Table 33: 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	0.015	0.005	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						0.011	

Table 34: 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						0.014	

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 35: 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

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 36: Measure Savings for U-tube Lamp and Ballast (per lamp)

ComEd Building Types	Coincident Demand Savings (kW)	Energy Savings (kWh)
Office	0.009	31.2
School (K-12)	0.005	20.5
College/University	0.008	37.5
Retail/Service	0.010	44.4
Restaurant	0.008	57.7
Hotel/Motel	0.007	53.5
Medical	0.009	72.6
Grocery	0.010	62.5
Warehouse	0.009	48.9
Light Industry	0.010	42.4
Heavy Industry	0.010	42.4
Average = Miscellaneous	0.009	46.7

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.[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).

[5] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Table 37: 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 Table 38. The wattages were collected from PG&E's Non-residential retrofit standard wattages table.

Table 38: 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						0.010	

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 39: 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

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 40: 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

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 41: 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 42: Measure Savings for ≤100W MH

ComEd Building Types	Annual Operating Hours	Peak kW Savings	kWh Savings
Office	2,808	0.048	135
School (K-12)	1,873	0.048	90
College/University	3,433	0.048	165
Retail/Service	4,210	0.048	202
Restaurant	5,278	0.048	253
Hotel/Motel	4,941	0.048	237
Medical	6,474	0.048	311
Grocery	5,824	0.048	280
Warehouse	4,859	0.048	233
Light Industry	4,290	0.048	206
Heavy Industry	4,290	0.048	206
Average = Miscellaneous	4,389	0.048	211

Table 43: Measure Savings for 101W-200W MH

ComEd Building Types	Annual Operating Hours	Peak kW Savings	kWh Savings
Office	2,808	0.065	183
School (K-12)	1,873	0.065	122
College/University	3,433	0.065	223
Retail/Service	4,210	0.065	274
Restaurant	5,278	0.065	343
Hotel/Motel	4,941	0.065	321
Medical	6,474	0.065	421
Grocery	5,824	0.065	379
Warehouse	4,859	0.065	316
Light Industry	4,290	0.065	279
Heavy Industry	4,290	0.065	279
Average = Miscellaneous	4,389	0.065	285

Table 44: Measure Savings for >200W-350W MH

ComEd Building Types	Annual Operating Hours	Peak kW Savings	kWh Savings
Office	2,808	0.126	354
School (K-12)	1,873	0.126	236
College/University	3,433	0.126	432
Retail/Service	4,210	0.126	531
Restaurant	5,278	0.126	665
Hotel/Motel	4,941	0.126	623
Medical	6,474	0.126	816
Grocery	5,824	0.126	734
Warehouse	4,859	0.126	612
Light Industry	4,290	0.126	541
Heavy Industry	4,290	0.126	541
Average = Miscellaneous	4,389	0.126	553

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 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 45: Baseline and Retrofit Wattages[6]

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)			159
Average			126

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.

[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.

Table 46: 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]

[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.

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 47: 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 48: 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	147.9
College/University	0.057	271.2
Retail/Service	0.072	321.1
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.[10] 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).

[10] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Table 49: Factors used for Calculating Lighting Savings

ComEd Building Types	Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
Office	2,808	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 50: 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 51: 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

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 52: Baseline and Retrofit Wattages

Measures[11]	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

[11] Southern California Edison Company, Cold Cathode Fluorescent Lamp Workpaper WPSCNRLG0063. 2007.

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).

Table 53: 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
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	4,859	1.09	0.84	1.06	0.020	115
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	4,321	1.19	0.77	1.12	0.020	108

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 54: Measure Life and Incremental Measure Cost[12]

	Value	Source
Measure Life	5	SCE WP
Incremental Measure Cost	$9.68	PG&E WP

[12] Southern California Edison Company, Cold Cathode Fluorescent Lamp Workpaper WPSCNRLG0063. 2007, Pacific Gas & Electric, Lighting WP.doc, 2006.

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 55: Measure Savings for LED (per lamp)

ComEd Building Types	Coincident Demand Savings (kW)	Annual Energy Savings (kWh)
Office	0.034	101.7
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 56: 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 57: 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 58: 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

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 59: Integrated Electronic Self-Ballasted Ceramic Metal Halide lamp Savings

ComEd Building Types	Coincident Demand Savings (kW)	Energy Savings (kWh)
Office	0.048	146.1
School (K-12)	0.025	102.8
College/University	0.040	188.5
Retail/Service	0.050	218.2
Restaurant	0.041	264.5
Hotel/Motel	0.036	268.9
Medical	0.045	364.8
Grocery	0.048	314.2
Warehouse	0.044	245.9
Light Industry	0.051	213.0
Heavy Industry	0.051	213.0
Average = Miscellaneous	0.044	231.1

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 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 60: 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

[14] 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. Calculations assume that a PAR 38 halogen (45-90W) lamp is replaced with an integrated electronic self-ballasted 25W Ceramic Metal Halide lamp.

Table 61: Baseline and Retrofit Wattages for Ceramic Metal Halide lamps

Base Lamp Wattage	Retrofit Lamp Wattage	Demand Savings per fixture	Weight Percentages
45	27	0.018	15%
60	27	0.033	30%
75	27	0.048	10%
90	27	0.063	25%
100	27	0.073	20%
Weighted Average		0.048	

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 62: 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

Exit Signs	
Measure Description	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. Non-electrified and remote exit signs are not eligible. All new exit signs or retrofit exit signs must be UL or ETL 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. Non-electrified and remote exit signs are not eligible. All new exit signs or retrofit exit signs must be UL or ETL 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 63: Baseline and Retrofit Wattages

Measure	Base Wattage	Retrofit Wattage	Wattage Reduction
Two Incandescent Bulbs (20W each) -> LED EXIT Sign (5W)	40	5	35

The measure savings use the above non-coincident savings.

Table 64: Exit Sign Savings

ComEd Building Types	Peak kW Savings	kWh Savings
Office	0.044	358.7

School (K-12)	0.043	352.6
College/University	0.043	352.6
Retail/Service	0.042	340.3
Restaurant	0.044	352.6
Hotel/Motel	0.040	349.5
Medical	0.044	361.8
Grocery	0.044	346.5
Warehouse	0.038	325.0
Light Industry	0.038	318.9
Heavy Industry	0.038	318.9
Average = Miscellaneous	0.042	343.4

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.[15]

Table 65: 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

[15] 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:

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 66: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	16	DEER
Incremental Measure Cost	$81	ICF Portfolio Study

LED Channel Signs	
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[16]

The following table summarizes the savings for LED channel signs.

Table 67: 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
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.

[16] PGE LED Channel Sign work paper

(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 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.

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 68: 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	340.2
College/University	0.131	623.7
Retail/Service	0.165	738.4
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.[17] 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 69: 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:

[17] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

The following table provides the sample retrofit options and demand reduction assumptions used.

Table 70: 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 71: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	16	PG&E work paper
Incremental Measure Cost	$75	PG&E work paper

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.18 The occupancy sensor is assumed to turn off equipment for 2,450 hours/year. The factors used are for office building.

Table 72: Office Building Factors

Hours	Energy Interactive Effect	Demand Interactive Effects	Coincidence Factor
2,450	1.17	1.25	0.81

[18] 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 73: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	8	DEER
Incremental Measure Cost	$20	DEER

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
Measure Incremental Cost	Source: DEER
Effective Useful Life	Source: DEER 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 74: 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	0.0002	0.657
School (K-12)	1,873	1.23	0.42	1.15	0.0001	0.431
College/University	3,433	1.22	0.68	1.15	0.0002	0.789
Retail/Service	4,210	1.19	0.88	1.11	0.0002	0.935
Restaurant	5,278	1.26	0.68	1.15	0.0002	1.214
Hotel/Motel	4,941	1.14	0.67	1.14	0.0002	1.127
Medical	6,474	1.26	0.74	1.18	0.0002	1.528
Grocery	5,824	1.25	0.81	1.13	0.0002	1.316
Warehouse	4,859	1.09	0.84	1.06	0.0005	2.575
Light Industry	4,290	1.08	0.99	1.04	0.0005	2.231
Heavy Industry	4,290	1.08	0.99	1.04	0.0005	2.231
Average = Miscellaneous	4,389	1.19	0.77	1.12	0.0003	1.385

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 * 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.[19] Therefore, the table below shows the assumed range of occupancy off rates.

Table 75: 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 76: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	8	DEER
Incremental Measure Cost	$0.32	DEER

[19] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

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), 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
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.

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.[20] 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.

[20] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Table 77: 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	0.0010	3.2854
School (K-12)	1,873	1.23	0.42	1.15	0.0005	2.1534
College/University	3,433	1.22	0.68	1.15	0.0008	3.9474
Retail/Service	4,210	1.19	0.88	1.11	0.0010	4.6735
Restaurant	5,278	1.26	0.68	1.15	0.0009	6.0697
Hotel/Motel	4,941	1.14	0.67	1.14	0.0008	5.6322
Medical	6,474	1.26	0.74	1.18	0.0009	7.6393
Grocery	5,824	1.25	0.81	1.13	0.0010	6.5811
Warehouse	4,859	1.09	0.84	1.06	0.0009	5.1505
Light Industry	4,290	1.08	0.99	1.04	0.0011	4.4616
Heavy Industry	4,290	1.08	0.99	1.04	0.0011	4.4616
Average = Miscellaneous	4,389	1.19	0.77	1.12	0.0009	**4.9141**

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.

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 78: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	11	DEER
Incremental Measure Cost[21]	$0.75	KEMA

[21] Based on the assessment of active projects in the 2008-09 ComEd Smart Ideas Program.

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	IECC 2006 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)[22]. 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.

[22] This website also has a list of eligible systems.

Table 79: Program Qualifying Efficiencies

	Unit Size	Minimum Efficiency
Less than or equal 5 tons	< 65,000 Btuh	14 SEER
		15 SEER
More than 5 tons	≥ 65,000 Btuh and <240,000 Btuh	11.5 EER
		12 EER
	≥240,000 Btuh and <760,000 Btuh	10.5 EER
		10.8 EER
	≥ 760,000 Btuh	9.7 EER
		10.2 EER

Measure Savings

The coincident kW and the annual kWh savings per ton of installed cooling system are provided below.

Table 80: Measure Savings for Unitary or Split Air Conditioning Systems

Measure Description	Unit Size	Business Type	CEE Tier	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Unitary or Split AC	5 or less	College/University	1	0.067	49.1
Unitary or Split AC	5 or less	Grocery	1	0.068	87.8
Unitary or Split AC	5 or less	Heavy Industry	1	0.066	40.4
Unitary or Split AC	5 or less	Hotel/Motel	1	0.070	87.3
Unitary or Split AC	5 or less	Light Industry	1	0.068	41.5
Unitary or Split AC	5 or less	Medical	1	0.068	96.7
Unitary or Split AC	5 or less	Office	1	0.070	41.2
Unitary or Split AC	5 or less	Restaurant	1	0.068	54.4
Unitary or Split AC	5 or less	Retail/Service	1	0.069	65.0
Unitary or Split AC	5 or less	School (K-12)	1	0.066	20.7
Unitary or Split AC	5 or less	Warehouse	1	0.070	36.0
Measure Description	**Unit Size**	**Business Type**	**CEE Tier**	**Peak Electric Demand Reduction (kW/ton)**	**Electric Savings (kWh/ton)**
Unitary or Split	5 or less	Miscellaneous	1	0.068	56.4

AC					
Unitary or Split AC	5 or less	College/University	2	0.126	91.6
Unitary or Split AC	5 or less	Grocery	2	0.128	163.9
Unitary or Split AC	5 or less	Heavy Industry	2	0.124	75.5
Unitary or Split AC	5 or less	Hotel/Motel	2	0.203	162.9
Unitary or Split AC	5 or less	Light Industry	2	0.127	77.4
Unitary or Split AC	5 or less	Medical	2	0.126	180.5
Unitary or Split AC	5 or less	Office	2	0.130	76.8
Unitary or Split AC	5 or less	Restaurant	2	0.126	101.5
Unitary or Split AC	5 or less	Retail/Service	2	0.128	121.4
Unitary or Split AC	5 or less	School (K-12)	2	0.122	38.6
Unitary or Split AC	5 or less	Warehouse	2	0.131	67.1
Unitary or Split AC	5 or less	Miscellaneous	2	0.134	105.2
Unitary or Split AC	5 to 10	College/University	1	0.128	93.4
Unitary or Split AC	5 to 10	Grocery	1	0.130	167.0
Unitary or Split AC	5 to 10	Heavy Industry	1	0.126	76.9
Unitary or Split AC	5 to 10	Hotel/Motel	1	0.133	166.1
Unitary or Split AC	5 to 10	Light Industry	1	0.130	78.9
Unitary or Split AC	5 to 10	Medical	1	0.139	202.8
Unitary or Split AC	5 to 10	Office	1	0.132	78.3
Unitary or Split AC	5 to 10	Restaurant	1	0.129	103.5
Unitary or Split AC	5 to 10	Retail/Service	1	0.131	123.8
Measure Description	**Unit Size**	**Business Type**	**CEE Tier**	**Peak Electric Demand Reduction (kW/ton)**	**Electric Savings (kWh/ton)**
Unitary or Split	5 to 10	School (K-12)	1	0.125	39.4

AC					
Unitary or Split AC	5 to 10	Warehouse	1	0.134	68.4
Unitary or Split AC	5 to 10	Miscellaneous	1	0.131	109.0
Unitary or Split AC	5 to 10	College/University	2	0.167	121.5
Unitary or Split AC	5 to 10	Grocery	2	0.169	217.3
Unitary or Split AC	5 to 10	Heavy Industry	2	0.164	100.0
Unitary or Split AC	5 to 10	Hotel/Motel	2	0.173	216.0
Unitary or Split AC	5 to 10	Light Industry	2	0.169	102.7
Unitary or Split AC	5 to 10	Medical	2	0.180	263.7
Unitary or Split AC	5 to 10	Office	2	0.172	101.8
Unitary or Split AC	5 to 10	Restaurant	2	0.167	134.6
Unitary or Split AC	5 to 10	Retail/Service	2	0.170	161.0
Unitary or Split AC	5 to 10	School (K-12)	2	0.162	51.2
Unitary or Split AC	5 to 10	Warehouse	2	0.174	89.0
Unitary or Split AC	5 to 10	Miscellaneous	2	0.170	141.7
Unitary or Split AC	10 to 20	College/University	1	0.195	124.1
Unitary or Split AC	10 to 20	Grocery	1	0.198	220.3
Unitary or Split AC	10 to 20	Heavy Industry	1	0.192	139.1
Unitary or Split AC	10 to 20	Hotel/Motel	1	0.203	213.1
Unitary or Split AC	10 to 20	Light Industry	1	0.197	119.9
Unitary or Split AC	10 to 20	Medical	1	0.196	218.2
Measure Description	**Unit Size**	**Business Type**	**CEE Tier**	**Peak Electric Demand Reduction (kW/ton)**	**Electric Savings (kWh/ton)**
Unitary or Split	10 to 20	Office	1	0.201	105.6

AC					
Unitary or Split AC	10 to 20	Restaurant	1	0.195	144.1
Unitary or Split AC	10 to 20	Retail/Service	1	0.199	170.0
Unitary or Split AC	10 to 20	School (K-12)	1	0.190	54.4
Unitary or Split AC	10 to 20	Warehouse	1	0.203	100.9
Unitary or Split AC	10 to 20	Miscellaneous	1	0.197	146.3
Unitary or Split AC	10 to 20	College/University	2	0.233	148.6
Unitary or Split AC	10 to 20	Grocery	2	0.237	263.8
Unitary or Split AC	10 to 20	Heavy Industry	2	0.230	136.3
Unitary or Split AC	10 to 20	Hotel/Motel	2	0.243	255.3
Unitary or Split AC	10 to 20	Light Industry	2	0.236	143.6
Unitary or Split AC	10 to 20	Medical	2	0.235	261.4
Unitary or Split AC	10 to 20	Office	2	0.241	126.5
Unitary or Split AC	10 to 20	Restaurant	2	0.234	172.6
Unitary or Split AC	10 to 20	Retail/Service	2	0.238	192.3
Unitary or Split AC	10 to 20	School (K-12)	2	0.227	65.1
Unitary or Split AC	10 to 20	Warehouse	2	0.243	120.9
Unitary or Split AC	10 to 20	Miscellaneous	2	0.236	171.5
Unitary or Split AC	20 to 60	College/University	1	0.107	67.9
Unitary or Split AC	20 to 60	Grocery	1	0.108	120.6
Unitary or Split AC	20 to 60	Heavy Industry	1	0.105	63.6
Measure Description	**Unit Size**	**Business Type**	**CEE Tier**	**Peak Electric Demand Reduction (kW/ton)**	**Electric Savings (kWh/ton)**
Unitary or Split	20 to 60	Hotel/Motel	1	0.111	116.7

AC					
Unitary or Split AC	20 to 60	Light Industry	1	0.108	65.7
Unitary or Split AC	20 to 60	Medical	1	0.107	119.5
Unitary or Split AC	20 to 60	Office	1	0.110	57.8
Unitary or Split AC	20 to 60	Restaurant	1	0.107	78.9
Unitary or Split AC	20 to 60	Retail/Service	1	0.109	93.1
Unitary or Split AC	20 to 60	School (K-12)	1	0.104	29.8
Unitary or Split AC	20 to 60	Warehouse	1	0.111	55.3
Unitary or Split AC	20 to 60	Miscellaneous	1	0.108	79.0
Unitary or Split AC	20 to 60	College/University	2	0.135	85.9
Unitary or Split AC	20 to 60	Grocery	2	0.137	152.4
Unitary or Split AC	20 to 60	Heavy Industry	2	0.133	80.4
Unitary or Split AC	20 to 60	Hotel/Motel	2	0.140	147.5
Unitary or Split AC	20 to 60	Light Industry	2	0.137	83.0
Unitary or Split AC	20 to 60	Medical	2	0.135	151.0
Unitary or Split AC	20 to 60	Office	2	0.139	73.1
Unitary or Split AC	20 to 60	Restaurant	2	0.135	99.7
Unitary or Split AC	20 to 60	Retail/Service	2	0.138	117.7
Unitary or Split AC	20 to 60	School (K-12)	2	0.131	37.6
Unitary or Split AC	20 to 60	Warehouse	2	0.141	69.9
Unitary or Split AC	20 to 60	Miscellaneous	2	0.136	99.8
Measure Description	**Unit Size**	**Business Type**	**CEE Tier**	**Peak Electric Demand Reduction (kW/ton)**	**Electric Savings (kWh/ton)**
Unitary or Split	≥ 60	College/University	1	0.060	38.0

AC					
Unitary or Split AC	≥ 60	Grocery	1	0.060	67.4
Unitary or Split AC	≥ 60	Heavy Industry	1	0.059	35.5
Unitary or Split AC	≥ 60	Hotel/Motel	1	0.062	65.2
Unitary or Split AC	≥ 60	Light Industry	1	0.060	36.7
Unitary or Split AC	≥ 60	Medical	1	0.060	66.8
Unitary or Split AC	≥ 60	Office	1	0.062	31.8
Unitary or Split AC	≥ 60	Restaurant	1	0.060	44.1
Unitary or Split AC	≥ 60	Retail/Service	1	0.061	52.0
Unitary or Split AC	≥ 60	School (K-12)	1	0.058	16.6
Unitary or Split AC	≥ 60	Warehouse	1	0.062	30.9
Unitary or Split AC	≥ 60	Miscellaneous	1	0.060	44.1
Unitary or Split AC	≥ 60	College/University	2	0.113	72.2
Unitary or Split AC	≥ 60	Grocery	2	0.115	128.2
Unitary or Split AC	≥ 60	Heavy Industry	2	0.112	67.6
Unitary or Split AC	≥ 60	Hotel/Motel	2	0.118	124.1
Unitary or Split AC	≥ 60	Light Industry	2	0.115	69.8
Unitary or Split AC	≥ 60	Medical	2	0.114	127.0
Unitary or Split AC	≥ 60	Office	2	0.117	60.5
Unitary or Split AC	≥ 60	Restaurant	2	0.113	83.9
Unitary or Split AC	≥ 60	Retail/Service	2	0.116	99.0
Measure Description	**Unit Size**	**Business Type**	**CEE Tier**	**Peak Electric Demand Reduction (kW/ton)**	**Electric Savings (kWh/ton)**
Unitary or Split	≥ 60	School (K-12)	2	0.110	31.6

AC					
Unitary or Split AC	≥ 60	Warehouse	2	0.118	58.7
Unitary or Split AC	≥ 60	Miscellaneous	2	0.115	83.9

Measure Savings Analysis

Savings values are determined for both level 1 and level 2 of the CEE commercial AC systems. HVAC EER values used in the analysis are provided in the table below.

Table 81: Demand Savings and Efficiency Assumptions

Size (Tons)	Base (S)EER	Level 1 (S)EER	Level 2 (S)EER	SEER or EER
5 or less	13	14	15	SEER
5 to 10	10.1	11.5	12	EER
10 to 20	9.5	11.5	12	EER
20 to 60	9.5	10.5	10.8	EER
≥ 60	9.2	9.7	10.2	EER

Savings calculations were perfomed 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.

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 Level 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 economiziers for both the baseline and retrofit cases. Units smaller than 10 tons were assumed to not have economizers.

Measure Life and Incremental Measure Cost
The measure life for packaged units is 15 years according to DEER[23].

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 82: Package Units Incremental Measure Cost[24]

Measure	Cost
65,000 Btuh or less - Tier 2	$113
65,000 Btuh or less - Tier 3	$172
65,000 to 240,000 Btuh - Tier 2	$73
65,000 to 240,000 tons - Tier 3	$97
240,000 to 760,000 Btuh - Tier 2	$193
240,000 to 760,000 Btuh - Tier 3	$247
760,000 Btuh or more - Tier 2	$167
760,000 Btuh or more - Tier 3	$203

[23] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report
[24] 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 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.
Units	Per Ton
Base Case Description	Chillers at IECC 2006 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 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's specification sheet with the rated kW/Ton-IPLV or COP-IPLV must accompany the application. Qualifying efficiencies for chillers are summarized below:

Table 83: Efficiency Levels for Chillers

Chiller Type	Size	IECC 2006 kW/ton- IPLV	Level 1 kW/ton IPLV	Level 2 kW/ton IPLV
Scroll or Helical-Rotary	< 150	0.68	0.61	0.54
	150 to 300	0.63	0.57	0.50
	≥ 300	0.57	0.51	0.46
Centrifugal	< 150	0.67	0.60	0.54
	150 to 300	0.60	0.54	0.48
	≥ 300	0.55	0.49	0.44
Reciprocating	All	0.70	0.63	0.56
Air Cooled Chiller	All	1.15	1.04	0.92

Measure Savings

Qualifying air cooled chillers must have a kW/ton IPLV of 1.04 that is 10 percent below the IECC 2006 standards.

The coincident kW and the annual kWh savings per ton of installed chiller are provided below.

Table 84: Measure Savings for Chillers

Measure Description	Unit Size	Business Type	CEE Tier	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Air Cooled	< 150	College/University	1	0.149	143.8
Air Cooled	< 150	Grocery	1	0.16	176
Air Cooled	< 150	Heavy Industry	1	0.149	119.1
Air Cooled	< 150	Hotel/Motel	1	0.161	200.7
Air Cooled	< 150	Light Industry	1	0.163	88.2
Air Cooled	< 150	Medical	1	0.162	194.2
Air Cooled	< 150	Office	1	0.172	102
Air Cooled	< 150	Restaurant	1	0.158	146.6
Air Cooled	< 150	Retail/Service	1	0.154	136.2
Air Cooled	< 150	School (K-12)	1	0.143	73
Air Cooled	< 150	Warehouse	1	0.153	100
Air Cooled	< 150	Miscellaneous	1	0.101	87.1
Air Cooled	≥ 300	College/University	1	0.149	143.8
Air Cooled	≥ 300	Grocery	1	0.16	176
Air Cooled	≥ 300	Heavy Industry	1	0.149	119.1
Air Cooled	≥ 300	Hotel/Motel	1	0.161	200.7
Air Cooled	≥ 300	Light Industry	1	0.167	106.2
Air Cooled	≥ 300	Medical	1	0.162	194.2
Air Cooled	≥ 300	Office	1	0.172	102
Air Cooled	≥ 300	Restaurant	1	0.158	146.6
Air Cooled	≥ 300	Retail/Service	1	0.154	140.7
Air Cooled	≥ 300	School (K-12)	1	0.143	73
Air Cooled	≥ 300	Warehouse	1	0.154	104.9
Air Cooled	≥ 300	Miscellaneous	1	0.102	88.7
Air Cooled	150-300	College/University	1	0.149	143.8
Air Cooled	150-300	Grocery	1	0.16	176
Air Cooled	150-300	Heavy Industry	1	0.149	119.1
Air Cooled	150-300	Hotel/Motel	1	0.161	200.7
Air Cooled	150-300	Light Industry	1	0.167	106.2
Air Cooled	150-300	Medical	1	0.162	194.2
Air Cooled	150-300	Office	1	0.172	102
Air Cooled	150-300	Restaurant	1	0.158	146.6
Air Cooled	150-300	Retail/Service	1	0.154	137.2
Air Cooled	150-300	School (K-12)	1	0.143	73
Air Cooled	150-300	Warehouse	1	0.15	102.2

Measure Description	Unit Size	Business Type	CEE Tier	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Air Cooled	150-300	Miscellaneous	1	0.102	88.3
Centrifugal	< 150	College/University	1	0.062	72.4
Centrifugal	< 150	Grocery	1	0.072	114.6
Centrifugal	< 150	Heavy Industry	1	0.067	69.4
Centrifugal	< 150	Hotel/Motel	1	0.081	104.4
Centrifugal	< 150	Light Industry	1	0.069	43.1
Centrifugal	< 150	Medical	1	0.067	91.2
Centrifugal	< 150	Office	1	0.07	45.6
Centrifugal	< 150	Restaurant	1	0.068	89.4
Centrifugal	< 150	Retail/Service	1	0.064	67.3
Centrifugal	< 150	School (K-12)	1	0.064	38.7
Centrifugal	< 150	Warehouse	1	0.069	46.1
Centrifugal	< 150	Miscellaneous	1	0.068	71.1
Centrifugal	< 150	College/University	2	0.116	134.4
Centrifugal	< 150	Grocery	2	0.133	212.7
Centrifugal	< 150	Heavy Industry	2	0.125	128.8
Centrifugal	< 150	Hotel/Motel	2	0.151	193.8
Centrifugal	< 150	Light Industry	2	0.128	80.1
Centrifugal	< 150	Medical	2	0.125	169.4
Centrifugal	< 150	Office	2	0.13	84.8
Centrifugal	< 150	Restaurant	2	0.126	165.9
Centrifugal	< 150	Retail/Service	2	0.119	124.8
Centrifugal	< 150	School (K-12)	2	0.118	71.8
Centrifugal	< 150	Warehouse	2	0.129	85.6
Centrifugal	< 150	Miscellaneous	2	0.127	132.0
Centrifugal	≥ 300	College/University	1	0.053	62
Centrifugal	≥ 300	Grocery	1	0.063	98.1
Centrifugal	≥ 300	Heavy Industry	1	0.058	59.4
Centrifugal	≥ 300	Hotel/Motel	1	0.069	89.3
Centrifugal	≥ 300	Light Industry	1	0.059	50.1
Centrifugal	≥ 300	Medical	1	0.058	78
Centrifugal	≥ 300	Office	1	0.06	39
Centrifugal	≥ 300	Restaurant	1	0.058	76.5
Centrifugal	≥ 300	Retail/Service	1	0.055	63
Centrifugal	≥ 300	School (K-12)	1	0.055	33
Centrifugal	≥ 300	Warehouse	1	0.062	44.5

Measure Description	Unit Size	Business Type	CEE Tier	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Centrifugal	≥ 300	Miscellaneous	1	0.059	63.0
Centrifugal	≥ 300	College/University	2	0.098	113.5
Centrifugal	≥ 300	Grocery	2	0.114	179.9
Centrifugal	≥ 300	Heavy Industry	2	0.106	108.8
Centrifugal	≥ 300	Hotel/Motel	2	0.127	163.6
Centrifugal	≥ 300	Light Industry	2	0.108	91.8
Centrifugal	≥ 300	Medical	2	0.106	142.9
Centrifugal	≥ 300	Office	2	0.11	71.6
Centrifugal	≥ 300	Restaurant	2	0.106	140.2
Centrifugal	≥ 300	Retail/Service	2	0.114	115.5
Centrifugal	≥ 300	School (K-12)	2	0.1	60.6
Centrifugal	≥ 300	Warehouse	2	0.114	81.6
Centrifugal	≥ 300	Miscellaneous	2	0.109	115.5
Centrifugal	150-300	College/University	1	0.053	62
Centrifugal	150-300	Grocery	1	0.061	98.2
Centrifugal	150-300	Heavy Industry	1	0.058	59.4
Centrifugal	150-300	Hotel/Motel	1	0.069	89.4
Centrifugal	150-300	Light Industry	1	0.059	50.1
Centrifugal	150-300	Medical	1	0.058	78.1
Centrifugal	150-300	Office	1	0.06	39.1
Centrifugal	150-300	Restaurant	1	0.058	76.5
Centrifugal	150-300	Retail/Service	1	0.055	58.7
Centrifugal	150-300	School (K-12)	1	0.055	33.1
Centrifugal	150-300	Warehouse	1	0.123	41.5
Centrifugal	150-300	Miscellaneous	1	0.065	62.4
Centrifugal	150-300	College/University	2	0.107	123.9
Centrifugal	150-300	Grocery	2	0.125	196.3
Centrifugal	150-300	Heavy Industry	2	0.115	118.8
Centrifugal	150-300	Hotel/Motel	2	0.139	178.7
Centrifugal	150-300	Light Industry	2	0.118	100.2
Centrifugal	150-300	Medical	2	0.116	156.1
Centrifugal	150-300	Office	2	0.12	78.1
Centrifugal	150-300	Restaurant	2	0.116	153
Centrifugal	150-300	Retail/Service	2	0.11	117.3
Centrifugal	150-300	School (K-12)	2	0.109	66.1
Centrifugal	150-300	Warehouse	2	0.175	82.9

Measure Description	Unit Size	Business Type	CEE Tier	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Centrifugal	150-300	Miscellaneous	2	0.123	124.7
Reciprocating	< 150	College/University	1	0.059	56.4
Reciprocating	< 150	Grocery	1	0.07	74.5
Reciprocating	< 150	Heavy Industry	1	0.063	46.3
Reciprocating	< 150	Hotel/Motel	1	0.063	81.2
Reciprocating	< 150	Light Industry	1	0.065	35
Reciprocating	< 150	Medical	1	0.064	75.5
Reciprocating	< 150	Office	1	0.075	39.9
Reciprocating	< 150	Restaurant	1	0.067	56.9
Reciprocating	< 150	Retail/Service	1	0.086	70.1
Reciprocating	< 150	School (K-12)	1	0.061	28.8
Reciprocating	< 150	Warehouse	1	0.068	43.7
Reciprocating	< 150	Miscellaneous	1	0.067	55.3
Reciprocating	< 150	College/University	2	0.119	112.9
Reciprocating	< 150	Grocery	2	0.139	149.2
Reciprocating	< 150	Heavy Industry	2	0.126	92.7
Reciprocating	< 150	Hotel/Motel	2	0.126	162.5
Reciprocating	< 150	Light Industry	2	0.131	70.2
Reciprocating	< 150	Medical	2	0.127	151.2
Reciprocating	< 150	Office	2	0.141	79.9
Reciprocating	< 150	Restaurant	2	0.148	113.9
Reciprocating	< 150	Retail/Service	2	0.177	123.8
Reciprocating	< 150	School (K-12)	2	0.123	57.6
Reciprocating	< 150	Warehouse	2	0.194	87.5
Reciprocating	< 150	Miscellaneous	2	0.141	109.2
Reciprocating	≥ 300	College/University	1	0.059	56.4
Reciprocating	≥ 300	Grocery	1	0.07	74.5
Reciprocating	≥ 300	Heavy Industry	1	0.063	46.3
Reciprocating	≥ 300	Hotel/Motel	1	0.063	81.2
Reciprocating	≥ 300	Light Industry	1	0.065	37.9
Reciprocating	≥ 300	Medical	1	0.064	75.5
Reciprocating	≥ 300	Office	1	0.075	39.9
Reciprocating	≥ 300	Restaurant	1	0.067	56.9
Reciprocating	≥ 300	Retail/Service	1	0.065	54.7
Reciprocating	≥ 300	School (K-12)	1	0.061	28.8
Reciprocating	≥ 300	Warehouse	1	0.068	41.1

Measure Description	Unit Size	Business Type	CEE Tier	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Reciprocating	≥ 300	Miscellaneous	1	0.065	53.9
Reciprocating	≥ 300	College/University	2	0.119	112.9
Reciprocating	≥ 300	Grocery	2	0.139	149.2
Reciprocating	≥ 300	Heavy Industry	2	0.126	92.7
Reciprocating	≥ 300	Hotel/Motel	2	0.126	162.5
Reciprocating	≥ 300	Light Industry	2	0.131	75.9
Reciprocating	≥ 300	Medical	2	0.127	151.2
Reciprocating	≥ 300	Office	2	0.141	79.9
Reciprocating	≥ 300	Restaurant	2	0.148	113.9
Reciprocating	≥ 300	Retail/Service	2	0.155	109.6
Reciprocating	≥ 300	School (K-12)	2	0.123	57.6
Reciprocating	≥ 300	Warehouse	2	0.137	82.4
Reciprocating	≥ 300	Miscellaneous	2	0.134	108.0
Reciprocating	150-300	College/University	1	0.059	56.4
Reciprocating	150-300	Grocery	1	0.07	74.5
Reciprocating	150-300	Heavy Industry	1	0.063	46.3
Reciprocating	150-300	Hotel/Motel	1	0.063	81.2
Reciprocating	150-300	Light Industry	1	0.065	37.9
Reciprocating	150-300	Medical	1	0.064	75.5
Reciprocating	150-300	Office	1	0.075	39.9
Reciprocating	150-300	Restaurant	1	0.067	56.9
Reciprocating	150-300	Retail/Service	1	0.065	53.8
Reciprocating	150-300	School (K-12)	1	0.061	28.8
Reciprocating	150-300	Warehouse	1	0.068	40.5
Reciprocating	150-300	Miscellaneous	1	0.065	53.8
Reciprocating	150-300	College/University	2	0.119	112.9
Reciprocating	150-300	Grocery	2	0.139	149.2
Reciprocating	150-300	Heavy Industry	2	0.126	92.7
Reciprocating	150-300	Hotel/Motel	2	0.126	162.5
Reciprocating	150-300	Light Industry	2	0.131	75.9
Reciprocating	150-300	Medical	2	0.127	151.2
Reciprocating	150-300	Office	2	0.141	79.9
Reciprocating	150-300	Restaurant	2	0.148	113.9
Reciprocating	150-300	Retail/Service	2	0.155	107.7
Reciprocating	150-300	School (K-12)	2	0.123	57.6
Reciprocating	150-300	Warehouse	2	0.136	81.1
Reciprocating	150-300	Miscellaneous	2	0.134	107.7

Measure Description	Unit Size	Business Type	CEE Tier	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Scroll or Helical Rotary	< 150	College/University	1	0.06	55.5
Scroll or Helical Rotary	< 150	Grocery	1	0.072	82.6
Scroll or Helical Rotary	< 150	Heavy Industry	1	0.062	47.6
Scroll or Helical Rotary	< 150	Hotel/Motel	1	0.071	79.9
Scroll or Helical Rotary	< 150	Light Industry	1	0.068	35.6
Scroll or Helical Rotary	< 150	Medical	1	0.068	75
Scroll or Helical Rotary	< 150	Office	1	0.068	40.5
Scroll or Helical Rotary	< 150	Restaurant	1	0.081	58.5
Scroll or Helical Rotary	< 150	Retail/Service	1	0.066	54.6
Scroll or Helical Rotary	< 150	School (K-12)	1	0.061	29.3
Scroll or Helical Rotary	< 150	Warehouse	1	0.068	39.8
Scroll or Helical Rotary	< 150	Miscellaneous	1	0.068	54.5
Scroll or Helical Rotary	< 150	College/University	2	0.121	111.2
Scroll or Helical Rotary	< 150	Grocery	2	0.143	165.6
Scroll or Helical Rotary	< 150	Heavy Industry	2	0.124	95.3
Scroll or Helical Rotary	< 150	Hotel/Motel	2	0.143	160.1
Scroll or Helical Rotary	< 150	Light Industry	2	0.136	71.2
Scroll or Helical Rotary	< 150	Medical	2	0.136	150.3
Scroll or Helical Rotary	< 150	Office	2	0.137	81.2
Scroll or Helical Rotary	< 150	Restaurant	2	0.148	117.1
Scroll or Helical Rotary	< 150	Retail/Service	2	0.156	109.5
Scroll or Helical Rotary	< 150	School (K-12)	2	0.122	58.7

Measure Description	Unit Size	Business Type	CEE Tier	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Scroll or Helical Rotary	< 150	Warehouse	2	0.136	79.7
Scroll or Helical Rotary	< 150	Miscellaneous	2	0.137	109.1
Scroll or Helical Rotary	≥ 300	College/University	1	0.052	47.8
Scroll or Helical Rotary	≥ 300	Grocery	1	0.062	71.2
Scroll or Helical Rotary	≥ 300	Heavy Industry	1	0.054	41
Scroll or Helical Rotary	≥ 300	Hotel/Motel	1	0.061	68.8
Scroll or Helical Rotary	≥ 300	Light Industry	1	0.059	33.9
Scroll or Helical Rotary	≥ 300	Medical	1	0.059	64.6
Scroll or Helical Rotary	≥ 300	Office	1	0.059	35
Scroll or Helical Rotary	≥ 300	Restaurant	1	0.058	50.4
Scroll or Helical Rotary	≥ 300	Retail/Service	1	0.064	56.9
Scroll or Helical Rotary	≥ 300	School (K-12)	1	0.053	25.3
Scroll or Helical Rotary	≥ 300	Warehouse	1	0.063	36
Scroll or Helical Rotary	≥ 300	Miscellaneous	1	0.058	48.3
Scroll or Helical Rotary	≥ 300	College/University	2	0.096	87.8
Scroll or Helical Rotary	≥ 300	Grocery	2	0.114	130.7
Scroll or Helical Rotary	≥ 300	Heavy Industry	2	0.099	75.2
Scroll or Helical Rotary	≥ 300	Hotel/Motel	2	0.113	126.4
Scroll or Helical Rotary	≥ 300	Light Industry	2	0.108	62.2
Scroll or Helical Rotary	≥ 300	Medical	2	0.108	118.7
Scroll or Helical Rotary	≥ 300	Miscellaneous	2	0.112	87.7
Scroll or Helical Rotary	≥ 300	Office	2	0.109	64.2

Measure Description	Unit Size	Business Type	CEE Tier	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Scroll or Helical Rotary	≥ 300	Restaurant	2	0.106	92.5
Scroll or Helical Rotary	≥ 300	Retail/Service	2	0.107	94.5
Scroll or Helical Rotary	≥ 300	School (K-12)	2	0.097	46.4
Scroll or Helical Rotary	≥ 300	Warehouse	2	0.181	66.1
Scroll or Helical Rotary	150-300	College/University	1	0.052	47.7
Scroll or Helical Rotary	150-300	Grocery	1	0.062	71
Scroll or Helical Rotary	150-300	Heavy Industry	1	0.053	40.9
Scroll or Helical Rotary	150-300	Hotel/Motel	1	0.061	68.7
Scroll or Helical Rotary	150-300	Light Industry	1	0.059	33.8
Scroll or Helical Rotary	150-300	Medical	1	0.058	64.4
Scroll or Helical Rotary	150-300	Office	1	0.059	34.8
Scroll or Helical Rotary	150-300	Restaurant	1	0.057	50.2
Scroll or Helical Rotary	150-300	Retail/Service	1	0.082	47.4
Scroll or Helical Rotary	150-300	School (K-12)	1	0.052	25.2
Scroll or Helical Rotary	150-300	Warehouse	1	0.058	35
Scroll or Helical Rotary	150-300	Miscellaneous	1	0.059	47.2
Scroll or Helical Rotary	150-300	College/University	2	0.113	103.5
Scroll or Helical Rotary	150-300	Grocery	2	0.134	154.1
Scroll or Helical Rotary	150-300	Heavy Industry	2	0.116	88.7
Scroll or Helical Rotary	150-300	Hotel/Motel	2	0.133	149
Scroll or Helical Rotary	150-300	Light Industry	2	0.127	73.3
Scroll or Helical Rotary	150-300	Medical	2	0.127	139.9

Measure Description	Unit Size	Business Type	CEE Tier	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Scroll or Helical Rotary	150-300	Office	2	0.128	75.6
Scroll or Helical Rotary	150-300	Restaurant	2	0.125	109
Scroll or Helical Rotary	150-300	Retail/Service	2	0.146	102.8
Scroll or Helical Rotary	150-300	School (K-12)	2	0.114	54.7
Scroll or Helical Rotary	150-300	Warehouse	2	0.19	76
Scroll or Helical Rotary	150-300	Miscellaneous	2	0.132	102.4

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.

Measure Life and Incremental Measure Cost
The measure life for packaged units is 20 years according to DEER[25].

The following table provides IMC documented for this measure. Incremental cost is cost difference between the energy efficient equipment and the less efficient option.

[25] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report

Table 85: Chiller Incremental Measure Cost[26]

Measure Name	Level 1	Level 2
Water Cooled Chiller - Scroll or Helical Rotary <150 tons	$ 138.53	$ 211.04
Water Cooled Chiller - Scroll or Helical Rotary 151-300 tons	$ 80.89	$ 176.15
Water Cooled Chiller - Scroll or Helical Rotary >300 tons	$ 21.80	$ 49.87
Water Cooled Chiller - Centrifugal <150 tons	$ 138.53	$ 211.04
Water Cooled Chiller - Centrifugal 151-300	$ 80.89	$ 176.15
Water Cooled Chiller - Centrifugal >300 tons	$ 21.80	$ 49.87
Water Cooled Chiller - Reciprocating	$ 80.40	$ 145.69
Air Cooled Chiller kW/ton-IPLV of 1.04 or lower	$ 126.70	

[26] 2008 DEER, www.deeresources.com

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. There are two eligible efficiency levels as listed by the Consortium for Energy Efficiency. A unit can either qualify under ENERGY STAR standards or 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	8.63 EER
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: 2008 DEER
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. There are two eligible efficiency levels as listed by the Consortium for Energy Efficiency (CEE). 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 are listed CEE high-efficiency room air conditioning specifications (www.cee1.org)[27]. 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 86: Qualifying Efficiencies

	Level 1	Level 2
Size (Btuh)	**2000 ENERGY STAR (EER)**	**SEHA Tier 1 (EER)**
< 8,000	10.7	11.2
8000 to 13,999	10.8	11.3
14,000 to 19,999	10.7	11.2
>= 20,000	9.4	9.8

[27] 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. The coincident savings are identical across all building types.

Table 87: Measure Savings for Room AC

Measure Description	Business Type	Unit Size (Tons)	Level	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Room AC	Office	All	1	0.17	193
Room AC	School (K-12)	All	1	0.17	106
Room AC	College/University	All	1	0.17	178
Room AC	Retail/Service	All	1	0.17	216
Room AC	Restaurant	All	1	0.17	419
Room AC	Hotel/Motel	All	1	0.17	396
Room AC	Medical	All	1	0.17	277
Room AC	Grocery	All	1	0.17	286
Room AC	Warehouse	All	1	0.17	198
Room AC	Light Industrial	All	1	0.17	178
Room AC	Heavy Industrial	All	1	0.17	178
Room AC	Average = Miscellaneous	All	1	0.17	245
Room AC	Office	All	2	0.27	303
Room AC	School (K-12)	All	2	0.27	166
Room AC	College/University	All	2	0.27	280
Room AC	Retail/Service	All	2	0.27	340
Room AC	Restaurant	All	2	0.27	605
Room AC	Hotel/Motel	All	2	0.27	622

Measure Description	Business Type	Unit Size (Tons)	Level	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
Room AC	Medical	All	2	0.27	436
Room AC	Grocery	All	2	0.27	450
Room AC	Warehouse	All	2	0.27	311
Room AC	Light Industrial	All	2	0.27	280
Room AC	Heavy Industrial	All	2	0.27	280
Room AC	Average = Miscellaneous	All	2	0.27	379

Measure Savings Analysis

Savings values are calculated for both Level 1 and Level 2 efficiencies with standard efficiency of 8.63 EER as the baseline. Efficiency levels depend on the size of the unit, however to simplify calculations Level 1 is averaged to be 10 EER and Level 2 is averaged to be 11 EER.

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 9 years according to ENERGY STAR[28].

The following table provides IMC documented for this measure. Incremental cost is cost difference between the energy efficient equipment and the less efficient option.

[28] www.energystar.gov

Table 88: Room AC Incremental Measure Cost[29]

	Cost per Ton
Level 1	$ 138.53
Level 2	$ 80.89

[29] 2008 DEER, www.deeresources.com

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 89: Measure Savings for PTAC/HP

Measure Description	Business Type	Unit Size (Tons)	EER	Peak Electric Demand Reduction (kW/ton)	Electric Savings (kWh/ton)
PTAC/HP	Office	0.5 to 1.5	Qualifying	0.22	136
PTAC/HP	School (K-12)	0.5 to 1.5	Qualifying	0.22	105
PTAC/HP	College/University	0.5 to 1.5	Qualifying	0.22	211
PTAC/HP	Retail/Service	0.5 to 1.5	Qualifying	0.22	216
PTAC/HP	Restaurant	0.5 to 1.5	Qualifying	0.22	288
PTAC/HP	Hotel/Motel	0.5 to 1.5	Qualifying	0.22	328
PTAC/HP	Medical	0.5 to 1.5	Qualifying	0.22	315
PTAC/HP	Grocery	0.5 to 1.5	Qualifying	0.22	301
PTAC/HP	Warehouse	0.5 to 1.5	Qualifying	0.22	148
PTAC/HP	Light Industry	0.5 to 1.5	Qualifying	0.22	147
PTAC/HP	Heavy Industry	0.5 to 1.5	Qualifying	0.22	147
PTAC/HP	Average = Miscellaneous	0.5 to 1.5	Qualifying	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 90: 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[30].

The IMC documented for this measure is $84 per ton[31], which is the cost difference between the energy-efficient equipment and the less efficient option.

[30] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report
[31] 2008 DEER, www.deeresources.com

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 91: 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 92: 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[32]. The motors are assumed to have a load factor of 80 percent and an efficiency of 92.5 percent for calculating the equipment kW.

kW reduction = 0.19 x (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.

Coincident kW reduction = kW reduction x 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

[32] This percentage is a conservative estimate. DEER on average calculated over 30% savings for installing a VSD.

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.

Annual kWh Savings = kW Savings x Run Hours

Table 93: Chiller Annual Operating Hours

	Chillers
Building Type	
College/University	3498
Grocery	5840
Heavy Industry	4380
Hotel/Motel	3370
Light Industry	3012
Medical	2654
Office	1221
Restaurant	5293
Retail/Service	3357
School (K-12)	1889
Warehouse	3227
Average = Miscellaneous	3431

Table 94: Pump and Fan Annual Operating Hours

	Pumps and Fans
Building Type	
College/University	4216
Grocery	5840
Heavy Industry	3585
Hotel/Motel	6872
Light Industry	2465
Medical	6871
Office	1766
Restaurant	4654
Retail/Service	3438
School (K-12)	2203
Warehouse	3222
Average = Miscellaneous	4103

Measure Life and Incremental Measure Cost

The measure life for packaged units is 15 years according to DEER[33].

The IMC documented for this measure is $90 per horsepower and $150 per horsepower for chiller and pump/fan applications respectively[34].

[33] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report
[34] 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 95: 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 96: 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

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 [35]

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.

[35] "Infiltration Barriers- Strip Curtains," Workpaper WPSCNRRN0002. Southern California Edison Company. 2007.

Table 97: 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 98: 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 99: 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 100: 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 101: 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 [36]

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.

[36] "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.

The following table is the average values (across PG&E climate zones) calculated within the PG&E workpaper.

Table 102: 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 103: 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 [37]

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.

[37] "Efficient Evaporator Fan Motors (Shaded Pole to ECM)," Workpaper WPSCNRRN0011. Southern California Edison Company. 2007.

Table 104: 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 105: 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 106: 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 107: ECM Walk-In Savings Values Summary

	kWh Savings/ft	Peak kW Savings/ft
Restaurant	411	0.033
Grocery	392	0.054
Average	401	0.044

Table 115: ECM Reach-In Savings Values Summary

kWh Savings/ft	Peak kW Savings/ft
345	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 108: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	All	15	DEER[38]
Incremental Measure Cost	Walk-In	$250	Fisher Nickel[39]
Incremental Measure Cost	Reach-In	$184.71	SCE

[38] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report

[39] "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 [40]

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.

Table 109: 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 110: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	16	DEER
Incremental Measure Cost	$291.50	DEER

[40] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report

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 door
Base Case Description	No door closer
Measure Savings	Source: DEER
Measure Incremental Cost	Source: DEER $433.22
Effective Useful Life	Source: DEER 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 [41]

The savings for this measure is taken from DEER as the average savings across the various PG&E climate zones since the southern California climate zones tend to be drier and warmer than the Chicago area.

Table 111: DEER Savings for Auto Door Closers

PG&E Climate Zones	kWh Savings Per Door	Peak kW Savings Per Door
1	2,302	0.204
2	2,395	0.401
3	2,334	0.302
4	2,319	0.327
5	2,312	0.191
11	2,395	0.346
12	2,400	0.401
13	2,457	0.426
16	2,329	0.296
Average	2,360	0.322

Savings values resulted from modeling conditions, assume on average 40% reduction in infiltration.

[41] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report

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 112: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	8	DEER
Incremental Measure Cost	$433.22	DEER

Refrigeration Economizer	
Measure Description	Installation of an outside air refrigeration economizer
Units	Per compressor horsepower
Base Case Description	Refrigeration system without an economizer.
Measure Savings	Source: Efficiency Vermont
Measure Incremental Cost	Source: Efficiency Vermont
Effective Useful Life	Source: Efficiency Vermont 15 years

This measure is for the installation of outside air economizers for walk-in coolers. The economizers allow the use of outside airs rather than operating the compressor. Sufficient controls must be installed with the economizer.

Measure Savings

The coincident peak demand savings is 0 kW (i.e., no summer time savings). The coincident demand savings is 0.385 kW and annual energy savings is 1,135 kWh per economizer.

Measure Savings Analysis

Annual energy savings were calculated based on the methodology presented in Efficiency Vermont Technical User Reference Manual (No. 2004-29). The following are the equations used (see the reference for references of assumed values):

Demand Savings = kWh savings / Hours

$$\text{Energy Savings} = \left[HP \times kWh_{Cond} + \left(kW_{Evap} \times n_{fans} + kW_{Circ}\right) \times Hours \times FC \times DC_{Comp} \times BF\right] - \left[kW_{Econ} \times DC_{Econ} \times Hours\right]$$

Where:

HP = Horsepower of compressor (assumes 5 HP)

kWh_{Cond} = Condensor unit savings, assumed on average 1,138 kWh/HP

kW_{Evap} = Evaporator fan connected load (0.123 kW)

n_{fans} = Number of evaporator fans (assume two)

kW_{Circ} = Circulating fan connected load (0.035 kW)

Hours = Number of annual hours that economizer operates, 2944 hours based on 39°F cooler set point, Chicago weather data

FC = Fan control factor, assumed to be 1 for fan controls

DC_{Comp} = Duty cycle for compressor (50%)

BF = Interactive effects for reduced cooling load from reduced hours of evaporator fan operation (1.3)

kW_{Econ} = Economizer fan connected load (0.227 kW)

DC_{Econ} = Duty cycle for economizer fan (63%)

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.

Table 113: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	15	Efficiency Vermont
Incremental Measure Cost	$511.60	Efficiency Vermont

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 114: 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 115: 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
Measure Incremental Cost	Source: DEER $180
Effective Useful Life	Source: DEER 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.[42]

Measure Life and Incremental Measure Cost

The measure life is 10 years.[43] The IMC documented for this measure is $180 per unit.[44] 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.

[42] 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
Measure Incremental Cost	Source: DEER $80
Effective Useful Life	Source: DEER 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.[45]

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[46]

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.

[43] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

[44] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

[45] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

[46] 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 [47]

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 116: 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.

[47] 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.[48] 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 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[49]. A manufacturer's specification sheet must accompany the application that shows rating in accordance to ARI standard 810.

Measure Savings [50]

Savings values are obtained from the PG&E workpaper for the food service sector. Annual operating hours are assumed to be 8,760.

[48] The websites have a list of qualifying model numbers, www.energystar.gov or www.cee1.org.
[49] The websites have a list of qualifying model numbers, www.energystar.gov or www.cee1.org.
[50] "Food Service Equipment Workpapers; Ice Machine –Commercial Air Cooled," Pacific Gas and Electric. 2005.

Table 117: 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

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 118: 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 119: 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 120: 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

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 121: Measure Coincident kW Savings

	1200 RPM		1800 RPM		3600 RPM	
MOTOR HORSEPOWER	ODP MOTOR Coincident Demand Reduction (kW)	TEFC MOTOR Coincident Demand Reduction (kW)	ODP MOTOR Coincident Demand Reduction (kW)	TEFC MOTOR Coincident Demand Reduction (kW)	ODP MOTOR Coincident Demand Reduction (kW)	TEFC MOTOR Coincident Demand Reduction (kW)
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 122: Measure kWh Savings

	1200 RPM		1800 RPM		3600 RPM	
MOTOR HORSEPOWER	ODP MOTOR Annual Savings (kWh)	TEFC MOTOR Annual Savings (kWh)	ODP MOTOR Annual Savings (kWh)	TEFC MOTOR Annual Savings (kWh)	ODP MOTOR Annual Savings (kWh)	TEFC MOTOR Annual Savings (kWh)
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 $\frac{(\text{Motor HP}) \times (0.746\ \text{kW/HP}) \times (\text{Load Factor})}{\text{Motor Efficiency}}$.

Generally motors are oversized and so the load factor is assumed to be 75 percent.[51]

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)

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[52].

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[53]. 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 123: Annual Operating Hours[54]

	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

[51] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures
[52] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures
[53] 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).
[54] 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 124: Baseline Efficiencies Standard Motors

	1200 RPM		1800 RPM		3600 RPM	
MOTOR HORSEPOWER	Standard Efficiency ODP	Standard Efficiency TEFC	Standard Efficiency ODP	Standard Efficiency TEFC	Standard Efficiency ODP	Standard Efficiency 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 125: NEMA Premium Efficiencies

	1200 RPM		1800 RPM		3600 RPM	
MOTOR HORSEPOWER	NEMA Premium Efficiency ODP	NEMA Premium Efficiency TEFC	NEMA Premium Efficiency ODP	NEMA Premium Efficiency TEFC	NEMA Premium Efficiency ODP	NEMA Premium Efficiency 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.[55]

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.

[55] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Table 126: Motor Incremental Measure Cost[56]

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

[56] Southern California Edison Premium Motors Workpaper WPSCNPR0008. 2007