MEASUREMENT AND VERIFICATION OF ENERGY EFFICIENCY PROGRAM FOR LOS ANGELES DEPARTMENT OF WATER AND POWER

Annual Report for 2007-2008

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INTRODUCTION

Los Angeles Department of Water & Power (LADWP) has implemented several energy efficiency programs to motivate customer reduction in energy demand resulting in energy savings. In order to verify the energy savings achieved by their customers during 2007-2008, LADWP has contracted with Expedient Energy (ExEn) to conduct independent Measurement and Verification (M&V) for their energy conservation and incentive measures.

LADWP electric customers have implemented energy conservation measures at their buildings and facilities in accordance with the LADWP's Incentive Programs in five project areas:

- Chiller Efficiency Program (CEP)
- Lighting (CLEO)
- Custom Performance Program (CPP)
- Heating, Ventilating & Air Conditioning (HVAC)
- Refrigeration Program (RP)

LADWP provided copies of participant application forms to ExEn in each of the five targeted areas. Upon receipt and review of these applications, ExEn conducted site visits of selected customers and performed targeted M&V audits.

This report provides the findings of the M&V Audits in each area.

EXECUTIVE SUMMARY

Purpose of Measurement & Verification (M&V)

M&V* is utilized to quantify facility and utility energy savings using industry standardized, replicable methodologies. These methodologies allow accurate comparison results of a facility's energy usage at various times, e.g. before and after implementation of Energy Efficiency Measures (EEMs). M&V provides real data that indicates the value of the project implementation, as well as confirming that the EEMs were initiated as indicated by the participant application forms.

ExEn's M&V Program for LADWP Energy Efficiency Program serves three specific purposes:

1. Verify proper installation and implementation of the Energy Efficiency Measures associated with the Energy Efficiency Program
2. Note deficiencies, as needed
3. Measure actual energy savings associated with EEM implementation

**Measurement and Verification (M&V) within this report defines project-specific Energy Efficiency Measures (EEMs) as implemented in accordance with the LADWP Energy Efficiency Program (EEP).*

Methodology

The specific methodologies utilized by ExEn for measuring and verifying actual energy savings as a result of implemented efficiency measures vary depending upon the actual technologies being assessed. However, the general methodology utilizes the assumed baseline efficiency of the equipment to be replaced and the actual energy usage of the new equipment under the same times and modes of operation. For example, an assumption of replaced equipment energy usage at peak hours of operation is compared to new equipment energy usage at peak hours of operation. Specific methodologies, and discrepancies as applicable, are noted for each program.

Summary for M&V Programs

M&V Programs Summary

Project	LADWP Projected Savings	ExEn Savings	% of LADWP Projection
	kWh	kWh	
CEP	4,184,545	4,170,534	100%
CLEO	2,160,866	1,990,742	92%
CPP	1,166,415	1,304,794	112%
HVAC	17,374	21,668	125%
RP	761,180	742,209	98%
Total	8,290,380	8,229,947	99%

Measurement & Verification of energy savings for five of LADWP Energy Efficiency Programs showed that the baseline energy savings were met by an acceptable 1% below the projected savings by LADWP. In some cases, the installed equipment were: (1) Not the same as the units proposed in the incentive applications, (2) The proposed EEM were not installed completely and (3) Conservative baseline energy consumptions were projected. In these situations, energy saving calculations were not in line with established LADWP baselines. In order to avoid a recurrence of this issue, Expedient Energy recommends verification of all installed equipment before the incentive amount is paid to the customers. These discrepancies highlight the need for continuing measurement and verification efforts in any successful energy efficiency program to ensure both the accuracy and efficacy of the process.

OVERVIEW OF INDIVIDUAL PROGRAMS

Chiller Efficiency Program (CEP)

LADWP's Chiller Efficiency Program (CEP) provides incentives to qualified chillers, purchased, installed and operation on, or after July 1, 2006. Installing new energy efficient chillers will increase building's operating efficiency and yield energy saving benefits throughout the chiller's operating lifetime.

ExEn's subcontractor Alliance Consulting Engineers (ACE) visited twelve (12) designated sites to perform required M&V to verify proper installation of the chillers that were incentivized according to EEP's by the department.

ExEn prepared independent energy saving calculations and conducted verification of electric demand savings (kW) and electric energy savings (kWh) attributed to the EEM's.

Analysis Methodology
The energy saving calculations are based on the new chiller IPLV (Integrated Part Load Value) compared to measured IPLV based on kW/ton chiller efficiency under different load conditions as is shown below. The key assumption that allows this type of calculation is that the proposed and baseline chillers have identical operating characteristics. That is, the only difference between the proposed and baseline chillers is the rated efficiency.

Site Measurement:

- **A = kW/ton @ 100% Load**
- **B = kW/ton @ 75% Load**
- **C = kW/ton @ 50% Load**
- **D = kW/ton @ 25% Load**
- **Calculating the measured IPLV**

IPLV = 1/((0.01/A)+(0.42/B)+(0.45/C)+(0.12/D))

To measure kW/ton of the new installed chiller the following tasks are performed:

1. Utilizing a Electric Meter (B-clamp Meter 6000) measured the electric input to the chiller
2. Utilizing the chiller's control board to register electric input and performance load
3. Record performance data throughout the day at various chiller loading condition
4. Process and analyze data and project chiller efficiency

After analyzing all gathered data, chiller's kW/ton performance was extrapolated and calculated for various load condition. Then, the calculated kW/ton was used to determine chiller's IPLV.

Chiller Program Energy Savings

The following table summarizes annual M&V results for Chiller Efficiency program.

Chiller Projects Summary

Project	LADWP Projected Savings	ExEn Savings	LADWP Projected Savings	ExEn Savings	% of LADWP Projection
	kW	kW	kWh	kWh	
[redacted]	142.79	145.07	273,862	278,239	102%
	143.31	137.60	274,872	263,922	96%
	105.12	102.45	201,620	196,493	97%
	239.75	240.81	459,841	461,875	100%
	235.30	231.77	743,783	736,879	99%
	379.71	386.98	728,292	742,220	102%
	129.60	138.73	248,573	266,083	107%
	17.44	17.37	33,450	33,318	100%
	56.51	58.91	108,388	112,995	104%
	72.40	76.68	138,863	147,076	106%
	214.80	203.65	411,986	390,598	95%
	292.50	281.98	561,015	540,837	96%
Total	**2029.23**	**2021.99**	**4,184,545**	**4,170,534**	**100%**

Conclusion and Recommendations for Chiller Efficiency Program (CEP)

M&V determined that the total targeted energy savings for the chiller efficiency incentive program were achieved as projected by LADWP's established baseline.

Lighting (CLEO)

LADWP's Commercial Lighting Efficiency Offer Program (CLEO) provides rebates for retrofitting existing fixtures and lighting equipment with state-of-the-art, energy efficient lighting technologies. By implementing CLEO program, it offers energy saving benefits by reducing building's electricity bills, reducing lighting maintenance cost and increasing building's efficiency performance and workplace productivity.

ExEn visited eighteen (18) designated sites to perform required M&V to verify proper installation of the lighting system that was incentivized according to EEP's by LADWP.

ExEn prepared independent energy saving calculations and conducted verification of electric demand saving (kW) and electric energy savings (kWh) attributed to the EEM's.

Analysis Methodology

The pre-retrofit parameters were compared to post-retrofit parameters to derive electric demand (kW) and electric energy (kWh) savings.

System Performance Factors - Illumination levels shall be verified to the lighting levels stated or desired by the LADWP and provided in the site data package, unless otherwise noted. Generally, these levels include 50 foot-candles at work station surfaces, 30 foot-candles in work areas and 10 foot-candles in non-work areas, measured at a height of 30 inches above floor level. Total harmonic distortion of electronic ballasts used in fluorescent retrofits shall not exceed 15 percent.

Savings Calculation:

The average kW and peak kW are the same for all measures. Unless otherwise specified, the Field Support Group (FSG) would determine the hours of operation per year for all measures during the pre and post inspection and enter that number in their Final Post-Inspection report spreadsheet. The resulting number of hours will be used to determine the annual energy savings (kWh). **LADWP baseline of 72W for 2T12 and ES Ballast and 55W for a 2T8 and Electronic Ballast is used. Also the LADWP kW and kWh savings take the de-lamping from T12 to T8 in consideration which we could not field verify. As such the energy (kW and kWh) savings are for retrofits only.** The retrofit projects have generally resulted in actual energy savings in excess of the computed savings by ExEn as the de-lamping has not been considered and the fact that the baseline is in some instances lower than the actual existing field energy consumption.

Lighting Program Energy Savings

The following table summarizes annual M&V results for lighting program.

CLEO Projects Summary

Project	LADWP Projected Savings	ExEn Savings	LADWP Projected Savings	ExEn Savings	% of LADWP Projection
	kW	kW	kWh	kWh	
[redacted]	47.52	47.08	185,112	183,783	99%
	22.04	22.06	193,079	193,202	100%
	44.04	45.88	384,733	400,834	104%
	21.55	21.28	94,829	94,177	99%
	23.00	23.36	79,563	80,812	102%
	67.95	68.61	363,785	366,470	101%
	10.45	10.45	57,444	57,444	100%
	75.76	75.62	615,450	614,021	100%
	3.281	1.737	12,678	6,712	53%
	3.98	3.89	14,894	14,701	98%
	2.21	2.21	8,289	8,256	100%
	1.35	1.31	5,054	4,912	97%
	19.58	18.19	73,308	68,111	93%
	8.54	8.27	31,978	31,889	97%
	4.32	4.29	16,185	16,832	99%
	8.49	8.04	24,484	23,312	95%
Total	**364.06**	**362.27**	**2,160,866**	**2,165,465**	**100%**

*Combine savings from Pierce College South Gymnasium, College Art Room, and Pierce College Music Rooms 3400 & 3401

Conclusion and Recommendations for Lighting Program (CLEO)

Total energy savings for the lighting incentive program for the selected customers in this report were achieved as projected by LADWP's established baseline.

Custom Performance Program (CPP)

LADWP's Custom Performance Program (CPP) is patterned after the California Investor Owned Utilities' (IOU's) Standard Performance Contract (SPC) Program. This program provides incentives for energy saving measures not covered by existing prescriptive programs, such as equipment controls, industrial processes and other innovative energy saving strategies. CPP offers: lower electricity usage for building's operation, increase in building operating efficiency, and reduction in energy bills plus financial incentives.

Program incentives apply to equipment controls, CO sensors, high efficiency technologies, and other innovative strategies. Program managers and LADWP engineers will evaluate the benefits and merits of each of the energy saving measures using an efficiency estimation tool and calculate appropriate cash incentives for participating customers based on the program guidelines.

ExEn visited seven (7) identified sites to perform required M&V to verify proper installation of new Lighting Fixtures, Variable Speed Drive (VSD) for AHU Motor Fan, Chillers and Cooling Tower Fans, CO sensors for parking garages, Compressed Air Systems, and Other-Special Process/Installation that was incentivized according to EEP's by LADWP.

ExEn prepared independent energy saving calculations and conducted verification of electric demand savings (kW) and electric energy savings (kWh) for each site attributed to the EEM's.

Analysis Methodology
The energy savings is based on the post-installation electrical consumption of the new equipment. Savings are estimated by simply applying the ratio of baseline efficiency to proposed efficiency. This method assumes that the baseline equipment operates identically to the proposed equipment but in a less efficient manner.

Determination of Energy Savings for Custom Performance Program:
The following activities were completed in order to demonstrate savings:

- Determine baseline, minimum standard, efficiency and operation
- Determine new equipment efficiency and operation
- Calculated post-installation for new equipment energy use (kW-h)

Custom Performance Program Energy Savings

The following table summarizes annual M&V results for Custom Performance Program:

Custom Performance Projects Summary			
Project	**LADWP Projected Savings**	**ExEn Savings**	**% of LADWP Projection**
	kWh	**kWh**	
[redacted]	509,250	509,250	100%
[redacted] (1)	133,033	104,273	78%
[redacted]	23,833	23,832	100%
[redacted] (2)	162,061	412,984	255%
[redacted]	11,375	11,375	100%
[redacted]	11,375	11,375	100%
[redacted] (3)	315,488	231,705	73%
Total	**1,166,415**	**1,304,794**	**112%**

(1) The proposed exhaust fan motor efficiency was 84% but was calculated at an 80% efficiency
(2) The proposed energy savings calculation assumed a low baseline energy usage
(3) The proposed energy savings calculation assumed a low baseline energy usage

Conclusion and Recommendations for Custom Performance Program (CPP)

M&V determined that the total targeted energy savings for the custom performance project incentive program was 12% above the LADWP established baseline. We recommend that all energy saving measure applications for rebate be verified for installation *before* the rebate amounts are paid to the customers.

Heating, Ventilating & Air Conditioning (HVAC)

LADWP's Heating, Ventilating & Air Conditioning (HVAC) Program offers rebates for qualified energy efficient HVAC units. This program offers a great opportunity to reduce the cost of heating, ventilating and cooling buildings while maintaining a comfort zone that satisfies both employees and customers.

ExEn visited four (4) identified sites and performed the required M&V to verify the following:

- Proper installation
- Confirming the installed unit for size and efficiency as per submittals
- Check operation of condenser fan, compressors, and supply air fan
- Note any deficiencies

ExEn prepared independent energy saving calculations and conducted verification of electric demand savings (kW) and electric energy savings (kWh) attributed to the EEM's and compared to LADWP established baseline energy consumption for the EEMs.

Analysis Methodology

Efficiency of package units is measured by the *Energy Efficiency Ratio* (EER) or Cooling Btu's per hour divided by electric input in Watts.

The energy savings is based on comparing the efficiency of the new installed unit with the existing unit that was replaced. Savings are estimated by simply applying the ratio of baseline efficiency (see table A) to installed efficiency. This method assumes that the baseline HVAC equipment operates identically to the proposed equipment but in a less efficient manner.

Determining Energy Savings:

The following activities have been completed in order to demonstrate savings:

- Determine baseline, minimum standard, efficiency (EER) by comparing the existing unit efficiency with the required minimum Title-24 efficiency and degrading the efficiency by 1% per year
- Determine new HVAC system efficiency (EER)
- Calculate post-installation HVAC system equipment energy use (kW-h)

Table-A: Title 24 Minimum Efficiency Requirements

	Efficiency			
Title 24 standard	≥65,000 Btu/h and ≤135,000 Btu/h	≥135,000 Btu/h and ≤240,000 Btu/h	≥240,000 Btu/h and ≤760,000 Btu/h	≥760,000 Btu/h
1995	8.2 EER	8.5 EER	8.5 EER	8.2 EER
1998	8.9 EER	8.5 EER	8.5 EER	8.2 EER
2001	10.3 EER	9.7 EER	9.5 EER	9.2 EER
2005	10.3 EER	9.7 EER	9.5 EER	9.2 EER

For all units over 20 years old, a base efficiency of 6.4 EER is assumed.

HVAC Energy Savings

The following table summarizes annual M&V results for HVAC program.

HVAC Projects Summary

Project	LADWP Projected Savings	ExEn Savings	LADWP Projected Savings	ExEn Savings	% of LADWP Projection
	kW	kW	kWh	kWh	
[redacted]	5.50	6.60	5,726	6,868	120%
	5.50	7.38	5,726	7,686	134%
	1.34	2.04	1,395	2,119	152%
	4.35	4.80	4,528	4,994	110%
Total	**16.69**	**20.81**	**17,374**	**21,668**	**125%**

Conclusion and Recommendations for HVAC

M&V determined the total energy savings exceeded LADWP's established baseline by 25%. In such cases, better-than-projected energy savings can be directly tied to conservative baseline energy consumption assumed by LADWP. Assumptions must be recognized as such and are based on factors like industry standards of energy usage determined by the age and condition of the unit.

Refrigeration Program (RP)

LADWP's Refrigeration Program (RP) provides rebates for the replacement or retrofit of existing refrigeration equipment with qualified state-of-the-art energy efficient refrigeration technologies. This program reduces building's electricity expenses, improves buildings' energy efficient performance, and benefits the environment by reducing the amount of green house gases emitted into the atmosphere.

ExEn visited twelve (12) identified sites to perform required M&V to verify proper installation of the new ice making machine, evaporator fan motors and door gasket replacement on refrigerators that was incentivized according to EEP's by LADWP.

ExEn prepared independent energy saving calculations and conducted verification of electric demand saving (kW) and electric energy savings (kWh) attributed to the EEM's.

Analysis Methodology

The energy savings is based on the post-installation electrical consumption of the new refrigeration equipment. Savings are estimated by simply applying the ratio of baseline efficiency to proposed efficiency. This method assumes that the baseline refrigeration equipment operates identically to the proposed equipment but in a less efficient manner.

Determination of Energy Savings:

The following activities were completed in order to demonstrate savings:

- Determine baseline, minimum standard, efficiency
- Determine new refrigeration system efficiency
- Calculated post-installation refrigeration system equipment energy use (kW-h)

Refrigeration Program Energy Savings

The following table summarizes annual M&V result for Refrigeration program:

Refrigeration Projects Summary

Project	LADWP Projected Savings	ExEn Savings	% of LADWP Projection
	kWh	kWh	
[redacted]	72,684	72,684	100%
	7,300	7,008	96%
	48,302	46,954	97%
	70,780	68,766	97%
	41,193	40,033	97%
	61,109	59,393	97%
	120,128	116,771	97%
	115,214	111,953	97%
	4,927	5,256	107%
	1,661	1,664	100%
	110,300	107,222	97%
	107,582	104,506	97%
Total	**761,180**	**742,209**	**98%**

Conclusion and Recommendations for Refrigeration Program (RP)

M&V determined that the total targeted energy savings for the refrigeration incentive program was met within the acceptable margin of 2% below the LADWP established baseline.

DETAIL OF M&V ACTIVITIES

Chiller Efficiency Detail of M&V Activities

ExEn visited twelve (12) selected sites to perform M&V on task CEP-1. The following describes the site and number of Chiller systems that were verified per EEP incentive.

- [redacted]

Building #1 - [redacted] is a multi-story office building. The building is equipped with two 285 Ton chillers located in a chiller plant. The chillers are configured to operate in stages, when chiller CH-1 reaches 60% loading then chiller CH-2 starts to operate. Operating the chillers under part load conditions improves the overall efficiency of the plant. Table-1 shows summary comparison of the energy savings for these units based on the LADWP and M&V calculation methodology. Based on this comparison the new installed chillers perform approximately 2.0% (see Table-1) better than the original projections.

Building #2 - [redacted] is a multi-story office building. The building is equipped with two 424 Ton chillers. Chillers CH-1 and CH-2 are located in a chiller plant. Table-1 shows summary comparison of the energy savings for these units based on the LADWP and M&V calculation methodology. Based on this comparison the new installed chillers perform approximately 4.0% (see Table-1) less than the original projections.

Building #3 - [redacted] is a multi-story office building. The building is equipped with two chillers, located in a chiller plant up on the roof. Only chiller CH-2 is included in this program. The chiller CH-2 provides 480 tons of cooling capacity. Table-1 shows summary comparison of the energy savings for these units based on the LADWP and M&V calculation methodology. Based on this comparison the new installed chiller performs approximately 3.0% (see Table-1) less than the original projections.

Building #4 - [redacted] is a university. The building is equipped with two chillers, located in a chiller plant. Both chillers CH-2 and CH-3 are included in this program. Chiller CH-2 is a 750 ton chiller which replaces two existing 285 ton chillers while CH-3 is a 500 ton chiller that replaced the old existing 500 ton chiller. Combined, the two chillers provide 1250 tons of cooling. Table-1 shows summary comparison of the energy savings for these units based on the LADWP and M&V calculation methodology. Based on this comparison the new installed chillers perform exactly similar (see Table-1) to the original projections.

Building #5 - [redacted] It is a broadcasting building with operating 24 hours a day. The building is equipped with multiple chillers, located in a chiller plant. Only chillers CH-7 and CH-8 are included in this program. The chillers are 650 tons each for a total capacity of 1300 tons. Table-1 shows summary comparison of the energy savings for these units based on the LADWP and M&V calculation methodology. Based on this comparison the new installed chillers perform approximately 2.0% (see Table-1) less than the original projections.

Building #6 - [redacted] This is large Central Plant Facility housing multiple chillers. Chiller CH-7 at a 2813 ton nominal capacity is included in this program. Table-1 shows summary comparison of the energy savings for this unit based on the LADWP and M&V calculation methodology. Based on this comparison the new installed chiller performs approximately 2.0% (see Table-1) better than the original projections.

Building #7 - [redacted] The building is equipped with multiple chillers but only chiller CH-6 is included in this program. The chiller is 1800 tons. Table-1 shows summary comparison of the energy savings for this unit based on the LADWP and M&V calculation methodology. Based on this comparison the new installed chiller performs approximately 7.0% (see Table-1) better than the original projections.

Building #8 - [redacted] is a low-rise office building. The building is equipped with two chillers, located in a chiller plant. Chiller CH-2 at 160 Tons is the only chiller included in this program. Table-1 shows summary comparison of the energy savings for this unit based on the LADWP and M&V calculation methodology. Based on this comparison the new installed chiller performs exactly similar (see table-1) to the original projections.

Building #9 - [redacted] is a multi-story office building located on Wilshire Boulevard. The building is equipped with two chillers, located in the basement. Only chiller CH-2 is included in this program. The chiller capacity is 299 tons. Table-1 shows summary comparison of the energy savings for this unit based on the LADWP and M&V calculation methodology. Based on this comparison the new installed chiller performs approximately 4.0% (see table-1) better than the original projections.

Building #10 – [redacted] is a multi-story office building located on Wilshire Boulevard. The building is equipped with three chillers, located in a chiller plant. Only the smaller chiller CH-3 is included in this program. The chiller capacity is 362 tons. Table-1 shows summary comparison of the energy savings for this unit based on the LADWP and M&V calculation methodology. Based on this comparison the new installed chiller performs approximately 5.0% (see table-1) better than the original projections.

Building #11 - [redacted] is a multi-story office building located on Wilshire Boulevard. The building is equipped with two chillers, located in a chiller plant. Both chillers CH-1 and CH-2 are included in this program. The chillers are 600 tons each for a total capacity of 1200 tons. Table-1 shows summary comparison of the energy savings for these units based on the LADWP and M&V calculation methodology. Based on this comparison the new installed chillers perform approximately 5.0% (see table-1) less than the original projections.

Building # 12 - [redacted] is equipped with three chillers, located in a chiller plant. All three chillers CH-1, CH-2 and CH-3 are included in this program. Each chiller is 500 tons. Combined, the three chillers provide 1500 tons of cooling. Table-1 shows summary comparison of the energy savings for these units based on the LADWP and M&V calculation methodology. Based on this comparison the new installed chillers perform approximately 3.0% (see Table-1) less than the original projections.

Table B

CALCULATED IPLV FIGURES BASED ON FIELD MEASUREMENT VERIFICATION

Building #	1	1	2	2	3	4	4	5	5	6	7	8	9	10	11	11	12	12	12
	CH-1	CH-2	CH-1	CH-1	CH-2	CH-2	CH-3	CH-7	CH-8	CH-7	CH-6	CH-2	CH-1	CH-1	CH-1	CH-2	CH-1	CH-2	CH-3
	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton	kW/ton
At 100% load	0.56	0.57	0.58	##	0.55	0.55	0.56	0.57	0.56	0.61	0.65	0.73	0.61	0.56	0.58	0.58	0.55	0.55	0.55
At 75% load	0.39	0.41	0.43	##	0.39	0.41	0.44	0.44	0.43	0.46	0.52	0.66	0.47	0.41	0.45	0.45	0.43	0.43	0.43
At 50% load	0.28	0.30	0.34	##	0.29	0.31	0.32	0.31	0.31	0.37	0.43	0.42	0.34	0.28	0.32	0.32	0.31	0.31	0.31
At 25% load	0.40	0.40	0.44	##	0.37	0.35	0.33	0.47	0.47	0.43	0.49	0.60	0.45	0.39	0.44	0.44	0.38	0.38	0.38
IPLV*	**0.333**	**0.352**	**0.386**	##	**0.337**	**0.352**	**0.365**	**0.373**	**0.370**	**0.412**	**0.473**	**0.520**	**0.4**	**0.34**	**0.38**	**0.38**	**0.36**	**0.36**	**0.36**

*** Provided IPLV by LADWP for rebate amount paid to the customer**

Building #	
1	[redacted]
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

Chiller Efficiency Program Summary of LADWP Projected Savings

The following table shows verified data and energy savings projections for each location.

Project: M&V
Task: CEP-1
DATE: 9/9/2008
ExEn Job#: 08-135

TABLE -1

Energy Efficiency Report Summary

		New Installed Chiller					Existing Chiller		New Chiller				Baseline T-24	Annual Operation	Energy savings New Vs. T-24 Published IPLV		Energy savings New Vs. T-24 Estimated IPLV (2)		% of LADW Projection
Account Name	Service Address	# of Unit	Chiller #	Manufacturer	Model #	Serial #	Total Ton	kW/Ton (1)	Total Ton	Published IPLV	M &V IPLV (2)	kW	IPLV	Hours	Annual kW	Annual kWh	Annual kW	Annual kWh	
[redacted]		1	CH-1	Trane CenTraVac	CVHE320	LO7E02495	250	0.75	285	0.334	0.333	94.9	0.597	1918	74.96	143,764	75.21	144,245	100%
		1	CH-2	Trane CenTraVac	CVHE450	LO7E02494	250	0.75	285	0.359	0.352	100.3	0.597	1918	67.83	130,098	69.86	133,994	103%
		1	CH-1	Carrier Evergreen	19XRV4041352KDH64	74208	424	-	424	0.381	0.386	163.7	0.55	1918	71.66	137,436	69.51	133,318	97%
		1	CH-2	Carrier Evergreen	19XRV4041352KDH64	74207	424	-	424	0.381	0.389	165.1	0.55	1918	71.66	137,436	68.09	130,604	95%
		1	CH-2	Trane CenTraVac	CVHF485	LO7E02362	480	-	480	0.331	0.337	161.6	0.55	1918	105.12	201,620	102.45	196,493	97%
		1	CH-2	Trane CenTraVac	CVHF770	LO8A00293	2 @ 285	0.95	750	0.357	0.352	264.4	0.55	1918	144.75	277,631	148.14	284,133	102%
		1	CH-3	Trane CenTraVac	CVHF570	LO8A00294	500	0.80	500	0.360	0.365	182.3	0.55	1918	95.00	182,210	92.67	177,742	98%
		1	CH-7	Carrier Evergreen	19XRV5757456LDH64	74547	600	0.91	650	0.369	0.373	242.6	0.55	1057	117.65	124,356	114.87	121,422	98%
		1	CH-8	Carrier Evergreen	19XRV5757456LDH64	74548	600	0.91	650	0.369	0.370	240.6	0.55	5265	117.65	619,427	116.90	615,457	99%
		1	CH-7	York MAXE	YKZCZ4J7-DKFS	SNSM-743610	2,250	-	2,812.7	0.415	0.412	1,160.0	0.55	1918	379.71	728,292	386.98	742,220	102%
		1	CH-6	York MAXE	YKJGJBJ4-DDF	SLSM-696430	n/a	-	1,800	0.478	0.473	851.3	0.55	1918	129.60	248,573	138.73	266,083	107%
		1	CH-2	Carrier HXC	30HXC161R--661AA	2407Q07559	153	0.91	160	0.520	0.520	83.3	0.629	1918	17.44	33,450	17.37	33,318	100%
		1	CH-1	Carrier Evergreen	19XRV3030327KBH64	72821	299	0.9	299	0.408	0.400	119.6	0.597	1918	56.51	108,388	58.90	112,976	104%
		1	CH-1	Carrier Evergreen	19XRV4142343KBH64	72818	362	0.9	362	0.350	0.340	123.1	0.55	1918	72.40	138,863	76.02	145,806	105%
		2	CH-1	Carrier Evergreen	19XRV5051446LCH64	72819 72820	1,200	0.9	1,200	0.371	0.380	456.0	0.55	1918	214.80	411,986	204.00	391,272	95%
		3	CH-1 CH-2 CH-3	York	YKDFDFQ7-CPF	SERM-185440 SERM- 185550 SERM_185660	1,200	0.9	1,500	0.355	0.360	540.0	0.55	1918	292.50	561,015	285.00	546,630	97%
Total															2,029.2	4,184,546	2,024.70	4,175,712	100%

Notes:
(1) Existing unit efficiency assumed by LADWP
(2) Established based on the average data measured.

Conclusion and Recommendations for Chiller Efficiency Program (CEP)

M&V determined that the total targeted energy savings for the chiller efficiency incentive program were achieved as projected by LADWP established baseline.

Lighting Efficiency Detail of M&V Activities

ExEn visited eighteen (18) sites to perform the required M&V to verify proper installation of the lighting system that was incentivized according to EEP's by LADWP. Detail of each site visit follows in the next section.

ExEn prepared independent energy saving calculations and conducted verification of electric demand saving (kW) and electric energy savings (kWh) attributed to the EEM’s.

1. [redacted]

Date of EM&V: 08-26-2009

This is a [redacted] wastewater treatment facility operating as a full secondary treatment. Customer received a proposal for retrofit of 264 High Bay Fluorescent Fixtures. A lighting retrofit was performed on 214 High Bay Fluorescent four (4) T-5 lamps and 49 Linear Bay Fluorescent two (2) T-5 lamps and 198 occupancy sensors.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Existing	# Incentive	Hours	kW savings per Item	Total kW Savings	Total kWh Savings
MHS400/1	Metal Halide	215	3000	0.218	46.87	140,610
MH200/1	Metal Halide	34	3000	0.013	0.442	1,326
MH175/1	Metal Halide	16	3000	0.013	0.208	624
-	sensor	198	-	-	0	42,552
Total		463			47.52	185,112

ExEn FIELD VERIFICATION

Measure Code	Invoice Task Number	New	# Verified	Baseline Watts per Fixture	Watts per Fixture	kW Savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
LIF0103	CLEO-6	High Bay Linear fluorescent Fixtures 4-lamp T-5	215	458	242	0.216	3,000	46.44	139,320	99%
LIC0202	CLEO-6	High Bay Linear fluorescent Fixture 2-Lamp T-5	49	295	282	0.013	3,000	0.637	1,911	98%
LIK0402	CLEO-11	Occupancy Sensor (160 Watts controlled)	12	-	-	0	3,000	-	1,728	100%
LIK0404	CLEO-11	Occupancy Sensor (240 Watts controlled)	189	-	-	0	3,000	-	40,824	100%
Total			465					47.077	183,783	99%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

2. [redacted]

Date of EM&V: 8-27-2009

This is a multi-tenant sixth (6)-story executive plaza. The office spaces have been retrofitted with one (1) T-5, two (2) T-5, two (2) T-8, and LED Exit Signs. The lobby area(s) have been retrofitted with 14-26 Watt Screw-In CFL.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Existing	# Incentive	Hours	kW savings per Item	Total kW Savings	Total kWh Savings
LIA0101	Screw-In CFL 5-13 Watts	150	8,760	0.055	8.25	72,270
LIC0101	Linear Fluorescent Fixture 1-Lamp RLO T-5	459	8,760	0.013	5.967	52,271
LIC0201	Linear fluorescent Fixture 2-Lamp RLO T-5	252	8,760	0.013	3.276	28,698
LIE0101	High Performance fluorescent RLO 4-ft 2-Lamp T8 30 Watt	51	8,760	0.024	1.224	10,722
LIJ0102	LED Exit Sign	14	8,760	0.031	0.434	3,802
LIC0303	T-12 to T-8	289	8,760	0.010	2.89	25,316
Total		1,215			22.041	193,079

ExEn FIELD VERIFICATION

Measure Code	Invoice Task Number	New	# Verified	Baseline Watts per Fixture	New Watts per Fixture	kW Savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
LIA0202	CLE0-1	Screw in CFL 14-26 Watts	150	75	20	0.055	8,760	8.3	72,270	100%
LIC0102	CLEO-3	Linear fluorescent Fixture 1-Lamp NLO T-5	459	35	22	0.013	8,760	5.967	52,271	100%
LIC0202	CLE0-3	Linear fluorescent Fixture 2-Lamp NLO T-5	252	40	27	0.013	8,760	3.276	28,698	100%
LICO303	CLE0-3	Linear fluorescent Fixture T12 to T8 Change Out	289	32	22	0.01	8,760	2.89	25,316	100%
LIE0108	CLEO-5	High Performance fluorescent NLO 4-ft 2-Lamp T-8 28-Watt	51	65	41	0.024	8,760	1.224	10,722	100%
LIJ0102	CLEO-10	LED Exit Sign Replacing Incandescent	14	35	3	0.032	8,760	0.448	3,924	103%
Total			1,215					22.055	193,202	100%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

3. [redacted]

Date of EM&V 08-26-2009

This is a three (3)-story government facility. Existing incandescent and fluorescent exit signs have been retrofitted with LED exit signs and one (1) T-12 with one (1) T-8.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Existing	# Incentive	Hours	kW savings per Item	Total kW Savings	Total kWh Savings
F42EE	1X4 Wrap ES-2-40-12 Fluorescent	1,729	8,736	0.024	41.496	362,509
F81ES	1X8 Strip S1-96-120 Fluoresccent	3	8,736	0.05	0.15	1,310
ECF7W	Exit Sign 2-9 W PL	57	8,736	0.011	0.627	5,477
EI120/1	Exit Sign 20W	57	8,736	0.031	1.767	15,437
Total		1,846			44.04	384,733

ExEn FIELD VERIFICATION

Measure Code	Invoice Task Number	New	# Verified	Baseline Watts per Fixture	New Watts per Fixture	kW Savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
LID0100	CLEO-4	High Performance fluorescent RLO 4-ft 2-Lamp T-8	1,729	75	50	0.025	8,736	43.225	377,614	104%
LID0107	CLEO-4	High Performance fluorescent RLO 4-ft 4-Lamp T-8	3	95	45	0.05	8,736	0.15	1,310	100%
LIJ101	CLEO-10	LED ES Replacing Fluorescent	57	15	3	0.012	8,736	0.684	5,975	109%
LIJ102	CLE0-10	LED ES Replacing Incandescent	57	34	2	0.032	8,736	1.824	15,934	103%
Total			1,846					45.883	400,834	104%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

4. Customer Name: [redacted]

Date of EM&V: 08-26-2009

This is a multi-tenant 31-story Office building. The majority of the lighting has been retrofitted to reduce wattage on 4299 28-Watt T-8 fixtures with high performance ballasts.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Existing	# Incentive	Hours	kW savings per Item	Total kW Savings	Total kWh Savings
F21SS	1L20 Wrap	210	3858	0.017	3.57	13,773
F32SS	2L30 1X3 PRIS	74	3858	0.02	1.48	5,710
FU2EE	2L40 2X2 PRIS	341	3858	0.037	12.617	48,676
F42EE	2L40 2X4 S REFL PRIS	20	3858	0.029	0.58	2,238
F44EE	4L40 2X4 PRIS	25	3858	0.024	0.6	2,315
F46EE	6L40 4X4 PRIS	4	3858	0.051	0.204	787
F82EE	2L96 STRIP	1	3858	0.06	0.06	231
F82EE	2L96 HO STRIP	1	3858	0.049	0.049	189
E120/2	EXIT-D GREEN	77	8760	0.031	2.387	20,910
Total		753			21.547	94,829

ExEn FIELD VERIFICATION

Measure Code	Invoice Task Number	New	# Verified	Baseline Watts per Fixture	New Watts per Fixture	kW Savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
LIC0101	CLE0-3	Linear Flurescent 4-ft-1-Lamp-RLO T-8	210	37	20	0.017	3,858	3.57	13,773	100%
LIC0201	CLE0-3	Linear Flurescent 4-ft-2-Lamp-RLO T-8	74	64	44	0.02	3,858	1.48	5,710	100%
LIC0204	CLE0-3	Linear Flurescent 4-ft-3 Lamp-RLO T-8	341	82	46	0.036	3,858	12.276	47,361	97%
LIE0107	CLEO-5	Reduced Wattage w/ High Performance Ballast Two 28-Watt Lamp RLO T-8	20	72	44	0.028	3,858	0.56	2,160	97%
LIE0108	CLEO-5	Reduced Wattage w/ High Performance Ballast Two 28-Watt Lamp NLO T-8	25	74	49	0.025	3,858	0.625	2,411	104%
LIE0109	CLE0-5	Reduced Wattage w/ High Performance Ballast Three 28-Watt Lamp NLO T-8	4	180	130	0.05	3,858	0.2	772	98%
LIE0111	CLE0-5	Reduced Wattage w/ High Performance Ballast Four 28-Watt Lamp RLO T-8	1	155	100	0.055	3,858	0.055	212	92%
LIE0112	CLE0-5	Reduced Wattage w/ High Performance Ballast Four 28-Watt Lamp NLO T-8	1	148	98	0.05	3,858	0.05	193	102%
LIJ0102	CLE0-10	LED ES Replacing Incandescent	77	36	4	0.032	8,760	2.464	21,585	103%
Total			753					21.28	94,177	99%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

5. Customer Name: [redacted]

Date of EM&V: 08-27-2009

This is a multi-tenant 23-story office building. The majority of the existing lighting 4-foot T-12 fixture has been retrofitted with new energy efficient 4-foot T-8 fixture with electronic ballast and incandescent exit sign been replaced with LED exit signs.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Existing	# Incentive	Hours	kW savings per Item	Total kW Savings	Total kWh Savings
I100	Incandescent Fixture 100-Watt	55	3,460	0.049	2.70	9,325
no code	75W Incandescent Flood	47	3,460	0.055	2.59	8,944
F41EE	One-Lamp 4-Foot T-12 Fluorescent Fixture	324	3,460	0.017	5.51	19,058
F31SS	One-Lamp 3-Foot T-12 Fluorescent Fixture	347	3,460	0.013	4.51	15,608
F32SS	Two Lamp 4-Foot T-12 Fluorescent Fixture	122	3,460	0.02	2.44	8,442
F42EE	Two Lamp 4-Foot T-12 Fluorescent Fixture	260	3,460	0.013	3.38	11,695
F34SS	Three Lamp 4-Foot T-12 Fluorescent Fixture	8	3,460	0.042	0.34	1,163
F42EE	Two Lamp 4-Foot T-12 Fluorescent Fixture	20	3,460	0.029	0.58	2,007
F43EE	Three Lamp 4-Foot T-12 Fluorescent Fixture	25	3,460	0.024	0.60	2,076
F82EE	Two Lamp 8-Foot T-12 Fluorescent Fixture	6	3,460	0.06	0.36	1,246
Total		1,214			23.00	79,563

ExEn FIELD VERIFICATION

Measure Code	Invoice Task Number	New	# Verified	Baseline Watts per Fixture	New Watts per Fixture	kW Savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
LIA0102	CLEO-1	Screw-In CFL 14-26 Watts	55	80	26	0.054	3,460	2.97	10,276	110%
LIA0202	CLEO-1	Screw-In CFL 14-26 Watts	47	79	26	0.053	3,460	2.491	8,619	96%
LIC0101	CLEO-3	Linear Fluorescent 4-Ft One Lamp RLO T8	324	44	27	0.017	3,460	5.508	19,058	100%
LIC0102	CLE0-3	Linear Fluorescent 4-Ft One Lamp NLO T8	347	43	30	0.013	3,460	4.511	15,608	100%
LIC0201	CLEO-3	Linear Fluorescent 4-Ft Two Lamp RLO T8	122	65	45	0.02	3,460	2.44	8,442	100%
LIC0202	CLE0-3	Linear Fluorescent 4-Ft Two Lamp NLO T8	260	43	30	0.013	3,460	3.38	11,695	100%
LIC0207	CLEO-3	Linear Fluorescent 4-ft Four Lamp RLO T8	8	88	46	0.042	3,460	0.336	1,163	100%
LIE0107	CLE0-5	Reduce Wattage w/ Ballast Two 28-Watt Lamp RLO T8	20	84	46	0.038	3,460	0.76	2,630	131%
LIE0108	CLEO-5	Reduce Wattage w/ Ballast Two 28-Watt Lamp NLO T8	25	88	64	0.024	3,460	0.6	2,076	100%
LIE0111	CLE0-5	Reduced Wattage w/ Ballast Four 28-Watt Lamp RLO T-8	6	160	100	0.06	3,460	0.36	1,246	100%
Total			1,214					23.36	80,812	102%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

6. Customer Name: [redacted]

Date of EM&V: 08-27-2009

This is a 52-story [redacted] office building. The existing 2x2 fixtures have been retrofitted to two (2) U lamps with new electronic ballast, incandescent fixtures to Ceramic Metal Halide and 16-Watt exit sign to 3-Watt LED exit sign.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Existing	# Incentive	Hours	kW savings per Item	Total kW Savings	Total kWh Savings
I100	INC.SM JAR	660	4,067	0.049	32.34	131,527
F42SS-BX	2L40 BIAX 2X2 36 CELL	1,000	4,067	0.013	13.00	52,871
I260	INC-REC CAN	203	7,840	0.1	20.30	159,152
ECF7W	EXIT-S EDGE	210	8,760	0.011	2.31	20,236
Total		2,073			67.95	363,785

ExEn FIELD VERIFICATION

Measure Code	Invoice Task Number	New	# Verified	Baseline Watts per Fixture	New Watts per Fixture	kW Savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
LIA0102	CLEO-1	Screw-in CFL 14-26 Watts	660	75	25	0.05	4,067	33	134,211	102%
LIC0202	CLEO-3	Linear Fluorescent -TWO LAMP NLO	1,000	68	55	0.013	4,067	13	52,871	100%
LIH0102	CLEO-8	Ceramic Metal Halide- >= 70 Watts	203	170	70	0.1	7,840	20.3	159,152	100%
LIJ0101	CLEO-10	LED Exit Sign New Fixture-replacing Fluorescent	210	15	4	0.011	8,760	2.31	20,236	100%
Total			2,073					68.61	366,470	101%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

7. Customer Name: [redacted]

Date of EM&V 08-27-2009

This is an [redacted] office building. Customer received a proposal for retrofit on reducing wattage on 2688 T-8 fixtures with high performance ballast, 79 LED exit sign, 222 4-foot T-5 fixtures and 57 screw-in CFLs.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Invoice Task Number	Existing	# Incentive	Hours	kW savings per Item	Total kW Savings	Total kWh Savings
Data not provided			57	4,500	0.049	2.79	12,569
			222	4,500	0.013	2.89	12,987
			30	4,500	0.043	1.29	5,805
			21	4,500	0.049	1.03	4,631
			79	8,760	0.031	2.45	21,453
			49	-	-	-	-
Total			458			10.45	57,444

ExEn FIELD VERIFICATION

Measure Code	Invoice Task Number	New	# Verified	Baseline Watts per Fixture	New Watts per Fixture	kW Savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
LIA0102	CLE0-1	Screw-In CFL 14-26 Watts	57	69	20	0.049	4,500	2.793	12,569	100%
LIC0102	CLEO-3	Linear Fluorescent 4-Ft One Lamp NLO T-8	222	35	22	0.013	4,500	2.886	12,987	100%
LIE0110	CLEO-5	Reduce Wattage Three 28-Watt Lamp NLO T-8	30	173	130	0.043	4,500	1.29	5,805	100%
LIE0112	CLE0-5	Reduce Wattage Four 28-Watt Lamp NLO T-8	21	147	98	0.049	4,500	1.029	4,631	100%
LIJ0102	CLEO-10	LED ES Replacing Incandescent	79	32	1	0.031	8,760	2.449	21,453	100%
LIK0104	CLEO-11	Occupancy sensors (controls 200 watts)	49	-	-	-	-	-	-	-
Total			458					10.447	57,444	100%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

8. Customer Name: [redacted]

Date of EM&V: 08-27-2009

This is an [redacted] warehouse. The majority of the existing lighting 8-foot T-12 fixture has been retrofitted with 8-foot T-8 fixture with electronic ballasts and the 4-foot T-12 fixture has been retrofitted with 4-foot T-8 fixture with electronic ballasts. The incandescent exist sign has been retrofitted with energy saving LED exit sign.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Existing	# Incentive	Hours	kW savings per Item	Total kW Savings	Total kWh Savings
I150	150-Watt Incandescent	13	3,120	0.055	0.72	2,231
F41EE	4-Ft One Lamp T-12 Fixture	139	6,935	0.013	1.81	12,532
F32SS	3-Ft Two Lamp T-12 Fixture	3	4,950	0.02	0.06	297
I100	100-Watt Incandescent	24	8,760	0.013	0.31	2,733
I150	150-Watt Incandescent	14	3,120	0.042	0.59	1,835
F82EE	8-Ft Two-Lamp T-12 Industrial	41	3,120	0.026	1.07	3,326
no. code	8-Ft T-12	779	8,760	0.01	7.79	68,240
F42EE	4-Ft Two Lamp T-12 Fixture	269	8,760	0.024	6.46	56,555
F41EE	4-Ft One Lamp T-12 Fixture	444	8,760	0.017	7.55	66,120
F44EE	4-Ft Four-Lamp T-12 Fixture	222	6,935	0.009	2.00	13,856
F44EE	4-Ft Four-Lamp T-12 Fixture	118	6,935	0.05	5.90	40,917
F83EE	8-Foot 3-Lamp T-12 Industrial Fixture	486	8,760	0.065	31.59	276,728
F81ES	8-Ft One-Lamp T-12 Fixture	30	8,760	0.027	0.81	7,096
F82EE	8-Ft Two-Lamp T-12 Industrial Fixture	143	8,760	0.029	4.15	36,328
HPS400	400 W High Pressure Sodium	6	8,760	0.298	1.79	15,663
MV400	400 Watt Mercury Vapor	20	3,120	0.15	3.00	9,360
ES120/1	Incandescent ES	6	8,760	0.0311	0.19	1,635
Total		2,757			75.76	615,450

ExEn FIELD VERIFICATION

Measure Code	Invoice Task Number	New	# Verified	Baseline Watts per Fixture	New Watts per Fixture	kW Savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
LIA0202	CLEO-1	Screw-In CFL 14-26 Watts	13	75	20	0.055	3,120	0.715	2,231	100%
LIC0102	CLEO-3	Linear Fluorescent w/ Ballast 4-Ft One-Lamp NLO T-8	139	41	28	0.013	6,935	1.807	12,532	100%
LIC0201	CLEO-3	Linear Fluorescent w/ Ballast 3-Ft Two-Lamp RLO T-8	3	60	40	0.02	4,950	0.06	297	100%
LIC0202	CLEO-3	Linear Fluorescent w/ Ballast 3-Ft Two Lamp NLO T-8	24	75	60	0.015	8,760	0.36	3,154	115%
LIC0207	CLEO-3	Linear Fluorescent w/ Ballast 4-Ft Four-Lamp RLO T-8	14	187	145	0.042	3,120	0.588	1,835	100%
LIC0208	CLEO-3	Linear Fluorescent w/ Ballast 4-Ft One-Lamp NLO T-8	41	140	114	0.026	3,120	1.066	3,326	100%
LIC0303	CLE0-3	Delamp T-12 to T-8 Change Out	779	124	114	0.01	8,760	7.79	68,240	100%
LID0101	CLEO-4	Super High Performance 4-Ft Two Lamp RLO T-8	269	70	47	0.023	8,760	6.187	54,198	96%
LID0102	CLEO-4	Super High Performance 4-Ft Two Lamp NLO T-8	444	72	55	0.017	8,760	7.548	66,120	100%
LID0103	CLEO-4	Super High Performance 4-Ft Two Lamp HLO T-8	222	144	135	0.009	6,935	1.998	13,856	100%
LID0107	CLEO-4	Super High Performance 4-Ft Four Lamp RLO T-8	118	144	93	0.051	6,935	6.018	41,735	102%
LID0109	CLEO-4	Super High Performance 4-Ft Four Lamp HLO T-8	486	210	145	0.065	8,760	31.59	276,728	100%
LID0110	CLEO-4	Super High Performance 8-Ft One Lamp T-8	30	81	54	0.027	8,760	0.81	7,096	100%
LID0111	CLEO-4	Super High Performance 8-Ft Two Lamp T-8	143	123	95	0.028	8,760	4.004	35,075	97%
LIF0101	CLE0-6	4-Lamp T-8	6	455	145	0.31	8,760	1.86	16,294	104%
LIF0104	CLE0-6	6-Lamp T-5	20	455	305	0.15	3,120	3	9,360	100%
LIJ0102	CLEO-10	LED ES Replacing Incandescent	6	40	3	0.037	8,760	0.222	1,945	119%
Total			2,757					75.623	614,021	100%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

9. Customer Name: [redacted]

Date of EM&V: 07-09-2008

This is a multi-tenant 2-story commercial office. Customer received a proposal for retrofit of 300 two (2) T-12 lamps and one electro-magnetic ballast with two (2) T-8 lamps and one electronic ballast. A lighting retrofit was performed on 193 2-lamp fixtures. The fixtures in the WIC - Pediatric area are four lamps with two electronic ballasts. However, the installed ballasts are High Light Output ballasts (REL-2P32-HL-SC) with an input power of 79W for two (2) T-8 lamps. The field verified energy savings are compared to a baseline of two (2) F-40 with energy saver magnetic ballast as the existing condition. The new system uses 0.007KW more per two (2) T-8 with one electronic ballast.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Invoice Task No.	Existing	# Incentive	kW savings per Item	Hours	Total kW Savings	Total kWh Savings
LID0102	CLEO-4	2X4, 2L- FI. Fixture	193	0.017	3864	3.281	12678
Total			193	0.017	3864	3.281	12678

GES FIELD VERIFICATION

Location	Pix	F.C	# Verified	New	Baseline Watts per Fixture	Retrofit Ballast REL-2P32-HL-SC	kW savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
Corridor	Y	35	193	w/2 T8 & 1El. Ball.	88	79	0.009	3864	1.737	6712	53%
Total			193		88	79	0.009	3864	1.737	6712	53%

Conclusion and Recommendations

As shown and described above, the customer installed a higher energy use lighting fixture than submitted in the rebate application. Therefore, the amount of energy savings are 47% less than originally projected. It is recommended that the actual installation of all lighting energy savings measures applications be verified before the rebate amounts are paid to the customer.

10. Customer Name: [redacted]

Date of EM&V: 7-10-2008

This is a single-story [redacted]. Eight (8) foot fixtures have been retrofitted with three (3) T-8 or one (1) T-8 on a 4-foot section and two (2) T-8 in the other 4-foot section with one 3-Lamp electronic ballast.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Invoice Task No.	Existing	# Incentive	kW savings per Item	Hours	Total kW Savings	Total kWh Savings
LIC0101	CLEO-3	40W T12 & Mag. Ball.	32	0.017	3744	0.544	2037
LIC0102	CLEO-3	140W T12 & Mag. Ball.	16	0.013	3744	0.208	779
LIE0101	CLEO-5	2 40W T12 & Mag. Ball.	22	0.027	3744	0.594	2224
LIE0102	CLEO-5	2 40W T12 & Mag. Ball.	10	0.022	3744	0.22	824
LIE0103	CLEO-5	3 40W T12 & Mag. Ball.	6	0.047	3744	0.282	1056
LIE0104	CLEO-5	4 40W T12 & Mag. Ball.	48	0.038	3744	1.824	6829
LIE0105	CLEO-5	4 40W T12 & Mag. Ball.	5	0.055	3744	0.275	1030
LIJ0102	CLEO-10	Incandescent	1	0.031	3744	0.03	116
Total			140			3.978	14894

GES FIELD VERIFICATION

Location	Pix	F.C	# Verified	New	Baseline Watts per Fixture	Retrofit Ballast REL-2P32-HL-SC	kW savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
Lobby	Y	40	32	1T8 & 1El. Ball.	43	26	0.017	3744	0.544	2037	100%
Side & Breakroom	Y	50	16	1T8 & 1El. Ball.	43	30	0.013	3744	0.208	779	100%
Lobby	Y	40	22	2 T8 & 1El. Ball.rlo	72	45	0.027	3744	0.594	2224	100%
Main Floor	Y	50	10	2 T8 & 1El. Ball.nlo	72	50	0.022	3744	0.22	824	100%
Main Floor	Y	55	6	3T8 & 1El. Ball.	115	72	0.043	3744	0.258	966	91%
Mail Room (5' Ceiling)	Y	75	48	3 T8 & 1El. Ball.	115	78	0.037	3744	1.776	6649	97%
Lobby	Y	55	5	4 T8 & 1El. Ball.	144	93	0.051	3744	0.255	955	93%
	Y		1	LED	36	5	0.031	8640	0.031	268	100%
Total			140						3.886	14701	98%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved within an acceptable 2% below the LADWP baseline.

11. Customer Name: [redacted]

Date of EM&V 07-09-2008

This is a single-story [redacted] Eight (8) foot fixtures have been retrofitted with three (3) T-8 or one (1) T-8 on a 4-foot section and two (2) T-8 in the other 4-foot section with one 3-Lamp electronic ballast.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Invoice Task No.	Existing	# Incentive	kW savings per Item	Hours	Total kW Savings	Total kWh Savings
LIC0101	CLEO-3	60W Inc.	1	0.033	3744	0.033	124
LIC0102	CLEO-3	75 W Inc.	2	0.05	3744	0.1	374
LIE0101	CLEO-5	60W incand.	1	0.048	3744	0.048	180
LIE0102	CLEO-5	140W T12 & Mag. Ball.	2	0.017	3744	0.034	127
LIE0103	CLEO-5	140W T12 & Mag. Ball.	7	0.013	3744	0.091	341
LIE0104	CLEO-5	40W T12 & Mag. Ball.	4	0.027	3744	0.108	404
LIE0105	CLEO-5	40W T12 & Mag. Ball.	10	0.047	3744	0.47	1760
LIE0105	CLEO-5	40W T12 & Mag. Ball.	35	0.038	3744	1.33	4980
Total			62			2.214	8289

GES FIELD VERIFICATION

Location	Pix	F.C	# Verified	New	Baseline Watts per Fixture	Installed Watts per Fixture	kW savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
Janitor			1	<14 Watts	60	13	0.047	3744	0.047	176	142%
Front			2	14-26 Watts	75	23	0.052	3744	0.104	389	104%
Side Door			1	< 14 Watts	60	13	0.047	3744	0.047	176	98%
Restroom			2	1T8 & 1El. Ball.	72	26	0.046	3744	0.092	344	271%
Main Floor	Y	60	7	1T8 & 1El. Ball.	43	26	0.017	3744	0.119	446	131%
Main Floor	Y	100	4	2 T8 & 1El. Ball.	72	55	0.017	3744	0.068	255	63%
Main Floor (Lobby)	Y	45	10	3 T8 & 1El. Ball.	115	68	0.047	3744	0.47	1760	100%
Main Floor (Lobby Counter)	Y	100	34	3 T8 & 1El. Ball.	115	78	0.037	3744	1.258	4710	95%
Total			61						2.205	8256	100%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

12. Customer Name: [redacted]

Date of EM&V: 07-09-2008

This is a single-story [redacted]. Eight (8) foot fixtures have been retrofitted with three (3) T-8 or one (1) T-8 on a 4-foot section and two (2) T-8 in the other 4-foot section with one 3-Lamp electronic ballast.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Invoice Task No.	Existing	# Incentive	kW savings per Item	Hours	Total kW Savings	Total kWh Savings
LIA0102	CLEO-1	75W Incand.	2	0.05	3744	0.100	374
LIC0101	CLEO-3	140W T12 & Mag. Ball.	14	0.017	3744	0.238	891
LIE0101	CLEO-5	140W T12 & Mag. Ball.	2	0.027	3744	0.054	202
LIE0102	CLEO-5	2 40W T12 & Mag. Ball.	14	0.022	3744	0.308	1153
LIE0104	CLEO-5	3 40W T12 & 2 Mag. Ball.	16	0.038	3744	0.608	2276
LIE0106	CLEO-5	4 40W T12 & Mag. Ball.	1	0.042	3744	0.042	157
Total			49			1.35	5054

GES FIELD VERIFICATION

Location	Pix	F.C	# Verified	New	Baseline Watts per Fixture	Installed Watts per Fixture	kW savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
Restroom	Y	20	2	23W screw-in CFL	75	23	0.052	3744	0.104	389	104%
Mail Room	Y	63	14	1T8 & 1El. Ball.	45	26	0.019	3744	0.266	996	112%
Locker Room	Y	52	2	2 T8 & 1El. Ball.	72	45	0.027	3744	0.054	202	100%
Main Floor	Y	54	14	2 T8 & 1El. Ball.	72	55	0.017	3744	0.238	891	77%
Main Floor	Y	73	16	3 T8 & 3 El. Ball.	116	78	0.038	3744	0.608	2276	100%
PO Box Area	Y	50	1	4 T8 & 1El. Ball.	144	102	0.042	3744	0.042	157	100%
Total			49						1.312	4912	97%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

13. Customer Name: [redacted]

Date of EM&V: 08-15-2008

This is a [redacted] grocery store similar to [redacted]. Majority of the retrofits in this store are of old 8-foot T-8 lamps to new energy efficient 4-feet T-8 lamps and electronic ballasts.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Invoice Task No.	Existing	# Incentive	kW savings per Item	Hours	Total kW Savings	Total kWh Savings
LID0107	CLEO-4	Sales Area	224	0.05	3744	11.2	41933
LIE0113	CLEO-5	Main Floor	156	0.033	3744	5.148	19274
LIA0102	CLEO-1	Display	16	0.049	3744	0.784	2935
LIE0117	CLEO-5	Meat	36	0.068	3744	2.448	9165
Total			432			19.58	73308

GES FIELD VERIFICATION

Location	Pix	F.C	# Verified	New	Baseline Watts per Fixture	Installed Watts per Fixture	kW savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
Sales Area	Y	64	224	4T8 & 1El. Ball.rlo	144	94	0.05	3744	11.2	41933	100%
Main Floor	Y	62	156	2 T8 & 1El. Ball.rlo	72	45	0.027	3744	4.212	15770	82%
Display	Y	65	16	25W CFL	75	25	0.05	3744	0.8	2995	102%
Meat	Y	45	36	4 T8 & 1El. Ball.nlo	144	89	0.055	3744	1.98	7413	81%
Total			432						18.192	68111	93%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

14. Customer Name: [redacted]

Date of EM&V: 08-15-2008

This is a single-story [redacted]. Eight (8) foot fixtures have been retrofitted with three (3) T-8 or one (1) T-8 on a 4-foot section and two (2) T-8 in the other 4-foot section with one 3-Lamp electronic ballast.

Energy Saving Table

LADWP EXISTING DATA

Measure Code	Invoice Task No.	Existing	# Incentive	kW savings per Item	Hours	Total kW Savings	Total kWh Savings
LIC0102	CLEO-3	2 40W T12 & Mag. Ball.	5	0.013	3744	0.065	243
LIC0201	CLEO-3	1'X8' 96W T12 & Mag. Ball.	1	0.02	3744	0.02	75
LIE0101	CLEO-5	4 40W T12 & Mag. Ball.	71	0.027	3744	1.917	7177
LIE0102	CLEO-5	2 40W T12 & Ma	10	0.022	3744	0.22	824
LIE0103	CLEO-5	3 40W T12 & Mag. Ball.	14	0.047	3744	0.658	2464
LIE0104	CLEO-5	3 40W T12 & Mag. Ball.	108	0.038	3744	4.104	15365
LIE0105	CLEO-5	4 40W T12 & Mag. Ball.	15	0.055	3744	0.825	3089
LIE0106	CLEO-5	4 40W T12 & Mag. Ball.	13	0.042	3744	0.546	2044
LIJ0102	CLEO-10	Replace Incand.	6	0.031	3744	0.186	696
Total			243			8.541	31978

GES FIELD VERIFICATION

Location	Pix	F.C	# Verified	New	Baseline Watts per Fixture	Installed Watts per Fixture	kW savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
Lobby/Office	Y	40	5	2 T8 & 1El. Ball.	43	30	0.013	3744	0.065	243	100%
Post area	Y	50	1	2 T8 & 1El. Ball.	72	52	0.02	3744	0.02	75	100%
Main Floor		50	71	2 T8 & 1El. Ball.	72	45	0.027	3744	1.917	7177	100%
Office	Y	40	10	2 T8 & 1El. Ball.NO	72	53	0.019	3744	0.19	711	86%
3 40W T12 & Mag. Ball.	Y	60	14	3 T8 & 1El. Ball.RL	115	72	0.043	3744	0.602	2254	91%
Work Area	Y	60	108	3 T8 & 1El. Ball.	115	78	0.037	3744	3.996	14961	97%
Office	Y	55	15	4 T8 & 1El. Ball.	144	93	0.051	3744	0.765	2864	93%
Office	Y	65	13	4 T8 & 1El. Ball.	144	103	0.041	3744	0.533	1996	98%
Exits	Y	5	6	LED	36	5	0.031	8640	0.186	1607	100%
Total			243						8.274	31889	97%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

15. Customer Name: [redacted]

Date of EM&V 08-15-2008

This is a single-story [redacted] Eight (8) foot fixtures have been retrofitted with three (3) T-8 or one (1) T-8 on a 4-foot section and two (2) T-8 in the other 4-foot section with one 3-Lamp electronic ballast.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Invoice Task No.	Existing	# Incentive	kW savings per Item	Hours	Total kW Savings	Total kWh Savings
LIC0102	CLEO-3	2 40W T12 & Mag. Ball.	2	0.017	3744	0.034	127
LIC0201	CLEO-3	1 X8' 96W T12 & Mag. Ball.	18	0.013	3744	0.234	876
LIE0101	CLEO-5	4 40W T12 & Mag. Ball.	18	0.027	3744	0.486	1820
LIE0102	CLEO-5	2 40W T12 & Ma	4	0.022	3744	0.088	329
LIE0103	CLEO-5	3 40W T12 & Mag. Ball.	12	0.047	3744	0.564	2112
LIE0104	CLEO-5	3 40W T12 & Mag. Ball.	48	0.038	3744	1.824	6829
LIE0105	CLEO-5	4 40W T12 & Mag. Ball.	14	0.055	3744	0.77	2883
LIE0106	CLEO-5	4 40W T12 & Mag. Ball.	4	0.042	3744	0.168	629
LIJ0102	CLEO-10	Replace Incand.	5	0.031	3744	0.155	580
Total			125			4.323	16185

GES FIELD VERIFICATION

Location	Pix	F.C	# Verified	New	Baseline Watts per Fixture	Installed Watts per Fixture	kW savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
Lobby/Office	Y	40	2	2 T8 & 1El. Ball.	43	26	0.017	3744	0.034	127	100%
Post area	Y	50	18	2 T8 & 1El. Ball.	72	52	0.02	3744	0.36	1348	154%
Main Floor		50	18	2 T8 & 1El. Ball.	72	45	0.027	3744	0.486	1820	100%
Office	Y	40	4	2 T8 & 1El. Ball.NO	72	50	0.022	3744	0.088	329	100%
3 40W T12 & Mag. Ball.	Y	60	12	3 T8 & 1El. Ball.RL	115	72	0.043	3744	0.516	1932	91%
Work Area	Y	60	48	3 T8 & 1El. Ball.	115	78	0.037	3744	1.776	6649	97%
Office	Y	55	14	4 T8 & 1El. Ball.	144	93	0.051	3744	0.714	2673	93%
Office	Y	65	4	4 T8 & 1El. Ball.	144	103	0.041	3744	0.164	614	98%
Exits	Y	5	5	LED	36	5	0.031	8640	0.155	1339	100%
Total			125						4.293	16832	99%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

16. Customer Name: [redacted]

Date of EM&V: 08-15-2008

This is a Gymnasium where the 400W High Bay Metal Halide Lighting has been retrofitted with six (6) T-5 lamps and electronic ballasts and reflector. Per LADWP record, 24 fixtures have received incentives. The incentive amount is for 24 fixtures but we verified that 36 fixtures were retrofitted.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Invoice Task No.	Existing	# Incentive	kW savings per Item	Hours	Total kW Savings	Total kWh Savings
LIF0200	CLEO-6	400W M ET. Hal.	24	0.15	2400	3.6	8640
Total			24			3.6	8640

GES FIELD VERIFICATION

Location	Pix	F.C	# Verified	New	Baseline Watts per Fixture	Installed Watts per Fixture	kW savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
South	Y	40 Horizon.	36	6T5- HO El. Bal.	440	3X117 W	0.09	2400	3.24	7776	90%
Gymnasium		20Vertical	36			or 350W			3.24	7776	90%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

17. Customer Name: [redacted]

Date of EM&V: 08-15-2008

This is an Art room where students make art. The projects in [redacted] were installed directly by the facilities department installers. The hardware was procured from electrical vendors, F32T8 (25Watt Philips) lamps were installed with low watt electronic ballasts.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Invoice Task No.	Existing	# Incentive	kW savings per Item	Hours	Total kW Savings	Total kWh Savings
LIE0113	CLEO-5	2-T12 &2 Ball.	30	0.033	3240	0.99	3208

GES FIELD VERIFICATION

Location	Pix	F.C	# Verified	New	Baseline Watts per Fixture	Installed Watts per Fixture	kW savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
Art Room	Y	50 FC	30	2-T8, 1-El. Ballast	72	40	0.032	3240	0.96	3110	97%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

18. Customer Name: [redacted]

Date of EM&V: 08-15-2008

These are two adjacent music rooms (3400 and 3401) with 25-foot high ceilings. The projects in [redacted] were installed directly by the facilities department installers. The hardware was procured from electrical vendors. Sixty (60) fluorescent light fixtures were removed and replaced with T-8 and electronic ballasts in these two music rooms.

Energy Saving Table:

LADWP EXISTING DATA

Measure Code	Invoice Task No.	Existing	# Incentive	kW savings per Item	Hours	Total kW Savings	Total kWh Savings
LIE118	CLEO-5	4T12 +2 Ballasts	60	0.065	3240	3.9	12636

GES FIELD VERIFICATION

Location	Pix	F.C	# Verified	New	Baseline Watts per Fixture	Installed Watts per Fixture	kW savings per Item	Hours	Total kW Savings	Total kWh Savings	% of LADWP Projection
Music Room 3400, 3401	Y	47 FC	65	4-T8, 1-El. Ballast	144	85	0.059	3240	3.835	12425	98%

Conclusion and Recommendations

All lighting energy savings measures at this site were installed according to the submitted application and the projected energy savings are being achieved.

Custom Performance Program Efficiency Detail of M&V Activities

ExEn visited seven (7) selected sites to perform M&V on Custom Performance. The following describes the sites and equipment measures that were verified per EEP incentive.

- [redacted]

Lighting Energy Detailed Calculations:

1. [redacted] 465 mercury vapor fixtures were replaced and upgraded with 94 metal halide fixtures. Table-1 shows summary of the energy savings for these units.

Account Name: [redacted]
Service Address:

	# of Fixtures	Fixture Wattage	Total kW	Hrs of Operation	Total kWh
Existing Fixtures	465	454	211.11	3,000	633,330
Retrofit	94	440	41.36	3,000	124,080
	Total Savings		169.75		509,250

VSD on AHU Motor Fans, Chillers, and Cooling Tower Energy Detailed Calculations:

2. [redacted] A VFD retrofit was done on a chiller and cooling tower. Table-2 shows summary of the energy savings for these units.

Account Name: [redacted]
Service Address:

	DESCRIPTION Chiller-VSD Energy Savings Calculation			
A	(E) Chiller		450	Tons
B	(E) Chiller efficiency		0.600	kW/Ton
C	(E) Chiller Max. demand	= A x B	270.0	kW
D	Equivalent Full-load Ann. Hours	Provided by Owner	6,205	Hours
E	(E) Chiller Annual energy used	= C x D	1,675,350	kWh
F	(E) Chiller efficiency at max. load		0.600	kW/Ton
G	(E) Chiller Max. Demand	= F x A	270.0	kW
H	Max. Demand Savings	= C - G	-	kW
	(E) Chiller Energy:	Based on typical chiller performance		
	%-Time at Loads …	%-Time (E) (Estd Values)	kW/Ton (F) (by Mfgr.)	kWh = (AxF)x(DxE)
	100%	5%	0.600	83,768
	90%	10%	0.539	150,446
	80%	15%	0.494	207,073
	70%	20%	0.461	257,669
	60%	20%	0.419	234,214
	50%	15%	0.384	160,758
	40%	10%	0.416	116,269
	30%	5%	0.484	67,600
	20%	0%	0.630	-
I	(N) Chiller Energy Total kWh	100%		1,277,798
J	(N) Chiller Ann. kWh Savings	= E - I		397,552
	Memo: Percentage Energy Saved	= J / E		23.7%

	DESCRIPTION: Cooling Tower-VSD Energy Saving Calculations			
A	Annual equipment energy	= D x C	36,569	kWh
B	Fan Motor Size		10	Hp
C	Max. Demand	= B x 0.746	7.5	kW
D	Equiv. Full-Load Hours		4,902	Hours
	%-Time at Loads …	%-Time (E) (Estd Values)	Pct.-Load (F) (by Mfgr.)	kWh = (CxF)x(DxE)
	100%	5%	1.00	1,828
	90%	15%	0.82	4,498
	80%	25%	0.65	5,942
	70%	30%	0.51	5,595
	60%	20%	0.38	2,779
	50%	5%	0.27	494
G	Total:	100%		21,137
H	Annual Energy Savings kWh	= A - G Tot. kWh		15,432
	Memo: Pctg. Ann. kWh Savs.	*= H / A*		*42.2%*

3. [redacted] 12 VSD were installed on 12 Air Handling Unit Supply Fan Motors. Table-2 shows summary of the energy savings for these units.

Account Name: [redacted]
Service Address:

	DESCRIPTION AHU VSD Energy Saving Calculations			
A	Annual equipment energy	= C x D	640,068	kWh
B	Total Fan Motors	12-units @25hp Each	300.0	Hp
C	Unit Max. Demand	= B x 0.746	223.8	kW
D	Equiv. Full-Load Hours	From Elec Bal Wks	2,860	Hours
		%-Time (E)	%-Load (F)	kWh
	%-Time at Loads …	(Estd Values)	(by Mfgr.)	= (CxF)x(DxE)
	100%	10%	100%	64,007
	90%	20%	82%	104,971
	80%	30%	65%	124,813
	70%	25%	51%	81,609
	60%	10%	38%	24,323
	50%	5%	27%	8,641
G	Total:	100%		408,363
H	Annual Energy Savings kWh	= G Tot. kWh - A		231,705
	Memo: Pctg. Ann. kWh Savs.	*= H / A*		*36.2%*

Air Compressor Energy Detailed Calculations:

4. [redacted] An old air compressor for process air system was replaced with a more efficient air compressor. Table-3 shows summary of the energy savings for these units.

Account Name: [redacted]
Service Address:

	DESCRIPTION: Air Compressor Energy Saving Calculations			
	Old System			
A	Annual equipment energy	= C X E / efficiency	50,915	kWh
B	Air Compr.		25.0	Hp
C	Air Compr. Max. Demand	= B x 0.746	18.7	kW
D	Equiv. Full-Load Hours		2,184	Hours
E	Efficiency		80%	
	New System			
A	Annual equipment energy	= C X D / E X G	27,082	kWh
B	Air Compr.		25.0	Hp
C	Air Compr. Max. Demand	= B x 0.746	18.65	kW
D	Equiv. Full-Load Hours		2,184	Hours
E	Efficiency		94%	%
G	Not in use 37.5 % of the time	= 1-0.375	62.5%	% In use
	Annual Savings			
	Old System		50,915	kWh
	New System		27,082	kWh
	Savings		23,832	kWh

Other-Special Process/Installation Energy Detailed Calculations:

5. [redacted] Four (4) CO_2 sensors were installed in the parking garage. Table-4 shows summary of the energy savings for these units.

Account Name: [redacted]
Service Address:

	DESCRIPTION: CO Sensor Control for Parking Garage Exhaust Fans			
A	Annual equipment energy	= D x C	130,341	kWh
B	Fan Size		20.0	Hp
C	Air Compr. Max. Demand	= B x 0.746	14.9	kW
D	Equiv. Full-Load Hours		8,736	Hours
	CO Sensors savings	Estimated savings	80%	
	Annual Energy Savings		104,272.90	kWh

6. [redacted] A new food warmer was installed. Table-4 shows summary of the energy savings for these units.

Account Name: [redacted]
Service Address:

	DESCRIPTION: Replace Existing Food Warmer New System			
A	Annual equipment energy	= B X E	11,375	kWh
B	Annual energy savings	From test report	15,167	kWh
C	Equiv. Full-Load Hours per day		12	Hours
D	Avg. operation hrs.	From test report	16	Hours
E	Estimated % equipment use	= C X D	75%	
	Annual Energy Savings		11,375	kWh

7. [redacted] A new food warmer was installed. Table-4 shows summary of the energy savings for these units.

Account Name: [redacted]
Service Address:

	DESCRIPTION: Replace Existing Food Warmer New System			
A	Annual equipment energy	= B X E	11,375	kWh
B	Annual energy savings	From test report	15,167	kWh
C	Equiv. Full-Load Hours per day		12	Hours
D	Avg. operation hrs.	From test report	16	Hours
E	Estimated % equipment use	= C X D	75%	
	Annual Energy Savings		11,375	kWh

Custom Performance Program Summary of LADWP Projected Savings

The following tables show verified data and energy savings projections for each location.

TABLE-1

Lighting Energy Efficiency Report Summary											
							Savings	Annual Savings LADWP	Annual Savings ExEn	Delta Annual Savings	% of LADWP Projection
Account Name	Service Address	Description	Manufacturer	Type of fixture	Fixture Wattage	# of Fixtures	kW	kWh	kWh	kWh	
[redacted]		Lighting	-	Metal Halide	440	94	169.75	509,250	509,250.00	0	100%

TABLE-2

VSD Energy Efficiency Report Summary											
							Savings	Annual Savings LADWP	Annual Savings ExEn	Delta Annual Savings	% of LADWP Projection
Account Name	Service Address	Description	Manufacturer	Model #	Type	# of Units	kW	kWh	kWh	kWh	
[redacted](1)	[redacted]	CH	Trane	RTWA-100	Screw	1	25.90	144,995	397,552	252,557	274%
		CT	Trane	Quiet CT	-	1	3.90	17,066	15,432	1,634	90%
		VSD on CH & CT	Trane	CVFHF-485	Propeller	1	29.80	162,061	412,984	250,923	255%
[redacted](2)	[redacted]	VFD on HVAC Fan Motor	ABB	ACH550-VD-038A-4		12	51.70	315,488	231,705	83,783	73%

TABLE-3

Air Compressor Energy Efficiency Report Summary											
							Savings	Annual Savings LADWP	Annual Savings ExEn	Delta Annual Savings	% of LADWP Projection
Account Name	Service Address	Description	Manufacturer	Model #	Type	# of Units	kW	kWh	kWh	kWh	
[redacted]		Air Compressor	Champion	RCS25	Rotary Screw	1	0.00	23,833	23,832	1	100%

TABLE-4

Other-Special Process/Installation Energy Efficiency Report Summary											
							Savings	Annual Savings LADWP	Annual Savings ExEn	Delta Annual Savings	% of LADWP Projection
Account Name	Service Address	Description	Manufacturer	Model #	Type	# of Units	kW	kWh	kWh	kWh	
[redacted](3)	[redacted]	CO Sensors in Pking Garage	Quantum Group	STAR24VC25-100	-	4	0	133,033	0	133,033	0%
[redacted]		Food Warmer	Pitco	SRTG	-	1	0.00	11,375	11,375	0	100%
		Food Warmer	Pitco	SRTG	-	1	0	11,375	11,375	0	100%

(1) The proposed energy savings calculation assumed a low baseline energy usage. Please see Expedient Energy VSD on AHU Motor Fans, and Cooling Tower Detailed Energy Calculations

(2) The proposed energy savings calculation assumed a low baseline usage

(3) The proposed exhaust fan motor efficiency was 84% but was calculated at an 80% efficiency

Conclusion and Recommendations for Custom Performance Project (CPP)

M&V determined that the total targeted energy savings for the custom performance project incentive program was 12% above the LADWP established baseline. We recommend that all energy saving measure applications for rebate be verified for installation *before* the rebate amounts are paid to the customer

HVAC Efficiency Detail of M&V Activities

ExEn visited four (4) selected sites to perform M&V for HVAC-3. The following describes the sites and equipment measures that were verified per EEP incentive.

- [redacted]

The following describes the site locations and HVAC systems that were verified per EEP incentive for these locations:

1. [redacted] This store is located in a strip mall and is a single-story structure. A new 10-ton Lennox package Gas/Electric roof top air conditioning unit was installed at this facility. Table below shows summary of the energy savings for this unit.

Account Name: [redacted]
Service Address:

Size of replaced unit	10	Tons
Age of replaced unit	15	Years
Minimum T-24 efficiency (1995 Std)	8.2	EER
Efficiency degradation	1%	Per Year
Existing Unit Efficiency	**6.97**	EER

	DESCRIPTION: Replaced (1) 10.0 Tons AC units with new LENNOX, LGA120H2B				
A	New AC Units Tons Replaced			10	Tons
B	Annual Cooling Hours			1,041	Hours
C	EER of Existing AC unit		7.0	1.72	kW/Ton
D	EER of New AC unit		11.3	1.06	kW/Ton
E	Existing AC Demand	= A x C		17.22	kW
F	New AC Demand	= A x E		10.62	kW
G	**Demand kW Saved**	= E - F		**6.6**	kW
H	**Annual kWh Saved**	= G x B		**6,868**	kWh

2. [redacted] This building is a relatively old stand alone single story building. A new 10-ton Carrier package Gas/Electric roof top air conditioning unit was installed. Table below shows summary of the energy savings for this unit.

Account Name: [redacted]
Service Address:

Size of replaced unit	10	Tons
Age of replaced unit	20	Years
Minimum T-24 efficiency (1995 Std)	8.2	EER
Efficiency degradation	1%	Per Year
Existing Unit Efficiency	**6.56**	EER

	DESCRIPTION: Replaced (1) 10.0 Tons AC units with new CARRIER, 48HJD012				
A	New AC Units Tons Replaced			10	Tons
B	Annual Cooling Hours			1,041	Hours
C	EER of Existing AC unit		6.6	1.83	kW/Ton
D	EER of New AC unit		11.0	1.09	kW/Ton
E	Existing AC Demand	= A x C		18.29	kW
F	New AC Demand	= A x E		10.91	kW
G	**Demand kW Saved**	= E - F		**7.4**	kW
H	**Annual kWh Saved**	= G x B		**7,686**	kWh

3. [redacted] in Van Nuys. The complex is a relatively old 3-story building. A new 2-ton RUUD package roof top Heat Pump unit was installed for one of the units in this building. Table below shows summary of the energy savings for this unit.

Account Name: [redacted]
Service Address:

Size of replaced unit	2	Tons
Age of replaced unit	30	Years
Existing Unit Efficiency	**6.4**	EER

	DESCRIPTION: Replaced (1) 2.0 Tons AC units with new RUUD, RQPLB-024JK000				
A	New AC Units Tons Replaced			2	Tons
B	Annual Cooling Hours			1,041	Hours
C	EER of Existing AC unit		6.4	1.88	kW/Ton
D	EER of New AC unit		14.0	0.86	kW/Ton
E	Existing AC Demand	= A x C		3.75	kW
F	New AC Demand	= A x E		1.71	kW
G	**Demand kW Saved**	= E - F		**2.0**	kW
H	**Annual kWh Saved**	= G x B		**2,119**	kWh

4. [redacted] This store is located in a strip mall and is a single-story structure. A new 7.5-ton Trane package Gas/Electric roof top air conditioning unit was installed at this facility. Table below shows summary of the energy savings for this unit.

Account Name: [redacted]
Service Address:

Size of replaced unit	7.5	Tons
Age of replaced unit	14	Years
Minimum T-24 efficiency (1995 Std)	8.2	EER
Efficiency degradation	1%	Per Year
Existing Unit Efficiency	**7.05**	EER

	DESCRIPTION: Replaced (1) 7.5 Tons AC units with new TRANE, YHC092A3RLA				
A	New AC Units Tons Replaced			7.5	Tons
B	Annual Cooling Hours			1,041	Hours
C	EER of Existing AC unit		7.1	1.70	kW/Ton
D	EER of New AC unit		11.3	1.06	kW/Ton
E	Existing AC Demand	= A x C		12.76	kW
F	New AC Demand	= A x E		7.96	kW
G	**Demand kW Saved**	= E - F		**4.8**	kW
H	**Annual kWh Saved**	= G x B		**4,994**	kWh

HVAC Summary of LADWP Projected Savings

The following table provides LADWP projected savings and ExEn M&V Data Results.

TABLE-1

Energy Efficiency Report Summary													
						Capacity	Unit Effeciency		New Unit	Old Unit	Savings	Annual Savings	% of LADWP Projection
Account Name	Service Address	# of Unit	Manufaturer	Model Number	Serial Number	Tons	New EER	Old EER	kW	kW	kW	kWh	
[redacted]		1	LENNOX	LGA120H2B	_____	10.0	11.3	7.0	LADWP Projected Savings				120%
									-	-	5.50	5,726	
									ExEn Calculated Savings				
									10.62	17.22	6.60	6,868	
[redacted]		1	CARRIER	48HJD012	_____	10.0	11.0	7.3	LADWP Projected Savings				134%
									-	-	5.50	5,726	
									ExEn Calculated Savings				
									10.91	18.29	7.38	7,686	
[redacted]		1	RUUD	RQPLB-024JK000	7464F260615585	2.0	14.0	7.3	LADWP Projected Savings				152%
									-	-	1.34	1,395	
									ExEn Calculated Savings				
									1.71	3.75	2.04	2119	
[redacted]		1	TRANE	YHC092A3RLA	628101422L	7.5	11.3	7.3	LADWP Projected Savings				110%
									-	-	4.35	4,528	
									ExEn Calculated Savings				
									7.96	12.76	4.80	4,994	

Conclusion and Recommendations for HVAC Program

M&V determined the total energy savings exceeded LADWP's established baseline by 25%. In such cases, better-than-projected energy savings can be directly tied to conservative baseline energy consumption assumed by LADWP. Assumptions must be recognized as such and are based on factors like industry standards of energy usage determined by the age and condition of the unit.

Refrigeration Efficiency Detail of M&V Activities

ExEn visited twelve (12) selected sites to perform M&V on Refrigeration. The following describes the sites and refrigeration measure that were verified per EEP incentive.

- [redacted]

1. [redacted] 208 evaporative fan motors for various refrigeration units were replaced with new more efficient motors. Table-1 shows summary of the energy savings.

2. [redacted] A new ice machine was installed. Table-1 shows summary of the energy savings.

3. [redacted] New gaskets were installed on glass door refrigerators for total of 28 refrigerator doors. Table-2 shows summary of the energy savings for these units.

4. [redacted] New gaskets were installed on glass door refrigerators for total of 43 refrigerator doors. Table-2 shows summary of the energy savings for these units.

5. [redacted] New gaskets were installed on glass door refrigerators for total of 24 refrigerator doors. Table-2 shows summary of the energy savings for these units.

6. [redacted] New gaskets were installed on glass door refrigerators for total of 42 refrigerator doors. Table-2 shows summary of the energy savings for these units.

7. [redacted] New gaskets were installed on glass door refrigerators for total of 73 refrigerator doors. Table-2 shows summary of the energy savings for these units.

8. [redacted] New gaskets were installed on glass door refrigerators for total of 122 refrigerator doors. Table-2 shows summary of the energy savings for these units.

9. [redacted] This restaurant is out of business and no access to the store was available.

10. [redacted] Establishment is a restaurant. A new refrigerator unit with Glass Door Rich-In style was installed in this resturant. Table-3 shows summary of the energy savings for this unit.

11. [redacted] New gaskets were installed on glass door refrigerators for total of 65 refrigerators. Table-4 shows summary of the energy savings for these units.

12. [redacted]. New gaskets were installed on glass door refrigerators for total of 71 refrigerators. Table-4 shows summary of the energy savings for these units.

Refrigeration Program Summary of LADWP Projected Savings

The following tables show verified data and energy savings projections for each location.

Project: **M&V**
Task: **RP**
Date: **6/5/2009**
EXEN Job #: 08-135

TABLE-1

Energy Efficiency Report Summary											
							Savings	Annual Savings LADWP	Annual Savings ExEn	Delta Annual Savings	% of LADWP Projection
Account Name	Service Address	Description	Manufacturer	Model #	Type	# of Units	kW	kWh	kWh	kWh	
[redacted]		Evaporative Fan Motor	General Electric	Various	Various	108	2.16	72,684	72,684	0	100%
		Commercial Ice Machine Air Cooled 1.001-1.500 lbs	HOWE	2000-RLE	Rapid Freeze	1	0.80	7,300	7,008	-292	96%

TABLE-2

Energy Efficiency Report Summary											
				Refrigerator	Total Gasket	Gasket	Savings	Annual Savings LADWP	Annual Savings ExEn	Delta Annual Savings	% of LADWP Projection
Account Name	Service Address	Description	# of Refrigerator	Glass Door	Linear Foot	Modle #	kW	kWh	kWh	kWh	
[redacted]		Rerigerator Door Gasket replaced	9	29.88" x 60.75"	136.0	RS #2263	5.36	48,302	46,954	-1,348	97%
			19	29.88" x 60.75"	326	RS #2263					
		Refrigerator Door Gasket replaced	43	29.88" x 65.06"	677	RS #2263	7.85	70,780	68,766	-2,014	97%
		Refrigerator Door Gasket replaced	5	29.25" x 62.50"	76.5	RS #2263	4.57	41,193	40,033	-1,160	97%
			9	28.86" x 64"	193.3	RS #9536					
			10	34.75" x 72"	177.9	RS #9536					
		Refrigerator Door Gasket replaced	42	28.75" x 54.75"	592	RS #2263	6.78	61,109	59,393	-1,716	97%
		Refrigerator Door Gasket replaced	11	29.75" x 65"	174	RS #2278	13.33	120,128	116,771	-3,357	97%
			62	29.63" x 64.75"	981	RS #2263					
		Refrigerator Door Gasket replaced	60	29.63" x 64.80"	944	RS #2263	12.78	115,214	111,953	-3,261	97%
			62	29.88" x 65.20"	158	RS #2263					

Project: **M&V**
Task: **RP - 4**
Date: **7/8/2008**
EXEN Job #: **08-135**

TABLE-3

Energy Efficiency Report Summary											
							Savings	Annual Savings LADWP	Annual Savings ExEn	Delta Annual Savings	% of LADWP Projection
Account Name	Service Address	Description	Manufacturer	Model #	Type	# of Units	kW	kWh	kWh	kWh	
[redacted]		Commercial Ice Machine Air Cooled 1.001-1.500 lbs	Hoshizaki	KM-1300 SRH	RCU-A	1	0.60	4,927	Out of Business	N/A	N/A
		New Refrigerantor (Glass door reach-in)	True Food service Equipment	GDM-33	Reach-In	1	0.19	1,661	1,664	3	100%

TABLE-4

Energy Efficiency Report Summary											
				Refrigerator	Total Gasket	Gasket	Savings	Annual Savings LADWP	Annual Savings ExEn	Delta Annual Savings	% of LADWP Projection
Account Name	Service Address	Description	# of Refrigerator	Glass Door	Linear Foot	Modle #	kW	kWh	kWh	kWh	
			52	28" x 59"	768.5	EES 2263					
[redacted]		Rerigerator Door Gasket	15	29.88" x 60.75"	226.6	EES 2263	12.24	110,300	107,222	-3,078	97%
		replaced	4	31" x 59"	60.0	EES 2263					
		Refrigerator Door Gasket replaced	65	29.88" x 65.06"	1,029	EES 2263	11.93	107,582	104,506	-3,076	97%

Conclusion and Recommendations for Refrigeration Program (RP)

M&V determined that the total targeted energy savings for the refrigeration efficiency incentive program was met within the acceptable margin of 2% below the LADWP established baseline.