

To: Honorable Public Utilities Board

Submitted by: */S/*
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AGM – Customer Resources

From: Kelly Brezovec
Utility Energy Analyst

Approved by: */S/*
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Subject: By Motion, Accept the Evaluation, Measurement, & Verification of Alameda Municipal Power’s Non-Residential Direct-Install Energy Efficiency Programs for Fiscal Years 2016 and 2017

RECOMMENDATION

By motion, accept the evaluation, measurement, & verification of Alameda Municipal Power’s non-residential direct-install energy efficiency programs for fiscal years 2016 and 2017.

BACKGROUND

California Assembly Bill (AB) 2021 (September 2006) requires that all publicly owned utilities, in consultation with the California Energy Commission, develop an estimate of all potentially achievable, cost-effective energy efficiency savings and establish annual targets for energy efficiency savings and demand reductions over 10 years. It also requires an independent evaluation that measures and verifies the energy efficiency savings and reductions in demand achieved by utility programs.

The legislative requirement for a bi-annual evaluation, measurement, & verification (EM&V) study also provides staff with a valuable opportunity to learn from an independent third party how well the utility’s programs performed and how they can be improved. Additionally, the findings are used in Alameda Municipal Power’s (AMP) electric forecast.

AMP has completed an EM&V of energy efficiency programs every other year since 2010. This year’s study focuses on lighting and refrigeration measures installed as part of “Energy Plus,” AMP’s non-residential direct-install program.

Energy & Resource Solutions (ERS) was selected to manage the measurement and verification through a Request for Qualification process managed by the Northern California Power Agency (NCPA) in 2014. Three vendors were qualified through this process, including ERS. AMP selected ERS based on the company’s qualifications and previous positive experiences with their team.

DISCUSSION

Energy Plus is AMP's non-residential direct-install program administered by Ecology Action, an energy efficiency consultancy based in Santa Cruz, California. The program is focused on removing barriers to non-residential customers to complete lighting, HVAC and refrigeration retrofits. Ecology Action markets the program, conducts energy audits that include project design and specifications, encourages customers to complete the retrofit, refers the customer to a pre-approved contractor to complete the retrofit, and upon completion of the program, surveys the customers to determine satisfaction with the program. Additionally, Ecology Action provides oversight and inspection of all retrofits, does the processing and payment of rebates, and provides program tracking and reporting.

The EM&V study focused on Energy Plus-administered lighting and refrigeration projects completed during fiscal years 2016 and 2017. The study measured how well AMP's reported savings are aligned to the savings verified through survey and on-site verification.

Overall, the results are positive. Realization rate is a measure of the current observed or evaluated energy savings compared to the originally reported savings estimates. A high realization rate means that the energy efficiency savings were delivered as expected based on the original estimates. The realization rates were 98.3 percent for lighting and 86.6 percent for refrigeration. Half of the 14 sites surveyed for lighting projects had a 100 percent realization rate. Eleven of the 14 refrigeration sites had a 100 percent realization rate.

The refrigeration realization rate, while still high, was lower than expected mainly due to a single site that was under construction during the site visit by ERS. The evaluation procedure requires that the study is completed as a snapshot in time. The construction project meant that the site was not benefitting from any claimed savings, which reduced the realization rate from 93.7 percent to 86.6 percent.

Detailed results and full descriptions of the test methodology are available in the attached report, Exhibit A.

NEXT STEPS

Staff and the direct-install program administrator, Ecology Action, will work together to implement appropriate changes to improve the realization rate of future Energy Plus projects. The next EM&V study will occur in 2020 and will likely focus on residential energy efficiency projects.

FINANCIAL IMPACT

There is no financial impact at this time.

LINKS TO STRATEGIC PLAN AND METRICS

KRA 1: Customer Programs & Experience

Goal 1.1 Ensure that customers have a positive experience

Goal 1.2 Increase customer energy efficiency
Goal 1.3 Provide programs that support green Alameda

EXHIBIT

- A. 2015-2017 Non-Residential Energy Efficiency Program Evaluation
- B. AMP Energy Plus Evaluation - Presentation



AGENDA ITEM NO.: 6.B
MEETING DATE: 07/16/2018
EXHIBIT A

Non-Residential Program Evaluation

prepared for

Alameda Municipal Power

ERS

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June 15, 2018



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APPENDIX A: ENERGY SAVINGS CALCULATIONS



1 EXECUTIVE SUMMARY

This report documents the evaluation activities undertaken by ERS for Alameda Municipal Power (AMP). The evaluation focuses on the energy savings impacts of AMP’s non-residential projects completed under the “Energy Plus” rebate program. The evaluated program and projects were completed during the 2015–2016 and 2016–2017 program years (July 1, 2015, through June 30, 2017).

The primary objective of the evaluation is to provide independent verification of AMP’s reported energy savings. The secondary objective is to provide recommendations – based on the findings of this report – for program improvement.

The evaluation effort consisted of four primary sets of activities: conducting research, developing evaluation plans, collecting data, and estimating energy savings. ERS visited 28 project sites and collected data to verify the energy-saving attributes of each energy efficiency measure implemented.

ERS combined the research and data collection results to analyze and develop energy savings estimates using standard engineering principles and evaluation methodologies. Table 1-1 provides the program energy savings results.

Table 1-1. Program Energy Savings

Description	Lighting Energy Savings (kWh)	Refrigeration Energy Savings (kWh)
Reported savings	2,941,357	295,386
Verified savings	2,891,354	255,804
Measure realization rate	98.3%	86.6%

Based on our observations and analysis, AMP’s lighting and refrigeration programs are performing well and effectively achieving energy savings. To help AMP continue to improve its programs, the following recommendations are provided for consideration:

- ❑ For lighting projects, require third-party implementers to provide documented justification of the facility’s weekly, seasonal, and annual hours of operation.
- ❑ Require third-party implementers to record preexisting lighting control types and account for operating hour adjustments potentially associated with the controls.

- ❑ AMP should consider deploying light loggers for larger lighting projects to verify the proposed hours of operation. For lighting projects that claim savings greater than 100,000 kWh, require metering of a sample of projects to verify the hours of operation.
- ❑ AMP should maintain a copy of all inputs and outputs used in proprietary lighting calculators that estimate project savings.
- ❑ Require third-party implementers to review and apply baseline guidelines from the California (CA) Publicly Owned Utilities (POU) Energy Efficiency Best Practices Reporting Guidelines. This will help implementers collect and track the data that is relevant to baseline determination, which in turn will enable AMP to verify the accuracy of the estimated savings.

2 INTRODUCTION

This report documents the evaluation activities undertaken by ERS for AMP. The evaluation focuses on the energy savings impacts of specific programs and projects completed during the 2015–2016 and 2016–2017 program years (July 1, 2015, through June 30, 2017).

2.1 Focus of Evaluation

The focus of this evaluation effort was non-residential lighting and refrigeration measures installed through AMP’s third-party, direct-install “Energy Plus” program over a two-year period.

Lighting measures included interior and exterior fixtures installed at retail, multifamily, industrial, and educational facilities. Refrigeration measures included electronically commutated (EC) evaporator fan motors, automatic door closers, and strip curtains installed in walk-in coolers and freezers at restaurants and retail facilities.

2.2 Evaluation Objectives

The primary objective of the evaluation is to provide independent verification of AMP’s reported energy savings for non-residential lighting and refrigeration measures. The secondary objective is to provide recommendations – based on the findings of this report – for program improvement.

For this evaluation effort, 29 projects funded under this program were randomly sampled by ERS for evaluation. This included 14 lighting projects and 15 refrigeration projects.

2.3 Overview of Evaluation Activities

The evaluation consisted of four primary sets of activities:

1. **Conduct research** – ERS conducted initial research and review of the following:
 - Similar evaluation efforts
 - AMP program process and procedures
 - Publicly owned utility compliance reporting requirements and methodologies
 - Project-specific technologies used to save energy
2. **Develop sampling and evaluation plans** – ERS developed a sampling plan to select projects for site evaluation and then developed measurement & verification (M&V) plans for each of the evaluated sites.
3. **Collect data** – ERS visited each of the selected project sites to interview staff and collect data regarding energy efficiency measures installed at the site.
4. **Estimate energy savings** – ERS combined the research and data collection results to analyze and develop energy savings estimates per the methodologies described in Section 3 of this report.

3 METHODOLOGY

In this section we describe the M&V approach for sampling, data collection, and savings verification. We also discuss the reliability of energy savings estimates and our recommendations for reporting program influence in terms of net-to-gross energy savings.

3.1 Measurement and Verification Approach

Overall objectives for this evaluation:

- Determine whether the energy-saving measures are installed and operating properly.
- Verify the energy savings, using the best available information.
- Determine the realization rate for the selected projects.
- Extrapolate results from the sample projects to estimate program savings.

3.2 Sampling

ERS developed a sample design to randomly select projects for site evaluation. Using stratified ratio estimation, a total of 29 were selected for evaluation (15 refrigeration sites and 14 lighting sites). The sample size was designed to achieve a relative precision of 10% at the 90% confidence level. All primary sample sites selected were evaluated except for one.

For the lighting measures, the sample realization rate was calculated for the 14 sites and then expanded to the 71 lighting projects to estimate the program-level savings results. The resulting realization rate is 98.3%, the standard error is 0.9%, the error bound is 0.01, and the relative precision is 1.4% at the 90% confidence level.

For the refrigeration measures, the sample realization rate was calculated for the 14 sites (one site was dropped due to the inability to access the refrigeration equipment). We then expanded the calculation to the 33 refrigeration projects to estimate the program-level savings results. The resulting realization rate is 86.6%, the standard error is 4.1%, the error bound is 0.07, and the relative precision is 7.7% at the 90% confidence level.

3.3 Data Collection

ERS’s first step in the data collection process included collecting project data from the third-party implementer, Ecology Action. This included receiving project scopes for the sites selected, make/model numbers for equipment installed, corresponding energy savings calculations, and site contact information.

ERS engineers collected information on-site regarding the retrofit project to determine if the measures were installed and operational. Information was also gathered to assist with verifying energy savings estimates. Site visits were conducted between April 12, 2018, and May 4, 2018.

The following data collection plans were used for guidance when conducting the site visits. These two plans, one for lighting sites (Table 3-1) and one for refrigeration sites (Table 3-2), highlight the project parameters and variables that were verified on-site and used in the energy-saving calculations.

Table 3-1. Data Collection Plan – Lighting Measures

Data Collection Plan	As Implemented or Found
Quantities – Count all fixtures in small sites; sample fixtures at larger sites that were retrofitted.	For four sites, all of the fixtures were counted. For ten sites, sample fixtures were selected and verified.
Equipment specification – Obtain wattages of new lamps.	Wattages were obtained for the project documentation. This documentation included make/model numbers of the fixtures installed, which was used to verify wattages.
Schedules – Obtain daily, weekly, and seasonal schedules.	The hours proposed in the project documentation were verified with site staff.
Controls – Verify lighting control type.	Reported control types were not provided. Control methods for all lighting sites were observed but not collected.
Baseline determination – Verify wattage of replaced lamps and ballasts, if possible.	Obtained from project documentation.

Table 3-2. Data Collection Plan – Refrigeration Measures

Data Collection Plan	As Implemented or Found
Quantities – Observe whether the measure or the system retrofitted is in place and operational.	All refrigeration measures were verified to either be present or missing.
Equipment specification – Verify from project documentation.	Project documentation provided reflects the equipment installed.
Equipment operation – Verify equipment is operational.	All installed measures were verified to be operational.
Baseline determination – Verify preexisting conditions through interview with the site contact.	Obtained from project documentation.

3.4 Gross Energy Savings Estimates

Gross savings reflect the calculated savings for all measures at the selected sites. This differs from net savings, which modifies the gross savings based on program spillover and/or free-ridership. All energy savings calculations performed by ERS for the sites evaluated are included in a separate zip file and are referenced as Appendix A to this report.

3.4.1 Reported Energy Savings

For both the lighting and refrigeration measures, the savings were calculated by the third-party implementer.

The lighting measure savings were estimated using a proprietary savings calculator developed by the third-party implementer. The calculator uses default inputs and calculation methodologies that are consistent with the lighting savings calculator provided by the Publicly Owned Utility Technical Reference Manual (POU TRM).¹ The refrigeration measure savings were calculated using deemed savings values obtained from the POU TRM.

Demand reduction values were provided for the projects evaluated, although they did not reflect the peak coincident demand reduction.

3.4.2 Verified Energy Savings

For the lighting measures, energy savings were verified through a two-step process. First, ERS verified the accuracy of the proprietary calculator. For four projects, ERS estimated project savings by using the POU TRM lighting savings calculator. The results were compared to the

¹ The POU TRM provides methods, formulas, and deemed energy estimates for estimating utility program energy savings. It is generally the primary source of savings estimates for all California POU's.

reported savings from the proprietary calculator. The comparisons verified that the proprietary savings calculator produces results that are consistent with the POU TRM lighting savings calculator. ERS calculated the energy savings by spot-checking the calculations provided by Ecology Action.

Once the accuracy of the proprietary calculator was verified, ERS adjusted the project savings estimates based on information gathered on-site. The installed fixture wattages were spot-checked against the DesignLights Consortium qualified products list. ERS adjusted the quantities of lamps or fixtures as needed based on observations on site. In addition, the annual operating hours were adjusted as needed to account for interior lighting being turned off during holidays.

For the refrigeration measures, ERS calculated the energy savings using deemed savings values per unit for each project, per the POU TRM. The measures were verified to be installed, and the quantities observed on-site were used to adjust the reported savings. Tables 3-3 and 3-4 summarize the reported and verified methodology approaches for the lighting measures and refrigeration measures, respectively.

Table 3-3. Comparison of Savings Estimate Methodologies – Lighting Measures

Description	Reported Savings Approach	Verified Savings Approach
Calculation methodology	Ecology Action's modified lighting calculator (MLC) was used on all projects, except for two projects where the TRM400 lighting calculator was used. However, no savings estimate was provided for the second baseline.	A spreadsheet model (TRM400 lighting calculator) was used for the analysis. Savings were estimated for 4 sample sites. Adjustments to the MLC calculator were made based on site observations and engineering judgment. Savings for the second baseline were not calculated.
Baseline description	An existing conditions baseline was used in the analysis. Ecology Action used an early-retirement methodology.	Verified savings are based on an early retirement, dual baseline. The remaining useful life (first) baseline is existing conditions and the second baseline is minimum code requirements.
Baseline determination	Early retirement	Early retirement, consistent with the POU reporting guidelines recommendations.
Operating hours	Operating hours are based on typical weekly occupancy schedules, and they differ on a site-by-site basis. Exterior fixtures assume a "12 hours on 12 hours off" operation.	Operating hours for the spaces retrofit were verified through interviews with the site contact. Adjustments were made to account for annual operating hours.
Equipment/system efficiency	Rated power based on wattage of installed fixture	Rated power based on wattage and quantities observed on site, using fixture make and model numbers as a reference.

Table 3-4. Comparison of Savings Estimate Methodologies – Refrigeration Measures

Description	Reported Savings Approach	Verified Savings Approach
Calculation methodology	Deemed savings per unit installed per the POU TRM.	Deemed savings per unit installed per the POU TRM.
Baseline description	An existing conditions baseline was used in the analysis.	Existing conditions, as noted in the POU TRM: ECMs – shaded pole Strip curtain – no curtain installed Door closer – no door closer installed
Baseline determination	Natural replacement/existing conditions.	Natural replacement/existing conditions.
Operating hours	Deemed per the POU TRM.	Deemed per the POU TRM.
Equipment/system efficiency	Deemed efficient conditions per the POU TRM.	Deemed efficient conditions per the POU TRM.

3.5 Net-Energy Savings

To determine net-energy savings, a net-to-gross (NTG) factor is used to adjust gross energy savings for free ridership and spillover. Free ridership describes program participants who would have implemented energy efficiency in the absence of the program, and spillover describes the program’s ability to indirectly influence behavior (customer or market behavior) leading to increased energy efficiency.

Net-energy savings are difficult to assess, and the results of efforts to quantify these savings at the measure or program level have a high degree of uncertainty. Given this uncertainty and the relatively high cost to conduct primary research, most, if not all, small- to medium-sized utilities choose to use stipulated NTG factors for reporting program net savings.

The POU regulatory compliance reporting tool (E3) includes default NTG factors obtained from evaluations of large investor-owned utility programs. The scale and program delivery methods for these larger programs greatly differ from POU programs, so the default NTG factors may not accurately represent POU program influence. As such, the default NTG factors provided in the E3 reporting tool can be overwritten by the utility program administrator.

For both lighting and refrigeration measures, AMP reported net savings using an NTG factor of 90%. In part because the customer provided a letter indicating the program implementer influenced the customer’s decision to retrofit its lighting, the NTG factor used by AMP provides a reasonable assessment of program influence and the net energy savings achieved by the program.

3.6 Uncertainty Analysis

Energy savings cannot be measured directly. Energy savings estimates are a predictor of the absence of energy use; they account for the difference between how energy-consuming systems and equipment would operate (baseline conditions) and how they operate after being upgraded (post-retrofit conditions). To assess the reliability of the verified energy savings presented in this report, ERS reviewed all potential sources of error associated with our evaluation efforts. Although a verification level of rigor was used for most sites, we find the savings presented in this report to be a reasonably accurate estimate of the energy savings achieved.

The following is a list of the potential sources of error:

- ❑ **Preexisting conditions** – For the most part, ERS could not directly verify the preexisting equipment or operating conditions while on site. Information regarding the preexisting conditions was obtained from the contractor (via rebate documentation) or through interviews with site personnel.
- ❑ **Equipment operating hours** – For the lighting measures, the operating hours were estimated based on our on-site interviews, contractor-supplied estimates, and assumptions regarding typically observed holiday schedules. The refrigeration measures were assumed to operate continuously.

4 RESULTS

This section summarizes the results of the evaluation effort, including the verified savings and corresponding realization rates compared to the program-reported savings.

4.1 Gross Energy Savings

Table 4-1 summarizes the energy savings for the sample sites. The energy savings reported by AMP are compared to the energy savings verified by ERS.

Table 4-1. Evaluated Site Savings

Description	Lighting Energy Savings (kWh)	Refrigeration Energy Savings (kWh)
Reported savings	1,891,719	153,475
Verified savings	1,862,143	127,545
Measure realization rate	98.3%	86.6%

The realization rate is used to extrapolate the results to all measures. Table 4-2 shows the reported and verified savings for all measures.

Table 4-2. Program Energy Savings

Description	Lighting Energy Savings (kWh)	Refrigeration Energy Savings (kWh)
Reported savings	2,941,357	295,386
Verified savings	2,891,354	255,804
Measure realization rate	98.3%	86.6%

For the lighting measures, Table 4-3 provides the results for each evaluated site.

Table 4-3. Energy Savings for Lighting Sites

Site #	Reported Savings (kWh)	Verified Savings (kWh)	Realization Rate
Site #1	31,633	31,633	100.0%
Site #2	2,182	2,122	97.3%
Site #3	117,343	99,849	85.1%
Site #4	220,252	215,955	98.0%
Site #5	302,881	297,779	98.3%
Site #6	329,906	329,906	100.0%
Site #7	221,213	221,213	100.0%
Site #8	72,848	71,808	98.6%
Site #9	26,008	24,368	93.7%
Site #10	302,301	302,301	100.0%
Site #11	120,270	120,270	100.0%
Site #12	2,632	2,560	97.3%
Site #13	115,874	115,874	100.0%
Site #14	26,376	26,505	100.5%
Total	1,891,719	1,862,143	98.3%

For the refrigeration measures, Table 4-4 provides the results for each evaluated site.

Table 4-4. Energy Savings for Refrigeration Sites

Site #	Reported Savings (kWh)	Verified Savings (kWh)	Realization Rate
Site #15	14,353	14,353	100.0%
Site #16	3,078	3,078	100.0%
Site #17	30,720	12,966	42.2%
Site #18	958	958	100.0%
Site #19	11,368	0	0.0%
Site #20	2,972	2,972	100.0%
Site #22	2,022	2,022	100.0%
Site #23	33,632	33,632	100.0%
Site #24	13,232	10,686	80.8%
Site #25	9,736	15,474	158.9%
Site #26	2,022	2,022	100.0%
Site #27	12,008	12,008	100.0%
Site #28	3,078	3,078	100.0%
Site #29	14,296	14,296	100.0%
Total	153,475	127,545	86.6%

4.2 Explanation of Realization Rates

Realization rates that are lower than 100% were mainly influenced by differences between the reported and verified measure quantities. For the lighting measures, the verified operating hours for most measures were slightly lower than the reported operating hours.

4.2.1 Operating Hours

For the lighting measures, the operating hours provided in the program documentation were used as a basis for the verified savings calculations. The weekly operating hours were then confirmed on site with the site staff.

The reported annual operating hours are based on typical weekly occupancy schedules. However, no adjustment was made to account for annual occupancy schedules. To estimate the verified operating hours, it is assumed that, where applicable, the site was unoccupied during typical holidays. Holiday hours were applied to applicable sites, such as interior locations at schools, offices, and retail facilities. This resulted in a slight reduction in annual operating hours. Exterior lighting projects, such as parking lots and garages, and areas where lights operate 24/7 are not impacted by holiday hours and were therefore not adjusted.

4.2.2 Installation Rate

We observed that several lighting and refrigeration sites had differing measure quantities compared to the provided project documents.

The following discrepancies were observed at the lighting sites:

- ❑ For Site #9, the project site address was incorrect; however, the site contact provided the correct street address and location for the retrofit. At this site, Warehouse 10.19 was reported to have two T8 fixtures installed in the project documents, but no fixtures were observed. Additionally, six T8 fixtures were expected to be installed in Warehouse 10.20, where only five fixtures were observed.
- ❑ At Site #3, only 9 LED wallpacks were observed to be installed on the historic building instead of the reported quantity of 24, as this particular location of the facility was being renovated.
- ❑ At Site #14, 58 LED downlights were counted in the hallways in building #4 compared to 55 in the project documentation. Additionally, only 18 LED wallpacks were identified on the clubhouse exterior, opposed to the expected count of 20.

For the refrigeration projects, the following discrepancies were observed:

- ❑ The refrigeration project at Site #17 had multiple measures that were not installed as expected. In kitchen cooler #2 and kitchen freezer #2, the project documents indicated one strip curtain and one door closer was installed in each, but these were observed to not be present. Additionally, in kitchen freezer #1, a door closer was observed to be installed, but according to the site contact that measure was installed prior to the project. In this same freezer, two evaporator fans were present but these were not retrofit with ECMs, per the site contact.
- ❑ Site #19 had several refrigeration measures installed under the program; however, at the time of the evaluation, this site was under construction due to a change in ownership and was not accessible. The savings for this site were reduced to zero as it could not be verified that the refrigeration measures were still installed and operational. It should be noted that the relative impact of this site is significant to the overall realization rate found for all refrigeration measures. If these measures are reinstalled and become operational as part of the new business, the site realization rate becomes 100%. This would change the total verified savings for the sample sites to 138,913 kWh, resulting in a realization rate increase from 86.6% to 93.7%.
- ❑ At Sites #23 and #28, strip curtains were observed to be installed but were tied back to provide easier access. While the corresponding savings would likely be reduced, it is difficult to quantify the impact of this measure not being properly installed and therefore the savings associated with this measure was verified as reported.
- ❑ At Site #24, the project documents indicated that one automatic door closer and strip curtains were installed on the kitchen freezer. However, during the site visit it was discovered that these two measures had been removed while the customer made repairs to the freezer; the customer indicated these would eventually be reinstalled. For verified savings estimates, there are no estimated savings for these measures. If the customer does reinstall the measures, then the measure savings will be realized.

- ❑ Strip curtains were installed at Site #25, although the savings for this particular measure was reported as zero. In the verified savings calculations, this was increased to reflect the deemed savings values for this measure.

5 SUMMARY AND RECOMMENDATIONS

Based on the results of the analysis, the total program savings for both the lighting and refrigeration projects are 3,147,158 kWh per year. The program-reported savings, verified savings, and realization rate are provided in Table 5-1.

Table 5-1. Measure Group Energy Savings

Description	Lighting Energy Savings (kWh)	Refrigeration Energy Savings (kWh)
Reported savings	2,941,357	295,386
Verified savings	2,891,354	255,804
Program realization rate	98.3%	86.6%

5.1 Recommendations

Based on our observations and analysis, AMP’s lighting and refrigeration programs are performing well and effectively achieving energy savings. To help AMP continue to improve its programs, the following recommendations are provided for consideration:

- ❑ For lighting projects, require third-party implementers to provide documented justification of the facility’s weekly, seasonal, and annual hours of operation.
- ❑ Require third-party implementers to record preexisting lighting control types and account for operating hour adjustments potentially associated with the controls.
- ❑ AMP should consider deploying light loggers for larger lighting projects to verify the proposed hours of operation. For lighting projects that claim savings greater than 100,000 kWh, meter a sample of projects to verify the hours of operation.
- ❑ AMP should maintain a copy of all inputs and outputs used in proprietary lighting calculators used to estimate project savings.
- ❑ Require third-party implementers to review and apply baseline guidelines from the POU Energy Efficiency Best Practices Reporting Guidelines. This will help implementers collect and track data relevant to baseline determination, which in turn will enable AMP to verify the accuracy of the estimated savings.

AMP NON-RESIDENTIAL PROGRAM EVALUATION

2015 – 2017 Lighting & Refrigeration “Energy Plus” Direct-Install Program

Presented by:
Todd Winner, ERS



AGENDA

1

Overview

2

Evaluation Activities

3

Results

4

Recommendations

5

Summary

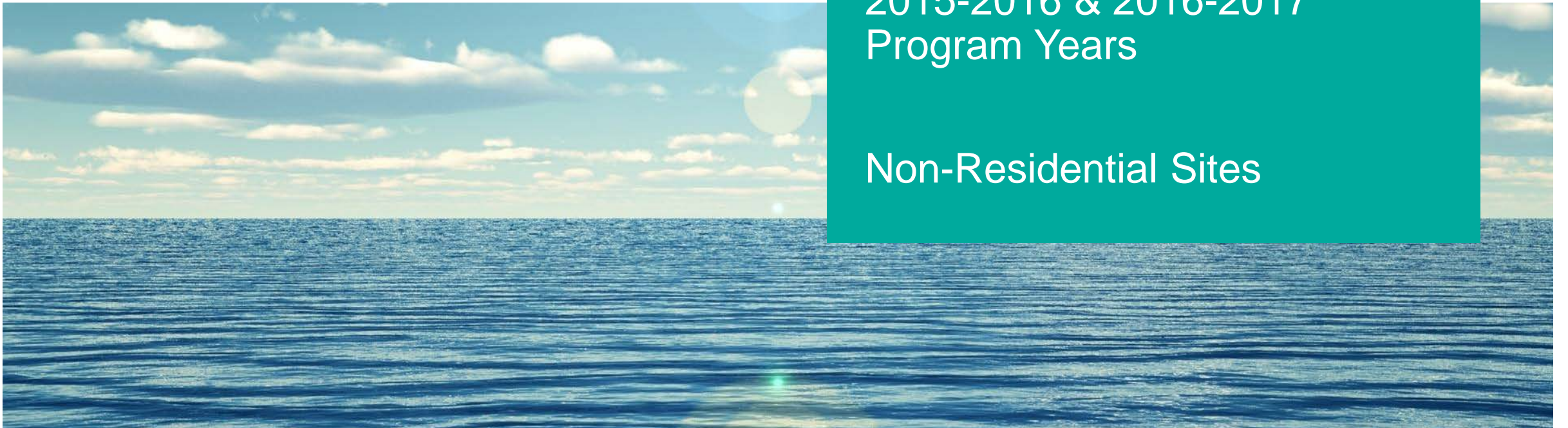
OVERVIEW

Energy Plus Direct Install
Program

Lighting and Refrigeration
Measures

2015-2016 & 2016-2017
Program Years

Non-Residential Sites



EVALUATION ACTIVITIES

29 Sites Selected:

14 Lighting Sites

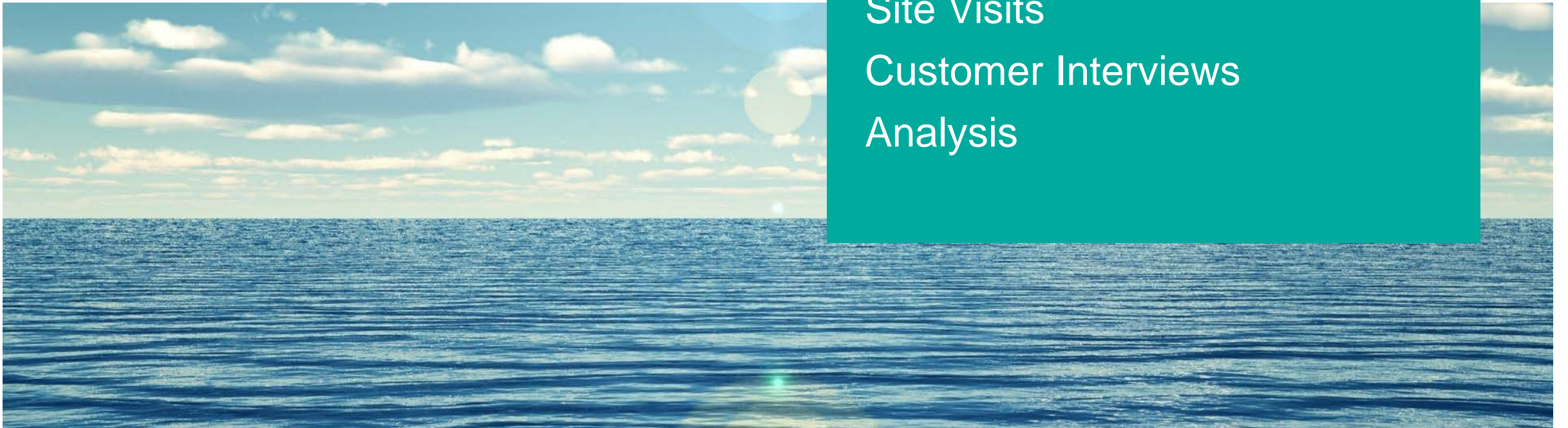
15 Refrigeration Sites

Documentation Review

Site Visits

Customer Interviews

Analysis



EVALUATION ACTIVITIES

- On-site verification of measures installed
 - Verified lighting measure quantities, technology types, and hours of operation
 - Verified refrigeration measures installed and operational

RESULTS

Lighting Direct-Install Program
Refrigeration Direct-Install Program



REALIZATION RATE

$$\text{Realization Rate (\%)} = \frac{\text{Evaluation Verified Savings}}{\text{Program Reported Savings}}$$

Realization Rate a snapshot in time of program's performance

RESULTS – LIGHTING

- 98.3% measure realization rate
- Majority of measures found installed as expected
- Yearly hours of operation discrepancy – accounting for holiday schedule

Energy Savings for Lighting Sites

Site #	Reported Savings (kWh)	Verified Savings (kWh)	Realization Rate
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Site #13	115,874	115,874	100.0%
Site #14	26,376	26,505	100.5%
Total	1,891,719	1,862,143	98.3%

RESULTS – LIGHTING

- Three sites with differing measure quantities
- One site undergoing major renovation – multiple exterior fixtures either not installed or removed

Energy Savings for Lighting Sites

Site #	Reported Savings (kWh)	Verified Savings (kWh)	Realization Rate
Site #1	31,633	31,633	100.0%
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Site #4	220,252	215,955	98.0%
Site #5	302,881	297,779	98.3%
Site #6	329,906	329,906	100.0%
Site #7	221,213	221,213	100.0%
Site #8	72,848	71,808	98.6%
Site #9	26,008	24,368	93.7%
Site #10	302,301	302,301	100.0%
Site #11	120,270	120,270	100.0%
Site #12	2,632	2,560	97.3%
Site #13	115,874	115,874	100.0%
Site #14	26,376	26,505	100.5%
Total	1,891,719	1,862,143	98.3%

RESULTS – REFRIGERATION

- 86.6% measure realization rate
- Some measures either not installed or removed due to repairs/renovations
- One site with realization rate of 158.9% - additional measures found

Energy Savings for Refrigeration Sites

Site #	Reported Savings (kWh)	Verified Savings (kWh)	Realization Rate
Site #15	14,353	14,353	100.0%
Site #16	3,078	3,078	100.0%
Site #17	30,720	12,966	42.2%
Site #18	958	958	100.0%
Site #19	11,368	0	0.0%
Site #20	2,972	2,972	100.0%
Site #22	2,022	2,022	100.0%
Site #23	33,632	33,632	100.0%
Site #24	13,232	10,686	80.8%
Site #25	9,736	15,474	158.9%
Site #26	2,022	2,022	100.0%
Site #27	12,008	12,008	100.0%
Site #28	3,078	3,078	100.0%
Site #29	14,296	14,296	100.0%
Total	153,475	127,545	86.6%

RESULTS – REFRIGERATION

- One site was undergoing repairs to their walk-in cooler and had removed the installed measures
- One site under construction, not able to visit
 - If this site had reinstalled the energy efficient refrigeration equipment, realization rate would have been 93.7%

Energy Savings for Refrigeration Sites

Site #	Reported Savings (kWh)	Verified Savings (kWh)	Realization Rate
Site #15	14,353	14,353	100.0%
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Site #28	3,078	3,078	100.0%
Site #29	14,296	14,296	100.0%
Total	153,475	127,545	86.6%

RECOMMENDATIONS

- For lighting projects, require third-party implementers to provide documented justification of the facility's weekly, seasonal, and annual hours of operation.
- If cost-effective, consider deploying light loggers for larger lighting projects to verify the proposed hours of operation. For lighting projects that claim savings greater than 100,000 kWh, meter a sample of projects to verify the hours of operation.

SUMMARY

Overall Finding:

Program found to generally be performing very well

Performance Summary:

Lighting Realization Rate: 98.3%

Refrigeration Realization Rate: 86.6%



SUMMARY

- Majority of measures found to be installed and operational as expected
- Both lighting and refrigeration programs had high realization rates
- During the evaluation period, some measures found to be not installed or removed – lowered realization rates slightly
- One refrigeration site that was under construction had its corresponding energy savings zeroed out – energy savings would have been realized if measures were reinstalled



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