0.958	0.958	0.958	0.941	0.950
200	0.954	0.958	0.958	0.962	0.950	0.954

Measure Life and Incremental Measure Cost
The measure life is assumed to be 15 years.[50]

The following table provides the incremental measure cost. Incremental cost is cost difference between the energy-efficient equipment and the less efficient or standard option. The incremental values are from those presented in the SCE workpaper. Only costs for 1,800-rpm motors are provided since these are the ones most prevalent in the market place. It is assumed the costs for 1200 and 3600 rpm do not differ too much from the 1800 rpm motor.

[50] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Table 148: Motor Incremental Measure Cost[51]

Measure Category	ODP 1800 RPM	TEFC 1800 RPM
1 HP	$51	$50
1.5 HP	$11	$73
2 HP	$46	$65
3 HP	$38	$73
5 HP	$25	$99
7.5 HP	$71	$71
10 HP	$43	$90
15 HP	$21	$168
20 HP	$100	$165
25 HP	$116	$329
30 HP	$46	$331
40 HP	$226	$398
50 HP	$246	$384
60 HP	$285	$332
75 HP	$100	$366
100 HP	$129	$555
125 HP	$262	$961
150 HP	$342	$609
200 HP	$614	$964

[51] Southern California Edison Premium Motors Workpaper WPSCNPR0008. 2007

Refrigeration

Strip Curtains	
Measure Description	New strip curtains or clear plastic swinging doors must be installed on doorways of walk-in boxes and refrigerated warehouses. This incentive is not available for display cases or replacing existing strip curtains that have useful life left. A pre-inspection may be performed. Incentive is based on square footage of doorway.
Units	Per Square Foot
Base Case Description	Walk-in storage without infiltration barriers.
Measure Savings	Source: SCE, KEMA
Measure Incremental Cost	Source: SCE $7.77
Effective Useful Life	Source: SCE 4 years

Strip curtains can be installed to reduce infiltration in refrigeration storage areas. New strip curtains or clear plastic swinging doors must be installed on doorways of walk-in boxes and refrigerated warehouses to qualify for rebates. This incentive is not available for display cases or replacing existing strip curtains that have useful life left. A pre-inspection may be performed. The incentive is based on square footage of doorway.

Measure Savings [52]
Savings values are obtained from the Southern California Edison (SCE) workpaper for infiltration barriers, which covers all 16 Californian climate zones. SCE savings values were determined using a set of assumed conditions for restaurants, small grocery storage, and large grocery storage. We have used only PG&E climate zones in calculating our averages and have taken out the drier, warmer climates of southern California. Details on cooling load calculations including refrigeration conditions, can be found in the SCE workpaper.

A baseline is used to calculate savings and incremental cost. In this case, the baseline for this measure assumes that there are no strip curtains installed at the facility.

The following tables are values calculated within the SCE workpaper.

[52] "Infiltration Barriers- Strip Curtains," Workpaper WPSCNRRN0002. Southern California Edison Company. 2007.

Table 149: SCE Restaurant Savings

Restaurant				
SCE Workpaper Values	Cooler Strip Curtains		Freezer Strip Curtains	
Northern California Climate Zones	Annual Savings (kWh/sqft)	Peak Demand Reduction (kW/sqft)	Annual Savings (kWh/sqft)	Peak Demand Reduction (kW/sqft)
1	76	0.005	207	0.015
2	118	0.009	336	0.027
3	106	0.008	302	0.023
4	107	0.008	304	0.023
5	97	0.007	273	0.020
11	136	0.011	386	0.032
12	128	0.010	366	0.030
13	134	0.011	381	0.030
16	99	0.008	282	0.023
Average	111	0.009	315	0.025

Table 150: SCE Small Grocery Savings

Small Grocery				
SCE Workpaper Values	Cooler w/ Glass Doors Strip Curtains		Freezer Strip Curtains	
Northern California Climate Zones	Annual Savings (kWh/sqft)	Peak Demand Reduction (kW/sqft)	Annual Savings (kWh/sqft)	Peak Demand Reduction (kW/sqft)
1	58	0.003	179	0.010
2	91	0.005	296	0.021
3	82	0.004	265	0.017
4	83	0.004	266	0.017
5	74	0.004	238	0.015
11	106	0.007	343	0.025
12	100	0.006	324	0.023
13	104	0.006	337	0.023
16	77	0.004	247	0.017
Average	86	0.005	277	0.019

Table 151: SCE Medium and Large Grocery Savings

Medium & Large Grocery						
SCE Workpaper Values	Cooler Strip Curtains		Cooler w/ Glass Doors Strip Curtains		Freezer Strip Curtains	
Northern California Climate Zones	Annual Savings (kWh/sqft)	Peak Demand Reduction (kW/sqft)	Annual Savings (kWh/sqft)	Peak Demand Reduction (kW/sqft)	Annual Savings (kWh/sqft)	Peak Demand Reduction (kW/sqft)
1	58	0.003	57	0.002	182	0.009
2	91	0.005	90	0.005	307	0.019
3	82	0.004	81	0.004	273	0.015
4	82	0.004	82	0.004	274	0.015
5	74	0.004	74	0.003	244	0.013
11	106	0.006	105	0.006	358	0.023
12	100	0.005	99	0.005	337	0.021
13	104	0.006	103	0.005	351	0.021
16	76	0.004	76	0.004	255	0.015
Average	86	0.004	85	0.004	287	0.017

Savings values in the table below are a weighted average of walk-in cooler (80 percent) and freezer (20 percent) applications. The workpapers for the 2006-2008 program years include this distribution of coolers and freezers in their refrigeration measure savings analyses. It is not anticipated that the application of strip curtains outside of the restaurant/grocery sector; however, the average savings value can apply to all other applications. The following table provides the calculated program savings.

Table 152: Strip Curtain Savings Summary

Building Type	Annual Savings (kWh/sqft)	Peak Demand Reduction (kW/sqft)
Restaurant	152	0.012
Grocery	125	0.007
Average	139	0.010

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case, the strip curtain measure, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 153: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	4	SCE
Incremental Measure Cost	$7.77	SCE

Anti-Sweat Heater Controls	
Measure Description	For this measure, a device is installed that senses the relative humidity in the air outside of the display case and reduces or turns off the glass door (if applicable) and frame anti-sweat heaters at low-humidity conditions. Technologies that can turn off anti-sweat heaters based on sensing condensation (on the inner glass pane) also qualify. Rebate is based on the total linear footage of the case.
Units	Per Linear Foot (width)
Base Case Description	No Anti-Sweat Heater controls installed.
Measure Savings	Source: PG&E, SCE
Measure Incremental Cost	Source: PG&E, SCE $34
Effective Useful Life	Source: PG&E, SCE 12 years

An anti-sweat heater is a device that senses the relative humidity in the air outside of the display case and reduces or turns off the glass door (if applicable) and frame anti-sweat heaters at low-humidity conditions. Technologies that can turn off anti-sweat heaters based on sensing condensation (on the inner glass pane) also qualify. The rebate is based on the total linear footage of the case.

Measure Savings [53]

Savings values are obtained from the draft Pacific Gas and Electric (PG&E) workpaper for anti-sweat heater controls. However, both PG&E and Southern California (SCE) savings values were determined using a set of assumed conditions for grocery stores. In the workpapers, some of the key assumptions are:

- ASH demand is assumed to be 0.0423 kW/linear foot
- On average, the control system reduces the run time of the ASH by 86.8 percent.

Details on assumptions and calculations can be found in the workpapers.

The following table is the average values (across PG&E climate zones) calculated within the PG&E workpaper.

[53] “Anti-Sweat Heater Controls,” Workpaper WPSCNRRN0009. Southern California Edison Company. 2007. PG&E uses the same method as SCE, but the workpaper is not yet published, ASH Controls PGECOREF108.

Table 154: ASH Control Savings

	kWh Savings/ft	Coincident kW Savings/ft
Anti-Sweat Heater Controller	402	0.007

Both energy and peak kW savings take into account additional savings due to interactive effects.

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case the anti-sweat heater controls, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 155: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	12	SCE
Incremental Measure Cost	$34	SCE

Electronically Commutated Motors (ECM)	
Measure Description	This measure is applicable to the replacement of an existing standard-efficiency shaded-pole evaporator fan motor in refrigerated display cases or fan coil in walk-ins. The replacement unit must be an ECM. This measure cannot be used in conjunction with the evaporator fan controller measure.
Units	Per Motor
Base Case Description	Shaded Pole Motors
Measure Savings	Source: SCE, KEMA
Measure Incremental Cost	Source: SCE, Fisher-Nickel
Effective Useful Life	Source: DEER 15 years

This measure applies to the replacement of an existing standard-efficiency shaded-pole evaporator fan motor in refrigerated display cases or fan coil in walk-ins. The replacement unit must be an electronically commutated motor (ECM). This measure cannot be used in conjunction with the evaporator fan controller measure.

Measure Savings [54]
Savings values are obtained from the SCE workpaper for efficient evaporator fan motors, which covers all 16 California climate zones. SCE savings values were determined using a set of assumed conditions for restaurants and grocery stores. We have used only PG&E climate zones in calculating our averages and have taken out the drier, warmer climates of southern California.

SCE's savings approach calculates refrigeration demand, by taking into consideration temperature, compressor efficiency, and various loads involved for both walk-in and reach-in refrigerators. Details on cooling load calculations, including refrigeration conditions, can be found in the SCE workpaper. The baseline for this measure assumes that the refrigeration unit has a shaded-pole motor. The following tables are values calculated within the SCE workpaper.

[54] "Efficient Evaporator Fan Motors (Shaded Pole to ECM)," Workpaper WPSCNRRN0011. Southern California Edison Company. 2007.

Table 156 SCE Restaurant Savings Walk-In

	Restaurant			
SCE Workpaper Values	Cooler		Freezer	
Northern California Climate Zones	kWh Savings Per Motor	Peak kW Savings Per Motor	kWh Savings Per Motor	Peak kW Savings Per Motor
1	318	0.0286	507	0.030
2	253	0.0330	263	0.037
3	364	0.0315	649	0.034
4	365	0.0313	652	0.034
5	350	0.0305	605	0.033
11	410	0.0351	780	0.040
12	399	0.0340	748	0.039
13	407	0.0342	771	0.039
16	354	0.0315	620	0.034
Average	358	0.0322	622	0.036

Table 157: SCE Grocery Savings Walk-In

	Grocery			
SCE Workpaper Values	Cooler		Freezer	
Northern California Climate Zones	kWh Savings Per Motor	Peak kW Savings Per Motor	kWh Savings Per Motor	Peak kW Savings Per Motor
1	318	0.0284	438	0.030
2	252	0.0534	263	0.064
3	364	0.0486	552	0.056
4	365	0.0480	553	0.055
5	349	0.0452	516	0.051
11	410	0.0601	656	0.074
12	398	0.0566	631	0.069
13	406	0.0574	649	0.070
16	354	0.0486	528	0.056
Average	357	0.0496	532	0.058

Table 158: SCE Grocery Savings Reach-In

	Grocery			
SCE Workpaper Values	Cooler		Freezer	
Northern California Climate Zones	kWh Savings Per Motor	Peak kW Savings Per Motor	kWh Savings Per Motor	Peak kW Savings Per Motor
1	306	0.031	362	0.031
2	269	0.033	273	0.035
3	331	0.032	421	0.034
4	332	0.032	422	0.034
5	323	0.032	402	0.033
11	357	0.034	476	0.037
12	350	0.034	462	0.036
13	355	0.034	472	0.037
16	325	0.032	409	0.034
Average	328	0.033	411	0.035

Savings values in the following table are an average of walk-in cooler (80 percent) and freezer (20 percent) applications. The workpapers for the 2006-2008 program years include this distribution of coolers and freezers in their refrigeration measure savings analyses. Strip curtains are unlikely to occur outside the restaurant/grocery sector, but if they do the average savings can apply. The following table provides the calculated program savings.

Table 159: ECM Walk-In Savings Values Summary

	kWh Savings/ft	Peak kW Savings/motor
Restaurant	411	0.033
Grocery	392	0.051
Average	401	0.042

Table 160: ECM Reach-In Savings Values Summary

kWh Savings/ft	Peak kW Savings/motor
344	0.033

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. We will consider ECM an early replacement measure where the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 161: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	All	15	DEER[55]
Incremental Measure Cost	Walk-In	$250	Fisher Nickel[56]
Incremental Measure Cost	Reach-In	$184.71	SCE

[55] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report

[56] "GE ECM Evaporator Fan Motor Energy Monitoring" Food Service Technology Center, Fisher-Nickel Inc. 2006. Prepared for PG&E.

Evaporator Fan Control	
Measure Description	This measure is for the installation of controls in medium-temperature walk-in coolers. The controller reduces airflow of the evaporator fans when there is no refrigerant flow. The measure must control a minimum of 1/20 HP where fans operate continuously at full speed. The measure also must reduce fan motor power by at least 75% during the off cycle. This measure is not applicable if any of the following conditions apply: 1) The compressor runs all the time with high duty cycle 2) The evaporator fan does not run at full speed all the time 3) The evaporator fan motor runs on poly-phase power 4) The evaporator fan motor is not shaded-pole or permanent split capacitor 5) Evaporator does not use off-cycle or time-off defrost.
Units	Per Motor
Base Case Description	Cooler with continuously running evaporator fan.
Measure Savings	Source: DEER
Measure Incremental Cost	Source: DEER $291
Effective Useful Life	Source: DEER 16 years

This measure is for the installation of controls in medium temperature walk-in coolers. The controller reduces airflow of the evaporator fans when there is no refrigerant flow. The measure must control a minimum of 1/20 HP where fans operate continuously at full speed. The measure also must reduce fan motor power by at least 75 percent during the off cycle.

This measure is not applicable if any of the following conditions apply:

1) The compressor runs all the time with high duty cycle
2) The evaporator fan does not run at full speed all the time
3) The evaporator fan motor runs on poly-phase power
4) The evaporator fan motor is not shaded-pole or permanent split capacitor
5) Evaporator does not use off-cycle or time-off defrost.

Measure Savings [57]
Savings for this measure were obtained from the DEER database and are summarized in the following table. The baseline is assumed to be evaporator fans that run continuously with either a permanent split capacitor or shaded-pole motors. In the energy-efficient case the fan is still assumed to operate even with the evaporator inactive.

[57] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report

Table 162: Evaporative Fan Control Savings

Northern California Climate Zones	kWh Savings Per Motor	Peak kW Savings Per Motor
1	480	0.057
2	476	0.064
3	479	0.062
4	475	0.061
5	477	0.056
11	476	0.058
12	476	0.065
13	476	0.061
16	483	0.061
Average	478	0.060

DEER provides savings numbers for building vintages and grocery only. The numbers above are averages of these vintages. We are assuming that this measure will be applicable for all building types.

Measure Life and Incremental Measure Cost
The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. We will consider evaporator fan controllers a new technology measure where the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 163: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	16	DEER
Incremental Measure Cost	$291.50	DEER

Automatic Door Closer for Walk-In Coolers	
Measure Description	This measure is for installing an auto-closer to the main insulated opaque door(s) of a walk-in cooler. The auto-closer must firmly close the door when it is within 1 inch of full closure.
Units	Per closer
Base Case Description	No auto door closer or non-operational door closer
Measure Savings	Source: PGECOREF110.1 – Auto-Closers for Main Cooler or Freezer Doors
Measure Incremental Cost	Source: DEER 2008 $156.82
Effective Useful Life	Source: DEER 2008 8 years

This measure consists of the installation of an automatic, hydraulic-type door closer on main walk-in cooler doors. These closers save energy by reducing the infiltration of warm outside air into the refrigeration itself.

Measure Savings

Savings calculations are based on values from through PG&E's Workpaper PGECOREF110.1 – Auto-Closers for Main Cooler or Freezer Doors. Savings are averaged across all California climate zones and vintages. Annual savings are 943 kWh and 0.137 kW.

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 164: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	8	DEER 2008
Incremental Measure Cost	$156.82	DEER 2008

Automatic Door Closer for Walk-in Freezers	
Measure Description	This measure is for installing an auto-closer to the main insulated opaque door(s) of a walk-in freezer. The auto-closer must firmly close the door when it is within 1 inch of full closure.
Units	Per closer
Base Case Description	No auto door closer or non-operational door closer
Measure Savings	Source: PGECOREF110.1 – Auto-Closers for Main Cooler or Freezer Doors
Measure Incremental Cost	Source: DEER 2008 $156.82
Effective Useful Life	Source: DEER 2008 8 years

This measure is for installing an auto-closer to the main insulated opaque door(s) of a walk-in freezer. The auto-closer must firmly close the door when it is within 1 inch of full closure.

Measure Savings

Savings calculations are based on values from through PG&E's Workpaper PGECOREF110.1 – Auto-Closers for Main Cooler or Freezer Doors. Savings are averaged across all California climate zones and vintages. Annual savings are 2307 kWh and 0.309 kW.

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. We will consider the incremental cost of door closers as full cost.

Table 165: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	8	DEER 2008
Incremental Measure Cost	$156.82	DEER 2008

Door Gaskets	
Measure Description	This measure consists of the replacement of weak, worn out refrigeration door gaskets with new, better fitting gaskets.
Units	Per linear feet of gasket
Base Case Description	Non-sealing leaking gasket
Measure Savings	Source: NCPA 2009 – Refrigerated Door Gasket Replacement Energy Savings – Keep Your Cool Program, SCE WPSCNRRN0001.1, SCE WPSCNRRN0004.1
Measure Incremental Cost	Source: DEER 2008 $9.61
Effective Useful Life	Source: DEER 2008 4 years

This measure consists of the replacement of weak, worn out refrigeration door gaskets with new, better fitting gaskets. Tight-fitting gaskets inhibit the infiltration of warm and moist air from the surrounding environment.

These gaskets must be installed on a glass or solid walk-in or reach-in cooler or freezer door which opens to an un-refrigerated space. The replacement gaskets must meet the case/door manufacturer's installation specifications in regards to dimensions, materials, attachment method, gasket profile, compression, and magnet placement.

Measure Savings

Savings calculations are based on SCE's work papers *WPSCNRRN0001.1 – Door Gasket for Main Doors of Walk-In Coolers & Freezers* and *WPSCNRRN0004.1 – Door Gaskets for Glass Doors of Walk-In Coolers*. Adjustments were made to accommodate field observations made during NCPA's Keep Your Cool Program, which found a ratio of 2 inches of damaged gasket per foot of gasket (0.17) replaced, instead of one foot of every 45 feet of gasket replaced (0.02). every 45 feet of gasket replaced (0.02). Other assumptions include:

1. Hinge repair was provided with gasket repair but is not captured in the savings estimate calculation.
2. Of gasket replacements, 90% were found in medium temperature applications (cooler) and 10% were low temperature applications (freezer).
3. SCE work papers based results on missing gaskets only versus damaged or worn gaskets. This analysis assumes 67% heat loss for damaged or worn gaskets, compared to missing gaskets.

Savings are averaged across all CA climate zones. Annual savings are 48 kWh and 0.011 kW.

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 166: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	4	DEER 2008
Incremental Measure Cost	$9.61	DEER 2008

LED Refrigerated Case Lighting	
Measure Description	Replace fluorescent refrigerated case lighting with light emitting diode (LED) source illumination. Fluorescent lamps, ballasts, and associated hardware are typically replaced with pre-fabricated LED light bars and driver units.
Units	Per door
Base Case Description	Fluorescent refrigerated case lighting
Measure Savings	Source: PG&E LED Refrigerated Case Lighting Workpaper
Measure Incremental Cost	Source: PG&E LED Refrigerated Case Lighting Workpaper
Effective Useful Life	Source: PG&E LED Refrigerated Case Lighting Workpaper 16 years

Replace fluorescent refrigerated case lighting with light emitting diode (LED) source illumination. Fluorescent lamps, ballasts, and associated hardware are typically replaced with pre-fabricated LED light bars and LED driver units. The two LED lamp products, 5' light bars and 6' light bars are eligible.

Measure Savings Analysis
The coincident demand savings is 0.061KW per door and annual energy savings is 375 kWh per door.

Measure Savings Analysis
The energy and demand savings are derived from an Emerging Technologies (ET) study of the refrigerated case lighting done by PG&E.

The electricity use (kWh) savings and gross summer peak demand (kW) reduction comprises two factors: reduced lighting load and reduced refrigeration requirements due to reduced heat gain. Reductions in lighting load occur continuously over the expected annual operating period, which includes the summer peak period. Savings due to reduced heat gain are computed assuming those reduced effects occur during the period in which the lighting systems operate, in consideration of the refrigeration compressor COP and the reduced cooling load, under normal operation (i.e., doors closed). Baseline and retrofit equipment assumptions are presented in the next table.

Table 167: Baseline and Retrofit Wattages LED refrigeration Lighting (per door)

	Estimated Energy Savings kWh/yr/door	Estimated Demand Savings kW/door	Weight Percentages
5' LED Light Bar			
Premium Tier	341	0.055	25%
Standard Tier	292	0.047	25%
6' LED Light Bar			
Premium Tier	465	0.075	25%
Standard Tier	403	0.065	25%
Weighted Average	375	0.061	

Measure Life and Incremental Measure Cost
The table below provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case the lighting measures, the IMC is equal to the full measure cost since cost of the less efficient option is $0.

The EUL for an LED exit sign or retrofit kit is estimated to be 16 years (over 140,000 hours), according to DEER. The core technology, LED sources and driver, are similar for both the established application (exit sign lighting) and the emerging technology (refrigeration case lighting). LED Power (LED equipment manufacturer) provided an expected life of 50,000 hours for the LED low-temperature case lighting, which is much less than the DEER estimate of 16 years for LED exit sign technology. It is well documented that LED life is extended in a low-temperature environment; therefore the expected useful life of 50,000 hours assumed for this application is probably conservative. Based on the fixture run-time of 6,205 hours annually for the facility in the study, the expected life calculates to 8 years.

Table 168: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	Fixture life	16	PG&E Work paper
Incremental Measure Cost	LED Refrigerated Case Lighting	$266	PG&E Work paper

Beverage Machine Controls	
Measure Description	The beverage machine is assumed to be a refrigerated vending machine that contains only nonperishable bottled and canned beverages. The controller must include a passive infrared occupancy sensor to turn off fluorescent lights and other vending machine systems when the surrounding area is unoccupied for 15 minutes or longer. For the beverage machine, the control logic should power up the machine at 2-hour intervals to maintain product temperature and provide compressor protection.
Units	Per machine
Base Case Description	No controls
Measure Savings	Source: DEER 2005
Measure Incremental Cost	Source: DEER 2005 $180
Effective Useful Life	Source: DEER 2005 10 years

The beverage machine is assumed to be a refrigerated vending machine that contains only nonperishable bottled and canned beverages. The controller must include a passive infrared occupancy sensor to turn off fluorescent lights and other vending machine systems when the surrounding area is unoccupied for 15 minutes or longer. For the beverage machine, the control logic should power up the machine at 2-hour intervals to maintain product temperature and provide compressor protection.

Measure Savings

Beverage machine controls savings are taken from the DEER database. It is assumed that controls are only effective during off-peak hours and so have no peak-kW savings. The annual energy savings are 1,612 kWh per year.[58]

Measure Life and Incremental Measure Cost

The measure life is 10 years.[59] The IMC documented for this measure is $180 per unit.[60] For this measure, the beverage machine controls, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

[58] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

[59] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

[60] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Snack Machine Controls	
Measure Description	The controller must include a passive infrared occupancy sensor to turn off fluorescent lights and other vending machine systems when the surrounding area is unoccupied for 15 minutes or longer.
Units	Per machine
Base Case Description	No controls
Measure Savings	Source: DEER 2005
Measure Incremental Cost	Source: DEER 2005 $80
Effective Useful Life	Source: DEER 2005 10 years

The snack machine controller must include a passive infrared occupancy sensor to turn off fluorescent lights and other vending machine systems when the surrounding area is unoccupied for 15 minutes or longer.

Measure Savings

Snack machine controls savings are taken from the DEER database. It is assumed that controls are only effective during off-peak hours and so have no peak-kW savings. The annual energy savings are 387 kWh per year.[61]

A baseline is used to calculate savings and incremental cost. In this case, the baseline for this measure assumes that there are controls installed for the machine.

Measure Life and Incremental Measure Cost[62]

The measure life is 10 years. The IMC documented for this measure is $80 per unit. For this measure, the beverage machine controls, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

[61] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

[62] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

ENERGY STAR Refrigerated Beverage Vending Machine	
Measure Description	ENERGY STAR beverage vending machines qualify for an incentive. Qualifying machines can be found at http://www.energystar.gov/ia/products/prod_lists/vending_machines_prod_list.pdf.
Units	Per Machine
Base Case Description	Standard Unit
Measure Savings	Source: ENERGY STAR
Effective Useful Life	Source: ENERGY STAR 14 years

Qualifying beverage vending machines must be ENERGY STAR rated. Qualifying machines can be found at http://www.energystar.gov/ia/products/prod_lists/vending_machines_prod_list.pdf.

Measure Savings [63]
Beverage machine savings are taken from the ENERGY STAR savings calculator and summarized in the following table. ENERGY STAR provides savings numbers for machines with and without control software. The average savings are calculated here. It is assumed that controls are only effective during off-peak hours and so have no peak-kW savings.

Table 169: ENERGY STAR Vending Machine Savings

Vending Machine Capacity (cans)	kWh Conventional Machine	kWh ENERGY STAR Machine w/o software	kWh ENERGY STAR Machine w/ software	kWh Savings Per Machine w/o software	kWh Savings Per Machine w/ software
<500	3,113	2,014	1,454	1,099	1,659
500	3,916	2,162	1,685	1,754	2,231
699	3,551	2,309	1,800	1,242	1,751
799	4,198	2,457	1,915	1,741	2,283
800+	3,318	2,605	2,030	713	1,288
Average	3,619	2,309	1,777	1,310	1,842
Total Average	1,576				

Measure Life and Incremental Measure Cost
The measure life is 14 years according to ENERGY STAR.

[63] ENERGY STAR Savings Calculator.
http://www.energystar.gov/index.cfm?c=vending_machines.pr_vending_machines

High-Efficiency Icemakers	
Measure Description	The rebate covers ice machines that generate 60 grams (2 oz.) or lighter ice cubes, flaked, crushed, or fragmented ice. Only air-cooled machines qualify (self contained, ice making heads, or remote condensing). The machine must have a minimum capacity of 101 lb of ice per 24-hour period (per day). The minimum efficiency required is per ENERGY STAR or CEE Tier 2.[64] A manufacturer's specification sheet must accompany the application that shows rating in accordance to ARI standard 810.
Units	Per icemaker
Base Case Description	0.10% less efficient than CEE Tier 1 qualifying icemaker
Measure Savings	Source: KEMA calculation
Measure Incremental Cost	Source: PG&E workpapers
Effective Useful Life	Source: DEER 2005 12 years

The rebate covers ice machines that generate 60 grams (2 oz.) or lighter ice cubes, flaked, crushed, or fragmented ice. Only air-cooled machines qualify (self-contained, ice-making heads, or remote condensing). The machine must have a minimum capacity of 101 lb of ice per 24-hour period (per day). The minimum efficiency required is per ENERGY STAR or CEE Tier 2[65]. A manufacturer's specification sheet must accompany the application that shows rating in accordance to ARI standard 810.

Measure Savings [66]

Savings values are obtained from the PG&E workpaper for the food service sector. Annual operating hours are assumed to be 8,760.

Table 170: Ice Maker Savings (per unit)

Size (lb / 24 hrs)	Peak kW Savings	Annual kWh Savings
101-200	0.118	1029
201-300	0.177	1551
301-400	0.210	1840
401-500	0.229	2004
501-1,000	0.363	3176
1,001-1,500	0.573	5019
> 1,500	0.638	5585

[64] The websites have a list of qualifying model numbers, www.energystar.gov or www.cee1.org.
[65] The websites have a list of qualifying model numbers, www.energystar.gov or www.cee1.org.
[66] "Food Service Equipment Workpapers; Ice Machine –Commercial Air Cooled," Pacific Gas and Electric. 2005.

Measure Savings Analysis

The savings methodology for this measure is based on the method presented in PG&E's 2006-2008 Food Service Equipment workpapers. The savings are based on the difference of the ice harvest rate (IHR) which is expressed as kWh per 100 lb. Icemaker sizes are expressed by the rate of their production in lb per 24-hour period. The following are the equations used to calculate the savings.

Annual kWh Savings = (Baseline IHR – Retrofit IHR) x Size x 365 days per year/ 100 lb

The baseline IHR assumed for this workpaper are units that have an IHR 110 percent of the CEE Tier 1 qualifying equipment (also the FEMP recommended efficiency). The following table provides the Tier 1 and the program's baseline IHR.

Table 171: Baseline Ice Harvest Rate

Size (lbs / 24 hrs)	CEE Tier 1 IHR	Program Baseline IHR
101-200	9.4	10.34
201-300	8.5	9.35
301-400	7.2	7.92
401-500	6.1	6.71
501-1,000	5.8	6.38
1,001-1,500	5.5	6.05
> 1,500	5.1	5.61

The qualifying efficiencies (CEE Tier 2) are provided in the table below.

Table 172: Qualifying Icemakers

Size (lb / 24 hrs)	Qualifying kWh per 100 lb
101-200	8.5
201-300	7.7
301-400	6.5
401-500	5.5
501-1000	5.2
1001-1500	5.0
>1500	4.6

Measure Life and Incremental Measure Cost

The measure life for icemakers is 12 years based on the DEER study assumption for food service equipment.

The following table provides the IMC documented for this measure. For some measures the IMC is equal to the full measure cost. These are replace-on-burnout measures or measures that are a new technology. Retrofit measures generally dictate IMC, which is the cost difference between the retrofit and baseline technology. Installing high-efficiency icemakers is typically a retrofit that occurs as a replace on burnout; hence, the incremental measure cost is the difference between the retrofit and baseline equipment.

The PG&E workpapers have different assumptions of qualifying equipment. They qualify equipment that meets FEMP-recommended kWh per 100 lb ice-making rate (CEE Tier 1). Their baseline is based on the lower 25 percentile of available equipment as listed in the ARI directory. It is assumed the incremental cost of the icemaker that qualifies in the Smart Ideas Program as compared to the baseline calculated here is comparable to the difference in cost (IMC) to the units discussed in the PG&E workpapers.

Table 173: Ice Maker Incremental Measure Cost

Size (lbs / 24 hrs)	$ per unit
101-200	$296
201-300	$312
301-400	$559
401-500	$981
501-1,000	$1,485
1,001-1,500	$1,821
> 1,500	$2,194

Food Service

ENERGY STAR® Steam Cooker	
Measure Description	This measure consists of the replacement of a conventional Steam Cooker unit with an ENERGY STAR rated unit.
Units	Per cooker
Base Case Description	Conventional, non ENERGY STAR unit
Measure Savings	Source: ENERGY STAR
Measure Incremental Cost	Source: 2009 PG&E Workpaper – PGECOFST104.1 – Commercial Steam Cooker – Electric and Gas $2,490
Effective Useful Life	Source: ENERGY STAR 12 years

This measure consists of the replacement of a conventional Steam Cooker unit with an ENERGY STAR rated unit. Steamer performance is determined by applying the ASTM *Standard Test Method for the Performance of Steam Cookers* (F1484),[67] considered to be the industry standard for quantifying the efficiency and performance of steamers. The following table is the ENERGY STAR standards for electric steam cookers. The standard is version 1.1, current as of August 2003.

Table 174. ENERGY STAR Steam Cooker Standards

Pan Capacity	Cooking Energy Efficiency	Idle Rate (watts)
3-pan	50%	400
4-pan	50%	530
5-pan	50%	670
6-pan and larger	50%	800

*Cooking Energy Efficiency is based on heavy load (potato) cooking capacity

Measure Savings

The savings for this measure is calculated using ENERGY STAR methodology, with updates based upon research done at the Food Service Technology Center. Measure data for savings calculations are based on average equipment characteristics. Annual energy use is calculated based on preheat, idle, and potato cooking energy efficiency and production capacity test results from applying ASTM F1484.

The following is the calculation for daily energy consumption per the PG&E workpapers.

[67] American Society for Testing and Materials. 2005. *Standard Test Method for the Performance of Steam Cookers.* ASTM Designation F1484-05, in *Annual Book of ASTM Standards,* West Conshohocken, PA.

$$EDay = LBFood * \frac{EFood}{Efficiency} + IdleRate * (OpHrs - \frac{LBFood}{PC} - \frac{TpreHT}{60}) + EpreHT$$

$$Average\ Demand = \frac{EDay}{OpHrs}$$

Table 175: Steam Cooker Variable Assumptions[68]

Variable	Variable Description (Units)	Value Assumed (Baseline)	Value Assumed (ENERGY STAR)
EDay	Daily Energy Consumption (kWh/day)	23.7	11.6
LBFood	Pounds of Food Cooked per Day (lb/day)	100	100
Efood	ASTM Energy to Food (kWh/lb) = kWh/pound of energy absorbed by food product during cooking	0.0308	0.0308
Efficiency	Heavy Load Cooking Energy Efficiency %	26%	50%
IdleRate	Idle Energy Rate (kW)	1.0	0.4
OpHrs	Operating Hours/Day (hr/day)	12	12
PC	Production Capacity (lbs/hr)	70	50
TPreHt	Preheat Time (min/day)	15	15
EPreHt	Preheat Energy (kWh/day)	1.5	1.5

Savings assume a 3-pan steam cooker, operating 12 hours a day, 365 days per, with one preheat daily. The annual savings calculated for an ENERGY STAR steam cooker is 4,419 kWh. Average demand savings is 1 kW.

Measure Life and Incremental Measure Cost
The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is the cost difference between the energy-efficient equipment and the less efficient option.

Table 176: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	12	ENERGY STAR
Incremental Measure Cost	$2,490	PG&E

[68] ENERGY STAR Commercial Steam Cooker Calculator

ENERGY STAR® Combination Oven	
Measure Description	This measure consists of the replacement of a conventional Combination Oven unit with an ENERGY STAR rated unit.
Units	Per oven
Base Case Description	Conventional, non ENERGY STAR unit
Measure Savings	Source: ENERGY STAR
Measure Incremental Cost	Source: 2009 PG&E Workpaper – PGECOFST100.1 – Commercial Combination Oven – Electric and Gas $3,824
Effective Useful Life	Source: DEER 2008 12 years

This measure consists of the replacement of a conventional Combination Oven unit with an ENERGY STAR rated unit. Oven performance is determined by the ASTM Standard Test Method for the Performance of Combination Ovens defined in standard F1639-05,[69] considered to be the industry standard for quantifying combination oven efficiency and performance.[70] Savings calculations for combination ovens assume they meet or exceed heavy-load cooking energy efficiencies of > 60%, utilizing the ASTM standard F1639.

Measure Savings
The savings for this measure is calculated using ENERGY STAR methodology, with updates based upon research done at the Food Service Technology Center. Measure data for savings calculations are based on average equipment characteristics, as established by ENERGY STAR. Annual energy use was calculated based on preheat, idle, and cooking energy efficiency and production capacity test results from applying ASTM F1639.

The following is the calculation for daily energy consumption per the PG&E workpapers.

$$EDay = LBFood * \frac{EFood}{Efficiency} + IdleRate * (OpHrs - \frac{LBFood}{PC} - \frac{TpreHT}{60}) + EpreHT$$

$$Average\ Demand = \frac{EDay}{OpHrs}$$

[69] American Society for Testing and Materials. “Standard Test Method for the Performance of Convection Ovens.” ASTM Designation F1639-05. in *Annual Book of ASTM Standards*, West Conshohocken, PA.
[70] PG&E Food Service

Table 177: Combination Oven Variable Assumptions[71]

Variable	Variable Description (Units)	Value Assumed (Baseline)	Value Assumed (Energy Efficient)
EDay	Daily Energy Consumption (kWh/day)	106	55
LBFood	Pounds of Food Cooked per Day (lb/day)	200	200
Efood	ASTM Energy to Food (kWh/lb) = kWh/pound of energy absorbed by food product during cooking	0.0732	0.0732
Efficiency	Heavy Load Cooking Energy Efficiency %	44%	60%
IdleRate	Idle Energy Rate (kW)	7.5	3.0
OpHrs	Operating Hours/Day (hr/day)	12	12
PC	Production Capacity (lbs/hr)	80	100
TPreHt	Preheat Time (min/day)	15	15
EPreHt	Preheat Energy (kWh/day)	3.0	1.5

Savings assume a 10-pan steam cooker, operating 12 hours a day, 365 days per, with one preheat daily. The annual savings calculated for the combination oven is 18,432 kWh. Average demand savings is 4.208 kW.

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option.

Table 178: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	12	DEER2008
Incremental Measure Cost	$3,824	PG&E

[71] PG&E Food Service Equipment Workpapers (October 2005)

ENERGY STAR® Hot Food Holding Cabinet	
Measure Description	This measure consists of the replacement of a conventional Hot Food Holding Cabinet unit with an ENERGY STAR rated unit.
Units	Per cabinet
Base Case Description	Conventional, non ENERGY STAR unit
Measure Savings	Source: ENERGY STAR
Measure Incremental Cost	Source: PG&E Full Size: $1,891 Three-Quarter Size: $1,497 Half Size: $707
Effective Useful Life	Source: DEER 2008 12 years

This measure consists of the replacement of a conventional Hot Food Holding Cabinet unit with an ENERGY STAR rated unit (last updated April 2009). Hot-food holding cabinets that meet current ENERGY STAR specifications are 60% more energy-efficient than standard models and must meet a maximum idle energy rate of 40 watts/ft^3. All operating energy rates' savings assumptions are used in accordance with American Society for Testing and Materials' (ASTM) Standard F2140. Energy-usage calculations are based on 15 hours-a-day, 365 days-per-year operation (5,475 hours) at a typical temperature setting of 150°F (based on ENERGY STAR assumptions).

To estimate energy savings, hot food holding cabinets are categorized into three size categories, as in the following table.

Table 179. Cabinet Size Assumptions[72]

Size	Internal volume	Average volume for calculations
Full-size	> 15 ft^3	20 ft^3
Three-quarter size	10 – 15 ft^3	12 ft^3
Half size	< 10 ft^3	8 ft^3

The following is the calculation for daily energy consumption per the ENERGY STAR Hot Food Holding Cabinet calculator.

$$EDay = \frac{InternalVolume * (IdleRate) * (OpHrs)}{1000}$$

[72] ENERGY STAR Commercial Hot Food Holding Cabinet Calculator based on PG&E FSTC research

$$Average\ Demand = \frac{EDay}{OpHrs}$$

Measure Savings

The savings based on ENERGY STAR savings methodology are summarized in the table below. The average is 5293 kWh per year and 0.967 kW.

Table 180: Hot Holding Cabinet Savings by Size

	Full-size	Three-quarter size	Half size
Energy (kWh/year)	9,308	3,942	2,628
Demand (kW)	1.700	0.720	0.480

Measure Life and Incremental Measure Cost

The estimate useful life of this measure is 12 years (DEER 2008). The following table provides the IMC documented for this measure. Cost data is taken from PG&E workpapers. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option.

Table 181: Incremental Measure Cost

	Full-size	Three-quarter size	Half size
Full Measure Cost	4160	3743	2295
Incremental Measure Cost	1891	1497	707

ENERGY STAR® Solid Door Reach-In Freezer	
Measure Description	This measure consists of the replacement of a conventional Solid Reach-In Freezer unit with an ENERGY STAR rated unit.
Units	Per freezer
Base Case Description	Conventional, non ENERGY STAR unit
Measure Savings	Source: ENERGY STAR
Measure Incremental Cost	Source: PG&E Workpaper PGECOFST107.1 – Commercial Glass Door Refrigerators $804.75
Effective Useful Life	Source: DEER 2008 12 years

This measure consists of the replacement of a conventional Solid Reach-In Freezer unit with an ENERGY STAR rated unit. Only units with built-in refrigeration systems are qualified. Units with remote refrigeration systems or units do not qualify. Customers must provide proof that the appliance meets the CEE Tier II efficiency specifications using ASHRAE Standard 117-1992 (38°F ± 2°F).

Table 182: ENERGY STAR Qualified Commercial Solid Door Freezers (kWh per day)[73]

Product Volume, cubic feet	Freezer
0 < V < 15	≤ 0.250V + 1.250
15 ≤ V < 30	≤ 0.400V – 1.000
30 ≤ V < 50	≤ 0.163V + 6.125
50 ≤ V	≤ 0.158V + 6.333

Measure Savings

The savings for this measure is calculated using ENERGY STAR methodology. Savings are calculated using an average volume for all qualified Solid Door Reach-In Freezer units, which is 37 cubic feet[74]. The estimated annual savings is 1,486 kWh and 0.170 kW. Actual savings will vary based on equipment type and volume.

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option.

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73 www.energystar.gov, Note: V = Internal volume in ft^3
74 Per the Energy Star listing as of May 2010.

Costs are averaged across unit volumes. The units modeled in PG&E's work papers have slightly different efficiency requirements, but incremental costs are assumed to be similar.

Table 183: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	12	DEER2008
Full Measure Cost	$5624.00	PG&E Workpaper PGECOFST107.1
Incremental Measure Cost	$804.75	PG&E Workpaper PGECOFST107.1

ENERGY STAR® Glass Door Reach-In Freezer	
Measure Description	This measure consists of the replacement of a conventional Glass Reach-In Freezer unit with an ENERGY STAR rated unit.
Units	Per freezer
Base Case Description	Conventional, non ENERGY STAR unit
Measure Savings	Source: ENERGY STAR
Measure Incremental Cost	Source: PG&E Workpaper PGECOFST106.1 – Commercial Glass Door Refrigerators $804.75
Effective Useful Life	Source: DEER 2008 12 years

This measure consists of the replacement of a conventional Glass Reach-In Freezer unit with an ENERGY STAR rated unit. Only units with built-in refrigeration systems are qualified. Units with remote refrigeration systems or units do not qualify. Customers must provide proof that the appliance meets the CEE Tier II efficiency specifications using ASHRAE Standard 117-1992 (38°F ± 2°F).

Table 184. Efficiency Standards for ENERGY STAR Qualified Commercial Glass Door Freezers (kWh per day)[75]

Product Volume, cubic feet	Freezer
$0 < V < 15$	$\leq 0.607V + 0.893$
$15 \leq V < 30$	$\leq 0.733V - 1.000$
$30 \leq V < 50$	$\leq 0.250V + 13.500$
$50 \leq V$	$\leq 0.450V + 3.500$

Measure Savings

The savings for this measure is calculated using ENERGY STAR methodology. Savings are calculated using an average volume for all qualified Solid Door Reach-In Freezer units, which is 37 cubic feet, since no glass doors are listed. The estimated annual savings is 3,357 kWh and 0.383 kW. Actual savings will vary based on equipment type and volume.

[75] www.energystar.gov, Note: V = Internal volume in ft^3

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option.

Costs are averaged across unit volumes. Costs are assumed to be comparable to Glass Door Reach-In Refrigerators.

Table 185: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	12	DEER2008
Full Measure Cost	$4241.00	PG&E Workpaper PGECOFST106.1
Incremental Measure Cost	$163.25	PG&E Workpaper PGECOFST106.1

Miscellaneous

Network PC Management Software	
Measure Description	Network PC management software allows network administrators to control the power settings on all network computers. Power settings include “on”, “standby”, “sleep” and “off” modes. Energy savings can be achieved, as network administrators can put computers on low power settings during off hours.
Units	Per Workstation
Base Case Description	Computers without network power management software.
Measure Savings	200 kWh per year
Measure Incremental Cost	$23/workstation
Effective Useful Life	10 years

Network PC management software allows network administrators to control the power settings on all network computers. Most computers come with power settings that include “on”, “standby”, “sleep” and “off” modes, each of which can be set to activate during periods of inactivity. These modes however may not be set properly. This measure can achieve savings by allowing network administrators to put all network computers on low power settings during appropriate hours.

Measure Savings

Table 186: Network PC Management Savings

Peak kW Savings	Annual kWh Savings
0	200

Measure Savings Analysis

Various studies have been conducted on the savings achieved by central computer power management systems. Savings depend on both the baseline conditions as well as the usage type of the computers. The analysis in this paper is based on papers done by Beacon Consultants Network Inc[76] and Northwest Energy Efficiency Alliance prepared by Quantec[77].

[76] J. Michael Walker, Beacon Consultants Network Inc. “Power Management for Network Computers: A Review of Utility Incentive Programs.” Updated July 14, 2009
[77] “Surveyor Network Energy Manager, Market Progress Evaluation Report, No 2,” Prepared by Quantec for Northwest Energy Efficiency Alliance. January 19, 2005.

The Quantec paper summarizes a number of verification studies at various sites, including both schools and office building, using the following table of demand assumptions.

Table 187: Assumed Power Demand (Watts) [78]

Mode	Flat Panel Monitors	CRT Monitors	Desktop Computers	Laptop Computers
On	31.7	65	50.8	12.0
Suspend/Sleep	0.6	5	1.8	1.9
Off	0.6	1	1.2	1.2

The paper concludes that average annual savings are 129 kWh/workstation for office computers and 317 kWh/workstation for those in computer labs. The higher savings in the latter case result from higher idle times.

On a per site basis, the annual savings vary from 350 kWh/workstation to as low as 34 kWh/workstation. The large range reflects both the differences in baseline behavioral conditions and differences in the demands of laptops and desktops, as well as CRT monitors and flat panel monitors (as shown in the above table). The phase out of CRT monitors should also be noted. For the reasons of uncertainty stated above, there is good reason to be conservative with our savings figure. The stated conservative case is an annual savings of 200 kWh/workstation.[79]

There is no peak demand saving for this measure, since at peak times it is assumed that the computers are on.

Measure Life and Incremental Measure Cost

Measure life indicates the license life and so goes beyond the useful life of the computer itself (usually 3-5 years).

Table 188: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	10	Northwest Energy Efficiency Alliance
Incremental Measure Cost	$23	Northwest Energy Efficiency Alliance

[78] "Surveyor Network Energy Manager, Market Progress Evaluation Report, No 2," Prepared by Quantec for Northwest Energy Efficiency Alliance. Section V. Verification of Surveyor Functionality and Energy Savings. January 19, 2005.

[79] J. Michael Walker, Beacon Consultants Network Inc. "Power Management for Network Computers: A Review of Utility Incentive Programs." Updated July 14, 2009

Attachment C

List of Electric and Natural Gas Energy Efficiency Measures with Ranking

Residential Electric Measures

Measure	Average Contribution to Savings	Cumulative Contribution to Savings
Standard Bulbs	42.23%	39.6%
Heat Pump Water Heaters >=2.0	10.49%	49.4%
ER CAC ≥14.5 SEER	7.77%	56.7%
Appliance Recycling - Refrigerators, Freezers, RAC	7.28%	63.5%
Specialty Bulbs	7.03%	70.1%
Air Sealing - Electric CAC	6.00%	75.7%
ECM added to hi-efficiency furnace	4.90%	80.3%
High-Efficiency Clothes Washer	2.80%	82.9%
ASHP ≥ 14.5 SEER	2.27%	85.0%
CAL 4' T8 32W lamp w/ electronic ballast	2.17%	87.1%
Air Sealing - Electric Heat	1.92%	88.9%
Ground Source Heat Pump	1.80%	90.6%
1.75 GPM Shower Heads - Electric DHW	1.46%	91.9%
In-unit Integral CFL 100w to 23w	1.42%	93.3%
ENERGY STAR Window AC (10.8 EER)	1.31%	94.5%
High-Efficiency Bathroom Exhaust Fan	1.10%	95.5%
Occupancy Sensor - residence	0.80%	96.3%
CAL LED Exit Sign (retrofit kit)	0.52%	96.7%
R-11 Wall Insulation - Electric Heat	0.43%	97.1%
Ceiling Insulation (R-11 to R-38) - Electric Heat	0.42%	97.5%
CAC ≥ 14.5 SEER	0.30%	97.8%
Faucet Aerators - Electric DHW	0.29%	98.1%
E-Star Home - combo	0.28%	98.4%
Elec Heat Set Back Thermostat	0.27%	98.6%
CAL Integral CFL >13W, screw-in lamp	0.23%	98.8%
High-Efficiency Dishwasher	0.20%	99.0%
Smart Strips	0.18%	99.2%
High-Efficiency Freezer	0.15%	99.3%
Programmable Thermostats - Electric Heat	0.12%	99.4%
RCA Test In /Out CAC	0.09%	99.5%
Ceiling Insulation (R-11 to R-38) - Electric CAC	0.09%	99.6%
Gas Heat Set Back Thermostat A/C Savings	0.09%	99.7%
RCA Test In/Out ASHP	0.08%	99.8%
ASHP 16 SEER - Electric Heat	0.07%	99.8%
CAL Modular CFL, pin-based fixture	0.05%	99.9%
ENERGY STAR Air Purifiers	0.04%	99.9%
R-11 Wall Insulation - Electric CAC	0.04%	99.9%
Dehumidifiers	0.02%	100.0%
Programmable Thermostat - Electric CAC	0.02%	100.0%

CAL 4' T8 32W lamp w/ elec. ballast & reflector	0.01%	100.0%
CAL Occupancy Sensor	0.01%	100.0%
Basement Wall Insulation - Electric CAC	0.00%	100.0%

Non-residential Electric Measures

	Average Contribution to Savings	*Cumulative Contribution to Savings*
T8/T5 New Fluorescent Fixtures with Electronic Ballast	41.68%	32.24%
Pulse Start or Ceramic MH lamps	20.35%	47.97%
High-Performance or Reduced Wattage Fluor Lamp and Ballast	14.36%	59.08%
VSD for HVAC and Process Motors	5.94%	63.67%
Screw-in CFLs	3.54%	66.41%
Delamp, Fluor Lamp, add Reflector	7.17%	71.96%
Lighting Occupancy Sensors	7.85%	78.03%
Delamp, Fluor. Lamp, Ballast, Holders	5.50%	82.28%
12" Traffic LED Signal Head	3.49%	84.98%
LED T-1 Electroluminescent Exit Signs	3.45%	87.65%
Reduced Wattage Fluorescent Lamp Only	3.02%	89.98%
Timeclocks for Lighting	0.40%	90.29%
12" Arrow LED Module	1.67%	91.59%
Anti-Sweat Heater Control	0.00%	91.59%
LED Lamp/Fixture	1.32%	92.61%
EC Motor for Walk-in and reach-in coolers/freezers	0.50%	93.00%
Water-Cooled Chillers	1.00%	93.77%
Hardwired Compact Fluorescent Fixtures	0.97%	94.52%
Anti-sweat Heater Control	0.90%	95.21%
Exterior/Garage LED/Induction Fixture	0.80%	95.83%
16"x18" Pedestrian Combo	0.75%	96.41%
VSD for HVAC Chillers	0.60%	96.87%
LED Refrigeration Case Lighting	0.40%	97.18%
Guest Room Energy Management Control	0.40%	97.49%
Beverage Machine Control	0.39%	97.79%
Bi-Level Stairwell/Hall/Garage Fixtures w/ integrated sensors	0.35%	98.06%
12" Pedestrian LED Module	0.34%	98.32%
Plug Load Occupancy Sensor	0.31%	98.57%
Cold Cathode Fluorescent Lamp	0.30%	98.80%
Air-Cooled Chillers	0.20%	98.95%
Kitchen Demand Ventilation Controls New	0.20%	99.11%
VSD - Air Compressor	0.20%	99.26%
Unitary and Split System Air Conditioning and Air Source Heat	0.14%	99.37%
Room Air Conditioners	0.11%	99.46%
Daylighting Controls	0.10%	99.53%
Sensor-Controlled Parking Lot Bi-level Fixture	0.10%	99.61%
Ground Source Heat Pump	0.09%	99.68%
Integrated Ballast Ceramic Metal Halide Lamps	0.06%	99.72%
Electric Steam Cookers	0.04%	99.75%
Snack Machine Control	0.03%	99.78%

PTAC/PTHP	0.03%	99.80%
ENERGY STAR Solid Door Freezers	0.03%	99.83%
ENERGY STAR Glass Door Freezers	0.03%	99.85%
ENERGY STAR Glass Door Refrigerator	0.03%	99.87%
Pre Rinse Sprayers – Electric Water Heater	0.03%	99.90%
Electric Low Flow faucet Aerators	0.03%	99.92%
Interior Induction Fixture	0.03%	99.94%
Strip Curtains on Walk-Ins	0.03%	99.96%
Premium Efficiency Motors 25-100 hp	0.02%	99.98%
Premium Efficiency Motors 125-200hp	0.02%	99.99%
High-Efficiency Ice Makers	0.01%	100.00%
ENERGY STAR Refrigerated Vending Machine	0.00%	100.00%
8" Traffic LED Signal Head	0.00%	100.00%
8" Arrow LED Module	0.00%	100.00%
8"-9" Pedestrian LED Module	0.00%	100.00%
Kitchen Demand Ventilation Controls Retrofit	0.00%	100.00%
Refrigeration Economizer	0.00%	100.00%
Evaporative Fan Control	0.00%	100.00%
Automatic Door Closers for Walk-in Freezers	0.00%	100.00%
Tractor Heater timers		100.00%
LED "Open" Sign		100.00%
Plug Load Occupancy Sensor		100.00%
Evaporator Fan Control		100.00%
AC Tuneup		100.00%

Non-residential Gas measures

Measure Description	*Average Contribution to Savings*	*Cumulative Contribution to Savings*
Steam Trap, Buy Down	24.8%	17.7%
Furnaces, up to 150 MBh (Categories: 90%, 92-94.9%, and 95%+ AFUE)	18.5%	30.8%
Boiler Tune-up	16.3%	42.4%
Hydronic Boilers, 85% or greater-Replace (Categories: up to 300 MBh, 301-499 MBh, 500-999MBh, 1000-1700 MBh, 1701-2000 MBh)	16.0%	53.8%
HE Pre-Rinse Spray Valve, Low-Flow Pre-Rinse	11.5%	62.0%
Boiler Reset Controls, Retrofit	11.0%	69.8%
Programmable Thermostat	7.5%	75.2%
Tankless Water Heater	6.0%	79.5%
Commercial Steamer, Energy Star Rated with E of >38%	5.4%	83.3%
Water Heater-Energy Star Free Standing, 0.67 EF ++	2.6%	85.2%
Condensing Unit Heaters, up to 300 MBH, 90% TE with power venting	2.3%	86.8%
H-E Rack Oven-Double Oven	2.1%	88.3%
H-E Conveyor Oven Large (>=25-in conveyor width)	1.8%	89.5%
Pasta Cooker	1.7%	90.8%
Condensing Boilers, 90% TE or greater-Replace (Categories: up to 300 MBh, 301-499 MBh, 500-999 MBh, 1000-1700 MBh)	1.7%	92.0%
Infrared Upright Broiler	1.7%	93.2%
Water Heater (large), 88% TE	1.7%	94.4%
H-E Combined Oven	1.3%	95.3%
Infrared Charbroiler	1.1%	96.1%
Fryer, Energy Star rated with E of >50%	0.9%	96.8%
Infrared Heaters (all sizes), Low intensity	0.6%	97.3%
Furnace Tune-up 110-250 Mbtu	0.6%	97.7%
Convection Oven, Energy Star rated with E of >40%	0.6%	98.1%
Infrared Rotisserie Oven	0.5%	98.4%
Showerheads	0.5%	98.8%
Infrared Salamander Broiler	0.4%	99.1%
Faucet Aerators	0.4%	99.4%
Griddle, Energy Star Rated	0.4%	99.7%
GREM	0.2%	99.8%
Combined High Efficiency Boiler & Water Htg. Unit, 90%AFUE or greater	0.2%	99.9%
Hot Water Reset	0.1%	100.0%

Residential Gas Measures

Measure Description	Average Contribution to Savings	Cumulative Contribution to Savings
High Efficiency Furnace (92% and 95% AFUE)	43%	36.9%
Low-flow shower heads	20%	54.4%
Air Infiltration Reduction	10%	62.8%
Wall Insulation	8%	69.9%
Storage Water Heater, E Factor 0.67	6%	75.0%
Basement/Sidewall Insulation	6%	79.9%
Thermostats	6%	84.7%
Faucet Aerator	5%	88.8%
Water Heater Turn-down	3%	91.6%
High Efficiency Boiler (90% and 95% AFUE)	2%	93.7%
Duct insulation and sealing (15% leakage base)	2%	95.6%
Attic Insulation - open blown ceiling	2%	97.4%
Pipe Insulation	2%	99.0%
ENERGY STAR HOME	1%	99.4%
Floor Insulation	0%	99.7%
Crawl Space Insulation	0%	100.0%
Window, U = .2	0%	100.0%