



ENERGY EFFICIENCY

in California's Public Power Sector

12th Edition — 2018

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Project Managers: Jonathan Changus, Northern California Power Agency
Bryan Cope, Southern California Public Power Authority

Kelly Birdwell Bresovec
Alameda Municipal Power
Phil Hayes, Andrew Markis & Ruzan Soloyan
Anaheim Public Utilities
Paul Reid,
Azusa Light & Water
Jim Steffens & Veronica Craghead,
City of Banning
Marlee Mattos,
City of Biggs
Kapil Kulkarni,
Burbank Water & Power
Jessica Sutorus & Adrienne Rogers,
City of Colton
Craig Kuennen & Herbert Garcia,
Glendale Water & Power
Terry Crowley,
City of Healdsburg
Hugo Valdez & Sabrina Barber,
Imperial Irrigation District
Theresa Phillips,
Lassen Municipal Utility District
Adam Brucker,
City of Lodi
Jennifer Main,
City of Lompoc
Berenice Barajas & Daniel Blustein,
Los Angeles Department of Water & Power
Vanessa Lara,
Merced Irrigation District
Peter Govea & Bob Hondeville,
Modesto Irrigation District
Michael McLellan,
City of Moreno Valley
Rainie Torrance,
City of Needles
Bruce Lesch & Justin Zagunis,
City of Palo Alto Utilities

Amanda Stevens,
Pasadena Water & Power
Vanessa Xie,
City of Pittsburg
Corby Erwin,
Plumas-Sierra Rural Electric Cooperative
Basil Wong,
Port of Oakland
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Len Viejo,
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EXECUTIVE SUMMARY

California's publicly owned utilities (POUs) have collaborated since 2006 on developing energy efficiency programs and reporting annual results in a consistent and comprehensive manner. This twelfth report explores the latest results from POU's wide range of energy efficiency programs.

During the 2017 reporting cycle, POU's expended over **\$225 million** on energy efficiency programs, resulting in over **860 GWh** of net annual energy savings. Since the enactment of Senate Bill 1037 (Kehoe, 2005), public power has spent nearly **\$1.6 billion** on energy efficiency, achieving over **73,580 GWh** in net lifecycle energy savings.

Year	Net Peak Savings (kW)	Net Annual Savings (MWh)	Net Lifecycle Savings (MWh)	Total Utility Expenditures (\$)
FY05/06	52,552	169,303	2,249,214	\$ 54,412,728
FY06/07	56,772	254,332	3,062,361	\$ 63,151,647
FY07/08	82,730	401,919	4,473,801	\$ 103,907,266
FY08/09	117,435	644,260	6,749,912	\$ 146,093,107
FY09/10	93,712	522,929	5,586,299	\$ 123,433,250
FY10/11	81,121	459,459	4,604,364	\$ 132,372,795
FY11/12	82,561	439,710	4,638,521	\$ 126,936,631
FY12/13	89,305	521,478	5,722,100	\$ 134,475,230
FY13/14	110,455	568,980	6,414,228	\$ 169,901,735
FY14/15	124,807	644,703	7,836,316	\$ 163,008,335
FY15/16	107,925	771,592	10,253,633	\$ 154,796,668
FY16/17	113,549	861,942	11,991,602	\$ 226,386,251
TOTAL	1,112,923	6,260,606	73,582,351	\$ 1,598,875,644

New to the report this year, POU's are now separately reporting results for programs exclusively available to Multifamily and Low-Income customers, and Behavior, Retrocommissioning, and Operator (BROs) has been added as its own measure category. In addition, public power investments in support of developing and implementing Title 24 Building Energy Efficiency Standards updates are reported as a separate line item. These adjustments align the POU annual report with the Energy Commission's ongoing efforts to track progress towards achieving the statewide annual targets of doubling the energy efficiency savings by 2030.

The ingenuity and collaborative spirit of public power will be critical to the success of the state's 2030 energy efficiency goal. The successes of the past year provide an excellent foundation on which public power looks to build upon.

INTRODUCTION

This report reflects public power's response to a number of key pieces of legislation.

Assembly Bill 1890 (Brulte, 1996) plays a prominent role in California's energy efficiency legacy. The bill established the Public Goods Charge, which has served as the primary funding source of publicly owned utilities' (POUs) energy efficiency programs for over two decades.

Senate Bill 1037 (Kehoe, 2005) required each POU to report annually to its customers and the Energy Commission on its energy efficiency and demand reduction programs.

Assembly Bill 2021 (Levine, 2006) directed each POU to identify all potentially achievable cost-effective, reliable, and feasible electricity efficiency savings and establish 10-year energy efficiency targets.

Senate Bill 350 (De León, 2015) required the annual report to include a comparison of actual energy efficiency savings to the annual target adopted in the most recent 10-year potential study. The bill also directed POUs to develop energy efficiency targets consistent with the statewide energy efficiency targets adopted by the Energy Commission.

This report compiles the required data from individual POUs into a single, comprehensive document in compliance with § 9505 of the Public Utilities Code. Furthermore, this compilation fosters analysis of broader energy efficiency trends and offers policymakers data-driven considerations regarding the practical impacts of their policies.

The purpose of this report is not only to look back on the success of the past year, but also to look ahead and inform discussions on how to achieve additional energy savings in the future.

"Energy efficiency is an enduring challenge. Inefficient use of energy and hence waste of money and resources will merit our attention for the foreseeable future, and I believe the same can be said of the threat of climate change."

Arthur H. Rosenfeld

Customers are ultimately responsible for achieving savings from energy efficiency.

Tailored Incentives & Programs

As California looks to double the energy savings from energy efficiency by 2030, it is critical that policies and programs aim to remove barriers for, and encourage voluntary action by, customers to reduce their energy usage to realize all cost-effective and feasible energy savings.

Whether the state adopts codes and standards that are more stringent for existing building retrofits or a utility offers rebates for a whole home retrofit, the customer is ultimately responsible for the decision to comply, manage, or invest in an energy efficiency measure.

This guiding principle that the customer is key to savings is what drives POU program design and implementation. Locally elected boards, such as a city council, govern POUs and are accountable to the customers they serve. While harnessing proven global innovations and, in many cases, helping advance emerging technologies, POUs are primarily responsive to local concerns regarding energy efficiency programs.

California POUs serve a diverse range of customers and communities. Key characteristics include building climate zone, customer class, annual retail sales, and customer economic conditions. Based on these factors, POUs develop energy efficiency programs to optimize benefits in and for their local communities.

Building Climate Zones

Building climate zones are one of the primary factors driving energy efficiency program design. California is divided into 16 separate and distinct climate zones, defined by multiple factors, including summer temperature range, record temperature highs and lows, annual precipitation, and seasonal differences.

POUs are located in 13 of the State's 16 climate zones, ranging from Truckee Donner PUD over the Sierra Crest to Merced Irrigation District in the heart of the Central Valley to downtown Los Angeles, the nation's second largest city.

Customer heating and cooling needs vary significantly among climate zones. As a result, the energy savings from HVAC retrofits differ dramatically across utilities in different climate zones.

For example, an HVAC retrofit in the City of Needles in Climate Zone 15, characterized as extremely hot and dry, yields considerably greater energy savings than a similar HVAC retrofit in a coastal community like Lompoc (Climate Zone 5).

A cost-effective investment for a customer in one climate zone may not deliver the same energy benefits and cost savings for a similarly situated customer in another community.

Customer Class

As noted in Figure 2, electricity consumption by customer class varies across POU, which affects energy efficiency program results. Statewide, residential customers consumed approximately one-third (33.2%) of all electricity delivered by POU in 2016.¹

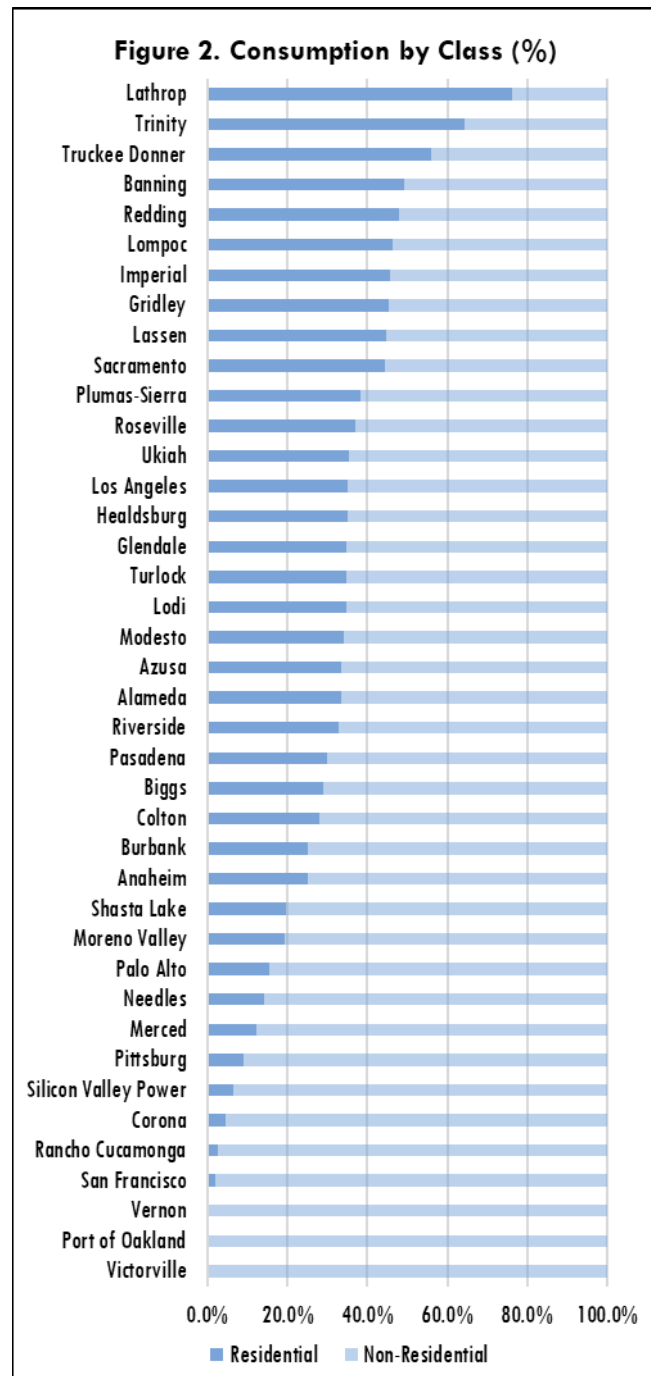
Traditional programs for residential customers are increasingly not cost-effective. State and federal standards have made modern appliances and HVAC units so efficient that the energy savings from ultra-efficient models compared to base models is much less significant than in prior years.

There remains a great deal of cost-effective energy efficiency potential in the residential sector. However, significant barriers, including marginal customer interest in deeper retrofits, complicated code requirements, and lack of a building owner value proposition make deeper energy retrofits in the residential sector challenging.

Non-residential customers consume more energy per account than residential customers do. In 2016, the average POU non-residential account consumed 113.6 megawatt-hours; in comparison, the average POU residential customer consumed 7.1 megawatt-hours. By virtue of their economies of scale, non-residential customers present the greatest opportunity to achieve cost-effective energy savings.

POUs balance their program offerings for non-residential customers and residential customers to ensure the portfolio is cost-effective, even if individual programs are not. The cost-effective portfolio perspective provides all customers access to incentives for reducing their energy consumption.

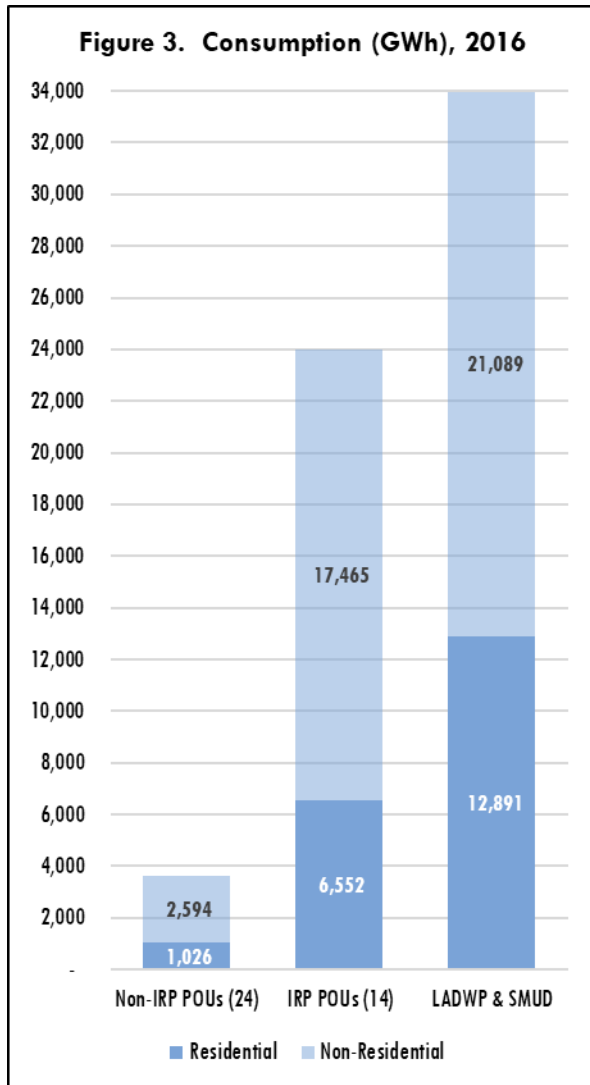
¹ California Energy Consumption Database, <http://www.ecdms.energy.ca.gov/>



Annual Retail Sales

California is home to POUs of all shapes and sizes. Figure 3 below depicts POU retail sales grouped by size:

- Los Angeles Department of Water & Power and Sacramento Municipal Utility District.
- IRP POUs: the 14 POUs (in addition to LADWP & SMUD) subject to the Integrated Resource Plan (IRP) provisions of SB 350.²
- Non-IRP POUs: 24 smallest POUs not subject to the IRP requirements.



At the larger end of the spectrum, Los Angeles Department of Water and Power (LADWP) and Sacramento Municipal Utility District (SMUD) together represent over half (**55.1%**) of all public power retail sales.

On the other end of the spectrum, the 24 smallest POUs constitute about 1/10 of the retail sales of LADWP and SMUD (**5.9%**). These 23 small POUs constitute just **1.9%** of the total electricity consumed statewide, including investor owned utilities.

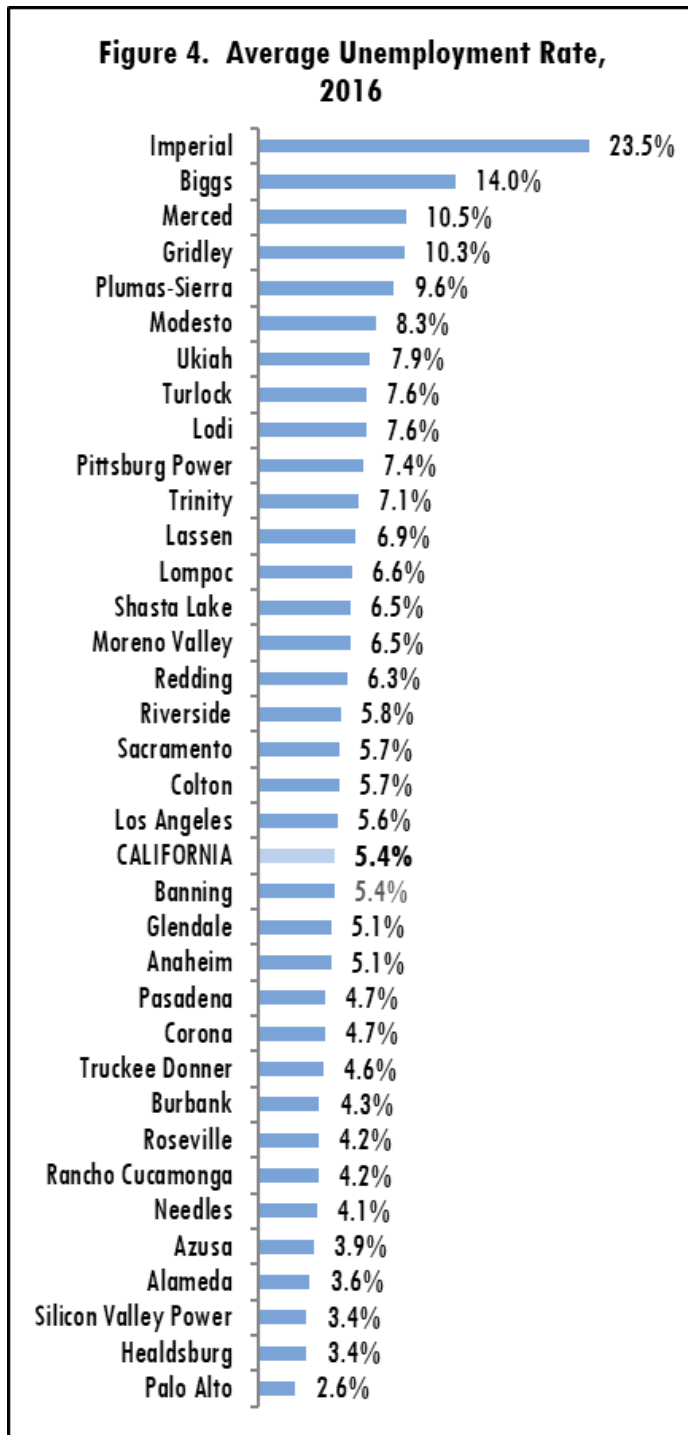
In general, larger utilities serve a more diverse customer base and offer a larger portfolio of programs. In contrast, smaller utilities focus on fewer programs that best fit their particular community's needs.

Program administration can be a challenge for utilities with limited resources. A small POU may have a single staff member manage their energy efficiency programs, among other customer programs and duties. To support POU programs, CMUA, NCPA, and SCPPA serve as forums for joint action, including management of energy efficiency reference and reporting tools.

The collaborative nature of public power allows for the development of joint resources and sharing of best practices.

² Cal. Pub. Util. Code § 9621

Customer Economic Factors



Customer economic factors also inform public power decisions regarding energy efficiency programs. Many POU serve low-income communities in which unemployment is relatively high and the median income is low. POU that serve rural communities in the inland and northern parts of the state tend to have higher unemployment rates compared to Bay Area and LA metropolitan areas.

Income is a critical factor influencing the programs a POU offers to its customers. As noted in the *Low-Income Barriers Study, Part A*, because low-income customers have limited disposable funds, they may be more risk-averse and less capable of participating in programs with high upfront payments or copayments for energy efficiency or renewable equipment. At the same time, poor credit or lack of collateral may restrict access to financing options.³

POUs share the State's interest in assisting low-income customers in overcoming the additional barriers they face when pursuing energy efficiency improvements. POU are expanding their strategies for low-income customers. Many POU have elected to exclude low-income programs from traditional cost-effectiveness metrics, which do not capture the full range of benefits from low-income energy efficiency projects.

³ Scavo, J., Korosec, S., Guerrero, E., Pennington, B., and Doughman, P., 2016, *Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-income customers and Small Business Contracting Opportunities in Disadvantaged Communities*, California Energy Commission, Publication Number: CEC-300-2016-009-CMF.

RESOURCES & TOOLS

This section provides a brief overview of the technical resources and analytical tools used or developed by public power to evaluate its energy efficiency program and develop energy efficiency targets.

Technical Reference Manual

The Database for Energy Efficient Resources (DEER) is not a viable resource for public power to continue to use. In 2013, POUs contracted for the development of a technical reference manual (TRM) modeled after the Northwest Regional Technical Forum resource. Public power retained Energy & Resource Solutions (ERS) to develop the TRM to be used by utilities across the state's different building climate zones. ERS completed the TRM in 2014 and performed updates in 2016 and 2017. The TRM has replaced DEER as the basis for which most POUs calculate the energy savings of their programs.

The TRM provides the methods, formulas, and default assumptions used for estimating energy savings and peak demand impacts from energy efficiency measures and projects in a very clear and open format. POUs use the energy savings estimates to report program accomplishments and measure progress towards program goals. Energy efficiency measures are documented and classified as either unit energy savings (UES) measures, semi-custom measures, or custom measures. The TRM includes both nonresidential and residential measures, and presents each measure type in separate sections, grouped by technology type.

The TRM includes the main manual as well as supporting spreadsheets. The TRM also includes spreadsheets that provide detailed and transparent measure calculations and, for semi-custom measures, energy savings calculators for estimating energy savings for project-specific measures. As needed, each section also contains supplementary tables and charts to provide additional measure details. Measures with multiple savings values (savings by size, building use, varying levels of efficiency, etc.) will have both savings and cost data listed in a supplementary table. The last section of the TRM provides the custom measure protocol, which outlines a process for estimating and documenting custom measure savings.

The TRM includes energy savings calculators, which are Excel spreadsheet-based engineering models for estimating semi-custom measures per the described methodology. They provide a consistent, transparent, and user-friendly approach for estimating project-specific energy savings. The TRM provides a much higher degree of transparency for public power, policymakers, and interested stakeholders regarding the energy savings estimates underpinning public power's energy efficiency programs.

For more information on the 2016 TRM, visit: <http://cmua.org/energy-efficiency-technical-resource-manual-2016/>

For more information on the 2017 TRM, visit <http://cmua.org/energy-efficiency-technical-resource-manual-2017/>

Public power is actively involved in the efforts of the California Technical Forum (CalTF) to create a statewide electronic TRM, or eTRM. NCPA, SCPA, SMUD, and LADWP sit on the CalTF Policy Advisory Committee, which consists of statewide energy efficiency stakeholders who advise on the organization's vision, mission, guiding principles, and affirm the annual Work Plan. In addition, POU staff also support CalTF by serving as members of the Technical Forum, which is the body of independent subject matter experts that peer review methodologies, data, assumptions, and energy savings values.

One of CalTF's primary objectives is to implement a best-in-class eTRM as a successor to DEER. The first iteration of the eTRM focuses on measures with deemed savings, or unit energy savings. POUs will rely on the TRM for semi-custom and custom measures, and will integrate the CalTF eTRM into program planning as it becomes available.

For more information on the CalTF, visit: <http://www.caltf.org/>

Energy Efficiency Reporting Tool

Energy and Environmental Economics (E3) designed the Energy Efficiency (EE) Reporting Tool for POUs to analyze and report on the energy savings results from energy efficiency programs. POUs may also use the tool to analyze the savings from potential new programs and determine whether they are likely to prove cost effective.

The EE Reporting Tool contains the TRM database of energy efficiency measures. POUs select the measures that reflect their programs and enter the relevant data. E3 designed the EE Reporting Tool to minimize the data input required by the utilities. Relying on default TRM values and assumptions, POUs may enter as little as the number of units installed, the incentive provided to the customer and overhead costs to report meaningful results. Alternatively, utilities may modify or enter their own assumptions and create customized measures that best reflect their programs or service territory. The EE Reporting Tool then provides summary tables by program category that report the units installed, achieved savings, program costs and cost effectiveness.

Avoided costs and EE measure load shapes in the EE Reporting Tool are represented using six time-of-use periods (rather than 8,760 hourly resolution). In addition, the TRM measures are a consolidated and representative subset of the much larger number of measures in the DEER database. Both of these simplifications make the model much more user-friendly for the diverse range of public power utilities.

Evaluation, Measurement & Verification

Section 9505(d) of the Public Utilities Code requires each POU to make available to its customers and to the Energy Commission the results of any independent evaluation that measures and verifies the energy efficiency savings and the reduction in energy demand achieved by its energy efficiency.

The Evaluation, Measurement & Verification (EM&V) process used to provide POU program managers with feedback relies on the approaches articulated in the National Action Plan for Energy Efficiency, adopted CPUC protocols, and the innovation and expertise of firms experienced in program evaluation. In addition, public power worked with the Energy Commission to develop a consistent set of EM&V guidelines for third-party consultants retained to evaluate utility programs.

EM&V reports help to define the effectiveness of individual programs with the intent of improving future offerings. Key findings from the EM&V reports confirm high realization rates for reported energy savings. This indicates that this annual report provides a reliable source of data to help policymakers gauge the progress of the state's overall energy efficiency efforts.

For more information on POU EM&V reports, visit: <http://www.ncpa.com/policy/reports/emv/>

PROGRAM RESULTS

This section provides an overview of the energy efficiency program results for public power in California. [Appendix A](#) contains additional information on each POU's portfolio, including program descriptions, expenditures, and energy savings.

Most POUs manage programs on a fiscal year basis and programs results reported are for FY 2016-17.⁴ The following POUs operate on a calendar year basis and report results for CY 2017:

- Imperial Irrigation District
- Merced Irrigation District
- Modesto Irrigation District
- Plumas-Sierra Rural Electric Coop.
- Sacramento Municipal Utility District
- Truckee Donner Public Utility District
- Turlock Irrigation District

Figure 6 provides a comprehensive summary of energy efficiency program savings for all POUs. LADWP alone represents over half (**55.6%**) of the total annual energy savings for public power. Together with SMUD, the two largest POUs represent **73.6%** of the total annual energy savings achieved by POUs last year. The 16 POUs subject to the integrated resource plan requirements of SB 350 provided **97.8%** of public power's annual energy savings, which is roughly these utilities' share of total POU customer electricity consumption (**94.1%**).

Figure 7 reviews results by program category. Excluding Codes and Standards,

lighting programs once again account for the largest share of the annual energy savings (**49.1%**), which represents a rebound for lighting programs after two consecutive years of marked decline. This could be a reflection of the market acclimating to the 2013 Title 24 Building Energy Efficiency Standards, which established stringent requirements for lighting retrofits.

Programs specifically for low-income and multifamily customers delivered **7,050 MWh** and **1,120 MWh** respectively in net annual energy savings. These results do not include low-income or multi-family customer participation in general residential programs and, as such, do not reflect the total energy savings accrued by these customers.

Figures 8, 9, and 10 summarize program results since the first annual report in 2006. During the 2017 reporting cycle, POUs spent **\$226.4 million** on programs, resulting in over **860 GWh** of net annual energy savings and **11,990 GWh** of net lifecycle energy savings. All of these totals are new records for public power by a large margin.

Public power investment in energy efficiency increased by over **\$70 million** and programs delivered an additional **90 GWh** of energy savings compared to last year. Since 2006, public power has collectively spent almost **\$1.6 billion** on energy efficiency resulting in over **6,260 GWh** in net annual energy savings and **73,580 GWh** in net lifecycle energy savings.

⁴ POU fiscal years run from July 1 to June 30.

Figure 6. Energy Efficiency Program Results by Utility

Summary by Utility		Resource Savings Summary					Cost Summary			Cost Test Ratios		
Utility	Gross Peak Savings (kW)	Gross Annual Energy Savings (kWh)	Gross Lifecycle Energy Savings (kWh)	Net Peak Savings (kW)	Net Annual Energy Savings (kWh)	Net Lifecycle Energy Savings (kWh)	Utility Incentives Cost	Utility Mktg, EM&V, and Admin Cost	Total Utility Cost	PAC	TRC	Utility (\$/kWh)
Alameda	346	2,521,520	26,806,604	307	2,294,754	23,635,162	\$ 382,174	\$ 722,110	\$ 1,104,284	1.20	0.79	\$ 0.07
Anaheim	11,587	33,287,970	314,046,234	11,587	33,287,970	314,046,234	\$ 4,107,052	\$ 1,200,485	\$ 5,307,538	8.00	8.00	\$ 0.02
Azusa	1,123	6,913,939	68,459,367	988	5,969,284	60,118,423	\$ 633,775	\$ 180,670	\$ 814,445	8.16	4.70	\$ 0.02
Banning	2,345	416,405	4,972,400	1,884	381,580	4,580,670	\$ 132,395	\$ 77,888	\$ 210,283	2.90	2.50	\$ 0.06
Biggs	2	135,802	2,037,949	1	122,090	1,832,367	\$ 29,339	\$ 5,006	\$ 34,345	4.90	4.46	\$ 0.03
Burbank	4,551	14,145,863	118,646,946	4,551	14,145,863	118,646,946	\$ 3,151,882	\$ 1,281,790	\$ 4,433,672	2.49	1.13	\$ 0.05
Colton	311	1,225,099	12,136,695	300	1,196,866	11,872,111	\$ 446,633	\$ 503,978	\$ 950,611	1.50	1.54	\$ 0.10
Corona	-	34,222	190,384	-	27,378	152,307	\$ 4,778	\$ 3,000	\$ 7,778	2.59	2.56	\$ 0.06
Glendale	2,043	18,938,735	76,329,511	2,002	18,842,350	74,767,037	\$ 1,876,465	\$ 146,095	\$ 2,022,560	5.18	2.27	\$ 0.04
Gridley	11	69,023	794,487	4	49,572	530,940	\$ 20,708	\$ 45,858	\$ 66,566	0.87	0.83	\$ 0.17
Healdsburg	22	540,933	5,931,237	18	456,430	4,990,361	\$ 347,740	\$ 45,151	\$ 392,891	1.63	1.36	\$ 0.10
Imperial	5,314	27,942,889	207,598,724	4,281	24,044,767	173,229,532	\$ 4,262,326	\$ 1,025,345	\$ 5,287,671	4.17	1.38	\$ 0.05
Lassen	92	686,231	8,009,384	71	542,649	6,335,696	\$ 166,222	\$ 34,604	\$ 200,826	3.57	2.49	\$ 0.04
Lathrop	-	-	-	-	-	-	\$ -	\$ -	\$ -	0.00	0.00	\$ -
Lodi	348	4,823,545	57,263,177	262	3,854,298	45,565,924	\$ 375,055	\$ 1,709,251	\$ 2,084,306	2.65	1.49	\$ 0.06
Lompoc	19	223,445	2,178,058	14	174,501	1,715,032	\$ 30,968	\$ 77,664	\$ 108,632	2.10	1.45	\$ 0.07
Los Angeles	43,087	478,886,663	7,977,934,355	43,087	478,886,663	7,977,934,355	\$ 99,593,802	\$ 27,070,456	\$ 126,664,258	4.99	4.04	\$ 0.04
Merced	0	1,452,132	7,344,768	0	1,167,128	5,870,571	\$ 107,369	\$ 390,000	\$ 497,369	1.68	0.73	\$ 0.10
Modesto	2,585	13,964,452	192,466,928	2,070	11,374,931	156,629,072	\$ 1,407,002	\$ 1,323,681	\$ 2,730,682	6.36	2.36	\$ 0.02
Moreno Valley	153	966,142	4,045,420	153	955,629	3,940,288	\$ 64,582	\$ 55,584	\$ 120,166	3.36	5.95	\$ 0.05
Needles	1	3,704	52,885	1	3,091	45,061	\$ 111,252	\$ 3,172	\$ 114,424	0.00	0.00	\$ -
Palo Alto	742	7,322,643	65,678,138	595	5,986,491	51,790,776	\$ 539,529	\$ 2,391,148	\$ 2,930,677	1.04	0.69	\$ 0.07
Pasadena	3,409	25,122,797	179,363,503	3,343	24,948,511	177,443,323	\$ 4,666,554	\$ 962,125	\$ 5,628,679	4.43	4.41	\$ 0.04
Pittsburg	19	59,455	594,547	15	47,564	475,638	\$ 55,124	\$ 7,687	\$ 62,811	0.94	0.41	\$ 0.17
Plumas-Sierra	24	176,449	2,743,478	17	110,830	1,750,054	\$ 22,594	\$ 88,068	\$ 110,662	1.63	0.90	\$ 0.09
Port of Oakland	42	283,269	2,266,152	33	226,615	1,812,922	\$ 14,163	\$ 16,651	\$ 30,814	6.96	1.61	\$ 0.02
Rancho Cucamonga	15	53,809	860,947	15	53,809	860,947	\$ 23,487	\$ 32,000	\$ 55,487	1.87	3.24	\$ 0.10
Redding	1,507	4,546,566	57,909,753	1,151	3,477,714	42,921,382	\$ 2,626,721	\$ 389,847	\$ 3,016,568	1.98	1.75	\$ 0.09
Riverside	4,844	22,448,150	307,851,018	4,056	20,955,995	273,260,645	\$ 5,433,764	\$ 558,232	\$ 5,991,996	6.95	6.03	\$ 0.03
Roseville	4,376	14,850,972	112,395,393	4,354	14,672,051	110,077,264	\$ 2,783,250	\$ 1,667,194	\$ 4,450,444	1.23	1.10	\$ 0.04
Sacramento	37,670	210,645,075	2,503,817,774	26,030	155,385,527	1,839,042,042	\$ 16,715,881	\$ 23,267,083	\$ 39,982,965	4.27	1.68	\$ 0.04
San Francisco	201	3,194,818	50,207,265	190	3,025,728	46,825,465	\$ 3,100,679	\$ 171,542	\$ 3,272,221	2.15	1.82	\$ 0.10
Shasta Lake	85	373,680	4,369,233	49	276,038	3,082,778	\$ 120,401	\$ 51,962	\$ 172,363	2.12	1.93	\$ 0.07
Silicon Valley Power	1,680	20,494,724	308,858,903	1,458	16,887,615	257,607,570	\$ 2,305,866	\$ 2,065,335	\$ 4,371,201	6.49	2.66	\$ 0.02
Trinity	5	1,392	20,880	4	1,114	16,704	\$ 99,430	\$ 5,000	\$ 104,430	0.03	0.08	\$ 9.03
Truckee Donner	240	1,770,068	24,122,117	179	1,242,635	17,532,740	\$ 451,107	\$ 294,232	\$ 745,339	2.37	2.37	\$ 0.06
Turlock	71	14,915,468	164,917,908	44	14,692,228	161,896,434	\$ 1,682,249	\$ 284,761	\$ 1,967,010	10.72	3.66	\$ 0.02
Ukiah	15	106,418	1,355,713	10	77,025	941,223	\$ 38,082	\$ 46,059	\$ 84,141	1.40	0.93	\$ 0.12
Vernon	529	6,509,432	22,116,489	424	2,096,451	17,826,112	\$ 193,493	\$ 61,641	\$ 255,134	9.14	7.03	\$ 0.02
Victorville	-	-	-	-	-	-	\$ -	\$ -	\$ -	0.00	0.00	\$ -
TOTAL	129,413	940,053,899	12,896,694,724	113,549	861,941,734	11,991,602,108	\$ 158,123,895	\$ 68,262,356	\$ 226,386,251	5.04	3.51	\$ 0.04

Figure 7. Energy Efficiency Program Results by Measure Category

Summary by Category	Resource Savings Summary							Cost Summary		
	Measure Category	Units Installed	Gross Peak Savings (kW)	Gross Annual Energy Savings (kWh)	Gross Lifecycle Energy Savings (kWh)	Net Peak Savings (kW)	Net Annual Energy Savings (kWh)	Net Lifecycle Energy Savings (kWh)	Utility Incentives Cost	Utility Mktg, EM&V, and Admin Cost
Res Clothes Washers	7,885	513	702,600	9,193,652	427	464,628	6,251,592	\$ 221,967	\$ 109,474	\$ 331,441
Res Behavior	11,093		26,970,493	56,970,493		24,720,493	50,220,493	\$ 379,500	\$ 1,766,987	\$ 2,146,487
Res Comprehensive	39,441	3,016	17,357,638	90,445,719	3,005	17,230,188	89,135,856	\$ 5,403,522	\$ 494,126	\$ 5,897,648
Res Cooling	63,354	12,525	33,221,226	286,117,078	10,711	28,660,494	239,230,651	\$ 9,822,969	\$ 7,280,614	\$ 17,103,583
Res Dishwashers	1,383	60	41,444	432,060	57	35,621	372,952	\$ 64,510	\$ 6,980	\$ 71,491
Res Electronics	345	1	49,927	239,286	1	49,440	236,853	\$ 8,975	\$ 13,080	\$ 22,055
Res Heating	3	11	17,896	447,398	8	14,317	357,919	\$ 8,400	\$ 11,330	\$ 19,730
Res Lighting	1,165,438	15,910	100,646,023	1,517,231,024	14,568	93,575,194	1,409,656,888	\$ 21,279,842	\$ 3,526,324	\$ 24,806,166
Res Pool Pump	15,218	3,424	14,093,846	155,362,190	3,333	12,784,842	137,368,080	\$ 6,633,775	\$ 2,035,858	\$ 8,669,632
Res Refrigeration	31,771	2,799	18,219,621	105,974,157	2,645	17,225,321	98,667,021	\$ 1,535,132	\$ 2,308,337	\$ 3,843,469
Res Shell	3,220,076	3,664	14,506,475	399,506,847	3,162	13,326,047	376,160,642	\$ 4,166,060	\$ 1,715,909	\$ 5,881,969
Res Water Heating	315	36	357,212	3,575,317	26	294,071	2,942,909	\$ 136,747	\$ 108,778	\$ 245,525
Non-Res Behavior								\$ -	\$ -	\$ -
Non-Res Comprehensive	5,878	12,510	95,483,758	1,336,868,501	12,119	90,652,015	1,269,956,582	\$ 17,723,017	\$ 9,583,359	\$ 27,306,376
Non-Res Cooking	16	25	121,795	1,449,020	24	119,781	1,424,847	\$ 12,050	\$ 52,181	\$ 64,231
Non-Res Cooling	6,131	8,100	22,528,405	354,170,293	7,943	21,934,270	346,815,140	\$ 6,932,767	\$ 1,666,550	\$ 8,599,317
Non-Res Heating	2	9	17,608	204,492	8	16,527	188,282	\$ 3,575	\$ 1,234	\$ 4,809
Non-Res Lighting	421,142	27,252	215,339,622	2,824,199,619	25,528	207,644,021	2,731,763,989	\$ 70,284,021	\$ 14,298,353	\$ 84,582,374
Non-Res Motors	12	260	1,731,240	25,134,449	259	1,706,020	24,815,068	\$ 405,257	\$ 167,575	\$ 572,832
Non-Res Process	474	1,434	9,734,248	160,265,484	1,231	8,106,510	132,816,221	\$ 542,456	\$ 773,384	\$ 1,315,839
Non-Res Pumps	10	76	50,657,204	731,048,425	73	50,583,606	729,846,895	\$ 24,348	\$ 861,973	\$ 886,322
Non-Res Refrigeration	9,059	10,357	6,343,393	74,673,242	10,151	4,445,753	52,793,026	\$ 958,383	\$ 553,015	\$ 1,511,398
Non-Res Shell	3,755	706	5,342,662	28,056,616	702	5,326,339	27,826,962	\$ 203,774	\$ 49,934	\$ 253,708
Non-Res Water Heating								\$ -	\$ -	\$ -
Multifamily	23,101	162	1,400,252	19,683,264	130	1,120,202	15,746,611	\$ -	\$ 833,430	\$ 833,430
BROs	124,290	46	6,317,028	6,659,675	37	6,090,022	6,379,459	\$ 361,532	\$ 126,009	\$ 487,542
Other	6,662	12	8,627,220	89,119,437	10	7,285,499	73,943,135	\$ 790,912	\$ 1,489,940	\$ 2,280,851
Sub-total	5,156,853	102,908	649,828,834	8,277,027,739	96,156	613,411,218	7,824,918,071	\$ 147,903,491	\$ 49,834,733	\$ 197,738,224
Low-Income	39,929	7,123	17,240,926	225,987,242	7,051	16,664,421	219,185,299	\$ 10,219,698	\$ 13,945,666	\$ 24,165,364
T&D	2	-	532,286	1,678,290	-	532,286	1,678,290	\$ 0	\$ 2,427	\$ 2,427
Codes and Standards	7	19,382	272,451,853	4,392,001,453	10,342	231,333,809	3,945,820,448	\$ 706	\$ 4,479,531	\$ 4,480,236
TOTAL	5,196,791	129,413	940,053,899	12,896,694,724	113,549	861,941,734	11,991,602,108	\$ 158,123,895	\$ 68,262,356	\$ 226,386,251

Figure 8. Energy Efficiency Program Results, 2006-2017

Year	Portfolio, Excluding Title 24 Support			Title 24 Support			Total Portfolio, Including Title 24 Support		
	Net Annual Savings (MWh)	Net Lifecycle Savings (MWh)	Total Utility Expenditures (\$)	Net Annual Savings (MWh)	Net Lifecycle Savings (MWh)	Total Utility Expenditures (\$)	Net Annual Savings (MWh)	Net Lifecycle Savings (MWh)	Total Utility Expenditures (\$)
FY05/06	169,303	2,249,214	\$ 54,412,728				169,303	2,249,214	\$ 54,412,728
FY06/07	254,332	3,062,361	\$ 63,151,647				254,332	3,062,361	\$ 63,151,647
FY07/08	401,919	4,473,801	\$ 103,907,266				401,919	4,473,801	\$ 103,907,266
FY08/09	644,260	6,749,912	\$ 146,093,107				644,260	6,749,912	\$ 146,093,107
FY09/10	522,929	5,586,299	\$ 123,433,250				522,929	5,586,299	\$ 123,433,250
FY10/11	459,459	4,604,364	\$ 132,372,795				459,459	4,604,364	\$ 132,372,795
FY11/12	439,710	4,638,521	\$ 126,936,631				439,710	4,638,521	\$ 126,936,631
FY12/13	456,407	4,420,676	\$ 130,475,230	65,071	1,301,424	\$ 4,000,000	521,478	5,722,100	\$ 134,475,230
FY13/14	497,798	4,990,596	\$ 165,704,723	71,182	1,423,632	\$ 4,197,012	568,980	6,414,228	\$ 169,901,735
FY14/15	508,715	5,400,690	\$ 156,434,622	135,988	2,435,626	\$ 6,573,713	644,703	7,836,316	\$ 163,008,335
FY15/16	516,453	5,691,247	\$ 147,913,974	255,139	4,562,386	\$ 6,882,694	771,592	10,253,633	\$ 154,796,668
FY16/17	630,608	8,045,782	\$ 221,906,015	231,334	3,945,820	\$ 4,480,236	861,942	11,991,602	\$ 226,386,251
TOTAL	5,501,893	59,913,463	\$ 1,572,741,988	758,714	13,668,888	\$ 26,133,655	6,260,606	73,582,351	\$ 1,598,875,644

Figure 8 above updates similar tables from previous reports to reflect public power’s increasing contribution to the development of the Title 24 Building Energy Efficiency Standards (Title 24). The need for public power support of Title 24 is increasing as the state moves to zero net energy homes by 2020, and non-residential buildings by 2030. However, POUs wish to avoid confusion as the Energy Commission also accounts for energy savings from Title 24.

Prior to last year, the annual reports did not differentiate between support for Title 24 and customer incentive programs and as such, Figure 8 provides corrected totals. This figure has also been updated from last year’s report to reflect all annual and lifecycle energy savings in net MWh consistent with Energy Commission practice in developing annual statewide targets to achieve a doubling of the energy savings from energy efficiency by 2030.

Figure 9. Energy Efficiency Expenditures (\$), 2006-2017

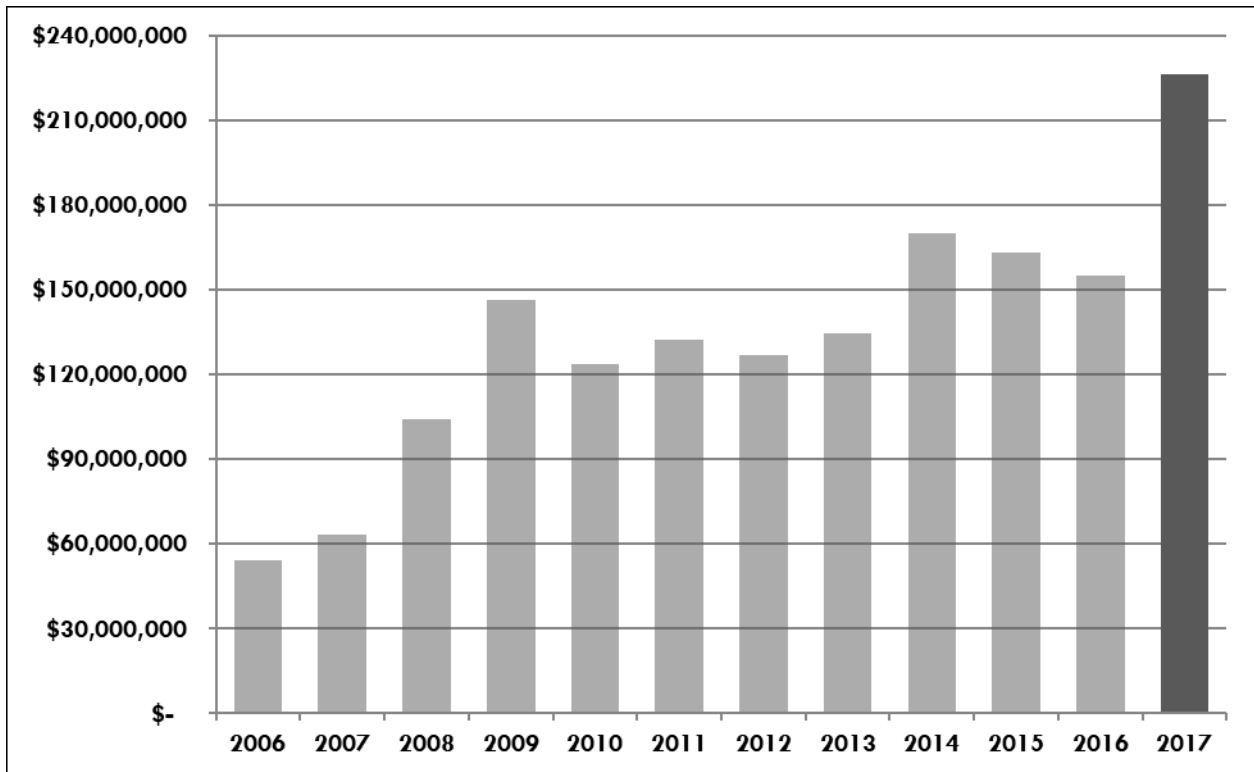
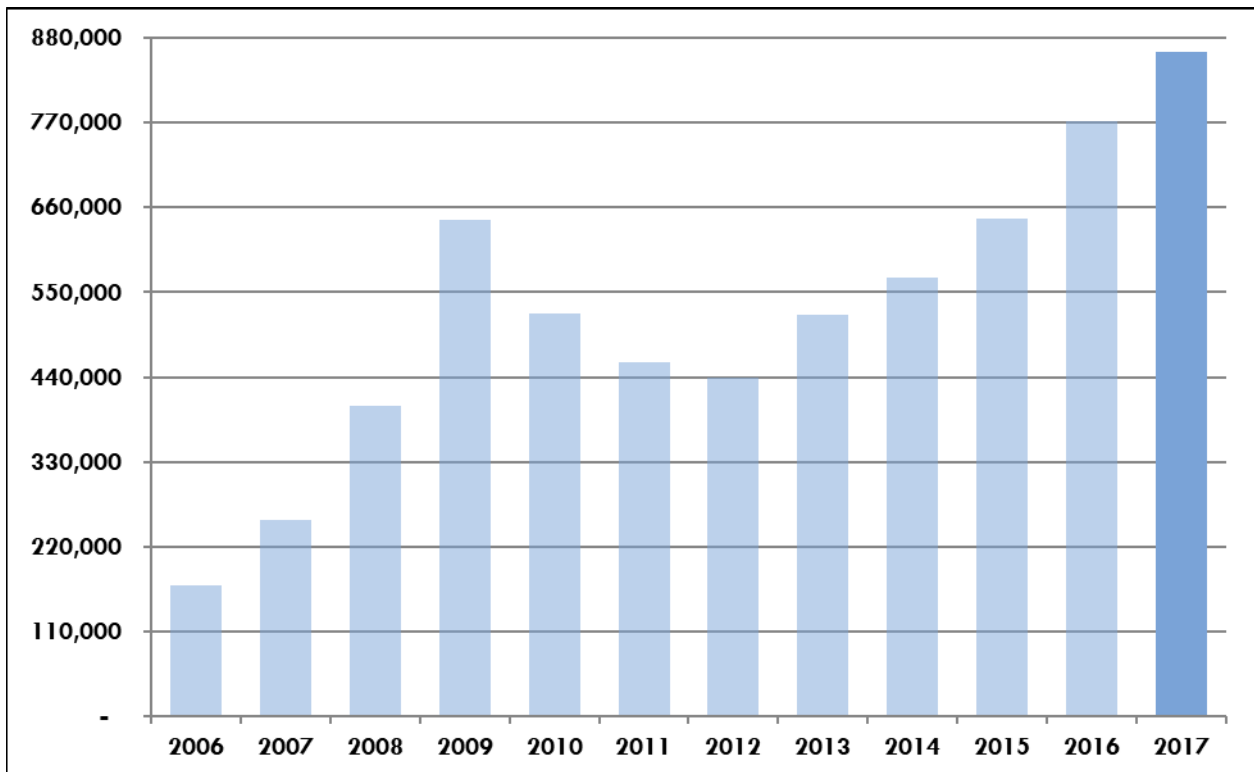


Figure 10. Annual Net Energy Savings (MWh), 2006-2017



POLICY CONSIDERATIONS

Governor Brown has challenged the state to be bold on climate change, and energy efficiency in particular. Public power proved up to the challenge as evidenced by the dramatic increase in both energy efficiency investments and energy savings; POUs blew past the \$200 million expenditures and 800 GWh annual savings milestones.

As energy efficiency policies, market, and technologies evolve, POUs will continue to develop innovative programs tailored to the changing needs of their respective communities. As the state looks to double the energy savings from energy efficiency by 2030, the ingenuity and collaborative spirit of public power will be even more critical. The unparalleled success of the past year provides an excellent foundation on which public power looks to build upon.



An emerging area of focus for POUs is building electrification programs. New technologies and shifting consumer demand are creating opportunities to replace current natural gas, propane, and wood-burning end-uses with clean, cost-effective electric alternatives. However, the path to unlocking the benefits of building electrification is fraught with opportunities to produce adverse unintended consequences. In the following section, POUs offer our thoughts on building electrification as a key strategy in furtherance of the state's energy efficiency and climate change policy goals.

Building electrification can deliver energy savings and GHG emission reductions.

California's climate strategy requires deep decarbonization across all sectors of the economy in order to achieve the GHG emission reduction goals. Commissioner Hochschild has summarized the need succinctly: "We want to see a migration of services that are now fueled by natural gas, diesel, and gasoline to being powered by this new, clean electric grid."⁵

Building electrification can deliver energy savings and GHG emissions reductions. The Energy Commission notes that advances in heat pump technology have made substituting natural gas with electricity for heating systems more viable and offer increased efficiency compared to traditional resistance heating devices such as electric clothes dryers.⁶ CARB states that building electrification has potential to reduce the significant GHG emissions from activities such as space and water heating in the residential, commercial, and industrial sectors.⁷

A growing number of stakeholders support building electrification as a clean energy and climate solution. The Natural Resources Defense Council partnered with E3 on modeling how the United States could reduce GHG emissions by 80 percent by 2050, relative to 1990 levels.⁸ The research notes the electrification of appliances as inherently more efficient than direct natural gas. Heat-pump water heaters are 2.5 to 3 times as efficient as electric resistance or natural gas water heaters.⁹ Electric heat pump space heating is also three to four times as efficient as natural gas heating.¹⁰

Southern California Edison (SCE) recently released a whitepaper outlining an "integrated blueprint for California to reduce greenhouse gas emissions and air pollutants." In the whitepaper, SCE states that space and water heating currently contributes more than two-thirds of total residential and commercial building GHG emissions. Electrifying nearly one-third of residential and commercial space and water heaters, in addition to increased energy efficiency and strong building codes and standards, could reduce GHG emissions from this sector from 49 to 37 MMT/year, or 7 percent of the 2030 goal.¹¹

⁵ Wang, S. and Brown, G., May 25, 2017, Q&A: The State of Clean Energy With David Hochschild of the California Energy Commission, *Greentech Media*, Available: <https://www.greentechmedia.com/>.

⁶ California Energy Commission, October 2017, *Senate Bill 350: Doubling Energy Efficiency Savings by 2030*, pg. 60

⁷ California Air Resources Board, November 2017, *California's 2017 Climate Change Scoping Plan*, pg. 66.

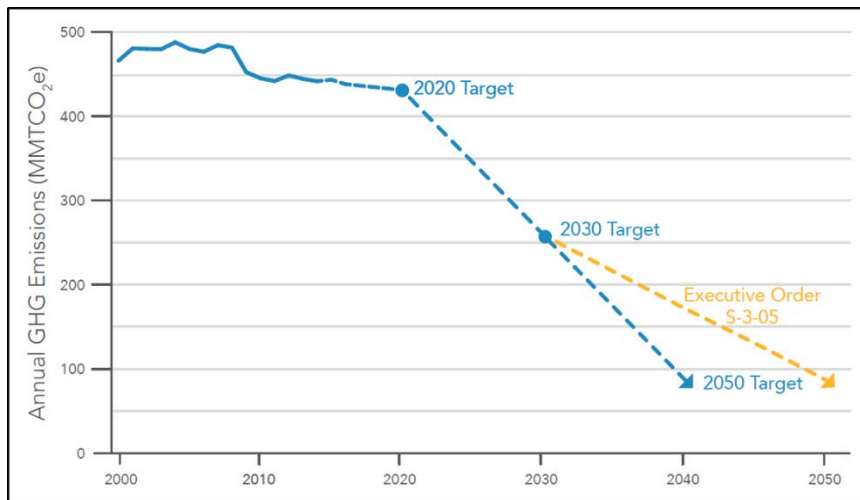
⁸ NRDC and E3, September 2017, *America's Clean Energy Frontier: The Pathway to a Safer Climate Future*, Available: <https://assets.nrdc.org/sites/default/files/americas-clean-energy-frontier-report.pdf>

⁹ Delforge, P., November 2016, *Simulation of Heat Pump Water Heater Real-World Performance*, NRDC, Available: <https://www.nrdc.org/resources/nrdc-ecotope-heat-pump-water-heater-performance-data>.

¹⁰ Nadel, S., May 2016, *Comparative Energy Use of Residential Furnaces and Heat Pumps*, ACEEE, Available: <http://aceee.org/comparative-energy-use-residential-furnaces-and>.

¹¹ Southern California Edison, November 2017, *The Clean Power and Electrification Pathway: Realizing California's Environmental Goals*, Available: <https://www.edison.com/>.

Figure 11. California's GHG Emission Reduction Goals



Source: California Air Resources Board

Reducing GHG emissions by 80% below 1990 levels by 2050 necessitates a dramatic reduction in the carbon intensity of building energy usage.

While the Energy Commission and CARB agree that building electrification can deliver energy and climate benefits, they have also identified issues to be addressed moving forward. The Energy Commission notes that unlike traditional energy efficiency programs, fuel substitution causes electric load to increase,¹² which is seemingly at odds with the SB 350 goal of doubling energy efficiency savings by 2030. CARB states that switching from natural gas end uses to electricity generated by burning natural gas would not be effective in reducing GHG emissions.¹³

There are also barriers to building electrification in the existing regulatory environment. The Time Dependent Valuation (TDV) methodology used in Title 24 Building Energy Efficiency Standards does not fully account for the cost of carbon thereby advantaging natural gas over electric end-uses. The California Public Utilities Commission three-prong fuel substitution test was established in the 1990s specifically to deter, not encourage, electrification in existing buildings.

In order to address implementation issues and remove regulatory barriers building electrification, public power supports the recommendation of the Energy Commission to develop a comprehensive framework to implement fuel substitution programs that maximize energy savings and GHG emission reductions, in collaboration with CARB, CPUC, utilities, and stakeholders.¹⁴ POUs urge the Energy Commission to convene public workshops on building electrification as part of the 2018 *Integrated Energy Policy Report Update* docket (i.e., 18-IEPR-07 or 18-IEPR-09).

Building electrification can complement related efforts to electrify the transportation sector as both are essential to the meeting the State's GHG emission reduction goals. Further clarification is needed regarding GHG accounting for POUs that incur increased retail sales—and increased electric sector GHG emissions—while decreasing overall GHG emissions in other sectors.

¹² CEC, pg. A-24

¹³ CARB, pg. 66.

¹⁴ CEC, pg. 62.

APPENDIX A

This appendix consists of detailed narratives of each POU's energy efficiency programs, as well as general descriptions of the utilities.

All POUs – Summary of Energy Efficiency Programs, FY 2016-2017

Summary by Utility	Resource Savings Summary						Cost Summary
	Gross Peak Savings (kW)	Gross Annual Energy Savings (kWh)	Gross Lifecycle Energy Savings (kWh)	Net Peak Savings (kW)	Net Annual Energy Savings (kWh)	Net Lifecycle Energy Savings (kWh)	
Alameda	346	2,521,520	26,806,604	307	2,294,754	23,635,162	\$ 1,104,284
Anaheim	11,587	33,287,970	314,046,234	11,587	33,287,970	314,046,234	\$ 5,307,538
Azusa	1,123	6,913,939	68,459,367	988	5,969,284	60,118,423	\$ 814,445
Banning	2,345	416,405	4,972,400	1,884	381,580	4,580,670	\$ 210,283
Biggs	2	135,802	2,037,949	1	122,090	1,832,367	\$ 34,345
Burbank	4,551	14,145,863	118,646,946	4,551	14,145,863	118,646,946	\$ 4,433,672
Colton	311	1,225,099	12,136,695	300	1,196,866	11,872,111	\$ 950,611
Corona	-	34,222	190,384	-	27,378	152,307	\$ 7,778
Glendale	2,043	18,938,735	76,329,511	2,002	18,842,350	74,767,037	\$ 2,022,560
Gridley	11	69,023	794,487	4	49,572	530,940	\$ 66,566
Healdsburg	22	540,933	5,931,237	18	456,430	4,990,361	\$ 392,891
Imperial	5,314	27,942,889	207,598,724	4,281	24,044,767	173,229,532	\$ 5,287,671
Lassen	92	686,231	8,009,384	71	542,649	6,335,696	\$ 200,826
Lathrop	-	-	-	-	-	-	\$ -
Lodi	348	4,823,545	57,263,177	262	3,854,298	45,565,924	\$ 2,084,306
Lompoc	19	223,445	2,178,058	14	174,501	1,715,032	\$ 108,632
Los Angeles	43,087	478,886,663	7,977,934,355	43,087	478,886,663	7,977,934,355	\$ 126,664,258
Merced	0	1,452,132	7,344,768	0	1,167,128	5,870,571	\$ 497,369
Modesto	2,585	13,964,452	192,466,928	2,070	11,374,931	156,629,072	\$ 2,730,682
Moreno Valley	153	966,142	4,045,420	153	955,629	3,940,288	\$ 120,166
Needles	1	3,704	52,885	1	3,091	45,061	\$ 114,424
Palo Alto	742	7,322,643	65,678,138	595	5,986,491	51,790,776	\$ 2,930,677
Pasadena	3,409	25,122,797	179,363,503	3,343	24,948,511	177,443,323	\$ 5,628,679
Pittsburg	19	59,455	594,547	15	47,564	475,638	\$ 62,811
Plumas-Sierra	24	176,449	2,743,478	17	110,830	1,750,054	\$ 110,662
Port of Oakland	42	283,269	2,266,152	33	226,615	1,812,922	\$ 30,814
Rancho Cucamonga	15	53,809	860,947	15	53,809	860,947	\$ 55,487
Redding	1,507	4,546,566	57,909,753	1,151	3,477,714	42,921,382	\$ 3,016,568
Riverside	4,844	22,448,150	307,851,018	4,056	20,955,995	273,260,645	\$ 5,991,996
Roseville	4,376	14,850,972	112,395,393	4,354	14,672,051	110,077,264	\$ 4,450,444
Sacramento	37,670	210,645,075	2,503,817,774	26,030	155,385,527	1,839,042,042	\$ 39,982,965
San Francisco	201	3,194,818	50,207,265	190	3,025,728	46,825,465	\$ 3,272,221
Shasta Lake	85	373,680	4,369,233	49	276,038	3,082,778	\$ 172,363
Silicon Valley Power	1,680	20,494,724	308,858,903	1,458	16,887,615	257,607,570	\$ 4,371,201
Trinity	5	1,392	20,880	4	1,114	16,704	\$ 104,430
Truckee Donner	240	1,770,068	24,122,117	179	1,242,635	17,532,740	\$ 745,339
Turlock	71	14,915,468	164,917,908	44	14,692,228	161,896,434	\$ 1,967,010
Ukiah	15	106,418	1,355,713	10	77,025	941,223	\$ 84,141
Vernon	529	6,509,432	22,116,489	424	2,096,451	17,826,112	\$ 255,134
Victorville	-	-	-	-	-	-	\$ -
TOTAL	129,413	940,053,899	12,896,694,724	113,549	861,941,734	11,991,602,108	\$ 226,386,251

ALAMEDA MUNICIPAL POWER

Alameda Municipal Power At a Glance

- Climate Zone 3A
- Number of retail customer connections: 35,000 connections. 88 percent residential, 12 percent non-residential.
- Annual total retail sales by customer class: \$55,696,886 (\$21,510,126 - residential, \$34,186,759 – non-residential)
- Annual total budget for energy efficiency programs: \$1,438,348
- Annual total amount actually expended for energy efficiency programs: \$1,104,284

Alameda Municipal Power Overview

- Due to Alameda's temperate climate and small amount of industry, the peak demand for electricity is in the winter (December and January) in the early evening. Alameda Municipal Power's (AMP) electric load is relatively flat compared to most California utilities and there is no residential air conditioning.
- In calendar year 2017, AMP installed advanced metering infrastructure (AMI), or smart meters, throughout Alameda. All customers will have access to their interval data by summer 2018 via a new online portal.
- AMP has committed to spending much of our cap-and-trade and renewable energy credit (REC) funds to reduce greenhouse gas emissions in its service area.
- Total energy sales have been relatively flat since 2014, around 345,000 MWh per year. The average residential energy use has been hovering around 340 kWh per month since 2015. AMP does not expect to see an increase over time as energy generation from solar and energy efficiency programs and standards offset potential increases due to electric vehicles. This trend is similar to other utilities both in California and nationally.

Major Program Changes

Fiscal year (FY) 2016 was AMP's top year for energy efficiency savings due to convergence of the commercial lighting direct install program, LED streetlight retrofit, and residential behavior change program. FY 2017 savings included a very successful non-residential direct install program, but just one final portion of streetlights and the final half-year of the residential behavior change program. Overall, FY 2017 was a year of continuing programs, rather than creation of new offerings.

Program Highlight

AMP's non-residential direct-install program, Energy Plus, provided more than 60 percent of total savings. The program, which provided both lighting and refrigeration upgrades, is particularly attractive to small businesses that are eager to benefit from the energy savings, but do not have in-house expertise in energy-saving technologies and installations. The Energy Plus rebates can

cover up to 90 percent of the upgrade cost for small businesses and 80 percent for all other non-residential customers.

Program Descriptions

- Energy Plus Program – Non-Residential Lighting, Non-Residential Refrigeration: The Energy Plus Program, which started in January 2016, is a non-residential direct-install lighting, refrigeration, heating, ventilation, and air conditioning (HVAC) program. More than 100 customers, over half of them small commercial, participated in lighting and refrigeration upgrades with low co-pay amounts due to AMP's rebates. This program will remain open until December 2019.
- My Energy – Residential Behavior: The My Energy program, powered by Opower, concluded in December 2016. The program provided residential customers with regular mail and email distributions of energy efficiency tips and behavior changes. AMP's energy savings were based on differences in energy use between test and control groups.
- Non-residential Lighting (Custom) Program – Non-Residential Lighting – This program, like Energy Plus, offered non-residential customers rebates for lighting upgrades. While there were few participants in this program, AMP maintains this program as a means of offering customers a do-it-yourself option for energy efficiency upgrades. This is a common pathway for chain retailers who are trying to manage incentivized upgrades across various locations.
- Residential Online Rebates – Residential Clothes Washers, Lighting, Refrigeration, Other (Electric Clothes Dryers): Alamedans have been able to participate in residential energy efficiency rebates using a simple web application since March 2016. In FY 2017 the tool received nearly 400 applications. Rebates were available for LED bulbs, LED fixtures, LED decorative string lights, electric clothes dryers, washing machines, heat pump water heaters, refrigerators, freezers, and refrigerator/freezer recycling. This program will remain open in FY 2018.
- Instant Rebate Program (Upstream Lighting) – Residential Lighting: The Instant Rebate Program was an upstream LED offering that provided residents the opportunity to purchase pre-rebated LEDs from select Alameda retailers. Most of the savings from this program were captured in the FY 2016 savings, but some savings ran into the first month of FY 2017. In the final month of the program, customers purchased 377 LEDs.
- LED streetlight retrofit: Non-Residential Lighting: The bulk of the streetlight retrofit was in FY 2016. In FY 2017, AMP completed one additional street that had not been completed in FY 2016.

EM&V

AMP completes an EM&V study every other year with a focus on the two previous years. The most recent EM&V report, by Energy & Resource Solutions is available [here](#). The next report will cover the non-residential direct install programs for FY 2016 and FY 2017.

Sources of Energy Savings

With a goal of getting the most accurate energy savings, AMP staff used a variety of sources. For the residential lighting energy savings, AMP used historical AMP customer program data, buoyed by a high realization rate in the FY 2015 EM&V report. The energy savings figures for the residential refrigerator/freezer, LED string lights, and washing machines were from the “Technical Resource Manual” (TRM 2016) for the CA Municipal Utility Association. The electric clothes dryer savings was from an Energy Star report. Energy savings from My Energy, AMP’s residential behavior program, were from actual AMP billing records and compared the test group, those that received the printed Home Energy Report (HER), to the control group that did not receive HERs. Opower, the vendor responsible for My Energy, handled these calculations.

Energy savings for non-residential programs were calculated using a hybrid of actual pre- and post-installation inspections and the TRM 2016. Streetlights and customized lighting projects were fully calculated. Savings from the direct install program, Energy Plus, used a combination of the TRM 2016 and full pre and post calculations.

Complimentary Programs

- **Low-Income Programs:** AMP continues to provide financial assistance to Alameda's low-income families through the EASE (Energy Assistance through Supportive Efforts) and EAP (Energy Assistance Program) programs. For FY 2017, EASE, an emergency relief program, helped 58 households receive a total of \$7,474 in electric bill assistance. A maximum amount of \$200 is available per household within a three-year period through the EASE program. The EAP provides a 25 percent monthly discount on the electric bill. A total of \$82,107 was allocated to 587 Alameda households. These programs are funded through the public purpose component of AMP's energy charge.
- **Renewable Energy Programs:** Alameda Green, AMP's voluntary green power program, provides customers with the option to choose 100% renewable energy at an additional cost of \$0.015/kWh. As of the end of FY 2017, there were 2,100 residential and 70 commercial customers enrolled in Alameda Green. AMP staff encouraged enrollment through Alameda Green mentions in AMP's customer newsletter, four bill inserts, social media, an outreach program, and a contest among customer service representatives. In June 2017, AMP earned a national ranking for green utility programs from the U.S. Department of Energy's National Renewable Energy Laboratory (NREL). AMP's "Alameda Green" program made NREL's "Top 10" lists for its high participation rate and green power sales rate in 2016.
- **Research, Development, and Demonstration:** There was no AMP activity in research, development, and demonstration in FY 2017.

- Electric Vehicles: In FY 2017 there were a total of 445 AMP customers registered to receive the electric vehicle (EV) discount. The percent of Alamedans with an EV is roughly double that of the state average. AMP has seen a steady increase in EV discount participants since there were 58 in FY 2014. AMP has five plug-in vehicles in its own fleet.
- Energy Storage: AMP does not have any onsite storage and an evaluation of energy storage was done in 2014 as required by California AB 2514. The evaluation concluded that energy storage was not cost effective at this time. However, AMP continues to evaluate the potential for this technology.

ANAHEIM PUBLIC UTILITIES

Anaheim Public Utilities At a Glance

- Established 1894
- Climate Zone 8
- 181,886 meters. 118,264 electric and 63,622 water
- Annual total retail sales by customer class – 25.3% residential, 32.9% commercial, 41.8% industrial
- Annual total budget for energy efficiency programs – \$5,772,289
- Annual total amount actually expended for energy efficiency programs – \$5,307,538

Anaheim Public Utilities Overview

The City of Anaheim is Orange County's second largest city and the 10th largest in the state. Additionally, the City houses the only not-for-profit, municipally-owned utility in the county. Anaheim Public Utilities (APU) consistently provides electricity and water to a community of 358,000 residents, over 20,000 businesses, and more than 25 million annual visitors over an area that covers more than 50 square miles. For over 120 years, APU has provided its customers with reliable electric services at affordable rates. Over the years, APU has reached out to its customers to develop programs and services that best meet the community's needs.

APU continues to work closely with the City's Community and Economic Development and Planning Departments to make every effort to implement the goals and policies of Anaheim's Housing Element. Construction of the Rockwood Special Needs Apartment Complex was completed in 2016, which provided 70 rental units for the homeless including those suffering with mental illnesses. Consequently, this project placed 150 children and their families into permanent homes. APU supported this effort by providing funding per apartment unit to promote the installation of energy efficiency measures in order to assist these residents on their utility bills. These efforts and successes demonstrate the City's continued commitment towards ensuring that the housing needs of its residents are recognized and effectively addressed.

APU has engaged local school districts to install utility owned community solar projects on school properties to provide the residents of Anaheim with clean energy. Currently, nine schools have committed to participation in the Solar for Schools Program and construction is scheduled for summer 2018. The benefits include financial incentives for participating school districts as well as hands on educational opportunities for the students. APU is also evaluating an income qualified discount program associated with the power generated through the Solar for Schools Program.

Major Program Changes

APU continues to enhance and expand its already extensive array of energy efficiency program offerings for its customers. APU has modified its energy efficiency program portfolio in FY16-17 to take advantage of the successful partnering with the Southern California Gas Company by doubling the funds, offering additional measures and increasing the customer eligibility for the

income qualified direct installation program. Income qualified customers receive the value of a one stop approach that provides electric, gas and water savings through a host of resource efficiency measures, equipment and appliances.

Additionally, APU is committed to new energy efficiency technology such as light emitting diodes (LED's). As a result, APU has now transitioned its security Dusk to Dawn lighting program exclusively to LED technology. Residential, commercial and multifamily customers can replace older inefficient security lighting technology with LED fixtures provided by APU. In FY 16-17, APU completed a citywide distribution of LED bulbs to 90,000 residents through a direct mail program as well as increased the number of LED retrofits in the Street Light Replacement Project.

Program Highlight

APU's Lighting Incentive Program achieved over 7.5 million kWh savings in FY 16-17 due to increased participation by Anaheim's commercial and industrial customers. Participation in the program continues to grow as the rapid development of LED technology has led to improved products, lower prices and better utility incentives. Businesses are realizing the benefits of LED lighting technology with increased energy savings and reduced maintenance costs.

APU's Customized Energy Incentives Program provides customers the flexibility to target their greatest energy using equipment on site with incentives designed to specifically meet their needs. By documenting energy use before and after equipment upgrades at their facilities, APU customers can replace the greatest energy end users at their businesses through performance based incentives. This can be a great alternative to selecting a one size fits all prescriptive menu of measures with pre-established incentives. Customers who need assistance in identifying their business's largest users can also reach out to APU for a comprehensive audit or design review. Commercial customers who participated in the Customized Energy Efficiency Incentives Program saved nearly 2 million kWh in energy savings through process efficiency improvements this fiscal year.

APU offers incentives for high efficiency LED Sports Lighting retrofits for athletic stadiums and fields by promoting reliable lighting through the latest technology. The Anaheim Angels recently replaced inefficient metal halides to LED fixtures with instant strike capabilities, which reduced their energy consumption and provided better lighting controls. In addition, Anaheim schools have expressed interest in the program to replace inefficient lighting at their sports fields.

In the partnership with the Southern California Gas Company, both utilities benefitted from the jointly delivered programs and services to their mutual customers. The working relationship between the two utilities streamlined implementation, facilitated the use of common contractors to implement electricity, water and natural gas efficiency measures, and allowed the utilities to cross-promote each other's conservation programs.

APU is proud to support the education efforts of Anaheim youth at all grade levels by providing classroom and outdoor education on the importance of conserving natural resources, protecting

the environment, and learning to use water and energy efficiently in their daily lives. The School Education Program connected with close to 10,000 elementary school students on the value of sustainable resources. Additionally, APU hosts an annual water conservation poster contest to help celebrate the month of May as California's Water Awareness Month.

Program Descriptions

Current Commercial Customer Programs Descriptions

Total annual program cost: \$2,905,702

Resulting in 3,671 kilowatt demand reduction and 14,170,745 kilowatt-hour savings

- Air Compressor Program – Non Res Comprehensive: Provides free comprehensive audits on this technology and its operation on a systemic basis and awards incentives for installing qualifying system components that improve energy system efficiency.
- Comprehensive Energy Audits – Non Res Comprehensive: Customized on-site audits and recommendations designed to improve energy operating efficiency and help customers reduce costs.
- Customized Energy Incentives Program – Non Res Comprehensive: Customized financial incentives for installation of high-efficiency air conditioning, motor controls and other production related equipment.
- Heat Pump Incentives Program – Non Res Heating: Encourage installation of high-efficiency heat pumps.
- Lighting Incentives – Non Res Lighting: Provides incentives to improve energy efficiency for a variety of lighting applications.
- New Construction – Non Res Comprehensive: Customers receive design assistance and incentives for new construction and facility expansions that install energy-efficient equipment that exceed Title 24.
- Operations Program – Non Res Comprehensive: Produces energy savings by taking large transformers offline that are not serving customers' loads.
- Small Business Energy Management Assistance Program – Non Res Lighting, Non Res Cooling, Non Res Refrigeration, Non Res Comprehensive: Provides customers of less than 50 kilowatt demand with energy use evaluations, retrofit funding and installation assistance; focusing on lighting upgrades, programmable thermostats, air conditioning and refrigeration tune-ups.
- Small/Medium Business Audits – Non Res Comprehensive: Customized on-site audits and recommendations designed to improve operating energy efficiency and help customers reduce costs.
- Upstream HVAC – Non Res Cooling: Provides rebates to the sales channel that most influences the stocking and selling of qualifying high efficiency equipment; the goal is to facilitate the purchase of the high efficiency equipment by the end-use customer.

Current Residential Customer Program Descriptions

Total annual Program Costs: \$2,337,399

Resulting in 6,453 kilowatt demand reduction and 8,474,438 kilowatt-hour savings.

- Air Duct Repair – Res Cooling: Provides incentives to residential customers who have a licensed HVAC contractor perform an Air Duct Repair.

- Dusk-to-Dawn Lighting – Res Lighting: Residents can receive outdoor LED security lights for new or existing installation at no cost.
- School Education Programs (Res Comprehensive): Public and Private school students in Anaheim are engaged both in the classroom and through hands-on outdoor labs to explore environmental issues in our region. Additionally, students can learn about energy and water consumption by completing in-home conservation audits. APU also donates LED bulbs to Anaheim schools for students to sell and raise funds for educational field trips or classroom materials.
- Holiday Lights Exchange – Res Lighting: Provides holiday lights to residents who turn in old incandescent holiday lights.
- Home Incentives – Res Cooling, Res Shell, Res Pool Pump, Res Refrigeration, Res Dishwashers: Rebates for purchase and installation of high efficiency ENERGY STAR® rated appliances and high efficiency conservation measures.
- Home Utility Check-Up Audits – Res Comprehensive: A customized in-home audit of water and energy use and existing appliances.
- Home Utility Check-Up Equipment and LED Direct Install – Res Lighting: Customers receive free installation of up to five LED's during the Home Utility Check-Up audit.
- LED Distribution – Res Lighting: Distribution of two 8.5 watt 800 lumen bulbs to residents via direct mail.
- On-Line Home Utility Check-Up – Res Comprehensive: Customers can click on Public Utilities to complete a detailed survey online. Customers receive money saving advice and learn about incentives designed to help them be more water and energy efficient.
- Refrigerator Recycling Program – Res Refrigeration: Provides a rebate to customers who recycle an old operational refrigerator or freezer.
- TreePower – Res Cooling: - Provides complimentary shade trees and incentives for residential customers. Shade trees when properly placed can help reduce air conditioning costs.
- Weatherization Program – Res Cooling, Res Lighting, Res Pool Pump, Res Shell, Res Comprehensive: Income qualified direct installation program that provides plug load occupancy sensors, up to 10 LED bulbs, CFL torchieres, duct sealing, refrigerant charge testing and Energy Star room air conditioners.

EM&V

APU has completed their EM&V analysis for both its Small Business Energy Management Assistance Program and its Small/Medium Business Refrigeration Program. Additionally, the Department completed an EM&V analysis of its Upstream HVAC program.

Sources of Energy Savings

The source of energy savings used to calculate program performance was the TRM where applicable. In addition utility work papers were used.

Complimentary Programs

- Income-Qualified Senior, Military, Veteran or Disabled Customer Energy Credit: Provides a 10 percent reduction on the electric portion of bills to seniors, military veterans or long-term disabled customers at or below 80 percent of the Orange County median income.

- Dusk to Dawn Income-Qualified Assistance: In addition to receiving a free LED outdoor light, income-qualified residents may also have the light installed by one of Anaheim's approved and licensed electrical contractors free of charge.
- Emergency Assistance Program: Provides a one-time electric utility payment for customers in economic hardship.
- Green Power Program: Customers pay an extra charge to support renewables. The funds go towards purchasing solar, wind, geothermal, hydroelectric and other forms of renewable generation.
- Research Development and Demonstration: Customers are reimbursed for out-of-pocket expenses up to \$500 per Plug-in Electric Vehicles (EV) Charger. Eligible expenses include the charger purchase price and installation costs. In addition to the \$500 rebate, permit application fees for the installation of the EV charger are waived. In addition, commercial, industrial, and municipal customers who install a plug-in EV chargers at locations accessible to patrons, multi-family dwelling residents, commuters and visitors are reimbursed for out-of-pocket expenses up to \$5,000 per charging station for public access locations, or \$10,000 for school or affordable housing locations. Eligible expenses include the charger purchase price and installation costs. In addition to the rebate, the City's permit application fee for the EV charger is waived.

Other Programs

Total annual program cost: \$64,436

Resulting in 1,463 kilowatt demand reduction and 10,642,787 kilowatt-hour savings

- Affordable Housing New Construction Program – Res Clothes Washers, Res Lighting, Res Cooling, Res Refrigeration, Res Dishwashers, Non Res Lighting: Incentives for developers who install high efficiency energy and water measures in their developments for affordable housing projects located throughout the community.
- Commercial & Residential Water Savings Resulting from Equipment Rebates: Businesses and residents are eligible for rebates by installing or retrofitting with qualifying water-saving devices through the "SoCal Water\$mart" Program in partnership with Metropolitan Water District. Water savings result from the application of measures such as;
 - Landscape Performance
 - Rotating Nozzle Rebates
 - SmarTimer Rebates
 - Home Utility Checkup direct installs of water saving devices
- Codes and Standards: Savings are drawn from the statewide allocation of energy savings credits for FY 2016/2017 due to Codes and Standards and based on Anaheim's percent share of statewide load.
- Transmission & Distribution (T&D): Increased efficiencies by upgrading electric infrastructure.

AZUSA LIGHT & WATER

Azusa Light & Water at a Glance

- Climate Zone 9
- The utility serves approximately 16,555 retail customer connections
- Total retail sales by customer class - 31% residential (\$11,496,330) and 69% commercial/industrial(\$25,346,971)
- Annual total budget for energy efficiency programs (including EM&V, admin/overhead and incentives, however excluding RD&D, Renewable and Low Income) \$903,635
- Annual total amount actually expended for energy efficiency programs \$814,445

Azusa Light & Water Overview

Since inception of the energy efficiency programs, Azusa Light & Water has expended over \$12 Million toward providing energy conservation information to the Azusa community and rewarding businesses and residents for upgrading inefficient energy consuming equipment with more energy efficient equipment. These efforts have resulted in an annual peak demand and energy use reductions of approximately one percent.

Major Program Changes

During the past year the residential rebate programs have been combined, refined and simplified to make the program more cost effective and easier to administer.

Program Highlight

The direct install Small Business Audit/Retrofit Program continues to provide the maximum impact on meeting the needs of the harder to reach businesses and small retailers within the service territory. These hard to reach customers have a very tight cash flow and in many times are unable to participate in the rebate programs unless there is little to no up-front monetary outlay. This program allows customers to immediately see the savings and avoid the initial cash outlay associated with the typical rebate type programs.

The joint Library Awareness and LED Lamp Distribution Program was ramped up this fiscal year and replaced the outdated CFL Distribution Program, thus achieving outstanding energy efficiency gains in a very cost effective manner.

Commercial and Industrial Customer Program Descriptions

- Business Partnership Program: Retrofit existing buildings and factories with high efficiency lighting, air conditioning and process equipment.
- Free Energy Audits: Provide suggestions on the most energy efficient equipment and more cost effective methods of operations.
- New Business Retrofit Program: Encourage the use of the most energy efficient equipment in the design and construction of new buildings and factories.

- Small Business Audit/Retrofit Program: Provide free utility audit, free CFL retrofit, free packaged A/C tune-ups, the first \$1,500 free lighting retrofit and recommendations for further energy saving measures with a corresponding 50% rebate up to a maximum rebate of \$10,000 per customer account.
- “Keep Your Cool Audit/Retrofit Program”: Provide free utility audit, free LED case lighting retrofits, free refrigeration tune-ups, free case seal replacements, auto door closers and fan controllers.

Residential Programs Descriptions

- Home Weatherization Rebate Program: Rebates are offered for a variety of home weatherization measures.
- EnergyStar® Appliance Program: Rebates are offered for most high efficiency appliances that have the EnergyStar® rating, including but not limited to, refrigerators, air conditions, LED Televisions and computer monitors, dishwashers, clothes washers, pool pumps, ceiling fans and various lighting measures.
- Free Home-in-Home Energy Audits: Provide recommendations for the effective use of energy within the residence.
- Free On-Line Home Energy Audit Program: Customers can enter various parameters that match their home and lifestyle, and receive an immediate list of conservation recommendations and measures along with an estimate of what each appliance within the home is using in the way of energy.

Public Facilities Program Description

- Program guidelines are essentially the same as the current commercial and industrial programs; therefore they are included in that category for funding and savings.

City Schools Program Description

- LivingWise: Provide an interactive 6th grade conservation education program to all 6th grade classes within the City of Azusa, both private and public.

EM&V

Azusa Light & Water contracted with Lincus Energy in 2010 to complete a study of the various FY 2008-09 energy efficiency programs and associated savings. The Lincus study is available on the CMUA website and the Azusa light & Water website (<http://www.ci.azusa.ca.us/DocumentCenter/View/26058>). Azusa Light & Water will continue to make EM&V reports available to the CEC and other parties as they are completed and will continue with its EM&V programs and practices in the future.

Sources of Energy Savings

For savings, Azusa Light & Water uses a combination of figures from TRM, E3, utility work papers and custom savings analysis along with vendor calculations when applicable.

Complimentary Programs

- Low-Income Programs: The Azusa Light & Water Low Income Assistance Program is outlined in Rule No. 18 of Azusa Light & Water's Rules and Regulations. Interested customers are required to fill out an application and provide documentation of income. In general, Azusa Light & Water's guidelines for qualifying customers follow the low income thresholds used by the State.
- Research, Development, and Demonstration: Azusa Light & Water has, jointly with the Southern California Public Power Authority (SCPPA), is an active member of the APPA DEED Program.

CITY OF BANNING

City of Banning At a Glance

- Established in 1922.
- Climate Zone 15
- 26 employees.
- Of the 12,101 customers, 90% are residential
- Average demand during FY 16/17 was 16.9 MW, up 1.3% from the prior period.
- Peak demand during FY 16/17 was 46.3 MW, up 4.9% from the prior period. Peak demand is primarily due to air conditioning load during the summer.
- Retail energy sales in FY 16/17 were 143,729,492 kWh, up 2.7% from the prior period. Retail sales are broken down as 52 percent residential and 48 percent commercial/industrial/institutional.

City of Banning Overview

During FY 16/17, Banning spent \$210,283 in Energy Efficiency programs, which have provided 416,454 kWh energy savings. It should be noted that the City of Banning is located in an economically disadvantaged area. A significant portion of the City's population is either low income or senior citizens living on a fixed income. Due to the economic demographics of Banning's population, a significant portion of Public Benefits dollars are utilized to provide low-income assistance through reduced rates.

Major Program Changes

One of Banning's main goals for FY 2016/17 is to expand participation in its commercial retrofit and refrigeration programs, primarily through the adoption of significantly increased monetary incentives for our small commercial businesses. To accomplish this goal Banning increased the budget and worked with community organizations to further increase awareness and overall participation of the Business Energy Efficiency Funds, or "B.E.E.F" program. Banning also increased the rebates for residential central air conditioning units, and implemented a rebate for residential air conditioner tune ups.

Program Descriptions

- Business Energy Efficiency Fund: Monetary incentives for commercial customers to install energy efficiency upgrades/retrofits such as lighting, refrigeration, motors, air conditioning tune-ups, etc.
- Air Conditioner: Monetary incentives to replace an existing central air conditioning unit with a new high-efficiency unit.
- Air Conditioner Tune Ups: Monetary incentives for getting air conditioning units tuned up.
- EnergyStar® Appliances: Monetary incentives for purchasing products that meet the Energy Star® criteria.
- EnergyStar® Refrigerator: A monetary incentive for replacing an old inefficient refrigerator with a new energy efficient unit.
- Recycle: Rebates offered to remove and recycle operating old and inefficient refrigerators and freezers.

- Energy Weatherization: Monetary incentives to replace inefficient materials with products that will improve the energy efficiency of their facility and reduce energy use.
- Shade Tree: Rebates offered to plant shade trees around homes to help reduce the amount of energy used for air conditioning.
- Commercial Programs: Monetary incentives for commercial customers to install more energy-efficient equipment such as lighting, signage, refrigeration, etc.
- New Construction: Monetary incentives for new construction projects that exceed the energy efficiency above California's Title 24 standards.
- Energy Audits: Provides customers with a variety of recommendations for reducing energy consumption.
- Low Income Assistance: An electric utility reduced Baseline Rate for qualified customers. As mentioned above, the majority of the Public Benefits funds are spent providing low-income assistance.

EM&V

The City of Banning Electric Utility has hired third-party firms, such as Lincus, Inc., to perform EM&V studies in previous years. The City will continue with its EM&V programs and practices.

Complimentary Programs

Renewable Portfolio Standard. As of January 1, 2018, the City of Banning's energy portfolio is greater than 50% renewable.

Solar Energy. Banning has met its California SB1 requirements by providing \$2.4 million in rebates for the installation of solar photovoltaic systems in its service territory. The rebates have helped install approximately 0.75MW of customer-owned solar photovoltaic capacity in the city.

Electric Vehicles. The State of California has set a goal of having 1.5 million zero emission vehicles on the roads by 2025. It is anticipated that the majority of these zero emission vehicles will be electric vehicles. As battery storage technology improves, the costs for electric vehicles will continue to decline, which will result in a higher participation in electrical vehicle ownership within the Utility's territory.

- The City received a grant to have an electrical vehicle public charging station constructed in the McDonald's parking lot, which is now completed, and running.

Biggs Municipal Utilities at a Glance

- Electric utility established in 1903
- Biggs is located in climate zone 11
- The electric utility has 732 retail customer connections servicing 720 retail customers
- Retail sales in FY 2017 was 17,360,554 kWh, up 19% over the previous reporting period. The brake-down by customer class is 27% residential, 6%, commercial and 67% industrial (one large customer).
- Budgeted amount for energy efficiency programs for FY 16/17 was \$41,040.00. The amount actually expended was \$36,547.29, funded through 2.85% Public Benefits Surcharge and Green House Gas Auction proceeds. Unallocated funds were re-appropriated to augment funding for our Solar PV Incentive Program.

Utility Overview

The City of Biggs is primarily a residential city with one large industrial customer. A significant portion of the City's population is either low income or senior citizens living on fixed incomes. The City experienced a 19% load increase in FY 2017, more than double the load increase of the last reporting cycle. This increase is attributable to increased activity at our large, industrial customer, Sunwest Milling. A projected increase in residential load from new construction was mostly offset by significant installation of leased and purchased solar P.V. systems. Few customers took advantage of energy efficiency rebates.

Major Program Changes

There have been no major changes in programs offered, but budgeted funds increased substantially as Greenhous Gas auction revenues were budgeted for a Streetlight Replacement Project during this reporting cycle. With low customer participation in offered energy efficiency programs, the City focused on street-light replacement to capture efficiency savings and increase the safety of city neighborhoods. Review of all programs began in CY 2017 to evaluate cost effectiveness after implementation of changes to Title 24.

Program Descriptions

- Referral to Community Action Agency for LiHEAP grants.
- Commercial Lighting Program: Customized Lighting Retrofit Rebate Program available to all commercial customers and educational facilities.
- Commercial HVAC Program : Customized HVAC Retrofit & Optimization Program provides generous incentives for businesses and educational facilities to update aging HVAC units or tune-up units that don't need replacement.
- Residential Appliance Program: This program offers incentives to residential customers for the purchase of Energy-Star rated refrigerators and the recycling older units.

- **Residential HVAC Program:** Tiered incentives for replacement of aging HVAC units at residential properties. The greater the SEER level above Title 24 requirements, the greater the potential incentive. The Res. HVAC program also provides incentives for tune-ups of HVAC units, the installation of 7-day programmable thermostats and the installation of whole-house fans.
- **Residential Shell Program:** This program offers incentives for increasing insulation levels and installation of dual-pane, low E windows to replace existing single-pane. Future programs may include whole-house air sealing.

EM&V

In 2007, in response to AB 2021, Biggs hired a third-party contractor to formulate an EM & V plan. In 2008, 2009 & 2010, Biggs contracted with Navigant Consulting to perform Energy Efficiency Program Evaluation studies of all programs the city offers. Those studies can be found on the NCPA website and our city [website](#). With the understanding that all programs need not be evaluated every year, Biggs moved to evaluation of all programs, in three year blocks. Biggs is currently working to find a consultant to perform multiple years worth of EM&V reports and have budgeted \$12,000 toward fulfilling our EM&V requirement.

Sources of Energy Savings Data

2016 TRM and 2014 DEER were used to calculate savings.

Complimentary Public Benefits Programs

- **Renewable Energy Programs:** Biggs offers incentives to customers who install up to 3 kW of solar PV capacity for residential service and custom incentive programs for commercial customers.
- **Low-Income Programs:** Biggs works with Community Action Agency of Butte County to provide weatherization, appliance replacement, lighting replacement and HEAP grants to income-qualified household within our service territory.

BURBANK WATER AND POWER

Burbank Water and Power (BWP) At a Glance

- Located in Climate Zone 9
- More than 46,000 residential and more than 6,500 commercial electric service connections, serving a total population of about 105,000 residents and more than 3,300 businesses.
- 1,080,000 MWh in total retail sales was recorded for FY 2016-17. Percent of retail sales by customer class: 25.2% residential, 74.8% non-residential.
- The Fiscal Year (FY) 2016-17 budget for energy efficiency incentives was \$3,618,000, with additional funds set aside for administration, overhead, and EM&V. Of this, \$3,152,000 (87%) was spent. BWP's funding source for energy efficiency programs is the Public Benefits Charge. BWP can reallocate unspent budgeted dollars to other Public Benefits programs or, more typically, invests them in the following fiscal year. In FY 2017-18, BWP has budgeted \$3,508,000 for energy efficiency program incentives.

Burbank Water and Power Overview

Burbank is known as the Media Capital of the World, and is home to two of the world's largest studios, Warner Bros. and Disney. The city is also home to thousands of smaller businesses, many of whom moved to Burbank in the early 1990s after the aerospace industry contracted and real estate became plentiful and cheap. From BWP, these businesses have come to expect cost-effective and reliable electric service, as well as additional services such as fiber optic networking.

At the same time, Burbank has a vibrant residential community, with a housing mix of about 18,500 single family homes that ranges from post-war bungalows to two story view homes. There are also about 27,000 multifamily homes, a figure that continues to increase with infill and high-density development. As a result of nearly 20 years of energy efficiency history, increasingly stringent codes and standards, and a community ethos of sustainability, the average Burbank household uses about 500 kWh per month. This efficient baseline makes it a challenge to design programs that can squeeze more energy efficiency juice out of an increasingly shrinking lemon.

BWP's energy efficiency portfolio has been designed to reflect our organizational goal of continuing to provide sustainable, affordable, and reliable service to all of our residents and businesses. At the same time, BWP is adjusting to changes in the utility industry, including concepts such as:

1. "Negative Load Growth," where energy efficiency and subsidized distributed generation are "fully" offsetting economic growth; and,
2. The "Duck Curve", where customer solar PV generation in the afternoon leads to a steep ramp up in the amount of electricity required to be supplied by the utility in the evening.

This results in a daily load profile that resembles a duck, potentially invalidating current Time Of Use (TOU) rate design and resource planning criteria.

To address the operational challenges of the Duck Curve, BWP is focusing more on reducing peak demand, and streamlining operational costs through energy efficiency. In addition, BWP’s promotion of transportation electrification offers an opportunity to help address the Duck Curve and negative load growth as more California consumers purchase EVs. BWP has been working to add new public chargers, including 6 new public chargers at the Hollywood Burbank Airport in FY 16-17, to complement the current rebate program for residents and businesses.

To further promote EVs, in April 2017, BWP also hosted an EV Ride and Drive event in order to attract area residents to the benefits of owning electric vehicles. Partnering with both the cities of Glendale and Pasadena, BWP invited guests to take the EVs on display for a spin, and receive feedback from EV owners on their personal experiences. Of the 350 guests who attended the April event, more than 230 guests took nearly 500 test drives on various EV models, ranging from plug-in hybrids to all-battery electrics. The event also featured information on public charging station locations, and most importantly, tried to address the issue of “range anxiety”. BWP also featured information on charger rebates and promoted the advantages of the TOU electric billing rate to help reduce peak demand consumption.

Another way to address these challenges are through innovative rate designs. In FY 16-17, BWP’s Small Commercial customers were placed on a TOU rate, thereby completing the transition for all Burbank businesses to a cost-based electric rate. With the TOU rate divided in 3 daily rate periods (on-peak, mid-peak, and off-peak) during summer months and 2 daily rate periods (mid-peak, and off-peak) during “non-summer” months, local businesses will be able to monitor their usage, maximize their consumption during the less expensive rate periods, potentially resulting in lower electric bills.

With minimal customer service or electric service impact, the TOU transition showed that businesses are able to align their operations to BWP’s low cost periods, while still able to participate in energy efficiency programs. BWP’s three core programs for commercial customers, Business Bucks, Energy Solutions, and Upstream HVAC, achieved more than 2.2 MW of peak demand savings in FY 2016-17.

Major Program Changes

Since the utility’s growing reliance on digital communications from the previous fiscal year, BWP increased its customer outreach encouraging customers to explore and use interactive features on all digital mediums from web portals to social media, thereby reducing phone calls in the Customer Service call center. The table below highlights how customers have explored a few of BWP’s online platforms and, as a result, reduced the burden and costs on the call center.

Communication platforms	FY 2015-16 Activity	FY 2016-17 Activity	Change
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BWP Twitter	1,645	2,043	24%
Home Energy Reports	6,379	11,221	80%
Phone Calls	78,753	73,835	-6%

BWP's HVAC Upstream Program has also shown an increased degree of popularity among commercial customers who have participated since its debut during the prior fiscal year. In FY 2015-16, 732 tons were rebated with peak demand savings at 160 kW. During FY 2016-17, 1,167 tons were rebated, resulting in an annual peak demand savings of nearly 200 kW – a 21 percent increase from the prior year.

Program Highlight

For residents, BWP's Home Improvement Program (HIP) continues to serve customers offering free weatherization upgrade services in order to increase the energy efficiency of Burbank's single family homes. BWP introduced the program in November 2009 as a whole house, direct install program and it has been expanding ever since. In partnering with the Southern California Gas Company and the Metropolitan Water District of Southern California, BWP has been able to reduce electric usage while leveraging additional funding to also reduce natural gas and water use. HIP has several components, including an in-home audit with energy and water education and installation of LED lamps and water savings devices. In addition, BWP assesses single family homes for additional services including the installation of attic insulation, duct testing and sealing, central air conditioning tune-ups and air sealing, as well as outdoor water conservation measures. With the current program, many of our participating residents are now qualified to receive incentives through the state's Advanced Energy Upgrade California Program.

During FY 2016-17, BWP focused its marketing efforts to target more single family homes through a redesign of communication materials and increased digital marketing. In FY 2016-17, the program served nearly 663 households, and provided weatherization upgrades to 216 homes, a 42 percent increase from the previous fiscal year. Overall, the program reduced peak demand by more than 500 kW, a 110 percent increase from the previous year. The increase in program activity, and the resulting increase in peak demand savings, demonstrates the link between program design and program outreach, and the need for continuous iteration and improvement.

Program Descriptions

The following is a sampling of BWP's largest programs by end-use:

Residential Cooling and Non-Residential Cooling: BWP provides services that address all aspects of space cooling for residential homes and commercial buildings, including rebates for the purchase of high-efficiency air conditioners and heat pumps, and free HVAC tune-ups. For FY 2016-17, these programs resulted in more than 1.4 MW of peak demand reductions.

Residential Refrigeration: BWP provides rebates for the purchase of ENERGY STAR refrigerators, including 189 in FY 2016-17. BWP also provides new ENERGY STAR refrigerators at no cost to

income-qualified customers. In addition, BWP also removes and recycles residents' second refrigerators at no cost in order to reduce their bills and lessen these older appliances' impact on the grid. Through these three programs, 420 inefficient refrigerators were removed or replaced with more efficient models, resulting in more than 105,000 kWh in annual electricity savings.

Non-Residential Lighting: BWP provides free direct installation services, including for high efficiency lighting, to all qualified small businesses in Burbank. In addition, BWP provides rebates per annual electricity saved for customized lighting projects, including \$0.10 per kWh saved for LED lighting. Through these efforts, BWP achieved 1.8 MW in peak demand savings and 5.9 million kWh in annual electricity savings for our commercial customers.

EM&V

Along with most other POU's in California, BWP uses the E3 Reporting Tool to ensure accurate reporting of electricity and peak demand savings and cost-effectiveness. In order to verify these savings, and meet the requirements of AB 2021, BWP also builds evaluation, measurement, and verification elements into every program and facilitates independent third-party studies. BWP's previous EM&V studies can be found at <http://www.ncpa.com/current-issues/energy-efficiency-reports.html>.

Sources of Energy Savings

The majority of energy savings values used to evaluate BWP's program performance were obtained from the TRM developed for California's POU by a third-party firm, ERS. In the case where an installed measure was not available in the TRM, BWP relied on vendor or other third-party data to estimate energy savings.

Complementary Programs

- Low-Income Programs: BWP offers a Lifeline rate to about 2,000 income-qualified customers, a 40 percent discount off the standard residential electric rate, making it among the most generous programs in the state. BWP also offers the Refrigerator Exchange program for Lifeline customers.
- Renewable Energy Programs: BWP's Solar Support Rebate program continued to offer both residential and commercial customers with rebates for installing solar panels. In FY 2016-17, the rebate for residential customers was \$0.32 per watt installed, and \$0.24 per watt installed for commercial customers. In FY 16-17, 28 rebates were provided for solar PV systems that are westerly-facing, in order to minimize the effects of the Duck Curve. The program was discontinued during FY 16-17 after the legislatively-mandated 10 year program term ended, mainly due to falling solar panel prices.
- Research, Development, and Demonstration: BWP operates a demonstration program of 23 Ice Bear units installed at City-owned buildings and large businesses. The Ice Bear is a peak-shifting thermal energy storage unit that works with air conditioners. The unit is simply a tank containing water that is frozen during off-peak hours; the ice is then used to

provide cooling, in substitution of the air conditioner's compressor, during peak hours. In FY 2016-17, the units provided about 250 kW of peak demand capacity reduction, directly mitigating the impact of the Duck Curve.

- Energy Storage: In addition to the Ice Bear units, and investment opportunities at utility-scale, BWP is investigating distribution-level and customer-owned energy storage in a number of ways, through Requests for Information and Proposals through SCPPA's Energy Storage Working Group.

CITY OF COLTON ELECTRIC DEPARTMENT (CED)

City of Colton Electric Department (CED) At a Glance

- Climate Zone(s) – CED is in Climate Zone 10
- Number of retail customer connections – The City of Colton has a total of 18,450 retail connections. Residential 16,112, Commercial 2,044, Municipal 221 and Industrial 73
- Annual total retail sales by customer class – Residential \$15,859,318, Commercial \$13,896,302, Industrial \$26,001,851, and Other \$1,044,595. Total revenues \$56,807,066
- Annual total budget for energy efficiency programs (including EM&V, admin/overhead, incentives) – \$1,166,847.
- Annual total amount actually expended for energy efficiency programs – \$662,869

City of Colton Electric Department (CED) Overview

Fiscal year 2016/2017 budget expenditures increased 30% (\$813,913 to \$1,166,847) from the previous reporting year to provide additional programs and assistance to CED customers. To help increase participation in energy efficiency and assistance programs, CED continued working with a marketing firm to assist the utility with marketing materials in English and Spanish to reach Colton's diverse community. Residents and businesses received marketing materials to help educate them on Energy Efficiency rebates and other programs CED offers for customers.

Major Program Changes

CED continues to expand its EE program development by entering into additional Southern California Public Power Authority (SCPPA) contract agreements for residential and commercial customers. This reporting year CED increased its business direct installation program to provide additional funds to complete projects that struggling businesses didn't have the funds to complete. CED added a Holiday Light Exchange Program for residents to have the opportunity to exchange old inefficient string lights for LED lights. CED had over 151 customers participate in the light exchange. CED also added an online Web-shop for residents to purchase energy efficient light bulbs, smart power strips and smart thermostats from the convenience of our website.

Program Highlight

This reporting year the program that had the greatest impact for our residents was a marketing strategy program called "Spring into Summer". During the First Day of Spring, March 19, 2017 to the last day of Spring, June 19, 2017, residents received additional rebate incentives for Energy Efficient items that prepared them for Summer. This program had the greatest impact because our residential rebate participation increased and residents were happy to save energy during the hotter months of summer reducing their energy use and bills.

Program Descriptions

- EE Rebates Non-Residential: Commercial and industrial customers participating in lighting and equipment upgrades were rebated \$0.10 per kWh saved on the projected first year's savings.

- EE Rebates Residential: Residential customers participated in a variety of energy efficient projects which provide rebates for the upgrades installed in their homes, such as A/C upgrade rebates. The rebate amounts depend on the equipment installed.
- Refrigerator Replacement Program (ARCA): CED assisted customers with replacing old inefficient refrigerators with new energy efficient models, removing and recycling their old unit. The utility provided the new unit for \$15 a month, billed for 12 consecutive months on the customer's account. Total unit cost to the customer is \$180.
- A/C Tune-Up: CED provides a rebate up to \$60 for residential A/C Tune ups.
- KYC: Keep Your Cool offered small commercial businesses with inefficient refrigeration, lighting and cooling. The program provided \$5,000 per location in EE upgrades.
- Residential DI: Residential customers with annual energy usage of over 10,000 kWh will receive an energy audit and received up to \$1,000 in direct install EE measures.
- Commercial DI: Small business customers with less than 20 kW participated in an energy audit and direct install of EE measures up to \$5,000 per business.
- Hospitality: Commercial program for lodging/hotels that provides a whole building approach for energy efficiency. EE measures included in this program are: retrofits for lighting to LED's, insulation, HVAC controls, duct test and seal, and pool and spa pump upgrades.
- Living Wise Program: School based energy efficiency education program, designed to generate long term resource savings by bringing interactive take home kits containing high efficiency measures they use to install within their home.
- Web-shop: Residents receive up to \$50 a year and free shipping toward buying down the cost of energy efficient lightbulbs, smart power strips, and smart thermostats on an online purchasing platform. The Web-shop is located on the utilities website at www.coltononline.com.
- Holiday Light Exchange: Residents can trade in their inefficient holiday lights for LED holiday lighting during the month of December.
- Municipal DI: This program provided direct installation of energy efficiency measures throughout City owned facilities.

EM&V

CED contracts with Alternative Energy Services Consulting (AESC) annually to complete CED programs studies of the residential and commercial program and associated savings. Current studies are available on CED website, (www.ci.colton.ca.us/DocumentCenter/View/3225). CED will continue to make EM&V reports available to the CEC and other parties as they are completed and will continue with its EM&V programs and practices in the future budgeting \$10,000 per year.

Sources of Energy Savings

The sources used to calculate program performance were the TRM and DEER data. The TRM was utilized for all measures that had not been updated in the 2014 Title 24 code changes.

Complimentary Programs

- Low-Income Programs: Income qualified applicants were provided a Tier 1 allotment increase of 139 kWh. This brings the Tier 1 allotment from 250 kWh to 389 kWh each month for 12 consecutive months from the date of approval.
- Renewable Energy Programs: This reporting year Public Benefit Funds did not fund any renewable energy programs. The Electric Utility enterprise fund, funded solar photovoltaic rebates for residential customers and funded the planning and construction of a community solar project.
- Research, Development, and Demonstration: CED participated in an emerging technology demonstration of a solar powered, ductless mini-split air conditioning systems in a commercial setting. CED placed the unit on the City of Colton Water Department outdoor water pumping house. The results of the study is available online at www.coltononline.com.
- Electric Vehicles: CED continues to grow its EV program. The utility currently has 12 level II public chargers available, an EV rate which adds 250 kWh to residential 2nd Tier of energy, and an EV charger rebate of \$500 for level II chargers.
- Energy Storage: Colton Electric Utility participates in an energy storage working group through SCPPA. Energy storage is being renewed for future participation. CED has purchased 3 Ice Bear thermal energy storage units for installation in 2018 as part of trial project.

CORONA DEPARTMENT OF WATER AND POWER (DWP)

Corona Department of Water and Power (DWP) At a Glance

- DWP 's customers reside in climate zone 10.
- DWP provides electric service to approximately 2,450 customers.
- DWP's annual energy sales were 153,400 megawatt-hours (6.0% more than last year).
- The budget for energy efficiency programs was \$336,900.
- \$5,131 was incurred for energy efficiency incentive payments and to develop marketing materials.
- DWP began serving electric customers in 2001 with unbundled generation services to existing investor-owned utility customers and bundled service to customers continuing to build new facilities located in the designated service territory.
- The peak demand was 28.6 megawatts (7.7% more than last year) and
- Ninety-six percent of energy sales were to non-residential customers.

Corona Department of Water and Power (DWP) Overview

All bundled customers' facilities are less than thirteen years old and met the 2005, 2008, 2013 or 2016 Title 24 requirements. The recent age of these facilities provide less energy efficiency upgrade opportunities. DWP continued to offer customers the same energy efficiency programs.

Program Highlight

- \$4,778 in energy efficiency incentive payments was disbursed for commercial LED lighting installations.
- DWP serves municipal facilities that can be interrupted as scheduled.

Program Descriptions

- Audits – Residential – Res Audits: On-site energy audits that analyze customer usage and demand to develop recommendations designed to improve energy efficiency and reduce load requirements. Rebates are available for energy efficiency upgrades identified in these audits. Verification services to ensure appropriate installation of recommended measures are also provided.
- Appliances – Residential – Res Clothes Washers: Rebates are provided to customers who purchase and install Energy Star® washing machines.
- Water Heating – Residential – Res Water Heating: Provide Energy efficiency kits to residential customers that include low flow showerheads, low flow faucet aerators, and energy conservation tips brochure.
- Pool Pumps – Residential – Res Pool Pumps: Provides incentives to improve energy efficiency for pool pumps, which reduce energy usage by a specified amount.
- Whole House Fan – Residential – Res Shell: Provides incentives to improve energy efficiency for whole house fans, which reduce energy usage by a specified amount.

- Lighting – Residential – Res Lighting: Provides incentives to improve energy efficiency for lighting applications, which reduce energy usage by a specified amount.
- HVAC – Residential – Res Cooling: Financial incentives for the replacement of cost-effective energy-savings HVAC units that reduce annual energy usage or load requirements by a specified amount.
- Audits – Industrial – Non-Res Audits: On-site energy audits that analyze customer usage and demand to develop recommendations designed to improve energy efficiency and reduce load requirements. Rebates are available for energy efficiency upgrades identified in these audits. Verification services to ensure appropriate installation of recommended measures are also provided.
- Lighting – Commercial – Non-Res Lighting: Provides incentives to improve energy efficiency for lighting applications, which reduce energy usage by a specified amount.
- HVAC – Commercial – Non-Res Cooling: Financial incentives for the replacement of cost-effective energy-savings HVAC units that reduce annual energy usage or load requirements by a specified amount.
- Refrigeration – Industrial – Non-Res Refrigeration: Financial incentives for the replacement of cost-effective energy-savings refrigeration equipment that reduces annual energy usage or load requirements by a specified amount.
- Process – Industrial – Non-Res Process: Financial incentives for the replacement of cost-effective energy-savings motors, pumps, and equipment that reduce annual energy usage by a specified amount.
- Other – Industrial – Non-Res Other: Direct funding for projects on the utility-side of the meter that provide benefits to customers in terms of improved safety, system integrity, energy efficiency, conservation, or research and development.

EM&V

Engineering analysis programs are the basis for energy savings and incentive calculations. The budget for energy efficiency was \$336,800; and \$4,778 in energy efficiency incentive payments were disbursed.

Sources of Energy Savings

The Energy Efficiency Technical Reference Manual provided energy savings estimates for DWP programs.

Complimentary Programs

- Renewable Energy Programs:
 - Net Metering Program: A net metering tariff schedule is available to qualifying customers.
 - DWP Solar Installations: DWP has installed 350 kW of photovoltaic systems.
- Electric Vehicles: DWP installed eight electric charging vehicle stations.

- Energy Storage: DWP's energy storage goal is to procure cost-effective energy storage applications equal to one percent (1%) of its peak load during calendar year 2020, with installations occurring no later than the end of calendar years 2021. No specific cost-effective energy storage application has been identified to date.

GLENDALE WATER & POWER

Glendale Water & Power At a Glance

- Established in 1909
- Climate Zone 9
- 87,982 electric meters and 34,088 water meters.
- Total retail sale of electricity for FY 2016-17 of 1,062,605 MWh
- Retail sales (MWh) by customer class – Residential (35.08%), Commercial (31.45%), Industrial (32.60%), Street lighting (.87%)
- Budgeted amount for energy efficiency programs: \$1,810,000, amount actually expended: \$1,515,851 and funding source: Electric Revenue. The unused budget is maintained in a fund balance to be applied towards qualifying projects, programs and services.

Utility Overview

Being one of the first Utilities to install both electric and water advanced meters, Glendale Water & Power (GWP) is developing and implementing new and innovative energy efficiency, load management, demand response and customer engagement programs for its customers. Our customers are eager to take advantage of the many benefits and new programs a modernized utility offers. Trends in utilities are leading towards providing digital communications that give customers near real time usage information that help consumers take charge of their energy use and give them the tools to manage it.

A modernized electric grid greatly expands data acquisition and data sharing across business units, lowers system losses, prevents energy theft and dramatically improves outage and asset management, reducing maintenance and capital costs with the goal of keeping downward pressure on consumer prices. For the current FY 2016-17 reporting year, GWP's energy efficiency programs saved 18,842 MWh (1.77% of retail sales) and reduced peak demand by 2 MW (0.76% of peak demand). With a modernized utility system, GWP will offer more programs and increase customer engagement through mobile applications to enable our customers to be stewards in conservation by giving them the tools to empower them.

Major Program Changes

In FY 2016-2017 we continued the implementation of the Conservation Voltage Reduction (CVR) pilot program. Using DVI's Edge system, it builds on GWP's investment in Automated Metering Infrastructure (AMI) by using the data generated by the new digital meters and SCADA to reduce customer energy consumption by maintaining optimal voltage levels on GWP's distribution transformers and feeders. CVR conserves electricity by operating electric customer voltages in the lower half of the ten percent (10%) voltage band required by ANSI equipment standards. The program was expanded and yielded an increase on energy savings. A CVR program is one of the most effective ways of obtaining energy savings without having to enroll customers into a specialized program. It is also a very effective way to reduce energy loss on the system and

know and track that you are reducing losses. It is also a technology that customers will not visually see or feel a difference in their usage, but can be proud that their utility invested in such a program to produce such high energy savings.

Program Highlights

Our Home Energy Reports from OPOWER, the Large Business Energy Solutions program and the Conservation Voltage Reduction pilot program produced the most energy savings from our portfolio. The Home Energy Reports had the greatest impact on our residential customers. This program also reached the majority of our customers and provides constant communication and engagement. Our Business Energy Solutions program is a CMUA award winning program that is designed to allow GWP large business customers the flexibility to define their own needs and develop their own energy efficiency projects. The Conservation Voltage Reduction pilot program was expanded and it now includes a total of 8 transformers, and 16 feeders which contributed to an increased annual energy savings.

Program Descriptions

Glendale Water & Power is a leader in many aspects of the utility industry. Along with aggressive conservation efforts, GWP has been giving back to the Community through its Public Benefit Programs. These programs not only assist low-income customers with their electric bills, they also provide funding and education for all customers to invest in new technologies helping them save money and lower their energy and water consumption.

Residential Customer Programs

- **OPOWER Home Energy Reports** - Provides 6 print paper reports annually to 50,000 residential customers on their energy use. Reports also include action steps for each household to help them reduce their electricity consumption. Currently, the program is integrating the existing two month billing data and a wealth of external data sources to educate customers on how they can save energy. With the installation of digital meters throughout Glendale's service territory, customers are mailed a home energy report that includes their Smart Grid data and access to the website where they can review their energy usage. (Res Comprehensive)
- **OPOWER Web Portal** - Provides up to 75,000 customers with web-access to electric usage information from their digital meters. The software analytics engine enables the coupling of insightful messaging with specific, targeted action steps for each household to help the customer reduce their electricity consumption. The addition of interval electric usage data has given customers the ability to view their usage in monthly, weekly, daily or hourly intervals. Access to granular information coupled with the analytic engine will provide customers with greater insight into their usage and provide more in-depth ways for them to save energy and money.
- **Smart Home Energy and Water Savings Rebates** - Provides incentives to promote the purchase of approved energy and water saving appliances and devices. Currently GWP

offers a web portal for residents to submit their rebate applications online. (Res Shell, Res Cooling, Res Dishwasher, Res Pool Pump, Res Refrigerator, Res Clothes Washers)

- **Smart Home AC Tune-Ups** - Provided by Proctor Engineering, helps residential customers save energy by ensuring that their air conditioning and duct systems are functioning at their optimal level. (Res Shell)
- **Livingwise®** - Provides energy and water conservation education materials for Glendale public and private school students. These materials support 10 hours of intensive energy education as well as in-home installation of energy saving devices including compact florescent light bulbs. (Res Comprehensive, Res Lighting)
- **Tree Power** - Provides up to 3 free shade trees and arborist services to ensure that the trees are planted correctly. When properly sited and cared for, a healthy, mature shade tree helps provide shade that cools the home and helps reduce air conditioning use. (Res Cooling)
- **Conservation Voltage Reduction (CVR)** – GWP partnered with Dominion Voltage, Inc. to provide their EDGE solution, a conservation voltage reduction (CVR) program, as a pilot. CVR conserves electricity by operating electric customer voltages in the lower half of the ten percent (10%) voltage band required by ANSI equipment standards. The CVR program builds on GWP's investment in Automated Metering Infrastructure (AMI) by using the data generated by the new digital meters to reduce power costs by increasing the efficiency of GWP's distribution system. During the FY 16-17, the program produced energy savings of 3,002 MWh. When fully implement, GWP expects annual energy savings to approach 22,997 MWh. Currently GWP has 8 transformers and 16 feeders in the program. When fully implemented, GWP expects to have as many 54 feeders and 38 transformers in the program. (Res Cooling)
- **Mobile My Connect** - CMUA award winning program that provides residential customers a free mobile application through GWP's Smart Customer Mobile engagement program which offers residential customers an interactive app called GWP- Mobile My Connect to better manage their energy and water usage on a smart phone, tablet and web anytime and anywhere. The user-friendly portal platform, provided by Smart Energy Systems LLC, delivers real-time usage information and two-way communication between the customer and GWP. GWP – Mobile My Connect, allows residential customers to view current and historical bills as well as pay bills, set budget goals, submit service requests, view/report outages, send messages directly to GWP and obtain electric vehicle or solar panel usage information.
- **In-Home Display/Thermostat Program** - GWP partnered with CEIVA Energy, LLC to provide a unique In-Home Display (IHD) solution for residential customers. The CEIVA IHD is a digital picture frame that integrates customer's personal photographs with meaningful and useful historical water usage information and near real time electric consumption information. The CEIVA IHD works as a home gateway that simultaneously communicates with GWP's electric digital meters as well as the customer's existing home networks via Wi-Fi or Ethernet. In addition to providing interval energy and water consumption usage information, GWP has the ability to enhance outreach, by pushing energy efficiency

program, conservation and event messages directly to the IHD. In FY 2014-15 GWP's pilot consisted of 72 IHD's with a broad cross section of residential customers. GWP expanded our current pilot with CEIVA from 72 to 187 customers in FY 2015-16, and integrated smart thermostats, and remote provisioning/web portal software. Currently in FY 2017-18 there are a total of 989 IHD's and smart thermostats installed in customers' homes.

Commercial Customer Programs

- **Smart Business Energy Saving Upgrades** - CMUA award winning program that provides small business customers with comprehensive no-cost energy surveys, customized written reports, energy education, and directly installs as much as \$2,000 worth of cost-effective energy conservation measures. (Non-Res Comprehensive, Non-Res Lighting)
- **Smart Business AC Tune-Ups** - Provided by Proctor Engineering, helps small business customers save energy by ensuring that their air conditioning systems are functioning at their optimal level. (Non-Res Shell)
- **Business Energy Solutions (BES)** - CMUA award winning program that provides incentives for medium and large businesses to complete pre-approved energy saving retrofit projects. Qualified customers can receive up to \$50,000 in incentives per fiscal year. Projects must be cost-effective from the customer's perspective based on the value of total estimated energy savings over the life of the installed measures. Incentives for approved retrofit projects are limited to 20% of eligible project cost or 100% of the incremental costs necessary to bring a remodeling and/or new construction project above the minimum Title 24 energy standard. In no case will an incentive exceed the value saved energy over the life of the measures assuming \$0.06 per kWh saved. (Non-Res Lighting, Non-Res Cooling, Non-Res Motors)
- **Small and Medium Business Analytics** - The business website portal and mobile platform engages small to medium-sized business customers over a mobile platform that provides comprehensive energy management information designed to provide insight and business customer interaction related to energy and water usage, energy efficiency and conservation, and device/appliance management for continuous improvement on energy management and energy decisions.

New Programs – FY 2017-2018

- **High Bill Alerts** - GWP and Opower are partnering to launch the High Bill Alerts to all GWP customers that sign up for the service. High Bill Alerts are designed to analyze AMI data to help customers save energy and money when they are likely to consume more energy than usual for a billing period. Before the end of a billing period, High Bill Alerts inform customers that they are likely to have high energy use, and they provide insights to help customers reduce their consumption before the billing period ends.
Smart Home Energy and Water Saving Surveys – The program evaluates the efficiency of customer homes, installs energy and water saving devices and makes recommendations for additional energy and water measures customers can implement.
Behavioral Demand Response Program – GWP continued the partnership with Opower to implement a residential Behavioral Demand Response (BDR) program which leveraged

AMI data analytics, behavioral science, and multi-channel communications to give customers personalized insights on how to best trim their electricity use during peak events. In FY 2017-2018 this program targeted 33,000 utility residential customers to receive electronic, IVR, and paper communication using a behavioral science approach. The communications encourages customers to adjust their energy consumption during periods of peak energy demand. BDR is an innovative approach to residential demand response because it gives customers personalized feedback on their performance shortly after a peak event is complete. Customers no longer have to wait until their monthly bill to see how much they saved and this is paramount to locking in positive peak shaving behaviors for future events. (Res Cooling)

EM&V

Glendale Water & Power plans to initiate EM&V analysis of energy efficient programs in FY 2018-19 in support of AB 2021. For FY 2018-19 Glendale has budgeted \$50,000 to its energy efficiency budget to conduct EM&V studies that will be conducted through the use of a third-party contractor. GWP will select energy efficiency programs based on the kWh savings. The purpose of the EM&V study is to ensure that measures are installed as claimed by GWP and to lend credibility to GWP's savings reports as compared to the industry standards that were available at the time of GWP's program processing and implementation. It is Glendale's plan to review all energy efficiency programs in terms of cost effectiveness, customer participation and administration.

Glendale Water & Power consistently performs the following in support of EM&V activities:

- A pre-and post-inspection of 100% of all large commercial retrofit projects under the Business Energy Solutions program, including a review of their energy-saving calculations.
- All residential and commercial solar PV installations are field inspected and verified by city personnel for program compliance.
- Audits and installations performed by third-party contractors for Glendale's direct install Smart Business Energy Saving Upgrades program have high inspection rates that are performed by the consultant.

Sources of Energy Savings

The sources of energy savings used to calculate program performance was a combination of using the TRM, work papers and third party EE verifications.

Complimentary Public Benefits Programs

Renewable Energy Programs: These programs provide incentives to install solar photovoltaic systems in Glendale. Funding supported by Public Benefit Funds and distributed between residential, small business and large business customers. GWP has budgeted for the Smart Home Solar Solutions program beyond the SB1 sunset date.

- **Smart Home Solar Solutions** - This program provides incentives to promote the installation of grid-connected solar photovoltaic systems in Glendale. A total of 1.1 MW in grid-connected residential solar photovoltaic installations in FY 2016-17.

- **Business Solar Solutions** - This program provides incentives to promote the installation of grid-connected solar photovoltaic systems on small businesses in Glendale. A total of .238 MW in grid-connected small business solar photovoltaic installations in FY 2016-17.
- **Large Business Solar Solutions** - This program provides incentives to promote the installation of grid-connected solar photovoltaic systems on large businesses in Glendale. An existing total of .0592 MW in grid-connected large business solar photovoltaic installations in FY 2016-17.

Low-Income Programs:

- **Senior Care** - This program provides electric bill discounts for low-income seniors and disabled customers 55 and older. Senior Care was closed to new participants in 2009 when Glendale Care was implemented.
- **Glendale Care** - This program offers all eligible low-income customers a discount of \$13 on their electric bills.
- **Guardian** - This program provides bill discounts for households with special electrically powered medical equipment needs.
- **Helping Hand** - This program provides bill payment and deposit assistance for low-income customers.

Research, Development, and Demonstration:

- **Codes & Standards** - GWP has included our respective share of the energy savings that are attributable to the State's Building Codes and Appliance Standards that are applied and enforced by the City of Glendale.

Electric Vehicles:

- **Electric Vehicles** – In FY 16-17 we installed a total of 4 Level 2 EV charging stations throughout the City. In February 2018 we received additional funding approval from Glendale's City Council to invest in the installation of more publicly accessible EV charging stations. Our goal is to install 7 Level 2 publicly accessible EV charging stations in FY 18-19.
- **EV Level II Charger Rebate** - Offer a maximum of \$500 rebate to residential and commercial customers who install a Level II (240V) EV charger in Glendale.

Energy Storage:

- **Battery Energy Storage System** - Installed a 2 MW Battery Energy Storage System (BESS) at Glendale's Grandview Substation that was commissioned in April 2017. This BESS will help to regulate our interconnection to operate within threshold demands. In addition, the system will help mitigate the intermittence of the renewable resources such as solar generation. This project is scalable so that we can gain experience on how to use the storage technology to determine full scale energy storage projects in the future. The scale projects will increase the redundancy and resiliency of our power system. GWP is one of the first Southern California utilities to integrate a Battery Energy Storage System into their portfolio.

GRIDLEY MUNICIPAL UTILITY

Gridley Municipal Utility At a Glance

- Climate Zone(s): 11
- Number of retail customer connections: 2,913
- Annual total retail sales by customer class (Residential 16,651,606 kWhs, Commercial 15,449,077 kWhs, Industrial 3,324,899 kWhs)
- Annual total budget for energy efficiency programs (including EM&V, admin/overhead, incentives): \$140,000
- Annual total amount actually expended for energy efficiency programs: \$66,566

Gridley Municipal Utility Overview

Gridley Municipal Utility (GMU) feels a significant responsibility to its community to invest their Public Benefits funds in such a way as to impact both energy savings and financial savings/positive economics in Gridley. GMU offers a comprehensive menu of rebates to all residential, commercial and industrial customers. GMU's customer demographic has historically resulted in lower customer participation in programs that require capital investment by the customer.

Because of this, GMU has offered direct install programs that provide energy efficiency measures to customers at little or no cost to them. In FY17, GMU offered a comprehensive menu of energy efficiency rebate programs. GMU offered the Keep Your Cool (KYC) program to commercial customers to upgrade their refrigeration equipment. The program started in late FY17, and was completed in FY18. Therefore, some savings from the program will not be reported until FY18. This resulted in net annual kWh savings of 49,572 for FY17. Since 2013, GMU has acquired 100.38% of our AB2021 goals.

Major Program Changes

There were no major program changes implemented in FY17.

Program Highlight

The KYC program was responsible for 88% of the kWh savings for FY17. The KYC program provides customers with commercial refrigeration upgrades at no cost to the customer. This overcomes the problem many customers have with lack of capital to invest in energy efficiency upgrades.

Program Descriptions

GMU manages a comprehensive energy efficiency incentive program for residential and commercial customers focusing on energy efficiency and peak load reduction. For residential customers, rebates are offered for the installation of various energy efficiency measures, such as lighting, HVAC, appliances, and weatherization. For commercial customers, rebates are available for upgraded lighting, HVAC, appliances, refrigeration equipment, electronics, and in cases where an analysis is performed rebates can be offered for additional equipment that reduces energy

use and/or demand. On-site energy audits are provided by GMU energy specialists. Energy efficiency measures are recommended and additional visits are completed upon request.

- Residential Lighting Program [Res Lighting]: GMU offers rebates to homeowners who install ENERGY STAR® qualified LED lamps/bulbs, ceiling fans and LED holiday lights.
- Residential HVAC Program [Res Cooling]: GMU offers rebates to homeowners who install high performance heat pumps, central air-conditioners, room air-conditioners, or whole house fans that exceed current state requirements. GMU also offers a rebate for duct sealing when not required by code.
- Residential Equipment Program [Res Clothes Washers; Res Dishwashers; Res Pool Pump; Res Refrigeration]: GMU offers rebates to homeowners who purchase new ENERGY STAR qualified products, including clothes washers, room air conditioners, dishwashers, pool pumps and refrigerators.
- Residential Weatherization Program [Res Shell]: GMU offers rebates to homeowners who invest in weatherizing their homes, including attic and wall insulation, window treatments/replacement or air/duct sealing.
- Residential Water Heater Rebate Program [Res Water Heating]: GMU offers rebates to homeowners who purchase a new, energy efficient electric water heater.
- Commercial Lighting Program [Non-Res Lighting]: GMU offers rebates to business owners who invest in the installation of energy efficiency lighting upgrades. There is a prevalence of inefficient lighting throughout the city and most high bay lighting uses high intensity discharge fixtures instead of more efficiency fluorescent or LED fixtures.
- Commercial Custom Program [Non-Res Comprehensive]: GMU offers rebates to business owners based on site-specific consumption. Rebates are tailored to the individual business owner's needs based on the audit and the potential energy savings associated with the customer project.

EM&V

GMU is planning to complete EM&V in FY18 by working with several other utilities to gain economies of scale. GMU has received a proposal from an EM&V company and is reviewing the scope of work.

Sources of Energy Savings

For FY17, GMU has relied heavily on the savings listed in the Technical Resource Manual. Non-residential lighting and custom projects rely on custom savings calculations.

City of Healdsburg at a Glance

- Climate Zone 2
- Serve 5,895 retail customer connections
- For Calendar Year 2017 total annual retail sales reached 77,190 MWh; 27,340 MWh residential, 42,231 MWh commercial, and 7,618 MWh industrial
- For fiscal year 2017 the City of Healdsburg budgeted \$395,000 for energy efficiency rebates. Fiscal year 2017 budget was higher than usual to allow the funding of a low-income direct install program.
- During the 2017 calendar year the City was able to accomplish the low-income direct install program, completed several commercial retrofits, and provide continued incentives for residential customers. In total the City expended roughly \$350,000 for the payment of energy efficiency incentives and administration costs.

City of Healdsburg Overview

The City of Healdsburg's Electric Department manages a comprehensive energy efficiency program for residential and commercial customers incentivizing energy conservation as well as peak load reduction. For residential customers, rebates help to drive installations of a variety of energy efficiency measures. Residential rebates are offered in the following areas; lighting, appliance, heat and cooling, weatherization, and pool pumps. For commercial customers, rebates are generally site specific and developed as customer programs to allow the greatest program flexibility and variety of incentives to the end users. All custom commercial incentives must be accompanied with analysis demonstrating a benefit to cost ratio greater than one and acceptable to the end user.

Major Program Changes

For the 2017 calendar year, the City initiated a comprehensive direct install program for low-income customers. The program installed high efficiency light bulbs, smart power strips, several water conservation measures, and collected information about each residential units future energy efficiency potential. In total, the program is estimated to save low-income customers over 236,084 kWh in energy and over 3 million gallons of water each year.

Program Highlight

In 2017 the greatest energy efficiencies achieved were by the low-income direct install program and the custom commercial energy efficiency program. Typically low-income customers are not able to participate in energy efficiency programs. The direct install program paid all of the costs associated with installing energy efficiency and water conservation measures, allowing greater customer participation and higher energy efficiency gains.

The City's custom commercial programs allows the end user flexibility in the development of retrofits that drive measurable savings. For 2017 the City was able to work directly with

commercial customers to drive lighting, refrigeration, and building envelop upgrades. In total commercial programs achieved over 240,000 kWh in energy savings.

Program Descriptions

The City offers the following residential programs:

- Free Home Audits: On-site energy and water audits are available to residential customers. Energy efficiency measures are recommended based on each audit and upon request, the customer is provided a written report summarizing findings and recommendations to reduce the customer's monthly energy consumption.
- Appliance Rebates: The City provides rebates for the purchase of several ENERGY STAR® rated appliances.
- Residential Heat Pump and Efficient Air Conditioning Rebates: The City offers rebates for residential and small business customers who install high performance heat pumps, central air-conditioners or evaporative coolers that exceed current state requirements.
- Residential Lighting Rebates: The City offers rebates to homeowners who install ENERGY STAR® qualified LED lamps and LED string/holiday lights.
- Residential Electric Water Heater: The City offers customers a rebate toward the installation of energy efficient electric water heaters.
- Weatherization/Window Incentives: The City provides financial incentives for homeowners who invest in home weatherization and window replacement projects.

The City offers the following commercial programs:

- Energy Audits and Rebates: This program offers complementary, on-site energy audits for both commercial and industrial customers. Energy efficiency recommendations and follow up visits support implementation of recommended energy efficiency measures. Energy efficiency rebates are available for upgrades identified through these audits.
- Commercial Lighting: This program engages local lighting and electrical contractors to promote and install energy efficient lighting upgrades through technical assistance and financial incentives available from Healdsburg's Electric Department.
- Commercial Refrigeration and HVAC: The City offers commercial customers a wide selection of refrigeration and HVAC rebates. These rebates are performance based and provided greater reward to projects that reduce system peak demand.
- Custom Energy Efficiency Programs: The Healdsburg Electric Department will consider custom energy efficiency programs for site-specific consumption. The Electric Department will require that the City's contractor review and endorse all custom programs. This review may result in a small cost adder to the proposed project but validates the benefit to cost ratio of the program. The Healdsburg Electric Department retains the sole right to approve or deny custom projects.

IMPERIAL IRRIGATION DISTRICT

Imperial Irrigation District At a Glance

- Climate Zone: 15
- Number of retail customer connections: 149,431
- Public Programs Budget for CY 2016:
 - Energy Efficiency – \$6,155,795
 - Low income/rate assistance programs - \$6,737,000
- CY16 total retail sales by customer class
 - Residential – 51.91%
 - Commercial – 42.76%
 - Industrial – 0.24%
 - Agricultural – 2.20%
 - Other – 2.89%

Imperial Irrigation District Overview

As the sixth largest utility in California, IID controls more than 1,200 megawatts of energy derived from a diverse resource portfolio that includes its own generation, and long- and short-term power purchases. IID's Energy Department provides electric power to more than 145,000 customers in the Imperial Valley and parts of Riverside and San Diego counties.

As a consumer-owned utility, IID works to efficiently and effectively meet our customers' demands at the best possible rates, tying our area's low-cost of living directly with low-cost utilities. Our diverse resource portfolio provides our customers with some of the lowest cost rates in southern California which is critical given unemployment rates within the service territory are one of the highest in the nation.

IID's energy efficiency programs are a key factor in the utility's overall goal. These programs provide a positive impact on utility cost by stabilizing energy consumption and reducing purchases of expensive peak power. Additionally, customers are provided with an opportunity to take charge of their energy utilization and by doing so, reducing their electricity consumption and cost.

Major Program Changes

The program portfolio and rebate levels remained consistent from previous years.

Program Descriptions

Commercial Customer Programs

- Commercial Audits: This program provides commercial customers with onsite energy evaluations of their facilities and helps the business owner identify opportunities for energy conservation. This service is offered at no cost to the customer and is recommended as the first step towards their energy conservation journey.

- Custom Energy Solutions Program (CESP): This program is designed to promote energy efficiency by offering financial incentives to commercial customers who install energy-efficiency equipment. The larger commercial customers that participate generally have their own energy efficiency specialists they've consulted with for their upgrades and have identified the details of their project prior to applying for the rebate. However, for all other commercial customers that may not have access to an energy efficiency specialist, IID offers technical expertise to assist them in identifying the energy efficiency measures and cost saving opportunities. Measures incentivized include interior and exterior lighting, process loads and HVAC/refrigeration.
- New Construction Energy Efficiency Program (NCEEP): This program combines an integrated design process with financial incentives for energy saving design at least 10 percent above the current Title 24 requirements for a building envelope; or as a systems approach method for individual measures.
- Energy Rewards Rebate Program: This program offers commercial customers prescriptive rebates for qualified energy efficient measures. Qualifying measures must retrofit, replace or upgrade old equipment with new, energy-efficient technologies that meet and/or exceed the Title 24 standards in effect at the time of installation.
- Quality A/C Tune-Up Program: Through this program participating small commercial account customers receive HVAC services which may include duct test and seal (DTS), refrigerant charge adjustment (RCA), inspection of all electrical connections and tightening, inspection of all moving parts and lubrication, inspection of condensate drain, inspection of system controls and thermostat setting, and cleaning of evaporator and condenser air conditioning coils.

Residential Customer Programs:

- Energy Rewards Rebate Program: This program offers residential customers prescriptive rebates for qualified energy efficient measures. Qualifying residential measures must retrofit, replace or upgrade old equipment with new, energy-efficient technologies that meet and/or exceed the Title 24 standards in effect at the time of installation.
- Quality A/C Tune-Up Program: Through this program participating residential account customers receive HVAC services which may include duct test and seal (DTS), refrigerant charge adjustment (RCA), inspection of all electrical connections and tightening, inspection of all moving parts and lubrication, inspection of condensate drain, inspection of system controls and thermostat setting, and cleaning of evaporator and condenser air conditioning coils.
- Residential Audits: Customers may receive a free home energy assessment once every three years. An assessment will identify problems that may, when corrected, save the customer a significant amount of money over time.
- Refrigerator Recycling: This program is designed to encourage customers to recycle their old refrigerators rather than using them as a secondary refrigerator usually located either in uninsulated garages or outdoors. Through the program a customer's refrigerator will be picked-up and recycled, in addition to them receiving a \$50 incentive per unit.

Codes and Standards

Through IID's participation with SCPPA, IID accounts for codes and standards savings which are drawn from the statewide allocation of energy savings credits attributed to codes and standards. The codes and standards savings claimed by IID are pro-rated based on the district's percent share of statewide load.

Sources of Energy Savings

IID utilized a combination of savings from the TRM, KEMA 2009 report, utility work papers and custom savings when applicable. For the prescriptive rebate program, the district relied on the deemed savings provided by the TRM as the individual efficiency measure's performance characteristics and use conditions were well known and consistent. Subsequently for the custom programs, custom savings were calculated taking into account the properties of existing equipment, replacement equipment and future use.

Complimentary Programs

- Low-Income Programs

As a large number of IID's residential customers participate in its income-qualified programs, a significant portion of revenue generated through the public benefits charge is allocated towards these programs. Program expenditures for the 2016 year totaled over \$6.3M, with an average enrollment of 13,900 customers.

- Residential Energy Assistance Program (REAP) – This program provides customers with a discounted rate on their electric bill. Qualification is based on the number of residents per household and the total gross income of all the income sources in the home. Qualifying customers may receive a 20 percent discount on their monthly bill. Qualifying seniors 60 or older may apply to receive a 30 percent discount.
- Emergency Energy Assistance Program (EEAP) – This program provides financial assistance to customers in a financial crisis, facing disconnection for nonpayment.
- Medical Equipment Energy Assistance Program (MEEUAP) – This is an assistance program that reduces the electric rate for a defined quantity of electricity used to operate medical equipment by a household that has a full-time resident who requires specific medically necessary electric equipment to sustain life or prevent deterioration of a person's medical condition.

- Energy Storage:

The District's first ever battery energy storage system went online in November 2016. The project is a 30-megawatt, 20-megawatt-hour lithium-ion battery storage system that will increase reliability across the IID grid by providing the ability to balance power and integrate solar while providing spinning reserve and black start power restoration capabilities. IID anticipates its customers will benefit from reduced operating costs throughout the lifetime of the project, providing a significant cost savings to ratepayers. The project is one of the largest of its kind in the western United States.

- Renewable Energy Programs:
 - Net Billing – The Net Billing Program is NEMs successor program and also compensates net-surplus customers in accordance with the Distributive Self-Generation Service Rate
 - E-Green Solar Program - Imperial Irrigation District has initiated a process to bring inexpensive utility-scale solar to its low-income residents. IID reviewed its customer needs and available resources to develop a unique solar program known as eGreen. The eGreen program will be customized to bring solar energy to low-income families while benefiting from IID’s ability to acquire attractive energy pricing. eGreen will allow IID customers to “go green” and reap the benefits of clean, renewable solar power without the need for on-site installation.

LASSEN MUNICIPAL UTILITY DISTRICT

Lassen Municipal Utility District At a Glance

- Climate Zone(s): 16
- Number of retail customer connections: 10,500
- Annual total retail sales by customer class (Residential 70,621,148 kWhs, , Commercial 46,918,666 kWhs , Industrial 4,846,315 kWhs)
- Annual total budget for energy efficiency programs (including EM&V, admin/overhead, incentives): \$214,000
- Annual total amount actually expended for energy efficiency programs: \$200,826

Lassen Municipal Utility District Overview

LMUD remains committed to helping customers manage their energy use through energy education and a comprehensive offering of energy efficiency incentives. For residential customers, rebates are offered for the installation of various energy efficiency measures. For commercial customers, rebates are available for upgraded lighting, refrigeration equipment, HVAC equipment, and in cases where an analysis is performed rebates can be offered for additional equipment that reduces energy use and/or demand. Many customers are not able to participate in standard rebate programs that require significant capital investment of their own. To compensate for this, LMUD periodically offers direct install programs at no cost to commercial and residential customers that provide energy saving and other benefits.

Major Program Changes

LMUD offers a comprehensive menu of energy efficiency rebate programs to our residential, commercial and agricultural customers. LMUD also offered the Keep Your Cool (KYC) Program to commercial customers in FY17 to encourage them to upgrade their older refrigeration equipment. The program offers ECM motors, strip curtains, ASH controllers and other refrigeration measures at no cost to the customer. There were no major program changes to LMUDs standard rebate programs offered to customers in FY17.

Program Highlight

LMUDs energy efficiency programs acquired a first-year annual savings of 542,649 kWhs in FY17, exceeding the savings target of 290,000 kWh by 87%. The KYC Program delivered 57% of the total kWh savings in FY17. The Commercial Lighting Program delivered 37% of the total kWh savings. History has demonstrated that direct install programs are beneficial and customers will take advantage of free give-a-ways.

Program Descriptions

LMUD manages a comprehensive energy efficiency incentive program for residential and commercial customers.

- Residential Lighting Program [Res Lighting]: LMUD offers rebates to homeowners who install ENERGY STAR® qualified LED lamps/bulbs, ceiling fans and LED holiday lights.
- Residential HVAC Program [Res Cooling]: LMUD offers rebates to homeowners who install high performance heat pumps, central air-conditioners, whole house fans and ground source heat pumps that exceed current state requirements.
- Residential Equipment Program [Res Clothes Washers; Res Dishwashers; Res Pool Pump; Res Refrigeration, Res Electronics]: LMUD offers rebates to homeowners who purchase new

ENERGY STAR qualified products, including clothes washers, room air conditioners, dishwashers, refrigerators, freezers and advanced power strips.

- Residential Water Heater Rebate Program [Res Water Heating]: LMUD offers rebates to customers who purchase new, energy efficient electric water heaters and heat pump water heaters.
- Commercial Lighting Program [Non-Res Lighting]: LMUD offers rebates to business owners who invest in the installation of energy efficiency lighting upgrades. There is a prevalence of inefficient lighting throughout the city and instead of more efficiency fluorescent or LED fixtures.
- Commercial Custom Program [Non-Res Comprehensive]: LMUD offers rebates to business owners based on site-specific consumption. Rebates are tailored to the individual business owner's needs based on the audit and the potential energy savings associated with the customer project.
- Keep Your Cool Program [Non-Res Refrigeration]: The Keep Your Cool program offers EC motors, strip curtains, ASH controllers and other refrigeration measures at no cost to the customer.

EM&V

LMUD is planning to complete EM&V in FY18 by working with several other utilities to gain economies of scale. LMUD has received a proposal from an EM&V company and is reviewing the scope of work.

Sources of Energy Savings

For FY17, LMUD has relied heavily on the savings listed in the Technical Resource Manual. Non-residential lighting, custom projects and non-deemed refrigeration measures rely on custom savings calculations.

Complimentary Programs

- Low-Income Programs: LMUD offers two low-income programs. ECAP offers year-round rate assistance based on the type of home heating. The assistance increases in the colder winter months when usage tends to be higher. EEAP provides a one-time assistance payment to help avoid disconnection in the case of a financial emergency. This program is funded by LMUD's Public Benefits Program and administered by the local Salvation Army Office.
- Renewable Energy Programs: LMUD offers customers a Net Energy Metering program that pays customers for excess net generation.
- Electric Vehicles: LMUD offers customers rebates on EV charging stations. Publicly accessible and residential are based on a first come, first served basis.

LATHROP IRRIGATION DISTRICT

Lathrop Irrigation District At a Glance

- Climate Zone 12
- 75 residential customers, 1 school
- 2017 retail sales: Residential 3.04 GWh; Non-Residential 0.95 GWh

Lathrop Irrigation District Overview

Lathrop Irrigation District began providing retail electric service in April 2013 after being formed in 2002. LID began service with just two customers: Comcast and River Islands Technology Academy. LID was formed to be the electric provider for homes and businesses on Stewart Tract, a new and growing section of Lathrop. It has an elected board that is answerable to local residents rather than the CPUC (California Public Utilities Commission). The board is comprised of land owners and is locally elected.

LID serves electricity to residences and businesses within the River Islands at Lathrop development. At this time, there are no plans to serve other areas of Lathrop with power--PG&E will continue to be the provider outside of LID territory.

The first phase of development (over 4,000 homes and three million square feet of commercial space) is fully entitled and ready for construction. Construction of infrastructure in this phase is nearly complete and vertical construction is underway. Eventually, LID will provide electric service for retail and office facilities, educational and recreational amenities, entertainment, employment and environmental enhancements to the city.

Major Program Changes

LID primarily serves residential customers in new construction—built within the last five years. Given the state’s stringent building energy standards there are limited opportunities and potential for cost-effective energy efficiency savings. In addition, many customers enjoy the energy benefits of rooftop solar, further depressing demand for energy efficiency programs and services. To date, LID has not received any customer requests or interest of energy efficiency rebates and programs.

Complimentary Programs

- Low-Income Programs: LID offers a Community Alternative Rates for Electric Service (CARES) Program that provides eligible residential customers with a 25% reduction of the R-1 tariff rate.
- Renewable Energy Programs: LID supports customer-sited renewable generation systems up to 1 MW in capacity. Availability of this schedule is limited to 5% of LID’s aggregate customer peak demand.

LODI ELECTRIC UTILITY

Lodi Electric Utility At a Glance

- Climate Zone(s): 12
- Number of retail customer connections: 26,152
- Annual total retail sales by customer class (Residential 146,192,111 kWhs, Commercial 160,318,423 kWhs, Industrial 118,900,040 kWhs)
- Annual total budget for energy efficiency programs (including EM&V, admin/overhead, incentives): \$932,820
- Annual total amount actually expended for energy efficiency programs: \$2,084,306, \$1,485,373 of which was funded with the Green House Gas allowance fund.

Lodi Electric Utility Overview

Lodi's non-residential lighting produced the majority of energy savings achieved in Lodi Electric Utility's (LEU's) FY2017 energy efficiency program portfolio. For FY17, non-residential lighting upgrades and custom projects accounted for 92% of the acquired energy savings. A custom motor upgrade project delivered an additional 5% of the savings acquired. The balance of the savings acquired was through a variety of programs to LEU's customers.

Due to the age of Lodi's housing stock and the nature of Lodi's climate zone, residential customers continue to achieve the greatest energy savings through HVAC replacements, improvements to insulation and by purchasing ENERGY STAR® certified appliances, including refrigerators, dishwashers, clothes washers and pool pumps. The greatest opportunity for residential energy efficiency savings continues to be with low-income and rental property. Lodi's median household income is estimated at \$51,139 and renter occupied property comprises approximately 46 percent of all Lodi housing units. Many of LEU's residential customers have not typically participated in traditional rebate programs that require customer co-pays.

Major Program Changes

In FY17, LEU continued to offer a comprehensive selection of programs for our commercial, industrial and residential customers. In addition, the City completed an LED street light upgrade project that provided 46% of the non-residential lighting savings. The project utilized Green House Gas allowance funds, not LEU's Public Benefit portfolio. Commercial lighting provided 22% and industrial provided 32% of the non-residential lighting energy savings.

LEU continued to offer the Residential Direct Install and Snapshot Audit program that it started in FY16. This program offered installation of LEDs, advanced power strips, thermostatic shower valves, shower heads, and aerators in customers' homes at no cost. The intent was to provide a program for residential customers that do not traditionally participate in energy efficiency rebate programs. While open to all residential customers, the program specifically targeted multi-family and low-income properties, as they are not likely to benefit from traditional energy efficiency programs.

Program Highlight

The Non-Residential Rebate Program continues to be the main driver in regard to overall energy savings achieved. Fifty-three commercial and industrial customers completed lighting upgrade projects in FY2017. Through key accounts management, the utility maintains a proactive and positive relationship with Lodi's largest energy consumers. These relationships are vital to Lodi's

overall economic development strategy and through them our large commercial and industrial customers have been effectively encouraged to engage and make investments in lighting retrofits, process equipment improvements, behavioral modification, etc.

Program Descriptions

LEU manages a comprehensive energy efficiency incentive program for residential and commercial customers focusing on energy efficiency and peak load reduction. For residential customers, rebates are offered for the installation of various energy efficiency measures, such as lighting, HVAC, appliances, and weatherization. For commercial customers, rebates are available for upgraded lighting, HVAC, appliances, refrigeration equipment, electronics, and in cases where an analysis is performed rebates can be offered for additional equipment that reduces energy use and/or demand. On-site energy audits are provided by LEU energy specialists. Energy efficiency measures are recommended and additional visits are completed upon request.

- Residential Lighting [Res Lighting]: LEU offers rebates to homeowners who install ENERGY STAR qualified LED lamps/bulbs, ceiling fans and LED holiday lights.
- Residential HVAC [Res Cooling]: LEU offers rebates to homeowners who install high performance heat pumps and air-conditioners that exceed current state requirements. LEU also offers a rebate for duct sealing when not required by code.
- Residential Equipment [Res Clothes Washers; Res Dishwashers; Res Pool Pump; Res Refrigeration; Res Electronics]: LEU offers rebates to homeowners who purchase new ENERGY STAR qualified products, including clothes washers, dishwashers, pool pumps, refrigerators and advanced power strips.
- Residential Weatherization [Res Shell]: LEU offers rebates to homeowners who invest in weatherizing their homes, including attic and wall insulation, window treatments, solar attic fans, and air sealing.
- Residential Water Heater Rebate [Res Water Heating]: LEU offers rebates to homeowners who purchase a new, energy efficient electric water heater.
- Residential Direct Install [Res Electronics; Res Lighting]: Audits are performed on residential homes and advanced smart power strips, faucet aerators, thermostatic shower valves, and ENERGY STAR rated LEDs are installed at no cost to the customer.
- Commercial Lighting [Non-Res Lighting]: LEU offers rebates to business owners who invest in the installation of energy efficiency lighting upgrades.
- Commercial Custom [Non-Res Comprehensive]: LEU offers rebates to business owners based on site-specific equipment and usage. Rebates are tailored to the individual business owner's needs based on the audit and the potential energy savings associated with the project.

EM&V

LEU has implemented an Evaluation, Measurement & Verification (EM&V) Plan, and has completed eight consecutive annual assessments (reports) of randomly selected programs and large rebates as part of the designed EM&V Plan. Our EM&V reports are available for review at: www.ncpa.com/policy/reports/emv/

Sources of Energy Savings

For FY17, LEU has relied heavily on the savings listed in the Technical Resource Manual. The Commercial Lighting and Commercial Custom programs use custom savings calculations.

Complimentary Programs

- Low-Income Programs:

- Lodi C.A.R.E. Package Program: Provides grants to very low-income customers in need of assistance paying their electric utility account; the program coordination/customer screening is performed by the Lodi Salvation Army.
- Lodi SHARE Discount Rate: LEU provides a rate discount of 30% for qualifying residential customers on their electric utility monthly billing statement; \$400,000 annually is budgeted for this rate discount from the Lodi Public Benefits Program fund.
- Renewable Energy Programs: LEU's Solar PV Rebate program ended on December 31, 2018. LEU exceeded the 5% State Net Energy Metering (NEM) target in January 2017 and the NEM program was closed to new customers. LEU has since implemented a new solar ordinance for customers interested in installing new or expanded solar facilities.
- Electric Vehicles: LEU is a proud partner with the California Municipal Utilities Association, the California Center for Sustainable Energy and the Clean Vehicle Rebate Project in the promotion of PEVs in our community and in California. LEU continues to provide a total of seven free Level 2 charging stations at five municipal parking facilities. LEU also offers customers a discounted EV charging rate.
- Energy Storage: LEU participated in the NCPA/SCPPA joint contract with DNV GL, which provided an updated evaluation of energy storage technologies. After further consideration, LEU did not find energy storage as a viable or cost-effective technology to invest in at this time and has declined to recommend setting energy storage targets.
- Educational Outreach: Lodi LivingWise Program: Provided curriculum to 11 teachers and home energy efficiency "kits" and manuals to 426 6th grade students in Lodi schools; the program is designed to teach the students the basics of energy and water conservation and allows them to install and experience energy efficient devices within their own homes.

City of Lompoc at a Glance

- Climate Zone 5
- Total retail customer connections – 14,925;
Residential – 13,244; Commercial Electric – 1633; Commercial Power & Demand - 48
- Retail sales by customer class – Residential – 54,685,605 kWh;
Commercial Electric –31,426,324 kWh; Commercial Power & Demand –32,446,177 kWh
- The total budget for energy efficiency programs - \$222,000.
- The total amount expended for energy efficiency programs - \$108,632.

Utility Overview

The local climate, demographics and customer base impact the potential savings from energy efficiency programs offered by the Utility. Because the local climate is a cool Mediterranean climate, there is typically no residential air conditioning and limited air conditioning in commercial buildings. Since there is little need for air conditioning in our coastal climate and most buildings are heated by gas, the majority of energy efficiency programs are focused on lighting and refrigeration.

Residential customers make up 89% of the customer base, with an average electric use of 325 kWh per month. Only 11% of the retail customer connections are commercial and demand customers, where the majority of savings opportunities can be found. The demographics also have an impact on the participation rate of energy efficiency programs. The average medium household income in Lompoc is \$46,728 with 20% of the population living in poverty (2016 US Census Quick Facts). Many residential customers have limited funds or incentive to make energy efficiency improvements to their homes, especially if they are renting.

Major Program Changes

In this reporting year, three additional programs were added: 1) Energy Star Clothes Washer Replacement and Recycle program, 2) Energy Star Low-Income Clothes Washer and Recycle program, and 3) Energy Star Dishwasher Replacement program. Because the City also provides water service to its customers, funding for these programs do not come from Public Benefits Charges, but from a Water Retrofit Fund. Because of the drought conditions over the last few years in the local area, programs that save water have been popular and customers are making investments to save both water and electricity.

Program Highlights

Despite the many challenges that affect the potential savings from energy efficiency programs, the City of Lompoc did see a 2% decrease in residential use and a 3% decrease in commercial use from FY 2015-16. The majority of energy efficiency program savings came from the Commercial Lighting Program. Several large retrofit projects took place, including retrofits at a car dealership which included replacing 1000 watt parking lot light fixtures with LED fixtures.

Unfortunately, there are a few challenges to encouraging customers to participate in this program. When surveyed by staff, many commercial customers report that they rent their space and do not have the capital to invest in retrofits and owners are reluctant to make the investments. Another factor that discourages business owners to make lighting retrofits is the requirement to obtain a permit from the City of Lompoc Building Division in order to receive a rebate. Customers comment that the requirement to meet the local building codes and Title 24 Building and Energy Efficiency Standards can be difficult to understand and costly.

The Customer Audit Program continues to be successful in meeting customers' needs. Staff spends a great deal of time working with customers on a personal basis to help them understand their energy use. Because the City has automatic meter reading capability, staff is able to view real-time electric daily use and hourly data which has proven to be helpful. Customers are provided reports of their electric use which can help them better understand their usage and share it with other household members. Many customers are able to implement staff suggestions from the audits and reduce energy use without the need to spend money on energy efficiency retrofits or upgrades.

Program Descriptions

- Buy Back Refrigerator and Freezer Recycle Program - Res Refrigeration: This program provides a rebate to customers who dispose of their extra refrigerator or freezer and recycle it properly at the City of Lompoc Landfill.
- Commercial Lighting Program - Non-Res Lighting: Provides rebates for the installation of energy efficient lighting.
- Commercial Custom Energy Efficiency Program - Non-Res Lighting: Provides a rebate for equipment and lighting retrofits not covered by existing programs.
- Energy Star Dishwasher Replacement Program - Res Dishwasher: This program provides a rebate to customers who purchase an Energy Star dishwasher and recycle their old appliance at the City of Lompoc Landfill. This program is not funded by Public Goods Charges.
- Energy Star Clothes Washer Replacement and Recycle Program - Res Clothes Washer: This program provides a rebate to customers who purchase an Energy Star clothes washer and recycle their old appliance at the City of Lompoc Landfill. This program is not funded by Public Goods Charges.
- Energy Star Refrigerator and Freezer Replacement and Recycle Program – Res Refrigeration: This program provides a rebate to customers who purchase an Energy Star refrigerator or freezer and recycle their old appliance at the City of Lompoc Landfill.
- LED Bulb Rebate Program - Res Lighting: Provides rebates for the purchase of Energy Star LED bulbs.
- LED Holiday Light Rebate Program - Res Lighting: Provides rebates for the purchase of LED Holiday light strands.

- Income Qualifying Energy Star Refrigerator & Recycle Program - Low-Income: In this program, the City helps purchase an Energy Star refrigerator to replace a customer's working primary refrigerator from a participating dealer. The customer must qualify for the Electric Rate Assistance Program and pay a portion of the cost back to the City over a year. Appliances must be recycled at the City of Lompoc Landfill.
- Income Qualifying Energy Star Clothes Washer & Recycle Program - Low-Income: In this program, the City helps purchase an Energy Star clothes washer to replace a customer's working clothes washer from a participating dealer. The customer must qualify for the Electric Rate Assistance Program and pay a portion of the cost back to the City over a year. Appliances must be recycled at the City of Lompoc Landfill. This program is not funded by Public Goods charges.

EM&V

Lompoc's Evaluation Measurement and Verification (EM&V) reports can be found on the NCPA website at <http://www.ncpa.com/policy/reports/emv>. The City will continue to perform EM&V studies in the future.

Sources of Energy Savings

The City of Lompoc generally relies on the Technical Reference Manual (TRM) as the primary source for calculating and reporting annual energy efficiency program performance.

Complimentary Programs

- Low-Income Programs:
 - Electric Rate Assistance: The City provides financial assistance to customers that are below the 2017 Department of Housing and Urban Development (HUD) Low Income Limits Calculation for the local area. The assistance is paid toward their electric usage charge.
 - Income Qualifying Appliance Energy Star Replacement and Recycle Programs: The City helps purchase an Energy Star clothes washer or refrigerator to replace a customer's working appliance from a participating dealer. The customer must qualify for the Electric Rate Assistance Program and pay a portion of the cost back to the City over a year.
- Energy Audits: Residential and commercial phone and onsite audits are available to customers. During the audit, customers are informed about conservation rebate programs and educational opportunities that are available.
- Watt Meter Lending Program: Customers can borrow a watt meter to measure the energy use of appliances and electronics.
- Research, Development, and Demonstration: The City participated in an energy storage potential study through NCPA.
- Electric Vehicles: The City owns 2 electric vehicles and 1 dual port charging station for City vehicles use only. Currently, the City is researching infrastructure upgrades to accommodate electric vehicle charging station energy demand.

- Energy Storage: As of this report, the City has not identified any cost-effective energy storage projects. The City continues to evaluate energy storage opportunities.

LOS ANGELES DEPARTMENT OF WATER AND POWER

Los Angeles Department of Water and Power (LADWP) At A Glance

- Established in 1902 to deliver water to the City of Los Angeles. Electricity distribution began in 1916.
- Climate Zones primarily include CZ6 and CZ9.
- Serves over 4 million people via 1.46 million electric and 676,000 water connections. Nearly 70% of electricity usage is by the commercial/industrial sectors and over 30% by residential customers.
- The Power system supplies more than 26 million megawatt-hours a year. Approximately 22,414 GWh in retail sales were reported for FY 16-17 (8,087 residential, 12,614 commercial, 1,591 industrial, 121 Owens Valley, 130 Street Light)
- A peak demand of 6,502 MW was reached on August 31, 2017.
- Load for the years 2001 to 2012 grew by 0.55. When taking into consideration energy efficiency programs, load growth is forecasted to average 0.3% between 2013 and 2033.
- Budgeted amount for FY 16-17 energy efficiency programs is \$177,779,000.
- FY16-17 total amount actually expended for energy efficiency programs was \$132,692,464

LADWP Overview

LADWP is the largest municipal utility in the nation, and the third largest utility in California. The utility faces significant challenges as it works to comply with environmental and code mandates while maintaining quality delivery of services. Increasing renewable energy to 36% by 2020 and 55% by 2030, the continued rebuilding of coastal generation units, replacement of coal, infrastructure reliability investments, and ramping up energy efficiency and other demand side programs are all critical and concurrent strategic actions that LADWP has to carry out over the coming decade.

As part of its planning process, LADWP has committed to a number of energy efficiency activities to meet regulatory mandates and to meet the City's energy needs, including the following goals:

- Leverage energy efficiency as part of the strategy for eliminating coal from LADWP's energy portfolio
- Achieve an energy efficiency goal of 15% by 2020 which is equivalent to powering about 61,500 homes annually
- Contribute to the City's plan to reduce greenhouse gas emissions by 45% below 1990 levels by 2025, 60% below 1990 levels by 2035, and 80% below 1990 levels by 2050

Major Program Changes

LADWP is continuing with a dramatic ramp-up in energy efficiency investments and results over previous years to meet the City's sustainability goals and align with State legislation. In FY 2016-17, LADWP:

- Increased the annual EE budget to \$178M
- Continued to implement the 8 guiding principles adopted in 2012 to guide this increased investment to ensure equity of access to EE for all customers, leverage this investment for job creation, commitment to transparency, and leverage community groups to reach hard-to-reach customers (guiding principles may be found in the LADWP Portfolio Business Plan)
- Updated the detailed Business Plans for the portfolio that are comparably specific to what the IOUs create for their EE funding requests to the CPUC.
- Continued LADWP's partnership with SoCal Gas to deliver joint programs in order to offer mutual customers electric, gas, and water savings in a "one stop shop".
- Dedicated a significant amount of the EE portfolio budget to Direct Install programs (equipment and installation completely free) to serve LADWP's low- moderate- and fixed-income customers, both residential and non-residential. These include the Home Energy Improvement Program, Commercial Direct Install, and LAUSD Direct Install Program
- Achieved 16% more energy savings in FY 16/17 than in FY 15/16.

Program Highlight

The LADWP Residential Lighting LED Distribution Program had the greatest impact in FY 16/17. LADWP delivered two free LED bulbs to 1.2 million residential customers as part of the city's "Save Energy LA" campaign. The program is expected to result in 1,640 GWh of energy savings and up to \$246 million in customer bill savings over the lifetime of the LED bulbs. Additionally, the avoided cost of producing energy is estimated to be \$146 million, representing a lifetime return on investment for this program to LADWP of almost 10 to 1.

Program Descriptions

➤ **Mass Market Programs**

- Home Energy Improvement Program - Res Comprehensive, Low Income: The Home Energy Improvement Program is a comprehensive direct install whole-house retrofit program that offers residential customers a full suite of free products and services to improve the energy and water efficiency in the home by upgrading/retrofitting the home's envelope and core systems. This program is not limited to low income customers, but priority is given to customers who are in most need of assistance.
- Refrigerator Exchange Program – Res Refrigeration, Low Income: The Refrigerator Exchange Program is a free refrigerator replacement program designed to target customers that qualify on either LADWP's Low-Income or its Senior Citizen/Disability Lifeline Rates as well as Multi-Residential or Non-Profit customers. This Program leverages a 3rd Party Contractor, ARCA (Appliance Recycling Centers of America), to administer the

delivery of the Program and provides energy efficient refrigerators for this customer segment to replace older, inefficient, but operational models.

- Refrigerator Turn-in and Recycle Program – Res Refrigeration: The Refrigerator Turn-in and Recycle Program offers a \$50 rebate, along with free pick-up, to residential customers to turn-in old refrigerators and freezers, for recycling. Eligible units must be fully operational and satisfy certain age and size requirements. LADWP leverages a 3rd Party Contractor, ARCA, to administer the delivery of the Program.
- Consumer Rebate Program – Res Cooling, Shell, Pool Pump: The Consumer Rebate Program (CRP) offers incentives to its residential customers to promote and advance comprehensive energy efficiency measures, including whole house solutions, performance standards and opportunities for integration. CRP is designed to offer and promote specific and comprehensive energy solutions within the residential market sector.
- Energy Upgrade California™ Home Upgrade – Res- Cooling, Heating, Comprehensive, Water Heating, Pool Pump, Shell: The Energy Upgrade California™ Home Upgrade (EUCA) Program is a collaborative effort among California counties, cities, non-profit organizations, the state’s investor-owned utilities, and publicly owned utilities to deliver a California statewide “whole house” residential retrofit energy efficiency program, in which LADWP partners with Southern California Gas Company (SoCalGas). EUCA offers incentives to homeowners who complete selected energy-saving home improvements on single-family residences or 2-4 unit buildings, such as townhouses, condominiums, etc.
- Efficient Product Marketplace - Res Cooling, Electronics, Lighting, Refrigeration: The Efficient Product Marketplace Program provides residential customers the opportunity to research, locate and purchase energy efficient products from a single website. It is a web based service where customers can view a selection of popular energy efficient brands available at numerous stores and online retailers and apply for a rebate electronically.
- HVAC Optimization Program – Res Cooling, Non-Res Cooling: The AC Optimization Program provides services by certified professional HVAC technicians to analyze cooling systems and provide basic maintenance and efficiency services so that HVAC systems can operate at optimal levels.
- Residential Lighting Efficiency Program - Res Lighting: Under this Program, 1.2 million residential customers received two free LED bulbs as part of the City’s “Save Energy LA” campaign.

➤ **Commercial, Industrial, Institutional (CII) Programs Descriptions**

- Commercial Lighting Incentive Program - Non-Res Lighting: The Commercial Lighting Incentive Program (CLIP), launched October 1, 2014, is designed to leverage the previous lighting program successes while offering greater flexibility to lighting projects. This new design is intended to make CLIP as user friendly as possible, streamlining the application and administration process, leveraging participating contractors and the Trade Ally Program, to the degree possible and to capture the maximum energy savings and enhance the customer experience.

- Commercial Direct Install - Non-Res Lighting: The Commercial Direct Install Program is a free direct-install program available to qualifying businesses whose average monthly electrical demand is 250 kilowatts (kW) or less. LADWP is partnering with Southern California Gas Company on this Program to offer a tri-resource efficiency program aiming to reduce the use of electricity, water and natural gas.
- Los Angeles Unified School District Direct Install – Non-Res Lighting: The Los Angeles Unified School District Direct Install Program is designed to improve energy and water efficiency throughout LAUSD’s facilities through upgrades in electric, water and natural gas consuming systems, in partnership with the Southern California Gas Company (SoCalGas). This Program provides energy efficiency design assistance, project management experience and retrofitting installation, utilizing LADWP’s Efficiency Solutions Engineering (ESE) Group engineering and Power Construction Maintenance (PCM) to assist LAUSD facilities in need of aid in reducing energy usage and corresponding utility expenses.
- Savings By Design – Non-Res Comprehensive: The Savings By Design (SBD) Program is a California statewide non-residential new construction program, in which LADWP will partner with Southern California Gas Company (SoCalGas) to offer a uniform, multi-faceted program designed to consistently serve the needs of the commercial building community. SBD encourages energy-efficient building design and construction practices, promoting the efficient use of energy by offering up-front design assistance, owner incentives, design team incentives, and energy design resources.
- Food Service Program - Non-Res Refrigeration, Cooking: LADWP in cooperation with the Southern California Gas Company (SoCalGas®) offers incentives to encourage retrofit measures and technologies to reduce energy consumption in supermarkets, liquor stores, convenience stores, restaurants, etc. Rebates are offered for ovens, griddles, steam cookers, holding cabinets, glass and solid door refrigerators/freezers, ice makers, and kitchen demand ventilation controls.
- Custom Performance Program - Non-Res Cooling, Comprehensive, Motors, Lighting, Refrigeration: The Custom Performance Program (CPP) offers cash incentives for energy saving measures not covered by existing prescriptive programs, such as equipment controls, industrial processes and other innovative energy saving strategies exceeding Title 24 or Industry Standards that are not included in other LADWP non-residential energy efficiency programs. In addition, the Chiller Efficiency Program is now part of the CPP; employing energy modeling using LADWP approved software in calculating energy savings for incentives. Other program offerings include incentives for equipment controls, CO monitoring systems, hotel guest room controls, variable frequency drives, cutting edge high-efficiency lighting technologies, and other innovative strategies.
- California Advanced Home Program - Res Comprehensive: The California Advanced Home Program is an incentive program that utilizes the statewide CAHP through its partner utility, Southern California Gas Company, to incentivize cost-effective energy efficiency upgrades in residential new construction. CAHP targets high density residential new

construction, including single and multi-family high rise buildings, as this is the area with the greatest new construction energy savings potential in LADWP's service territory.

- Upstream HVAC – Non-Res Cooling: The upstream HVAC Program is a market transformation oriented program that offers incentives to upstream market actors who sell qualifying high efficiency HVAC equipment. By increasing the stocking and promotion of high efficiency HVAC equipment, upstream market actors are in a position to impact customers and influence their choice of equipment.

➤ **Cross Cutting Programs Descriptions**

- Codes, Standards & Ordinances - Non-Res Process, Codes and Standards, Non-Res Pumps: The Codes, Standards & Ordinances Program conducts advocacy activities to improve energy and water efficiency of buildings, appliances, and to promote conservation. These activities include monitoring and active participation in code and standard development, legislative review, compliance improvements, sponsorship of local ordinances and participation in policy efforts with other City departments, state agencies, and utilities. The goal of this program is to promote sustainability with regard to water and energy use. Locally, the principal audience includes the LA City Department of Building and Safety, LA City Planning, LA City Department of Public Works, and the LA City Council, which together develop and adopt codes and standards specific to Los Angeles that go beyond state and federal regulation. Other audiences include state agencies, which conduct periodic rulemakings to update energy efficiency and water conservation regulations and standards, and industry groups that conduct research and develop industry specific standards.
- City Plants - Res Cooling, Shell: The Plants Program provides free shade trees for residents and property owners in Los Angeles to promote the planting of trees to improve the city's tree canopy, air quality, storm-water retention and importantly, building energy efficiency. This program is operated by the City Plants team under the City's Board of Public Works and supported by LADWP. Through this partnership, City Plants is able to provide free shade trees for residents and property owners along with educational information on where to plant the trees for maximum energy efficiency benefits. City Plants currently focuses on providing trees for residential customers but also provides trees to commercial customers and plants trees on residential parkways, commercial parkways, and other city property.
- LADWP Facilities Upgrade - Non-Res Comprehensive: The LADWP Facilities Upgrade Program strives to improve energy and water efficiency throughout LADWP's facilities with energy efficiency upgrades in HVAC and lighting and water efficiency upgrades in plumbing fixtures, leak correction and landscaping improvements. It identifies and assists those LADWP facilities to reduce energy and water usage, which will result in a reduction in energy and water consumption and procurement expense for LADWP that would otherwise be borne by LADWP customers.
- Program Outreach & Community Partnerships: The Program Outreach & Community Partnerships Program (Program) is an advocacy program that strives to improve customer

awareness among LADWP’s “hard-to-reach” customers of electric and natural gas energy efficiency and water conservation programs through the activities of community based organizations. Grantees work in one of the fifteen Los Angeles City Council Districts or on an at-large basis to improve community and customer awareness of LADWP’s core energy efficiency and water conservation programs and steps customers can take to reduce energy and water use. Through a competitive selection process, this Program awarded eighteen \$45,000 grants and six \$90,000 grants to local non-profit organizations in FY 2016/17.

Evaluation, Measurement & Verification

Results for the last 3 year-long portfolio evaluation cycle are published on LADWP Website link below:

https://www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB436019&RevisionSelectionMethod=LatestReleased

LADWP has opted to evaluate its programs and activities from a holistic standpoint. Moving forward, LADWP plans to evaluate the energy efficiency market impacts of all the combined efforts of City of Los Angeles (inclusive of LADWP’s efficiency programs). The Market Transformation (MT) evaluation plan was developed during the last evaluation cycle and will be updated on an ongoing basis. The purpose of the MT evaluation is to quantify the incremental energy savings due to various market interventions introduced by the City of Los Angeles as a whole which may include impacts outside of LADWP efficiency incentive programs.

The total budget for EM&V over the 3 year contract period was \$3,705,437 which is equivalent to 0.74% of the total portfolio budget on an annual basis. This budget is planned to be maintained in the coming years as LADWP solicits third party EM&V consultants for another evaluation cycle.

Sources of Energy Savings

All Deemed measures are taken from IOU workpapers as reviewed and vetted through the California Technical Forum. All remaining programs use custom calculations for savings estimates. A small number of programs that have not made any changes since the last evaluation cycle have adjusted savings claims by applying the reported realization rates.

Complementary Programs

- Low-Income Programs:
 - Refrigerator Exchange Program and Home Energy Improvement Program (described above).
- Renewable Energy Programs
 - Solar Incentive Program (SIP): The Solar Incentive Program offers incentives to offset the cost of installing a solar rooftop system on your home or business. LADWP has been helping our customers to go solar since 1999. In September 2007, the LADWP revised its earlier SIP guidelines to comply with Senate Bill 1

(SB 1), the California Solar Initiative. Under this legislation, the LADWP has committed to providing \$313 million to support solar photovoltaic (PV) projects over 10 years—through 2016—with a goal of achieving 280 megawatts (MW) of solar PV by the end of that period.

- Green Power for a Green L.A. Program: The Green Power for a Green L.A. Program gives Los Angeles residents, businesses, and governmental agencies a stake in helping to preserve and protect our environment through their voluntary contribution to support additional renewable energy. Customers who sign up for Green Power choose to have all, or a portion, of their electricity needs generated from renewable energy sources.
- Research, Development, and Demonstration:
 - LADWP is currently developing a Distributed Energy Resource (DER) Pilot to assess grid impacts for various DER technologies inclusive of efficiency measures, battery storage, solar PV generation, demand response compatible smart devices.
 - LADWP is key participant in the statewide Codes and Standards Advocacy group and has contributed funding for CASE studies and code updates.
 - LADWP is key participant in the Emerging Technologies Coordinating Council that help advance emerging technologies from development to commercialization through assessment of potential utility incentive programs to buy down initial costs.
- Electric Vehicles
 - Electric Vehicle Charger Rebate Program: The LADWP “Charge Up L.A.!” Electric Vehicle Program is designed to encourage the installation of convenient electric vehicle (EV) charging stations at residential and commercial locations to support the purchase and use of EVs. This program benefits the environment and helps EV users save on fuel costs at the same time. The rebate is offered to qualifying commercial customers who purchase and install Level 2 (240-volt) chargers at their place of business for employees and public use. Commercial customers can receive up to \$4,000 for hardwired wall or pedestal mounted or EV chargers. One (1) EV charger rebate is available to commercial customers who have a minimum of three (3) parking spaces available to employees, customers, visitors, and/or tenants. One (1) additional EV charger rebate is available for each additional 10 parking spaces. Residential customers can receive a rebate of up to \$500. Customers who choose to install an optional dedicated time-of-use (TOU) meter will qualify for the LADWP’s EV discount of 2.5 cents per kilowatt-hour (kWh), plus receive an additional \$250 rebate. This dedicated TOU service will add additional cost to the installation process but will yield lower electricity costs for off peak charging.
 - Plug Into Power Poles: In a pilot program to expand EV infrastructure citywide, LADWP installed the city’s first utility-mounted EV chargers. Unlike EV chargers that connect to underground electric lines, the pole EV chargers require no additional street work other than connecting and charging equipment to the existing wires on the power poles.

- LADWP EV Fleet: LADWP operates one of the largest plug-in fleets in the city with 114 plug-in hybrid sedans and plug-in hybrid bucket trucks and digger derrick trucks. The ongoing effort will result in a total of 371 electric hybrid vehicles in LADWP's fleet, which translates to about one million pounds of CO2 avoided annually.
- Energy Storage: Los Angeles is already a leader in energy storage thanks to the LADWP Castaic Pumped-Storage Plant that provides more than 1,500 MW of energy storage. LADWP continues to invest in environmental stewardship and superior reliability by:
 - Upgrading the Castaic Pumped-Storage Plant to accommodate intermittent renewable energy sources
 - Piloting multiple energy storage projects that involve thermal energy storage, battery storage/microgrid, technology for dispatchable and customer-side storage
 - Work with City agencies to streamline permitting and interconnection process for residential energy-storage projects

According to the Los Angeles City pLAN, the long-term goal is to increase the cumulative total MW of energy storage capacity to at least 1,654 MW by 2025.

MERCED IRRIGATION DISTRICT

Merced Irrigation District At a Glance

- For more than 75 years, the Merced Irrigation District (MID) has been in the business of generating wholesale electrical power.
- MID provides retail electric service to approximately 8,500 customers.
- MID budgeted \$375,000 for energy efficiency rebates, allocated between commercial, industrial, agricultural, and residential customers.

Merced Irrigation District Overview

Merced Irrigation District is located in Merced County. Merced County has been significantly impacted by the economy. We have seen a significant decline in the number of customers investing in energy efficiency projects.

Major Program Changes

A large percentage of our energy efficiency savings have traditionally come from our large industrial customers. Those customers only make up approximately 15% of our customer base.

Current programs are being evaluated and will completely revised.

Program Descriptions

- **Commercial/Industrial Lighting Program:** The Commercial Lighting Program is a turnkey lighting retrofit rebate program with a financial rebate menu for energy saving lighting equipment retrofits. The menu includes generous rebates for the replacement of T-12 lamps, Metal Halide Fixtures, Incandescent Lighting, and Exit Signs. The program also provides rebates for the addition of lighting controls including Photocells and Occupancy Sensors. We currently offer rebates for LED upgrades under our Customized Retrofit Program.
- **Commercial/Industrial Mechanical Equipment Program:** The Commercial/Industrial Retrofit Program is a turnkey mechanical equipment rebate program with a financial rebate menu for energy saving mechanical equipment retrofits. The menu includes generous rebates for the replacement of mechanical equipment with more energy efficiency equipment including: Refrigeration Equipment, Air Conditioning Equipment, Chillers, Motors, and Pumps. The program also provides rebates for Variable Frequency Drives on pumps, motors, and fans. Rebates are also available for Cooling Load Reduction measures to include Duct Sealing, Cool Roofs, Window Film, and Programmable Thermostats.
- **Customized Commercial/Industrial Retrofit Program:** The Customized/Industrial Retrofit Program enables qualifying commercial and industrial customers to apply for financial incentives on more specialized and comprehensive energy saving measures that do not fall under the Commercial Lighting Program or the Mechanical Equipment Retrofit Program. Applications for this program are evaluated and approved on an individual per application basis. Financial incentives for qualifying customer projects are paid for annual kilowatt hour savings in a one year period on approved projects.

- **Residential Rebate Program:** This program encourages residential customers to purchase EnergyStar® labeled products, home appliances and energy-efficient compact fluorescent light bulbs. We also offer customers rebates for upgrading their HVAC systems.

EM&V

Merced Irrigation District partnered with Modesto and Turlock into one evaluation effort for EM&V. The three Irrigation Districts of Modesto, Turlock, and Merced (MTM) are located in California's central valley near one another and each offer similar DSM programs.

Complimentary Programs

- **Residential Energy Assistance Program (CARE):** Since 2000, MID has been providing a 20 percent discount on monthly energy bills for Low-Income Families, and the Medical Baseline and Life-Support Program for those who depend on electrically powered medical equipment.

MODESTO IRRIGATION DISTRICT

Modesto Irrigation District At a Glance

- Climate Zone 12 (entire service area)
- 121,000 active retail customer/service connections (approx.)
- Annual total retail sales by customer class are: 34% residential, 29% commercial, 32% industrial, 4% agricultural and pumping, 1% other (based on 2016 GWH)
- \$5.0 million annual total budget for energy efficiency programs (including EM&V, admin/overhead, incentives)
- \$2.73 million annual total amount actually expended for energy efficiency programs

Modesto Irrigation District Overview

MID electric sales have remained essentially “flat” over the past decade. The last major increase in energy sales occurred in 2006 (+3%) and significant reductions occurred in the recession years of 2009 and 2010 (-3% and -4%, respectively). On the capacity side, MID hit an all-time system peak in 2017 of 696 MW (uncontrolled). Load growth for 2017 was +1.4% (based on Total System Input GWH). Clearly, the economy in the central valley continues to affect MID and its customers, which in turn impacts EE program participation and results.

Another trend in the MID service area is a significant installation of leased solar systems, which require little or no out-of-pocket cost for the homeowner. The customer motivation for installing these systems includes high utility rates and the perceived certainty of reduced future electric bills. Installation of these systems has reduced system load growth and may also dampen residential customer interest in pursuing EE projects.

Major Program Changes

MID made no major changes to its EE programs in 2017, primarily due to implementing the replacement of its electric billing, meter data management and EE program tracking systems. Go-live on the new systems occurred in early September.

Program Highlight

Customers residing in mobile homes offer unique opportunities as manufactured homes in general create challenges for typical energy efficiency upgrades. MID created a pilot turnkey energy efficiency program that is specially designed for customers in manufactured homes. The program creates a one-stop shop for the install of specific energy efficiency measures and provides an in-home assessment and qualification for other utility (gas) weatherization and assistance programs. The customer response to this program has been overwhelming positive and will likely be considered again in 2018.

Program Descriptions

MID offers incentive programs that cover a wide variety of energy efficiency measures. The common theme for these programs is for customers to be MPowered. The correlation between

these program offerings and the sector-category classifications used in the summary table of the E3 Reporting Tool are shown in the following table:

Program Sector	Category	Corresponding MID Program(s) Offered*
Appliances	Res Clothes Washers	Mpower Home
Behavior	Res Behavior	NA
Comprehensive	Res Comprehensive	NA
HVAC	Res Cooling	Mpower Home & Weatherization
Appliances	Res Dishwashers	NA
Consumer Electronics	Res Electronics	Weatherization (<i>Microwave Oven</i>)
HVAC	Res Heating	Mpower Home (<i>Heat Pump</i>)
Lighting	Res Lighting	Mpower Home & Weatherization
Pool Pump	Res Pool Pump	Mpower Home
Refrigeration	Res Refrigeration	Mpower Home & Weatherization
HVAC	Res Shell	Mpower Home & Weatherization
Water Heating	Res Water Heating	Mpower Home & Weatherization
Behavior	Non-Res Behavior	NA
Comprehensive	Non-Res Comprehensive	Mpower Business: New Construction
Process	Non-Res Cooking	Mpower Business: Custom
HVAC	Non-Res Cooling	Mpower Business: Express & Custom
HVAC	Non-Res Heating	Mpower Business: Express & Custom (<i>Heat Pump</i>)
Lighting	Non-Res Lighting	Mpower Business: Express, Custom & New Construction
Process	Non-Res Motors	NA
Process	Non-Res Process	Mpower Business: Custom & New Construction
Process	Non-Res Pumps	Mpower Business: Custom
Refrigeration	Non-Res Refrigeration	Mpower Business: Express & Custom
HVAC	Non-Res Shell	Mpower Business: Custom & New Construction
Water Heating	Non-Res Water Heating	NA
Multifamily	Multifamily	Weatherization
BROs	BROs	NA
Other	Other	Mpower Business: Custom & New Construction

* see MID website (www.mid.org) for program details

EM&V

MID continued its ongoing efforts to obtain independent, third-party review of its EE programs. To that end, MID hired Power Services, Inc. (CMVP qualified) to perform M&V on selected 2017 projects - in conjunction with the rebate review and approval process - which included lighting, process and refrigeration. In 2017, preliminary steps were taken to hire Anchor Blue Consulting to conduct EM&V on the 2016 & 2017 EE programs. MID's annual budget for EM&V work is \$75,000 and completed studies can be found at: <http://www.ncpa.com/policy/reports/emv>

Sources of Energy Savings

MID offers two types of rebates: express and performance, which are based on deemed and calculated savings, respectively. The deemed savings for the express rebates are based on a combination of TRM, KEMA, DEER and IOU work paper data. The calculated savings for the performance rebates are based on ex-anti and ex-post data from the specific project.

Complimentary Programs

- **Low-Income Programs:** MID's low income programs are comprised of weatherization, CARE rate discount and educational outreach. Energy savings from the weatherization program are included in the results for the SB1037 report. Customer demand for weatherization exceeds the annual amount budgeted and the rate discount alone represents a substantial portion of the total public benefits funding allocation. However, MID continues to facilitate new partnerships with other organizations and agencies to increase its outreach and provide additional weatherization services to low-income customers.
- **Renewable Energy Programs:** MID's renewable energy programs are no longer funded from public benefits. Rather, they are conducted in accord with subsequent legislative or regulatory mandates, such as the Renewable Portfolio Standard (RPS) and the California Solar Initiative (CSI/SB1). To date, MID has procured enough renewable energy to satisfy the renewable energy trajectory that was established by the CEC for the three compliance periods through 2020, and recently executed two additional renewable energy contracts that will help MID meet compliance through 2025. MID continues to consider its options for meeting the remaining targets through 2030.
- **Research, Development, and Demonstration:** MID remains open to partner with other utilities or agencies in opportunities to leverage the limited funding it can allocate to this program area.
- **Electric Vehicles:** No utility program at this time.
- **Energy Storage:** In 2014, the MID board of directors adopted a policy determining that energy storage targets are not appropriate for MID. The board subsequently reviewed that policy and adopted a policy update confirming the previous determination that energy storage targets are not appropriate for MID. The district continues to evaluate the energy storage benefits that are applicable to the MID system and will consider updating this policy if warranted by operational and/or economic needs.

MORENO VALLEY UTILITY (MVU)

Moreno Valley Utility (MVU) At a Glance

- Climate Zone: 10
- Number of retail customer connections: approximately 6200
- Annual total retail sales by customer class: 39.2GWh residential, 157.7GWh commercial & industrial
- Annual total budget for energy efficiency programs: \$490,000
- Annual total amount actually expended for energy efficiency programs: \$120,000

Moreno Valley Utility (MVU) Overview

Moreno Valley Electric Utility, municipally owned, began serving its first customers on February 6, 2004. These “first customers” are located in the Promontory Park subdivision built by Western Pacific Housing, located at Cactus Avenue and Moreno Beach Drive. Since then, MVU has witnessed significant load growth with last year peaking at just under 50 megawatts on August 28th, 2017.

Although MVU met its Senate Bill 1 (SB1) goals in 2012 and ended solar rebates in 2016 both residents and businesses continue to express interest in solar. Local solar installers have effectively engaged MVU customers to install new solar, often maximizing the system size without offering cost-effective energy efficiency as a viable option. MVU is also seeing an uptick in customers adding additional panels to an existing rooftop solar system. New communities are being developed with solar pre-installed and MVU expects to process over 600 new home interconnections over the next few years.

Smart Meters are being deployed as part of a three-year replacement program to support high penetration of Distributed Energy Resources (DER). A new web-based customer portal and mobile application is nearly ready to be launched into production. MVU is increasing marketing efforts by providing quarterly newsletters, attending local events and by partnering with local agencies, including the City and Chamber of Commerce, to promote its utility service offerings.

Major Program Changes

Energy efficiency programs are relatively new at MVU so no major program changes were made last year. A couple of large commercial customers were expected to complete lighting retrofits however due to the capital approval process and their business cycles the projects were delayed.

Program Highlight

The commercial lighting program continues to be the favorite and most successful energy efficiency program at MVU, despite lower participation levels this reporting year.

MVU partnered with LivingWise (and SoCalGas) to provide elementary students and their parents an educational program. In addition, energy efficient literature and home activities led to dramatic energy, water and gas savings.

Program Descriptions

MVU offers many rebate programs to residential and commercial/industrial customers, only descriptions of the most popular are listed:

- Lighting Retrofits – Non-Res Lighting: rebates are available to commercial customers for LED lighting retrofits, other energy efficient lighting replacements, and for LED or photo-luminescent exit signs.
- Commercial Energy Efficiency Program – Non-Res Comprehensive: this Direct Install program provides small to medium-sized customers with an onsite energy audit and energy saving measures at no cost to the customer.
- Commercial Heating, Ventilation and Air Conditioning (HVAC) Retrofits – Non-Res Cooling: customers that install new high SEER HVAC units or replace older inefficient units can participate in this rebate program. The installation of new chillers that exceed Title 24 requirements or load-shifting Thermal Energy Storage (TES) systems may also qualify for rebates.
- Motor Replacements – Non-Res Motors: commercial customers that install premium efficiency motors are eligible for rebates under this program. Motors covered under this program must be new, three-phase induction motors (1hp to 200hp in size) and operate for at least 2,000 hours per year.
- New Construction and Major Tenant Renovation – Non-Res Shell: this program offers incentives for projects exceeding Title 24 by at least ten percent. Eligible customers are responsible for providing documentation of energy savings using energy modeling software and all calculations must be signed by a licensed mechanical engineer.
- Outreach Programs – Non-Res Behavior: the utility contracts with Automated Energy to provide the largest commercial customers with detailed energy usage information to help efficiently manage their energy consumption and evaluate potential energy efficiency projects.
- Residential Energy Audit & Direct Install – Res Comprehensive: this program targets very high energy use customers and participants in our Low Income Program. The program provides eligible residential customers with a full in-home energy audit and specific recommendations for their home plus a fixed set of maintenance and upgrades at no cost to the customer.
- Energy Star Appliance Rebates – Res Clothes Washers/Dishwashers/Etc.: customers who purchase Energy Star Qualified appliances can apply for a fixed rebate amount under this program.

EM&V

Engineering analysis programs such as DOE-2 are the basis for calculated energy savings and incentive calculations. MVU requires both pre-inspections and post-inspections for all projects that result in a commercial rebate over \$5000. The utility uses a third-party consultant to verify energy savings for complex projects and custom measures when necessary. As energy efficiency programs evolve and participation levels increase MVU will contract with one of the SCPPA-preferred EM&V service providers to create a plan.

Sources of Energy Savings

MVU relied primarily on the TRM values from the E3 model but also used reported energy savings from trusted engineering contractors to calculate program performance.

- Commercial Codes & Standards – MVU has recorded its share of the energy savings that are attributable to the State’s Building Codes and Appliance Standards (Title-24) that are applied and enforced by the City of Moreno Valley.

Complimentary Programs

- Low-Income Programs: MVU’s Energy Bill Assistance Program provides income-qualified residents with a 12% or 20% discount on monthly energy charges; this year’s expenditures were over \$46,000.
- Energy Storage: Battery storage is included in the City Hall solar carport project. There have been a few proposals by commercial customers to
- Demand Response: MVU continues to maintain and operate 15 commercial Ice Bear units on both city and customer facilities. The utility also benefits from a partnership with Ecobee providing smart thermostats for the summer demand response program.
- Research, Development, and Demonstration: Support for transportation electrification is becoming a priority for MVU so funding will be available for research and demonstration projects. As part of the solar carport at City Hall a 75kW/180kWh battery storage system will be installed as a demonstration with a kiosk in the lobby.
- Electric Vehicles: Compliments of a SCAQMD grant, this year additional utility-owned charging stations were added to City Hall for workplace and visitor charging. This includes an EVgo fast charger and 2 ChargePoint stations with 4 ports. MVU is starting to experience increased interest and activity both for workplace charging and home charging. MVU will select a third-party vendor later this year to help develop a transportation electrification strategy.
- Energy Storage: Battery storage is included in the City Hall solar carport project. There have been a few proposals by commercial customers to include battery storage with new solar installations but none have actually been installed. There is one residential Tesla Powerwall going through the permit and installation process. In the future MVU expects greater interest and activity in battery installations as prices fall.

CITY OF PALO ALTO UTILITIES

City of Palo Alto Utilities at a Glance

- Climate Zone(s): 4
- Number of retail electric customer connections: 29,615
- FY 2017 total retail electric sales by customer class:
 - Residential: 19%
 - Commercial: 64%
 - Industrial: 17%
- FY 2017 total budget for electric efficiency programs (including EM&V, admin/overhead, incentives and carryforward from the previous year): \$6.33 million
- FY 2017 total amount actually expended for electric efficiency programs: \$3.04 million

City of Palo Alto Utilities Overview

The City of Palo Alto Utilities (CPAU) has implemented a variety of energy efficiency programs since the 1970s. In 1998, in response to California's landmark energy legislation (AB 1890), CPAU established the Electric Public Benefits (PB) Program and increased the Electric PB program budget to 2.85 percent of projected annual revenue in order to fund energy efficiency programs. CPAU's electric efficiency program budget can be supplemented with supply funds in order to meet state requirements that publicly owned electric utilities, in procuring energy, first acquire all available energy efficiency and demand reduction resources that are cost effective, reliable and feasible. CPAU is committed to supporting environmental sustainability through promoting efficiency programs, promoting distributed renewable generation and influencing consumer demand through incentives and education. In March 2013, Palo Alto City Council approved a Carbon Neutral Electric Resource Plan, committing CPAU to a carbon-neutral electric portfolio beginning in 2013. CPAU reports the Net Annual Energy Savings in this report.

Major Program Changes

FY 2017 saw a major update to the promotional materials for all efficiency programs at CPAU. Staff began working with a marketing consultant to upgrade the marketing materials for all programs – including a full website migration. This effort required substantial staff time and a significantly-increased marketing contract. CPAU also began work to claim the savings associated with the development of Palo Alto's building reach code, the Green Building Ordinance. The multi-family direct-install program was expanded to include LED lighting measures and received additional budget, which led the reported savings to increase by more than 950% over FY 2016. The City's low-income program also added LED lighting measures and had its budget increased, which led the reported savings to increase by 430%. Finally, CPAU crafted a new requirement, which went into effect in FY 2018, for commercial retrocommissioning projects to include additional persistence procedures. This new requirement ensures that the savings persistence for these projects will increase from one year to three years.

Program Highlights

The **Commercial and Industrial Energy Efficiency Program** is the flagship of CPAU's commercial portfolio. With three engineering firms working closely with Key Accounts, this program is where Palo Alto sees the bulk of its energy savings. The consultants assist customers with audits, engineering studies, vendor selection, rebate processing and post-installation inspection. They make the process as easy as possible for the customer. CPAU implemented this program design into the residential market with the **Home Efficiency Genie** as "Your Trusted Energy Advisor", and have begun seeing increased engagement with residents. CPAU began an **EV Charger Rebate Program** in late FY 2017, using funds from the Low Carbon Fuel Standard, and staff has been working with a variety of organizations to help them participate over the next year. FY 2017 was the first full year for the **Heat Pump Water Program**, and CPAU promoted the program by holding a workshop, smoothing the permit process and expanding eligibility to new construction projects.

Program Descriptions

Commercial Programs:

- **Commercial Advantage Program (CAP):** Incentives are offered to commercial customers for investments in efficiency, lighting, motors, HVAC and custom projects that target gas, peak demand and energy reductions. In FY 2017, CAP recorded net annual electric savings of 834,797 kWh.
- **Commercial and Industrial Energy Efficiency Program (CIEEP):** This program offers Key Accounts the option of picking one of three engineering consulting firms to assist in helping them evaluate and implement energy efficiency projects. In FY 2017, CIEEP recorded net annual electric savings of 1,764,552 kWh.
- **Empower Small and Medium Business (SMB):** This is an ongoing program focusing on energy efficiency savings from mostly lighting retrofits in the small and medium commercial sector. In FY 2017, Empower recorded net annual electric savings of 215,354 kWh.
- **Business New Construction (BNC):** This program ended in FY 2016 due to the more stringent Title 24 requirements and the Palo Alto Green Building Ordinance ($\geq 10\%$ more efficient than Title 24), which made finding savings above the local code very difficult. Although the program is closed, there are some customers with projects that are still awaiting completion. Measure costs for this program are provided as incremental costs for the more efficient equipment. During FY 2017, BNC recorded a net annual electric savings of 184,491 kWh.

Residential Programs:

- **Multi-Family Plus:** This program provides no-cost, direct installation of energy efficiency (EE) measures to multi-family residences with four or more units including hospices, care centers, rehab facilities and select small and medium commercial properties. These properties are typically very difficult to engage and unlikely to institute EE measures on their own. The program was started in FY 2006, but was recently revamped to include more LED lighting upgrades as the price of LEDs has decreased and the quality of the lights has greatly improved. In FY 2017, the Multi-Family Plus program recorded net annual electric savings of 1,120,202 kWh. The new LED lighting measures led to an increase in savings of 960%.

- **Home Efficiency Genie:** The Home Efficiency Genie is CPAU's flagship residential program. Launched in June 2015, residents can call the 'Genie' to get free utility bill reviews and phone consultations. This program has a high educational value for Palo Alto residents and offers personalized consultation services for all utilities related questions, including measures such as rooftop solar and newer technologies like electric vehicles (EVs) and EV chargers, energy storage, heat pump technologies, smart home devices and carbon-reducing tactics such as electrification. At a highly-subsidized cost, residents have the option to receive an in-depth home assessment which includes air leakage testing, duct inspections, insulation analysis, energy modeling and a one-on-one review of assessment reports with an energy expert. This package is followed up with guidance and support throughout home improvement projects. During FY 2017, the Home Efficiency Genie program had net annual electric savings of 8,000 kWh that were directly attributable, while the ongoing energy education also likely led to substantial savings that are not being claimed.
- **Smart Energy:** This is an energy efficiency incentive program for residential customers. The City gives rebates to residents who install energy efficient measures and equipment in their homes. Among these are attic insulation, heat pump water heaters, pool pumps, smart power strips and whole-house fans. Due to federal minimum manufacturing standards for appliance efficiency, the number of appliances meeting rebate qualifying standards dropped significantly during FY 2016. In FY 2017, Smart Energy achieved net annual electric savings of 7,271 kWh.
- **Residential Energy Assistance Program (REAP):** This program provides weatherization and equipment replacement services to low-income residents and those with certain medical conditions, with no cost to the residents. This program has an equal focus on efficiency and comfort, and therefore is not meant to be cost-effective. With the addition of LED lighting upgrades to the list of measures in FY 2017, REAP recorded net annual electric savings of 121,543 kWh, an increase of 430% from the previous year.
- **Home Energy Report:** CPAU stopped providing residents with individualized reports, which compared their home energy use with neighbors in similarly sized homes, in FY 2016. However, based on the results of behavior studies on Home Energy Reports, savings persist with a decay rate of 20% per year for 5 years after the program has ended. In FY 2017, the Home Energy Report recorded second year persistence annual electric savings of 1,026,734 kWh.

Codes and Standards:

- **Green Building Ordinance:** CPAU helped the City of Palo Alto develop a building reach code that is more stringent than the state Title 24 standard. This ordinance applies to both residential and commercial buildings. The savings associated with this effort have not previously been claimed by CPAU, so efforts were undertaken in FY 2017 to develop a methodology for claiming these savings now and in the future. In FY 2017, 703,546 kWh of savings were achieved by the building code – a number which is expected to markedly increase in future years as the City's process for recording savings from the code is improved. CPAU continues to choose not to participate in claiming savings from state-level codes and standards development.

Evaluation, Measurement & Verification

For FY 2017, CPAU contracted with TRC Engineers, Inc. to undertake impact and process evaluation for the Commercial Advantage Program, CIEEP (BASE & Ecology Action), Multi-Family Plus Program and the Home Energy Report Program. The budget for this work is \$128,036. A final EM&V report is expected to be available by the end of March 2018.

Sources of Energy Savings

The energy savings data used for almost all of CPAU's programs were taken from the 2016 Technical Resources Manual. Some programs had savings determined by a consultant or other data sources. All savings data claimed by CPAU was vetted by staff and relies on highly-conservative assumptions.

Complimentary Programs

Community Resource Education Programs:

- CPAU offers free **energy efficiency advice** and **energy education programs** to the community. Activities include hosting Facility Manager Meetings for Key Account customers, residential energy workshops on topics like the SunShares program or Heat Pump Water Heaters, neighborhood association events, local fairs and special events.
- In April 2014, CPAU announced its intent to compete for the **Georgetown University Energy Prize**, a national competition that aimed to challenge communities across the U.S. to dramatically rethink their energy use. On January 14, 2015, CPAU was selected as one of the 50 communities in the U.S. leading the way on energy efficiency. During this competition, CPAU developed an online energy portal and worked closely with students and Cool Block participants to promote City programs and continue to save energy. The competition stretched over a two year period, ending December 2016, with a \$5 million prize to be awarded to the winner of the competition. CPAU ranked as the twelfth most efficient community at the end of this contest. In April of 2017, Georgetown sent out a message describing the prize package as including the opportunity to secure \$5 million in financing rather than a \$5 million cash prize.

Low-Income Program:

- **Rate Assistance Program (RAP):** CPAU offers a 25% discount on gas and/or electricity charges for residents with qualifying financial or medical needs. All households receiving Social Security Income, Temporary Assistance to Needy Families or Food Stamps automatically qualify for this rate discount. This program began in FY 1993.

Public School Program:

- CPAU provides an **annual grant** of up to \$50,000 to the Palo Alto Unified School District (17 schools with 12,000 students total) to support teacher training programs and the development of curriculums and education projects promoting renewable energy and energy and water

efficiency. CPAU participates in quarterly sustainable schools committee meetings and gives educational presentations to classes on energy efficiency, renewable energy and safety.

Customer-Side Renewable Energy:

- **Solar Water Heating Program:** CPAU offers rebates to residential and commercial customers who install qualifying solar water heating (SWH) systems. The program is governed by state law in regard to development, implementation and administration.
- **The PV Partners Program:** This program provided rebates to customers who installed solar photovoltaic (PV) systems. Rebate funds were fully reserved in April 2016. The last PV installations are expected to be constructed by April 2018.
- **SunShares Solar Discount Programs:** Palo Alto has participated in regional group-buy solar programs in 2015, 2016 and 2017. These programs are administered by a non-profit agency and offer discounted prices for residential solar PV systems from a few pre-qualified contractors. The Peninsula SunShares program was offered to residents in 2015 (May through August) and resulted in 54 new solar PV installations in Palo Alto for a total of 236 kW. The Bay Area SunShares was offered in 2016 (August to November) and resulted in 5 new solar PV installations in Palo Alto for a total of 28 kW. The Bay Area SunShares was offered again in 2017 (August to November) and resulted in 29 new solar PV installations in Palo Alto for a total of 157 kW. The 2017 program was expanded to include 9 Bay Area counties and Palo Alto was the top “Outreach Partner” both in terms of number of solar contracts signed and kW of rooftop solar capacity that will be installed through the program. Palo Alto’s share accounted for 14.5% of the program’s total contracted solar capacity.

Sustainability:

- **EV Chargers:** Palo Alto began offering rebates focused on hard to reach customers in March 2017 for Electric Vehicle Charging Stations installed at schools, multi-family complexes and non-profit buildings with common area charging accommodations using funds from Low Carbon Fuel Standard (LCFS) Credits. Rebates up to \$30,000 are available for schools and non-profits and up to \$18,000 are available for multi-family and mixed-use buildings. In FY 2017, CPAU paid EV charger rebates out to two organizations. Staff has been working with a number of multi-family complexes and non-profits and expects participation to be much more robust in FY 2018. The City has also used LCFS funds to host two EV ride-and-drive events.
- **Heat Pump Water Heater Pilot:** The City launched a Heat Pump Water Heater (HPWH) pilot program in late spring 2016 to encourage residents to replace their gas water heaters with efficient HPWHs. The program’s website provides information such as rebate levels (up to \$1,500), qualifying models (that meet the minimum efficiency standard required by the California Energy Commission) and installation considerations. With collaboration between Development Center and Utilities, the City developed a permit submittal checklist for installing an HPWH. In May 2017, the program was expanded to include lower rebates for new construction projects, and the City co-hosted a HPWH workshop for professionals with Passive House California.

Utility-Interconnected Renewable Generation in Palo Alto:

- **Palo Alto CLEAN:** The CLEAN (Clean Local Energy Accessible Now) program offers a feed-in tariff for any-sized renewable generation systems installed on the utility-side of the electric meter where all of the generated electricity is procured for use in Palo Alto's Renewable Portfolio Standard (RPS). CPAU has accepted applications for six systems for a total of 2.915 MW. For fiscal year 2017, the available prices were 16.5 ¢/kWh fixed for 15, 20 or 25 years for solar renewable energy resources, up to a capacity limit of 3 MW (and 8.8 ¢/kWh for a 15-year contract term, 8.9 ¢/kWh for a 20-year contract term or 9.1 ¢/kWh for a 25-year contract term beyond that limit), and 8.3 ¢/kWh for a 15-year contract term, 8.4 ¢/kWh for a 20-year contract term and 8.5 ¢/kWh for a 25-year contract term for non-solar eligible renewable energy resources.
- **Community Solar Program:** CPAU is currently assessing a community solar program, which will enable CPAU's customers who don't have the access to install PV on their building to buy or lease solar panels in a centralized solar PV array and receive regular credits for the solar generation on their utility bill.
- **PaloAltoGreen:** This program was launched on Earth Day in 2003 to give customers the option to voluntarily reduce greenhouse gas emissions associated with their electricity use. Participants paid an additional charge per kWh to cover the purchase of Renewable Energy Certificates (RECs) so that their electric use was supplied with 100% renewable energy. As of June 2014, the residential program was closed because the City's electric supply became 100% carbon neutral. PaloAltoGreen is still available for commercial customers who wish to be recognized under the U.S. EPA Green Power Leadership program or to earn Leadership in Energy and Environmental Design (LEED) Green Power credits.

Customer Connect Pilot Program and AMI Implementation:

- The 5-year **Customer Connect** pilot program that began in 2013 uses advanced electric, gas and water meters and related systems (known as Advanced Metering Infrastructure, or AMI) to help residential customers evaluate changes in their energy and water use and view their consumption through an online portal. This program has approximately 400 participating customers, of which 96 have enrolled in the pilot Time-of-Use electricity rate. Enrolled customers are able to save money by shifting electric usage to off-peak hours. The pilot also offers water leak-detection capability, and has detected over 200 leaks at customer premises. Staff communicated with customers to resolve the leaks on over a quarter of these incidents, saving them money and thousands of gallons of water. The 5-year pilot phase ended in December 2017, but the advanced customer meters, networks and customer portals are expected to be maintained through 2022. By that date, CPAU plans to roll out an AMI system for all utility customers so that the community can more effectively manage its consumption.

Program for Emerging Technologies (PET):

- CPAU's **Program for Emerging Technologies** program provides the opportunity for local businesses to submit proposals to CPAU for review and potential pilot testing. The goal is to

find and nurture creative products and services that will manage and better use electricity, gas, water and fiber optic services. From its inception in June 2012 through July 2017, the PET program has received 67 applications. PET pilot programs from FY 2017 include:

- Intelligent lighting platform for LED streetlights
- Off-the-shelf, do-it-yourself, pre-packaged PV system for residential and small commercial applications
- Thermal microgrids: fossil-fuel-free district energy systems that utilize heat recovery and renewable energy products

Commercially-Focused Programs:

- CPAU's **Demand Response** (DR) pilot program offers incentives to large commercial customers to voluntarily reduce their electricity use during periods of high demand in the summer months. In the past three years, 0.63 MW (2015), 0.24 MW (2016) and 0.28 MW (2017) of load were reduced during the annual peak demand hour. This program has become an integral part of CPAU's effort to lower both CPAU electricity purchase costs and customer bills. Reducing peak electricity use also enables utilities and generators throughout the state to reduce the amount of electricity generated from resources that are less efficient and emit more pollution.
- **Commercial Benchmarking:** This pilot program with GreenTraks, Inc. was implemented to assist 19 businesses with using the US EPA's Portfolio Manager online energy management tool. Each building is benchmarked against similar buildings based on its energy usage using an Energy Star rating of 1 to 100. The goal of the pilot is to help a mixture of small, medium and large commercial customers benchmark their building and determine the best ways to remove barriers and encourage more customers to use Portfolio Manager. This pilot program was also helpful in preparing Utility staff for AB 802 implementation.

FY 2017 EE Program Sector Results

Please note that the reported savings and incentives are for work completed in FY 2017, while the budget and contract costs are for work invoiced in FY 2017.

PASADENA WATER & POWER

Pasadena Water & Power At a Glance

- Climate Zone 9
- Number of retail customer connections: 65,984
- Retail Sales: 1,054.3 GWh (\$175.5 million)
 - Residential connections: 57,331 (30.4% of retail energy sold)
 - Commercial and Industrial connections: 8,648 (68.3% of retail energy sold)
 - Other: 1.3% of retail energy sold
- Over the ten-year period from FY2008 through FY2017, the cumulative annual impact of PWP's energy efficiency programs has reached over 150 GWh per year energy savings, or 14.4% of FY2017 retail energy sales volume.
- Budget for energy-efficiency programs:
 - \$5.6 million (3.2% of retail sales) expended for energy efficiency programs (includes incentives, administration, program marketing, and EM&V)
 - PWP funds procurement of all energy efficiency through Public Benefits Charge ("PBC") revenues. Current PBC revenue rate = \$0.00685 per kWh.
 - Energy-efficiency programs represented approximately 73% of Pasadena's PBC expenditures in FY2016/17. The solar incentive program represented 15%, Research Development and Demonstration (RD&D) was 1%, and low income bill payment assistance accounted for 11%.

Pasadena Water & Power Overview

Trends in Pasadena that have affected energy-efficiency programs include:

- In the last ten years since FY2008, PWP's annual retail energy sales volume has declined by 15%.
- Pasadena's local economy continues to grow.
 - Rising real estate property values have led to ongoing gentrification of older, lower income residential neighborhoods. This, combined with some recent low-income recertification requirements have reduced the number of income-qualified households on bill payment assistance and eligible for income qualified efficiency programs.
 - In 2016, Pasadena saw record-breaking level of development activity; the City's Planning Department processed 9,200 construction permits, including 3,600 permits for new construction with a valuation exceeding \$225 million.
- PWP's latest power rates became effective July 1, 2014 with an additional rate increases in July 2015 and July 2016.
- Aggressive energy-efficiency and demand reduction goals, adopted in 2013 and updated in 2017 by Pasadena's City Council, combined with other changes in the market (e.g., new codes and standards, increases in local distributed generation) continue to lead to flat energy load projections in the future. Additionally, the Aliso Canyon Facility closure

prompted PWP to accelerate efficiency program activities in 2016, primarily through temporarily higher incentive rates.

Major Program Changes

PWP offers a wide variety of energy efficiency programs designed to meet the energy efficiency goals adopted by the City Council while serving a broad cross-section of Pasadena customer groups.

Last year, PWP accelerated energy-efficiency program activity by increasing incentives, as one of many measures intended to mitigate the region's electric reliability concerns stemming from the Aliso Canyon Gas Storage facility closure. PWP ran a successful LED promotion beginning in the spring of 2016 for commercial customers, providing double-rebates for LED retrofit projects. Through this promotion, PWP provided incentives totaling approximately \$3.6 million, which includes rebates processed in FY 2016, 2017 and 2018, saving 13,851 MWh in the first year and reducing load by 2.2 MW. The majority of the savings is reported in the current FY 2016/17 report.

Also prompted by Aliso Canyon concerns, PWP ran a "Summer Readiness" Promotion in July 2016 to provide double rebates for residential customers. This promotion led to a 50% increase in rebate activity during that period, compared to the year prior.

Pasadena has begun shifting focus from rebates to direct install programs, in order to direct resources to customers who need the greatest support to complete efficiency improvements, including low and middle-income residential customers, seniors, and small businesses.

During FY 2016/17, PWP developed and secured a new vendor for a residential direct install program that since then, launched in August 2017, targeted to seniors and moderate-income households. Through this program PWP provides comprehensive no-cost home energy and water audits by a trained efficiency specialist and install free energy and water products services, for residential customers, and support PWP's focus on strong customer and community engagement. Measures and services planned include high quality LED light bulbs, showerheads, faucet aerators, toilet replacements, HVAC system 'check ups', and weatherization services such as ceiling insulation and weather-stripping, plus tips and customized guidance on additional energy and water upgrades with links to available incentives that will help customers save on their utility bills. This comprehensive program is leveraging co-funding from SoCalGas and the Metropolitan Water District.

PWP is working to further increase participation in the "Under One Roof" program that combines services and programs available from PWP and the City's Department of Housing and Career Development Services into a "one stop shop" for low-income customers. To achieve this goal, PWP has focused on marketing and simplifying program enrollment. PWP is also improving coordination among the different services and programs contained within this umbrella program by designating a new program coordinator role at PWP. Within this broader Under One Roof framework, PWP co-funds the Southern California Gas Company's (SoCalGas's) Energy Savings Assistance Program, supporting both

electric and water saving measures. PWP is working with a new ESAP program vendor to further expand last year's participation, with a goal of reaching at least 100 homes in FY 2018.

Program Highlights

In summary, below are the FY 2016/17 energy savings results by customer type (also see Tables 1 and 2 below):

- Residential: 6,350 MWh
- Non-Residential: 14,532 MWh
- T&D and C&S: 3,983 MWh
- Total: 24,949 MWh

Table 1. PWP Energy Efficiency Program Results (by program)

	Units Installed	Net Coincident Peak Savings (kW)	Net Annual Energy Savings (kWh)	Net Lifecycle Energy Savings (kWh)
TOTAL EE PORTFOLIO	57,819	3,343	24,948,511	177,443,323
Residential Rebates	54,859	70	175,924	2,068,978
Home Energy Reports	1		5,894,895	5,894,895
Residential Recycling	256	22	110,709	545,891
Commercial Direct Install WeDIP	98	273	969,304	10,387,397
T&D	1		3,016	90,480
C&S	1	682	3,979,972	3,979,972
Commercial Rebates (EEP and PE)	146	2,229	13,516,443	152,722,600
Low Income Product Giveaways				
Low Income Energy Savings Assis	260	2	6,638	84,713
Low Income Refrigerator Exchange	226	12	77,150	547,593
Residential Audits	319	18	37,004	37,004
PWP WebShop	1,650	2	21,945	286,023
Upstream HVAC	1	32	45,876	688,140
Livingwise	1		109,636	109,636

PWP's energy efficiency programs with the greatest impacts in FY2016/17 were:

- Energy Efficiency Partnering Program ("EEP") (13,516 MWh savings): Commercial efficiency incentive program providing customers with customized incentives to encourage energy saving and load reduction projects.
- Home Energy Reports (5,895 MWh savings): Originally launched in June 2011, the Home Energy Reports program completed its sixth year. PWP established a new contract for home energy report services in July 2016. In FY 2016/17, four printed reports were mailed to approximately 40,000 customers, reminding them of efficiency and rankings to encourage reductions in their energy usage; savings are tracked from actual metered data; no cost to participant.
- Water & Energy Direct Install Program ("WeDIP") (969 MWh savings): Small businesses direct install program to conduct retrofits for lighting, plumbing and refrigeration; no cost to participant.

Program Descriptions

PWP provides summaries of major programs by the associated sector-category classifications used in the E3 Reporting Tool.

- Residential Lighting
 - PWP expanded the LED WebShop to include advanced power strips and smart thermostats, and renamed it the “PWP WebShop” in 2016. The WebShop enables residential customers to purchase LED light bulbs and other small energy efficient products online at a lower-cost. PWP residential customers purchased or redeemed vouchers for approximately 1,600 products last year, the majority of them LED lightbulbs.
 - As part of the residential distributions and giveaway activities, PWP provides vouchers for efficient light bulbs upon request as well as a reward for participating in income-qualified rate assistance, electric vehicle and refrigerator recycling programs and for completing an online energy audit.
- Residential Refrigeration:
 - PWP provides rebates for the purchase of new ENERGY STAR® certified refrigerators through the Home Energy Rebate Program and. In addition, PWP provides a rebate to encourage customers to remove and recycle older refrigerators and freezers, to reduce their energy bill and lessen the impact that these older appliances have on the grid, and to ensure units are recycled in a safe and environmentally-responsible manner.
- Residential Pool Pump
 - PWP’s Home Energy Rebate Program provides rebates for the purchase of variable speed pool pumps.
- Residential Cooling
 - PWP’s Home Energy Rebate Program provides prescriptive rebates for the installation of efficient air conditioning equipment (central AC/HP, window air conditioners, and mini/multi splits), as well as related shell improvement measures such as insulation, solar attic and whole house ventilation fans, cool roof, skylights/windows, window films, sun shade screens, and shade trees.
- Residential Behavior
 - Home Energy Reports are mailed to approximately 40,000 customers, 4 times a year, providing them with information on their energy usage, including comparison with similar households, and information on efficiency opportunities and PWP programs in order to encourage reductions in their energy usage.
- Low-Income

- PWP provides new ENERGY STAR refrigerators at no cost to income-qualified customers and co-funds electric and water product and services that are provided to low-income customers through the SoCalGas's direct install ESAP program.
- Non-Residential Lighting, Refrigeration, and Cooling
 - PWP's non-residential EEP program provides custom incentives to business customers. The WeDIP program, designed to serve small businesses, provides no-cost audits and direct installation of lighting equipment, water saving measures such as low flow toilets and aerators, and simple refrigeration upgrades.
- T&D Efficiency
 - Distribution system upgrades yielded energy savings of 3 MWh.
- Codes and Standards
 - Under Codes and Standards ("C&S"), PWP has recorded 3,980 MWh and 682 kW of energy and peak demand savings that are occurring in the Pasadena service territory due to the State building codes that are encouraged and enforced by the City's Building Department and appliance standards. In collaboration with SCPPA members, PWP is working on expanding prior PWP-funded research on efficient laboratory fume hoods to support a proposal for new code requirements on fume hoods. SCPPA members submitted study results and new fume hood code recommendations to the CEC for potential adoption in the next Title 24 Building Code update.

The PBC fund supplements PWP's education program funding for school-aged children including Children Investigate the Environment, Green Living Curriculum, school tours, Student Art Contest, Solar Cup, and Living wise. Through these programs, the Department reaches 5,000 students annually. In FY2016/17, PWP and the City's Public Works Department partnered to deliver the 6-week Green Living Curriculum to all second grade PUSD students. The curriculum focuses on knowledge and actions that promote sustainable lifestyles.

EM&V

PWP expended \$75,819 on energy efficiency program EM&V to justify program design, expenditures and verify results:

- Residential Rebate Program: Contractors performed site verifications on at least 10% of all residential energy-efficient equipment purchases and installations, and 100% of refrigerator/freezer recycling and refrigerator exchange program participants.
- Non-Residential Programs:
 - EEP Program: Utility staff and contractors performed pre-and post-installation equipment and installation verification, on site, for 100% of customer projects with rebates exceeding \$5,000.

- Of the 146 non-residential custom projects completed, all had an independent engineering analysis conducted by a PWP engineering consultant □
 - Mechanical Equipment Retrofits: PWP's engineering contractor calculated energy savings and demand reduction using accepted engineering analysis such as DOE's eQuest building modeling software and the DOE Motor Master.
 - Lighting: Engineer-certified Excel workbook used to calculate lighting retrofit project energy savings based on the actual hours of operation.
 - Data Loggers: Data loggers and CT's were occasionally used to verify operating hours and equipment savings. All mechanical projects and a majority of lighting projects had both pre- and post-inspections.
- WeDIP Program: All water and energy direct install projects completed were pre- and post-inspected.

Sources of Energy Savings

PWP relies on the POU TRM data, where available, supplemented by best available technical data from independent engineering analysis where TRM measures are not yet available. For commercial programs, as discussed above, PWP relies on independent engineering analysis conducted by PWP's engineering consultant and industry models (e.g., DOE's eQuest building modeling software). The EEP program provide commercial customers with the ability to participate with any proven technology that saves energy, provided it meets the program requirements and the energy savings can be demonstrated.

Complimentary Programs

- Low-Income Programs: PWP has offered electric rate assistance programs to eligible low income seniors or disabled customers for several decades. The current Electric Utility Assistance Program ("EUAP") became effective in 2006 and provides monthly assistance to low income, seniors, and medically-qualifying customers. Project APPLE ("Assisting Pasadena People with Limited Emergencies" provides a one-time utility bill payment assistance program that provides eligible customers who need help paying their bills, up to \$100 per year. Funding for Project APPLE is provided through donations from PWP customers as well as PBC revenues.

In addition, PWP in partnership with other City departments offers specific income-qualified services under the Under One Roof program to income qualified customers including low-to-no interest loans, exterior house painting, wheel chair ramps, weatherization services, an ENERGY STAR refrigerator exchange, solar energy systems, and turf replacement to drought tolerant landscapes, free of charge.

- Renewable Energy Programs: PWP's Pasadena Solar Initiative ("PSI") aims to install 14 MW of customer owned solar photovoltaic by December 31, 2017 in line with Senate Bill 1, California's "Million Solar Rooftops" initiative. PWP continued to provide rebates in FY2016/17 to encourage customers to install solar photovoltaic systems on their home or business. PSI incentives are paid upfront through an Expected Performance Based Buydown ("EPBB") for smaller systems, whereas all systems larger than 100 kilowatts ("kW") are now paid over two-years based on metered output through a Performance Based Incentive ("PBI").

PWP customers installed an additional 1.1 MW of solar PV in the tenth and final year of the PSI program, bringing the program total to 8.8 MW as of June, 2017. Solar rebates were sunset December 31, 2017. PWP also offers a Green Power Program, where customers can opt to pay a premium (2.5 cents/kWh) on their electricity bill for clean, renewable power. This program is open to both residential and commercial customers.

- Research, Development, and Demonstration: Throughout the years PWP has invested resources in a variety of different RD&D projects. This year, PWP continued to focus its support on Plug-in Electric Vehicle (“EV”), discussed in more detail below.

PWP also received RD&D grant funding from the American Public Power Association to install and evaluate four solar-powered heat pumps at Pasadena Unified School District sites in December 2016. PWP partnered with other Southern California Public Power Authority member utilities on this project to evaluate the effectiveness of this equipment and to measure its potential to reduce heating and cooling energy usage.

- Electric Vehicles: During FY16/17, PWP continued to focus and grow support for EVs by funding several City fleet electric vehicles, managing the City’s first Direct Current (“DC”) Fast Charger that had at the Del Mar Gold Line Station Parking Structure, and providing approximately \$27,800 in incentives for individuals who purchase or lease an EV and/or install a Level 2 EV Charger at their Pasadena address. To support EV awareness and education, PWP hosted an EV “Ride-N-Drive” event at Brookside Park in April 2017. PWP sponsored and organized this first of a 3-event series, working in partnership with neighboring utilities in Burbank and Glendale and partner *Electric Car Insider* magazine.

PWP provided incentives for individuals who purchase a Plug-In Electric Vehicle (“EV”) and/or install a Level 2 EV Charger at their Pasadena address. PWP provides up to \$200 worth of LED light bulbs to residential customers for notifying PWP about their new electric vehicle. In addition, PWP offers a bill credit of up to \$400 to customers who install a Level 2 (240V) “wall mounted” or “hard-wired” charging station at their home, multi-unit complex, or business. The EV Charger incentive is also available to commercial customers and institutions for employees’ vehicle charging.

PITTSBURG POWER DBA ISLAND ENERGY

Island Energy At a Glance

- Year established: **1996**
- Climate Zone(s): **3**
- Number of retail customer connections: **538**
- Percent of retail sales by customer class: **9% residential, 91% commercial**
- All Energy Efficiency Programs are funded by Island Energy's Public Benefits Fund (PBF). During Fiscal Year 2016-2017, the annual PBF collection is \$119,045 from electricity sales and \$3,985 from natural gas sales. During Fiscal Year 2016-2017, \$10,000 was expended on Commercial Lighting Retrofit Program and \$24,039 was spent on Solar Incentive Program in the form of utility rebates. Unused fund in each program is carried forward to next year's respective program.

Utility Overview

Island Energy is a very small publicly owned utility provides electric and natural gas distribution services to a decommissioned Navy base named Mare Island, which now has become home of many industrial businesses and new homes. About 38 new homes were built during Calendar year 2017 and all new homes are equipped with rooftop solar system, good insulation and high energy efficient appliances. Island Energy offers the highest installation credit for rooftop solar system among the bay area to assist older residential homes to afford rooftop solar system.

Island Energy also offers various energy efficiency programs to commercial customers, ranging from commercial lighting retrofit, LED streetlights to commercial motor system upgrades.

Major Program Changes

To encourage uses of electric vehicles on Mare Island, Island Energy has implemented rebate program for EV charging stations. Island Energy not only provides rebates for electric vehicle charger installations at residential/commercial premises, but also provides a block of energy at the lowest rate to electric vehicle customers.

Program Highlight

The Commercial Lighting program has the greatest impact among all Energy Efficiency Programs and contributes over 85% of energy savings to Island Energy's Annual Energy Reduction Goal. Most commercial buildings on Mare Island have outdated lighting layouts and fixtures. Island Energy provides rebates for one-for-one lighting fixture replacement, as well as customized lighting retrofit projects. Most commercial lighting projects update the whole lighting layout with fewer and much more efficient lights or LEDs, resulted in 65% -80% wattage reductions and energy savings. With the rebates that Island Energy offers, the payback period for such lighting project is usually 1-2 years. The Commercial Lighting Program is definitely the most cost-effective energy saving measure on Mare Island.

Program Descriptions

- Commercial Lighting Program: Lighting Redesign, Overhaul or Retrofit Projects for Commercial Buildings. Incentive is based on one-for-one replacement or calculated based on expected annual energy Savings.
- Commercial Motors & Process Improvement: Replacement of Old Motors with NEMA Premium Efficiency Motors
- Compressed Air System: Installation of New Compress Air System or Redesign/Retrofit of Old Compress Air System
- Residential Home Energy Audit: Free On-Site Energy Advisory Service to Residential Customers
- Residential Retail Lighting: Free CFL Light Bulbs & LED Lights to Residential Customers
- Residential Appliance Efficiency: Rebates for Energy Star Qualified Clothes Washers, Dishwashers, Air Conditioners and Refrigerators.
- Residential Solar Incentive Program: Installation credits for photovoltaic solar systems for residential properties.
- Residential Net Energy Metering Program: Allow solar customers to bank their energy generation credits up to 12 months.
- Exported Renewable Energy: Excess renewable energy buyback at avoided energy cost
- LED Street & Parking Lights: Rebates for Street and parking LED Lights
- EV Charging Station: Rebate for electric vehicle charging station at residential premises

EM&V

The utility files EM&V reports as part of public utilities reporting compliance. Coming into year 2015, staff will focus more resources on R&D demonstration and educational programs on renewable energy resources and technologies for the public interests, such as community solar and green-energy programs.

Sources of Energy Savings

Staff review Energy efficiency applications and monitor closely on energy consumption changes after EE measures are installed. Utility has dedicated staff time to monitor and maintain spreadsheets and data for energy savings from energy efficiency and solar incentive programs.

Complimentary Programs

- Low-Income Programs: Island Energy offers 20% discount on electric and natural gas charges to qualified low-income customers.

PLUMAS-SIERRA RURAL ELECTRIC CO-OP

Plumas-Sierra Rural Electric CO-OP At a Glance

- Climate Zone 16
- Number of retail customer connections 7835 (residential 6956, commercial/industrial 768, agricultural 111)
- Annual total retail sales by customer class (residential 62,069 MWH, commercial/industrial 75,871 MWH, agricultural 10,369 MWH)
- Annual total budget for energy efficiency programs (including EM&V, admin/overhead, incentives) \$116,296
- Annual total amount actually expended for energy efficiency programs \$110,662

Plumas-Sierra Rural Electric CO-OP Overview

The local economy is recovering from the Great Recession and homeowners continue to upgrade their homes to improve efficiency and comfort with new windows, upgraded insulation and efficient air source and ground source heat pumps, resulting in increased participation in efficiency programs offered by PSREC.

An important aspect to note is PSREC's unique peak demand occurs during winter. Therefore, the most cost-effective program concentration is to reduce demand in the winter. The E3 model has limitations in how coincident peak demand savings are reported since PG&E's load profile is applied as the default.

Major Program Changes

In 2017, PSREC expanded the offerings in the residential HVAC program to provide more options to customers interested in upgrading HVAC systems.

Program Highlight

PSREC offers rebates to local farmers for upgraded motors and pumps in irrigation systems. During 2017, there was an increase in participation from local farmers in these programs, resulting in the majority of the energy savings being achieved by the agricultural sector.

Program Descriptions

- Geothermal Heating/Cooling Loans: HVAC – Res Heating, Res Cooling: - 0% interest ground source heat pump loop loans available for installation of ground-source heat pumps.
- HVAC Rebates: HVAC – Res Heating, Res Cooling: PSREC provides members with rebate options to encourage installation of energy-efficient electric heat pumps and ground-source heat pumps in new construction and existing homes and small businesses. Upgrading to an energy-efficient heating and cooling system will contribute to increased comfort in

homes while helping to reduce overall energy use.

- ENERGY STAR® Rebates: Appliances, Consumer Electronics, Refrigeration – Res Clothes Washers, Res Dishwashers, Res Electronics, Res Refrigeration: Rebates available for the purchase of an ENERGY STAR® refrigerator, dishwasher, clothes washer or other small electronics.
- Appliance Recycling: Refrigeration – Res Refrigeration: Non-essential Freezer/Fridge Retirement: Rebates offered for recycling a non-essential freezer or refrigerator.
- ENERGY STAR® Lighting Rebates and Giveaways: Lighting – Res Lighting: ENERGY STAR® LED Lamp Program: Offers rebates for the purchase and installation of LED lamps. PSREC also provided free LED lamps to members at its annual membership meeting. LED Holiday Light Rebate: Provides an incentive to replace incandescent holiday light strands with qualified new ENERGY STAR LED holiday light strands.
- Water Heater Sales and Rebates: Water Heating – Res Water Heating: Discounted sales of, and rebates for the purchase of high-efficiency electric water heaters, including heat pump water heaters.
- Weatherization Rebates: HVAC – Res Shell: PSREC offers members rebates for upgrading windows and insulation in their homes. By retrofitting a home to above-code R-Values, and upgrading windows to double-pane high-performance windows, members not only realize the added comfort, but also gain increased home values. PSREC encourages members to invest in weatherization measures prior to, or in addition to, investing in a new heating source for energy conservation.
- Agricultural Irrigation Rebates: Process – Non-Res Pumps: To encourage the installation of energy efficient equipment in agricultural irrigation systems PSREC offers rebates for pump tests and efficiency improvements.
- Efficiency Education - Education/Outreach: PSREC provides energy efficiency and conservation information to interested members to help them reduce their bill, understand their energy consumption and make their home more efficient. This program has successfully addressed high bill concerns by empowering members to use information such as our 'Do-It-Yourself Energy Audit' to learn more about their home and how they use energy.
- Efficiency Education - Energy Audits: PSREC provides free comprehensive energy audits to assist members with energy conservation and troubleshooting high energy consumption in their home. This program has been successful in educating members about efficiency and conservation and assisting in reduction of energy use, especially in low-income homes.

- Commercial Energy Audits: PSREC provides free energy audits to businesses to assist with energy conservation and troubleshooting high energy consumption. This program has been successful in assisting business owners in making decisions in efficiency upgrades and conservation.

EM&V

PSREC EM&V reports can be found online at: <http://www.ncpa.com/policy/reports/emv/>.

PSREC performs a yearly internal review to evaluate program effectiveness and improvement areas. PSREC has committed to seek third party evaluation of its programs every five years, dependent upon budget.

Sources of Energy Savings

PSREC uses the TRM as the source for the majority of reported energy savings. Some measures rely on savings from the Bonneville Power Administration's UES measure list. Savings for the commercial lighting program are custom calculations.

Complimentary Programs

- Low Income Winter Rate Assistance Program: Income-qualified members can apply for a discounted rate during the heating season. In conjunction, a home energy audit is offered, and efficiency information is provided to assist members with energy conservation.
- Net Metering Program: PSREC offers net-metering for members who install renewable energy generation systems.
- Community Shared Solar: PSREC is planning a 250KW community shared solar installation to offer solar energy to our members who currently cannot install solar on their homes or businesses due to cost, location or ownership status.
- Meter Lending Program: Members can borrow the PSREC WattsUp® meter to plug in 120-volt appliances, helping them identify energy use of specific appliances. This program has helped members understand just how much an appliance or space heater really uses and helps them make the choice of unplugging or reducing energy use.
- Lending Library and Resource Center: Provides energy efficiency and renewable energy resources to members through a book lending library and resource center in our office lobby.
- Research, Development, and Demonstration: PSREC is researching electric vehicle charging infrastructure and other program options to encourage the adoption of electric vehicles in its service area.

PORT OF OAKLAND

Port of Oakland At a Glance

- Climate Zone(s): 3
- Number of retail customer connections: 130-150
- Annual total retail sales by customer class (Residential (the Port has no residential customers), Commercial 24,201,905 kWh, Industrial 44,254,913 kWh)
- Annual total budget for energy efficiency programs (including EM&V, admin/overhead, incentives): \$240,000
- Annual total amount actually expended for energy efficiency programs: \$30,814

Port of Oakland Overview

The Port of Oakland (the Port) oversees the Oakland seaport, Oakland International Airport, and 20 miles of waterfront. Together with its business partners, the Port supports more than 73,000 jobs in the region and nearly 827,000 jobs nationwide. The Port exemplifies a unique combination of public/private endeavors. It encompasses a world-class container port, a thriving airport, an array of retail and commercial buildings and acres of recreational and open space. The Port has approximately 130-150 commercial electric customers.

Major Program Changes

In FY16, the Port restructured our incentives and procedures to promote EE programs and make it easier for customers and contractors to participate. Interest in the EE programs increased in FY17. Only one project was completed, but others were initiated with expected completion dates in FY18.

Program Highlight

In FY16-17, one project in the Non-Residential Lighting Program delivered all the net annual energy savings. Our revised procedures for the lighting program made it easy for the Port's tenants to participate, and resulted in total net annual savings of 283,269 kWhs.

Program Descriptions

- Energy Audits: The Port provides Energy Audits that focus on five major energy saving retrofit/improvement projects that will result in load reduction and more efficient use of energy. The proposed energy efficiency projects are prioritized by highest to lowest energy savings. Rebates are provided upon project completion, up to 100 percent of the total energy audit cost.
- Energy Saving Measures Exceeding Title 24 Standards: Port will provide a rebate for any new facility constructed within the Port by its electricity customers that exceed the title 24 standards in energy saving measures. Eligible facility must reduce energy usage by a minimum of 10% compared to the standard title 24 facility.

- Energy Saving Equipment Retrofits/Improvements Rebates: The Port has implemented a program that provides generous rebates and solid technical support for the installation of new energy efficiency equipment/improvements by our commercial customers.
- Lighting Retrofit: A program providing rebates for the installation of energy efficiency lighting upgrades. This rebate is based on a single flat incentive rate of \$.05 per first year annual kWh saved.

RANCHO CUCAMONGA MUNICIPAL UTILITY

Rancho Cucamonga Municipal Utility At a Glance

- Climate Zone(s): 10
- Number of retail customer connections: 921
- Annual total retail sales by customer class: Commercial \$9,957,263, Industrial \$632,849, Residential \$283,139
- Annual total budget for energy efficiency programs (including EM&V, admin/overhead, incentives): \$140,00
- Annual total amount actually expended for energy efficiency programs: \$55,500

Rancho Cucamonga Municipal Utility Overview

The amount of energy efficiency rebates in fiscal year 2017 were slightly lower than previous years with the trend continuing to be with lighting retrofits replacing inefficient lamps with LEDs. RCMU promotes the rebate programs and energy efficiency practices online, and offers free energy audits to educate customers on energy savings and potential upgrades on existing equipment. RCMU continues to grow and expand its existing distribution lines for future development and customer growth.

Program Highlight

The Energy Efficiency Rebate program continues to have the greatest impact and participation among RCMU customers. Participation in the direct installation program has declined over the past year due to a significant number of customers have already taken advantage of the program or are new to the service area.

Program Descriptions

- Direct Savings Program – Non-Res Lighting: To encourage and assist small and medium sized businesses to reduce their energy usage, RCMU will pay and install up to \$1,500 of recommended retrofit items that are determined from the complimentary energy audit. Any cost above the \$1,500 limit is paid by the customer.
- Energy Efficiency Program – Non-Res Lighting, Non-Res Refrigeration: RCMU has adopted an “Express Solution” model for energy efficiency rebates. Customers receive a rebate for estimated kilowatt hour savings for the first year in the following categories: Lighting, Interior LED, Exterior LED, Delamping, HVAC, Motors and Refrigeration.

Complimentary Programs

- Energy Audits: RCMU offers free, customized energy audits including lighting, HVAC and equipment assessment and a review of energy usage. Specific cost-effective recommendations to improve energy efficiency and reduce energy use are provided.

- Renewable Energy Programs: In FY 2017, RCMU added one new solar customer into the service area that is estimated to save a total of 465,365 kWh per year. The program is currently open to small solar installations (<30kW) only.
- Low Income: The program is intended to assist customers with their bill and is funded by the RCMU Public Benefit Fund. The household size and gross income requirements will be based off of the San Bernardino County Income Limits and Documentation system.
- Medical Support Assistance Program: The program will assist eligible residential customers where a full-time resident of the household regularly requires the use of essential medical support equipment. An application with supporting documentation from the patient's doctor is required to receive the credit each month.
- New Development Incentive: This incentive is for new development that is built to exceed a minimum of 15% above Title 24 Code. The incentive payment is based off of the final Title 24 report created by a Certified Energy Plans Examiner (CEPE) and verified by a third party certified Home Energy Rating Systems (HERS) Rater.
- Electric Vehicle Commercial Charger Rebate Program: The program will provide an incentive of up to \$4,000 per Level 2 (240-volt) charging station to RCMU commercial customers who install a workplace or public EV charger.

REDDING ELECTRIC UTILITY (REU)

Redding at a Glance

- Climate Zone -11
- Number of retail customer connections – 44,233
- Percentage of retail sales by customer class – Residential 49%, Commercial 49%, Industrial 2%
- FY 2017 Energy Efficiency (EE) Budget - \$3 million. The FY 2017 EE programs were funded from REU revenues as follows: \$2.2 million Public Benefits charges, \$0.8 million from general revenues.
- Load Overview – Total sales for FY 2017 were 746 million kWhs, a 0.40 percent decrease compared to FY 2016. The forecasted average annual decrease for the next five years is 0.60 percent.

Utility Overview

- Redding's electric sales have declined in recent years. Total sales for FY 2017 were 746 million kWhs - a 0.4 percent decrease compared to FY 2016. REU attributes this decline to lower economic activity and the impacts of energy efficiency programs, more stringent building and appliance standards, and increased customer-owned distributed generation.
- Due to Redding's hot summer climate and high residential load, REU's peak demand typically occurs in the summer between 4:00-5:00 p.m. and is more than double the peak demand during non-cooling months.
- Redding has committed much of our Cap and Trade auction proceeds to efforts that reduce greenhouse gas emissions, combat poverty, and achieve reliable energy savings.

Major Program Changes

In an effort to maximize REU's benefits to the community and maintain compliance with State and Federal regulations, REU implemented a variety of changes to the public benefits programs in FY 2017. These changes are as follows:

- In December 2016, the Redding City Council approved REU's recommendation to increase the commercial calculated lighting rebate from \$0.10/kWh to \$0.15/kWh and remove the \$10,000 per project rebate cap.
- In April 2017, Redding City Council approved the expenditure of \$6.5 million of Cap and Trade allowance proceeds on programs that save energy and/or reduce greenhouse gas emissions in the categories below. Upon Council Approval, the following programs were developed in FY 2017 and will be included in future annual program reports:
 - \$2 Million: Low Income Weatherization
 - \$0.5 Million: Shade Trees

- \$1.7 Million: Transportation Electrification including incentives for residential vehicle purchase and chargers, commercial vehicle purchase and chargers, public level 3 fast charger installation, and electrification of the City's Fleet.
- \$2.0 Million: Continue converting city-owned streetlights to LED (this project will occur over the next five years).
- \$0.3 Million: Non-motorized transportation enhancements.
- On June 30, 2017, REU ended the Ice Bear (Thermal Energy Storage) Program and no longer offers rebates and incentives for load shifting technologies. This decision was made based on REU's ability to meet demand utilizing existing resources.

Program Highlights

In FY 2017, REU's total commercial sector lighting savings increased over 2016 levels to 2.5 million kWh (net) due to an increase in the lighting rebate from \$0.10/kWh to \$0.15/kWh and removal of the \$10,000 rebate cap per project. Customer response was positive and REU received 7 rebate applications for rebates over \$10,000 accounting for over 50% of the total commercial lighting sector savings. REU anticipates that lighting rebates will continue to deliver savings in Redding for the foreseeable future, as we have not aggressively pursued these savings in the past.

Program Descriptions

- Appliances - Res – Clothes Washers: Rebates for dishwashers, clothes washers and dryers. Only makes and models on the current ENERGY STAR eligibility list qualify for a rebate.
- Comprehensive - Res – Comprehensive: Residential new construction rebates.
- HVAC - Res – Cooling: Rebates for heating, ventilation, air conditioning, duct repair, swamp coolers, and whole house fans.
- Pool Pump - Res – Pool Pump: Residential rebates for programmable, variable speed-drive pool pumps installed on existing or new in-ground pools.
- HVAC - Res – Shell: Residential rebates for insulation, window treatments, and radiant barrier.
- Water Heating - Res – Water Heating: Residential rebate for electric storage water heaters and heat pump water heaters.
- HVAC – Non-Res Cooling: Rebates for heating, ventilation, air conditioning, duct repair, and swamp coolers (this category also includes Thermal Energy Storage projects).
- Lighting - Non-Res – Lighting: Calculated lighting retrofit program uses a custom calculator to determine savings based on existing equipment, retrofit equipment and hours of operation.
- HVAC - Non-Res – Shell: Rebates for commercial window coverings.
- Other – Other: Utility funded program replacing City of Redding owned streetlights with new LED fixtures.

EM&V

During the reporting period, REU had a third-party review the Rebate Programs and implemented recommendations in FY 2017. REU is currently procuring professional services to conduct an EM&V study on the FY 2017 commercial lighting rebate program. Redding EM&V reports are available on NCPA's Website: <http://www.ncpa.com/current-issues/energy-efficiency-reports.html>. In addition to these activities, REU performs technical review on 100% of the rebate applications submitted to ensure that projects align with program requirements. Furthermore, REU performs pre and post field inspections on large projects that account for the majority of savings.

Sources of Energy Savings

For the vast amount of its EE programs, REU uses the standard measures as constructed within the E3 reporting tool. For REU's unique programs (TES and Home Performance), REU used the custom measure feature in E3 to represent the energy and demand impacts of those programs. For the commercial lighting program, REU utilizes a custom excel calculator.

Complimentary Benefits Programs

- **Low-Income Programs:** Low-income assistance spending (through the CARES Program and Lifeline Rate Discounts) continues to be the second largest area of our Public Benefits Program expenditures. During FY 2017, rate discounts represented about \$1.2 million paid with public benefits funds. Low-income programs have been most beneficial to a significant portion of our customer base that has limited situational and/or financial means to participate in other EE programs.
- **Renewable Energy Programs:** In September 2016, REU reinstated the final round of the the SB-1 mandated rebate program with an incentive of \$0.50 per CEC AC watt installed up to a maximum of \$5,000 per service location. In FY 2017, REU processed 224 PV installations with an installed capacity of 1,946 kW. Additionally, REU lifted the moratorium on circuits with distributed generation penetrations greater than 25% of the minimum circuit demand. During the program year, REU finalized the SB-1 rebate close out plan. REU stopped issuing solar rebate reservations on October 31, 2017.
- **Electric Vehicle(EV) Charging Infrastructure:** In FY 2017, REU developed the framework for Transportation Electrification incentives for residential chargers and vehicle purchase, commercial chargers and vehicle purchase, public level 3 fast charger installation, and electrification of the City Fleet. In April 2017, Redding City Council approved \$1.7 million of Cap and Trade funding to fund these initiatives which were launched in FY 2018. Status updates will be provided in future reports.

RIVERSIDE PUBLIC UTILITIES

Riverside Public Utilities at a Glance

- Climate Zone(s) - 10
- Number of retail customer connections:
 - Approximately 1,091,111,000 electric customers and 65,000 water retail customers, serving a total population of 326,733 residents
- Annual total retail sales by customer class (i.e.; residential, commercial, industrial) —:
 - Residential: \$117,662,000
 - Commercial: \$71,456,000
 - Industrial: \$115,432,000
- Annual total budget for energy efficiency programs (including EM&V, admin/overhead, incentives):
 - \$13,194,599 (includes base salaries without benefits)
- Annual total amount actually expended for energy efficiency programs:
 - \$6,430,740 (includes base salaries without benefits)

Riverside Public Utilities Overview

In Fiscal Year (FY) 16/17, Riverside Public Utilities (RPU) successfully exceeded the kilowatt-hour (kWh) savings goal of 1% of retail sales as adopted by the Board of Public Utilities in 2007. RPU assisted its customers in saving over 22 million kWh at an average cost of \$0.21 per kWh saved.

RPU helped revitalize the local economy by stabilizing utility rates through a rate freeze adopted by the City Council in 2010. This rate freeze provided customers with stable and predictable rates during the economic recovery period; however, the rate freeze also eroded utility and public benefit fund revenues. RPU is currently in the approval process of a new five-year rate plan.

Major Program Changes

RPU continues to enhance and expand its energy efficiency program portfolio for the benefit of its customers and the Riverside community. Staff examines the overall portfolio quarterly and recommends incentive level adjustments for consideration and direction by the RPU General Manager.

Although the local economy has stabilized and is moderately expanding, RPU is experiencing leveled participation in energy efficiency rebate and incentive programs. Overall program participation has remained flat over the past 7 years at approximately 20,000 rebates per year. This flattening demand for energy efficiency programs is likely due to a combination of market saturation, customer perception that solar generation is of higher value than energy efficiency, and overall weak consumer confidence.

Major changes or trends that impacted kWh savings in FY 16/17 include:

- The County of Riverside successfully launched its Home Energy Renovation Opportunity (HERO) Program in 2012. This AB 811 Property Assessed Clean Energy (PACE) program continues to grow in popularity. HERO offers another important tool for RPU customers seeking an alternative to finance energy efficiency measures in their homes. The City has also opened this market to numerous PACE providers. The financing tool, however, has not proven to be an attractive financing vehicle for commercial customers. Other financing tools may need to be explored to target commercial customers.
- Proposition 39 is resulting in some additional energy efficiency projects from local school districts and community colleges. Unfortunately, these projects have been slow to complete and have resulted in more modest kWh savings than had originally been projected.
- There is a growing trend in the energy efficiency field toward the use of behavioral programs such as OPower in order to enhance customer engagement and drive energy efficiency through influencing customer behavior. RPU has completed its initial analysis of such program offerings and implemented a program serving approximately 12,000 electric customers.
- RPU continues to implement several important new programs and has modified some existing programs in FY 16/17. For example, RPU increased rebate amounts for the residential HVAC Replacement Program for 16 SEER or higher rated units to incentivize customers to install more efficient HVAC equipment. This has led to a steady increase in participation in this program. As a utility located in Climate Zone 10, HVAC load is a major energy efficiency target. RPU also created a new Thermal Energy Storage Program with Ice Energy's Ice Bear product.
- The State of California is recovering from several years of unprecedented drought. The drought is having a significant impact on utilities, like RPU, that are both electric and water utility providers. Staff resources, by necessity, have been diverted away from energy efficiency programs in order to respond to the drought and the State's mandates for water conservation. The impact of this shift in resources will likely be realized in subsequent program year reporting.
- In order to capitalize on the growth of new LED lighting products in the marketplace, RPU continues to offer an LED retail buy-down program in partnership with GreenLite. Public benefit funds are combined with GreenLite's distribution platform through local participating retailers to offer several LED products at substantially discounted pricing for RPU customers. These attractive lighting incentives are designed to encourage customers to replace less efficient lighting products in their homes and businesses with state-of-the-art LED lighting products.

Program Highlight

RPU's Small Business Direct Installation (SBDI) and Keep Your Cool (KYC) Direct Installation programs continue to be a highlight of RPU's overall program portfolio in terms of both customer acceptance and kWh savings.

Although commercial customers only represent 10% of total utility customers, they represent the majority of RPU's load. As a result, RPU has dedicated additional program resources to assist commercial customers in achieving energy efficiency savings.

RPU's small business customers have often been reluctant to participate in traditional rebate programs due to lack of upfront capital, time, or technical ability to implement energy efficiency projects. RPU's SBDI Program was designed to address these primary customer concerns. The SBDI program is a comprehensive direct installation program combining measures such as lighting retrofits and controls, HVAC tune-ups, LED exit and "open" signs, Tier 2 advanced power strips, and various weatherization measures. Each project starts with an energy audit of the business's facility to prioritize recommended energy efficiency measures. SBDI offers businesses up to \$2,000 in free energy efficiency upgrades, and allows the business customer to fund additional improvements through contractor co-payments. The program is available throughout RPU's service territory and has been expanded to medium-sized business customers.

RPU contractors have found that the market potential for this program is substantial and that there is no shortage of businesses that can realize significant savings from energy efficiency upgrades provided through this program. Customer feedback regarding this program has been very positive, with almost 4,000 customers served in FY 16/17.

The Keep Your Cool (KYC) Program is similar but more specifically focused on a direct installation of cooling and refrigeration measures in mini-markets, delis, convenience stores and restaurants.

Combined, the KYC and SBDI programs have resulted in over 3 million kWh saved in this reporting year. Although on the higher end of measure costs within RPU's program portfolio, these direct installation programs maintain an average cost of \$0.30-\$0.50 per kWh saved. In addition, RPU receives additional benefits from increased customer engagement and customer satisfaction.

Program Descriptions

Commercial Rebate Programs

- Air Conditioning Incentives – Rebates for replacement of energy inefficient AC units (Non-Res Cooling).
- Energy Star Appliances – Rebates for purchase of Energy Star-rated refrigerators, dishwashers, commercial clothes washers, solid door refrigerator/freezers, ceiling fans and televisions (Non Res-Lighting, Non Res-Cooling, and Non-Res Refrigeration).
- Lighting Incentive – Rebates for kWh savings on installation of more energy efficient lighting and controls (Non-Res Lighting).
- Tree Power – Rebates for purchase and planting of up to 5 qualifying shade trees per year (Non-Res Cooling).
- Weatherization – Rebates for installation of insulation, window film and cool roofs (Non-Res Shell).

- Performance Based Incentive – Rebates for customers who can demonstrate a kWh savings based on custom energy-efficiency measures (Non-Res Comprehensive).
- Commercial Food Service Program – Program specifically targeting commercial food service customers such as restaurants, hospitality providers, institutional, medical/hospital customers, schools and government customers. The program is offered in conjunction with Southern California Gas Company (SCGC) and provides customers with a comprehensive facility audit offering recommendations on specific energy efficiency measures, estimated return on investment, and applicable utility incentives.
- Key Account Energy Efficiency Program (KEEP) – Program targeting RPU’s largest Time of Use Customers. This customer segment includes the top 300 RPU customers in terms of consumption. KEEP is intended to provide Key Account customers with a comprehensive energy efficiency plan including a priority list of recommended energy efficiency measures along with an estimated return on investment and applicable utility incentives. RPU is also working with SCGC on this program. Customers are also offered additional technical and contracting assistance to bring large energy efficiency projects from concept to completion (Non-Res Comprehensive).
- Custom Energy Technology Grants – Grants awarded for research, development, and demonstration of energy efficiency and renewable energy projects that are unique to the business or manufacturing process and can demonstrate energy savings, demand reduction or renewable power generation (RD&D Program).
- Energy Innovation Grants – Grants available to public or private universities within RPU’s service territory for the purpose of research, development, and demonstration of energy efficiency, renewable energy, energy storage, strategic energy research, and electric transportation (RD&D Program).
- Upstream HVAC Rebate Program – Rebate incentive for commercial high efficiency HVAC equipment purchases that exceed Title 24 requirements, provided upstream at the wholesale distribution channel level, thereby encouraging distributors to stock and sell more efficient HVAC equipment (Non-Res Cooling).
- Energy Management Systems – Rebates for the purchase and installation of energy management systems for monitoring and controlling facility energy load.
- New Construction and LEED construction Incentives – Rebates for energy savings exceeding Title 24 standards for pre-approved new construction projects.
- Pool and Spa Pumps Incentive – Rebates for purchase of qualifying multi-flow or variable speed high-efficiency pumps and motors.
- Premium Motor Incentives – Rebates for the purchase of premium high efficiency electric motors (none claimed this FY).
- Thermal Energy Storage Incentive – Feasibility study and incentives available for use of thermal energy storage based on program guidelines (none claimed this FY).
- Ice Energy Thermal Energy Storage Pilot Program – Combined thermal energy storage program and energy efficiency pilot program created in FY 14/15 and implemented in

FY 15/16 to replace old HVAC equipment with new energy efficient equipment installed concurrently with Ice Bear thermal energy storage equipment.

Residential Rebate Programs

- Energy Star Appliances – Rebates for purchase of Energy Star-rated refrigerators, dishwashers, clothes washers, room air conditioners, ceiling fans, and televisions (Res Cooling, Res dishwashers, Res Clothes Washers, Res Electronics).
- Cool Cash – Rebates for replacing Central Air Conditioners with a SEER rating of 15 above (Res Cooling).
- Tree Power – Rebates for purchasing and planting of up to five qualifying shade trees per year and one free qualifying shade tree coupon printed on the March back of the bill (Res Cooling).
- Pool Saver – Rebates for purchase and installation of high efficiency, variable speed, or multi-flow pool pump motors (Res Pool Pump).
- Weatherization – Rebates for installing attic insulation or wall insulation, standard rebates for duct replacement, duct testing/sealing, window film, solar and standard attic fans, whole house fans, and cool roofs (Res Shell, Res Cooling).
- Appliance Recycling – Free recycling service for old inefficient refrigerators and freezers (Res Refrigeration).
- Whole House Rebate Program – Rebates for completing multiple energy efficiency measures as one project. Points are awarded for each type of measure and then multipliers are given at specific point intervals on a sliding scale to encourage implementation of multiple energy efficiency measures as one project under one application (Res Comprehensive).

Residential Direct Installation Programs

- Multi-Family and Mobile Home Direct Installation – Program offering multi-family and mobile home residents direct installation measures including HVAC tune-ups, lighting efficiency upgrades, weatherization, and Tier 2 advanced power strips. Also addresses energy efficiency measures in common areas (Res Lighting).
- Energy Savings Assistance Program (ESAP) – Direct installation program targeting low-income customers, offered in partnership and cooperation with SCGC. Measures include lighting efficiency upgrades, HVAC tune-ups, smart power strips, and refrigerator recycling (low-income assistance, Res Lighting, Res Cooling, Res Refrigeration).

EM&V

RPU is committed to providing cost-effective, ongoing evaluation, measurement, and verification (EM&V) efforts for its energy efficiency programs. EM&V costs are covered in the individual program budgets.

In addition to periodic program audits, RPU consistently performs the following in support of EM&V activities:

- An onsite inspection rate of no less than 10% for all residential program participants, performed by RPU staff and contractors.
- A pre-and post-inspection of 100% of commercial rebate participants, including a review of historical energy usage, energy-saving calculations and post-measure bill analysis.
- All residential and commercial solar PV installations are field inspected and verified by city personnel for program compliance, system inter-connection standards, and rated production output.
- Contracted with the engineering firm Partner Energy to verify claimed energy savings on large, complex commercial projects prior to issuing a rebate incentive.
- Audits and installations performed by third-party contractors for RPU direct installation programs have high inspection rates that are performed by both the contractor and RPU staff.
- Refrigerator recycling program administered by Appliance Recycling Centers of America (ARCA) assures full inspection when the contractor picks up old appliances.

Sources of Energy Savings

RPU generally relies on the TRM as the primary source for deemed energy savings used in the calculating and reporting annual program performance. If a specific measure cannot be found in the TRM, RPU will generally use a verified utility work paper or appropriate engineering/manual calculation as back-up documentation to justify claimed kWh savings, and the specific measure is entered into the E3 reporting tool as a custom measure.

Complimentary Programs

- Electric Vehicles (EV): In 2016, RPU received a \$50,000 CEC grant to install a Level 3 EV charger at City Hall. RPU has committed \$25,000 of public benefit funds to offer free charging to all patrons of the station. This free charging period will cover a 24-month period to allow us to analyze charging frequency and customer habits in order to create an EV-only electric rate for RPU customers.
- Solar Rebate Program (SB1) – Throughout FY 16/17, RPU continued to promote residential and commercial participation in its solar rebate program to reduce peak load and offset customer electricity bills. In support of Senate Bill 1 (SB1) RPU has allocated a budget of \$2.5 million annually through December 31, 2016 for customer installed systems. RPU extended its program through December 31, 2017.
- SHARE – This low-income assistance program credits up to \$150 toward electric deposit or bill payment assistance for qualified low-income applicants annually. In FY 16/17, RPU served approximately 4500 low-income customers through the SHARE program for a total of over \$647,000 in public benefit funds credited to low-income families for bill payment assistance. RPU is currently revising this program in hopes to double participation in the coming years.
- Research, Demonstration and Development (RD&D) – RPU continues to invest in RD&D programs through partnerships with both businesses and local higher education institutions. RPU has expended over \$1,000,000 in public benefit funds over the last ten years

through its Energy Innovation Grant Program (see description above) to support energy research at local institutions of higher learning. Additional RD&D funding is provided to local commercial customers under the Custom Energy Technology Grant Program (see description above). RPU also participates in SCPPA-directed RD&D efforts and will continue to explore future RD&D opportunities as they occur on a case-by-case basis.

- Demand Response – RPU continues to manage a highly successful voluntary (non NERC certified) demand response program. This program, known as Power Partners, was developed in partnership with RPU's largest commercial customers. These important Key Account customers agree to voluntarily shed or shift a combined total of 11MW of electric load during the peak summer months from June-September if it is deemed necessary to call on this resource by RPU in cooperation with the CAISO.
- Pool Pump Timer Credit Load Shift Program – This program offers a bill credit of \$5 per month for customers who agree to install and program their residential pool pump timer so that the pump operates only during off-peak hours. RPU has implemented an ongoing inspection program to inspect 100% of these timers for program compliance.

ROSEVILLE ELECTRIC UTILITY

Roseville Electric Utility At a Glance

- Climate Zone 11
- 59, 237 retail electric accounts
- Total customer sales were 1,177,441 MWh
 - Residential - 439,598
 - Commercial & Industrial - 737,843
- Annual gross energy saved from energy efficiency - 14,851 MWh
- Total budget for energy efficiency programs - \$4,500,000
- Total spent on energy efficiency programs - \$4,451,346

Roseville Electric Utility Overview

Roseville Electric Utility and the City of Roseville are prime economic drivers in the South Placer County region. Roseville ranks in the top 50 housing markets nationwide with over 1200 new home permits and 22 new commercial building permits issued in 2017. Non-residential occupancy rates remain strong across all sectors. As we enter 2018, vacancy rates are at a historical low in single digits. Specifically, Industrial vacancy rate is at 3%; office vacancy rate of 8%; and Retail, Roseville Electric's largest commercial sector, vacancy rate is at 5.5%.

The strong economic climate supported residential and business investment in energy efficient exterior and interior LED lighting in FY 17 with 53% of the energy efficiency savings reported coming from LED measures alone.

Major Program Changes

The current new construction program is undergoing review and modification in preparation for 2020 zero net energy homes. The traditional programs included Preferred Homes, which must achieve 20% better cooling efficiency than code, and BEST (Blueprint for Energy and Solar Technology) Homes, which must achieve 15% total efficiency above code and include a photovoltaic system. These programs are transitioning in FY 18 to a new program modeled after the California Advanced Home Program.

Roseville Electric added windows as a measure for residential customers in FY 18.

Windows must be Energy Star rated with a U-value of .30 and an SHGC of .25 or less and bear the National Fenestration Rating Council label. Roseville introduced this rebate in FY 17 at \$5.00 per square foot with a maximum rebate of \$1000.

Program Highlight

LED lighting retrofits for residential and commercial customers continue to have the greatest impact on energy reduction. In FY 17, Roseville provided \$1.3 million in rebates to commercial customers for parking lot and other exterior lighting retrofits. The installation of these measures contributed 2,371,386 kWh reduction to Roseville Electric.

The Upstream Residential LED Lighting program expanded to include several new LED options. Over 5500 customers purchased 65,694 lamps in FY 17, contributing 1,705,474 kWh reduction to Roseville Electric.

Residential customers participating in the Home Energy Reports behavioral program contributed an additional 37% of Roseville Electric's energy efficiency savings for FY 17. Through the Home Energy Reports program, Roseville Electric is able to educate customers with tips to save energy in their homes. This program was offered to all Roseville residents in FY 17, and about 38,100 residents participated, saving 5,398,932 kWh.

Customers participating in the low-income rate assistance program are eligible for a free home energy audit and weatherization retrofit through funding provided by a combination of public goods funding and greenhouse gas (GHG) allowance auction proceeds.

Program Descriptions

- **Residential Windows**: Roseville Electric added windows as a measure for residential customers in FY 18. Windows must be Energy Star rated with a U-value of .30 and an SHGC of .25 or less and bear the National Fenestration Rating Council label.
- **Residential Whole House Fan**: Program offering a rebate to customers installing a permanently installed 2000 cfm (or greater) whole house fan.
- **EZ Energy Low-Income Home Audit and Install Program**: This program offers low-income residents an onsite energy efficiency audit and installation of weatherization measures that include attic insulation and HVAC tune ups. This program is primarily funded through greenhouse gas (GHG) allowance auction proceeds.
- **Residential Home Energy Reports**: Industry-recognized, contractor-managed energy efficiency behavior program providing education, feedback and tips to residential customers.
- **Residential HVAC**: Provides rebates to customers installing higher efficiency systems upon retrofit.
- **Residential Shade Tree**: Rebate program designed to incent and educate customers to plant drought-tolerant shade trees to keep their home cool. There are two rebate levels directly tied to the savings associated with each tree; trees are selected by a local urban forester, and validated through the tree calculator maintained by Sacramento Municipal Utility District.
- **Residential Pool Pump**: Rebate program designed to incent customers to upgrade from a single speed to a variable speed pool pump.

- Residential New Construction: This program is evolving as the drive to zero net energy home in 2020 gets closer. Programs offering incentives to builders to achieve greater savings than those required by building code are transitioning to a program modeled after the California Advanced Home Program.
- Residential Sunscreens: Rebate program designed to incent customers to install permanent sunscreens on their windows to keep their home cool.
- Residential LED Lighting: Upstream, vendor-managed program providing discounted LED lamps through local retail outlets in Roseville.
- Commercial LED and Other Lighting: Offers business customers a wide variety of energy efficient LED interior and exterior LED lighting retrofits and control options for updating their facilities.
- Commercial Food Service Equipment: Program provides rebates to commercial restaurants to install energy efficient electric food service equipment listed on the PG&E food technology website.
- Commercial HVAC: Includes package and split system retrofits along with several measures to reduce heat gain in the facility, including shade trees, window film, VFD and VSM retrofits to existing HVAC supply and return fans.
- Commercial New Construction: Program that is based on current Title 24 requirements. The designed structure must exceed Title 24 specifications by at least 10%. The rebate is based on kW reduced in the design.
- Commercial Custom: Customer driven rebate option targets projects that reduce peak loads and energy consumption and offers unlimited energy efficiency technology opportunities for the large and key account customers.

EM&V

EM&V is conducted annually on one or more programs. Selection of the programs to EM&V is prioritized by the dollars spent and savings claimed for the program. The budget for pre- and post-EM&V is determined by the program selected for review, and can vary from \$20,000 up to \$150,000. The budget depends on the extent of field measurement or customer surveys required to evaluate the program within the guidelines established by the California Energy Commission.

M&V is performed internally or by a third-party contractor on an ongoing basis for all programs. All EM&V reports are posted on the Northern California Power Agency (NCPA) website.

<http://www.ncpa.com/policy/reports/emv>.

Recommendations resulting from EM&V and M&V reports are used by Roseville Electric in the design and/or redesign of energy efficiency programs.

Recently completed EM&V include:

- Commercial Exterior Lighting (2017)
- Residential HVAC, Pool Pump, Whole House Fan and Sunscreen (2016)

Sources of Energy Savings

Roseville Electric relies on the savings in the E3 model provided by the TRM. If not available, the measure is entered to the E3 model as a custom measure. When a custom program is entered to the E3 model, the source of energy savings comes from a white paper, prior EM&V or a manual watt to watt calculation using TRM hours of operation and utility verified baselines. Roseville Electric relies on customer hours for some industries if they are more accurate in actual application than the hours in the TRM.

LED Lighting: Roseville Electric relies on TRM LED lighting measures when available in the E3 model; otherwise Roseville Electric relies on industry specs for watts and replacement data (incandescent or cfl) and calculates savings using the TRM hours of operation and replacement of incandescent lighting as the baseline. Roseville Electric assumes baseline of incandescent as few residential or commercial customers adopted CFL technology.

New Home Development Agreements: Roseville Electric is involved in all specific plan negotiations with new home builders in Roseville, and is able to enforce the requirement that all new home builders install HVAC systems with higher SEER and EER ratings than required by Title 24.

New Home Construction Rebate Program: Roseville Electric influences the construction of new homes in Roseville by providing rebates to participating builders for energy efficiency and solar. The energy efficiency savings are calculated using the Title 24 reports submitted for each participating village and rebated for energy efficiency by the percentage exceeding state housing standards.

Energy Reports: Roseville Electric contracts with Oracle (O Power) to provide energy efficiency reports to about 38,100 residents in Roseville. Statistically accurate savings from these reports are provided from the vendor detailing the energy savings.

Complimentary Programs

- Community Solar: Roseville is building a community solar project adjacent to the Roseville Energy Park with a tentative opening date in 2018. This pilot project will be offered to residential customers.
- Electric Vehicles: Customers purchasing a new electric vehicle are eligible for a rebate for both the vehicle and a plug in charger. Roseville Electric will be conducting an assessment of the impacts electric vehicle charging will have on the Utility. This assessment will provide recommendations for a strategic approach to address the electrification of the transportation industry.

- Low-Income Programs: Roseville Electric offers several rate assistance programs for qualified low-income residential customers. Roseville Electric spent \$ 252,528 providing rate reduction assistance to approximately 1,400 customers in FY 17. Roseville works with local agencies and libraries to promote this program to low income residents. Scholarships are provided through the Utility Exploration Center (UEC) for Title 1 schools to offset the costs for field trips to the UEC.
- Research and Development: Roseville Electric participated in three RD&D programs in FY17 including:
 - City of Roseville Utility Exploration Center: a 4000 sq. ft. facility with the mission to educate ratepayers and school children about water and energy conservation and a sustainable lifestyle. In support of this mission, Roseville Electric contributes to the development and maintenance of exhibits through annual contributions to the center. In FY 17, the Utility Exploration Center hosted 33,668 visitors, including 6,945 students. In FY 17, Roseville Electric contributed \$285,630 for exhibits and school programs and \$1,200 for scholarships for students.
 - APPA DEED: DEED is dedicated to increasing energy efficiency, reducing costs, investigating new technologies, and improving utility operations and services. Roseville Electric contributed \$4,265 to the DEED program in FY 17.
 - California Lighting and Technology Center (CLTC): The CLTC is a collaborative effort between the California Energy Commission, the U.S. Department of Energy and the National Electrical Manufacturers Association to advance energy efficient lighting and day lighting technologies. The goals of the CLTC are accomplished through partnership with utilities, lighting manufacturers, end users, builders, designers, researchers and government agencies. It was established in 2003 at the University of California, Davis. Roseville Electric contributed \$10,000 to the CLTC in FY 17.

SACRAMENTO MUNICIPAL UTILITY DISTRICT (SMUD)

SMUD at a Glance

- Year established: 1946
- Climate Zone: 12
- Total Customers (year-end): 626,460
- Percent of retail sales by customer class – 46% residential, 54% commercial/industrial/other
- SMUD spent \$36.7 million for residential and commercial energy-efficiency programs, compared to a budget of \$28.5 million.¹ All expenditures are public-goods funded.

SMUD Overview

SMUD is planning program changes to respond to the following industry trends and changing customer expectations:

- The expectations of residential and commercial customers are growing. Besides low-cost and reliable service, the expectation of the customer is now quality customer service and products that meet their business needs and personal lifestyles.
- Carbon reduction is becoming a driving force with regard to the electric and transportation industries in California. SMUD plans to have a new, Board-approved, Integrated Resource Plan by the end of 2018, which will impact energy efficiency direction and goals into the future.
- The increased emphasis on carbon reduction goals will also direct the utility industry to encourage the use of an increasingly renewable electric portfolio over natural gas.
- With the advent and proliferation of the Internet of Things (IoT), there are expanded levels of data, new communication and marketing channels and new opportunities to meet the needs of utility customers.
- LED have become the norm. The influence of energy efficiency programs have moved from the standard style lamp to specialty lamps and fixtures.
- While agreements were made in 2017 on how energy efficiency savings should be reported to the California Energy Commission (CEC), SMUD is still expecting a greater emphasis on energy efficiency in the future to meet the spirit of SB350.
- Starting in 2018, residential rates will begin to mimic commercial rates at SMUD, with a movement toward TOU rates. Time of Day (TOD) rates will be the default residential rate starting in 2019. It will also be mandatory for participation in some of SMUD's programs. This will place a greater focus on measures that impact peak demand and load management strategies.
- Commercial customers' interest in Zero Net Energy (ZNE) solutions is growing.
- More and more customers prefer to access information and communicate via mobile devices.

¹ Includes market research, planning, M&V, and emerging technologies R&D.

- Consumers are becoming increasingly interconnected, fundamentally shifting channels of social interaction.
- Customers want clear and simple choices.

Major Program Changes

The overall budget, energy and peak savings achieved in 2017 were relatively unchanged from 2016. The Energy Efficiency portfolio was enhanced with the inclusion of 33 GWh tied to SMUD's work on Codes and Standards. Also, the following program changes were made to facilitate customer demand and prepare for the future:

- The Retail Lighting program delivered less savings as the movement continued toward an LED only program and the eventual sunset of the program. The program went from a product mix of 90% LEDs and 10% CFLs in 2016 to a product mix of 100% LEDs and no CFLs in 2017. The program was able to accomplish this due to the continued reduction in LED prices.
- In collaboration with the EPA, SMUD continued to support and offer the Retail Product Platform (RPP) program, which incentivizes retailers to stock up, and make available greater Energy Star Products. For the 2017 program, new products were included. Through the 4 participating retailers, over 24,000 products were incentivized.
- During 2017, SMUD introduced an online marketplace, the SMUD Energy Store. Through this channel, nearly 10,000 items were sold. Over 4,600 of these items were the new Energy Star Smart Thermostats. Over 1,600 Energy Star Smart Thermostats were rebated through traditional SMUD rebate channels.
- The SMUD swimming pool pump initiative paid rebates for over 1,700 variable-speed swimming pool pumps, with nearly 40% paid through point-of-sale (POS) channels.

Program Highlight

Over 2017, SMUD took a courageous and needed change in focus from utility needs to customer needs and customer satisfaction. The Value For What You Pay (VFP) initiative required significant organizational changes. The Distributed Energy Resources (DER) delivery team, Advanced Energy Solutions (AES), was reorganized into Commercial, Residential, and Planning teams focused on all of the DER components (Energy Efficiency, Demand Response, Electric Vehicles, Storage, Electrification and Green Pricing). This has enabled the individual groups to focus on the specific needs of the commercial and residential sub-segments in a more holistic view as the bundling of the DER items becomes a better customer solution.

Program Descriptions

SMUD has been continuously operating energy-conservation, load management, and energy-efficiency programs since 1976. Over that 40 year time period, SMUD's customers have saved over 2 TWh of first year energy savings.

In 2007, the SMUD Board of Directors approved a significant expansion in annual savings goals for its energy-efficiency resources, from approximately 0.6% of annual sales to an annual

average of approximately 1.5% over the following decade. These goals have now been extended through 2023. The expanded goals were part of the Board's vision to "empower our customers with solutions and options that increase energy efficiency, protect the environment, reduce global warming, and lower the cost to serve our region." SMUD is continually redesigning its energy-efficiency portfolio to expand existing programs, plan and implement new programs, and develop and implement a broader marketing and engagement plan that will meet these expanded goals and the Board's vision.

For 2017, SMUD spent \$36.7 million for residential and commercial energy-efficiency programs, compared to a budget of \$28.5 million.² All expenditures are public-goods funded. These programs delivered 25.6 megawatts (MW) of peak-load reduction and 152.4 million kilowatt-hours (GWh) of annual energy savings.

Program Descriptions

Commercial/Industrial Retrofit Programs

Expenditures for commercial/industrial energy efficiency retrofit programs for existing buildings and facilities were \$20.6 million, with delivery of 7.3 MW of peak-load reduction and 59.2 GWh in annual energy savings.

- **Customized Energy Efficiency Incentives:** Promotes the installation of energy-efficient equipment, controls, and processes at commercial and industrial customer facilities. Provides incentives to contractors and/or customers to promote the installation of energy efficient lighting, HVAC, motors, and refrigeration equipment and controls. The program also provides incentives for retro-commissioning, process improvements, and data center storage projects that result in energy savings.
- **Express Energy Solutions:** Provides prescriptive incentives to participating qualified contractors for high-efficiency equipment across a variety of end-uses: lighting, HVAC, refrigeration, and food-service equipment. Incentives are targeted to the contractor/supplier in an effort to stimulate the market for energy-efficient equipment and services, and are designed to cover a significant portion of the incremental cost of the equipment.
- **Complete Energy Solutions:** Third party administrator performs comprehensive energy audits of small and medium-sized businesses. Customer receives a customized report detailing recommended energy improvements, estimated savings, estimated cost and payback. Third party administrator then assist customer in hiring a contractor to complete the project.
- **Savings by Design:** Provides incentives to builders and their design teams to design new commercial and industrial buildings 10-30 percent more energy efficient than required by Title 24 (or typical new construction in the case of Title 24-exempt buildings and processes).

² Includes market research, planning, M&V, and emerging technologies R&D.

- Prop 39 Schools Program: SMUD has taken the position of a trusted advisor with regard to the Prop 39 funding that has been made available to schools for retrofit projects. Instead of a traditional rebate program, SMUD has provided consultant services to help facilitate the local school districts' access to the Prop 39 funds. Since we still have aided with projects and the schools are using Prop 39 funding, we have included our costs in our reporting, but we have not added the schools cost for the projects as participant costs.

Residential Programs

Expenditures for residential energy-efficiency programs for existing homes were \$16.1 million and achieved 10.3 MW of peak-load reduction and 60.2 GWh in annual energy savings.

- Shade Trees: Provides free shade trees to SMUD customers. Implemented through the community-based non-profit Sacramento Tree Foundation (STF). STF foresters review tree selection and site locations with customers, who plant the trees.
- Equipment Efficiency: Provides rebates and/or SMUD financing for qualifying (Energy Star, Consortium for Energy Efficiency, and/or other high-efficiency) efficiency improvements to homes' building shells and equipment. Improvements include mini split heat pump, whole fans, central air conditioners and heat pumps, heat pump water heaters, and cool roofs.
- Home Performance Program: Participating contractors use building-science principles and diagnostic equipment to evaluate the current performance of the whole house, and then recommend comprehensive improvements that will yield an optimal combination of savings and comfort for homeowners. Once the homeowner selects the improvements that fit their needs and budget, participating contractors will do the work to Building Performance Institute standards.
- Appliance Efficiency Program: Provides rebates for qualifying (Energy Star or Consortium for Energy Efficiency-listed) appliances: smart thermostat, refrigerators, variable speed pool pumps, and room air-conditioners. Also included in this program are Refrigerator/Freezer Recycling, Pool Pumps and the Retail Partnership Program.
- Refrigerator/Freezer Recycling provides rebates for the free pick-up and environmental recycling of old refrigerators and freezers.
- Retail Partnership Program is an upstream program that works with big box retailers to pay retailer incentives for all the energy efficiency items they sell in their stores.
- Retail Lighting: Promotes energy efficient residential lighting products by providing incentives for manufacturers and their retail partners to sell Energy Star lighting at a discount. Implemented through agreements with manufacturers and retailers that involve cost buy-downs, marketing, and/or advertising. SMUD has been steadily increasing the percentage of LED bulbs rebated through this program.

Information/Education Programs

Expenditures for information and Education programs were \$1.0M in 2017 with 12.8 GWh in annual energy savings.

- Home and Business Electricity Reports: A scientifically designed program to measure the impact of sending electricity-usage reports to residential and commercial customers. The reports compare the customer's monthly usage to that of the previous year and to about 100 neighbors in similar-size homes with the same heat energy source. The reports are customized to each house or business and provide energy tips to assist the customer in making behavior changes that reduce their energy use.
- Residential Advisory Service: Provides on-site energy audits of homes, on-line energy audits, and telephone assistance for customers, with recommendations to reduce their homes' energy use (and bills). Recommendations include practices and home-improvement projects that will increase the energy efficiency of their dwellings.

Demand-Reduction Programs

- Peak Corps (Residential Air Conditioner Load Management Program): In the past, customers volunteered to allow SMUD to install a radio-controlled cycling device on their central air conditioners and to send a radio signal to switch, or cycle, off their air conditioners to reduce peak load on the electric-system. In the late 1990's the program was transitioned into maintenance mode with no new installations. In 2010 the program was modified for emergency use only and all service and maintenance related work was discontinued. In an Emergency Situation the Power System Operators have the ability to activate the entire ACLM cycling program within a 3 minute time span, but the program has not been activated since 2000.
- Power Direct (Automated Demand Response Program): Enhances facilities' energy performance by seamlessly integrating automated response capabilities into energy management, lighting and HVAC systems. Automatically reduces electricity consumption on Conservation Days in times of high demand.

EM&V

SMUD has established a framework to develop yearly measurement and verification (M&V) action plans. SMUD is planning M&V activities for all of its major programs, scheduled at fixed intervals (2-4 years apart), with the intention of evaluating all programs on a continued cyclical basis through 2020. For methodological approaches needed to perform specific types of evaluations, SMUD will be guided by the CPUC's "California Evaluation Framework" (June 2004) and "California Energy Efficiency Evaluation Protocols" (April 2006).

SMUD is planning to allocate approximately one percent of its total energy-efficiency budget towards impact- and persistence-focused M&V studies. These studies will be conducted primarily through the use of third-party contractors, with management and oversight by SMUD's Business Planning Department.

SMUD completed the following M&V activities in 2017:

- Customized Energy Efficiency Incentives
- Complete Energy Solutions

In 2018, M&V will be conducted for the following:

- Home and Business Electricity Reports
- Residential Smart Thermostats
- Residential HVAC

Sources of Energy Savings

In order to determine energy savings, programs may rely on several sources: the Database for Energy Efficient Resources (DEER), TRM, Energy Modeling Software, or specific studies conducted by utilities or recognized working groups. The goal is to use the most current studies/workpapers which best represent CZ12 and SMUD customers.

Complimentary Programs

- Smart Homes- New construction program that integrates energy efficiency, demand response and other technologies in an aligned vision. The program is designed to complement SMUD's other portfolio programs (EE, DR, EV, etc.) to support SMUD's future load requirements. The resulting home design from those builders that participate will be an innovative use of energy-efficient design technologies, integrated built-in DR capabilities, automated peak shifting strategies, and other "smart" connected options desired by homeowners. Planning began in 2017 for an All-Electric Smart Homes program that focuses on increasing the opportunities for reducing carbon emissions in residential new construction. It is anticipated that an All-Electric Smart Homes program will be ready for launch in Q2, 2018.
- Renewable Energy Programs: Incentives for net-energy-metered PV; a feed-in tariff for mid-scale systems (currently closed); voluntary green pricing programs including SolarShares, which supports expansion of distributed PV; commercial and residential REC purchase programs; and a community solar program aimed at enhancing K-12 curricula on renewable energy.
- Low-Income Programs: SMUD provides a low-income rate subsidy, a medical assistance rate subsidy, and no-cost weatherization services to our low-income customers. Pilot programs are currently in-place to try other energy efficiency options to assist our low-income customers.
- Research, Development, and Demonstration: SMUD has a centralized research and development program that conducts public good research across the electricity enterprises from the supply side to demand side. Research is conducted in eight research areas which include renewable energy, electric transportation, climate change, distributed generation, energy efficiency, demand response, storage and smart grid. These programs seek to track emerging technologies, demonstrate promising technologies and prepare SMUD and SMUD customers for adoption of these emerging technologies.
- Codes & Standards: SMUD continues to pursue the development and implementation of codes and standards (e.g. T24, T20, etc.) as the most cost effective source of Energy Savings. SMUD participates in several working groups, drives code compliance through programs, assists with workforce training, conducts research, and develops data

management systems to improve tracking and reporting. SMUD is claiming 33 net MWH energy savings associated with the Statewide Codes and Standards Team for 2017.

- Electric Vehicles: In 2017, SMUD's Drive Electric program continued to promote adoption of plug-in electric vehicles through special PEV rate offerings, participation in educational events, educational offerings through our website SMUD.org/PEV, and collaboration with local auto dealers and the local EV advocacy group Sac EV including its members such as City of Sacramento office of sustainability, SMAQMD, etc. SMUD's coordination of a large scale Ride-N-Drive event at the Sacramento International Auto Show resulted in test drives of plug-in electric vehicles and was one highlight of our PEV education efforts in 2017.
- Energy Storage: SMUD conducted field studies to examine grid-scale storage applications, risks and benefits. Additionally, SMUD started working on the design of the energy storage program to be offered to the Residential and Non-Residential customers starting in 2018 in order to fulfill AB 2514 requirements.

SAN FRANCISCO PUBLIC UTILITIES COMMISSION

San Francisco Public Utilities Commission (SFPUC) Hetch Hetchy Power

- Providing electricity to customers since 1925.
- Located in Climate Zone 3.
- Serving approximately 3,000 retail customer accounts.
- Customer classes: The SFPUC's primary customer base is providing electric service to municipal customers. This includes all City departments as well as related municipal entities such as the local School District, Community College District, and Housing Authority. This load consists primarily of nonresidential buildings, process loads (including substantial electric transit usage), multi-tenant residential buildings and streetlights. It also includes providing electric service to tenants on municipal property. Depending upon their funding sources municipal customers pay either a Municipal Electricity Service Rate or an Enterprise Fund rate based on the otherwise applicable PG&E rate. A small but growing portion of sales are made to non-municipal residential and commercial customers located in redevelopment projects at Treasure/Yerba Buena Islands and Hunters Point that are served off of Power Enterprise operated distribution systems.
- FY 2016-17 total electricity sales to retail customers: 946,000 megawatt-hours (MWh); peak demand: 140 megawatts (MW); load growth is negligible.
- In FY 2016-17, San Francisco appropriated \$1,000,000 for energy efficiency projects (other than streetlights). Actual spending of utility revenues (reporting all project costs in the year of completion instead of when funds were appropriated) totaled \$3.3 million divided between streetlight LED conversion (\$1.7 million) and all other energy efficiency projects (\$1.5 million).¹ Other public purpose programs include municipal renewable energy projects and the GoSolarSF solar incentive program.

San Francisco Public Utilities Commission Overview

The San Francisco Public Utilities Commission (SFPUC) is a department of the City and County of San Francisco that provides retail drinking water and wastewater services to San Francisco, wholesale water to three Bay Area counties, and green hydroelectric and solar power to San Francisco's municipal departments and select local residential and business communities. The SFPUC is comprised of three essential 24/7 service utilities: Water, Power, and Sewer. The mission of the SFPUC is to provide customers with high quality, efficient and reliable water, power, and sewer services in a manner that is inclusive of environmental and community interests, and that sustains the resources entrusted to our care.

The Power Enterprise, within the SFPUC, has two separate power programs, Hetch Hetchy Power and CleanPowerSF. SFPUC owns and operates the Hetch Hetchy hydro-electric power generation system consisting of 8 hydroelectric generating units (385 MW) which generate an average of 1.6 million MWh/year, 23 municipal solar arrays located throughout San Francisco (8.1 MW),

¹ Totals do not add up due to rounding.

and 2 biogas cogeneration facilities (3.1 MW), which together produce cost-effective energy with a zero greenhouse gas emission profile. The CleanPowerSF program, which is San Francisco's Community Choice Aggregator and managed by the SFPUC, provides a cleaner energy option than traditional PG&E service for businesses and residents throughout the SFPUC's service area.

Power Enterprise has made a commitment to energy efficiency as its highest priority resource.

Historically, Power Enterprise's energy efficiency programs mainly have targeted its municipal and public agency customers, and most of its programs have been provided at no charge to these civic agencies. Today, fee-for-service programs represent a growing portion of energy efficiency offerings. Power Enterprise is also developing new programs for its growing Hetch Hetchy Power residential and commercial customer sectors.

Major Program Changes

This year's energy savings are primarily derived from completion of a number of comprehensive HVAC retrofits of older municipal buildings and garages located throughout the city, which also resulted in substantial natural gas savings. Additionally, Power Enterprise continued to implement commissioning and design review projects to achieve electricity and natural gas savings at various sites. Finally, Power Enterprise continues to achieve significant savings through LED streetlight retrofits, which have significantly increased in scale this past fiscal year.

Program Highlights

Energy efficiency has been an essential component of Power Enterprise's resource portfolio for more than a decade. In the current reporting period, FY 2016-17, completed energy efficiency projects are estimated to save 3,190 MWh (net savings) of electricity per year, at a utility cost of \$3.3 million.

Program level highlights for FY 2016-17 include:

- Direct-install style retrofits provided most of the reported electricity savings, including HVAC upgrades at major parking garages and major Real Estate Division buildings and a large LED lighting upgrade at the Legion of Honor Museum.
- 4,532 streetlights were replaced with LED technology.
- Power Enterprise's calendar year 2016 annual report benchmarking the energy performance of San Francisco's municipal buildings includes 477 buildings representing almost 49 million square feet of building area.

Program Descriptions

Power Enterprise's energy efficiency programs are generally tailored to the particular customer (almost all of which are other City departments), because most of these customers are large, and have varied property characteristics. These programs include:

- **Direct-Install Program:** This program provides complete retrofit services to targeted municipal customers, usually at no cost to the customer. The program focuses on City

- agencies that are funded primarily through local tax receipts, fees, and federal/state-funded programs. These customers are considered hard-to-reach (due to limited access to capital and engineering, as well as insufficient price signals).
- **Civic Center Sustainability District:** Through a partnership with the Clinton Global Initiative and C40 Cities Climate Leadership Group (C40), this program demonstrates green, renewable and energy efficient technologies as a national model for sustainability in historic districts. For energy efficiency projects, the program provides free energy audits, design, construction management, construction services, and full funding to buildings in the City's Civic Center historic district.
 - **LED Street Light Conversion Project:** Through this program, San Francisco will convert about 18,000 high pressure sodium street lights to LED lights. The program will reduce energy use and maintenance costs, and improve pedestrian and vehicular safety. The project scope includes the installation of networked wireless controls, which will further reduce energy consumption via fixture dimming. The project launched in FY15-16. This year, 4,532 streetlight fixtures were replaced with LEDs, with a projected annual electricity savings of 830,000 kWh.
 - **Green Commissioning and Design Review Program:** Power Enterprise provides commissioning and related green building design review services on a fee-for-service basis for municipal new construction and major renovations. For existing buildings, the program offers retro-commissioning services.
 - **Energy Benchmarking Program:** San Francisco requires owners of non-residential buildings over 10,000 square feet to annually benchmark and disclose the energy performance of their buildings. In FY 16-17, Power Enterprise released its sixth annual report benchmarking the energy performance of San Francisco's municipal buildings, including 477 buildings representing nearly 49 million square feet of building area.
 - **Blueprint for Savings Program:** Encourages high performance energy efficiency design through up-front design assistance and [electric energy savings](#) cash incentives for projects that exceed code by 10%. Available to large non-residential [new](#) construction projects 50,000 square feet and larger.

EM&V

Historically, the majority of energy efficiency retrofit projects funded by Power Enterprise have included an individual M&V study following the International Performance Measurement and Verification Protocol (IPMVP). These projects have included an M&V plan with a sampling plan, a logging plan, an approach to data recovery and analysis, and a written report.

Sources of Energy Savings

Power Enterprise's mostly-direct-install energy efficiency portfolio allows it to report energy savings based on site-specific engineering studies with detailed ex ante savings estimates. These studies base savings on on-site collected data for hours of operation, nameplate data for replaced equipment, and detailed site-specific costs.

Complementary Programs

Power Enterprise offers several related programs, among them:

- Renewable Energy Programs:
 - Municipal Renewable Program: Under this program, Power Enterprise directly installs, maintains and operates solar PV systems on municipal buildings throughout the City and County of San Francisco; and
 - GoSolarSF: The program provides incentive payments to Power Enterprise and CleanPowerSF customers installing rooftop solar projects. The program focuses a component on low income residents, which complements the CPUC program administered by Grid Alternatives, a nonprofit organization.

SFPUC Power Enterprise						
Time Period: Fiscal Year 2016-2017						
San Francisco PUC Power Enterprise	Resource Savings Summary (1)(2)			Cost Summary (3)		
	Savings Summary (Completed Projects)					
Program	kW	kWh/yr	Lifecycle kWh	Utility Incentive & Direct Install (\$)	Utility Mktg, EM&V and Admin OH (4)	Total Utility Cost
Direct Install (General Fund)	164	1,907,939	28,619,085	\$ 1,365,954	\$129,716	\$ 1,495,670
Commissioning and Design Review	8	457,000	9,140,000		\$ 41,826	\$ 41,826
LED Street Lights	0	829,879	12,448,185	\$ 1,734,725	-	\$ 1,734,725
Total	172	3,194,818	50,207,270	\$ 3,100,679	\$171,542	\$ 3,272,221
(1) Energy Savings reported are "net savings". (2) In addition to electricity savings, EE retrofits are expected to achieve significant natural gas savings. (3) Costs for completed projects are reported in the year of completion. Some programs have no projects completing construction in FY2016-17. (4) Annual Program Admin costs are apportioned based on percent of savings, excluding streetlights.						

CITY OF SHASTA LAKE

City of Shasta Lake At a Glance

- Climate Zone(s): 11
- Number of retail customer connections: 4,516
- Annual total retail sales revenue by customer class (Residential 38%, Commercial 9%, Industrial 53%)
- Annual total budget for energy efficiency programs (including EM&V, admin/overhead, incentives): \$374,740
- Annual total amount actually expended for energy efficiency programs: \$172,363

City of Shasta Lake Overview

The City of Shasta Lake (CSL) feels a significant responsibility to its community to invest their Public Benefits funds in such a way as to impact both energy and financial savings for their customers, and a positive economic impact in CSL as well. CSL offers a comprehensive menu of rebates to all our customers. However, because of the economic downturn that has affected the City for several years, the number of customers taking advantage of standard rebate program offers has been relatively low.

In FY17, CSL energy efficiency programs acquired first year net annual kWh savings of 276,038.

Major Program Changes

CSL offered the Keep Your Cool (KYC) Program to commercial customers in FY17 to encourage them to upgrade their older refrigeration equipment. The program offers ECM motors, strip curtains, ASH controllers and other refrigeration measures at no cost to the customer. There were no major program changes to CSLs standard rebate programs offered to customers.

Program Highlight

The Commercial Lighting Program delivered 56% of the total kWh savings in FY17. The KYC program delivered 38% of the total kWh savings. Since 2011, CSL has achieved 115% of our AB2021 goals. History has demonstrated that direct install programs are beneficial and customers will take advantage of no-cost programs.

Program Descriptions

CSL manages a comprehensive energy efficiency incentive program for residential and commercial customers focusing on energy efficiency and peak load reduction. For residential customers, rebates are offered for the installation of various energy efficiency measures, such as lighting, HVAC, appliances, and weatherization. For commercial customers, rebates are available for upgraded lighting, HVAC, appliances, refrigeration equipment, electronics, and in cases where an analysis is performed rebates can be offered for additional equipment that reduces energy use and/or demand. On-site energy audits are provided by CSL energy specialists. Energy efficiency measures are recommended and additional visits are completed upon request.

- Residential Lighting Program [Res Lighting]: CSL offers rebates to homeowners who install ENERGY STAR® qualified LED lamps/bulbs, ceiling fans and LED holiday lights.

- Residential HVAC Program [Res Cooling]: CSL offers rebates to homeowners who install high performance heat pumps, central air-conditioners, room air-conditioners, or whole house fans that exceed current state requirements. CSL also offers a rebate for duct sealing when not required by code.
- Residential Equipment Program [Res Clothes Washers; Res Dishwashers; Res Pool Pump; Res Refrigeration]: CSL offers rebates to homeowners who purchase new ENERGY STAR qualified products, including clothes washers, room air conditioners, dishwashers, pool pumps, and refrigerators.
- Residential Weatherization Program [Res Shell]: CSL offers rebates to homeowners who invest in weatherizing their homes, including attic and wall insulation, window treatments/replacement, air/duct sealing and radiant barriers.
- Residential Water Heater Rebate Program [Res Water Heating]: CSL offers rebates to homeowners who purchase a new, energy efficient electric water heater.
- Commercial/Industrial Lighting Program [Non-Res Lighting]: CSL offers rebates to business owners who invest in the installation of energy efficiency lighting upgrades. There is a prevalence of inefficient lighting throughout the city and most high bay lighting uses high intensity discharge fixtures instead of more efficiency fluorescent or LED fixtures.
- Commercial/Industrial Custom Program [Non-Res Comprehensive]: CSL offers rebates to business owners based on site-specific consumption. Rebates are tailored to the individual business owner's needs based on the audit and the potential energy savings associated with the customer project.
- Keep Your Cool Program [Non-Res Refrigeration]: The Keep Your Cool program offers ECM motors, strip curtains, ASH controllers and other refrigeration measures at no cost to the customer.

EM&V

The CSL is planning to complete EM&V in FY18 by working with several other utilities to gain economies of scale. CSL has received a proposal from an EM&V company and is reviewing the scope of work.

Sources of Energy Savings

For FY17, CSL has relied heavily on the savings listed in the Technical Resource Manual. Non-residential lighting, custom projects and non-deemed measures rely on custom savings calculations.

Complimentary Programs

- **Low-Income Programs**: Lifeline monthly rate discount program and one-time bill assistance known as SHARE.
- **Renewable Energy Programs**: Focus on customized solar projects that benefit the City.
- **Research, Development, and Demonstration**: Focuses on LED lighting in various applications, community solar charging station(s), and latest HVAC applications in City owned facilities.
- **Electric Vehicles**: Support of local business in conversion of combustion engine vehicles to electric vehicles.
- **Energy Storage**: CSL is participating in the NCPA/SCPPA joint contract with DNV GL to provide an updated evaluation of solar and energy storage technologies.

SILICON VALLEY POWER (CITY OF SANTA CLARA)

Silicon Valley Power At a Glance

- Climate Zone 4
- 54,142 retail customers; 84% are residential; 15% are commercial & industrial; 1% are municipal
- Retail Sales Breakdown: 6.5% residential, 2.8% commercial, 90.2% industrial, 0.5% municipal (Note that commercial and industrial customers are categorized by their rate code, and not type of business performed at the location.)
- The amount budgeted for energy efficiency programs in FY 16-17 was \$7,267,441.
- The total amount actually expended was \$4,371,201. All funding for energy efficiency programs comes from the Public Benefits Charge on customers' utility bills. Unexpended energy efficiency dollars are typically rolled over into the following fiscal year's energy efficiency programs. However, at the end of Fiscal Year 2016-2017, SVP had built up a larger than usual reserve, so SVP will be reallocating a portion of the unexpended commercial energy efficiency program funds from previous years to fund the FY 2017-2018 PV rebates that were being funded through other utility budgets. This was also done in FY 2013-2014, FY 2014-2015, and FY 2015-2016 with unexpended energy efficiency funds for FY 2012-2013, FY 2013-2014, and FY 2014-2015.
- 75.8% system load factor
- Load growth projected at 9.3% for Fiscal Year 2017-2018

Silicon Valley Power Overview

Businesses in Santa Clara survived the economic downturn relatively well, and since then we continued to see load growth due to new data centers coming online over the last several years. Other than data center customers, most companies are still working with leaner staff who are not dedicated to energy projects and they continue to reserve available budgets for production efficiencies and enhanced revenue generation. In order to successfully compete for corporation's internal funding to reduce expenses, most large businesses continue to seek a two year payback to move forward on energy efficiency investments regardless of the expected life of the project benefits. This is one reason we have seen fewer large energy efficiency projects undertaken, but we are beginning to see longer term planning for projects, which are anticipated to be complete in future fiscal years.

Silicon Valley Power is unique in its mix of customers. While 84% of the customers are residential, over 90% of the utility retail sales are to commercial and industrial customers. Approximately 74% of our electric load is attributable to our largest "Key" Customers. Over 46% comes from data centers. Historically, it is those customers, including the large data centers, who implement a few large projects each year that make up the majority of our energy savings for the year. In Fiscal Year 2016-2017, we again saw few of these projects, which is partly due to the aforementioned lack of staff and budget, and partly due to the fact that these customers have been aggressively implementing energy efficiency measures for more than a decade and the

opportunities for improvements are fewer and have long payback periods. Some of the energy efficiency measures that are being implemented include IT improvements for which SVP does not have an incentive program and, like the energy savings from codes and standards, they are not accounted for in this report.

Major Program Changes

For FY 2015/2016, Silicon Valley Power added or modified the following programs:

- **Enhanced Ventilation Controls Demonstration Projects** – We have offered an enhanced ventilation controls rebate program for one year, but have had no customers participate to date. The program is targeted at smaller customers with rooftop package units of 15 tons or smaller. This customer segment is not at the forefront of adopting new technology. In order to educate customers on the technology and validate the energy savings, we propose to fund three demonstration projects at customers' facilities up to the lesser of 100% of the project cost or \$3,500. The customers would be required to allow SVP to install metering equipment to validate energy savings and to write a case study on the project. The case study will be used in promoting the rebate program to other customers and educating them on the energy savings and payback of the project.
- **ENERGY STAR Residential Heat Pump Electric Water Heater Rebate** – SVP initially offered a \$1,000 rebate for this technology when it was first introduced to the market in 2010. As the technology has become more widely adopted and commercially available, retail prices have dropped, and energy savings have been demonstrated to be less than initially expected, the rebate will be reduced to a maximum of \$500 per household for the purchase of an ENERGY STAR-qualified electric heat pump water heater. This is equal to the amount of rebate offered in surrounding service territories.

For FY 2015/2016, Silicon Valley Power ended the following programs:

- **Residential Refrigerator Recycling Program:** The program provider for this program liquidated its assets and closed its facilities in November 2015. SVP issued an RFP for another provider, but received no responses, as there are no local providers and it is not cost effective for those outside of the Bay Area to provide the service within our service territory. Subsequently, the Investor Owned Utilities in California have filed with the CPUC to discontinue the program as the market has been transformed and there is no longer a need for an appliance recycling rebate.
- **Tier I Smart Strip Commercial Rebate** – Due to a lack of demand for this program and a very low estimate of energy savings due to more efficient computer equipment, this rebate will be discontinued.
- **Residential and Business Solar Photovoltaic Rebates (PV):** The requirements for a PV rebate under Senate Bill 1 (SB1) end on December 31st, 2016. At that time, SVP discontinued its performance-based incentive for business customers. A business rebate for installation of solar systems up to 50kW was continued through June 30, 2017. While the

residential PV rebate was also scheduled to be discontinued at the end of June 2017, we ended up extending it through June 30, 2018.

Program Highlight

In this program year, the customized incentive programs, which includes the Customer Directed Rebate and the Data Center Program, had the largest impact toward our energy efficiency goals. The Customer Directed Rebate program is designed specifically to assist customers with energy efficiency projects that do not fit into our standardized programs. In both the Customer Directed Rebate and the Data Center Program, technical assistance is provided to help customers find customized solutions for their unique situations, and measurement and verification plans are developed and implemented in order to validate the energy savings. These programs require significant “hands on” approach from SVP, but often result in significant energy savings. This year, a total of 9 new custom projects falling under these two programs were implemented and 12 previous projects with performance incentive payments achieved additional energy savings for a combined total of 14,260,526 gross kWh in energy savings.

Program Descriptions

Res Lighting

- Midstream LED Light Bulb Rebates: SVP offers an instant rebate per Energy Star LED bulb 1,000 lumens or greater.

Res Pool Pump

- Pool Pump Rebate: SVP offers a \$100 rebate for the installation of a qualifying variable speed pool pump and controller.

Res Cooling

- Energy Star Ceiling Fan Rebates: Provides a rebate of \$35 per fan (up to three fans per residence) for the installation of Energy Star ceiling fans.

Res Water Heating

- Electric Heat Pump Water Heater: Provides a rebate of up to \$1,000 for replacing an existing electric water heater with an Energy Star Heat Pump Water Heater.

Non-Res Lighting

- Commercial Lighting Rebates: This program provides rebates for energy efficient lighting upgrades.

Res Clothes Washers

- Electric Clothes Dryer Rebate: this program provides a rebate of up to \$200 for ultra-efficient electric clothes dryers

Non-Res Cooling

- Commercial HVAC Rebate program: This program provides a rebate on the purchase and installation of new, more efficient air conditioners, HVAC systems, or heat pumps.
- Controls Rebate Program: This is a performance-based incentive for controls systems under a pilot rebate program. The incentive requires demonstrated energy savings over

a 5 year period and will make payments annually upon submission of a verification report.

- VFD Rebate: This program provides a rebate on qualifying variable frequency motor drives.
- Enhanced Ventilation Controls Rebate: This program provides an incentive of \$160 per ton for adding enhanced ventilation controls to HVAC rooftop packaged units 15 tons or smaller.

Non-Res Cooking & Non Res Refrigeration

- Food Service Equipment Rebate: This program provides a rebate for the purchase of qualifying energy-efficient commercial food service equipment. It includes a variety of equipment, including both cooking and refrigeration equipment.

Non-Res Process

- Data Center Efficiency Program*: The program is targeted to data centers with IT server loads greater than 350 kW or IT cooling loads greater than 100 tons. This program provides unique opportunities for energy-efficiency projects that may not otherwise fit into our standard rebate and customer assistance offerings.
- Uninterruptible Power Supply (UPS) Rebate: This program provides a rebate to customers who install Energy Star UPS equipment to protect enterprise servers, networking equipment, and large storage arrays.
- Plug Load Sensor Rebate: This program provides a rebate for smart power strips used in commercial facilities to reduce energy consumption from office equipment.

*Data center projects under these programs may include cooling measures, among others. However, since this is the essential cooling of servers and not for comfort of people, we consider these to be process loads.

Non-Res Comprehensive

- New Construction Rebate: This program provides an incentive to customers who exceed Title 24 by at least 10% on non-residential new construction projects.

Other programs that fall into multiple categories, depending on the energy efficiency measures implemented:

- Public Facilities' Energy Efficiency Program: SVP provides technical assistance and financial incentives for the expansion, remodel, and new construction of City of Santa Clara buildings. Included in this program are higher levels of rebates for qualifying equipment, energy management assistance, and a small budget for retro commissioning.
- City Facilities Energy Efficiency Loan Program: This program provides loans for approved energy efficiency measures implemented at City of Santa Clara facilities. Loans are paid back via the utility bill through the reduction in energy consumption.
- Customer Directed Rebate: This program provides a rebate for energy efficiency projects that do not qualify for our other rebate program offerings, but have demonstrable energy savings.

Other programs educational in nature that do not fall into a category for energy savings:

- Business Audits: Free energy efficiency audits to business customers.

Residential In-Home Energy Audits and Education: Through this technical support program SVP staff provides on-site audit analysis, energy efficiency recommendations and distributes energy saving items ("lime lite" night lights, outlet gaskets and switch plate thermometers). The Solar Explorer and the SVP information booth participate in major city events, providing education on energy efficiency and solar electric generation systems.

EM&V

Silicon Valley Power's EM&V plan and reports for the past eight years can be found at <http://www.ncpa.com/policy/reports/emv/>. Silicon Valley Power evaluates a different portion of its programs each year, with a goal to understand how the program is performing and was in which it can be improved in the future. The EM&V budget averages \$75,000 per year, but actual spending varies, depending on the EM&V needs for the year.

Sources of Energy Savings

Energy savings attributed to deemed measures in our programs come from the POU Technical Reference Manual. Energy savings attributed to lighting measures is determined using our lighting rebate calculator tool. Custom projects require a measurement and verification plan where actual savings can be validated.

Complimentary Programs

- **Low-Income Programs:** Our low income programs include a Rate Assistance Program, where qualified low-income customers receive a 25% discount on their electric bill
- **Renewable Energy Programs:**
 - **Santa Clara Green Power Program:** Residents can purchase 100% renewable energy through this voluntary program. The cost for residents and small businesses is a penny and a half per kWh. Larger companies who do not wish to purchase 100% renewable energy may purchase in 1,000 kWh blocks. Block pricing can vary depending on the location of the resources (CA vs. Western U.S), the size of the purchase, and the duration of the purchase commitment.
 - **Residential Solar Photovoltaic Rebate:** Provides significant financial incentive to residential customers for installation of solar systems. Customers receiving the rebate are required to also complete an energy audit, as is the case with the statewide California Solar Initiative. The rebate started at \$4.50 per watt and under a declining scale similar to the California Solar Initiative program, and is currently at \$1.00 per watt, up to a maximum system size of 10 kW.
 - **Business Solar Photovoltaic Rebate:** Provides financial incentives for the installation of solar systems at business sites. Rebate structure is designed to decline over time as more PV is installed in SVP's service territory, similar to the California Solar Initiative program. The rebates started at \$3.00 per output watt and declined over time. Businesses installing systems over 50kW and up to 1 MW were eligible for a Performance Based Incentive. These incentives started at \$0.40 per kWh and declined over time. SVP stopped accepting applications for systems over 50kW after December 31, 2016, but customers have up to one year from the date of application to install a system and performance incentives are paid over five years. Businesses are required to complete an energy audit in order to receive a rebate, as is the case with the statewide California Solar Initiative.

- Neighborhood Solar Program: SVP customers have the option to pay into a special fund to support the installation of solar electric systems at non-profit community buildings. To date, installations have included PV systems at Haman Elementary School, Valley Village Retirement Community, Bill Wilson Center, Hope Services, St. Justin's Parish, Our Lady of Peace Church, and the Muslim Community Association (MCA).
- Research, Development, and Demonstration:
 - Emerging Technologies Grant: This program encourages businesses to demonstrate new products and product applications not yet commercially viable in today's marketplace, install energy efficient technologies not generally known or widely accepted, yet show potential for successful market growth, successfully apply energy efficiency solutions in new ways, or introduce energy efficiency into industries or businesses that are resistant to adopting new technologies or practices.
 - APPA DEED Program: Silicon Valley Power is a paying member of the American Public Power Association (APPA) Demonstration of Energy and Efficient Design (DEED) and currently occupies a seat on the DEED Board. This program funds grants, internships and student scholarships to further R&D in the electric utility industry and support innovative applications of energy efficient or renewable technologies. In Fiscal Year 2014-2015, SVP applied for and was awarded a DEED grant for a "Field demonstration and performance validation of a CO₂ heat pump water heater/space heat combination system" in conjunction with Pacific Northwest National Laboratory. The remainder of the study is funded through Public Benefits Funds under the R&D budget. The study was completed in May 2017. Silicon Valley Power was also awarded two additional grants, both of which have matching funds coming from the Public Benefits Program. The first is for "Calibrated Modeling of Energy Savings of New High-Efficient Residential Window Covering". This project builds on the work that the Pacific Northwest National Labs did with Bonneville Power Administration to validate the energy savings of new high-efficient residential window coverings and model the energy savings for the various climate zones so that these results may be considered in energy efficiency program planning across the country. The project will be complete in March 2018. The second project is focused on "Energy Efficient Air Management in Small Data Centers through the Use of Liquid Cooling in Servers". This project is being conducted in conjunction with University of Washington, which models, designs and demonstrates a novel cooling solution for data centers. The project's goal is to implement and prove the enabling of components for the liquid cooling of high heat density Central Processing Units (CPUs) and Graphics Processing Units (GPUs) that will meet the server industry's requirements for RAS (Reliability, Availability, and Serviceability), cost, and size. This project was completed in December 2017 and the final report will be available in early 2018. Silicon Valley Power is actively working on two grant applications for the Spring 2018 APPA DEED grant cycle and will continue to pursue opportunities to investigate emerging technologies and new applications of proven technologies.
 - California Lighting Technology Center (CLTC): Silicon Valley Power provides financial support to the CLTC to further research and testing of emerging technologies in the area of lighting.
 - Lighting for Tomorrow Initiative: Silicon Valley Power provides financial support to the Consortium for Energy Efficiency's (CEE) Lighting for Tomorrow competition that

handpicks high-efficiency lighting products that best blend form and function through inspired design.

- **Electric Vehicles:** Silicon Valley Power and the City of Santa Clara have invested in Electric Vehicle charging stations for public and employee use at multiple City facilities. This includes the following:

Location	Level 2 EV Charging Ports	Level 3 DC Fast Charging Ports
Central Park Library	1	2
Santa Clara Convention Center	5	2
Tasman Garage (across from Levi's Stadium)	48	1
City Hall	7	0
Northside Library	4	0

The purchase or lease of electric vehicles is currently under consideration by our Electric Vehicle Task Force and one electric vehicle has been procured for use by Silicon Valley Power staff for in-home energy audits. Silicon Valley Power also purchases the Electric vehicle Insider magazine and provides copies free to customers visiting its table at public events, such as the annual Santa Clara Art & Wine Festival and Earth Day events throughout the community.

- **Energy Storage:** State Law (Assembly Bill 2514) requires publicly owned utilities to evaluate the use of energy storage as an element of power supply plans by adopting an Energy Storage Procurement Plan. Prior to the City of Santa Clara's adoption of its plan on August 19, 2014, Silicon Valley Power (SVP), the City of Santa Clara's electric utility, reviewed various technologies and their relative cost effectiveness in the current marketplace. This review found that storage technologies were not cost effective in 2014 with the exception of large pumped hydro storage, which is very sensitive to particular geographic locations. To satisfy SVP's obligations under state law, the City Council approved energy storage procurement targets in August 2014. Since that time, SVP staff has continued to meet with vendors and review the cost-effectiveness of energy storage technologies in Santa Clara. Staff put forward an internal strategy regarding demonstration and implementation plan. This implementation plan includes a three pronged effort to study and demonstrate energy storage in a variety of situations in the utility system. On December 20, 2016, Silicon Valley Power submitted an update to the California Energy Commission on its efforts to review and potentially adopt energy storage technologies in its territory. This update provides information on activities by SVP since the 2014 Energy Storage Procurement Plan was adopted and informationally provided to the CEC. SVP, as a member of the Northern California Power Agency (NCPA),

contracted with DNV-GL to re-evaluate energy storage targets, energy storage technologies, as well as, cost-effectiveness methodologies that can be used to make storage procurement decisions. Even though battery prices are decreasing, most applications of battery storage are not cost effective at this time for SVP. SVP has identified two potential pilot programs that may be beneficial to the local system reliability and assist customers with controlling their demand. SVP has also identified a Black Start Battery Hybrid project to support the greater Bay Area transmission system in case of system failure. Also in 2016 and 2017, SVP signed a series of power purchase agreements (PPAs) for a new solar project and new/repowered wind projects, all projects are estimated to begin production in 2020. As part of those PPAs, battery storage was evaluated and found not to be cost effective at this time. The viability of battery storage for those projects will be re-evaluated in 2020 and as market opportunities arise. Staff will continue to monitor the development of energy storage technologies and the Energy Storage Procurement Plan will be reviewed in three years to determine whether technologies have become cost-effective for the applications that SVP needs.

TRINITY PUBLIC UTILITY DISTRICT

Trinity Public Utility District At a Glance

- Created in 1982 as a result of the Trinity River Division Act of 1955, in which Congress provided mitigation for the economic devastation to the local economy resulting from the Act.
- The Congressional mitigation provides the Trinity River Public Utility District (TPUD) enough low cost and clean hydroelectric power to meet its entire load for the next several decades, but forbids the TPUD from selling any of the energy it does not need to meet load.
- Serves small economically depressed area in northern California consisting of approximately 7,500 meters in mountainous terrain covering an area the size of Delaware.
- TPUD is comprised of nine small substations serving 560 miles of distribution line.
- TPUD has a peak coincident demand of approximately 25 megawatts, which may occur in winter or summer.
- More than 60 percent of TPUD's load is residential and only two customers have a peak demand of more than 150 kilowatts.

Trinity Public Utility District Overview

With 7,230 meters, TPUD serves most of the customers in Trinity County with 100% renewable hydroelectric energy. TPUD does so through Western Area Power Administration contracts and by owning and operating 604 miles of power lines over rugged and mountainous terrain. The service area is sparsely populated with less than 12 customers per mile of line.

Although TPUD has not yet reaped all of the benefits promised to Trinity County by Congress, we are over 60% there. The result is that most of Trinity County is now served with the lowest electric rates in the State, keeping more than \$10 million annually in our local economy versus paying much higher private utility rates and exporting the money to stockholders. In addition, TPUD invests over \$3 million a year on local labor, supplies, and services much of which would not be spent locally if service were provided by PG&E.

Program Highlight

TPUD's primary energy efficiency program is a \$700 rebate for an electric heat pump. Propane furnaces and wood-burning stoves are pervasive throughout TPUD's service territory. Switching to an electric heat pump frequently saves customers on their heating bills. The cost of operating an electric heat pump is substantially less than a propane furnace; the cost of propane would have to be less than \$1.00 per gallon in order to be competitive with an electric heat pump. Given current rates for electricity and propane in our service territory, propane heating costs approximately three times as much as heating with an electric heat pump.

The heat pump program is predominantly a fuel substitution program, as the heat pumps installed are not replacing existing electric heating units, but rather propane or wood-burning units. As such, electric heat pumps generate substantial reductions in GHG emissions and other air pollutants as TPUD delivers electricity exclusively from federal hydropower resources.

Program Descriptions

- Weatherization Program: Provides incentives for installation of cost-effective weatherization measures including insulation and energy efficient windows in electrically heated homes for all new buildings and major remodels, about 30 per year.
- High Efficiency Heat Pump Rebate Program: Provides incentives to replace wood stoves, propane furnaces/heaters, and kerosene heating systems with high efficiency electric heat pumps (TPUD's service territory has no natural gas availability).
- High Efficiency Electric Water Heater Rebate Program: Provides incentives to replace propane water heaters with high efficiency electric water heaters.

Sources of Energy Savings

All energy savings data is derived from the CMUA Technical Reference Manual.

TRUCKEE DONNER PUBLIC UTILITY DISTRICT (TDPUD)

Truckee Donner Public Utility District (TDPUD) At a Glance (2017 Calendar Year)

- Climate Zone: 16 (winter, weekend, and holiday peaking electric utility)
- Number of retail customer connections: 13,768 (89% residential)
- CY17 total retail sales by customer class (i.e.; residential, commercial, industrial): \$24,206,345 with \$13,578,059 residential and \$10,628,286 commercial
- CY17 total budget for energy efficiency programs (including EM&V, admin/overhead, incentives): \$821,710
- CY17 total amount actually expended for energy efficiency programs: \$745,339.

Truckee Donner Public Utility District (TDPUD) Overview

TDPUD serves electricity and water to the greater Truckee area comprised of approximately 44 square miles in eastern Nevada County and approximately 1.5 square miles in adjacent Placer County. TDPUD is governed by a locally elected Board of Directors consisting of 5 members with staggered 4-year terms and operates on a calendar year budget. TDPUD is a transmission-dependent utility within NV Energy's control area and secures electric resources primarily through the Utah Associated Municipal Power System (UAMPS). TDPUD has been successful in the past in transitioning to renewable energy sources, keeping rates stable, and investing in accessible, cost-effective, energy efficiency programs.

In 2017, TDPUD continued to invest in public benefit, low income and renewable power programs spending over 3.5% of retail sales including 2.8% of retail sales spent directly on energy efficiency programs. TDPUD's energy efficiency results included a first year E3 'Gross' energy savings of 1.1% of retail sales, first year E3 'Net' energy savings of 0.8% of retail sales, and TRC of 2.38. TDPUD continues to deliver significant, cost-effective results aided by a customer base that embraces energy efficiency and conservation along with innovative program designs. However, a large portion of current savings come from residential LED lighting and other lighting programs. Maintaining these saving levels, on paper, is becoming increasingly difficult due, in part, to saturation but mostly due to the dramatic reductions in gross savings due to the misapplication of codes & standards and 'baseline savings' to actual energy efficiency retrofits. This is particularly true with screw-in residential lighting (EPA standards) and small business/commercial lighting retrofits (EPA standards & Title 24).

TDPUD treats energy efficiency as an electric resource ('first loading order') and is therefore motivated by actual savings. However, the E3 model does not consider actual savings and the E3 'Gross' savings are based on codes & standard baselines (not what was actually replaced). Thus, the savings and associated cost-effectiveness from E3 understate the true value of the energy efficiency resource.

Major Program Changes

- This year's results were bolstered by some large commercial energy efficiency projects with the Tahoe Truckee Unified School District, Truckee Tahoe Airport District, and Safeway.

- This is the third year that the EISA (Federal) lighting standards were applied as a baseline to screw in bulb measures and TDPUD continues to see a dramatic change in associated Residential programs (~37% of our portfolio based on annual kWh savings).
- The E3 'Gross' and 'Net' energy efficiency results that the TDPUD is able to claim in this report are diverging further and further away from the actual results. While our performance remains relatively strong, it is getting harder to justify the very high levels of spending based on cost-effective results. Furthermore, the costs and complexity of Title 24 are a major burden for small business/commercial lighting projects which constitutes the vast majority of TDPUD's commercial customer base. This is causing our customers to either forgo projects, spread them out over multiple years to avoid the Title 24 thresholds, or do the project without pulling permits (and utility incentives).
- TDPUD's energy efficiency results in the past had a strong commercial lighting component but the savings that we are able to claim continues to drop. The fact is that we still have a significant amount of older lighting technology in our community (T12's, incandescent, etc.) which could be targeted for cost-effective retrofits but the inability to claim the full, actual savings makes these projects appear to not be cost-effective.
- TDPUD continues to invest in Staff and tools to make the delivery and tracking of our energy efficiency programs easy for the customer and more efficient for the utility. This includes a cloud-based program management tool with on-line rebate applications, improved website, and social media.
- TDPUD continues to invest in our most successful programs and to seek out new, cost-effective program opportunities. TDPUD is seeing strong demand for our point-of-sale LED program, residential LED lighting rebate, refrigerator recycle rebate, appliance rebates which offers increasing incentives for CEE Tiers 2 & 3, and Residential Energy Surveys. Customers have embraced LED lighting technology as shown by a continued increase in LED rebates and TDPUD has phased out all CFL's.
- The funding for the energy efficiency programs increased slightly and spending remains very robust (2.8% of retail sales directly on energy efficiency programs). TDPUD did, in part due to diminishing returns in energy efficiency, move money into Electric Vehicle (EV) and customer engagement programs.

Program Highlight

- TDPUD's energy efficiency results included a first year E3 'Gross' energy savings of 1.1% of retail sales, first year E3 'Net' energy savings of 0.8% of retail sales, and TRC of 2.38. As stated above, we believe these figures overstate the true cost of the energy efficiency resource. The portfolio performance is solid and overall costs remain at or below TDPUD's cost to purchase and deliver power.
- TDPUD's Residential Energy Survey's remain a very popular program with customers. The 'visual survey' comes complete with over 20 free energy and water saving measures – including 16 free LED bulbs - that are delivered at the end of the survey for free. This program allows customers to implement the 'low hanging fruit' immediately and the educational component empowers customers to pursue more complicated energy efficiency opportunities.
- Residential lighting remains a critical program area (TDPUD is 89% residential with a large number of vacation homes). TDPUD continues to effectively deliver residential lighting through our Residential Energy Survey's, low-income program, at numerous events throughout the community, and at our office. The vast majority of light bulbs delivered to our customers is done face-to-face and the customers must ask for the light bulbs. As

stated previously, customers have embraced LED lighting and favor it over the CFL technology.

- TDPUD's LED Holiday Light Exchange remains very popular with ~3% of our customers visiting the conservation department in less than 1-month. Not only is the program cost-effective and very well received by our customers, but TDPUD takes the face-to-face opportunity to educate customers about other programs and to distribute free residential lighting.

Program Descriptions

- Residential Green Partner Lighting Program (Res Lighting): Encourages customers to replace incandescent and halogen light bulbs with energy efficient lighting by distributing, mostly in person and for free, 5-types of LED's to customers who visit the TDPUD Conservation Department or at a local event. LED give-a-ways include up to 16 mix-n-match specialty LEDs.
- Residential Lighting Rebate (Res Lighting): Encourages customers to replace incandescent and halogen light bulbs with energy efficient lighting by providing incentives for Light Emitting Diode (\$5 per LED Energy Star, \$2 per LED non-Energy Star) screw-in or plug in lamps.
- Residential Energy Survey – RES (Res Lighting): Provides free residential energy surveys and free energy and water-saving measures including the installation of up to 16 energy efficient LED bulbs, and 2 low-flow shower heads at the time of survey. Customers are also informed about TDPUD conservation programs that they may benefit from and provided with associated literature.
- Residential Appliance Rebate (Appliance): Provides increasing incentives to customers to purchase more energy efficient appliances (clothes washers, dishwashers, and refrigerators) as identified by Energy Star and the Consortium for Energy Efficiency (CEE). Rebates range from \$75 to \$125.
- Refrigerator Recycle (Res Refrigeration): Promotes the recycling of older, working refrigerators and freezers by providing customers with free pick-up and a \$30 rebate.
- LED Holiday Light Exchange (Res Lighting): Exchanges old incandescent holiday light strands with new, efficient Light Emitting Diode (LED) holiday strands for free. This one-for-one exchange (up to 66 feet of light strands) starts on the Wednesday before Thanksgiving and runs while supplies last.
- Energy Saving Program – ESP, Income-Qualified (Res Lighting): Provides a one-time bill credit and a free residential energy survey to income qualified customers. Customers are qualified by an intermediary agency and are eligible for a one-time credit equal to their highest energy charge in the past 12-months (not to exceed \$200) upon completion of the required Residential Energy Survey (RES).
- Watt Meter Loan (Not evaluated): Provides a free loan of a watt meter to help customers answer the question 'How much energy does that 110 VAC device use?'. Includes information about plug-loads and how to manage their energy use.
- Residential Building Efficiency Rebates (Res Shell): Provides an incentive of up to \$75 each for building envelope and/or duct air leakage tests and up to \$250 (50% of project cost) each for building envelope or duct leakage mitigation.
- Thermally Efficient Windows Rebate (Res Shell): Provides an incentive of \$5 per square foot of window to replace qualifying single-pane windows. Primary heating source must be a permanent electric space heating system.

- Water-Efficient Toilet Rebate (Non-Res Process): Encourages customers to replace high-water use toilets with low water use toilets (1.28 and 1.6 GPF) by providing increasing incentives for more efficient toilets. Rebates range from \$25 to \$100.
- Water-Efficient Toilet Exchange (Non-Res Process): Encourages customers to replace high-water use toilets with low 1.28 GPF water use toilets by offering a free toilet exchange or the option to apply a credit towards the purchase of any toilet carried by the exchange vendor that meets the program rules. Toilet exchange is conducted during regular business hours at a local toilet vendor.
- Customer Leak Repair Rebate (Non-Res Process): Provides a \$100 incentive to help customers locate and repair a water leak on their property. Requires the use of a licensed contractor for the repairs.
- HE Clothes Washer Water Rebate (Non-Res Process): Provides a \$50 incentive to customers who purchase a qualifying high water efficiency clothes washer. This is in addition to any applicable energy rebate.
- Residential Green Partners Water Program (Non-Res Process): Distributes, in person and for free, a variety of water saving measures to customers. Give-a-ways range from low-flow shower heads to sink aerators to hose spray nozzles.
- Patricia S. Sutton Conservation Garden (Not Evaluated): Promotes water-efficient landscaping by demonstrating, at the TDPUD's headquarters, native and drought tolerant plants, hardscaping/mulching techniques, and efficient irrigation. Plant lists, design, and materials used in the project are all available via a web-based resource at www.tdpud.org.
- Conservation Garden Party and Water-Wise Gardening Lecture Series (Not Evaluated): Encourages water-efficient gardening via lectures, access to local resources, and demonstrations.
- Neighborhood Resource Mobilization (Res Lighting): Delivers, through collaboration between a dozen local agencies, conservation programs directly to customers in a neighborhood block-party format.
- School Conservation Education (Res Lighting): Promotes energy and water conservation through an innovative series of programs designed to both educate students and deliver, for free, energy and water savings measures. 2017 handouts included 2 free LED A19 bulbs for every elementary and middle school student in TDPUD's service territory.
- Business Green Partners Lighting Program (Non-Res Lighting): Provides energy efficient screw-in light emitting diode (LED) bulbs, free of charge, to replace existing incandescent and halogen bulbs. TDPUD conservation specialist visits business to evaluate lighting needs and provide solutions.
- Commercial Lighting Rebate (Non-Res Lighting): Provides incentives to commercial customers for replacing inefficient lighting equipment with high efficiency lighting. Customers may receive a rebate equal to 1/3 of project cost (up to \$10,000) for replacing old linear fluorescent fixtures with reduced wattage T8 fluorescent or LED fixtures. Other lighting retrofits may qualify for a rebate equivalent to projected first year energy saving.
- Commercial Refrigeration (Non-Res Refrigeration): Provides energy-efficient refrigeration controls, motors, case lighting, and infiltration barriers. Customers receive a comprehensive refrigeration energy audit and proposal for energy efficient refrigeration measures from TDPUD's installation contractor. Once the proposal is accepted the measures are installed at no charge.

- Commercial Custom Rebate (Non-Res Process): Provides incentives to commercial electric customers for replacing inefficient plant equipment with high efficiency equipment. Customers may receive a rebate equal to the projected first year energy savings.
- Green Building (Not Evaluated): Promotes green building standards and techniques through collaboration with and support of local agencies and non-profits.
- Business Green Partners Water Program (Not Evaluated): Distributes to business and commercial customers free water saving measures including pre-rinse spray valves, faucet aerators and shower heads. Custom water-saving projects are evaluated for cost-effectiveness, peak reduction, and opportunities to demonstrate new technologies.

EM&V

TDPUD operates on a calendar-year for financials and we strive to deliver our completed E3 model and EM&V reports by the March 15th deadline for this report. This is a very short time-frame (2 ½ months) but the alternative of presenting EM&V results more than a year after program completion would not allow for timely feedback and program improvements. It should be noted that, given this timeframe, TDPUD does occasionally make minor adjustments to the E3 model presented in this report and the final results in the EM&V report. TDPUD has been conducting EM&V on an annual basis since 2008 and plans to continue to do so. The budget for EM&V is ~\$30,000 per year which is ~4% of program spending. TDPUD's EM&V reports can be found at <http://www.tdpud.org/departments/conservation/em-v-and-reporting>.

Sources of Energy Savings

TDPUD used a variety of sources for energy savings estimates including, but not limited to, California Municipal Utilities Association TRM, Pennsylvania TRM, Regional Technical Forum UES, DEER, and utility work papers.

TDPUD EM&V reports can be found at (<http://www.tdpud.org/departments/conservation/em-v-and-reporting>).

Complimentary Programs

- Low-Income Programs: The TDPUD's income-qualified program, Energy Saving Program (ESP), was also described in the Program Descriptions as the participation requires that customers also implement energy efficiency measures. ESP provides a one-time bill credit and a free residential energy survey to income qualified customers. Customers are qualified by an intermediary agency and are eligible for a one-time credit equal to their highest energy charge in the past 12-months (not to exceed \$200) upon completion of the required Residential Energy Survey (RES). TDPUD's income-qualified program achieves a solid return on investment for both the customer and utility.
- Renewable Energy Programs: TDPUD has a successfully fully subscribed our SB1 Solar Rebate program for our customers. TDPUD also achieved an estimated 67% Renewable Portfolio Standard (RPS) in 2017 using the methodology defined by the California Energy Commission. This number would be higher if we considered carbon-free resources. TDPUD has been able to transition our energy resource portfolio from primarily fossil fuel based in 2008 to a diversified mix that includes wind, solar, landfill gas, and small hydro while maintaining stable and competitive rates.

- Research, Development, and Demonstration: It is not practical for a small utility like TDPUD to run direct RD&D programs. However, through the Northern California Power Agency, TDPUD does participate in the American Public Power Associations DEED R&D program, the FLEX lab project and TDPUD Staff does investigate new energy and water conservation products and programs. TDPUD is researching innovative ways to capture residential EV charging data other than cost-prohibitive electric utility meters.
- Electric Vehicles: TDPUD installed two Plug-In Electric Vehicle (PEV) public access charging stations locations in 2015. Each location is monetized and has two, Level 2 PEV charging stations and are open to the public. One location is in the Truckee Train Depot in historic downtown Truckee and the other is located in the Pioneer Commerce Center. TDPUD has partnered with the Tahoe Regional Planning Agency (TRPA) on a Truckee-Tahoe PEV Readiness Plan and TRPA received a \$200,000 grant from the California Energy Commission (CEC).
- Energy Storage: TDPUD has not identified any cost-effective energy storage projects for our customers or for a utility with our demand profile and size.

TURLOCK IRRIGATION DISTRICT

Turlock Irrigation District at a Glance

- Climate Zone 12
- 102,330 of retail customer connections
- Annual total retail sales by customer class
 - \$122m residential
 - \$19m commercial
 - \$93m industrial
 - \$28m agricultural
 - \$16m municipal
 - \$3.9m pumping
 - \$1.96m other
- \$1,697,518 Annual total budget for energy efficiency programs (including EM&V, admin/overhead, incentives)
- \$1,967,010 Annual total amount actually expended for energy efficiency programs

Turlock Irrigation District Overview

TID continues to help customers achieve energy savings through the implementation and promotion of a variety of energy efficiency programs for all rate classes. Many programs provide rebate opportunities to encourage customers to conserve energy. A significant portion of the energy efficiency measures adopted by our customers were implemented by industrial and commercial segments. The majority of our savings are derived from LED lighting. However, TID provides a variety of options for businesses that are looking to make changes in their existing systems by making upgrades or retrofitting their existing facility. Rebates are available that address areas such as lighting, compressed air systems, refrigeration systems, motors, gaskets, chillers and many other systems components.

Major Program Changes

There were no major changes to our programs in 2017. However, we did increase our budget for our direct install LED lighting program for our small to medium commercial customers. Our customers appreciate this program and we were able to increase our savings with this cost effective program.

Program Highlight

TID's behavioral modification program, home energy analysis, had the largest savings impact of our residential programs. The home energy analysis reports, graph how each household is performing compared to similar homes, which has helped our customers save over 13 million

kWh's. Our customers are reacting to the home energy analysis by installing energy efficiency measures and implementing behavioral changes. In addition to the analysis reports, TID is pleased to provide our customers with a customized web portal. The web portal includes an interactive home energy audit tool and provides helpful energy saving tips.

Program Descriptions

Commercial, Industrial and Agricultural Customer Programs

- **Meter Manager:** TID offers an on-line energy management tool for business customers so they can monitor their energy usage and utilize that information to more efficiently manage their energy consumption simply by logging into a secure web site.
- **Energy Audits:** TID offers free on-site energy audits to commercial, industrial and agricultural customers who have concerns, questions or an interest in implementing measures to manage their energy usage and reduce consumption.
- **Commercial, Industrial, Agricultural Energy Efficiency Rebates:** TID offers rebates along with comprehensive technical support for all commercial, industrial and agricultural customers to promote the purchase and installation of commercial equipment and systems that support and enhance load reduction.
- **Commercial Rebate Programs:** TID offers customers rebates for purchasing and installing:
 - Commercial Motors
 - Commercial Refrigeration
 - Network PC Management Software
 - Commercial Lighting – Lighting – Non-Res Lighting
 - Advance Power Strip
 - Residential New Construction
 - Agricultural Irrigation Pump

Residential Customer Programs

- **Home energy analysis-Comprehensive – Res Comprehensive:** TID supplies our residential customers, a home energy analysis (HEA) report each month. The HEA provides the customer with information regarding their monthly usage compared to similar homes in our community or compared to their prior year(s) usage. In addition, a web portal gives our customers access to customize their home energy use, using the energy audit tool, and access to helpful energy saving tips.
- **Residential Energy Audits:** TID provides free in-home energy audits to customers who would like to learn how to reduce their energy use.
- **Residential Rebate Programs:** TID offers customers rebates for purchasing and installing:
 - Energy Star Refrigerator – Refrigeration – Res Refrigeration
 - Energy Star Room AC – HVAC – Res Cooling
 - Energy Star Clothes Washer – Appliances – Res Clothes Washer
 - Whole House Fan – HVAC – Res Shell
 - Shade Screens – HVAC – Res Shell

- Radiant Barrier – HVAC – Res Shell
 - Solar Attic Fan – HVAC – Res Shell
 - Energy Star Pool Pump – Pool Pump – Res Pool Pump
 - Energy Star Ductless Mini Split Air Conditioner – HVAC – Res Cooling
 - Central Air Conditioner – HVAC – Res Cooling
 - High Efficiency Central Air Conditioner – HVAC – Res Cooling
 - Central Heat Pump – HVAC – Res Cooling
 - LED – Lighting – Res Lighting
 - LED Holiday Lights – Lighting – Res Lighting
- Shade Tree Rebate – HVAC – Res Cooling: TID provides rebates for up to 3 trees per year that are planted to provide shade.
 - New Construction Rebate: TID offers a rebate to home builders for exceeding Title 24 energy standards.

EM&V

Please include the URL hyperlink for EM&V reports prepared. Briefly describe plans for current and future EM&V reports, including budgeted cost.

TID is currently working on our 2016 & 2017 EM&V.

Our 2014 & 2015 EM&V is available at:

http://ncpasharepointservice20161117100057.azurewebsites.net/api/document?uri=https://ncpapwr.sharepoint.com/sites/publicdocs/EMVReports/CY2014_2015_NonResidential_Turlock.pdf

Sources of Energy Savings

TID has primarily used the Technical Reference Manual to determine our savings. The majority of our commercial and industrial savings are driven by lighting projects. TID calculates the savings for each project, since our lighting rebate is paid by first year kWh savings. TID calculates the cost effectiveness using levelized utility cost for each program and as an overall portfolio. In 2017, our portfolio utility cost was \$.02/kWh.

Complimentary Programs

ASSISTANCE PROGRAMS:

- TID CARES Program: An energy assistance program for qualified customers to receive a discount on their monthly energy bills. The CARES program reduces the monthly customer charge of \$17 to \$6, a savings \$11, and provides a 15% discount on the first 800 kWh energy charges.

- Medical Rate Assistance: The District provides a 50% discount on the first 500-kWh energy charges for customers who use additional energy due to life-support equipment or a medical condition.
- Weatherization: TID has contracted with organizations within our community to provide weatherization services for families who meet the income qualification guidelines. The program enables families to reduce their energy bills by making their homes more energy efficient.

TID RENEWABLE ENERGY PROGRAM HIGHLIGHTS:

- Tuolumne Wind Project: TID purchased a 136.6 megawatt wind facility in 2008
- Solar: TID offered solar rebates for residential customers that are interested.
- Solar: In 2009, TID installed a 70.7 kW array of photovoltaic panels atop the newly renovated parking structure.
- Small Hydroelectric: TID was the first in California to construct small-scale hydroelectric power plants using its own canal system and those of neighboring irrigation districts that were not in the retail electric business. Combined the eight plants constructed, beginning in the mid 1970's provide a total of 20 megawatts of electric power. TID also owns and operates a 5 megawatt hydroelectric power plant at La Grange Dam on the Tuolumne River.
- Geothermal: In 1984, TID acquired an interest in a geothermal power plant in the Geysers Steam Field located in California's Lake County. The project has a capacity of generating 6.8 megawatts.
- In November of 2015, TID executed a 20 year Purchase Power Agreement for the full output of a 54 MW solar facility. The facility started generating mid-2017.

City of Ukiah At a Glance

- Climate Zone: 2
- Number of retail customer connections: 8,000
- FY16-17 annual total retail sales by customer class (residential 38,207,795 kWh, commercial 68,101,875 kWh, industrial 1,245,140 kWh)
- Annual total budget for energy efficiency programs (including EM&V, admin/overhead, incentives): \$143,650
- Annual total amount actually expended for energy efficiency programs: \$84,141

City of Ukiah Overview

The City of Ukiah (the City) is committed to helping their customers manage energy use through energy education and a comprehensive menu of energy efficiency incentives. In 2008, the City's PB fund account carried a large balance forward from previous years. The City responded by increasing rebate levels and removing incentive caps for energy efficiency and renewable programs for all customer segments, and increased funding to assist the City's lower-income customers. This had the desired effect of creating a dramatic increase in customer and contractor participation in the City's EE and renewable programs for the last several years. The City's customer base has not typically responded well to a "standard" energy efficiency incentive program. The main reason for this is many customers do not have the discretionary income to fund energy efficiency projects. Residential and commercial customers enthusiastically participate when the cost of their energy efficiency project is covered in full by the City's incentive programs. The City has responded by offering programs in the past to provide programs that deliver energy savings at no cost to residential and commercial customers. The City includes seasonal energy saving tips with their customer's energy bills to increase awareness and promote energy education.

In FY16-17, there has been an increased interest by developers to initiate new construction projects/developments to provide quality housing for the City's low-income and senior citizens.

Major Program Changes

During FY16-17, the City had successfully utilized the balance forward in the PB fund by providing our customers with EE, renewable and low-income programs, and restructured the incentive structure in an attempt to make available funding stretch to serve more customers and more projects. For FY16-17, this increased customer contribution requirements and resulted in a decrease in customer participation in programs across all customer segments.

In FY16-17, EE programs acquired net annual kWh savings of 77,025. Since FY11, the City has acquired 124% of their adopted energy efficiency targets. The City is considering adjusting rebate caps and increased marketing of EE programs to encourage more customer participation.

Program Highlight

The Commercial Lighting Program delivered the greatest percentage of savings in FY16-17, accounting for 82% of the total savings. The City has worked diligently over the years to build a network of lighting contractors and strived to keep them engaged in the program. By restructuring the incentives and caps, the result has reduced participation in the program by some contractors.

Program Descriptions

The City provides comprehensive energy efficiency incentive program offerings for residential and commercial customers focusing on energy efficiency and peak load reduction. For residential customers, rebates are offered for the installation of various energy efficiency measures, such as lighting, HVAC, appliances, and weatherization. For commercial customers, rebates are available for upgraded lighting, HVAC, appliances, refrigeration equipment, electronics, and in cases where an analysis is performed rebates can be offered for additional equipment that reduces energy use and/or demand. On-site energy audits are provided by the City energy specialists. Energy efficiency measures are recommended and additional visits are completed upon request.

- Residential Lighting [Res Lighting]: The City offers rebates to homeowners who install ENERGY STAR® qualified LED lamps/bulbs, ceiling fans and LED holiday lights.
- Residential HVAC [Res Cooling]: The City offers rebates to homeowners who install high performance heat pumps and air-conditioners that exceed current state requirements. The City also offers a rebate for duct sealing when not required by code.
- Residential Equipment [Res Clothes Washers; Res Dishwashers; Res Pool Pump; Res Refrigeration; Res Electronics]: The City offers rebates to homeowners who purchase new ENERGY STAR qualified products, including clothes washers, dishwashers, pool pumps, refrigerators and advanced power strips. Rebates are also available for refrigerator and freezer recycling.
- Residential Weatherization [Res Shell]: The City offers rebates to homeowners who invest in weatherizing their homes, including attic and wall insulation, window treatments/replacement, solar attic fans, and air sealing.
- Residential Water Heater Rebate [Res Water Heating]: The City offers rebates to homeowners who purchase a new, energy efficient electric water heater.
- Commercial Lighting [Non-Res Lighting]: The City offers rebates to business owners who invest in the installation of energy efficiency lighting upgrades. There is a prevalence of inefficient lighting throughout the city instead of more efficiency fluorescent or LED fixtures.
- Commercial Custom [Non-Res Comprehensive]: The City offers rebates to business owners based on site-specific consumption. Rebates are tailored to the individual business owner's needs based on the audit and the potential energy savings associated with the customer project.

EM&V

The City's last EM&V report was performed on work completed in 2009. The City has budgeted \$5,000 in FY2018 for evaluation of our programs. The City is currently exploring the opportunity of partnering with a group of other NCPA utilities on this EM&V effort to gain economies of scale.

Sources of Energy Savings

For FY17, the City has relied heavily on the savings listed in the Technical Resource Manual. The Commercial Lighting and Commercial Custom programs use custom savings calculations.

Complimentary Programs

- **Low-Income Programs:** The City offers a low-income bill assistance program to eligible customers
- **Renewable Energy Program Update:** The City's Solar Photovoltaic rebate program expired on June 30, 2017. The City still offers assistance and net metering agreements to customers wishing to install Solar PV. The City also provides final performance inspections at no cost to the customer to ensure the solar PV system is performing properly.
- **Electric Vehicles:** In addition to the 8 Tesla Fast Charging stations, the Electric Utility is planning placement of Level II chargers at strategic locations throughout the City.

VERNON PUBLIC UTILITIES

Vernon Public Utilities At A Glance

- The City of Vernon began serving electric customers in 1933 and is comprised of primarily of industrial and commercial customers which the City of Vernon was established in 1905
- Climate Zone 8
- During the fiscal year ending 2016/17, the electric system served approximately 1,914 customers, supplied approximately 1,095 Megawatt hours, and had a peak demand of 180 megawatts.
- Annual total retail sales by customer class Residential-\$45,154, Commercial-\$59,123,205 & Industrial-\$93,742,145
- The City of Vernon budgeted ½ million dollars to fund their energy efficiency programs, which 353,254 was actually spend. 2 million dollars was allocated to fund the new RPS pass-through for renewable energy and over 2 million was to help fund the City of Vernon Research & Development wind project.
- \$353,254 was the total amount actually expended for energy efficiency programs

Vernon Public Utilities Overview

The City of Vernon is currently conducting a comprehensive Integrated Resource Plan and a Rate Design based on a Cost of Service. The results of these studies will guide the Utility's decision making in the procurement of resources and delivery of services.

- To provide a host of programs that will enable business customers to conserve energy and utilize energy efficiently.
- To inform Vernon electric utility customers of the Public Benefit Programs and the associated benefits of participating in these programs.
- To monitor and evaluate the effectiveness of the programs.
- Meet or exceed energy efficient goals.

Major Program Changes

Vernon Public Utilities has not made any a major changes in their programs but the 2016/17 fiscal year has pointed to the business community that energy saving can be achieved by looking into great detail to the operation process side of the their respectable businesses. The City of Vernon business community continues to explore smart efficient ways to be resourceful. By focusing on more projects like compressors, heat conversion, and refrigeration controls and not always relying on the lighting aspect of savings. As our customers get smarter and efficient to increase their bottom line, Vernon Public Utilities has been a key ally to assist in any way possible to be more efficient. The challenges for VPU is that our customer baseline is 99 percent commercial/industrial which limits the type measures/projects can be implemented each year without proper planning or funds being allocated for each project and/or budgeting for capital improvements. This creates a challenge to meet our projected goals every year.

Program Highlight

This year highlights have been spread out to the lighting sector. Since Vernon Public Utilities customer base is consist of a lot of long-standing buildings. We had wide range of small to large companies convert to LED's. Our lighting program was really popular this year and a lot of companies has benefited.

Program Descriptions—E3 Classifications

- Lighting—Non-Res Lighting-Reflects the high volume of commercial/industrial lighting project that were conducted
- Refrigeration—Non Res Refrigeration-This is a custom measure that some of our cold storage facilities has implemented refrigeration controls systems. Next year participation in this sector will definitely increase.
- Process—Non-Res Motors: Installing energy efficient evaporator coolers controllers in cold storage facilities.

Program Descriptions

- Customer Incentive Program: Fund the exploration and implementation of energy efficient technologies and equipment, such as lighting technologies, variable speed drives, air compressors, motors, refrigeration, and air conditioning. Provide cash incentives to businesses that install energy efficient technologies.
- Customer-Directed Program: Fund customized projects demonstrating energy and cost savings and/or commercial market potential in the area of energy efficiency. Customers must fund at least 25 percent of total project cost. Projects are only eligible if they do not qualify for any of the other programs.
- Energy Education & Demonstration Workshops: Provide customers with an array of information resources to encourage energy efficiency measures through energy efficiency workshops and other forms of customer outreach.
- Energy Audit Program: Provide on-site audits for commercial/industrial businesses. A comprehensive audit includes an analysis of energy usage and costs, identification of energy conservation measures, and recommended actions.
- Time of Use Rate Programs: All customers loads exceeding 100 kilowatts demand are eligible to receive time-of-use rate; enabling them to reduce their energy cost through time management of their energy usage.

EM&V

The City of Vernon continues to have numerous projects this past fiscal year which require an in depth analysis of the energy, measurement & verification of their projects to prove the validity of the energy savings. Since we have the distinctiveness of being a small commercial/industrial city, we can provide smart and efficient reports to our customers proving their worth.

Sources of Energy Savings

Vernon Public Utilities does not have a targeted approach to energy efficiency. Currently Vernon has a customized incentive program that is driven by the energy efficiency technologies that are selected by the diverse industrial/manufacturing population of customers. These projects can range from compressed air optimization, HVA replacements, lighting, lighting controls to refrigeration equipment, refrigeration controls, pipe insulation and more efficient manufacturing equipment.

Complimentary Programs

- **Renewable Energy Programs:** Ongoing program
City of Vernon Renewable Portfolio Standard (RPS) Pass-Through
Procurement of renewable energy is one of the programs eligible for funding from public benefits charges. On June 19, 2012 City Council approved resolution No., 2012-97 authorizing the allocation of \$2 million per year of the funds derived from the public benefits charge to offset the renewable power cost pass-through to customers. The 'Renewable Portfolio Standard (RPS) Pass-Through' is a tariff mechanism designed to recover the cost of complying with California environmental laws governing the use of renewable energy supplies by power generating facilities statewide. It consists of two costs components: incremental renewable power cost and net greenhouse gas cost. The incremental renewable power cost reflects the cost of renewable energy and fuels reduced by the cost of conventional power in the base rates and credits for AB 1890 funds authorized to offset the cost of pass-through to customers.
- **Research, Development, and Demonstration:**
The City of Vernon Tehachapi wind energy on-going project located in Kern County, California is moving forward but the City is still collecting data, reviewing/addressing environmental issues, and discussing permitting with federal and local agencies. This particular project is a huge undertaking in scope which requires the City's due diligences to make this venture successful. This project is ongoing.

VICTORVILLE MUNICIPAL UTILITY SERVICES

Victorville Municipal Utility Services At a Glance

- VMUS industrial customers reside in climate zone 14.
- VMUS serves 64 non-residential meters.
- VMUS' annual energy sales were 93,310 megawatt-hours (4.8% more than last year).
- VMUS total budget for energy efficiency programs was \$175,000.
- No costs were expended for energy efficiency programs.
- The City of Victorville established VMUS in 2001 to provide safe, reliable and cost-effective service to retail customers that continue to build new facilities located in the designated service territory.
- VMUS receives wholesale power through its 33 kV and 12 kV switchgear equipment.
- Peak demand for the utility was 16.6 megawatts (1.6% less than last year).

Victorville Municipal Utility Services Overview

Customers are served through 12 kV underground facilities with larger gauge ASCR conductors to improve system reliability and reduce system losses. VMUS evaluates circuit load performance to optimize performance and reduce system losses. VMUS purchases and installs energy efficient transformers to reduce system losses.

All customers' facilities are fourteen years old or less, and meet the Title 24 requirements; which reduces the opportunity for energy savings. The system load factor is 69.1%. VMUS continued to offer customers the same energy efficiency programs.

Program Highlight

- Time-of-use meters and customers' access to their daily usage on the web portal provide the data to assess the cost of their energy usage and demand requirements.
- Cost-effective, reliable, and feasible energy efficiency improvements are a priority in the VMUS' integrated resource plan.
- VMUS serves municipal facilities that can be interrupted as scheduled.

Program Descriptions

- Audits – Industrial – Non-Res Audits: On-site energy audits of customer facilities to develop recommendations designed to improve energy operating efficiency and reduce load requirements.
- Lighting – Industrial – Non-Res Lighting: Provides incentives to improve energy efficiency for lighting applications, based on rate of \$0.064/kWh for one year of energy savings but shall not exceed 50 percent of the cost of the lighting product/equipment.
- HVAC – Industrial – Non-Res Cooling/Refrigeration: Financial incentives for the replacement of cost-effective energy-savings HVAC/Refrigeration units that reduces annual energy usage by at least 20 percent, based on rate of \$0.064/kWh or

\$0.525/therm for one year of energy savings, and/or reduces peak demand and exceeds state-mandated codes, federal-mandated codes, industry-accepted performance standards or other baseline energy performance standards, based on rate of \$100/kW for each on-peak kW that has been reduced, but shall not exceed 50 percent of the cost of associated equipment/materials.

- Refrigeration – Industrial – Non-Res Refrigeration: Financial incentives for the replacement of cost-effective energy-savings refrigeration units that reduces annual energy usage by at least 20 percent, based on rate of \$0.064/kWh or \$0.525/therm for one year of energy savings, and/or reduces peak demand and exceeds state-mandated codes, federal-mandated codes, industry-accepted performance standards or other baseline energy performance standards, based on rate of \$100/kW for each on-peak kW that has been reduced, but shall not exceed 50 percent of the cost of associated equipment/materials.
- Process – Industrial – Non-Res Process: Financial incentives for the replacement of cost-effective energy-savings motors, pumps, and equipment that reduces annual energy usage by at least 20 percent, based on rate of \$0.064/kWh or \$0.525/therm for one year of energy savings, and/or reduces peak demand and exceeds state-mandated codes, federal-mandated codes, industry-accepted performance standards or other baseline energy performance standards, based on rate of \$100/kW for each on-peak kW that has been reduced, but shall not exceed 50 percent of the cost of associated equipment/materials.
- Comprehensive - Industrial – Non-Res New Comprehensive: Reimbursement for new equipment in construction projects that exceed state-mandated codes, federal-mandated codes, industry-accepted performance standards, or other baseline energy performance standards by more than 10 percent. The program payment is based on 25 percent of the cost difference between standard and upgraded equipment and/or materials, or \$50,000, whichever is less.
- Other – Industrial – Non-Res Other: Direct funding for projects on the utility-side of the meter that provide benefits to customers in terms of improved safety, system integrity, energy efficiency, conservation, or research and development.

EM&V

Not applicable.

Sources of Energy Savings

VMUS relies upon the Energy Efficiency Technical Reference Manual for energy savings estimates.

Complimentary Programs

- Energy Storage: VMUS' energy storage goal is to procure cost-effective energy storage applications equal to one percent (1%) of its peak load during calendar year 2020, with installations occurring no later than the end of calendar years 2021. No specific cost-effective energy storage application has been identified to date.

APPENDIX B

Comparison of Reported Energy Savings to Annual Targets

Utility	Size	Reported (MWh)	Target (MWh)	% of Target
Alameda	Non-IRP	2,295	1,247	184.0%
Anaheim	IRP	33,288	25,742	129.3%
Azusa	Non-IRP	5,969	2,573	232.0%
Banning	Non-IRP	382	591	64.6%
Biggs	Non-IRP	122	46	265.4%
Burbank	IRP	14,146	11,281	125.4%
Colton	Non-IRP	1,197	1,759	68.0%
Corona	Non-IRP	27	334	8.2%
Glendale	IRP	18,842	11,607	162.3%
Gridley	Non-IRP	50	170	29.2%
Healdsburg	Non-IRP	456	336	135.8%
Imperial	IRP	24,045	16,656	144.4%
Lassen	Non-IRP	543	290	187.1%
Lodi	Non-IRP	3,854	3,492	110.4%
Lompoc	Non-IRP	175	229	76.2%
Los Angeles	IRP	478,887	394,000	121.5%
Merced	Non-IRP	1,167	1,392	83.8%
Modesto	IRP	11,375	18,986	59.9%
Moreno Valley	Non-IRP	956	277	345.0%
Needles	Non-IRP	3	128	2.4%
Palo Alto	IRP	5,986	6,245	95.9%
Pasadena	IRP	24,949	12,750	195.7%
Pittsburg Power	Non-IRP	48	123	38.7%
Plumas-Sierra	Non-IRP	111	146	75.9%
Port of Oakland	Non-IRP	227	104	217.9%
Rancho Cucamonga	Non-IRP	54	509	10.6%
Redding	IRP	3,478	3,458	100.6%
Riverside	IRP	20,956	19,756	106.1%
Roseville	IRP	14,672	8,007	183.2%
Sacramento	IRP	155,386	180,000	86.3%
San Francisco	IRP	3,026	4,857	62.3%
Shasta Lake	Non-IRP	276	239	115.7%
Silicon Valley Power	IRP	16,888	22,848	73.9%
Trinity	Non-IRP	1	122	0.9%
Truckee Donner	Non-IRP	1,243	1,552	80.1%
Turlock	IRP	14,692	16,394	89.6%
Ukiah	Non-IRP	77	428	18.0%
Vernon	IRP	2,096	6,664	31.5%
Victorville	Non-IRP	0	172	0.0%

This table compares each POU's reported energy savings for FY 2016-2017 programs to their annual energy efficiency target adopted in 2013 (2014 for LADWP, 2017 for Turlock).

Public power achieved **111.1%** of their adopted targets.

The 16 IRP utilities collectively achieved **111.0%** of their annual targets, which is particularly impressive as a number of these utilities adopted annual reach goals in excess of 1% of retail sales or greater.

The smaller, non-IRP utilities also collectively outperformed their potential studies, achieving **118.3%** of their adopted targets.

Moreno Valley, Biggs, Azusa, and the Port of Oakland all had exceptional years with reported energy savings more than double their adopted targets.