EVALUATION, MEASUREMENT, AND VERIFICATION OF THE MODESTO IRRIGATION DISTRICT, TURLOCK IRRIGATION DISTRICT, AND MERCED IRRIGATION DISTRICT (MTM) NON-RESIDENTIAL ENERGY EFFICIENCY PROGRAMS

FINAL REPORT

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Program Years 2019 & 2020

Prepared for:

Modesto Irrigation District Water and Power

TID WATER & POWER

MID MERCED IRRIGATION DISTRICT WATER & POWER

Submitted by:

ANCHOR BLUE

INCA ENERGY EFFICIENCY CONSULTANTS (INDUSTRIAL COMMERCIAL AGRICULTURAL)

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Introduction

Modesto Irrigation District, Turlock Irrigation District, and Merced Irrigation District (MTM) contracted Anchor Blue Consulting (Anchor Blue) and INCA Energy Efficiency Consulting (INCA) to conduct their Non-Residential Programs Impact Evaluation for Program Years 2019 and 2020. This evaluation report details evaluation and research findings. The Non-Residential program impact evaluation objectives are as follow:

- Review and assess quality of program tracking data, project files, and documentations
- Provide an unbiased and independent program evaluation combining onsite visit data, analysis, and desk research
- Present actionable recommendation to MTM with the goal of improving program and tracking efficiencies and accuracies

Portfolio-Level Ex-Post Net-to-Gross Savings

The MTM Non-Residential Program Impact Evaluation follows the California Evaluation Framework[1] and the California Energy Efficiency Evaluation Protocols[2] for reporting and adhere to International Performance Measurement and Verification Protocols (IPMVP) as our approach to estimating energy and demand savings detailing the following sections:

- Reporting Context
- Overview and Documentation of Specific Evaluation Effort
- Gross Savings
- Net Savings
- EM&V Summary and Conclusions

This evaluation aimed at a combined 15% precision level at 90% confidence for Program Years 2019 and 2020, combining the three utilities population of projects using a stratified sampling strategy. Upon review of the 2019 and 2020 data for all the utilities, Anchor Blue noted that one project completed in Modesto in 2020 accounted for about a quarter of the 2019 and 2020 combined savings for all three utilities. Anchor Blue and the three utilities agreed that including this one site in the combined evaluation could overwhelm

[1] CPUC California Evaluation Framework June 2014
[2] CPUC California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals April 2006

results from the other sites, especially for Merced and Turlock. Therefore, this 'mega project' was removed from the sample draw for the combined three utilities and evaluated separately. The mega project has its own realization rate due to this and is reported as a separate line item throughout the report.

With the mega project removed from the sample draw, the sampling resulted in 21 sample sites for evaluation. For each, Anchor Blue conducted project file reviews and onsite verification activities, including verifying installation, collecting operational data when appropriate, installing logging equipment as necessary and verifying equipment nameplates and model numbers.

The selected evaluated savings represents 11,169,398 kWh and 2,057 kW, which covers 33% of energy and 41% of demand savings claimed for MTM's Non-Residential program savings in PY2019/20, excluding the Modesto mega project. Including the mega project, 50% of the total energy and 53% of total demand savings were evaluated, as shown in Table 1 below.

Table 1. MTM Utility Level 2019 & 2020 Claimed and Evaluated Savings - Energy and Peak Demand

Utility	Total Gross Annual Ex-Ante Energy Savings (kWh)	Evaluated Gross Annual Ex-Ante Energy Savings (kWh)	% of the Total Energy Savings Evaluated	Total Gross Annual Ex-Ante Peak Demand Savings (kW)	Evaluated Gross Annual Ex-Ante Peak Demand Savings (kW)	% of the Total Demand Savings Evaluated
Modesto	5,396,438	1,587,713	29%	678	136	20%
Turlock	24,950,416	7,487,150	30%	4,355	1,921	44%
Merced	3,059,756	2,094,535	68%	0	0	NA
Total	**33,406,610**	**11,169,398**	**33%**	**5,033**	**2,057**	**41%**
Modesto Mega	11,206,288	11,206,288	100%	1,297	1,297	100%
Total with Mega	44,612,898	22,375,686	50%	6,330	3,354	53%

Source: Utility program data and Anchor Blue analysis

The overall energy and peak demand savings realization rates results are 97% and 74%, respectively, across MTM programs, excluding the Modesto mega project. These realization rates are applied to each utility's 2019 and 2020 non-residential program savings, except for the Modesto mega project, which received a realization rate of 95% for energy and 93% for peak demand. Table 2 and Source: *Utility program data and Anchor Blue analysis*

Table 3 below summarize the gross and net savings results by end-use category. Results by utility are reported in the *Portfolio Summary by Utility* section of this report.

Table 2. MTM Non-Residential Portfolio-Level Electric Savings 2019/2020

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Energy Savings Realization Rate	Gross Annual Ex-Post Energy Savings (kWh)	Net-to-Gross Ratio (CA eTRM)	Net Annual Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	97%	-	0.6	-
Non-Res HVAC	164,916	97%	159,968	0.65	103,979
Non-Res Lighting	28,803,881	97%	27,939,586	0.91	25,425,023
Non-Res Motors	201,438	97%	195,394	0.6	117,236
Non-Res Pool Pumps	5,274	97%	5,116	0.6	3,069
Non-Res Refrigeration	1,201,872	97%	1,165,808	0.6	699,485

Non-Res Shell	44,542	97%	43,206	0.6	25,923
Non-Res Process	2,795,441	97%	2,711,561	0.6	1,626,936
Non-Res Comprehensive	79,893	97%	77,496	0.6	46,497
Non-Res Behavior	-	97%	-	0.6	-
Other	109,352	97%	106,071	0.6	63,642
TOTAL	**33,406,610**		**32,404,204**	**0.87**	**28,111,792**
Modesto Mega	11,206,288	95%	10,610,848	0.8	8,488,678
TOTAL - with Mega	**44,612,898**		**43,015,052**		**36,600,471**

Source: Utility program data and Anchor Blue analysis

Table 3. MTM Non-Residential Portfolio-Level Demand Savings 2019/2020

End-Use Category	Gross Annual Ex-Ante Demand Savings (kW)	Demand Savings Realization Rate	Gross Annual Ex-Post Demand Savings (kW)	Net-to-Gross Ratio (CA eTRM)	Net Annual Ex-Post Demand Savings (kW)
Non-Res Cooking	-	74%	-	0.6	-
Non-Res HVAC	45	74%	33	0.65	21
Non-Res Lighting	4,758	74%	3,513	0.91	3,197
Non-Res Motors	12	74%	9	0.6	5
Non-Res Pool Pumps	-	74%	-	0.6	-
Non-Res Refrigeration	18	74%	13	0.6	8
Non-Res Shell	-	74%	-	0.6	-
Non-Res Process	147	74%	109	0.6	65
Non-Res Comprehensive	41	74%	30	0.6	18
Non-Res Behavior	-	74%	-	0.6	-
Other	13	74%	10	0.6	6
TOTAL	**5,033**		**3,716**		**3,320**
Modesto Mega	1,297	93%	1,211	0.8	969
TOTAL - with Mega	**6,330**		**4,927**		**4,289**

Source: Utility program data and Anchor Blue analysis

Key Findings

The gross impact evaluation results are based on 21 onsite visits that represent a sample of all MTM Non-Residential Programs. One 'mega' site in Modesto, account for a quarter of the combined utility 2019/2020 program savings, was also evaluated separately for a total of 22 sites evaluated. After reviewing relevant sample project files and datasets specific to each site, Anchor Blue designed Measurement &Verification (M&V) specific site plans for each sample site.

While onsite, the Anchor Blue team performed data collection activities such as verifying installation counts, make and model of equipment, operational data, and other relevant variables supporting M&V activities. Where appropriate, Anchor Blue installed loggers onsite to collect three weeks of operational data. Some sites required billing data analysis, for which Anchor Blue worked with each of the MTM utilities to acquire customer billing data. Anchor Blue created site-specific evaluation reports for each site evaluated, which are included in this report. The main findings and recommendations resulting from this impact evaluation are outlined below:

- With some exceptions, the project documentation provided good quality data to verify the installed equipment.

- Several sites went through scope changes during the rebate process and these changes were not as well documented in the project files. For two sites, this resulted in the incorrect rebate calculator being used for final rebate processing.
    - ***Recommendation:*** *for sites that go through scope changes during the rebate process, add 'notes to files', email communications, and/or all other relevant information related to the scope change in the project file.*

- Some project files had multiple lighting rebate calculator spreadsheets and/or different scanned versions of these spreadsheets. It was sometimes difficult to discern which was the final rebate calculator.
    - ***Recommendation:*** *If a site goes through multiple iterations of analysis due to scope changes or other corrections, mark the final rebate calculation workbooks as 'final' in the file name, ensuring that these savings are entered into the tracking database. Earlier versions should be kept but marked with their respective iteration version number in the file name.*

- Many lighting sites did not have any Excel rebate calculation spreadsheets provided, making it difficult to identify the exact reason for a change in energy savings in the ex-post calculations.
    - ***Recommendation:*** *Retain Excel rebate calculation workbooks for all custom lighting projects, in addition to project documentation.*

- Some sites claimed peak demand savings for exterior nighttime application fixtures, which operate during off peak hours and should have a coincident demand factor of 0 applied.
    - ***Recommendation:*** *Ensure the base lighting rebate and savings spreadsheets for each utility includes a 0.0 peak coincidence factor for exterior nighttime light fixture applications.*

- HVAC interactive effects and peak coincident demand factors are not applied for some sites. These factors are outlined in the CMUA TRM savings algorithm and provided in the CMUA TRM by space type. Interactive effects provide additional savings to be claimed from reduced air-conditioning usage at the site due to the lower heat output of LED lighting compared to the baseline. Peak coincident factors are an estimate of the percentage of full demand load that occurs during peak hours. Both factors provide better estimations of the impact of the lighting project on the site.
    - ***Recommendation:*** *All three Irrigation Districts should adopt the use of interactive effects and coincident peak demand factors in their lighting rebate and savings calculators.*

- Several sites used nonstandard baseline fixture wattage assumptions in the ex-ante calculations.
    - ***Recommendation:*** The CMUA TRM provides a detailed list of standard baseline fixture wattages that should be used by all utilities.

- All three Irrigation Districts use different lighting rebate calculators, creating inconsistencies in assumptions, some of which are mentioned in earlier findings.

  - ***Recommendation:*** *Consider adopting a universal lighting calculator to be used by all three irrigation districts, resulting in more consistency across calculations and assumptions.*

- Prescriptive savings sites received the lowest realization rates in this evaluation. All POUs in CA adopted the new ESP program tracking system to track program savings and apply prescriptive savings, replacing the previous E3 calculators. The realization rates were low for these sites due to the mis-selection of the appropriate measure savings in this new system. This is because historical and current measure level savings are included in the system for historical tracking purposes. However, upon review of the system with one utility, Anchor Blue noted that there is no indication of measure savings as 'active' or 'deactivated', so it is easy to apply an old measure savings value, which happened with two sites in this evaluation.
  - ***Recommendation:*** Review ESP tracking systems and update to ensure that only current CMUA TRM deemed savings are considered 'active' and available for use, somehow identifying historical measures as expired or deactivated so that they cannot be applied to current prescriptive applications

- Many of the sites changes in realization rates were due to unanticipated changes in equipment performance and/or operation hours, especially compounded by the CoViD-19 pandemic.

INTRODUCTION

This report summarizes Anchor Blue's impact evaluation of the three Irrigation Districts of Modesto, Turlock, and Merced's (MTM) combined Non-Residential program energy and demand savings for PYs 2019/2020. To reduce EM&V costs while maintaining the target statistical confidence, the three Irrigation Districts implemented a joint EM&V. The three sets of Non-Residential programs are similar in scope, customer characteristics, and geographical proximity.

MTM conducts regular impact evaluations for their Non-Residential programs. The purpose of this impact evaluation is to develop ex-post energy and demand savings results adhering to the CEC POU EM&V Guidelines and the California Energy Efficiency Evaluation Protocols. The CEC POU EM&V Guidelines specify the reporting requirements for EE program evaluations. The components of an impact study include sampling and statistical precision, gross savings, net-to-gross estimation, and EM&V reporting requirements.

The CEC Framework is summarized below:

- **Contextual Reporting**: Evaluation covering a significant portion of the POU's portfolio, assess risk or uncertainty in selecting the components of the portfolio evaluated. EM&V savings reported are consistent with the SB 1037 annual report.
- **Overview and Documentation of specific Evaluation Effort**: States the portion of portfolio evaluated, including EUL and lifecycle savings. Documents all engineering and analysis algorithms, assumptions, survey instruments, and methodology. Documentation of data collection instruments, metering equipment and protocols.
- **Gross Savings**: Review of baseline assumptions, characterizes the population of participants, discussion of sampling approach, design, and precision. Reports ex-post savings extrapolated to program population, and explanation of differences between ex-ante and ex-post savings.
- **Net Savings**: Includes a quantitative assessment of net-to-gross or indicating the sources of NTG assumptions.
- **EM&V Summary and Conclusions**: Report clearly recommendations for improving program processes, assesses the reliability of the verified savings and areas of uncertainty.

OVERVIEW OF MEASURE AND VERIFICATION APPROACH AND SAMPLING

General M&V Approaches

This study is an impact evaluation of MTM's energy and demand savings claimed for the Non-Residential programs for Program Years 2019 and 2020. The CoVid-19 pandemic led to the decision to delay performing the PY 2019 evaluation until this year and to combine the two years into one effort. For this evaluation, Anchor Blue used a stratified sampling approach with target ±15% precision at 90% confidence level.

The overarching goals of the PY 2019/2020 EM&V activities are to provide MTM with unbiased, objective, and independent program evaluation by providing the following:

- Useful recommendations and feedback to improve MTM program operation, tracking, and measure offerings.

- Assessment of the quality of the program tracking data and supporting project application data for impact evaluation purposes.
- Increased level of confidence in energy efficiency program results.

To achieve these goals, Anchor Blue undertook impact evaluations of the MTM non-residential programs using the following guidelines:

- CEC POU EM&V Guidelines
- California Energy Efficiency Evaluation Protocols
- California Evaluation Framework
- International Performance Measurement and Verification Protocols (IPMVP) to determine the best options for evaluating energy efficiency measures (EEMs).

For projects that received an onsite visit, Anchor Blue collected site-specific operating conditions, verified measure installations, placed metering equipment as necessary and took notes of conditions that might impact energy saving results. Using data collected onsite, the team developed a program level realization rate, which is the ratio of ex-ante vs. ex-post savings. From there, the realization rate is extrapolated to the population of participants to estimate ex-post savings for all projects in PYs 2019/2020.

Net-to-Gross (NTG) ratios were estimated to account for spillover and free rider effects based on measure type. NTG values were derived from the CA eTRM[3], which were generally sourced from the DEER database.

Sample Design

The Anchor Blue team defines the EM&V population universe as the program participants identified within each Irrigation Districts program tracking databases for their non-residential programs. Information on installed measures, installation dates, key customer characteristics, and estimated savings are the primary data components that are reviewed for programs when developing the sample design. Anchor Blue insured that each of the three utilities had projects included in the final sample.

Statisticians have developed many approaches to sample design. Each of these approaches may be best suited for a particular evaluation based on the objectives of each program and the availability of the population data. Some commonly used sampling approaches include:

- **Simple Random Sampling.** Simple random sampling is a method of selecting sample cases out of the population such that every one of the distinct population cases has an equal chance of being selected.
- **Systematic Sampling.** In systematic sampling, each sample unit is chosen at a prescribed interval. Often this approach is used to ensure that the sample draw achieves a representative distribution of a particular characteristic, such as ex-ante project savings.
- **Stratified Random Sampling.** In this method, the sample population is divided into subgroups (i.e., strata) based on a known characteristic such as savings level or energy usage. Stratified random samples can produce estimates with smaller coefficients of variation than simple random samples. A sample is then randomly chosen from each stratum in one of three ways: proportional stratification, optimal stratification, or disproportionate stratification.

[3] https://www.caetrm.com/cpuc/table/nettogross/ - accessed 10/1/2021

- **Cluster Sampling or Snowball Sampling.** Cluster sampling can be used to reduce the geographic distribution of the sample. The technique is employed where appropriate in sample selection or the scheduling of site visits to reduce travel times and more efficiently utilize field staff.
- **Ratio Estimation** is a sampling method that can achieve increased precision and reliability by taking advantage of a relatively stable correlation between an auxiliary variable and the variable of interest. For the evaluation of energy efficiency programs, the most frequency utilized ratio is the realization rate between ex-ante savings and ex-post savings.

Sampling for Modesto, Turlock, and Merced

MTM conducts their EM&V study together as a means to reduce cost, while maintaining statistical confidence. The three Irrigation Districts are close in geographical proximity and their programs are similar in scope and size. For the PY 2019/2020 Non-Residential evaluation, the population universe for the EM&V sample is all the PY 2019/2020 participants within each of the utilities non-residential existing buildings programs.

One exception to this population universe is a mega project from Modesto. This single project in 2020 claims 11,206,288 kWh of savings, just over 25% of the combined total claimed savings of 44,612,898 kWh for all three utilities in 2019/2020. Anchor Blue and the three utilities agreed that including this one site in the combined evaluation would overwhelm results from the other sites, especially for Merced and Turlock. Therefore, this mega site was not included in the population universe. Instead, this mega site was evaluated separately, receiving its own realization rate, and is reported as a separate line item throughout this report.

The remaining 33,406,610 kWh savings claimed from over 297 projects across the three utilities are evaluated together using a stratified ratio estimation sampling design. The sample was drawn with the goal of achieving a sampling precision of 90% (+/- 15%) at the project level. With this sampling precision, the sample size was 21 sites.

If each of the utilities had independently evaluated their non-residential programs with the same sampling precision, the combined number of sample sites would be 42. By combining the three utilities into one EM&V effort, a 50% reduction in sample sites is achieved with corresponding budgetary savings. Table 4 provides a breakout by utility of claimed ex-ante savings, the number of projects completed in PY 2019-2020, and the sample of projects drawn from each utility, not including the Modesto mega project.

Table 4. PY 2019 & 2020 Claimed Gross Ex-Ante Savings, Completed Projects, and Sampled Projects by Utility

Utility	Gross Ex-ante kWh	kWh Share	Number of Projects	Projects Share	Sampled Projects	Sampled Share
Modesto	5,396,438	16%	124	42%	12	57%
Turlock	24,950,416	75%	158	53%	6	29%
Merced	3,059,756	9%	15	5%	3	14%
Total	**33,406,610**	**100%**	**297**	**100%**	**21**	**100%**

Source: MTM Program Data and Anchor Blue Analysis
Note: This does not include the Modesto Mega Project, which claimed 11,206,288 savings and was evaluated separately

Stratified Ratio Estimation Sampling

Stratified ratio estimation combines a stratified sample design with a ratio estimator. Both stratification and ratio estimation take advantage of supporting information available for each project in the population. In the case of the non-residential programs, the supporting information is ex-ante energy savings per project.

By using the ex-ante energy savings per project as the stratification variable, the coefficient of variance (CV) in each stratum is reduced, thereby improving the statistical precision. Moreover, the sampling fraction can be varied from stratum to stratum to further improve the statistical precision. In particular, a relatively smaller sample is selected from the accounts with small energy savings, but the sample is forced to include a higher proportion of the projects with larger levels of energy savings.

Non-Residential Projects Sample

The population of accounts for the non-residential existing buildings programs consists of a total of 297 projects. These projects have a very wide range of energy savings extending from 108 kWh to 5,624,020 kWh, with the median being 23,602 kWh (not including the Modesto mega project). The population CV of the energy savings is large, and the stratified ratio estimation sampling provides the best methodology to attain both a sampling precision of 90% (+/- 15%) at the project level, as well as a very high percentage of overall sampled ex-ante savings. The final sample consists of 21 projects, 7% of total projects, but more importantly, 33% of the total ex-ante electric energy savings. Backup sites were also selected but were not necessary in this evaluation as Anchor Blue was able to visit all the primary selected sites. Table 5 identifies each sampled site with utility, sample strata, ex-ante savings, and calculated sample weight.

Table 5. Sample with Utility, Ex-ante Savings, Sample Strata, and Sample Weight

Utility - Site	Sample Strata	Ex-Ante kWh Savings	Stratum Weight
Modesto -1	Stratum 1	376,086	1.52
Modesto -2	Stratum 1	324,878	1.52
Modesto -3	Stratum 1	204,984	1.52
Modesto -4	Stratum 1	203,911	1.52
Modesto -5	Stratum 2	196,999	6.14
Modesto -6	Stratum 2	97,075	6.14
Modesto -7	Stratum 2	78,492	6.14
Modesto -8	Stratum 2	59,749	6.14
Modesto -9	Stratum 3	23,372	90.20
Modesto -10	Stratum 3	14,303	90.20
Modesto -11	Stratum 3	6,625	90.20
Modesto -12	Stratum 3	1,239	90.20
Turlock -13	Stratum 1	5,624,020	1.52
Turlock -14	Stratum 1	1,102,204	1.52
Turlock -15	Stratum 2	549,071	6.14
Turlock -16	Stratum 2	181,646	6.14
Turlock -17	Stratum 3	22,353	90.20
Turlock -18	Stratum 3	7,856	90.20
Merced -19	Stratum 1	1,725,199	1.52
Merced -20	Stratum 2	362,132	6.14
Merced -21	Stratum 3	7,204	90.20

Energy and Demand Savings Estimation

EM&V Protocols

This evaluation was conducted in adherence to the CEC POU EM&V Guidelines, the California Energy Efficiency Evaluation Protocols and referencing the International Performance Measurement and Verification Protocol (IPMVP)[4] for appropriate energy efficiency measures evaluation protocol. For specific evaluation methodology by site, refer to the individual site-reports in the 'Site Level gross Ex-Ante Savings and Estimating Ex-Post Savings' below.

Use of the CMUA Technical Reference Manual (TRM)

Anchor Blue used the 2017 CMUA TRM[5] in some way for most of the site analyses. The CMUA TRM provided the following data:

- Prescriptive HVAC equipment savings
- Custom lighting savings algorithms
- Baseline and default custom lighting inputs
- Baseline fixture wattage assumptions
- Default hours of use by space type, to be used if not provided by the site
- Lighting controls savings factors
- HVAC interactive effect factors by space type for lighting projects
    - Interactive effects provide additional electric savings to be claimed from reduced air-conditioning usage at the site due to the lower heat output of LED lighting compared to the baseline Both factors provide better estimations of the impact of the lighting project on the site.
- Coincident peak demand factors by space type for lighting projects
    - Peak coincident factors are an estimate of the percentage of full demand load that occurs during peak hours and applied to calculated demand savings

These algorithms, savings, lighting data and interactive/coincidence factors were applied as appropriate throughout the evaluation.

SITE LEVEL GROSS EX-ANTE SAVINGS AND ESTIMATING EX-POST SAVINGS

Site Modesto- 1

Project Summary

This site is a large grocery store in Modesto. The site upgraded all its interior lighting from T8s to LED tubes. The site went through a remodel after the project was completed, which moved some lights and removed about five percent of the lighting fixtures, confirmed by visual verification onsite and remodel plans. This reduced number of fixtures resulted in a 107% realization rate for energy savings and 108% for peak demand savings.

[4] For IPMVP document, access at: https://www.nrel.gov/docs/fy02osti/31505.pdf
[5] https://www.cmua.org/files/CMUA-POU-TRM_2017_FINAL_12-5-2017%20-%20Copy.pdf

Table 6. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	376,086	401,345	107%
Peak Demand Savings (kW)	39.5	42.7	108%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

This site updated all the linear fluorescent lighting in the facility. The fixtures ranged from 1- to 6-lamp 4-foot linear fluorescent fixtures. All baseline lamps are 32-watt T8s. The store operates 24/7, 365 days a year and the 8,760 hours are applied to all areas in the baseline. Baseline fixture wattages were:

- Fluorescent, 48" (6) T8 lamps, BF normal
- Fluorescent, 48" (6) 32w T8 lamps, BF normal: 168 watts
- Fluorescent, 48" (4) 32w T8 lamps, BF normal: 112 watts
- Fluorescent, 48" (3) 32w T8 lamps, BF normal: 84 watts
- Fluorescent, 48" (2) 32w T8 lamps, BF normal: 56 watts
- Fluorescent, 48" (1) 32w T8 lamps, BF normal: 29 watts

Description of Efficient Equipment and Operation

The efficient lighting installed were LED Type A plug in tubes. Most of the fixtures were one-for-one replacement, except for eight of the 6-lamp fixtures that were de-lamped to 2-lamp fixtures and all 15 of the 1-lamp fixtures were retrofitted to be two lamp fixtures. Each LED tube is 15 watts with a 1.2 ballast factor applied to the fixtures and with the fixture wattages described below:

- LED, Indoor Lamp (Tube - Plug In - UL Type A – 15w) - 6 Lamp: 108 watts
- LED, Indoor Lamp (Tube - Plug In - UL Type A – 15w) - 4 Lamp: 72 watts
- LED, Indoor Lamp (Tube - Plug In - UL Type A – 15w) - 3 Lamp: 54 watts
- LED, Indoor Lamp (Tube - Plug In - UL Type A – 15w) - 2 Lamp: 36 watts

The same 8,760 hours of use as the baseline were applied in the efficient case.

Comments on Ex-Ante Calculations

Ex-ante calculations showed 8,760 hours for all areas and lumped together areas by fixture type. Some areas were confirmed to not have 8,760 hours while Anchor Blue was onsite. The ex-ante calculations include HVAC interactive effect factors and coincident demand savings factors from the CMUA TRM based on the space type identified for each fixture.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the wattage and quantity of the fixtures
- Confirmed the operating schedule of the store and separate departments

- Discussed remodel changes to the lighting system with the remodel contractor onsite

Summary of Site Visit

Anchor Blue performed a site visit in June 2021. Anchor Blue verified the lighting count, fixture types, and operational hours. Lighting counts onsite showed variance by area type, and it became clear that the rebate spreadsheet had lumped areas by fixture type rather than by actual area. Because of this, Anchor Blue counted the total lamps rather than fixtures and compared the total verified lamps to the total claimed lamps. However, Anchor Blue found a higher number of fixtures in the store than were rebated.

While onsite, Anchor Blue observed that a remodel was taking place at the store and ran into the construction manager while onsite. The remodel construction manager informed Anchor Blue staff that some of the lights had been moved and some had been removed during the remodel, and that he could provide pre and post lighting plans to help the analysis. Anchor Blue received these pre and post lighting plans, which were used in the analysis to true up lighting counts and usage.

Anchor Blue discussed HOU with the onsite staff as well. In discussions with the staff, Anchor Blue found that several areas were not actually 8,760 as had been claimed. The meat department, bulk food department, bakery and offices all had less hours than the ex-ante spreadsheet. Anchor Blue recorded the hours open for those areas, also confirming that the lights were off in those areas when they were closed resulting in the following new line items in the ex-post spreadsheet to account for these locations different HOU:

- Meat Department – 5,840 HOU
- Bulk Foods Department – 4,377 HOU
- Bakery Department – 6,935 HOU

Office areas were estimated to be the same as the bulk foods department hours to account for staff being in those areas more often than default office hours (since they include weekends and longer hours) but should be less than 8,760 hours.

Ex-post Calculations and Assumptions

Much of the ex-post analysis revolved around determining the impact of the remodel on the fixture counts and re-allocating some fixtures to the areas identified above with less than 8,760 hours. During analysis, Anchor Blue found that there were two different photocopies of the lighting calculator, one that was the "actuals" and one that was "rebated" which had a lower number of fixtures. The rebated amount was lowered in order to match the 4,440 T8 lamps disposed in the recycling disposal manifest. This explains why there were more fixtures verified onsite than were on the 'rebated' spreadsheet. Anchor Blue also found a more detailed fixtures by spaces, which allowed for the delineation of the new spaces with different hours of use. Anchor Blue compared the verified number of lamps onsite to this inventory and got 95.6% verified, which matches the reduction in fixtures based on the remodel documentation provided.

The remodel documentation did not identify which fixtures were removed from what area, but in discussion with the contractor, the changes focused on the sales floor and stock areas. Therefore, the number of fixtures on those areas were reduced to account for the removal of fixtures during the remodel. The more discrete areas with less fixtures that were able to be verified onsite were not reduced. The final counts used in the ex-post analysis were equivalent to the 4.4% reduction found in the remodel documentation. The baseline number of fixtures were not changed.

Finally, in addition to the new spaces created with different operating hours, Anchor Blue changed the space type of the offices areas to 'offices' from the ex-ante 'grocery' space type and freezer areas to 'refrigerated space' from the ex-ante 'grocery' space type. These changes resulted in different coincidence demand factors and HVAC interaction factors for these spaces.

The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings, using interactive effects and coincidence factors to calculate savings.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,
$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor for energy savings by space type:

Grocery = 0.96
Refrigerated Space = 1.57
Offices = 1.12

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,
DIE_{Demand}: DEER Interactive Effects Factor for demand savings by space type:

Grocery = 1.28
Refrigerated Space = 1.32
Offices = 1.31

CDF: Coincident Diversity Factor for peak demand by space type:

Grocery = 0.69
Refrigerated Space = 0.69
Offices = 0.69

The realization rate for both energy savings (107%) and peak demand savings (108%) are due to the removal 4.4% of the fixtures during the store remodel. The change in HOU for some areas impacted a small number of the overall fixtures, resulting in minimal change on the energy realization rate.

Site Modesto- 2

Project Summary

This site is a strip mall in Modesto, California. The site replaced its outdoor lighting with LED fixtures, including parking lot lights, wall packs and facility operated canopy lights. Anchor Blue found slightly reduced energy savings due to minor variations in the number of lights found at the site, resulting in a 97.7% realization rate for energy savings. No demand savings were claimed for this site as it operates at night.

Table 7. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	324,878	317,444	97.7%
Peak Demand Savings (kW)	0	0	NA

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

The site replaced the following baseline fixtures by area, all of which operated on dawn to dusk controls:

- 1000-watt metal halide parking lot lamps on poles
- 400-watt metal halide parking lot lamps on shorter poles
- 3-Lamp 4ft T8 fixtures under canopies
- 2-lamp 2ft T8 fixtures under canopies
- 100-watt metal halide fixtures under canopies
- 100-watt high pressure sodium exterior wall pack fixtures

Description of Efficient Equipment and Operation

The facility replaced all the parking lot lights, wall packs and canopy lights not under tenant control with LED fixtures. Additionally, the site made some changes to the total number of pole mounted lights in the parking lot. Overall, 25 of the 1000W metal halide fixtures were completely removed, while eight new flood lamps were added to the site. The LED fixture wattages varied based on what baseline lamps were replaced:

- The tall parking lot pole-mounted lights were replaced with 215-watt LED pole heads
- The two short parking lot pole lights were replaced with 142-watt LEDs
- The metal halide canopy lights were replaced with 23.5-watt LEDs
- The fluorescent canopy lights were replaced with 32-watt LEDs.
- The HPS wall packs were replaced with 57-watt LEDs.
- 8 new, 74-watt LEDs were added to the building façade as parking flood lights

The new fixtures are also on dusk to dawn controls.

Comments on Ex-Ante Calculations

The ex-ante calculations used standard hours and baseline power for the fixtures, but the project documentation had some discrepancies in the numbers of fixtures as the project appeared to have changed from its original scope. Anchor Blue was provided two rebate analysis spreadsheets, however, neither matched the final rebate spreadsheet version, which was provided only as part of the pdf documentation. The

final version of the spreadsheet in the project pdf documentation listed the eight new LED building façade flood lamps as 'removed from project', but they were found onsite and appear to replace some of the removed parking lot pole fixtures.

All fixtures are outdoor lights on at night, therefore no interactive effects or coincident demand factors are included in the ex-ante calculations.

Onsite Visit and Ex-Post Savings Calculations

M&V Method
Anchor Blue collected the following data during the onsite visit:

- Confirmed the installation, type, and quantity of the fixtures
- Confirmed the operating schedule

Summary of Site Visit

Anchor Blue visited the facility in June 2021 and confirmed the installation of most of the listed lights. There were a few discrepancies, specifically:

- Anchor Blue found 20 fewer 2' x 4' retrofitted fixtures than claimed.
- Anchor Blue found one fewer 2' x 2' retrofitted fixtures than claimed.
- There were two more LED pole lights than listed in the final version of the project. This was consistent with the original draft version of the project.

The ex-ante values matched the invoice total, but since the lights could not be found at the site, Anchor Blue removed them from the totals. Additionally, the eight new pole mounted façade floods were listed as 'removed from the project' in the documentation. However, these fixtures were found onsite and are included in the total efficient wattage for the project since it appears that they replaced some of the lighting from the 25 total pole fixtures removed from the site.

Ex-post Calculations and Assumptions
The ex-post calculations used a standard algorithm with onsite findings to determine energy savings. The modified algorithm uses interactive effects to calculate savings. However, the interactive effects are 1.0 for this site since there is no heating and cooling interaction for outdoor fixtures. Anchor Blue used standard CMUA TRM baseline wattages for the baseline fixtures and the specification sheet wattage for the LED fixtures. Anchor Blue used CMUA TRM standard annual outdoor lighting hours of 4,180 for the fixture operation.

Annual Energy Savings Algorithm
$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,
$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor for energy savings for outdoor fixtures = 0

Summer Coincident Peak kW Savings Algorithm
$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,
DIE_{Demand}: DEER Interactive Effects Factor for peak demand savings for outdoor fixtures = 0
CDF: Coincident Diversity Factor for peak demand = 0 for exterior fixtures.

The 97.7% energy realization rate for the project decreased slightly due to the variance in the number of fixtures found on site.

Site Modesto- 3

Project Summary

This site is a parking garage with 8,760 lighting hours. Multiple lighting upgrade projects were done at this site from 2018-2020 and this project was one of those multiple projects. Anchor Blue verified three different types of fixtures onsite, 1-lamp, 2-lamp and 4-lamp high output LED fixtures. The claimed 90-watt LED fixtures matched the 2-lamp fixtures found onsite and were assumed to be the fixtures replaced for this project. 188 fixtures were verified compared to the 195 claimed, resulting in the 96% realization rate for energy savings. Demand savings were not claimed for this project, but because these fixtures operate 24/7, demand savings were calculated in the ex-post analysis.

Table 8. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	204,984	197,626	96%
Peak Demand Savings (kW)	0.0	15.8	NA

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

This rebate was for one of several projects that took place at the parking garage. This project replaced 195, 175-watt Metal Halide magnetic ballast fixtures operating at 8,760 hours.

Description of Efficient Equipment and Operation

The facility upgraded all the baseline lights to 90-watt LED fixtures operating 8,760 hours.

Comments on Ex-Ante Calculations

According to the project documentation, this rebate was one of several LED upgrades done at this site. The onsite visit confirmed this, and Anchor Blue identified two different fixture types in the main parking areas and a separate type of fixture in the stairwells. According to the site contact, all the fixtures were upgraded at different points between 2018 and 2020, but because of multiple rebates processed, it was unclear which fixtures were associated with this rebate. It appears that this rebate of 195 fixtures was processed based on matching the quantity of fixtures in the invoices as it was unclear which fixtures were actually replaced. Anchor Blue utilized the verified number of fixtures for the analysis rather than the claimed.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the wattage and quantity of the fixtures
- Confirmed the operating schedule
- Confirmed the presence of photocell sensors

Summary of Site Visit

Anchor Blue performed a site visit in June 2021. As stated above, there was ambiguity as to which fixtures were replaced under this rebate since multiple rebates were processed for this site. Anchor Blue identified three different fixture types (1-lamp, 2-lamp, and 4-lamp high output LED fixtures) in the facility and counted

all three types and verifying the fixture wattages. The 2-lamp fixtures matched the claimed 90-watt LEDs in the site documentation and the verified number of 2-lamp, 90-watt LEDs came out to 188 fixtures, close to the claimed 195 fixtures. Anchor Blue also verified with the site contact that the hours of operation for this site are 8,760 hours.

Ex-post Calculations and Assumptions

In the ex-post analysis, Anchor Blue used the verified number of fixtures (188) and the verified hours of use (8,760). The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings. The modified algorithm uses interactive effects and coincident peak factors to calculate savings as shown below.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor for energy savings for parking garage lights = 1.00

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,

DIE_{Demand}: DEER Interactive Effects Factor for peak demand savings for parking garage lights = 1.00
CDF: Coincident Diversity Factor for peak demand = 0.70 for parking garage lights

The realization rate for the energy savings is due to a lower number of verified fixtures than claimed (188 verified vs. 195 claimed). This rebate was treated as an exterior lighting rebate and therefore no demand savings were claimed. However, these fixtures operate 24/7 and therefore should have demand savings claimed, which have been calculated in the ex-post analysis.

Site Modesto- 4

Project Summary

The site is an industrial facility in Modesto that installed high bay LED lights with occupancy sensors in its new distribution center areas. This project was rebated through the MPower Business New Construction program and the ex-ante calculations were based on code lighting power density of 1-watt/sq-ft, as required for the building type. The ex-ante hours of use did not account for motion sensors as required by Title 24 and that were confirmed to be present onsite. The site is still ramping up its use, which rendered the lighting logger data unusable. Therefore, Anchor Blue applied the standard 31% motion sensor hours of use reduction from the CMUA TRM for the industrial storage space type to estimate the hours of use for ex-post. This is the primary reason for the 73% energy savings realization rate. The demand realization rate is 108% because the actual power usage was unchanged from the ex-ante calculations, but interactive effects and coincident peak factors were applied in the ex-post calculations.

Table 9. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	203,991	148,872	73%
Peak Demand Savings (kW)	44.6	48.3	108%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

The industrial facility built a new 147,800 square foot distribution center, including various work areas and storage for industrial uses. Savings were compared to the 1-watt/sq-ft lighting power density baseline, which is the Title 24 requirement for a building used for general commercial and industrial work. The hours of use were provided by the site contact.

Description of Efficient Equipment and Operation

The facility installed all LED high bay lights with area-based motion sensors in the facility. Motion sensors are required by Title 24 energy code.

Comments on Ex-Ante Calculations

The ex-ante calculations used prorated baseline power assumption for the baseline high bay fixtures to comply with Title 24 code but did not account for interactive effects to cooling the building or coincident demand factors. Ex-ante calculations used 4,576 hours of operation for all lights, which was provided by the site contact. However, it does not appear that the effect of motion sensors on the hours of use were accounted for in the ex-ante calculations, which are also required by Title 24 in this type of building and were observed on site. The site was anticipated to operate 16 hours a day, 5.5 days per week, all weeks of the year, with no holidays, equating to 4,576 annual hours of use. The CMUA TRM states that motion sensors decrease hours by 31% for commercial and industrial storage buildings, which this site most closely represents in most areas. This 31% was not applied to the ex-ante hours of use.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the installation and operation of the lights
- Confirmed the operating schedule

Summary of Site Visit

Anchor Blue visited the facility in June 2021 and confirmed the installation of motion sensor controlled high bay LED lights in all areas. It was not practical to count all 1,147 lights, but the installation density appeared to match the application and the invoices show three more fixtures than the number of claimed fixtures. According to facility staff, the distribution center is currently at only 30% capacity, and will be increasing from one to two shift operation in the late summer. Anchor Blue installed five lighting intensity loggers throughout the facility. These loggers record light levels rather than on/off status and were installed in general areas, not under specific lights. The final logger data showed low usage during the site visit in many areas, which aligns with the staff claim that the building is still ramping up capacity.

Ex-post Calculations and Assumptions

The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings using interactive effects and peak coincident demand factors to calculate savings. Anchor Blue used the standard baseline usage of 147,800 watts for the facility, consistent with 1/watt per sq ft requirements of Title 24 in this 147,800 sq ft building. The LED specification sheet wattage was used for the LED fixtures.

Anchor Blue deemed that the lighting intensity loggers were not an accurate representation of the facility's actual hours of use since the facility is only operating at 30% capacity and expected to increase in the future to the claimed operation schedule. Therefore, for the ex-post calculations, Anchor Blue used lighting hours that are based on the claimed 4,576 hours of use but applied the CMUA TRM standard motion sensor reduction of 31% for an ex-post hours of 3,157.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor for energy savings for industrial building = 1.04

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,
DIE_{Demand}: DEER Interactive Effects Factor for peak demand savings for industrial building = 1.18
CDF: Coincident Diversity Factor for peak demand = 0.92 for industrial building

The energy realization rate for the project increased slightly due to the inclusion of interactive effects, however decreased to 73% after applying the reduction in hours of use due to motion sensors. The demand realization rate resulted in 108% due to the inclusion of interactive effects and the coincident demand factor industrial buildings.

Site Modesto- 5

Project Summary

This site is a country club that offers a full restaurant, pro shop, locker rooms, fitness rooms, offices, and outdoor tennis courts. The project was difficult to evaluate due to several discrepancies in the site documentation, as noted in the next section in more detail. In summary, a preliminary rebate spreadsheet was used to process the rebate, but a post inspection rebate spreadsheet was also provided that included the actual areas rebated. This discrepancy is one of the main drivers of difference between the ex-ante and ex-post savings, as more interior areas were included in the post-inspection spreadsheet, and different fixture counts. Additionally, the rebate spreadsheets used default hours of use (HOU) for all areas. Anchor Blue logged several areas of the site which resulted in different hours for most areas, also contributing to the 77% realization rate for the energy savings. The peak demand savings realization rate is 240% because the post inspection spreadsheet included several interior areas that were not on the preliminary spreadsheet that include peak demand savings.

Table 10. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	196,999	152,471	77%
Peak Demand Savings (kW)	3.08	7.40	240%

Source: Project Documentation, Anchor Blue Analysis

Site Documentation Notes:

This site was very difficult to evaluate as there were discrepancies in the project file, onsite counts and analysis spreadsheets provided to Anchor Blue. Anchor Blue discussed this site with the MID staff who processed it, who confirmed how difficult this site was to process. The initial rebate spreadsheet developed for this site was based on preliminary information and did not have the proper documentation. There was a photocopy of this spreadsheet in the project file, with the claimed savings of 196,999 kWh and 3.08 kW. Ultimately, the proper information was provided by the vendor with several additional interior areas that were eligible for a rebate and added to a second iteration of the rebate spreadsheet that was used for the post-installation verification visit. This spreadsheet was also provided to Anchor Blue but contained different ex-ante savings estimates than the claimed savings with this updated spreadsheet showing 177,703 kWh saved and 7.369 kW saved.

In discussions with the site representative and MID staff, the second spreadsheet with (177,703 kWh claimed) was intended to be the spreadsheet used to process the rebate. This spreadsheet included additional project areas that were confirmed to be part of the project after additional vendor documentation was provided and the post-inspection was done, which included the pro shop, men's/women's locker rooms, and the kitchen. It appeared that the original spreadsheet (with 196,999 kWh claimed) was ultimately used to process the rebate and entered into the database. Anchor Blue verified that the database claimed savings matched the original scanned spreadsheet. This is one of the reasons for differences in the ex-post savings.

Description of Baseline Equipment and Operation

Several types of fixtures were replaced at this site in both interior and exterior areas. These include:

- 30-watt halogen can lights in the front entrance exterior area and the outdoor walkways

- 8ft T12 2-Lamp fixtures in the basement (claimed at the equivalent T8 fixture wattage)
- 2- and 4-Lamp 4ft T8 fixtures in kitchen, offices, and fitness room
- 4-lamp 2ft T8 fixtures in the pro shop and locker rooms
- 1000-watt Metal Halide fixtures in the tennis courts area
- 400-watt Metal Halide fixtures in the parking lot

For all the baseline fixtures, no schedules were provided by the vendor or site contact and default values were utilized from the MID lighting calculator. All outdoor lights (including the tennis courts) were given the exterior default HOU of 4,180 and interior lights were given default values for offices (2,640 HOU), assembly (2,610 HOU), or restaurant (4,830 HOU).

Description of Efficient Equipment and Operation

LED fixtures of different types were installed in all areas:

- The exterior halogen can lights were replaced with 12- and 15-watt LEDs
- The basement T12s were re-lamped with 42-watt 8ft LED tubes
- All 2x4 and 2x2 T8 fixtures were replaced with 30- and 40-watt LED troffer style fixtures
- The tennis court and parking lot fixtures were replaced with higher wattage LEDs

The same default space type hours as the baseline fixtures were utilized in the efficient case.

Comments on Ex-Ante Calculations

The ex-ante calculations all utilized default HOU from the lighting calculator. However, the country club does not operate as normal spaces would, often with longer hours than the default. Additionally, there were a few efficient fixtures with incorrect wattages based on the project file review. The ex-ante calculations included HVAC Interactive Effects Factors and coincident demand savings factors based on space type.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the wattage and quantity of the fixtures
- Confirmed the operating schedule
- Placed several lighting loggers in different areas to confirm operation

Summary of Site Visit

Anchor Blue performed a site visit in June 2021. The site visit stated that the entire facility had been retrofitted to LEDs and that there were multiple rebates provided through different programs and some fixtures that had not qualified for any rebates. The site contact was unsure which areas were rebated under this program and due to the discrepancies in the project file, Anchor Blue counted fixtures and confirmed wattages in all the possible areas on both spreadsheets, and additional areas that the site contact said had been rebated under either this project or another program. The efficient fixture types matched the description in most cases, but one area, offices, had two different types of fixtures rather than the one type identified in the project documentation. Additionally, a few other areas had discrepancies with the number of fixtures confirmed onsite, but generally were close to the claimed number of fixtures.

Ex-post Calculations and Assumptions

There were several updates made to both the baseline and efficient fixture types, wattages, counts and HOU in the ex-post calculation. The 'offices' line item was broken out into two lines because two different fixture types were found onsite (2x2s and 2x4s found onsite rather than only 2x4s claimed in the project documentation). Additionally, a few of the efficient fixture wattages were updated to match the documentation including the tennis court lights and LED troffers replacing 2x2s rather than 2x4s.

Anchor Blue placed four lighting loggers at this site, one of which failed. Regardless, the other loggers that did not fail provided better estimates of HOU than the default hours in the ex-ante calculations and were used for multiple areas. The logger placed in the locker room showed significant hours (5,809), indicating that this area was occupied during most of the business hours, which is 6:00 am to 11:00 pm. This logger data HOU estimate was also used for the basement and the fitness room. The office logger data showed lower HOU (4,785) than the locker rooms, but still higher than default spreadsheet HOU. Anchor Blue applied these HOU to the offices and the Pro Shop area. The kitchen lights were on most of the time according to the logger data.

Anchor Blue also updated the HOU for the tennis court lights based on the hours that the tennis courts are open. They are open from 6am to 11pm and Anchor Blue estimated the HOU for the tennis courts lights based on those hours and daylight hours in Modesto, assuming that these lights will be off from 11pm to 6am. This resulted in half the HOU from the ex-ante calculation.

The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings. The modified algorithm uses interactive effects to calculate savings.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factors for energy savings in several different area types:

Exterior = 1.00
Assembly = 1.04
Office = 1.12
Retail = 1.06
Kitchen = 1.03

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,

DIE_{Demand}: DEER Interactive Effects Factors for peak demand savings in several different area types:

Exterior = 1.00
Assembly = 1.18
Office = 1.31
Retail = 1.20
Kitchen = 1.18

CDF: Coincident Diversity Factor for peak demand in several area types:

Exterior = 0.0
Assembly = 0.53
Office = 0.71
Retail = 0.88
Kitchen = 0.80

Overall, the 77% realization rate for energy was lower due to changes in HOU, especially the lower hours of use for the tennis courts. Additionally, both the energy and peak demand savings were impacted by the discrepancy in the spreadsheet utilized for the rebate. An older version of the rebate spreadsheet was mistakenly used for the final rebate, which had included 10 more tennis court fixtures that were not eligible for the rebate and did not include the interior spaces such as the kitchen, pro shop and locker rooms. These additional interior areas increased the kW savings for the site, resulting in a 240% peak kW realization rate.

Site Modesto- 6

Project Summary

This site is an industrial facility in Modesto that replaced all its existing T8 fixtures with high bay and office recessed LED lights in its production facility. The energy realization rate is slightly lower due to reduced hours in the office areas based on lighting logger data. The demand savings increased slightly because of a change in the space type for the 'parts' space type to manufacturing from assembly, which had a higher coincidence factor than the assembly space type.

Table 11. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	97,075	95,184	98%
Peak Demand Savings (kW)	15.4	15.9	103%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

The industrial facility retrofitted their high bay and office T8 fixtures with new LEDs. The existing T8 fixtures were a variety of different standard wattage T8 fixtures, ranging from 1-lamp to 6-lamp 4-ft T8 fixtures, along with a few 4- and 6-lamp high performance T8 fixtures. The facility normally operates 24 hours, five days a week, resulting in 6,257 annual hours of use in the production areas. The office areas were claimed to have 3,120 hours of use. Most areas are controlled by manual switches, with a few office areas controlled by occupancy sensors.

Description of Efficient Equipment and Operation

The facility installed LED tubes and fixtures of varying wattages to replace its T8 lamps, depending on the number of lamps in the existing fixtures. The hours of use and controls were unchanged from the baseline.

Comments on Ex-Ante Calculations

The ex-ante calculations used standard CMUA TRM baseline wattages for the fixtures, including interactive effects and coincident demand factors.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the installation and operation of the lights
- Confirmed the operating schedule
- Installed data loggers in the office areas

Summary of Site Visit

Anchor Blue visited the facility in June 2021 and confirmed the installation of LED lights in all areas. The majority of these remained on during all operating hours, but a few storage and office areas had either locally controlled switches or motion sensors, consistent with the ex-ante claims. Anchor Blue counted and verified the number of fixtures for nearly all the claimed line items that were easily accessible. Since these sampled areas were verified with the onsite count, Anchor Blue assumed the inaccessible areas were also

verified. According to facility staff, the facility is currently operating continuously, but is normally on a five-day, 24-hour schedule. Anchor Blue installed data loggers in two areas around the offices, which are the only areas where lights do not remain on continuously when the facility is open.

Ex-post Calculations and Assumptions

The ex-post calculations used a standard lighting algorithm with onsite findings to calculate energy savings, including interactive effects and coincident demand factors from the CMUA TRM. Anchor Blue used the claimed 6,257 hours of use for the manufacturing areas, which is based on 24-hour usage, five days a week, which was verified as the normal schedule with the site contact. Anchor Blue updated the hours of use in the office areas based on the installed lighting logger data, which indicated 2,257 hours annually. Coincidence factors and interactive effects were applied by space type. Anchor Blue agreed with the claimed space types except for the assembly space type, which was applied to the 'Parts' area. Given that this space operated similarly to the other production areas, the space type was updated to manufacturing.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor for energy savings by space type =

Storage = 1.00
Manufacturing = 1.04
Offices = 1.12

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,

DIE_{Demand}: DEER Interactive Effects Factor for peak demand savings by space type =

Storage = 1.00
Manufacturing = 1.18
Offices = 1.31

CDF: Coincident Diversity Factor for peak demand by space type

Storage = 0.70
Manufacturing = 0.92
Offices = 0.71

The energy realization rate for the project decreased slightly at 98% due to reduced office area hours. The demand savings increased slightly to 103% due to a change in space type identification for the 'Parts' area from assembly to manufacturing, which had a higher coincidence factor.

Site Modesto- 7

Project Summary

The site is an industrial facility in Modesto that replaced 46 of its outdoor HID lights with LEDs and installed 11 circuit-based photocells to control them. There are more outdoor lights at this site than were claimed through this project, as all the outdoor lights are being upgraded to LEDs in increments. This site was rebated through the MPower Business Rebate program and the ex-ante savings were based on prescriptive rebates for the fixture and control types. However, the use of prescriptive savings results in significant deviation from the calculated ex-post savings used in this report. In review of this site with MID staff, the incorrect prescriptive measures were selected for this project, as explained in the 'Comments on Ex-Ante Calculations' section below. The misclassification of the baseline fixture type for the prescriptive savings resulted in much higher ex-ante savings than ex-post, as well as inadvertent peak kW savings, which should not exist for outdoor lighting operating through the night. As a result, the realization rate for energy on this project is low at 60% and 0% for demand savings.

Table 12. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	78,492	46,741	60%
Peak Demand Savings (kW)	14.2	0	0%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

The baseline lights replaced were 400-watt HPS lamps and 250-watt metal halides. All the baseline fixtures operated on a timeclock, operating only at night.

Description of Efficient Equipment and Operation

The facility replaced 22 400-watt high pressure sodium pole lights with 163-watt LED Fixtures and 24 250-watt wall packs with 104-watt LEDs. Additionally, the site installed 11 new circuit-based photocells to control them. However, since the baseline lights already had timeclock controls, these photocells should not have been included in the rebate since they provide no incremental savings.

Comments on Ex-Ante Calculations

The ex-ante calculations used prescriptive savings for the new equipment. This results in demand and energy savings for the photocells that would not exist in a custom calculation, as well as savings not directly based on actual operation or exact wattages for the new equipment. In review of this site with MID staff, it was identified that the incorrect prescriptive measures were selected for this project. The claimed savings were based off exterior linear fluorescent fixtures, not the HID fixtures described in the project documentation. Additionally, the prescriptive savings applied coincident kW savings for both lighting fixture types when no demand savings should be claimed since these fixtures are on from dusk to dawn only. Finally, no savings should have been claimed for the photocells since the baseline fixtures also operated only at night on timeclocks.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the installation and quantity of fixtures
- Confirmed the operating schedule

Summary of Site Visit

Anchor Blue visited the facility in June 2021 and confirmed the presence of more than the listed number of LED outdoor lights. This is due to ongoing replacement of lighting at the facility, only part of which was related to this specific project. It was not possible to identify the exact fixtures affected by this project, but Anchor Blue did confirm the presence of these LED fixtures in the larger outdoor area and more LED fixtures than claimed. Since the site was large, the presence of more LED fixtures than claimed were observed, and the confirmation that multiple lighting projects had taken place at this site outside of this rebate, Anchor Blue considered the fixtures in this project verified based on the verified totals in the invoices. All fixtures were off during the daylight hours of the visit.

Ex-post Calculations and Assumptions

The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings, including coincident peak demand factors and interactive effects to calculate savings. Anchor Blue used the standard baseline wattage for HID fixtures with magnetic ballasts from the CMUA TRM deemed fixture databased and the specification sheet wattage for the LED fixtures. Anchor Blue used 4,180 hours for standard dusk-to-dawn operation for both the baseline and efficient cases.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor for energy savings for outdoor fixtures = 1.0

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,
DIE_{Demand}: DEER Interactive Effects Factor for energy savings for outdoor fixtures = 1.0
CDF: Coincident Diversity Factor for peak demand = 0 for nighttime lighting

The energy realization rate for the project was low (60%) because ex-post calculations were based on the actual installation and ex-ante calculations used prescriptive savings for the measures, using the linear fluorescent baselines rather than HID. The peak demand realization rate is 0% because these fixtures operate at night during non-peak hours

Site Modesto- 8

Project Summary

This site is a drug store in Modesto. All the T8 lighting in the store was upgraded to LED plug in tube lighting. The documentation for this site did not include a full calculation spreadsheet, and therefore the exact differences between the ex-ante and ex-post savings are difficult to discern. However, there does appear to be a discrepancy in efficient wattages from the project documentation and the spreadsheet. It appears that some lower wattage LED tubes were input in the ex-ante calculation, but the project documentation shows that all the LED tubes should be 14-watts. This appears to be the largest reason for the 95% realization rate for both energy and peak demand. A small change in the hours of operation for a small portion of the lights (breakroom, managers office, and bathrooms) also accounted for a portion of the energy realization rate difference.

Table 13. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	59,749	56,846	95%
Peak Demand Savings (kW)	11.0	10.4	95%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

This site originally had both high performance 28-watt T8 lamps and normal 32-watt T8 lamps. The store lights operate on an automatic timer from 8am to 11pm every day and is not closed for any holidays. The breakroom and restrooms were assigned default HOU from the CMUA TRM.

Description of Efficient Equipment and Operation

All T8 tubes were replaced with 14-watt LED plug in tubes and operated the same as the baseline fixtures.

Comments on Ex-Ante Calculations

The original calculation spreadsheet was not provided for this site, only a scan of the summary page with the number of fixtures, fixture descriptions, and HOU. However, Anchor Blue was not able to replicate the savings based on the information provided using the CMUA TRM deemed values for the fixtures described in the baseline and the 14-watt LED tubes described in the project documentation and using the same space types, interactive effects, and coincidence factors. Anchor Blue was able to replicate savings by reducing the LED tube wattage to 11.5 watts for about half of the areas, but without the original documentation spreadsheet, it is unclear if that is the exact cause of the difference. This was one of the first uses of the new MID lighting calculator according to MID staff and there was some confusion with the new spreadsheet implementation that may have caused the variance.

Ex-ante calculations included both coincident peak factors and interactive effects by space type.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the wattage and quantity of the fixtures
- Confirmed the operating schedule
- Placed lighting loggers in three locations

Summary of Site Visit

Anchor Blue performed a site visit in June 2021. Anchor Blue verified the lighting count, fixture type, and operational hours. Anchor Blue also placed lighting loggers in three locations that did not follow the normal hours of use – the breakroom, restrooms, and managers office.

Ex-post Calculations and Assumptions

The baseline fixture wattage was not provided in the documentation, though the baseline fixture description was given. Based on this, Anchor Blue utilized the deemed assumptions for the high performance and standard performance T8 fixtures baseline fixtures. Anchor Blue used 14-watts for all the LED tubes in the efficient case.

In the ex-post analysis, Anchor Blue utilized the same hours of use for the main sales floor and pharmacy areas as claimed, since these were confirmed to be the same during the onsite visit and the fixtures are on automatic timers. Anchor Blue updated both the baseline and efficient hours of use for the breakroom, restrooms, janitor's closet, and managers office based on lighting logger data.

The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings, using coincident peak demand factors and interactive effects to calculate savings.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor by space type:

Retail: 1.06
Other: 1.04
Hall/Restroom/Storage: 1.0

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,

DIE_{Demand}: DEER Interactive Effects Factor for demand savings by space type:

Retail: 1.20
Other: 1.18
Hall/Restroom/Storage: 1.0

CDF: Coincident Diversity Factor for peak demand by space type:

Retail: 0.88
Other: 0.92
Hall/Restroom/Storage: 0.70

The difference in the realization rates has mostly to do with the likely discrepancy of efficient wattages used in the ex-ante calculation compared to the ex-post. Anchor Blue only found documentation for 14-watt LED tubes, which is what was utilized in the ex-post analysis and suspects that lower wattages were applied in error in the ex-ante calculation. This cannot be confirmed without the original spreadsheet but results in a 95% realization rate for both energy and demand.

Site Modesto- 9

Project Summary

This site is a small, used car dealership in Modesto. The site upgraded its parking lot fixture lights to LEDs on a photocell timer from Metal Halide fixtures on a timeclock. The realization rate differences resulted from changed hours of operation in the ex-post calculation to match the deemed CMUA TRM exterior night light hours of 4,180, from 4,380 in the ex-ante calculations. Additionally, the ex-post calculation removed the additional photocell savings which are already accounted for in the 4,180 exterior lighting hours.

Table 14. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	23,372	20,599	88%
Peak Demand Savings (kW)	0.0	0.0	0%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

This project was to upgrade exterior parking lot lights. The site had 16, 400-Watt Metal Halides with magnetic ballasts parking lot lights in the baseline case. The baseline fixtures were on a timeclock with hours defined as 4,380 hours.

Description of Efficient Equipment and Operation

The site replaced the exterior parking lot fixtures with 150-watt LED fixtures with photocells with the same hours of operation.

Comments on Ex-Ante Calculations

The original calculation spreadsheet was not provided for this site, only a scan of the summary page with the number of fixtures, fixture descriptions, and HOU. Anchor Blue replicated this site in a blank simplified lighting calculator and realized there was also an application of photocell controls to the efficient case. However, photocells are on a dawn to dusk schedule, which is already taken into account with default outdoor HOU and is a double application of savings. No interactive effects were included since these were exterior fixtures, and the coincident peak demand factor is 0 since these fixtures are on at night.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the wattage and quantity of the fixtures
- Confirmed the operating schedule

Summary of Site Visit

Anchor Blue visited the site in June 2021 and confirmed the number of fixtures, presence of photo cells and that the fixture were off during daylight hours.

Ex-post Calculations and Assumptions

In the ex-post analysis, Anchor Blue updated both the baseline and efficient hours of use to the deemed exterior night operated fixtures of 4,180 rather than the claimed 4,380. This was verified by a separate dawn to dusk analysis of the Modesto area. Additionally, Anchor Blue removed the photocell savings since these are already taken into account with the applied HOU.

The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings using peak coincident demand factors and interactive effects to calculate savings.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: = DEER Interactive Effects Factor for energy savings = 1.0

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,

DIE_{Demand}: DEER Interactive Effects Factor for demand savings for exterior lighting = 1.0
CDF: Coincident Diversity Factor for peak demand = 0.0 for exterior fixtures

The 88% realization rate for the energy savings is due to the lower number of operating hours and the removal of the photocell savings that are already taken into account with the dusk-to-dawn HOU.

Site Modesto- 10

Project Summary

This site is a sit-down restaurant that completed a full facility LED lighting upgrade. However, some fixtures were not in the original scope and not included in the original rebate, but were recorded in the ex-ante analysis file and subsequently in the tracking database. The inclusion of these fixtures caused negative savings to be added to the ex-ante data. The realization rate for the energy savings is due to the removal of the negative savings from fixtures not in scope (which caused higher kWh savings), but overall came in at 97% because the logged hours of use were lower than the claimed operating hours in the dining area. The 107% realization rate for the demand savings is due to the removal of the negative savings associated with the out-of-scope fixture in the ex-ante analysis file.

Table 15. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	14,303	13,845	97%
Peak Demand Savings (kW)	2.37	2.54	107%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

The fixtures that were included in this project were all 1-, 2-, or 4-lamp standard 4ft T8 Fluorescent fixtures in the kitchen, bathrooms, and dining rooms. Three other areas (the halls, storage and office areas) all had the fixtures upgraded as well, but were not part of the original scope and not supposed to be included in this analysis. The HOU were predefined for the kitchen, dining and halls at 5,511 hours and the bathrooms were defined as the CMUA default 500 hours.

Description of Efficient Equipment and Operation

The facility upgraded to LED Fixtures of varying wattages depending on the baseline number of lamps in the fixture prior. 1- and 2-lamp fixtures were replaced with 30-watt LED fixtures while the 4-lamp fixtures were replaced with either 36-watt (kitchen) or 55-watt (dining) fixtures. The site contact confirmed the removal of some fixtures in the dining room (from 20 to 12 fixtures) and the downsizing of the lights in the kitchen from 4-lamp to essentially 2-lamp LED equivalents. In both cases, the rational was that there was too much light before the LED upgrade.

Comments on Ex-Ante Calculations

It appears that an older version of the rebate calculator was used for the final rebate than should have been. The Excel savings calculator provided included three line items for the office, storage, and hallway areas, none of which had baseline fixtures associated with them, only efficient fixtures. This caused negative savings to be included for these three line items, which should not have been applied after review of the project file documentation. According to the documentation, these three areas were added after the original scope was done. The project documentation has two different savings/rebate calculators scanned in, one with these additional fixtures with a written note that saying, “this reflects what was actually done” (savings of 14,303 kWh and 2.373 kW) and another with these fixtures removed and a written note saying “Office, Storage, Hallway not part of original quote; added later and this TRM was used for the acceptance letter” (savings of 13,474 kWh). It appears that this latter calculation sheet was what was used to process the rebate, but the

savings from the earlier calculation spreadsheet went into the database of claimed savings. The ex-post analysis removes these three line items to match what was rebated.

The ex-ante calculations include interactive effects by space type and coincident peak demand factors.

Onsite Visit and Ex-Post Savings Calculations

M&V Method
Anchor Blue collected the following data during the onsite visit:

- Confirmed the wattage and quantity of the fixtures
- Confirmed the operating schedule
- Confirmed the presence of photocell sensors
- Installed lighting loggers in the kitchen, dining and bathrooms

Summary of Site Visit

Anchor Blue performed a site visit in June 2021. Anchor Blue verified the lighting count, fixture type, and operational hours. Anchor Blue also placed three lighting loggers, one in each area, which were left onsite for three weeks.

Ex-post Calculations and Assumptions
In the ex-post analysis, Anchor Blue removed the three extraneous line items to delete the negative savings from the calculations. Anchor Blue then calculated hours of use for each area based on lighting logger data, accounting for holidays. The calculated HOU compared to the ex-ante HOU are in the table below:

Area	Ex-Ante HOU	Ex-Post HOU
Kitchen	5,511	5,728
Dining	5,511	4,471
Restrooms	500	4,120

The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings, using coincident peak demand factors and interactive effects to calculate savings.

Annual Energy Savings Algorithm
$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,
$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: = DEER Interactive Effects Factor for energy savings for Sit-down restaurant = 1.03

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,
DIE_{Demand}: DEER Interactive Effects Factor for peak demand savings for Sit-down restaurant = 1.18

CDF: Coincident Diversity Factor for peak demand = 0.80 for a for Sit-down restaurant

The realization rate for the energy savings is due to the removal of the negative savings from fixtures not in scope (which caused higher ex-post kWh savings), but is less than 100% because the logged hours of use were lower than the claimed operating hours in the dining area. The 107% realization rate for the demand savings is due to the removal of the negative savings associated with the out-of-scope fixture in the ex-ante analysis file.

Site Modesto- 11

Project Summary

The site is a big box retail store in Modesto that replaced all eighteen of its roof top air conditioning units at the same time. Of these, only two were eligible for rebates under Modesto's program rules: one 5-ton packaged AC unit and one 14.8 ton packaged AC unit. This site was rebated through MID's MPower Business program, which uses prescriptive savings. Anchor Blue calculated savings based on the 2017 CMUA Savings Estimation Technical Reference Manual and found savings significantly below the ex-ante values, resulting in a 35% realization rate for energy savings and 14% for the demand realization rate. After discussions with MID Staff, it was realized that the ex-ante values used for this project were incorrectly selected from the new measure savings database (ESP) and likely represent values from an old code baseline.

Table 16. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	6,625	2,304	35%
Peak Demand Savings (kW)	4.9	0.67	14%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

The facility replaced its eighteen old roof top air conditioners with new units. However, only two of the eighteen new units qualified for rebates under Modesto's program. These units were rebated under MID's MPower Business program, which uses deemed savings per unit utilizing a code baseline.

Description of Efficient Equipment and Operation

The two units covered by the program, a York ZJ061C00D4B5ACA and a York ZJ180C00D4B5ACA, were installed along with sixteen other York AC roof top units. The small unit is rated at 5-tons and has an EER of 12.2 and SEER of 15.0. The larger unit is rated at 14.83 tons and has an EER of 12.4 and SEER of 14.0.

Comments on Ex-Ante Calculations

This is a prescriptive project that utilizes deemed savings values from MID's ESP measure database. However, the database includes both current CMUA TRM measures as well as older measures for tracking historical savings. Anchor Blue met with MID staff to discuss the differences in the ex-ante savings values compared to the CMUA TRM and it was determined that the ex-ante savings were based on older measures in the system, not the CMUA TRM savings values. These older prescriptive savings values are much higher and likely based on an older code level than the current CMUA TRM values.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the model and quantity of roof top air conditioners
- Confirmed the operating schedule

Summary of Site Visit

Anchor Blue visited the facility in June 2021 and confirmed the installation, models, and operation of the new RTUs. The operation is centrally programmed, and store staff could not provide any detail as to operation.

Ex-post Calculations and Assumptions

Anchor Blue utilized deemed savings from the CMUA TRM, which provides savings values per ton according to building type and climate zone, as well as unit type and efficiency. For a 5-ton packaged RTU AC Unit with 15 or greater SEER, the savings for an end-of-life replacement is 134 kWh/ton and 0.031 kW/ton. For a 12-17 ton packaged RTU AC Unit with 12 EER or greater, the savings for an end-of-life replacement is 95 kWh/ton and 0.033 kW/ton. Both the ex-ante and ex-post savings are based on end-of-life replacement values, not early retirement savings.

Annual Energy Savings Algorithm

ΔkWh = ΔkWh/ton x tons

Where:

ΔkWh/ton = CMUA TRM savings per ton for given air conditioner type and efficiency at large, single-story retail building in California climate zone 12:

5-Ton Unit (SEER 15) = 134 kWh/ton

12-17 Ton Unit (12 EER or greater) = 95 kWh/ton.

Tons = 5 and 14.83

Demand Savings:

ΔkW = ΔkW/ton x tons

Where:

ΔkWh/ton = CMUA TRM savings per ton for given air conditioner type and efficiency at large, single-story retail building in California climate zone 12:

5-Ton Unit (SEER 15) = 0.031 kW/ton

12-17 Ton Unit (12 EER or greater) = 0.033 kW/ton.

Tons = 5 and 14.83

The CMUA TRM deemed savings values are significantly lower than the ex-ante claimed savings, resulting in very low realization rates for both energy (35%) and demand (14%). Anchor Blue discussed this low realization rate with MID staff prior to finalizing savings, and it was determined that the ex-ante values utilized to claim savings were old savings values that are used in the system for historical savings tracking. These values are likely relative to an old code value and/or an old DEER deemed savings value.

Site Modesto- 12

Project Summary

The site is a small office in Modesto that replaced its split heat pump with a more efficient model. This site was rebated through MID's MPower Business program, which uses prescriptive savings. Anchor Blue calculated savings based on the 2017 CMUA Savings Estimation Technical Reference Manual deemed savings values for commercial HVAC. The savings values in the CMUA TRM were significantly lower than the ex-ante values, resulting in less than half of the claimed energy savings for the project. After discussions with MID Staff, the ex-ante values used for this project were incorrectly selected from the new measure savings database (ESP) and likely represent values from an old code baseline.

Table 17. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	1,239	537	43%
Peak Demand Savings (kW)	1.19	0.44	37%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

The facility replaced its old split system heat pump with a new, more efficient heat pump unit.

Description of Efficient Equipment and Operation

The efficient heat pump unit installed was a 16 SEER, 3.5 ton unit.

Comments on Ex-Ante Calculations

This is a prescriptive project that utilizes deemed savings values from MID's ESP measure database. However, the database includes both current CMUA TRM measures as well as older measures for tracking historical savings. Anchor Blue met with MID staff to discuss the differences in the ex-ante savings values compared to the CMUA TRM and it was determined that the ex-ante savings were based on an older measure in the system, not the CMUA TRM savings values. This older prescriptive savings value is higher and likely based on an older code level than the current CMUA TRM.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the model and installation of the new heat pump
- Confirmed the operating schedule

Summary of Site Visit

Anchor Blue visited the facility in June 2021 and confirmed the installation, model, and operation of the new heat pump. The operation is controlled by a local programmable thermostat. Staff at the office did not know the details of the old unit that was replaced.

Ex-post Calculations and Assumptions

The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings. The CMUA TRM spreadsheet #100 provided the values for savings per ton according to building type and

climate zone, as well as unit type and efficiency. Anchor Blue selected the <5 tons split system heat pump unit (SEER 15) for this analysis. Anchor Blue increased the SEER 15 savings by 7.2% since the installed unit is SEER 16, but the CMUA TRM's highest efficiency level is SEER 15. The 7.2% increase is the same extrapolation percentage used in the TRM to move from SEER 14 to SEER 15.

Annual Energy Savings Algorithm

ΔkWh = ΔkWh/ton x tons

Where:

ΔkWh/ton = CMUA TRM savings per ton for given air conditioner type and efficiency at large, single-story retail building in California climate zone 12 = 153 kWh/ton. (extrapolated from 143 for SEER 15)

Tons = 3.5

Demand Savings:

ΔkW = ΔkW/ton x tons

Where:

ΔkWh/ton = CMUA TRM deemed savings per ton for the given heat pump and efficiency in a small in California climate zone 12 = 0.124 kW/ton (extrapolated from 0.116 for SEER 15)

Tons = 3.5

The CMUA TRM deemed savings values are significantly lower than the ex-ante claimed savings, resulting in very low realization rates for both energy (43%) and demand (37%). Anchor Blue discussed this low realization rate with MID staff prior to finalizing savings, and it was determined that the ex-ante values utilized to claim savings were old savings values that are used in the system for historical savings tracking. These values are likely relative to an old code value and/or an old DEER deemed savings value.

Site Turlock- 13

Project Summary

This site is a new construction agriculture site with two large greenhouses. The site installed LED horticulture strip lighting (265 watts) throughout the facilities in lieu of 1000-watt ceramic metal halide fixtures. Anchor Blue found four more fixtures onsite than claimed, resulting in slightly lower energy savings realization rate of 99.9%. Peak demand savings realization rate is at 70% due to the application of peak coincidence factors from the CMUA TRM in the ex-post calculations, which were not applied in the ex-ante calculations.

Table 18. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	5,624,020	5,620,572	100%
Peak Demand Savings (kW)	1,728.5	1,209.2	70%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

This is a new construction project and the baseline equipment was estimated based on the lighting needs of the crops in the greenhouses. The lighting vendor provided an estimate of baseline ceramic metal halides (CMH) to meet the needs of the crops, which was estimated to be 2,615 1000-watt CMH fixtures.

Description of Efficient Equipment and Operation

The efficient lighting equipment installed 3,744 265-watt LED horticulture grow lights. The site estimated the hours of use for these lights based on weather station data within the area for the average intensity of solar radiation and timing/frequency of cloudy days. This equated to 3,253.7 HOU.

Comments on Ex-Ante Calculations

Ex-ante calculations did not include any peak demand coincidence factors or interactive effects. The interactive effects for this space type are 1.0, so does not affect on the ex-post calculations, but the peak demand coincidence factor does affect the ex-post savings.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the wattage and quantity of the fixtures
- Confirmed the operating schedule

Summary of Site Visit

Anchor Blue performed a site visit in June 2021. Anchor Blue verified the lighting count, fixture type, and operational hours. The lighting count resulted in four more fixtures verified than claimed. No logging equipment was placed on this site because of the seasonal variability of the lighting.

Ex-post Calculations and Assumptions

Anchor Blue received billing data for this site and after analyzing the data, the two greenhouses utilized about 30% more energy than the claimed energy savings. However, while onsite, Anchor Blue observed

several other pieces of equipment utilizing energy at the site, including booms to move over the crops, sprinklers, and other equipment. Due to this additional energy usage, the estimated HOU and consumption for the grow lights seem reasonable and in lieu of logging data, Anchor Blue utilized the estimated HOU from the ex-ante calculations for the ex-post savings.

The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings, using coincident peak demand factors and interactive effects to calculate savings.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor for energy savings = 1.0 (no heating or cooling)

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,

DIE_{Demand}: DEER Interactive Effects Factor for demand savings = 1.0 (no heating or cooling)
CDF: Coincident Diversity Factor for peak demand for unconditioned storage space = 0.70

The realization rate for the energy savings is nearly 100% given the only change to the ex-post calculations was the inclusion of four additional fixtures verified. The peak demand savings realization rate is at 70% due to the application of the coincident peak demand factors in the ex-post calculation, which were not included in the ex-ante calculations.

Site Turlock- 14

Project Summary

The site is a big box store in Turlock that replaced its high bay metal halide lighting with LEDs, while also removing sixteen fixtures. The ex-ante calculations did not include interactive effects, resulting in a slightly increased realization rate for the project. The demand savings were further increased because the ex-ante calculation double counted the efficient case demand consumption for the security lighting, resulting in higher ex-post peak demand savings.

Table 19. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	1,102,204	1,179,325	107%
Peak Demand Savings (kW)	112.74	167.0	148%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

The retail store had 459 high bay 400 W metal halide fixtures installed throughout the store. Of these, 306 operated continuously for security purposes and 153 operated only when the store was open, turning on a few minutes ahead of time to warm up.

Description of Efficient Equipment and Operation

The facility replaced all the metal halide fixtures with 443 high bay LED fixtures designed to dim for security hours. The new fixtures operate on a timeclock where they are at full power during store operating hours and at 35% power for six hours before opening and three hours after closing. All the lights are off from midnight to 3:00 am.

Comments on Ex-Ante Calculations

The ex-ante calculations used standard hours and baseline power for the fixtures but did not account for interactive HVAC effects. The demand calculations for the efficient case included all 443 efficient lights for both the security line item and the store hours line item. Both line items are necessary to calculate the proper kWh savings, but adding the demand for both line items result in the over counting of the efficient demand consumption since both line items both represent all the store fixtures, just operating at different levels for different hours. Anchor Blue removed the demand consumption for the 35% level security lighting line item in the ex-post analysis to account for this.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the wattage and quantity of the fixtures
- Confirmed the operating schedule

Summary of Site Visit

Anchor Blue visited the facility in June 2021 and confirmed the installation of 443 high bay LED fixtures throughout the building. The vast majority of the fixtures were on during the daylight visit, although five appeared to be out.

Ex-post Calculations and Assumptions

The ex-post calculations used a standard algorithm with onsite findings to calculate energy savings. The modified algorithm uses interactive effects and coincident demand factors to calculate savings. Anchor Blue used the deemed CMUA TRM baseline wattage for 400W metal halide fixtures with magnetic ballasts and the specification sheet wattage for the LED fixtures. Anchor Blue used lighting hours based on the store schedule for the baseline and the timeclock hours for the efficient fixture operation. Since all of the lights are on during peak demand hours, Anchor Blue manually adjusted the coincidence factor to 1.0, while also setting the coincidence factor of the efficient security lighting wattage to 0 as the lights only operate at that decreased brightness level during nighttime, off peak hours.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor for energy savings for retail = 1.07

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,

DIE_{Demand}: DEER Interactive Effects Factor for peak demand savings for retail = 1.21
CDF: Coincident Diversity Factor for peak demand = 1 for fixtures on during operating hours and 0 for fixture wattages only used during security hours

The energy realization rate for the project was 107% due to the inclusion of interactive effects in the ex-post calculations, which were not included in the ex-ante calculation. The demand realization rate increased significantly (148%) due to the removal of the double counted security lights demand consumption.

Site Turlock- 15

Project Summary

The site is an industrial facility in Turlock, CA which replaced its main production equipment on five production lines, one of which was incentivized through this project.

Table 20. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	549,071	549,071	100%
Peak Demand Savings (kW)	28	28	100%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

The facility had five production lines, each limited by a main piece of mixing machinery which performs the primary process for the production. All five of these machines were replaced, but only one was rebated through this project

Description of Efficient Equipment and Operation

The facility replaced five production machines, one on each of five production lines, with new ones that allowed for faster production with more consistent results. There is a reduction in the need for temperature changes, both cooling and warming, during the process, resulting in significant energy savings.

Comments on Ex-Ante Calculations

The ex-ante energy calculations based electric savings on reduced cooling, and also listed gas savings from reduced re-warming. No adjustments were made for any production level changes. Overall, the calculation is straight forward.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the installation and operation of the new equipment
- Requested data on production and operation changes

Summary of Site Visit

Anchor Blue visited the facility in June 2021, interviewed the site personnel, and confirmed installation and operation of the new equipment. The equipment was installed between early 2019 and sometime in 2020, although they did not provide exact dates. The site indicated that they had increased production 58% by 2021 relative to 2018 levels, but did not want to provide more detailed production data which would be necessary to accurately normalize the ex-ante savings calculations. Anchor Blue did not install data loggers since without production levels and baseline equipment details, logging the new ones would have been of limited use and the site was reluctant to allow access or provide data.

Ex-post Calculations and Assumptions

Anchor Blue used the billing data provided by TID and the limited information available on production and energy use through the end of 2020 to roughly estimate production normalized savings. However, since the site did not feel comfortable providing detailed production levels it was not possible to accurately calculate a precise production relative savings. The billing data analysis showed that the ex-ante savings were reasonable given the increase in production and utilized the ex-ante calculation and savings for the ex-post calculations.

Annual Energy Savings Algorithm

$$\Delta kWh = (kW_{base} - kW_{eff}) * \text{annual hours}$$

Where:

kW_{base} = $kW/ton * tons_{base}$

kW_{eff} = $kW/ton * tons_{eff}$

kW/ton = refrigeration efficiency, ex-ante used 0.9, which is reasonable for the equipment

tons = (GPM * 60 min/hr) * (delta T in Fahrenheit) * (8.34 lb-mass/US gallon) * cp/12000, where delta T is 42 °F for the base case and 10 °F for the efficient case

cp = specific heat in BTU/lb °F; ex-ante calculation used 1.1

Summer Coincident Peak kW Savings Algorithm

$$\Delta kW = kW_{base} - kW_{eff}$$

The savings appear reasonable based on the limited data available for production increases and the TID utility bill. However, without more detailed production data, precise savings cannot be accurately calculated. Since the ex-ante savings are consistent with the site claimed increase in production based on the bills in late 2020, Anchor Blue accepted the ex-ante savings as is in the absence of adequate data to calculate a production-based value.

Site Turlock- 16

Project Summary

This site is a strip mall that upgraded all its exterior and parking lot lighting with LEDs from metal halides and T12s. All but four fixtures were verified onsite, however several fixtures were on all day and treated as such in the ex-post analysis. The realization rate for the energy savings is due to the change in the HOU for most fixtures from 4,100 to 4,180 and some fixtures verified on all day up to 8,760 HOU. The peak demand savings realization rate is 11% because most of these lights operate only at night and not coincident with peak hours.

Table 21. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	181,646	172,143	95%
Peak Demand Savings (kW)	44.3	4.9	11%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

Several types of exterior fixtures were replaced at this site including parking lot lights, wall packs, and under building eaves fixtures. The baseline fixtures are defined below by location and were assigned 4,100 baseline hours of operation:

- Parking lot lights -> 400-watt Metal Halide
- Wall Packs -> 250-watt High Pressure Sodium
- Building Eaves (type 1) -> 175-watt Metal Halide
- Building Eaves (type 2) -> 2-Lamp, 4ft T12 Fluorescent

Description of Efficient Equipment and Operation

All of the lights were upgraded to different types of LEDs, described below by location. The same hours of use (4,100) were assigned to the efficient equipment.

- Parking lot lights -> 200-Watt LED Parking Lot Lights
- Wall Packs -> 100-watt LED wall pack area lights
- Building Eaves (type 1) -> 40-watt LED can lights (8" and 10")
- Building Eaves (type 2) -> 54-watt LED corn area light

Comments on Ex-Ante Calculations

The ex-ante calculations use 4,100 as the exterior HOUR. The CMUA TRM identifies 4,180 as the exterior lighting HOU. The ex-post analysis utilizes the latter HOU.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the wattage and quantity of the fixtures

- Confirmed the operating schedule

Summary of Site Visit

Anchor Blue performed a site visit in June 2021. All of the fixtures were verified except for two parking lot lights and two carriage lights. There was construction going on in the parking lot at one of the satellite store locations and it appears that the two parking lot fixtures may have been in that area and removed. The two unaccounted carriage lights may have been removed during a tenant change. Anchor Blue identified several fixtures that were on during the morning at the time of the site visit, around 10AM, and again later that afternoon at 4PM. These included 13 wall packs on the back of the strip mall and 35 of the under eaves fixtures.

Ex-post Calculations and Assumptions

Anchor Blue used the verified number of fixtures in the ex-post analysis for the efficient consumption and the claimed number of fixtures for the baseline consumption because it appears that both areas with a discrepancy in counts, the missing fixtures were removed. For most fixtures, Anchor Blue updated the HOU to be the deemed CMUA TRM exterior space type HOU of 4,180. However, for 13 wall packs and 35 under eaves fixtures that were on all day, Anchor Blue utilized 8760 HOU for the efficient case, assuming that these lights are on all the time. There is no way to know if these lights were also on all of the time prior to the retrofit, so Anchor Blue kept the ex-ante exterior HOU for the baseline fixtures. The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings. The modified algorithm uses interactive effects and peak coincident demand factors to calculate savings.

TID provided billing data for this site which verified a significant drop in usage (55%) from the baseline year of 2018 compared to 2020. The savings calculations resulted in a 62% savings from the baseline. However, billing data was not used outright as the billing data included some of the building tenants indoor use and did not necessarily include all the tenants, which some of the rebated lighting was on. It was unclear how much of the billing data provided was the rebated fixtures only and may include HVAC usage as well, which would account for the difference in savings between the two methods.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor for exterior lights = 1.00

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,

DIE_{Demand}: DEER Interactive Effects Factor for peak demand savings for exterior lights = 1.00
CDF: Coincident Diversity Factor for peak demand = 0 (exterior lights), 1.0 for lights on 8760

The realization rate for the energy savings of 95% is due to the change in the HOU from 4,100 to 4,180 and up to 8,760 HOU for some fixtures verified on all day. The peak demand savings realization rate is 11% because most of these lights operate only at night and not coincident with peak hours.

Site Turlock- 17

Project Summary

This site is a self-storage facility that completed an exterior LED lighting upgrade. The difference in the realization rate for the energy savings is from the hours of operation that were changed in the ex-post calculation to match the deemed CMUA TRM exterior night light hours of 4,180. The difference in the realization rate for the demand savings is that these fixtures are exterior, operating at night, and therefore should have a coincident peak demand factor of 0.0, which is applied in ex-post.

Table 22. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	22,353	22,789	102%
Peak Demand Savings (kW)	5.45	0.0	0%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

This project was to upgrade exterior wall packs on the storage building and outside the front office. The site had 44, 150-Watt Metal Halides with magnetic ballasts wallpacks on the storage buildings and the office in the baseline case. The baseline fixtures were on a photocell with claimed hours defined as 4,100 hours from dusk to dawn.

Description of Efficient Equipment and Operation

The site replaced the storage unit wall packs (42 of the 44 fixtures) with LED 60-watt wall packs and replace the two fixtures in front of the office with 150-watt LED fixtures. All replaced fixtures are also on photocells with the same hours of operation.

Comments on Ex-Ante Calculations

The ex-ante calculations were based on standard lighting savings algorithms. However, no peak coincidence factors were applied to the peak demand savings.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the wattage and quantity of the fixtures
- Confirmed the operating schedule
- Confirmed the presence of photocell sensors

Summary of Site Visit

Anchor Blue performed a site visit in June 2021 and verified the lighting count, fixture type, and operational hours. Anchor Blue also confirmed that the front office lights were replaced with higher wattage fixtures, as the customer wanted more lighting at the entrance.

Ex-post Calculations and Assumptions

In the ex-post analysis, Anchor Blue updated both the baseline and efficient hours of use to the CMUA TRM deemed exterior, night operated fixtures of 4,180 rather than the claimed 4,100. All other elements of the

ex-ante energy savings calculation remained the same, however a coincident peak demand factor of 0.0 was applied since these measures operate off peak at night.

The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings. The modified algorithm uses interactive effects to calculate savings.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor for energy savings for exterior lights = 1.0

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,

DIE_{Demand}: DEER Interactive Effects Factor for energy savings for exterior lights = 1.0
CDF: Coincident Diversity Factor for peak demand for exterior lights = 0.0

The 102% realization rate for the energy savings is due to the higher number of operating hours in the baseline and efficient cases, based on the deemed exterior, nighttime hours of operation from the CMUA TRM. The difference in the realization rate for the demand savings is that these fixtures are exterior, operating at night, and a coincident peak demand factor of 0.0 was applied in the ex-post calculations.

Site Turlock- 18

Project Summary

This site is a small retail store in a strip mall with a full upgrade to LED tubes in the existing T8 fixtures. The ex-ante calculation did not include ballast effects in the baseline fixtures, simply using the lamp wattage multiplied by the number of lamps to get the baseline wattage, which does not accurately reflect the actual fixture consumption. Anchor Blue updated the baseline wattages to reflect normal ballast factors using the CMUA TRM deemed values, which caused the peak demand and energy savings realization rates to be lower than claimed. However, the site stock area lighting is on all the time and the site also lowered its hours of operation since the project, resulting in increased savings for each fixture and pushing the realization rate over 100% for energy savings. The decrease in baseline wattages accounts for the lower realization rate for peak demand savings.

Table 23. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	7,856	8,247	105%
Peak Demand Savings (kW)	1.69	1.43	85%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

This site's baseline fixtures were standard T8 fixtures and baseline hours of operation were provided by the store based on work hours at the time.

Description of Efficient Equipment and Operation

LED tubes were retrofitted into all the existing fixtures. 23 3-lamp fixtures were retrofitted with LED tubes in the retail area, three 3-lamp fixtures in the stockroom and one 2-lamp fixture in the restroom. Hours of operation were the same as the baseline in the ex-ante calculations.

Comments on Ex-Ante Calculations

In the ex-ante analysis file, the baseline fixture wattages did not specify a ballast type nor did the ex-ante analysis utilize fixture wattages after the ballast type was considered. For each of the baseline T8 fixtures, the baseline wattage identified was simply the lamp wattage multiplied by the number of lamps. For the three lamp fixtures, this equated to 96 watts. However, a 3-lamp T8 fixture with a normal ballast factor is identified to consume 84 watts in the CMUA TRM deemed fixture wattages. Anchor Blue utilized the deemed wattages for the ex-post analysis, as this is what the fixture is actually consuming. Additionally, the ex-ante calculations do not include interactive effects or coincident peak factors.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the wattage and quantity of the fixtures
- Confirmed the operating schedule
- Placed lighting loggers in the stockroom and restroom areas

Summary of Site Visit

Anchor Blue performed a site visit in June 2021 and verified the number of fixtures and installation of LED tubes. Two lighting loggers were placed as well, one in the restroom and one in the stock room area. Anchor Blue talked to staff about hours of operation and work hours. The onsite contact stated that they had new operating hours since COVID and were at the store one hour before and after hours open.

Ex-post Calculations and Assumptions

In the ex-post analysis, Anchor Blue changed the baseline fixture wattages to match the deemed CMUA lighting database T8 fixtures. Since no ballasts were identified in the project documentation, Anchor Blue assumed normal ballast factors for these fixtures. This resulted in lower baseline fixture wattages than claimed.

For hours of operation, the site contact confirmed the hours of operation had changed since COVID19 and the new hours were not expected to change in the future. Hours of operation include an additional hour before and after open hours for staff to arrive, stock, and clean up after shifts per the site contact. For the ex-post analysis, the original claimed HOU were used for the baseline (4,654) and the new HOU (3,704) were used for the efficient fixtures. Logged data for the stock room showed that it was on 100% of the time and Anchor Blue utilized the logged HOU for the restroom area as well.

The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings. The modified algorithm uses interactive effects to calculate savings.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor for energy savings for retail = 1.06

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,

DIE_{Demand}: DEER Interactive Effects Factor for energy savings for retail = 1.20
CDF: Coincident Diversity Factor for peak demand = 0.88 for retail

Two factors affect the realization rate for the energy savings for this site that essentially cancel each other out. The lower baseline fixture wattages are offset by the change and lowered operating hours in the efficient case. The overall increase in savings is due to the inclusion of interactive effects, resulting in 105% energy realization rate. The peak demand savings realization rate is 85% due to the reduction in the baseline fixture wattages and the application of the coincident peak demand factor, which was not applied in the baseline.

Site Merced- 19

Project Summary

This site is a large medical facility that replaced all their existing lights with LEDs and added motion sensors in some areas. Overall, the ex-ante claims on this site were confirmed during the site visit and analysis, with some small differences found in logged hours of use, fixture wattages and fixture counts. The largest driver of the 109% realization rate for energy is Anchor Blue's inclusion of interactive HVAC effects, which were not included in the ex-ante calculations.

Table 24. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	1,725,199	1,883,968	109%
Peak Demand Savings (kW)	0	181	NA

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

This project upgraded all the facility's lighting, which was previously a mixture of primarily T8 linear fluorescent lights, with smaller numbers of compact fluorescents, biax lamps, and linear T5s. Additionally, there were a few halogens and HID fixtures throughout the facility. This facility has many different space types, some of which operate at more normal office schedules, but many of the areas operated long hours due to the nature of the facility.

Description of Efficient Equipment and Operation

The facility replaced all of its lights with LED fixtures and added motion sensors in a few storage and low use areas. The hours of use were the same as the baseline, unless motion sensors were added, which had lower hours of use than the baseline fixtures.

Comments on Ex-Ante Calculations

The ex-ante calculations were standard lighting savings calculations; however, they did not include interactive effects or coincident demand factors. Additionally, some of the ex-ante baseline fixture wattages varied slightly from standard CMUA TRM baseline wattage values. The variances were both higher and lower wattages, likely stemming from differences in ballast factor assumptions. Overall, the weighted average difference in wattages was 1% lower in the CMUA TRM compared to the claimed wattages, weighted by the number of fixtures installed.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the wattage and quantity of a sample of the fixtures
- Confirmed the operating schedule and installed data loggers in a selection of areas

Summary of Site Visit

Anchor Blue visited the facility in June 2021 and confirmed the installation and operation of the LED fixtures. Additionally, Anchor Blue installed 13 lighting loggers throughout the facility to determine hours of operation.

Because this was such a large site with many similar areas, Anchor Blue sampled representative areas of the site to verify installation and place loggers. Within the sample, Anchor Blue selected areas with less certain operating hours to place lighting loggers and determine more accurate hours of use, which included different medical rooms, facilities rooms, and storage rooms.

Ex-post Calculations and Assumptions

The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings. The modified algorithm uses interactive effects and coincident demand factors to calculate savings. All baseline wattages were updated to be consistent with the CMUA TRM deemed baseline wattages. This resulted in a weighted average 1% reduction in wattages in the entire facility, with some ex-ante fixtures higher than CMUA deemed wattages and some lower. Wherever possible, Anchor Blue applied the sampled area logger data to similar rooms within the facility. 11 of the 13 loggers provided useful data and were utilized in the analysis. A few discrete spaces had small variations in onsite verified fixture counts compared to the ex-anted claimed fixture counts, which were accounted for in the ex-post calculation.

Energy Savings:

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor for energy savings for large medical = 1.12

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,

DIE_{Demand}: DEER Interactive Effects Factor for energy savings for large medical = 1.31
CDF: Coincident Diversity Factor for peak demand for large medical = 0.71

Overall, the lighting found at the site matched the ex-ante claim, with slight variations. These small variations were the baseline fixture wattages, verified hours of use from logger data, and slight changes to fixture counts. These changes had a minimal impact on overall energy savings, with the main driver of difference in the ex-post calculations being the inclusion of HVAC interactive effects. The net effect of all the changes resulted in the 109% energy realization rate. No ex-ante demand savings were claimed for this site, though could have been.

Site Merced- 20

Project Summary

This site is a big box home improvement store in Merced. The site upgraded its interior high bay retail lighting from T5s to LEDs and exterior garden center lighting from metal halides to LEDs. The ex-ante calculations did not include any HVAC interactive effects or coincident peak demand factors, which were the driving factor for differences in the realization rates. However, hours of use differences also impacted the energy savings, but all the ex-post calculation modifications essentially canceled each other out for a 101% energy savings realization rate. No peak demand was claimed for this site, though demand savings are present.

Table 25. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	364,132	366,862	101%
Peak Demand Savings (kW)	0	53.7	NA

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

The retail area baseline fixtures had 4-Lamp T5 fixtures and the garden center had three different types of fixtures: high bay outdoor retail area fixtures with 400-Watt metal halides; low bay outdoor retail area fixtures with 250-Watt metal halides, and flood lamps that were 400-Watt metal halides. Operating hours for the store lights were estimated to be 5,510 hours, the garden center high and low bay lights were 2,249 hours; and the outdoor flood lights were 4,368 hours.

Description of Efficient Equipment and Operation

The interior fixtures were upgraded to 113-Watt, 8-ft LED fixtures operating at 5,124 hours. The garden center lights were upgraded as follows:

- 400W High Bay MH fixtures -> 151-Watt LED fixtures
- 250W High Bay MH fixtures -> 101-Watt LED fixtures
- 400W MH Flood Lights -> 99-Watt LED flood light fixtures

Comments on Ex-Ante Calculations

The interior lighting hours of use decreased in the efficient case from the base case, going down from 5,510 hours to 5,124 hours. It is unclear from the project documentation as to why the efficient case had a reduction in hours of operation, but Anchor Blue updated the hours of operation to reflect the current store hours. Ex-ante calculations also did not include interactive effects or peak demand coincidence factors

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the wattage and quantity of the fixtures
- Confirmed the operating schedule

Summary of Site Visit

Anchor Blue performed a site visit in June 2021. All of the fixtures were verified except for four of the outdoor flood lights. The configuration of the other flood lamps were two lamps per pole, and Anchor Blue found two poles that had no lamps on them, indicating that these fixtures had been de-lamped. Anchor Blue interviewed the manager on staff for the hours of operation and confirmed that the interior lights came on automatically when the store opens and closes.

Ex-post Calculations and Assumptions

In the ex-post analysis, Anchor Blue used the verified number of fixtures for each area type and the verified HOU for each space type as well. The interior lighting HOU was updated to reflect the current hours of use, which was higher than the claimed efficient fixtures hours of use (5,588 compared to the claimed 5,124). The exterior flood lights HOU were updated to the CMUA TRM deemed 4,180 hours for exterior lighting. The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings, using interactive effects and peak demand coincident factors to calculate savings.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor for energy savings by space type:

Retail = 1.06
Outdoor (garden center) = 1.0

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,
DIE_{Demand}: DEER Interactive Effects Factor for peak demand savings by space type:

Retail = 1.2
Outdoor (garden center) = 1.0

CDF: Coincident Diversity Factor for peak demand by space type:

Retail = 0.88
Outdoor (garden center) = 0.0

The realization rate for the energy savings increased due the inclusion of interactive effects and the de-lamping of four of the outdoor fixtures, but this was essentially canceled out by the increase in hours of use compared to the claimed savings. There were no peak demand savings claimed for this project, though peak demand savings were calculated in the ex-post analysis.

Site Merced- 21

Project Summary

The site is a big box store in Merced that replaced its outdoor metal halide wall pack lighting with LEDs. The ex-ante calculations used 24.9 W for the efficient wall packs, whereas the spec sheet shows their power as 25 W, resulting in a small reduction in savings. Also, Anchor Blue reduced the hours of use from 4,380 to 4,180 based on standard dusk to dawn operation, further reducing savings. Since these outdoor lights are only on at night, there is no demand savings.

Table 26. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	7,204	6,897	96%
Peak Demand Savings (kW)	0	0	NA

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

The outside of the retail store had ten wall packs distributed around the building, primarily above loading docks and exterior main doors. Prior to the project all ten were 150 W metal halide fixtures. All fixtures operated from dusk to dawn.

Description of Efficient Equipment and Operation

The facility replaced all ten of the outdoor wallpacks with integrated LED wallpacks. The new fixtures continue to operate automatically from dusk to dawn daily throughout the year.

Comments on Ex-Ante Calculations

The ex-ante calculations used standard hours and baseline power for the fixtures, but listed the efficient power as 24.9 W. Since spec sheets were not included with the project files, Anchor Blue downloaded them and found the listed power at 25 W. This may be a rounding issue, but in the absence of the reference source used for the ex-ante calculations, Anchor Blue used 25 W for the new fixtures.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the wattage and quantity of the fixtures
- Confirmed the operating schedule

Summary of Site Visit

Anchor Blue visited the facility in June 2021 and confirmed the installation of the ten wall packs, which were above doors on the exterior of the building. No other outdoor fixtures were found on the building. All the fixtures were off during the daylight visit. Anchor Blue's contact was a corporate representative of the store who confirmed the lights were on automatic dusk to dawn controls but did not provide details as to the exact control type.

Ex-post Calculations and Assumptions

The ex-post calculations used a standard algorithm with onsite findings to determine the energy savings. The modified algorithm uses interactive effects to calculate savings. Anchor Blue used the standard baseline wattage for 150 W metal halide fixtures with magnetic ballasts and the specification sheet wattage for the LED fixtures. Anchor Blue used standard CMUA TRM annual outdoor lighting hours of 4,180 for the fixture operation.

Annual Energy Savings Algorithm

$\Delta kWh = ((kW_{Baseline} - kW_{EE}) / 1000) \times HOURS \times DIE_{Energy}$

Where,

$kW_{Baseline}$: Connected load of baseline fixtures
kW_{EE}: Connected load of LED fixtures
HOURS: Average hours of use per year
DIE_{Energy}: DEER Interactive Effects Factor for energy savings for outdoor fixtures = 0

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = ((kW_{Baseline} - kW_{EE}) / 1000) \times DIE_{Demand} \times CDF$

Where,

DIE_{Demand}: DEER Interactive Effects Factor for energy savings outdoor fixtures = 0
CDF: Coincident Diversity Factor for peak demand outdoor fixtures = 0

The 96% realization rate for the project is due to the slight increase in efficient wattage based on the available specification sheet for the fixtures and the decrease in operational hours from 4,380 to 4,180.

Site Modesto - Mega

Project Summary

The site is a manufacturing facility in Modesto, CA that replaced one of its industrial furnaces. The replacement furnace was designed with a lower specific melting capacity, allowing for lower energy consumption, while still producing the same quality product. Additionally, the new furnace has optimized both the boost electrode placements within the furnace and the relation between the melting surface and atmosphere inside the tank, improving the overall efficiency. The ex-ante calculations were reasonable, and Anchor Blue implemented similar calculations for the ex-post analysis. The main reason for the 95% energy and 93% demand realization rates was to do with additional post-installation production data, which showed a slightly lower efficiency level than the data showed in the ex-ante analysis.

Table-27. First-Year Project Savings Summary

	Ex-ante	Ex-post	Realization Rate
Energy Savings (kWh/Year)	11,206,288	10,610,848	94.7%
Peak Demand Savings (kW)	1,297	1,211	93.4%

Source: Project Documentation, Anchor Blue Analysis

Description of Baseline Equipment and Operation

The facility has five glass furnaces to produce glass bottles, four of which are operating. This project is for the replacement of furnace number 3, which was at the end of its useful life. The baseline furnace produced an average of 307 tons per day. It operated at an efficiency of 141 kWh/ton produced when normalized to production levels of 411 tons/day.

Description of Efficient Equipment and Operation

The facility replaced glass furnace number 3, as the old furnace had reached end of life conditions. The construction of the new furnace involved complete removal of the old furnace and its entire surrounding structure down to the dirt. The replacement furnace was designed with a lower specific melting capacity, resulting in a longer dwell time for the input materials in the furnace for better refining. This also allows for lower energy consumption, while still producing the same quality product. Additionally, the new furnace has optimized both the boost electrode placements within the furnace and the relation between the melting surface and atmosphere inside the tank, improving the overall efficiency.

In the ex-ante data, the new furnace produces 411 tons per day and operates at an efficiency of 65 kWh/ton produced.

Comments on Ex-Ante Calculations

The ex-ante calculations compare the kWh per ton produced in the baseline and efficient calculations to determine energy savings. The calculations normalize the production levels of the baseline furnace to the production of the new furnace in addition to normalizing the input material mixture. The production levels are calculated on a daily average level and multiplied by 360 days of operation.

Although there are also changes in gas usage with the new furnace, fuel switching is not a part of the project.

Onsite Visit and Ex-Post Savings Calculations

M&V Method

Anchor Blue collected the following data during the onsite visit:

- Confirmed the installation and operation of the new equipment
- Pre and post installation production and consumption data for the furnace

Summary of Site Visit

Anchor Blue visited the facility in June 2021, interviewed the site personnel, and confirmed installation and operation of the new equipment. The new furnace was fully installed and operating. Site personnel provided more recent daily production and energy use data beyond what was already provided in the project files for both the baseline operation and the new furnace.

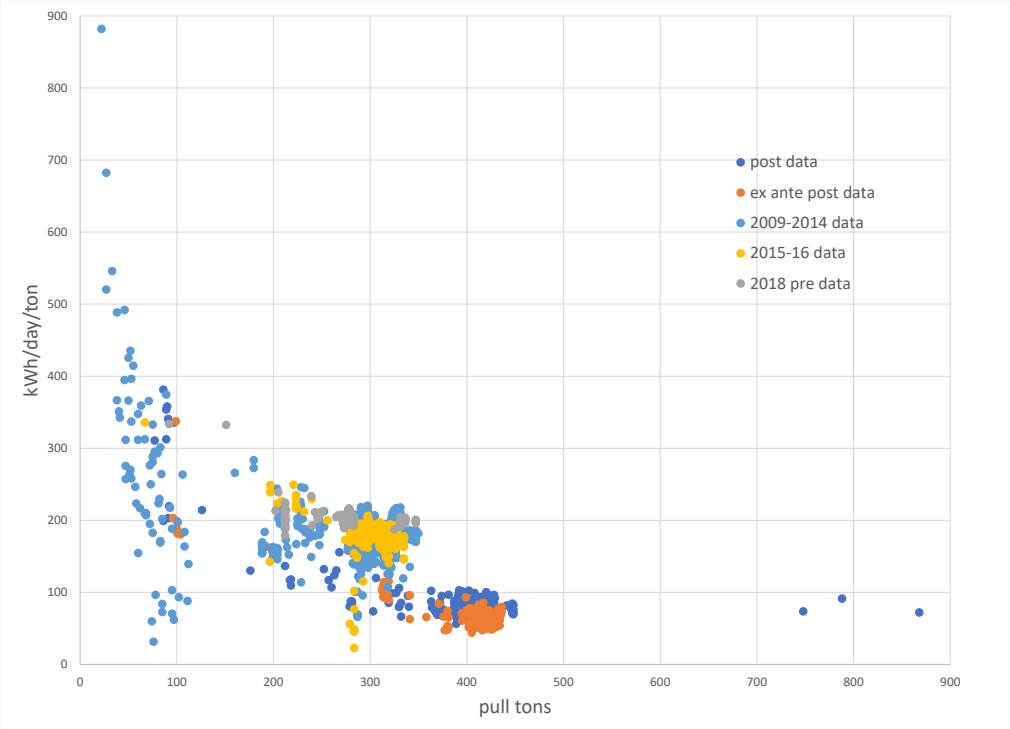
Ex-post Calculations and Assumptions

Anchor Blue used the data from the project file and the data obtained during the site visit to calculate energy savings for the equipment, taking the following steps, which are described in further detail in this section:

1. Normalized daily kW data in the baseline and efficient datasets to the industry standard 50% input material mixture
2. Calculated kWh/ton/day for each day in the baseline data
3. Performed a linear regression on the baseline kWh/ton/day as a function of daily production in tons, removing outliers (as production increases, the furnace efficiency increases)
4. Utilized the baseline linear regression of daily efficiency to extrapolate the baseline energy use to current tons per day production
5. Annualized the baseline and efficient data based on the current production levels of 393 at 50% input mixture material normalized, based on 365 days of operation
6. Subtracted the efficient electric consumption from the baseline to calculate annual electric energy savings in kWh
7. Divided the annual kWh savings by 8760 to estimate demand kW savings

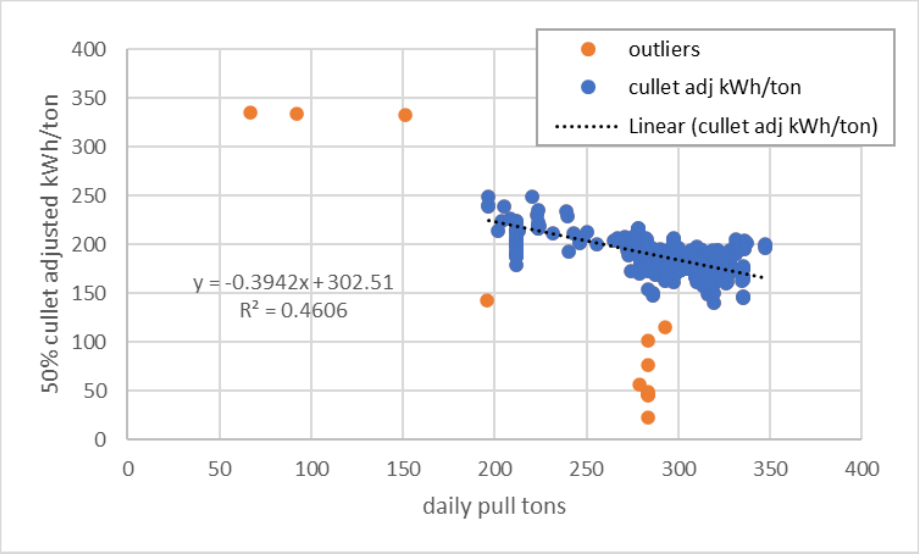
Anchor Blue performed normalizing adjustments to the input material mixture prior to averaging the data for annual savings calculations. The input mixture normalized 2018 baseline data provided by the site showed slightly lower efficiency than the input mixture normalized baseline data from 2015 and 2016, likely because the furnace was older at the time. Figure-1 below plots the efficiency of the baseline and efficient data, from both the ex-ante and ex-post datasets as a function of daily pull (furnace output) tons. The graph shows that although low production has very low efficiency, at higher production the efficiency becomes more stable for each dataset. The post-project efficient data shows clearly higher efficiencies than pre-project baseline data.

Figure-1. Input mixture normalized electric efficiency vs production



The efficiency after the project is significantly better than the baseline efficiency, even at similar production levels. As shown in Figure-2, the baseline efficiency continues to increase roughly linearly at typical production levels. While there is still significant scatter in the linear regression, as quantified by the low R^2 value, the linear extrapolation of efficiency to higher production levels is a good approximation based on the available data, similar to how MID extrapolated the efficiency levels in the ex-ante calculation adjustments. Anchor Blue also compared fits for non-linear extrapolations and did not find a significantly better fit as the data scatter is the main source of the poor R^2 value, rather than a non-linear trend.

Figure-2. Baseline input mixture normalized electric efficiency vs production



The post-installation data, including both the ex-ante efficient case dataset (2019 data) and the additional post-installation dataset (2020) provided during the onsite visit, results in an efficiency of 74 kWh/ton. This is about 13% less efficient than the ex-ante post-installation 2019 data only, which was used in the ex-ante calculations. The 2015-2016 ex-ante baseline dataset has an efficiency of 171 kWh/ton. The pre-project 2018 data shows a slightly higher energy use of 205 kWh/ton, resulting in a combined baseline of 184 kWh/ton. Extrapolated to the current production, this results in a baseline efficiency of 148 kWh/ton, which is about 5% lower efficiency than the ex-ante baseline calculated efficiency of 141 kWh/ton.

Overall, Anchor Blue found the methodology used for the ex-ante savings to be reasonable, as well as the adjustments made by MID. Anchor Blue used similar methodology in the ex-post analysis, with some adjustments. Anchor Blue used pre and post installation production data that included the ex-ante baseline and post-install datasets in combination with the additional pre and post installation data provided to Anchor Blue during the site visit. The use of this additional data showed a lower efficiency per ton produced in the ex-post data, which resulted lower in the final ex-post installation production and efficiency values than were in the ex-ante calculations in both the baseline and efficient cases. Anchor Blue also based the calculations on 365 days of operation annually rather than the 360 in ex-ante calculations, because the average production was based on all data, including outliers, which should account for any low production days.

Annual Energy Savings Algorithm

$\Delta kWh = (kW_{base} - kW_{eff}) * \text{annual hours}$

Where:

kW_{base} = baseline daily $kW_{input\ mix\ adjusted}$* production ratio

kW_{eff} = efficient daily $kW_{input\ mix\ adjusted}$, (already at current production rate)

production ratio = $tons_{eff}$ / $tons_{base}$

$tons_{base}$ = average daily pull tons for baseline data

$tons_{eff}$ = average daily pull tons for post-installation data

annual hours = annual hours of operation = 8,760 for this project

$kW_{input\ mix\ adjusted}$ = normalizes production efficiency due to variability of input mixture percentages

Summer Coincident Peak kW Savings Algorithm

$\Delta kW = kW_{base} - kW_{eff}$

Anchor Blue found the savings to be less than the ex-ante values. The reduction is mainly due to additional production data provided to Anchor Blue for the pre-installation baseline case (another 8 months of 2018 data provided prior to the installation) and an additional year of post-installation production. This newer data had a lower average daily production and higher power use than the original data used in the ex-ante calculations in both the baseline and efficient cases, resulting in a reduction in energy savings. The estimated demand scales directly with energy use as it is based on daily average data. However, since the ex-ante calculations used 360 days of annual operation instead of 365 as the ex-post calculation does, the energy and demand realization rates are slightly different. Overall, the realization rate is 94.7% for energy savings and 93.7% for demand resulting from these changes.

PROGRAM LEVEL ANALYSIS AND RESULTS

Adhering to the CEC's guidelines, Anchor Blue delivers savings results in gross savings, net savings, and lifecycle savings. Three steps are required to estimate all these results:

1. Calculate program level realization rates
2. Research and update Net-to-Gross (NTG) ratios
3. Calculate weighted average measure lives (WAML) for each utility for lifecycle savings calculations

This section outlines the analysis steps taken in these three steps, how the mega project is treated and finally presents the program level results.

Program Level Realization Rates

While developing the stratified sample design, Anchor Blue calculated the share of sampled ex-ante savings to total ex-ante savings within each stratum, which is the stratum weight. This is used as a multiplier to develop a total stratum weighted gross ex-ante and ex-post savings by applying that stratum weight to each sampled sites ex-ante and ex-post savings to reach an extrapolated program level ex-ante and ex-post savings. These extrapolated program level savings are used to calculate a stratum weighted program level realization rate that can be applied to all program savings except the Modesto mega project, which is treated separately and discussed in the *Treatment of Modesto Mega Project* section of this report.

Due to rounding and some minor changes to the sample data after the sample draw was complete, the extrapolated ex-ante savings numbers do not exactly match the actual ex-ante savings, but provides a means to calculate the program level, stratum weighted realization rate that is applied to the actual program savings in subsequent sections of this report. Table 28 summarizes the realization rates by project and the overall program realization rate weighted by stratum. The program level energy realization rate derived is 97%, excluding the Modesto mega project.

Table 28. MTM Program-Level Electric Gross Energy Ex-Post Savings and Realization Rates

Site	Ex-ante Savings (kWh)	Project Realization Rate	Ex-post Savings (kWh)	Stratum Weight	Extrapolated Ex-Ante Savings (kWh)	Extrapolated Ex-Post Savings (kWh)	Stratum Weighted Realization Rate
Modesto -1	376,086	107%	401,345	1.5	571,787	610,190	
Modesto -2	324,878	98%	317,444	1.5	493,932	482,630	
Modesto -3	204,984	96%	197,626	1.5	311,650	300,463	
Modesto -4	203,911	73%	148,872	1.5	310,019	226,339	
Modesto -5	196,999	77%	152,471	6.1	1,209,739	936,300	
Modesto -6	97,075	98%	95,184	6.1	596,122	584,510	
Modesto -7	78,492	60%	46,741	6.1	482,007	287,029	
Modesto -8	59,749	95%	56,846	6.1	366,909	349,082	
Modesto -9	23,372	88%	20,599	90.2	2,108,141	1,858,018	
Modesto -10	14,303	97%	13,816	90.2	1,290,122	1,246,195	
Modesto -11	6,625	35%	2,304	90.2	597,549	207,819	
Modesto -12	1,239	43%	537	90.2	111,757	48,437	
Turlock -13	5,624,020	100%	5,620,572	1.5	8,550,548	8,545,305	

Turlock -14	1,102,204	107%	1,179,325	1.5	1,675,749	1,793,001	
Turlock -15	549,071	100%	549,071	6.1	3,371,758	3,371,756	
Turlock -16	181,646	95%	172,143	6.1	1,115,459	1,057,102	
Turlock -17	22,353	102%	22,789	90.2	2,016,228	2,055,555	
Turlock -18	7,856	105%	8,247	90.2	708,607	743,875	
Merced -19	1,725,199	109%	1,883,968	1.5	2,622,927	2,864,314	
Merced -20	362,132	101%	366,862	6.1	2,223,794	2,252,840	
Merced -21	7,204	96%	6,897	90.2	649,797	622,105	
TOTAL	**11,169,398**		**11,263,659**		**31,384,600**	**30,442,866**	**97.0%**

Source: Anchor Blue Analysis
Note: Modesto Mega Project was evaluated separated from the stratified sample above and not included in the table above

Demand savings are calculated using the same stratified weighting method. Ex-post demand savings are estimated using the overall realization rate of 73.8%, excluding the Modesto mega project.

Table 29. MTM Program-Level Electric Gross Demand Savings and Realization Rate

Site	Ex-ante Peak Demand (kW)	Project Realization Rate	Ex-post Peak Demand (kW)	Stratum Weight	Extrapolated Ex-Ante Peak Demand (kW)	Extrapolated Ex-Post Peak Demand (kW)	Stratum Weighted Realization Rate
Modesto -1	39.5	108%	42.7	1.5	60.1	64.9	
Modesto -2	0.0	NA	0.0	1.5	0.0	0.0	
Modesto -3	0.0	100%	15.8	1.5	0.0	24.0	
Modesto -4	44.6	108%	48.3	1.5	67.7	73.4	
Modesto -5	3.1	240%	7.4	6.1	18.9	45.4	
Modesto -6	15.4	103%	15.9	6.1	94.8	97.6	
Modesto -7	14.2	0%	0.0	6.1	87.0	0.0	
Modesto -8	11.0	95%	10.4	6.1	67.4	63.9	
Modesto -9	0.0	NA	0.0	90.2	0.0	0.0	
Modesto -10	2.4	107%	2.5	90.2	213.8	229.1	
Modesto -11	4.9	14%	0.7	90.2	442.9	60.4	
Modesto -12	1.2	37%	0.4	90.2	107.3	39.7	
Turlock -13	1,728.5	70%	1,209.2	1.5	2,627.9	1,838.4	
Turlock -14	112.7	148%	167.0	1.5	171.4	253.9	
Turlock -15	28.0	100%	28.0	6.1	171.9	171.9	
Turlock -16	44.3	11%	4.9	6.1	272.0	30.1	
Turlock -17	5.5	0%	0.0	90.2	491.6	0.0	
Turlock -18	1.7	85%	1.4	90.2	152.4	129.0	
Merced -19	0.0	NA	181.0	1.5	0.0	275.2	
Merced -20	0.0	NA	53.7	6.1	0.0	329.8	
Merced -21	0.0	NA	0.0	90.2	0.0	0.0	
TOTAL	**2,057**		**1,789**		**5,047**	**3,727**	**73.8%**

Source: Anchor Blue Analysis
Note: Modesto Mega Project was evaluated separated from the stratified sample above and not included in the table above

Net-to-Gross Values

Net-to-gross (NTG) are used as an estimate to account for spillover and free rider effects based on measure type. Anchor Blue updated NTG ratios at the end use level for this evaluation based on the most recent CA eTRM[6] publication. These values are derived from DEER 2019 and DEER 2020, and if both DEER versions are listed in the CA eTRM, Anchor Blue selected the most recent DEER value. In most cases, a specific value was not identified for the end use and Anchor Blue utilized the 0.6 NTG value identified in the eTRM, which is to be applied to 'measures not covered by other NTG values.' The exceptions to this are the HVAC and Lighting end uses, which have 0.65 and 0.91 NTG values identified.

The NTG ratios are applied to the gross energy and demand savings to yield net savings results in subsequent program summary tables. Table 30 below outlines the NTG ratios applied by end use for net program savings results in subsequent tables. The programs are heavily weighted by lighting savings, bringing the weighted average program total NTG to 0.87, near the 0.91 lighting NTG ratio.

Table 30. 2021 CA eTRM NTG Ratios by End Use Category

End-Use Category	Net-to-Gross Ratio
Non-Res Cooking	0.6
Non-Res HVAC	0.65
Non-Res Lighting	0.91
Non-Res Motors	0.6
Non-Res Pool Pumps	0.6
Non-Res Refrigeration	0.6
Non-Res Shell	0.6
Non-Res Process	0.6
Non-Res Comprehensive	0.6
Non-Res Behavior	0.6
Other	0.6
Weighted Program Total NTG	**0.87**

Source: CA eTRM & Anchor Blue Analysis

Weighted Average Measure Life (WAML) and Lifecycle Savings

To estimate the program lifecycle ex-post savings, Anchor Blue calculated weighted average measure lives (WAML) from the CEC 2020 SB1037 Report. For Turlock and Modesto, the WAMLs used in this report were calculated at the total non-residential savings level for each utility, since more granular data could not be derived from the SB1037 report. For Merced, total portfolio savings, including residential, were used to calculate the WAML, as disaggregated sector level savings were not reported for Merced in the 2020 SB1037 Report. Table 31 below outlines the WAML applied to each utility savings for lifecycle savings in subsequent results tables.

Table 31. Weighted Average Measure Life by Utility from the 2020 SB1037 Report

Utility	WAML	Sectors included from SB1037
Merced	10.0	All
Turlock	15.0	Com, Ind, Ag, Other
Modesto	8.7	Com, Ind, Ag
All Utilities	11.8	

[6] https://www.caetrm.com/cpuc/table/nettogross/ - accessed 10/1/2021

Treatment of Modesto Mega Project

The Modesto mega project is treated separately throughout this analysis and the site was evaluated entirely on its own since it made up one quarter of the combined MTM PY 2019/2020 savings. All the program savings besides the mega project were sampled and stratified, resulting in a program level realization rate for all savings except for the mega project, as reported in the next section. The mega project will be reported in the following program summary tables, but as a separate line item with its own realization rate. Turlock and Merced should utilize the program level realization rate reported in the next section for all savings, while Modesto utilizes the program level realization rate for all savings in 2019/2020 besides the mega project, which will have its own realization rate applied.

Table 32 below outlines the Modesto mega project claimed savings, realization rate, and ex-post savings for both energy and demand. Unlike the sampled savings for the rest of the program, no stratum weights are applied to these savings since this project is separate from the sample.

Table 32. Modesto Mega project results and realization rates

Ex-ante Savings (kWh)	Mega Project Energy Realization Rate	Ex-post Savings (kWh)	Ex-ante Savings (kW)	Mega Project Demand Realization Rate	Ex-post Savings (kW)
11,206,288	94.7%	10,610,848	1,297.0	93%	1,211.0

Program Level Ex-Post Energy and Demand Savings

Anchor Blue applied the stratified weighted realization rates to the gross program level ex-ante savings to calculate the overall program level gross energy and demand ex-post savings, as outlined in Table 33. The Modesto mega project is reported as a separate line item from the program level savings, with its own realization rate applied. The 'Program Results – Stratified Sample' results apply to all savings in the Turlock and Merced territories. These results apply to all the savings in Modesto except the mega-project, which has its own realization rate as identified in the table below.

Table 33. Summary of Program-Level Electric Gross Energy and Demand Ex-Post Savings

Program or Mega	Gross Program Ex-Ante Savings (kWh)	Stratum Weighted Energy Realization Rate	Gross Program Ex-Post Savings (kWh)	Gross Program Ex-Ante Demand (kW)	Stratum Weighted Demand Realization Rate	Gross Program Ex-Post Demand (kW)
Program Results – Stratified Sample	**33,406,610**	**97%**	**32,404,204**	**5,033**	**74%**	**3,716**
Modesto Mega Project Results	11,206,288	95%	10,610,848	1,297	93%	1,211
Total Program Results with the Modesto Mega Project	44,612,898	96%	43,015,052	6,330	78%	4,927

Source: MTM Program Data and Anchor Blue Analysis
Note: Turlock and Merced should utilize the 'Program Results – Stratified Sample' results, Modesto should utilize the 'Program Results – Stratified Sample' for all savings but the mega project.

Anchor Blue applied the end-use level NTG ratios researched from the CA eTRM to the gross ex-post savings to estimate net ex-post savings, as shown in Table 34 below. The Modesto mega project is shown separately in the table and was given a NTG ratio of 0.8, which was the applied NTG in the 2020 SB1037 report.

Table 34. Summary of Program-Level Gross and Net Energy and Demand Ex-Post Savings

Program or Mega	Gross Program Ex-Post Savings (kWh)	Gross Program Ex-Post Demand (kW)	Weighted Average Net-to-Gross Ratio	Net Program Ex-Post Savings (kWh)	Net Program Ex-Post Demand (kW)
Program Results – Stratified Sample	**32,404,204**	**3,716**	**0.87**	**28,111,792**	**3,320**
Modesto Mega Project Results	10,610,848	1,211	0.80	8,488,678	969
Total Program Results with the Modesto Mega Project	43,015,052	4,927	0.85	36,600,471	4,289

Source: Anchor Blue Analysis

To estimate lifecycle savings, Anchor Blue applied the non-residential program level WAML calculated from the SB1037 reports, described earlier in this report. Table 35 below details the gross and net ex-post lifecycle kWh savings. The Modesto mega project was included in the WAML calculation and therefore uses the same WAML as the other sites.

Table 35. Summary of Program-Level Gross and Net Ex-Post Lifecycle Electric Savings

Program or Mega	Gross Program Ex-Post Savings (kWh)	Net Program Ex-Post Savings (kWh)	Weighted Average Measure Life (WAML)	Gross Program Lifecycle Ex-Post Savings (kWh)	Net Program Lifecycle Ex-Post Savings (kWh)
Program Results – Stratified Sample	**32,404,204**	**28,111,792**	**11.8**	**382,148,908**	**331,527,686**
Modesto Mega Project results	10,610,848	8,488,678	11.8	125,135,738	100,108,591
Total Program Results with the Modesto Mega project	43,015,052	36,600,471	11.8	507,284,646	431,636,277

Source: Anchor Blue Analysis

Ex-Post Energy and Demand Results by Measure Category

Table 36 report energy savings by end-use reporting category. Results of demand impacts are summarized in Table 37. The Modesto mega project is detailed in its own line item with its own realization rate.

Table 36. MTM PY 2019/2020 Gross and Net Ex-Post Portfolio-Level Electric Energy Savings

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Energy Savings Realization Rate	Gross Annual Ex-Post Energy Savings (kWh)	Net-to-Gross Ratio (CA eTRM)	Net Annual Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	97%	-	0.6	-
Non-Res HVAC	164,916	97%	159,968	0.65	103,979
Non-Res Lighting	28,803,881	97%	27,939,586	0.91	25,425,023
Non-Res Motors	201,438	97%	195,394	0.6	117,236
Non-Res Pool Pumps	5,274	97%	5,116	0.6	3,069
Non-Res Refrigeration	1,201,872	97%	1,165,808	0.6	699,485
Non-Res Shell	44,542	97%	43,206	0.6	25,923

Non-Res Process	2,795,441	97%	2,711,561	0.6	1,626,936
Non-Res Comprehensive	79,893	97%	77,496	0.6	46,497
Non-Res Behavior	-	97%	-	0.6	-
Other	109,352	97%	106,071	0.6	63,642
TOTAL	**33,406,610**		**32,404,204**		**28,111,792**
Modesto Mega	11,206,288	95%	10,610,848	0.8	8,488,678
TOTAL - with Mega	**44,612,898**		**43,015,052**		**36,600,471**

Source: Utility program data and Anchor Blue analysis

Table 37. MTM PY 2019/2020 Gross and Net Ex-Post Portfolio-Level Peak Demand Savings

End-Use Category	Gross Annual Ex-Ante Demand Savings (kW)	Demand Savings Realization Rate	Gross Annual Ex-Post Demand Savings (kW)	Net-to-Gross Ratio (CA eTRM)	Net Annual Ex-Post Demand Savings (kW)
Non-Res Cooking	-	74%	-	0.6	-
Non-Res HVAC	45	74%	33	0.65	21
Non-Res Lighting	4,758	74%	3,513	0.91	3,197
Non-Res Motors	12	74%	9	0.6	5
Non-Res Pool Pumps	-	74%	-	0.6	-
Non-Res Refrigeration	18	74%	13	0.6	8
Non-Res Shell	-	74%	-	0.6	-
Non-Res Process	147	74%	109	0.6	65
Non-Res Comprehensive	41	74%	30	0.6	18
Non-Res Behavior	-	74%	-	0.6	-
Other	13	74%	10	0.6	6
TOTAL	**5,033**		**3,716**		**3,320**
Modesto Mega	1,297	93%	1,211	0.8	969
TOTAL - with Mega	**6,330**		**4,927**		**4,289**

Source: Utility program data and Anchor Blue analysis

PROGRAM FINDINGS AND RECOMMENDATIONS

The main findings and recommendations resulting from this impact evaluation are outlined below:

- With some exceptions, the project documentation provided good quality data to verify the installed equipment.

- Several sites went through scope changes during the rebate process and these changes were not as well documented in the project files. For two sites, this resulted in the incorrect rebate calculator being used for final rebate processing.
    - ***Recommendation:*** *for sites that go through scope changes during the rebate process, add 'notes to files', email communications, and/or all other relevant information related to the scope change in the project file.*

- Some project files had multiple lighting rebate calculator spreadsheets and/or different scanned versions of these spreadsheets and it was sometimes difficult to discern which was the final rebate calculator.
    - ***Recommendation:*** *If a site goes through multiple iterations of analysis due to scope changes or other corrections, mark the final rebate calculation workbooks as 'final' in the file name, ensuring that these savings are entered into the tracking database. Earlier versions should be kept but marked with their respective iteration version number in the file name.*

- Many lighting sites did not have any Excel rebate calculation spreadsheets provided, making it difficult to identify the exact reason for a change in energy savings in the ex-post calculations.
    - ***Recommendation:*** *Retain Excel rebate calculation workbooks for all custom lighting projects, in addition to project documentation.*

- Some sites claimed peak demand savings for exterior nighttime application fixtures, which operate during off peak hours and should have a coincident demand factor of 0 applied.
    - ***Recommendation:*** *Ensure the base lighting rebate and savings spreadsheets for each utility includes a 0.0 peak coincidence factor for exterior nighttime light fixture applications.*

- HVAC interactive effects and peak coincident demand factors are not applied for some sites. These factors are outlined in the CMUA TRM savings algorithm and provided in the CMUA TRM by space type. Interactive effects provide additional savings to be claimed from reduced air-conditioning usage at the site due to the lower heat output of LED lighting compared to the baseline. Peak coincident factors are an estimate of the percentage of full demand load that occurs during peak hours. Both factors provide better estimations of the impact of the lighting project on the site.
    - ***Recommendation:*** *Ensure all three Irrigation Districts adopt the use of interactive effects and coincident peak demand factors in their lighting rebate and savings calculators.*

- Several sites used nonstandard baseline fixture wattage assumptions in the ex-ante calculations.
    - ***Recommendation:*** The CMUA TRM provides a detailed list of standard baseline fixture wattages that should be used by all utilities.

- All three Irrigation Districts use different lighting rebate calculators, creating inconsistencies in assumptions, some of which are mentioned in earlier findings.
    - ***Recommendation:*** *Consider adopting a universal lighting calculator to be used by all three irrigation districts, resulting in more consistency across calculations and assumptions.*

- Prescriptive savings sites received the lowest realization rates in this evaluation. All POUs in CA adopted the new ESP program tracking system to track program savings and apply prescriptive savings, replacing the previous E3 calculators. The realization rates were low for these sites due to the mis-selection of the appropriate measure savings in this new system. This is because historical and current measure level savings are included in the system for historical tracking purposes. However, upon review of the system with one utility, Anchor Blue noted that there is no indication of measure savings as 'active' or 'deactivated', so it is easy to apply an old measure savings value, which happened with two sites in this evaluation.
    - ***Recommendation:*** Review ESP tracking systems and update to ensure that only current CMUA TRM deemed savings are considered 'active' and available for use, somehow identifying historical measures as expired or deactivated so that they cannot be applied to current prescriptive applications.

- Many of the sites changes in realization rates were due to unanticipated changes in equipment performance and/or operation hours, especially compounded by the CoViD-19 pandemic.

PORTFOLIO SUMMARY BY UTILITY

Evaluated Savings Summary by Utility

This section provides a view of evaluated savings by each utility. The mega project in Modesto, which makes up a quarter of the entire portfolio savings across all utilities, was removed from the overall sample draw and evaluated on its own. It is rolled up into the overall Modesto savings with its own realization rate, but its realization rate does not affect Turlock or Merced. This was agreed upon early in the project with the three utilities since the magnitude of the mega project's savings would likely skew the results for the other two utilities and other projects in Modesto. The sample draw was based upon all projects in all three utilities in PY 2019/2020, excluding this mega project.

The selected sample site savings represents 11,169,398 kWh and 2,057 kW which covers 33% of energy and 41% demand savings claimed for MTM's Non-Residential program savings in PY 2019/2020, not including the mega project. The overall energy and peak demand savings realization rates are 97.0% and 74% across MTM programs respectively, except the Modesto mega project. This mega project received a realization rate of 95% for energy savings and 93% for demand savings.

Table 38 Shows the breakdown of the project statistics by utility. There are a total of 295 projects from the three utilities, where Anchor Blue sampled 21 projects to achieve a sampling precision of 90% (+/- 15%).

Table 38. Claimed Gross Ex-Ante Savings, Completed Projects, and Sampled Projects by Utility

Utility	Gross Ex-ante kWh	kWh Share	Number of Projects	Projects Share	Sampled Projects	Sampled Share
Modesto	5,396,438	16%	124	42%	12	57%
Turlock	24,950,416	75%	158	53%	6	29%
Merced	3,059,756	9%	15	5%	3	14%
Total	**33,406,610**	**100%**	**297**	**100%**	**21**	**100%**

Source: MTM Program Data and Anchor Blue Analysis
Note: This does not include the Modesto Mega Project, which claimed 11,206,288 savings and was evaluated separately

Table 39 summarizes the share of evaluated claimed savings as percentage of total claimed savings by each utility. This table shows the total savings with and without the Modesto mega project.

Table 39. Share of Evaluated Claimed Savings as Percentage of Total Claimed Savings by Utility

Utility	Total Gross Annual Ex-Ante Energy Savings (kWh)	Evaluated Gross Annual Ex-Ante Energy Savings (kWh)	Percent of the Total Energy Savings Evaluated
Modesto	5,396,438	1,587,713	29%
Turlock	24,950,416	7,487,150	30%
Merced	3,059,756	2,094,535	68%
Total w/o Mega	**33,406,610**	**11,169,398**	**33%**
Modesto Mega	*11,206,288*	*11,206,288*	*100%*

Modesto Total with Mega	*16,602,726*	*12,794,001*	*77%*
All MTM with Mega	***44,612,898***	***22,375,686***	***50%***

Source: MTM Project Tracking and Anchor Blue Analysis

Portfolio Level Gross and Net Savings by Utility

The tables below summarize the gross and net savings by end-use category specific to each utility. The Modesto data includes the mega project in its own line item with its own realization rate.

The realization rate is applied to each of the categories included in the EM&V combined sample. The net-to-gross ratios are taken from DEER database.

Modesto Energy (kWh) Savings by Program Year

Table 40. Modesto PY2019 Gross and Net Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Energy Savings Realization Rate	Gross Annual Ex-Post Energy Savings (kWh)	Net-to-Gross Ratio	Net Annual Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	97%	-	0.6	-
Non-Res HVAC	12,654	97%	12,274	0.65	7,978
Non-Res Lighting	3,074,829	97%	2,982,565	0.91	2,714,134
Non-Res Motors	-	97%	-	0.6	-
Non-Res Pool Pumps	-	97%	-	0.6	-
Non-Res Refrigeration	83,259	97%	80,761	0.6	48,456
Non-Res Shell	44,542	97%	43,206	0.6	25,923
Non-Res Process	-	97%	-	0.6	-
Non-Res Comprehensive	79,893	97%	77,496	0.6	46,497
Non-Res Behavior	-	97%	-	0.6	-
Other	106,646	97%	103,446	0.6	62,068
MID - Mega	-	NA		0.8	
TOTAL	3,401,823	97%	3,299,747	0.88	2,905,057

Source: MTM Project Tracking and Anchor Blue Analysis

Table 41. Modesto PY2020 Gross and Net Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Energy Savings Realization Rate	Gross Annual Ex-Post Energy Savings (kWh)	Net-to-Gross Ratio	Net Annual Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	97%	-	0.6	-
Non-Res HVAC	20,519	97%	19,903	0.65	12,937
Non-Res Lighting	1,971,390	97%	1,912,236	0.91	1,740,135
Non-Res Motors	-	97%	-	0.6	-
Non-Res Pool Pumps	-	97%	-	0.6	-
Non-Res Refrigeration	-	97%	-	0.6	-
Non-Res Shell	-	97%	-	0.6	-
Non-Res Process	-	97%	-	0.6	-
Non-Res Comprehensive	-	97%	-	0.6	-
Non-Res Behavior	-	97%	-	0.6	-
Other	2,706	97%	2,625	0.6	1,575
MID - Mega	11,206,288	95%	10,610,848	0.8	8,488,678
TOTAL	**13,200,903**	**95%**	**12,545,612**	**0.82**	**10,243,325**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 42. Modesto PY2019 & PY2020 Gross and Net Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Energy Savings Realization Rate	Gross Annual Ex-Post Energy Savings (kWh)	Net-to-Gross Ratio	Net Annual Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	97%	-	0.6	-
Non-Res HVAC	33,173	97%	32,177	0.65	20,915
Non-Res Lighting	5,046,219	97%	4,894,801	0.91	4,454,269
Non-Res Motors	-	97%	-	0.6	-
Non-Res Pool Pumps	-	97%	-	0.6	-
Non-Res Refrigeration	83,259	97%	80,761	0.6	48,456
Non-Res Shell	44,542	97%	43,206	0.6	25,923
Non-Res Process	-	97%	-	0.6	-
Non-Res Comprehensive	79,893	97%	77,496	0.6	46,497
Non-Res Behavior	-	97%	-	0.6	-
Other	109,352	97%	106,071	0.6	63,642
MID - Mega	11,206,288	95%	10,610,848	0.8	8,488,678
TOTAL	**16,602,726**	**95%**	**15,845,359**	**0.83**	**13,148,382**

Source: MTM Project Tracking and Anchor Blue Analysis

Modesto Demand Savings (kW) Savings by Program Year

Table 43. Modesto PY2019 Gross and Net Peak Demand Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Demand Savings (kW)	Demand Savings Realization Rate	Gross Annual Ex-Post Demand Savings (kW)	Net-to-Gross Ratio	Net Annual Ex-Post Demand Savings (kW)
Non-Res Cooking	-	74%	-	0.6	-
Non-Res HVAC	8.5	74%	6.3	0.65	4
Non-Res Lighting	344.3	74%	254.2	0.91	231
Non-Res Motors	-	74%	-	0.6	-
Non-Res Pool Pumps	-	74%	-	0.6	-
Non-Res Refrigeration	14.1	74%	10.4	0.6	6
Non-Res Shell	-	74%	-	0.6	-
Non-Res Process	-	74%	-	0.6	-
Non-Res Comprehensive	40.6	74%	30.0	0.6	18
Non-Res Behavior	-	74%	-	0.6	-
Other	13.0	74%	9.6	0.6	6
MID - Mega	-	NA		0.8	
TOTAL	**420.4**		**310.4**		**265**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 44. Modesto PY2020 Gross and Net Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante	Demand Savings Realization Rate	Gross Annual Ex-Post	Net-to-Gross Ratio	Net Annual Ex-Post Demand Savings (kW)

	Demand Savings (kW)		Demand Savings (kW)		
Non-Res Cooking	-	74%	-	0.6	-
Non-Res HVAC	16	74%	12	0.65	8
Non-Res Lighting	241	74%	178	0.91	162
Non-Res Motors	-	74%	-	0.6	-
Non-Res Pool Pumps	-	74%	-	0.6	-
Non-Res Refrigeration	-	74%	-	0.6	-
Non-Res Shell	-	74%	-	0.6	-
Non-Res Process	-	74%	-	0.6	-
Non-Res Comprehensive	-	74%	-	0.6	-
Non-Res Behavior	-	74%	-	0.6	-
Other	-	74%	-	0.6	-
MID - Mega	1,297	93%	1,211	0.8	969
TOTAL	**1,555**	**90%**	**1,401**		**1,139**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 45. Modesto PY2019 & PY2020 Gross and Net Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Demand Savings (kW)	Demand Savings Realization Rate	Gross Annual Ex-Post Demand Savings (kW)	Net-to-Gross Ratio	Net Annual Ex-Post Demand Savings (kW)
Non-Res Cooking	-	74%	-	0.6	-
Non-Res HVAC	25	74%	18	0.65	12
Non-Res Lighting	586	74%	433	0.91	394
Non-Res Motors	-	74%	-	0.6	-
Non-Res Pool Pumps	-	74%	-	0.6	-
Non-Res Refrigeration	14	74%	10	0.6	6
Non-Res Shell	-	74%	-	0.6	-
Non-Res Process	-	74%	-	0.6	-
Non-Res Comprehensive	41	74%	30	0.6	18
Non-Res Behavior	-	74%	-	0.6	-
Other	13	74%	10	0.6	6
MID - Mega	1,297	93%	1,211	0.8	969
TOTAL	**1,975**	**87%**	**1,712**		**1,404**

Source: MTM Project Tracking and Anchor Blue Analysis

Modesto Lifecyle Savings (kWh) Savings by Program Year

Table 46. Modesto PY2019 Gross and Net Lifecyle Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Net Annual Ex-Post Energy Savings (kWh)	Weighted Average Measure Life (WAML)	Gross Lifecycle Ex-Post Energy Savings (kWh)	Net Lifecycle Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	-	8.7	-	-

Non-Res HVAC	12,654	7,978	8.7	109,978	69,341
Non-Res Lighting	3,074,829	2,714,134	8.7	26,724,424	23,589,498
Non-Res Motors	-	-	8.7	-	-
Non-Res Pool Pumps	-	-	8.7	-	-
Non-Res Refrigeration	83,259	48,456	8.7	723,633	421,152
Non-Res Shell	44,542	25,923	8.7	387,131	225,309
Non-Res Process	-	-	8.7	-	-
Non-Res Comprehensive	79,893	46,497	8.7	694,378	404,126
Non-Res Behavior	-	-	8.7	-	-
Other	106,646	62,068	8.7	926,898	539,451
MID - Mega	-	-	8.7	-	-
TOTAL	**3,401,823**	**2,905,057**	**8.7**	**29,566,443**	**25,248,876**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 47. Modesto PY2020 Gross and Net Lifecyle Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Net Annual Ex-Post Energy Savings (kWh)	Weighted Average Measure Life (WAML)	Gross Lifecycle Ex-Post Energy Savings (kWh)	Net Lifecycle Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	-	8.7	-	-
Non-Res HVAC	20,519	12,937	8.7	178,338	112,441
Non-Res Lighting	1,971,390	1,740,135	8.7	17,134,046	15,124,126
Non-Res Motors	-	-	8.7	-	-
Non-Res Pool Pumps	-	-	8.7	-	-
Non-Res Refrigeration	-	-	8.7	-	-
Non-Res Shell	-	-	8.7	-	-
Non-Res Process	-	-	8.7	-	-
Non-Res Comprehensive	-	-	8.7	-	-
Non-Res Behavior	-	-	8.7	-	-
Other	2,706	1,575	8.7	23,519	13,688
MID - Mega	11,206,288	8,488,678	**8.7**	97,397,804	73,778,100
TOTAL	**13,200,903**	**10,243,325**	**8.7**	**114,733,707**	**89,028,355**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 48. Modesto PY 2019 & PY 2020 Gross and Net Lifecyle Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Net Annual Ex-Post Energy Savings (kWh)	Weighted Average Measure Life (WAML)	Gross Lifecycle Ex-Post Energy Savings (kWh)	Net Lifecycle Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	-	8.7	-	-
Non-Res HVAC	33,173	20,915	8.7	288,316	181,782
Non-Res Lighting	5,046,219	4,454,269	8.7	43,858,470	38,713,623
Non-Res Motors	-	-	8.7	-	-
Non-Res Pool Pumps	-	-	8.7	-	-

Non-Res Refrigeration	83,259	48,456	8.7	723,633	421,152
Non-Res Shell	44,542	25,923	8.7	387,131	225,309
Non-Res Process	-	-	8.7	-	-
Non-Res Comprehensive	79,893	46,497	8.7	694,378	404,126
Non-Res Behavior	-	-	8.7	-	-
Other	109,352	63,642	8.7	950,417	553,139
MID - Mega	11,206,288	8,488,678	**8.7**	97,397,804	73,778,100
TOTAL	**16,602,726**	**13,148,382**	**8.7**	**144,300,150**	**114,277,231**

Source: MTM Project Tracking and Anchor Blue Analysis

Turlock Energy (kWh) Savings by Program Year

Table 49. Turlock PY2019 Gross and Net Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Energy Savings Realization Rate	Gross Annual Ex-Post Energy Savings (kWh)	Net-to-Gross Ratio	Net Annual Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	97%	-	0.6	-
Non-Res HVAC	61,648	97%	59,798	0.65	38,869
Non-Res Lighting	7,646,644	97%	7,417,197	0.91	6,749,649
Non-Res Motors	121,215	97%	117,578	0.6	70,547
Non-Res Pool Pumps	-	97%	-	0.6	-
Non-Res Refrigeration	864,342	97%	838,406	0.6	503,044
Non-Res Shell	-	97%	-	0.6	-
Non-Res Process	2,246,370	97%	2,178,965	0.6	1,307,379
Non-Res Comprehensive	-	97%	-	0.6	-
Non-Res Behavior	-	97%	-	0.6	-
Other	-	97%	-	0.6	-
TOTAL	**10,940,219**	**97%**	**10,611,944**	**0.82**	**8,669,487**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 50. Turlock PY2020 Gross and Net Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Energy Savings Realization Rate	Gross Annual Ex-Post Energy Savings (kWh)	Net-to-Gross Ratio	Net Annual Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	97%	-	0.6	-
Non-Res HVAC	63,336	97%	61,435	0.65	39,933
Non-Res Lighting	13,058,023	97%	12,666,201	0.91	11,526,243
Non-Res Motors	80,223	97%	77,816	0.6	46,689
Non-Res Pool Pumps	5,274	97%	5,116	0.6	3,069
Non-Res Refrigeration	254,271	97%	246,641	0.6	147,985
Non-Res Shell	-	97%	-	0.6	-
Non-Res Process	549,071	97%	532,596	0.6	319,557
Non-Res Comprehensive	-	97%	-	0.6	-
Non-Res Behavior	-	97%	-	0.6	-

Other	-	97%	-	0.6	-
TOTAL	**14,010,197**	**97%**	**13,589,804**	**0.89**	**12,083,477**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 51. Turlock PY2019 & PY2020 Gross and Net Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Energy Savings Realization Rate	Gross Annual Ex-Post Energy Savings (kWh)	Net-to-Gross Ratio	Net Annual Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	97%	-	0.6	-
Non-Res HVAC	124,984	97%	121,233	0.65	78,802
Non-Res Lighting	20,704,666	97%	20,083,398	0.91	18,275,892
Non-Res Motors	201,438	97%	195,394	0.6	117,236
Non-Res Pool Pumps	5,274	97%	5,116	0.6	3,069
Non-Res Refrigeration	1,118,613	97%	1,085,048	0.6	651,029
Non-Res Shell	-	97%	-	0.6	-
Non-Res Process	2,795,441	97%	2,711,561	0.6	1,626,936
Non-Res Comprehensive	-	97%	-	0.6	-
Non-Res Behavior	-	97%	-	0.6	-
Other	-	97%	-	0.6	-
TOTAL	**24,950,416**	**97%**	**24,201,748**	**0.86**	**20,752,964**

Source: MTM Project Tracking and Anchor Blue Analysis

Turlock Demand Savings (kW) Savings by Program Year

Table 52. Turlock PY2019 Gross and Net Peak Demand Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Demand Savings (kW)	Demand Savings Realization Rate	Gross Annual Ex-Post Demand Savings (kW)	Net-to-Gross Ratio	Net Annual Ex-Post Demand Savings (kW)
Non-Res Cooking	-	74%	-	0.6	-
Non-Res HVAC	19	74%	14	0.65	9
Non-Res Lighting	1,445	74%	1,067	0.91	971
Non-Res Motors	12	74%	9	0.6	5
Non-Res Pool Pumps	-	74%	-	0.6	-
Non-Res Refrigeration	-	74%	-	0.6	-
Non-Res Shell	-	74%	-	0.6	-
Non-Res Process	119	74%	88	0.6	53
Non-Res Comprehensive	-	74%	-	0.6	-
Non-Res Behavior	-	74%	-	0.6	-
Other	-	74%	-	0.6	-
TOTAL	**1,595**		**1,178**		**1,038**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 53. Turlock PY2020 Gross and Net Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Demand Savings (kW)	Demand Savings Realization Rate	Gross Annual Ex-Post Demand Savings (kW)	Net-to-Gross Ratio	Net Annual Ex-Post Demand Savings (kW)
Non-Res Cooking	-	74%	-	0.6	-
Non-Res HVAC	1	74%	1	0.65	0
Non-Res Lighting	2,727	74%	2,014	0.91	1,833
Non-Res Motors	-	74%	-	0.6	-
Non-Res Pool Pumps	-	74%	-	0.6	-
Non-Res Refrigeration	4	74%	3	0.6	2
Non-Res Shell	-	74%	-	0.6	-
Non-Res Process	28	74%	21	0.6	12
Non-Res Comprehensive	-	74%	-	0.6	-
Non-Res Behavior	-	74%	-	0.6	-
Other	-	74%	-	0.6	-
TOTAL	**2,760**		**2,038**		**1,847**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 54. Turlock PY2019 & PY2020 Gross and Net Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Demand Savings (kW)	Demand Savings Realization Rate	Gross Annual Ex-Post Demand Savings (kW)	Net-to-Gross Ratio	Net Annual Ex-Post Demand Savings (kW)
Non-Res Cooking	-	74%	-	0.6	-
Non-Res HVAC	20	74%	15	0.85	13
Non-Res Lighting	4,172	74%	3,081	0.8	2,464
Non-Res Motors	12	74%	9	0.6	5
Non-Res Pool Pumps	-	74%	-	0.6	-
Non-Res Refrigeration	4	74%	3	0.6	2
Non-Res Shell	-	74%	-	0.6	-
Non-Res Process	147	74%	109	0.6	65
Non-Res Comprehensive	-	74%	-	0.6	-
Non-Res Behavior	-	74%	-	0.7	-
Other	-	74%	-	0.7	-
TOTAL	**4,355**		**3,215**		**2,549**

Source: MTM Project Tracking and Anchor Blue Analysis

Turlock Lifecyle Savings (kWh) Savings by Program Year

Table 55. Turlock PY2019 Gross and Net Lifecyle Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Net Annual Ex-Post Energy Savings (kWh)	Weighted Average Measure Life (WAML)	Gross Lifecycle Ex-Post Energy Savings (kWh)	Net Lifecycle Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	-	15.0	-	-
Non-Res HVAC	61,648	38,869	15.0	924,627	582,974

Non-Res Lighting	7,646,644	6,749,649	15.0	114,688,141	101,234,572
Non-Res Motors	121,215	70,547	15.0	1,818,042	1,058,094
Non-Res Pool Pumps	-	-	15.0	-	-
Non-Res Refrigeration	864,342	503,044	15.0	12,963,828	7,544,900
Non-Res Shell	-	-	15.0	-	-
Non-Res Process	2,246,370	1,307,379	15.0	33,692,167	19,608,715
Non-Res Comprehensive	-	-	15.0	-	-
Non-Res Behavior	-	-	15.0	-	-
Other	-	-	15.0	-	-
TOTAL	**10,940,219**	**8,669,487**	**15.0**	**164,086,806**	**130,029,255**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 56. Turlock PY2020 Gross and Net Lifecyle Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Net Annual Ex-Post Energy Savings (kWh)	Weighted Average Measure Life (WAML)	Gross Lifecycle Ex-Post Energy Savings (kWh)	Net Lifecycle Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	-	15.0	-	-
Non-Res HVAC	63,336	39,933	15.0	949,939	598,932
Non-Res Lighting	13,058,023	11,526,243	15.0	195,850,674	172,876,281
Non-Res Motors	80,223	46,689	15.0	1,203,224	700,272
Non-Res Pool Pumps	5,274	3,069	15.0	79,098	46,035
Non-Res Refrigeration	254,271	147,985	15.0	3,813,682	2,219,549
Non-Res Shell	-	-	15.0	-	-
Non-Res Process	549,071	319,557	15.0	8,235,244	4,792,881
Non-Res Comprehensive	-	-	15.0	-	-
Non-Res Behavior	-	-	15.0	-	-
Other	-	-	15.0	-	-
TOTAL	**14,010,197**	**12,083,477**	**15.0**	**210,131,861**	**181,233,950**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 57. Turlock PY2019 & PY2020 Gross and Net Lifecyle Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Net Annual Ex-Post Energy Savings (kWh)	Weighted Average Measure Life (WAML)	Gross Lifecycle Ex-Post Energy Savings (kWh)	Net Lifecycle Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	-	15.0	-	-
Non-Res HVAC	124,984	78,802	15.0	1,874,566	1,181,906
Non-Res Lighting	20,704,666	18,275,892	15.0	310,538,815	274,110,853
Non-Res Motors	201,438	117,236	15.0	3,021,267	1,758,366
Non-Res Pool Pumps	5,274	3,069	15.0	79,098	46,035
Non-Res Refrigeration	1,118,613	651,029	15.0	16,777,510	9,764,448
Non-Res Shell	-	-	15.0	-	-
Non-Res Process	2,795,441	1,626,936	15.0	41,927,410	24,401,596
Non-Res Comprehensive	-	-	15.0	-	-
Non-Res Behavior	-	-	15.0	-	-

Other	-	-	15.0	-	-
TOTAL	**24,950,416**	**20,752,964**	**15.0**	**374,218,667**	**311,263,205**

Source: MTM Project Tracking and Anchor Blue Analysis

Merced Energy (kWh) Savings by Program Year

Table 58. Merced PY2019 Gross and Net Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Energy Savings Realization Rate	Gross Annual Ex-Post Energy Savings (kWh)	Net-to-Gross Ratio	Net Annual Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	97%	-	0.6	-
Non-Res HVAC	6,760	97%	6,557	0.65	4,262
Non-Res Lighting	2,206,822	97%	2,140,604	0.91	1,947,949
Non-Res Motors	-	97%	-	0.6	-
Non-Res Pool Pumps	-	97%	-	0.6	-
Non-Res Refrigeration	-	97%	-	0.6	-
Non-Res Shell	-	97%	-	0.6	-
Non-Res Process	-	97%	-	0.6	-
Non-Res Comprehensive	-	97%	-	0.6	-
Non-Res Behavior	-	97%	-	0.6	-
Other	-	97%	-	0.6	-
TOTAL	**2,213,582**	**97%**	**2,147,161**	**0.91**	**1,952,211**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 59. Merced PY2020 Gross and Net Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Energy Savings Realization Rate	Gross Annual Ex-Post Energy Savings (kWh)	Net-to-Gross Ratio	Net Annual Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	97%	-	0.6	-
Non-Res HVAC	-	97%	-	0.65	-
Non-Res Lighting	846,174	97%	820,784	0.91	746,913
Non-Res Motors	-	97%	-	0.6	-
Non-Res Pool Pumps	-	97%	-	0.6	-
Non-Res Refrigeration	-	97%	-	0.6	-
Non-Res Shell	-	97%	-	0.6	-
Non-Res Process	-	97%	-	0.6	-
Non-Res Comprehensive	-	97%	-	0.6	-
Non-Res Behavior	-	97%	-	0.6	-
Other	-	97%	-	0.6	-
TOTAL	**846,174**	**97%**	**820,784**	**0.91**	**746,913**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 60. Merced PY2019 & PY2020 Gross and Net Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Energy Savings Realization Rate	Gross Annual Ex-Post Energy Savings (kWh)	Net-to-Gross Ratio	Net Annual Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	97%	-	0.6	-
Non-Res HVAC	6,760	97%	6,557	0.65	4,262
Non-Res Lighting	3,052,996	97%	2,961,387	0.91	2,694,862
Non-Res Motors	-	97%	-	0.6	-
Non-Res Pool Pumps	-	97%	-	0.6	-
Non-Res Refrigeration	-	97%	-	0.6	-
Non-Res Shell	-	97%	-	0.6	-
Non-Res Process	-	97%	-	0.6	-
Non-Res Comprehensive	-	97%	-	0.6	-
Non-Res Behavior	-	97%	-	0.6	-
Other	-	97%	-	0.6	-
TOTAL	**3,059,756**	**97%**	**2,967,944**	**0.91**	**2,699,124**

Source: MTM Project Tracking and Anchor Blue Analysis

Merced Demand Savings (kW) Savings by Program Year

Merced did not claim any ex-ante kW savings in 2019 or 2020

Merced Lifecyle Savings (kWh) Savings by Program Year

Table 61. Merced PY2019 Gross and Net Lifecyle Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Net Annual Ex-Post Energy Savings (kWh)	Weighted Average Measure Life (WAML)	Gross Lifecycle Ex-Post Energy Savings (kWh)	Net Lifecycle Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	-	10.0	-	-
Non-Res HVAC	6,760	4,262	10.0	67,688	42,677
Non-Res Lighting	2,206,822	1,947,949	10.0	22,097,057	19,504,947
Non-Res Motors	-	-	10.0	-	-
Non-Res Pool Pumps	-	-	10.0	-	-
Non-Res Refrigeration	-	-	10.0	-	-
Non-Res Shell	-	-	10.0	-	-
Non-Res Process	-	-	10.0	-	-
Non-Res Comprehensive	-	-	10.0	-	-
Non-Res Behavior	-	-	10.0	-	-
Other	-	-	10.0	-	-
TOTAL	**2,213,582**	**1,952,211**	**10.0**	**22,164,746**	**19,547,624**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 62. Merced PY2020 Gross and Net Lifecyle Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Net Annual Ex-Post Energy Savings (kWh)	Weighted Average Measure Life (WAML)	Gross Lifecycle Ex-Post Energy Savings (kWh)	Net Lifecycle Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	-	10.0	-	-
Non-Res HVAC	-	-	10.0	-	-
Non-Res Lighting	846,174	746,913	10.0	8,472,797	7,478,890
Non-Res Motors	-	-	10.0	-	-
Non-Res Pool Pumps	-	-	10.0	-	-
Non-Res Refrigeration	-	-	10.0	-	-
Non-Res Shell	-	-	10.0	-	-
Non-Res Process	-	-	10.0	-	-
Non-Res Comprehensive	-	-	10.0	-	-
Non-Res Behavior	-	-	10.0	-	-
Other	-	-	10.0	-	-
TOTAL	**846,174**	**746,913**	**10.0**	**8,472,797**	**7,478,890**

Source: MTM Project Tracking and Anchor Blue Analysis

Table 63. Merced PY2019 & PY2020 Gross and Net Lifecyle Energy Savings by End-use Category

End-Use Category	Gross Annual Ex-Ante Energy Savings (kWh)	Net Annual Ex-Post Energy Savings (kWh)	Weighted Average Measure Life (WAML)	Gross Lifecycle Ex-Post Energy Savings (kWh)	Net Lifecycle Ex-Post Energy Savings (kWh)
Non-Res Cooking	-	-	10.0	-	-
Non-Res HVAC	6,760	4,262	10.0	67,688	42,677
Non-Res Lighting	3,052,996	2,694,862	10.0	30,569,854	26,983,837
Non-Res Motors	-	-	10.0	-	-
Non-Res Pool Pumps	-	-	10.0	-	-
Non-Res Refrigeration	-	-	10.0	-	-
Non-Res Shell	-	-	10.0	-	-
Non-Res Process	-	-	10.0	-	-
Non-Res Comprehensive	-	-	10.0	-	-
Non-Res Behavior	-	-	10.0	-	-
Other	-	-	10.0	-	-
TOTAL	**3,059,756**	**2,699,124**	**10.0**	**30,637,543**	**27,026,515**

Source: MTM Project Tracking and Anchor Blue Analysis