City of Chula Vista Zero Net Energy Roadmap

December 5, 2019



Prepared by:

Srushti Koli

Lake Casco, PE

Dhananjay Mangalekar, PE

TRC

17911 Von Karman Avenue,

Suite 400, Irvine, CA 92614

Acknowledgements

TRC would like to thank Coleen Wisniewski, Cory Downs, Iracsema Quilantan, Robert Coleman, Yasemin Corrales, Barbara Locci, Alejandro Ruiz-Velasco, Stephen Mosca, and Jake Songhurst of City of Chula Vista for all their help and cooperation. TRC would also like to thank San Diego Gas and Electric (SDG&E) for coordinating this effort.

Disclaimer

The calculations provided herein are estimates only. TRC makes no warranty, expressed or implied, including, but not limited to, any warranty of merchantability or fitness for any particular use or application. TRC recommends that the City consult licensed contractors to verify site conditions and advise the City of the expected costs, savings, and scope details prior to any equipment ordering or construction.

Table of Contents

1 Executive Summary 7
2 Portfolio Summary 9
3 Goals and Objectives 11
4 Energy Report Cards 12
5 Proposed EEMs 38
6 Renewable Energy 79
7 ZNE Roadmap 82
Appendix A: Site General Descriptions 90
Appendix B: Existing Equipment Inventory 95
Appendix C: Proposed EEM Savings and Cost per Building 114

Table of Figures

Figure 1: Typical Fan Motor and Belt 40
Figure 2: Typical Evaporator Coil Section 40
Figure 3: Broken Economizer (OAD) Linkage 40
Figure 4: Typical Packaged RTU 42
Figure 5: Typical Outdoor Condensing Units 44
Figure 6: Existing Radiant Heater 46
Figure 7: Typical Fan Motor and Belt 47
Figure 8: Typical Coil Section 47
Figure 9: Broken Economizer (OAD) Linkage 47
Figure 10: Condensate on the Pipe Insulation (Police Department HQ) 50
Figure 11: Existing Chiller (Public Works) 51
Figure 12: Typical Outdoor Boiler Installation 52
Figure 13: Heating Hot Water Pumps at Police Department HQ 53
Figure 14: Heating Hot Water Pumps at Public Works 54
Figure 15: Primary Chilled Water Pumps at Public Works 54
Figure 16: Chilled Water Pumps at Civic Center Library 54
Figure 17: Heating Water Pumps at South Chula Vista Library 55
Figure 18: Hot Cold Air Aisle Management 59
Figure 19: Proposed Type B LED Plug-in Lamps 61
Figure 20: Proposed Type B LED Corn Cobs 62
Figure 21:Proposed LED Retrofit Kit 62
Figure 22: Example of Proposed Advanced Lighting Control System 63
Figure 23: Existing Loma Verde Pool 63
Figure 24: Typical Schematic of Advanced Power Strip Control 66
Figure 25: Low-E Reflective Window Film 67
Figure 26: Example of Circulating Block Heater 68
Figure 27: Typical ICE Bear System Schematic 69
Figure 28: Existing and Planned Solar PV Generation 80
Figure 29: ESPM and PV Watts Energy Generation Comparison 81
Figure 30: ZNE Energy Flow Diagram 83
Figure 31: ZNE Verification Process 86
Figure 32: Civic Center Building 100 and Fire Station 01 Virtual Net-Metering Monthly Energy Consumption 88
Figure 33: Civic Center Complex Microgrid Monthly Energy Consumption 89
Figure 34: Police Department HQ 90
Figure 35: Civic Center 90
Figure 36: Civic Center Library 91
Figure 37: Norman Park Senior Center 91
Figure 38: Fire Station 3 92
Figure 39: Loma Verde Recreation Center 92
Figure 40: Parkway Community Center 93
Figure 41: Otay Recreation Center 93

Figure 42: Lauderbach Community Center 94
Figure 43: Montevalle Recreation Center 94

Table of Tables

Table 1: Proposed EEM Savings and Cost Summary – All Sites 8
Table 2: Proposed Total EEM Savings and Cost Summary 8
Table 3: Facilities Description 10
Table 4: EEM Description 39
Table 5: EEM 1 Savings and Cost 40
Table 6: Existing Equipment Impacted by EEM 1 42
Table 7: EEM 2 Savings and Cost 42
Table 8: Existing Equipment Impacted by EEM2 43
Table 9: EEM 3 Savings and Cost 44
Table 10: Existing Equipment Impacted by EEM 3 45
Table 11: EEM 4 Savings and Cost 46
Table 12: Existing Equipment Impacted by EEM2 46
Table 13: EEM 5 Savings and Cost 47
Table 14: Existing Equipment Impacted by EEM 5 49
Table 15: EEM 6 Savings and Cost 50
Table 16: Existing Equipment (Police Department HQ) Impacted by EEM 6 51
Table 17: Existing Equipment (Public Works) Impacted by EEM 6 51
Table 18: EEM 7 Savings and Cost 52
Table 19: Existing Equipment Impacted by EEM 7 52
Table 20: EEM 8 Savings and Cost 53
Table 21: Existing Equipment Impacted by EEM 8 55
Table 22: EEM 9 Savings and Cost 56
Table 23: EEM 11 Savings and Cost 58
Table 24: EEM 12 Savings and Cost 60
Table 25: Existing Equipment Impacted by EEM 12 60
Table 26: EEM 13 Savings and Cost 60
Table 27: EEM 14 Savings and Cost 61
Table 28: EEM 15 Savings and Cost 62
Table 29: EEM 16 Savings and Cost 63
Table 30: EEM 17 Savings and Cost 64
Table 31: EEM Inventory of Existing Appliances 64
Table 32: EEM 16 Savings and Cost 64
Table 33: Inventory of Existing Vending Machines 65
Table 34: Inventory of Existing Computers 66
Table 35: EEM 19 Savings and Cost 66
Table 36: EEM 20 Savings and Cost 67
Table 37: EEM 21 Savings and Cost 68
Table 38: EEM 22 Savings and Cost 69

Table 39: Existing Equipment Impacted by EEM 10 70
Table 40: EEM 23 Savings and Cost 70
Table 41: Impacts of Electrification 72
Table 42: Lifetime Savings Metrics 72
Table 43: EEM Project Financial Metrics 72
Table 44: Financial Metrics Calculation Factors 74
Table 45: Applicable Incentives 75
Table 46: Project Funding Prioritization 79
Table 47: Total Renewable Energy and Battery Storage 80
Table 48: EEM, Renewable, Utility, and Total Energy Consumed in Baseline and Proposed Cases 84
Table 49: Carbon Emissions Savings Summary 85
Table 50: Chula Vista ZNE Project Lifetime Savings 85
Table 51: High Potential ZNE Buildings 87
Table 52: Police Dept HQ Operating Hours 90
Table 53: Civic Center Operating Hours 90
Table 54: Civic Center Library Operating Hours 91
Table 55: Civic Center Library Operating Hours 91
Table 56: Fire Station Locations 92
Table 57: Loma Verde Recreation Ctr. Operating Hours 92
Table 58: Parkway Comm Ctr. Operating Hours 93
Table 59: Otay Recreation Ctr. Operating Hours 93
Table 60: Lauderbach Comm Ctr. Operating Hours 94
Table 61: Montevalle Recreation Ctr. Operating Hours 94
Table 62: Existing Air-side HVAC Equipment Inventory 107
Table 63: Existing Boiler Inventory 108
Table 64: Existing Chiller Inventory 109
Table 65: Existing Cooling Tower Inventory 109
Table 66: Existing Pump Inventory 110
Table 67: Existing Pool Water Heating Boiler Inventory 111
Table 68: Existing Lighting Equipment Inventory 112
Table 69: Existing Domestic Hot Water (DHW) Heaters Inventory 113
Table 69: Proposed EEM Savings and Cost – Police Department 114
Table 70: Proposed EEM Savings and Cost – Civic Center Building 100 115
Table 71: Proposed EEM Savings and Cost – Civic Center Building 200 116
Table 72: Proposed EEM Savings and Cost – Civic Center Building 300 117
Table 73: Proposed EEM Savings and Cost – Civic Center Library 118
Table 74: Proposed EEM Savings and Cost – Public Works 119
Table 75: Proposed EEM Savings and Cost – South Chula Vista Library 120
Table 76: Proposed EEM Savings and Cost – Norman Park Senior Center 121
Table 77: Proposed EEM Savings and Cost – Montevalle Recreation Center 122
Table 78: Proposed EEM Savings and Cost – Otay Recreation Center 123
Table 79: Proposed EEM Savings and Cost – Park Way Recreation Center Complex 124
Table 80: Proposed EEM Savings and Cost – Loma Verde Recreation Center 125

Table 81: Proposed EEM Savings and Cost – Salt Creek Recreation Center 125
Table 82: Proposed EEM Savings and Cost – Veterans Recreation Center 126
Table 83: Proposed EEM Savings and Cost – Fire Station 1 127
Table 84: Proposed EEM Savings and Cost – Fire Station 2 128
Table 85: Proposed EEM Savings and Cost – Fire Station 3 129
Table 86: Proposed EEM Savings and Cost – Fire Station 4 130
Table 87: Proposed EEM Savings and Cost – Fire Station 6 131
Table 88: Proposed EEM Savings and Cost – Fire Station 7 132
Table 89: Proposed EEM Savings and Cost – Fire Station 8 133
Table 90: Proposed EEM Savings and Cost – Animal Shelter 134
Table 91: Proposed EEM Savings and Cost – Park Lighting 135
Table 92: Proposed EEM Savings and Cost – Street Lighting 135

1 Executive Summary

The purpose of this Zero Net Energy Roadmap is to identify ways to save energy, achieve City and state climate action planning goals with the ongoing reduction of greenhouse gas (GHG) emissions, and realize portfolio zero net energy (ZNE) status for the City of Chula Vista (City) by 2035. This report focuses on the City's current energy efficiency potential and identifies remaining energy needs to be met by other sources.

TRC analyzed 43 sites, with a total of 53 buildings, parks, and other properties, in this study. Table 2 presents the overall project financials for these sites.

Site	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Net Implementation Cost[1]	Simple Payback Period	Net Present Value	Return on Investment
	(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	(yr)	($)	(%)
Chula Vista Police Dept	959,195	217	51,652	465	$284,000	$2,164,000	8.3	$1,578,000	73%
Chula Vista Civic Center Bldg 100	182,843	216	1,464	44	$51,000	$492,000	10.3	$185,000	38%
Chula Vista Civic Center Bldg 200	118,632	152	1,288	30	$36,000	$363,000	10.7	$107,000	29%
Chula Vista Civic Center Bldg 300	275,585	231	5,532	84	$67,000	$537,000	8.8	$356,000	66%
Civic Center Library	252,083	41	4,221	73	$81,000	$1,034,000	13.3	$39,000	4%
Chula Vista Public Works	615,020	237	11,814	185	$183,000	$1,218,000	7.2	$1,331,000	109%
South Chula Vista Library	83,438	3	855	21	$21,000	$182,000	9.0	$91,000	50%
Norman Park Senior Center	47,044	22	682	13	$13,000	$157,000	12.3	$8,000	5%
Loma Verde Rec Center	0	0	6,960	37	$6,000	$51,000	9.8	-$17,000	-32%
Montevalle Rec Center	108,076	76	891	26	$33,000	$204,000	6.3	$224,000	110%
Otay Rec Center	27,997	13	19	6	$8,000	$55,000	6.7	$32,000	58%
Parkway Rec Center Complex	63,953	39	4,987	39	$24,000	$208,000	9.1	$57,000	28%
Salt Creek Rec Center	30,710	9	0	6	$7,000	$66,000	9.3	$6,000	9%
Veterans Rec Center	3,198	2	0	1	$1,000	$14,000	14.5	-$4,000	-28%
Fire Station 1	21,340	4	-23	4	$6,000	$64,000	11.3	$12,000	19%
Fire Station 2	9,149	3	-13	2	$3,000	$23,000	8.4	$10,000	42%
Fire Station 3	5,363	1	0	1	$2,000	$17,000	9.6	$7,000	42%
Fire Station 4	33,622	7	-10	7	$11,000	$83,000	8.2	$46,000	55%
Fire Station 6	30,670	8	-16	6	$9,000	$49,000	5.8	$56,000	115%
Fire Station 7	51,919	12	-22	10	$13,000	$146,000	11.5	$19,000	13%
Fire Station 8	49,469	14	-9	10	$11,000	$81,000	7.7	$47,000	58%

[1] Net implementation cost includes applicable incentives. See Section 5 for more details.

Site	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Net Implementation Cost[1]	Simple Payback Period	Net Present Value	Return on Investment
Animal Shelter	37,283	58	5,517	37	$15,000	$141,000	10.0	$75,000	53%
Chula Vista Streetlights	381,589	0	0	76	$169,000	$2,079,000	12.6	$244,000	12%
Park Lighting	96,397	24	0	19	$25,000	$97,000	3.9	$144,000	148%

Table 1: Proposed EEM Savings and Cost Summary – All Sites

Electricity Savings	Natural Gas Savings	Annual Cost Savings	Implementation Cost	Estimated Incentives	GHG Emission Reduction	Simple Payback Period
(MWh/yr)	(thm/yr)	($)	($)	($)	(MT $CO2_e$)	(Years)
3,486	**132,762**	**$1.08M**	**$10.07M**	**$0.55M**	**1,398**	**8.84**

Table 2: Proposed Total EEM Savings and Cost Summary

By implementing the energy efficiency measures identified in this report, the City would be approximately 37% away from achieving its electric and gas portfolio ZNE goals. **Based on the analysis, after EEM implementation the City must generate an additional 7.56 GWh of renewable energy to meet its portfolio ZNE goal and completely offset its electrical and natural gas facilities consumption**. This amounts to 140% more than the City's current and planned PV installations. With that being said, the City does have a number of good ZNE *building* candidates, see additional details in Section 7. This report also discusses other ZNE options for electrification and renewable natural gas which can be found in Section 5.24 and Section 7, respectively.

2 Portfolio Summary

TRC included a total of 43 sites in this study, and conducted an in-depth analysis of these sites, as presented in Table 3. TRC performed site visits on all major facilities based on the building area and baseline energy usage profile and sampled some of the other smaller building like fire stations and recreational centers. The analysis for the sites not visited by TRC was based on the previous audit information and equipment inventory provided by the City staff. Major upgrades/ renovations were planned at some of the City buildings, hence were excluded from the analysis. This table describes the basic characteristics of each of facility. Refer to Appendix A: Site General Descriptions for the facilities general descriptions and schedules and refer to Appendix B: Existing Equipment Inventory for the mechanical, lighting, water heater, and electrical generation inventory of each of the facilities listed in Appendix A: Site General Descriptions.

EEMs Analyzed	Site & Facility Name	Address	Sq. Ft.	Building Type
Yes	Police Dept HQ	315 4th Ave	298,688	Police Department
Yes	Civic Center - Building 100	276 4th Ave	42,230	Office
Yes	Civic Center - Building 200	276 4th Ave	30,562	Office
Yes	Civic Center - Building 300	276 4th Ave	50,124	Office
Yes	Civic Center - Library	365 F St	113,166	Assembly
Yes	Public Works - Yard	1800 Maxwell Ave	176,586	Various
Yes	South Chula Vista Library	389 Orange Ave	38,614	Assembly
Yes	Norman Park - Senior Center	270 F St	23,236	Assembly
Yes	Parkway Recreation Complex	385 Park way	41,711	Various
Yes	Montevalle Recreation Center	840 Duncan Ranch Rd	21,144	Assembly
Yes	Otay Recreation Center	3554 Main St	14,643	Assembly
No	Loma Verde Recreation Center[2]	1420 Loma Lane	23,536	Assembly
Yes	Loma Verde - Swimming Pool		12,200	Pool
Yes	Lauderbach Recreation Center	333 Oxford St	8,544	Assembly
Yes	Fire Station 1	447 F St	10,500	Fire Station
Yes	Fire Station 2	80 East J St	7,488	Fire Station
Yes	Fire Station 3	1410 Brandywine Ave	4,181	Fire Station
Yes	Fire Station 4	850 Paseo Ranchero	8,906	Fire Station
No	Fire Station 5[2]	391 Oxford St	3,956	Fire Station
Yes	Fire Station 6	605 Mount Miguel Rd	6,400	Fire Station
Yes	Fire Station 7	1640 Santa Venitia Rd	13,947	Fire Station
Yes	Fire Station 8	1180 Woods Drive	8,800	Fire Station

[2] Upgrades/renovations planned at site

EEMs Analyzed	Site & Facility Name	Address	Sq. Ft.	Building Type
No	Fire Station 9[2]	266 East Oneida Ct	2,169	Fire Station
No	Living Coast Discovery Center	1000 Gunpowder Dr	18,373	Assembly
Yes	Animal Shelter	130 Beyer Way	18,005	Assembly
Yes	Veterans Park - Building	785 E Palomar St	15,885	Assembly
Yes	Salt Creek Park - Building	2710 Otay Lakes Rd	19,500	Assembly
No	Heritage Park - Building[3]	1381 E Palomar St	6,000	Assembly
No	Sunset View Park - Building[3]	1390 South Green view Sr	12,800	Assembly
No	Cottonwood Park - Building[3]	1778 East Palomar	1,000	Assembly
No	Chula Vista Women's Club[2]	357 G St	4,310	Assembly
No	Rhor Park - Building[3]	4548 Sweetwater Rd	11,282	Assembly
No	Eucalyptus Park - Building[3]	4th St and C Rt	600	Assembly
Yes	Bay Boulevard Park	2050 Otay Valley Circle	65,340	Park
Yes	Bonita Long Canyon Park	1745 Coltridge Ln	474,804	Park
Yes	Breezewood Park	1091 Breezewood Dr	108,900	Park
Yes	Discovery Park	700 Buena Vista Way	888,624	Park
Yes	Explorer Park	Rancho Del Rey Parkway & Norella St	243,936	Park
Yes	Friendship Park	Fourth Ave & F St	174,240	Park
Yes	Greg Rogers Park	1189 Oleander Ave	1,833,876	Park
Yes	Harvest Park	1150 E Palomar St	230,868	Park
Yes	Hilltop Park	780 Hilltop Dr	327,571	Park
Yes	Los Niños Park	150 Teal St	222,156	Park
Yes	Marisol Park	916 Rancho Del Rey Pkwy	217,800	Park
Yes	Memorial Park	373 Park Way	165,528	Park
Yes	Mount San Miguel Park	2335 Paseo Veracruz	849,420	Park
Yes	Palomar Park	1359 Park Dr	117,612	Park
Yes	Rienstra Sports Complex	1500 Max Ave	309,276	Park
Yes	SDG&E Park	1450 Hilltop Dr	871,200	Park
Yes	Sunbow Park	500 E Naples St	161,172	Park
Yes	Sunridge Park	952 Beechglen Dr	287,496	Park
Yes	Terra Nova Park	450 Hidden Vista Dr	740,520	Park
Yes	Tiffany Park	1713 Elmhurst Ave	230,868	Park

Table 3: Facilities Description

[3] Equipment/Lighting inventory not available

3 Goals and Objectives

The purpose of this study is to develop a portfolio ZNE roadmap and implementation plan for the City. This has been accomplished through a detailed technical, market, and cost feasibility analysis of energy efficiency measures (EEMs). The following objectives were defined to fulfill all the details of the goal:

- **Achieve Portfolio-wide Zero Net Energy:** Achieve ZNE status at a city (portfolio) level and decrease GHG emissions by reducing demand and electrifying direct emissions equipment. This report uses a site energy ZNE metric, which compares the actual annual energy delivered to the sites across the City's portfolio to the City's on-site generation. This metric was chosen, as opposed to source energy ZNE, because it more closely reflects how the City's efforts will impact its finances and operations.
- **Improve Economic Impact:** Reduce costs associated with energy consumption, operations and maintenance, and control and manage loads to reduce the overall grid (i.e., SDG&E's grid) load.
- **Support Clean Energy Market Transformation:** Demonstrate an effective and clean portfolio ZNE roadmap that is scalable across local governments, counties, and regional agencies.

Moreover, the ZNE effort would also be an excellent expression of the City's commitment to the following climate and energy goals set forth by the State of California and the United Nations (UN):

- **Reduce Carbon Emissions by 45% between 2010 and 2030 and achieve zero net energy by 2050[4]:** In order to limit global warming to 1.5°C, the UN estimates that that zero net energy must be achieved globally by 2050. By implementing the measures outlined in the report the City contributes to this global effort.
- **Reducing Statewide GHG Emissions to 40% Below 1990 Levels by 2030 and 80% by 2050[5]:** Per California SB 350 the state has medium- and long-term emissions goals. By implementing the proposed energy efficiency and renewable energy strategies, the City can reduce its GHG contribution from its facilities by roughly 60%.
- **Use Renewable Resources for Half of the State's Electricity by 2030[5]:** Six percent of the energy consumed by the City currently originates from renewable power sources. Implementing the proposed EEMs and planned distributed energy resource (DER) measures would allow the city to move towards achieve its ZNE goal stated above.
- **Doubling Energy Savings in Existing Buildings by 2030[5]:** As presented in Section 7, the implementation of the proposed EEMs would substantially reduce the overall energy usage of the City by 35%.
- **Retrofit 50% of Existing Commercial Buildings to Become ZNE by 2030[6]:** As discussed in Section 7, by implementing the strategies outlined in this report the City can achieve site energy ZNE at a number of its facilities. This California goal references source energy ZNE which requires an additional calculation, however a site ZNE building will also qualify as a source ZNE building.

The Chula Vista ZNE project would contribute to all the above-mentioned energy goals by demonstrating how various EEMs can be utilized together with the City's current and future renewable generation resources to meet all the City's power needs.

[4] United Nations Development Programme, Sustainable Development Goal 13: Climate Action. https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-13-climate-action.html"
[5] California SB 350 "Clean Energy and Pollution Reduction Act", 2015
[6] California Long Term Energy Efficiency Strategic Plan, 2008

4 Energy Report Cards

TRC designed these report cards to provide a visual representation of the potential economic and energy savings achieved through the implementation of the EEMs. The report cards also show a breakdown of the proposed energy consumption and reduction of GHG.

Based on modelled energy savings, TRC performed an hourly analysis to determine the time-of-use, on-bill electricity savings using each site's specific utility rate tariff. Natural gas savings were also calculated using each site's blended natural gas rate. First year and lifetime financial metrics were calculated over a 20-year period for each EEM based on its estimated useful life.

Grid purchased utility consumption, energy efficiency potential, and renewable energy generation were compared to provide a site-specific energy breakdown and show the proposed EEMs impact each sites ability to reach ZNE. Finally, direct and indirect site energy emissions reductions were calculated over the lifetime of the project.

The following page can be used as a reference to understand the structure, graphs, and information included in each of the report cards presented in this section.

ZNE Report Cards Cheat Sheet

This section outlines the basic energy information of the site

Data obtained from the City's Corporate View and utility bills

This section outlines the EEMs identified for the site in Section 5 of the report. Refer to Appendix C for more details on the savings and payback.

This section outlines the annual energy breakdown with the grid purchased energy, renewable energy available based on the installed, and planned solar capacity and the energy offset from implementing EEMs

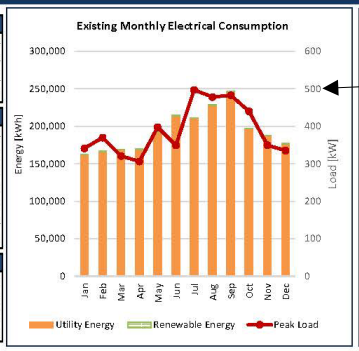
This section summarizes the lifetime savings and financial analysis

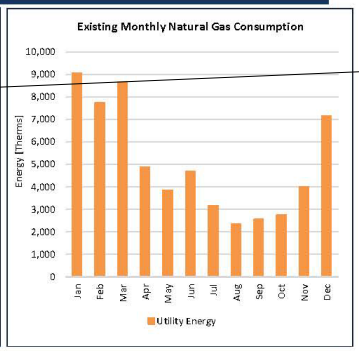
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	148,374
Building(s) Vintage:	2004
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf)	4.30

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	666513104
Utility Rate Tariff:	SDGE - AL-TOU: Secondary
Energy Purchased (kWh):	2,317,368
Peak Power (kW):	497
Blended Utility Rate:	$0.20
Solar PV Capacity:	4
Renewable Energy:	6,002

CURRENT NATURAL GAS BILLING DATA	
Service Account:	666505380
Utility Rate Tariff:	GN3
Energy Purchased:	60,787
Utility Rate:	$0.72





These two graphs represent the current electricity and gas consumption of the site.

In orange, the current utility energy being used is shown.

In green, is the installed renewable energy.

The red line represents the peak demand profile.

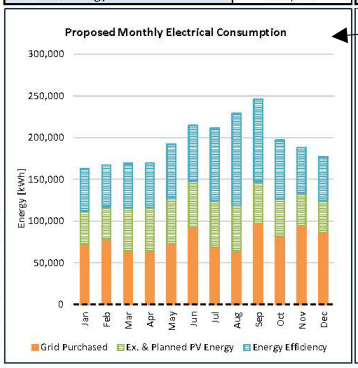
ENERGY EFFICIENCY

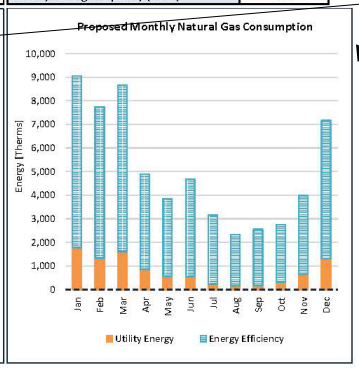
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-5	Air Handler Replacements
EEM-6	Chiller Plant Upgrades
EEM-7	Boiler Replacements
EEM-8	Pumping System Upgrades
EEM-9	HVAC Controls - EMS
EEM-12	Parking Garage Exhaust Fan VFDs
EEM-15	Lighting Controls - Occupancy Sensors
EEM-18	Plug Load Controls (Vending Misers and Power Strips)
EEM-21	Demand Response
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	343
Renewable Energy:	571,838

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	60
Battery Storage Capacity (kWh)	137

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Electricity Savings (kWh):	810,541
Demand Reduction (kW):	196.59
Natural Gas Savings (therms):	51,199
GHG Reductions (MT CO_2)[b]:	433
EEM Implementation Cost:	$2,502,000
EEM Annual Utility Savings[c]:	$144,070
EEM Annual Maintenance Savings[d]:	$75,060
EEM Simple Payback:	9.78





These two graphs show the impact the implementation of the identified EEM has on the current site's energy consumption.

In orange, the current utility energy being used is shown.

In green, is the installed and planned renewable energy.

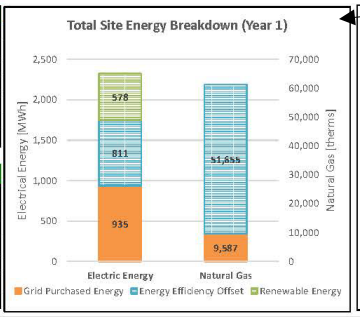
In blue, the reduction in energy corresponding to the implementation of the EEMs is shown.

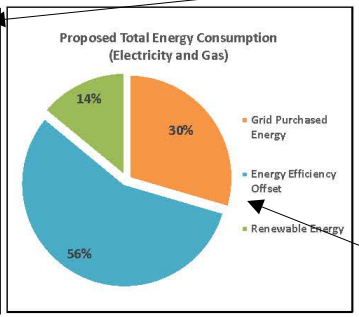
This graph shows the annual impact the implementation of the identified EEMs has on the current site's energy consumption.

SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	2,323,370
Grid Purchased Energy (kWh)	*934,988*
Energy Efficiency Offset (kWh)	*810,541*
Renewable Energy (kWh)	*577,840*
Total Baseline Natural Gas (therms)	60,787
Grid Purchased Energy (therms)	*9,587*
Energy Efficiency Offset (therms)	*51,655*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e,f,g]	
Electricity Savings (MWh)	12,268
Natural Gas Savings (therms)	798,107
GHG Emissions Reduction (MT CO2):	6,798
Net Present Value (NPV):	$1,038,169.04
Internal Rate of Return (IRR):	9.97%
Return on Investement (ROI):	11.2%
Savings to Investment Ratio:	1.231





In orange, the current utility energy being used is shown.

In green, is the installed and planned renewable energy.

In blue, the reduction in energy corresponding to the implementation of the EEMs is shown.

The pie chart aims to present the annual percentage of renewable energy (green) and the percentage of energy reduced through the proposed EEM implementation (blue).

In orange, the annual percentage of utility energy used to meet the remaining building demand is shown.

a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

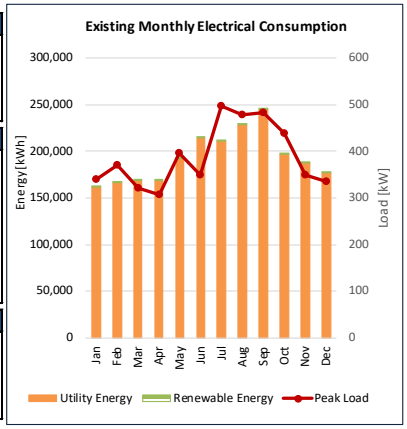
4.1 Police Department Headquarters

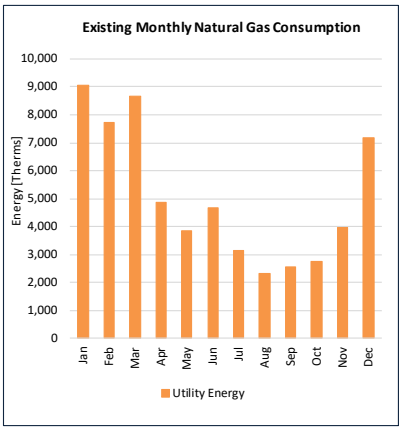
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	148,374
Building(s) Vintage:	2,004
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf)	4.30

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	666513104
Utility Rate Tariff:	SDGE - AL-TOU: Secondary
Energy Purchased (kWh):	2,317,368
Peak Power (kW):	497
Blended Utility Rate:	$0.20
Solar PV Capacity (kW):	4
Renewable Energy (kWh):	6,002

CURRENT NATURAL GAS BILLING DATA	
Service Account:	666505380
Utility Rate Tariff:	GN3
Energy Purchased (Therms	60,787
Utility Rate:	$0.72





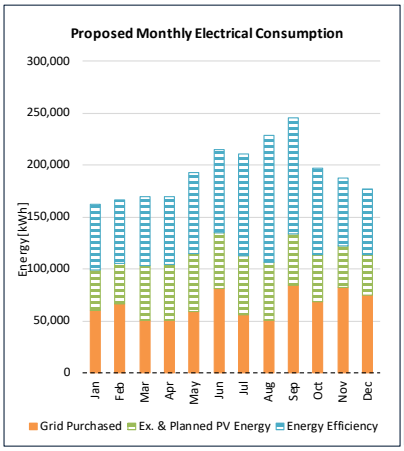
ENERGY EFFICIENCY

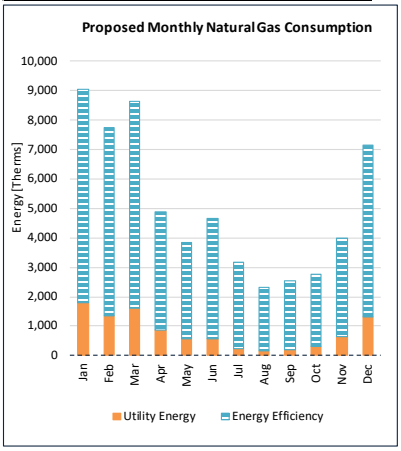
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)$_a$	
EEM-5	Air Handler Replacements
EEM-6	Chiller Plant Upgrades
EEM-7	Boiler Replacements
EEM-8	Pumping System Upgrades
EEM-9	HVAC Controls - EMS
EEM-12	Parking Garage Exhaust Fan VFDs
EEM-13	Interior Lighting Replacements
EEM-15	Lighting Controls - Occupancy Sensors
EEM-17	Appliance Replacement
EEM-18	Plug Load Controls (Vending Misers and Power Strips)
EEM-21	Demand Response
-	-

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)$_a$	
Annual Electricity Savings (kWh):	959,195
Annual Demand Reduction (kW):	217.47
Annual Natural Gas Savings (therms):	51,652
Annual GHG Reductions (MT CO2)$_b$:	465
EEM Implementation Cost:	$2,357,700
EEM Annual Utility Savings$_c$:	$175,673
EEM Annual Maintenance Savings$_d$:	$70,731
EEM Estimated Incentives:	$194,110
EEM Simple Payback:	8.31

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	343
Renewable Energy (kWh):	571,838

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	60
Battery Storage Capacity (kWh)	137

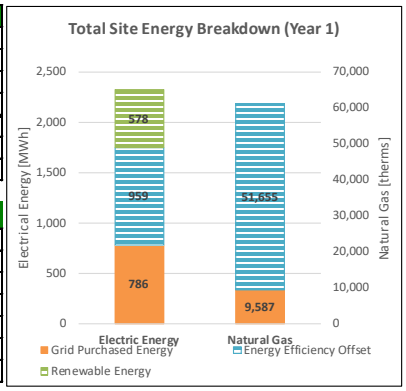


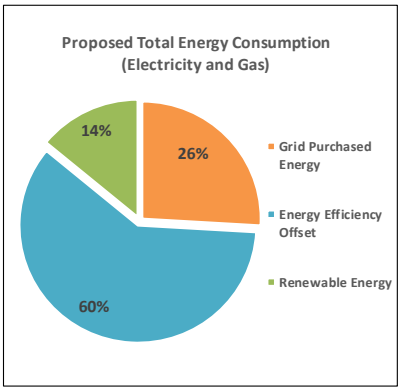


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	2,323,370
Grid Purchased Energy (kWh)	*786,335*
Energy Efficiency Offset (kWh)	*959,195*
Renewable Energy (kWh)	*577,840*
Total Baseline Natural Gas (therms)	60,787
Grid Purchased Energy (therms)	*9,587*
Energy Efficiency Offset (therms)	*51,655*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS$_{e,f,g}$	
Lifetime Electricity Savings (MWh):	13,605
Lifetime Natural Gas Savings (therms):	805,170
Lifetime GHG Emissions Reduction (MT CO2)	7,109
Net Present Value (NPV):	$1,577,860.84
Internal Rate of Return (IRR):	13.49%
Return on Investement (ROI):	72.9%
Savings to Investment Ratio:	1.729





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%, Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

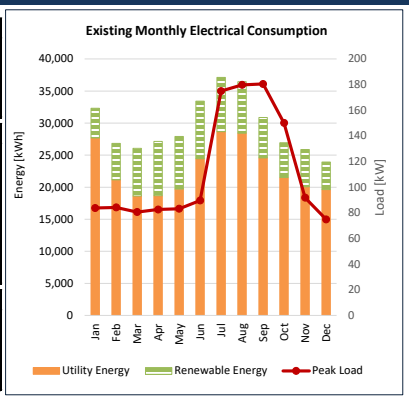
4.2 Civic Center Building 100

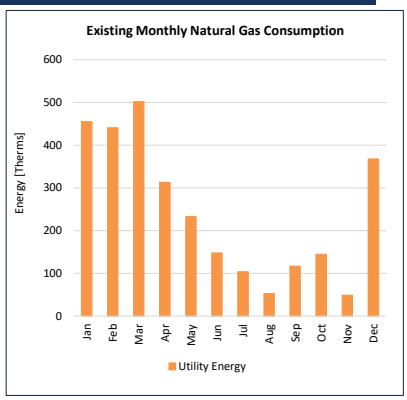
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	44,486
Building(s) Vintage:	2,004
Energy Star Score:	90
Energy Star Site EUI (kBTU/sf)	34.80

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	1150613925
Utility Rate Tariff:	SDGE - DG-R-CPP-GrFa: Secondary
Energy Purchased (kWh):	273,112
Peak Power (kW):	181
Blended Utility Rate:	$0.28
Solar PV Capacity (kW):	253
Renewable Energy (kWh):	81,751

CURRENT NATURAL GAS BILLING DATA	
Service Account:	1150615027
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	2,928
Utility Rate:	$0.77





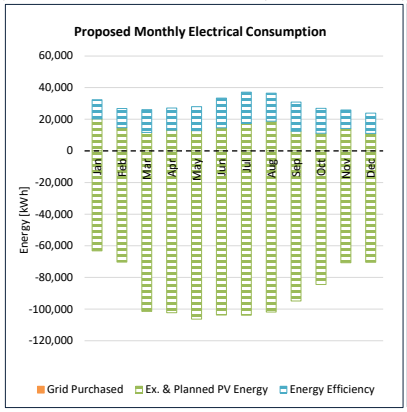
ENERGY EFFICIENCY

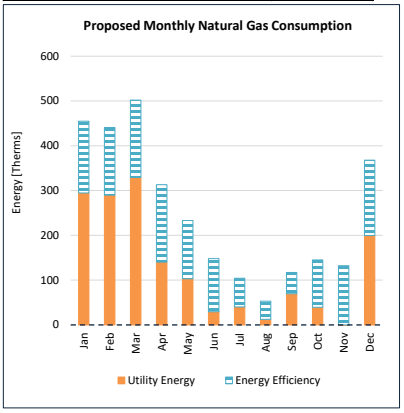
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)$_a$	
EEM-1	AC Unit Overhauls
EEM-9	HVAC Controls - EMS
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
EEM-18	Plug Load Controls
EEM-21	Demand Response
EEM-22	Demand Management - Thermal Energy Storage
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	698
Renewable Energy (kWh):	1,163,683

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)$_a$	
Annual Electricity Savings (kWh):	182,843
Annual Demand Reduction (kW):	215.79
Annual Natural Gas Savings (therms):	1,464
Annual GHG Reductions (MT CO2)$_b$:	44
EEM Implementation Cost:	$527,000
EEM Annual Utility Savings$_c$:	$40,216
EEM Annual Maintenance Savings$_d$:	$10,039
EEM Estimated Incentives:	$34,504
EEM Simple Payback:	10.26

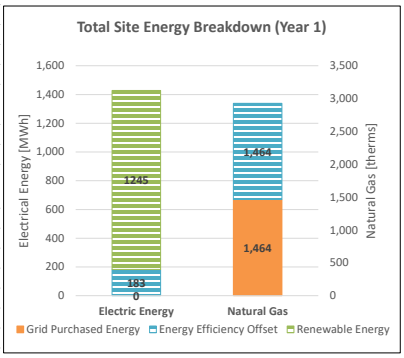


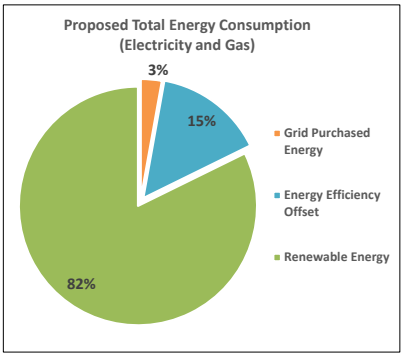


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	1,428,275
Grid Purchased Energy (kWh)	*0*
Energy Efficiency Offset (kWh)	*182,841*
Renewable Energy (kWh)	*1,245,434*
Total Baseline Natural Gas (therms)	2,928
Grid Purchased Energy (therms)	*1,464*
Energy Efficiency Offset (therms)	*1,464*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS$_{e,f,g}$	
Lifetime Electricity Savings (MWh):	2,579
Lifetime Natural Gas Savings (therms):	21,960
Lifetime GHG Emissions Reduction (MT CO2):	612
Net Present Value (NPV):	$184,746.25
Internal Rate of Return (IRR):	9.74%
Return on Investement (ROI):	37.5%
Savings to Investment Ratio:	1.375





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

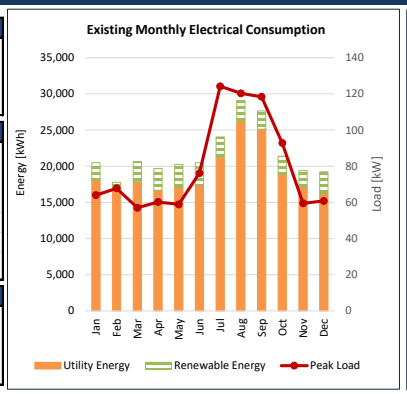
4.3 Civic Center Building 200

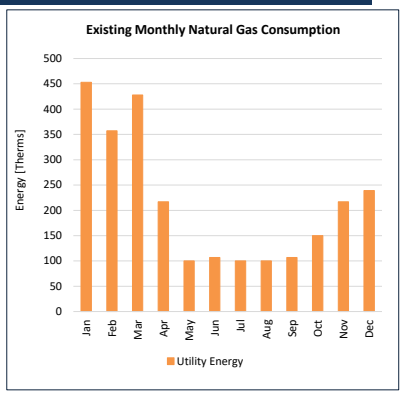
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	34,153
Building(s) Vintage:	2,004
Energy Star Score:	92
Energy Star Site EUI (kBTU/sf)	34.00

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	2245280622
Utility Rate Tariff:	SDGE - DG-R-GrFa: Secondary
Energy Purchased (kWh):	228,941
Peak Power (kW):	124
Blended Utility Rate:	$0.14
Solar PV Capacity (kW):	6
Renewable Energy (kWh):	31,131

CURRENT NATURAL GAS BILLING DATA	
Service Account:	3349110400
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	2,575
Utility Rate:	$0.93





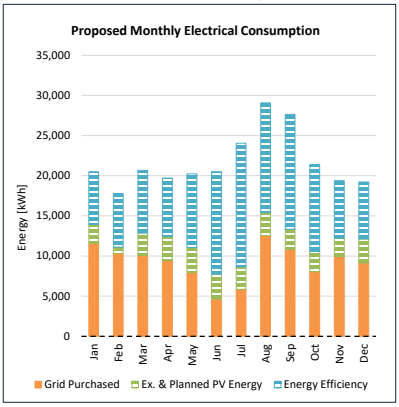
ENERGY EFFICIENCY

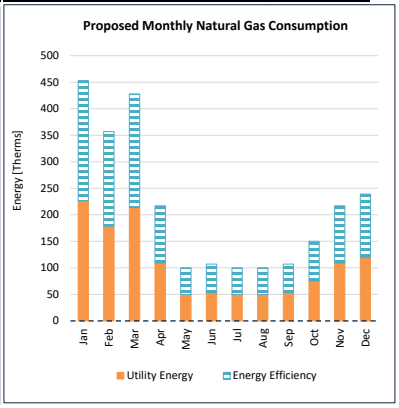
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-1	AC Unit Overhauls
EEM-9	HVAC Controls - EMS
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
EEM-18	Plug Load Controls
EEM-21	Demand Response
EEM-22	Demand Management - Thermal Energy Storage
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	118,633
Annual Demand Reduction (kW):	151.80
Annual Natural Gas Savings (therms):	1,288
Annual GHG Reductions (MT CO_2)[b]:	30
EEM Implementation Cost:	$385,000
EEM Annual Utility Savings[c]:	$27,830
EEM Annual Maintenance Savings[d]:	$7,090
EEM Estimated Incentives:	$22,323
EEM Simple Payback:	10.66

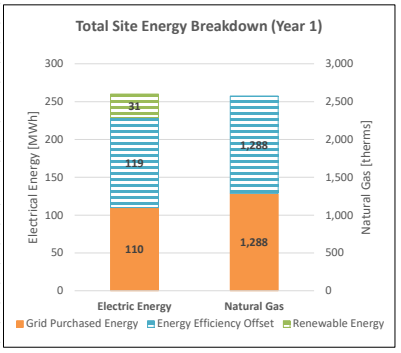


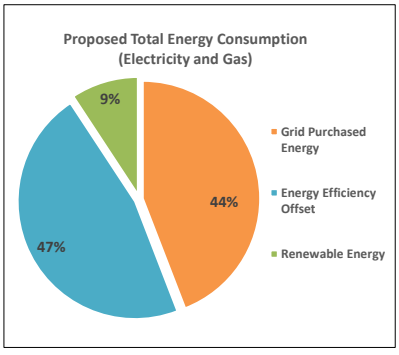


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	260,072
Grid Purchased Energy (kWh)	*110,310*
Energy Efficiency Offset (kWh)	*118,631*
Renewable Energy (kWh)	*31,131*
Total Baseline Natural Gas (therms)	2,575
Grid Purchased Energy (therms)	*1,288*
Energy Efficiency Offset (therms)	*1,288*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	1,612
Lifetime Natural Gas Savings (therms):	19,313
Lifetime GHG Emissions Reduction (MT CO_2):	416
Net Present Value (NPV):	$106,587.98
Internal Rate of Return (IRR):	8.83%
Return on Investement (ROI):	29.4%
Savings to Investment Ratio:	1.294





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

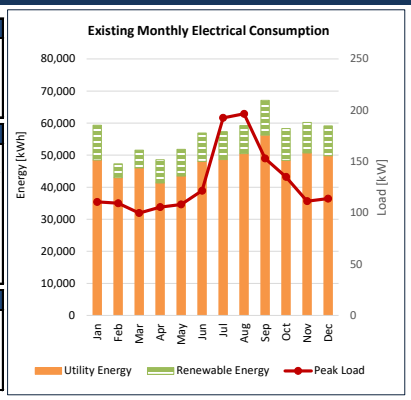
4.4 Civic Center Building 300

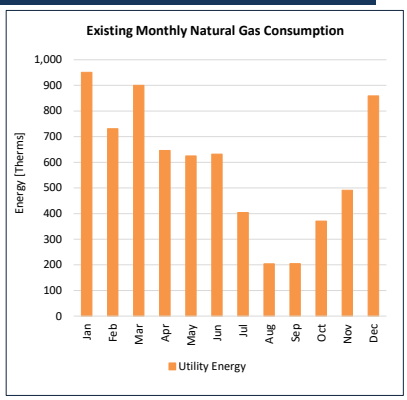
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	52,830
Building(s) Vintage:	2,004
Energy Star Score:	131
Energy Star Site EUI (kBTU/sf):	59.90

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	2826466104
Utility Rate Tariff:	SDGE - AL-TOU-GrFa: Secondary
Energy Purchased (kWh):	574,489
Peak Power (kW):	197
Blended Utility Rate:	$0.22
Solar PV Capacity (kW):	48
Renewable Energy (kWh):	102,190

CURRENT NATURAL GAS BILLING DATA	
Service Account:	8211623404
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	7,019
Utility Rate:	$0.74





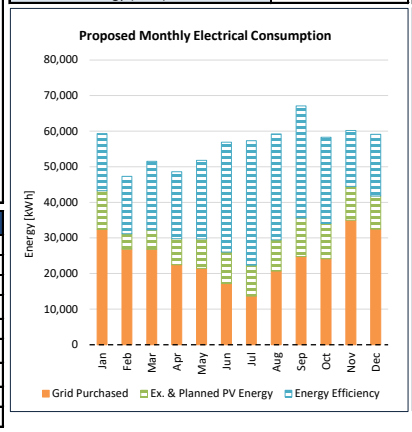
ENERGY EFFICIENCY

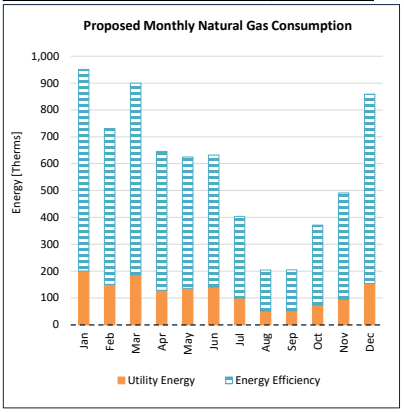
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)$_a$	
EEM-1	AC Unit Overhauls
EEM-9	HVAC Controls - EMS
EEM-11	Data Center Upgrades
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-18	Plug Load Controls
EEM-21	Demand Response
EEM-22	Demand Management - Thermal Energy Storage
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)$_a$	
Annual Electricity Savings (kWh):	276,585
Annual Demand Reduction (kW):	231.21
Annual Natural Gas Savings (therms):	5,532
Annual GHG Reductions (MT CO2)$_b$:	84
EEM Implementation Cost:	$586,850
EEM Annual Utility Savings$_c$:	$52,685
EEM Annual Maintenance Savings$_d$:	$10,091
EEM Estimated Incentives:	$49,415
EEM Simple Payback:	8.77

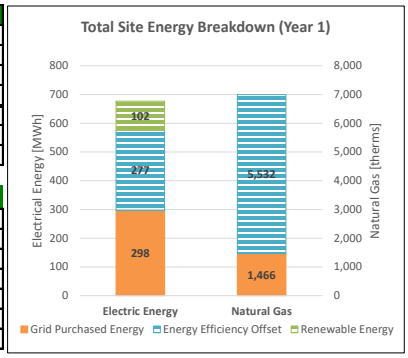


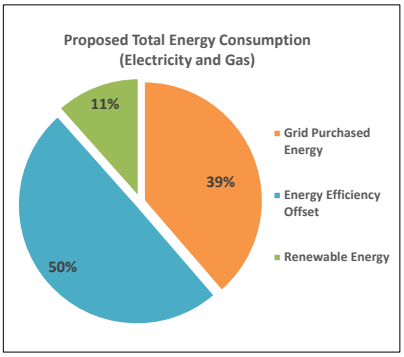


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	676,679
Grid Purchased Energy (kWh)	*297,909*
Energy Efficiency Offset (kWh)	*276,580*
Renewable Energy (kWh)	*102,190*
Total Baseline Natural Gas (therms)	7,019
Grid Purchased Energy (therms)	*1,466*
Energy Efficiency Offset (therms)	*5,532*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS$_{e,f,g}$	
Lifetime Electricity Savings (MWh):	3,969
Lifetime Natural Gas Savings (therms):	82,980
Lifetime GHG Emissions Reduction (MT CO2):	1,218
Net Present Value (NPV):	$355,610.48
Internal Rate of Return (IRR):	12.82%
Return on Investement (ROI):	66.2%
Savings to Investment Ratio:	1.662





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

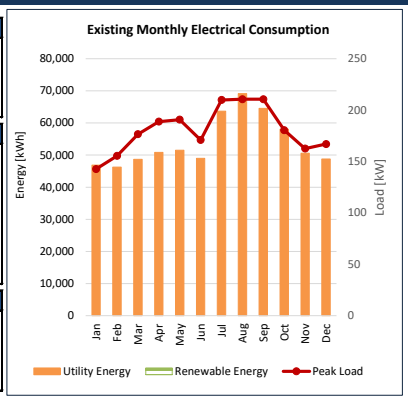
4.5 Civic Center Library

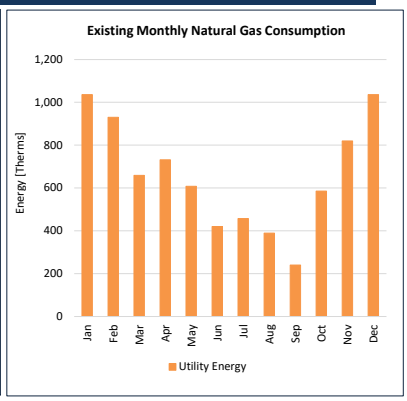
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	58,000
Building(s) Vintage:	1,974
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	4.30

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	929572850
Utility Rate Tariff:	SDGE - AL-TOU: Secondary
Energy Purchased (kWh):	647,924
Peak Power (kW):	211
Blended Utility Rate:	$0.13
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

CURRENT NATURAL GAS BILLING DATA	
Service Account:	5723778108
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	7,910
Utility Rate:	$0.88





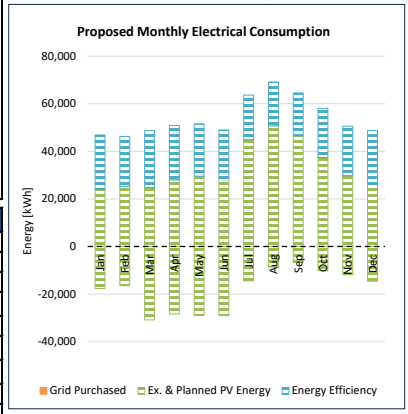
ENERGY EFFICIENCY

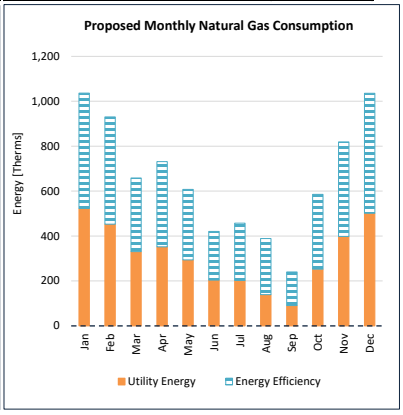
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)$_a$	
EEM-5	Air Handler Replacements
EEM-7	Boiler Replacements
EEM-8	Pumping System Upgrades
EEM-9	HVAC Controls - EMS
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
EEM-17	Appliance Replacement
EEM-18	Plug Load Controls
EEM-19	Weatherization (Tints)
EEM-21	Demand Response
-	-

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)$_a$	
Annual Electricity Savings (kWh):	252,083
Annual Demand Reduction (kW):	40.72
Annual Natural Gas Savings (therms):	4,221
Annual GHG Reductions (MT CO2)$_b$:	73
EEM Implementation Cost:	$1,069,900
EEM Annual Utility Savings$_c$:	$46,110
EEM Annual Maintenance Savings$_d$:	$30,867
EEM Estimated Incentives:	$35,775
EEM Simple Payback:	13.26

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	368
Renewable Energy (kWh):	613,518

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

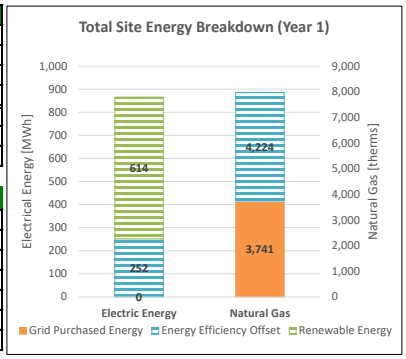


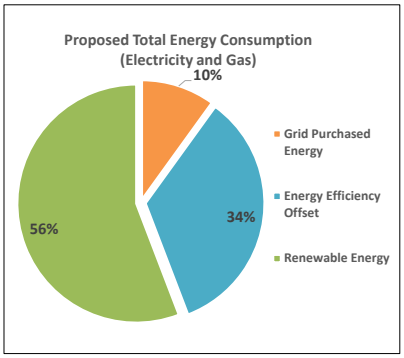


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	865,600
Grid Purchased Energy (kWh)	*0*
Energy Efficiency Offset (kWh)	*252,083*
Renewable Energy (kWh)	*613,518*
Total Baseline Natural Gas (therms)	7,910
Grid Purchased Energy (therms)	*3,741*
Energy Efficiency Offset (therms)	*4,224*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS$_{e,f,g}$	
Lifetime Electricity Savings (MWh):	3,468
Lifetime Natural Gas Savings (therms):	76,170
Lifetime GHG Emissions Reduction (MT CO2):	1,084
Net Present Value (NPV):	$38,820.30
Internal Rate of Return (IRR):	5.51%
Return on Investement (ROI):	3.8%
Savings to Investment Ratio:	1.038





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

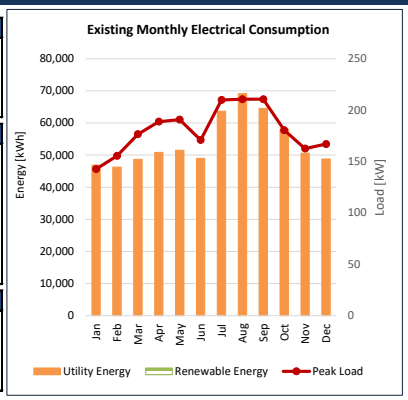
4.6 Public Works

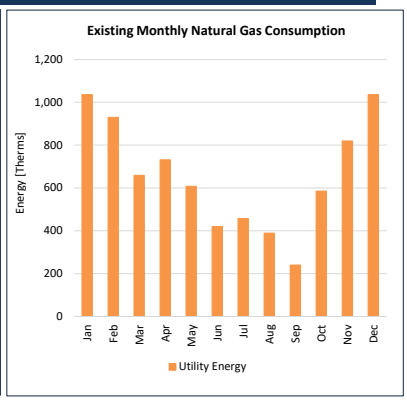
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	58,000
Building(s) Vintage:	1,974
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	4.30

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	929572850
Utility Rate Tariff:	SDGE - AL-TOU: Secondary
Energy Purchased (kWh):	647,924
Peak Power (kW):	211
Blended Utility Rate:	$0.13
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

CURRENT NATURAL GAS BILLING DATA	
Service Account:	5723778108
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	7,910
Utility Rate:	$0.88





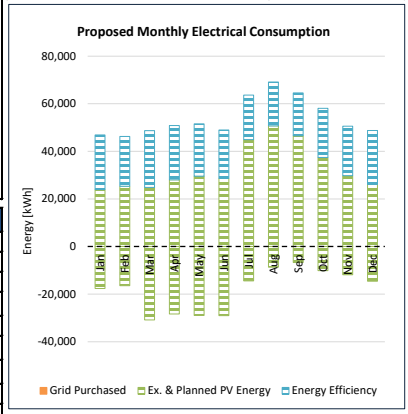
ENERGY EFFICIENCY

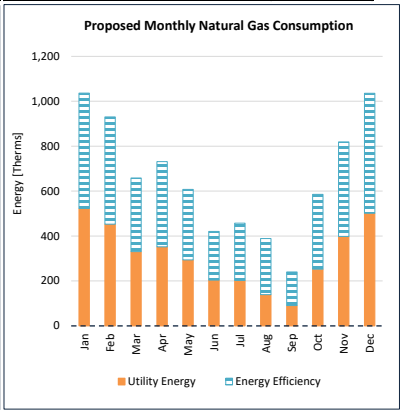
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-5	Air Handler Replacements
EEM-7	Boiler Replacements
EEM-8	Pumping System Upgrades
EEM-9	HVAC Controls - EMS
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
EEM-17	Appliance Replacement
EEM-18	Plug Load Controls
EEM-19	Weatherization (Tints)
EEM-21	Demand Response
-	-

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	252,083
Annual Demand Reduction (kW):	40.72
Annual Natural Gas Savings (therms):	4,221
Annual GHG Reductions (MT CO_2)[b]:	73
EEM Implementation Cost:	$1,069,900
EEM Annual Utility Savings[c]:	$46,110
EEM Annual Maintenance Savings[d]:	$30,867
EEM Estimated Incentives:	$35,775
EEM Simple Payback:	13.26

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	368
Renewable Energy (kWh):	613,518

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

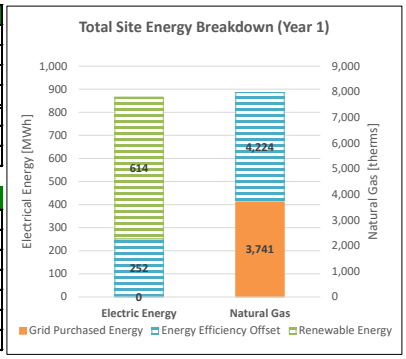


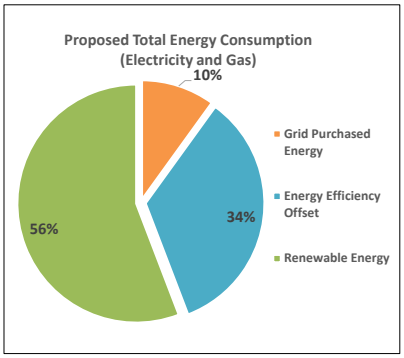


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	865,600
Grid Purchased Energy (kWh)	*0*
Energy Efficiency Offset (kWh)	*252,083*
Renewable Energy (kWh)	*613,518*
Total Baseline Natural Gas (therms)	7,910
Grid Purchased Energy (therms)	*3,741*
Energy Efficiency Offset (therms)	*4,224*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	3,468
Lifetime Natural Gas Savings (therms):	76,170
Lifetime GHG Emissions Reduction (MT CO2):	1,084
Net Present Value (NPV):	$38,820.30
Internal Rate of Return (IRR):	5.51%
Return on Investement (ROI):	3.8%
Savings to Investment Ratio:	1.038





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

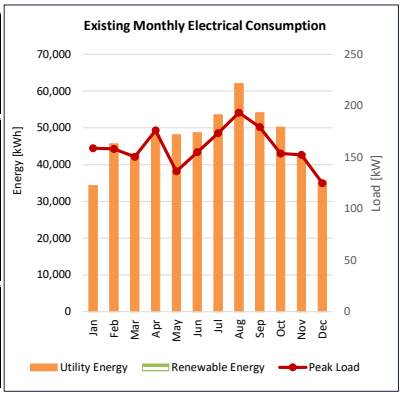
4.7 Chula Vista South Library

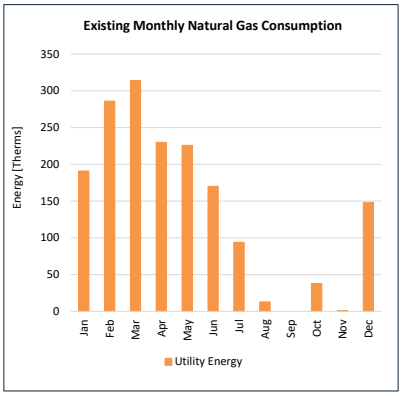
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	38,614
Building(s) Vintage:	1,995
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	4.30

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	9412423289
Utility Rate Tariff:	SDGE - AL-TOU: Secondary
Energy Purchased (kWh):	566,221
Peak Power (kW):	193
Blended Utility Rate:	$0.14
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

CURRENT NATURAL GAS BILLING DATA	
Service Account:	8389317700
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	1,711
Utility Rate:	$0.78





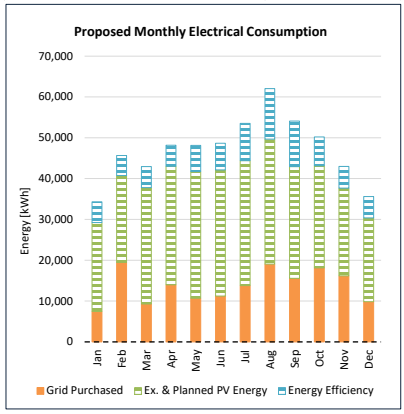
ENERGY EFFICIENCY

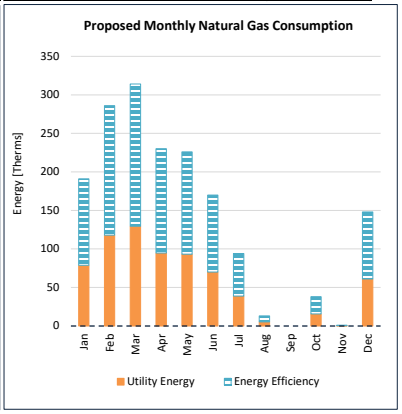
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-1	AC Unit Overhauls
EEM-8	Pumping System Upgrades
EEM-9	HVAC Controls - EMS
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
EEM-18	Plug Load Controls
EEM-21	Demand Response
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	187
Renewable Energy (kWh):	318,161

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	83,438
Annual Demand Reduction (kW):	2.71
Annual Natural Gas Savings (therms):	855
Annual GHG Reductions (MT CO_2)[b]:	21
EEM Implementation Cost:	$193,700
EEM Annual Utility Savings[c]:	$14,947
EEM Annual Maintenance Savings[d]:	$5,811
EEM Estimated Incentives:	$11,375
EEM Simple Payback:	9.04

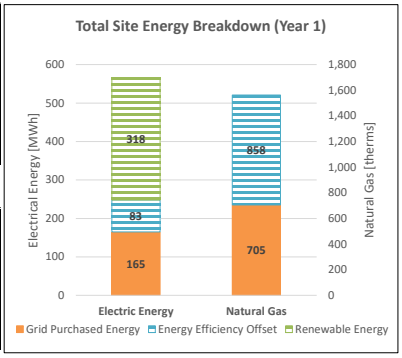


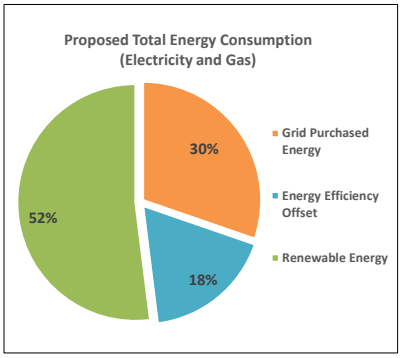


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	566,221
Grid Purchased Energy (kWh)	*164,622*
Energy Efficiency Offset (kWh)	*83,438*
Renewable Energy (kWh)	*318,161*
Total Baseline Natural Gas (therms)	1,711
Grid Purchased Energy (therms)	*705*
Energy Efficiency Offset (therms)	*858*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	1,158
Lifetime Natural Gas Savings (therms):	12,828
Lifetime GHG Emissions Reduction (MT CO2):	292
Net Present Value (NPV):	$91,422.53
Internal Rate of Return (IRR):	11.28%
Return on Investement (ROI):	50.1%
Savings to Investment Ratio:	1.501





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

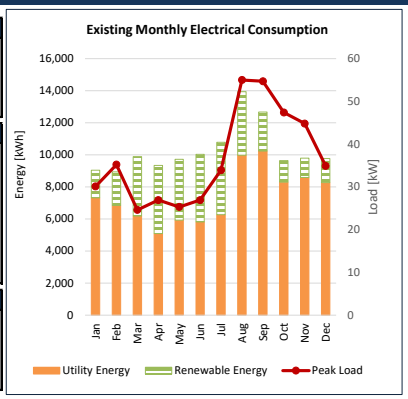
4.8 Norman Park Senior Center

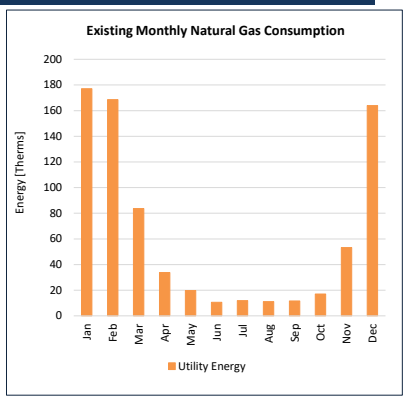
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	16,900
Building(s) Vintage:	2,001
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	4.30

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	7920034909
Utility Rate Tariff:	SDGE - DG-R-CPP: Primary
Energy Purchased (kWh):	88,784
Peak Power (kW):	55
Blended Utility Rate:	$0.29
Solar PV Capacity (kW):	25
Renewable Energy (kWh):	34,722

CURRENT NATURAL GAS BILLING DATA	
Service Account:	7920037848
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	762
Utility Rate:	$0.66





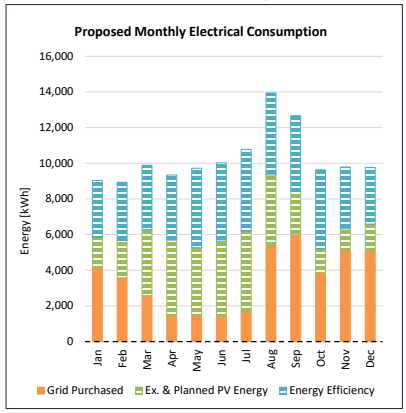
ENERGY EFFICIENCY

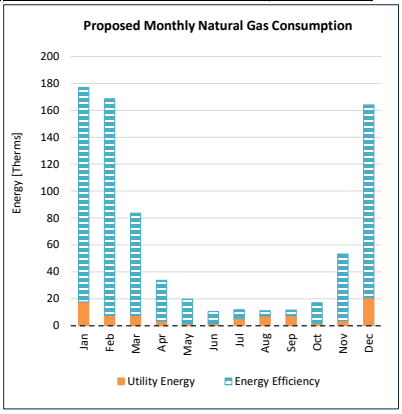
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)$_a$	
EEM-1	AC Unit Overhauls
EEM-9	HVAC Controls - EMS
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
EEM-18	Plug Load Controls
EEM-19	Weatherization (Tints)
EEM-22	Demand Management - Thermal Energy Storage
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)$_a$	
Annual Electricity Savings (kWh):	47,044
Annual Demand Reduction (kW):	22.43
Annual Natural Gas Savings (therms):	682
Annual GHG Reductions (MT CO2)$_b$:	13
EEM Implementation Cost:	$161,000
EEM Annual Utility Savings$_c$:	$8,553
EEM Annual Maintenance Savings$_d$:	$4,080
EEM Estimated Incentives:	$4,468
EEM Simple Payback:	12.31

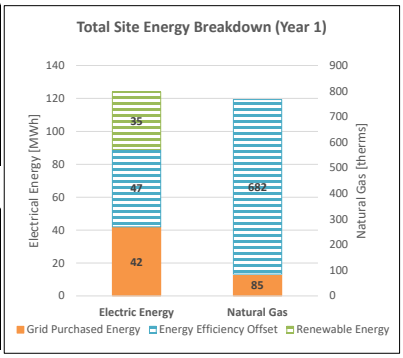


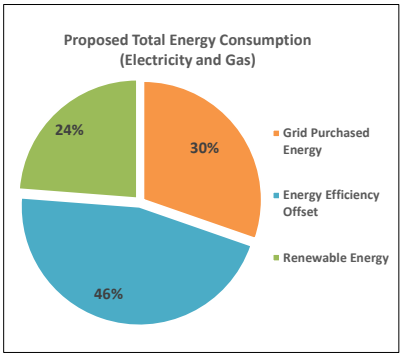


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	123,506
Grid Purchased Energy (kWh)	*41,740*
Energy Efficiency Offset (kWh)	*47,044*
Renewable Energy (kWh)	*34,722*
Total Baseline Natural Gas (therms)	762
Grid Purchased Energy (therms)	*85*
Energy Efficiency Offset (therms)	*682*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS$_{e,f,g}$	
Lifetime Electricity Savings (MWh):	608
Lifetime Natural Gas Savings (therms):	10,223
Lifetime GHG Emissions Reduction (MT CO2):	174
Net Present Value (NPV):	$8,393.98
Internal Rate of Return (IRR):	5.76%
Return on Investement (ROI):	5.4%
Savings to Investment Ratio:	1.054





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

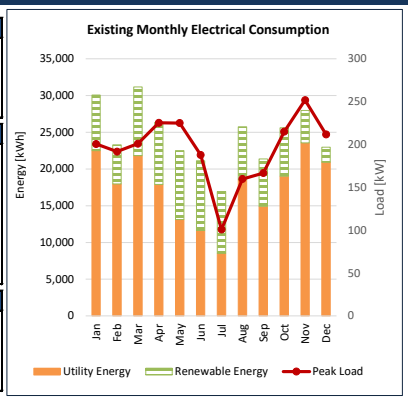
4.9 Montevalle Recreation Center

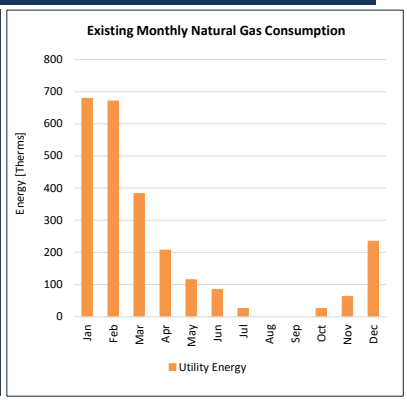
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	21,144
Building(s) Vintage:	2,006
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	61.40

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	435606965
Utility Rate Tariff:	SDGE - DG-R-GrFa: Secondary
Energy Purchased (kWh):	210,390
Peak Power (kW):	252
Blended Utility Rate:	$0.34
Solar PV Capacity (kW):	47
Renewable Energy (kWh):	84,662

CURRENT NATURAL GAS BILLING DATA	
Service Account:	435603848
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	2,488
Utility Rate:	$0.93





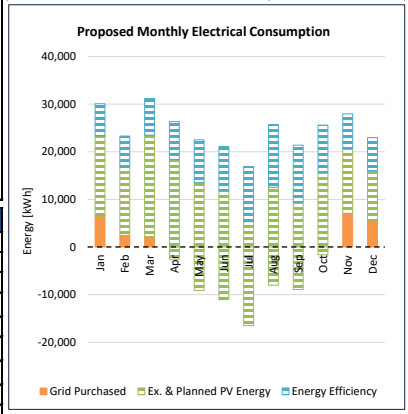
ENERGY EFFICIENCY

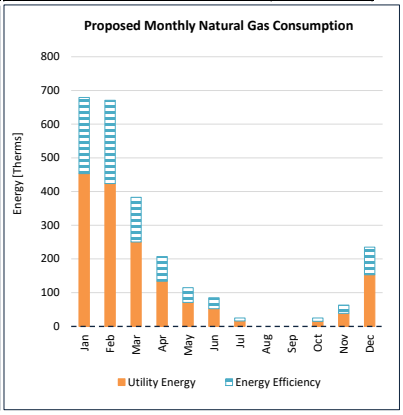
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-1	Packaged RTU Overhauls
EEM-9	HVAC Controls - EMS
EEM-13	Interior Lighting Replacements
EEM-14	Exterior Lighting Replacements
EEM-15	Lighting Controls - Occupancy Sensors
EEM-17	Appliance Replacement
EEM-18	Plug Load Controls (Vending Misers and Power Strips)
EEM-19	Weatherization (Tints)
EEM-21	Demand Response
EEM-22	Demand Management - Thermal Energy Storage
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	79
Renewable Energy (kWh):	136,557

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	67
Battery Storage Capacity (kWh)	137

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	108,076
Annual Demand Reduction (kW):	76.41
Annual Natural Gas Savings (therms):	891
Annual GHG Reductions (MT CO2)[b]:	26
EEM Implementation Cost:	$212,650
EEM Annual Utility Savings[c]:	$29,591
EEM Annual Maintenance Savings[d]:	$3,080
EEM Estimated Incentives:	$9,000
EEM Simple Payback:	6.35

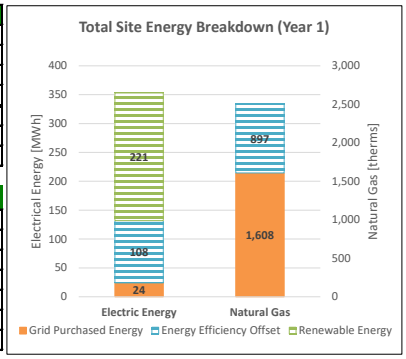


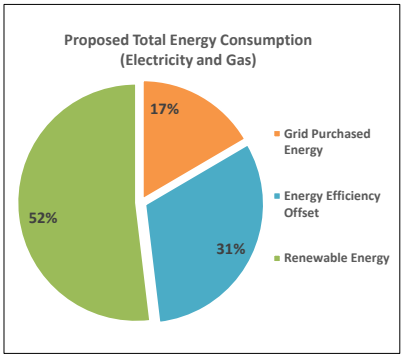


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	352,846
Grid Purchased Energy (kWh)	*23,551*
Energy Efficiency Offset (kWh)	*108,076*
Renewable Energy (kWh)	*221,219*
Total Baseline Natural Gas (therms)	2,488
Grid Purchased Energy (therms)	*1,608*
Energy Efficiency Offset (therms)	*897*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	1,455
Lifetime Natural Gas Savings (therms):	12,696
Lifetime GHG Emissions Reduction (MT CO2):	349
Net Present Value (NPV):	$224,020.97
Internal Rate of Return (IRR):	17.59%
Return on Investement (ROI):	110.0%
Savings to Investment Ratio:	2.100





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

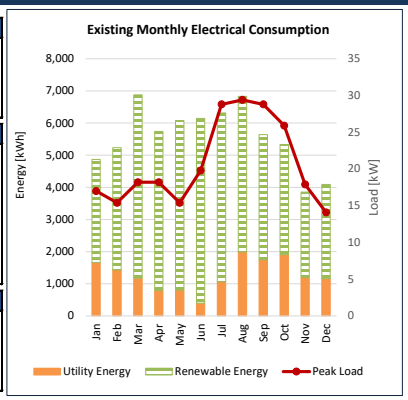
4.10 Otay Recreation Center

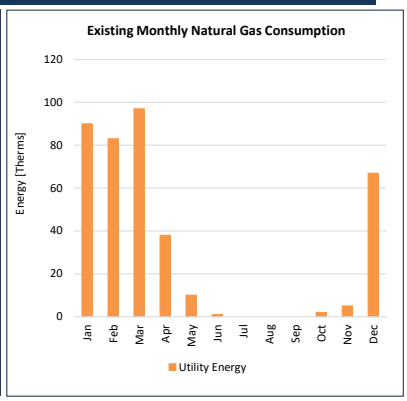
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	14,643
Building(s) Vintage:	1,999
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	7.80

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	9513652160
Utility Rate Tariff:	SDGE - TOU-A-P: Secondary
Energy Purchased (kWh):	15,333
Peak Power (kW):	29
Blended Utility Rate:	$0.17
Solar PV Capacity (kW):	33
Renewable Energy (kWh):	51,674

CURRENT NATURAL GAS BILLING DATA	
Service Account:	9513650586
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	393
Utility Rate:	$1.04





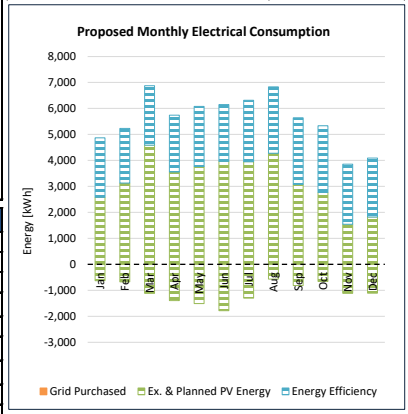
ENERGY EFFICIENCY

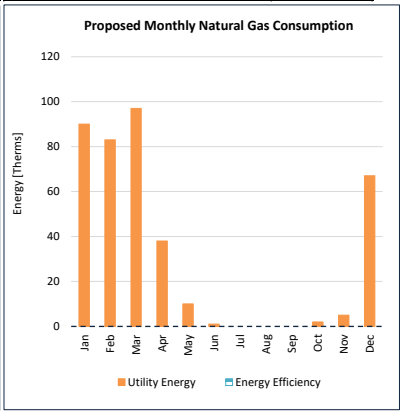
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)$_a$	
EEM-9	HVAC Controls - EMS
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
EEM-17	Appliance Replacement
EEM-18	Plug Load Controls
-	-
-	-
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)$_a$	
Annual Electricity Savings (kWh):	27,997
Annual Demand Reduction (kW):	13.04
Annual Natural Gas Savings (therms):	19
Annual GHG Reductions (MT CO2)$_b$:	6
EEM Implementation Cost:	$55,200
EEM Annual Utility Savings$_c$:	$6,615
EEM Annual Maintenance Savings$_d$:	$1,656
EEM Estimated Incentives:	$71
EEM Simple Payback:	6.66

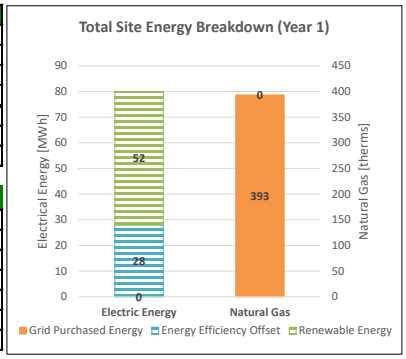


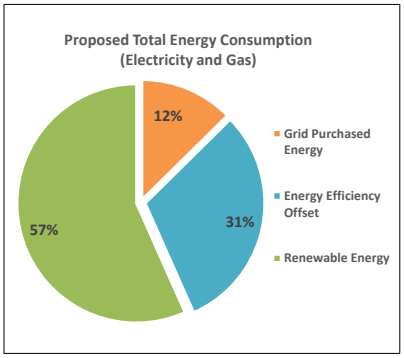


SUMMARY AND LIFETIME ENERGY IMPACTS

a	
Total Baseline Electrical Energy (kWh)	79,671
Grid Purchased Energy (kWh)	*0*
Energy Efficiency Offset (kWh)	*27,997*
Renewable Energy (kWh)	*51,674*
Total Baseline Natural Gas (therms)	393
Grid Purchased Energy (therms)	*393*
Energy Efficiency Offset (therms)	*0*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS$_{e, f, g}$	
Lifetime Electricity Savings (MWh):	295
Lifetime Natural Gas Savings (therms):	287
Lifetime GHG Emissions Reduction (MT CO2):	60
Net Present Value (NPV):	$31,861.81
Internal Rate of Return (IRR):	13.60%
Return on Investement (ROI):	57.8%
Savings to Investment Ratio:	1.578





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

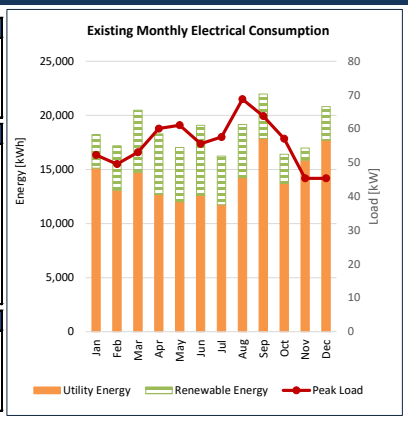
4.11 Park Way Recreation Center Complex

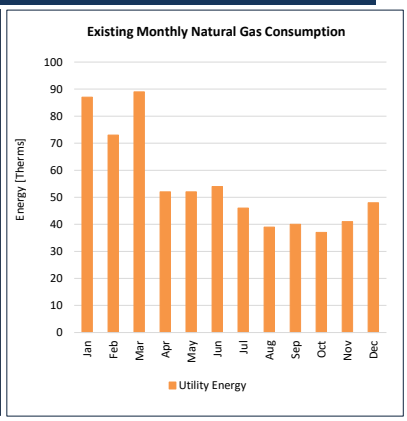
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	41,711
Building(s) Vintage:	1,954
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	19/15.3

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	1321687451/9196680 108
Utility Rate Tariff:	SDGE - DG-R-CPP: Secondary
Energy Purchased (kWh):	171,359
Peak Power (kW):	69
Blended Utility Rate:	$0.26
Solar PV Capacity (kW):	34
Renewable Energy (kWh):	50,502

CURRENT NATURAL GAS BILLING DATA	
Service Account:	6946680106/8071680109
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	658
Utility Rate:	$0.91





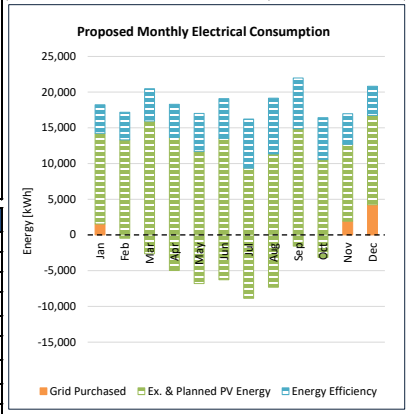
ENERGY EFFICIENCY

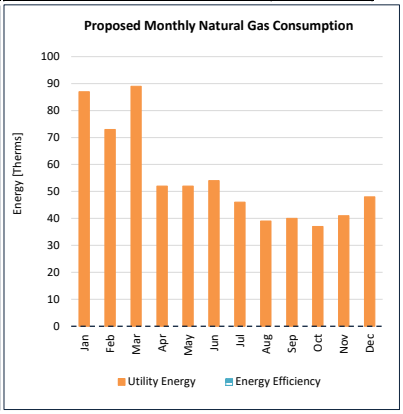
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-1	AC Unit Overhauls
EEM-2	Packaged Unit Replacements
EEM-9	HVAC Controls - EMS
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
EEM-16	Automatic Pool Covers
EEM-19	Weatherization (Tints)
EEM-21	Demand Response
EEM-22	Demand Management - Thermal Energy Storage
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	85
Renewable Energy (kWh):	141,709

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	63,953
Annual Demand Reduction (kW):	39.27
Annual Natural Gas Savings (therms):	4,987
Annual GHG Reductions (MT CO_2)[b]:	39
EEM Implementation Cost:	$216,000
EEM Annual Utility Savings[c]:	$14,530
EEM Annual Maintenance Savings[d]:	$4,680
EEM Estimated Incentives:	$8,356
EEM Simple Payback:	9.09

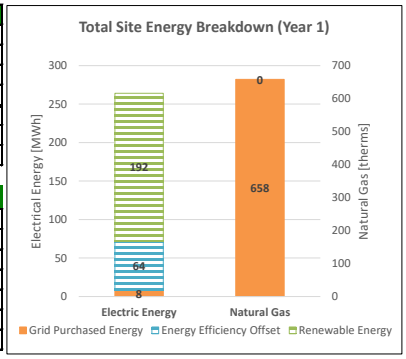


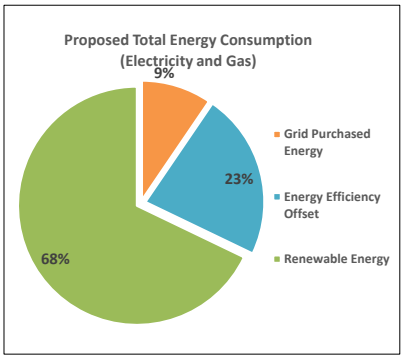


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	263,870
Grid Purchased Energy (kWh)	*7,705*
Energy Efficiency Offset (kWh)	*63,953*
Renewable Energy (kWh)	*192,211*
Total Baseline Natural Gas (therms)	658
Grid Purchased Energy (therms)	*658*
Energy Efficiency Offset (therms)	*0*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	836
Lifetime Natural Gas Savings (therms):	31,363
Lifetime GHG Emissions Reduction (MT CO2):	352
Net Present Value (NPV):	$57,472.92
Internal Rate of Return (IRR):	8.93%
Return on Investement (ROI):	27.7%
Savings to Investment Ratio:	1.277





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

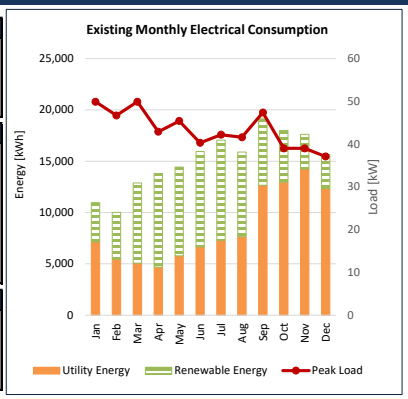
4.12 Loma Verde Recreation Center

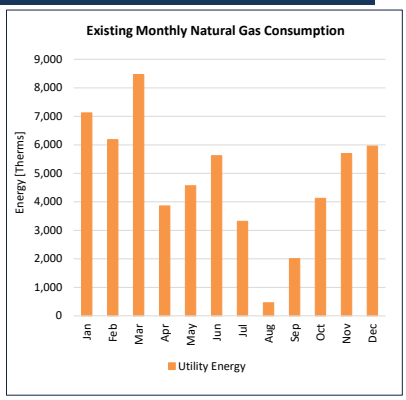
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	23,536
Building(s) Vintage:	1,969
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	176.00

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	9422134002
Utility Rate Tariff:	SDGE - DG-R-CPP: Primary
Energy Purchased (kWh):	101,920
Peak Power (kW):	50
Blended Utility Rate:	$0.28
Solar PV Capacity (kW):	46
Renewable Energy (kWh):	79,526

CURRENT NATURAL GAS BILLING DATA	
Service Account:	8297134008
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	57,387
Utility Rate:	$0.62





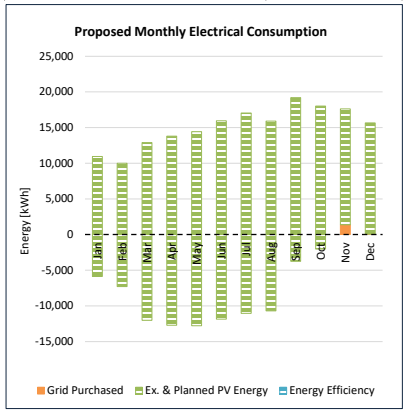
ENERGY EFFICIENCY

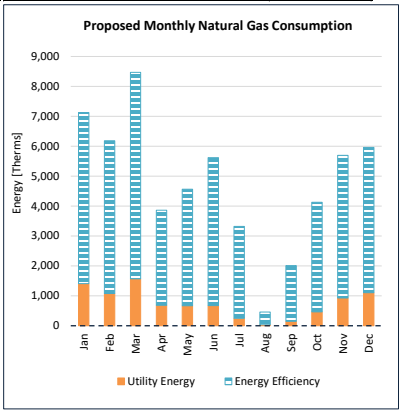
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-16	Automatic Pool Covers
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	112
Renewable Energy (kWh):	190,556

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	0
Annual Demand Reduction (kW):	0.00
Annual Natural Gas Savings (therms):	6,960
Annual GHG Reductions (MT CO2)[b]:	37
EEM Implementation Cost:	$60,000
EEM Annual Utility Savings[c]:	$0
EEM Annual Maintenance Savings[d]:	$1,800
EEM Estimated Incentives:	$8,700
EEM Simple Payback:	9.80

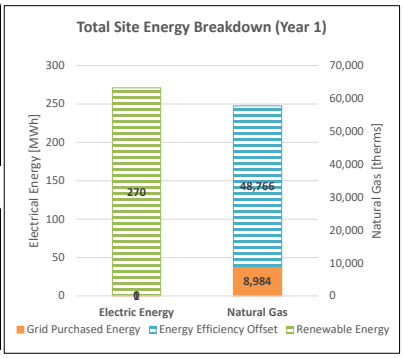


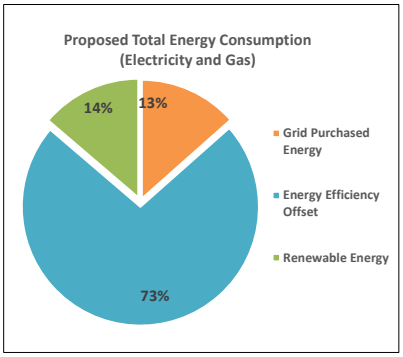


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	271,508
Grid Purchased Energy (kWh)	*1,426*
Energy Efficiency Offset (kWh)	*0*
Renewable Energy (kWh)	*270,082*
Total Baseline Natural Gas (therms)	57,387
Grid Purchased Energy (therms)	*8,984*
Energy Efficiency Offset (therms)	*48,766*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	0
Lifetime Natural Gas Savings (therms):	34,800
Lifetime GHG Emissions Reduction (MT CO2):	222
Net Present Value (NPV):	-$16,555.18
Internal Rate of Return (IRR):	-6.31%
Return on Investement (ROI):	-32.3%
Savings to Investment Ratio:	0.677





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

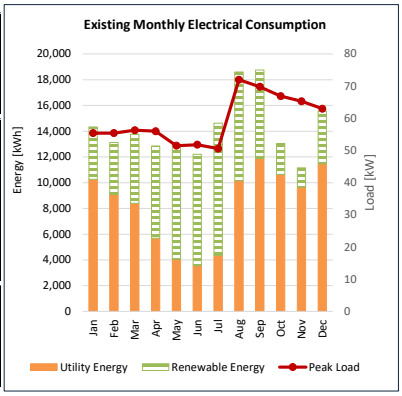
4.13 Salt Creek Recreation Center

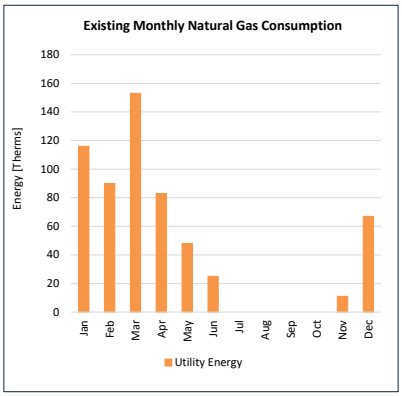
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	19,500
Building(s) Vintage:	2,006
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	4.30

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	3324732606
Utility Rate Tariff:	SDGE - DG-R-CPP: Primary
Energy Purchased (kWh):	99,186
Peak Power (kW):	72
Blended Utility Rate:	$0.33
Solar PV Capacity (kW):	47
Renewable Energy (kWh):	71,755

CURRENT NATURAL GAS BILLING DATA	
Service Account:	3324731869
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	593
Utility Rate:	$0.94





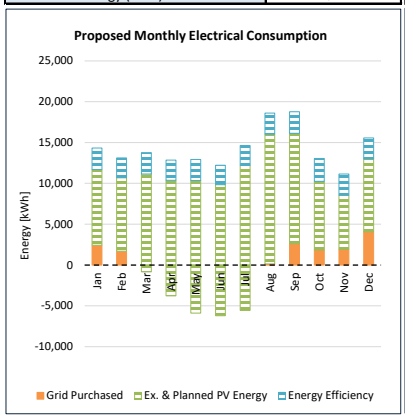
ENERGY EFFICIENCY

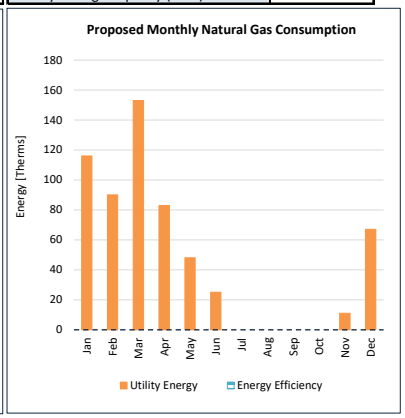
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	44
Renewable Energy (kWh):	76,057

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	30,710
Annual Demand Reduction (kW):	9.43
Annual Natural Gas Savings (therms):	0
Annual GHG Reductions (MT CO_2)[b]:	6
EEM Implementation Cost:	$66,000
EEM Annual Utility Savings[c]:	$5,143
EEM Annual Maintenance Savings[d]:	$1,980
EEM Estimated Incentives:	$0
EEM Simple Payback:	9.27

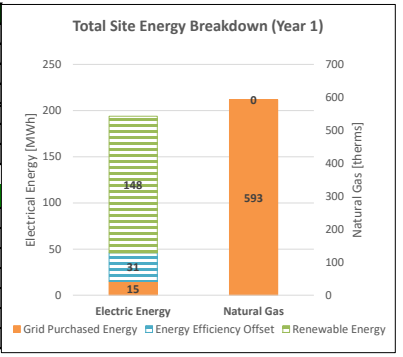


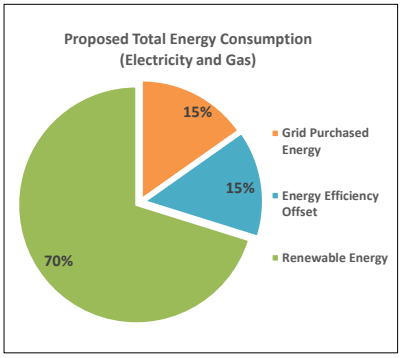


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	193,221
Grid Purchased Energy (kWh)	*14,699*
Energy Efficiency Offset (kWh)	*30,710*
Renewable Energy (kWh)	*147,812*
Total Baseline Natural Gas (therms)	593
Grid Purchased Energy (therms)	*593*
Energy Efficiency Offset (therms)	*0*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	304
Lifetime Natural Gas Savings (therms):	0
Lifetime GHG Emissions Reduction (MT CO2):	61
Net Present Value (NPV):	$5,746.28
Internal Rate of Return (IRR):	6.52%
Return on Investement (ROI):	8.7%
Savings to Investment Ratio:	1.087





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

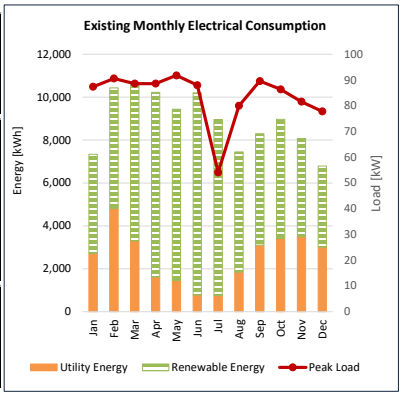
4.14 Veterans Recreation Center

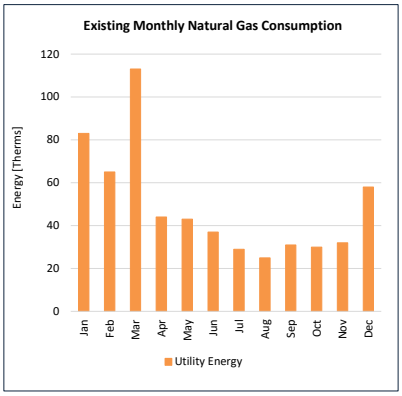
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	19,500
Building(s) Vintage:	2,006
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	4.30

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	680997906
Utility Rate Tariff:	SDGE - DG-R-CPP: Primary
Energy Purchased (kWh):	30,276
Peak Power (kW):	92
Blended Utility Rate:	$0.75
Solar PV Capacity (kW):	47
Renewable Energy (kWh):	76,567

CURRENT NATURAL GAS BILLING DATA	
Service Account:	680995822
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	590
Utility Rate:	$0.94





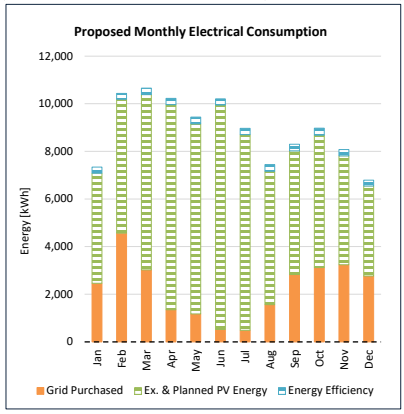
ENERGY EFFICIENCY

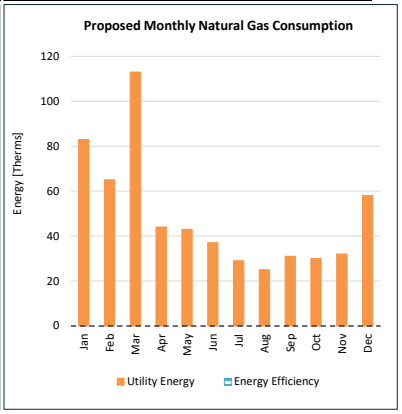
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	3,198
Annual Demand Reduction (kW):	1.71
Annual Natural Gas Savings (therms):	0
Annual GHG Reductions (MT CO2)[b]:	1
EEM Implementation Cost:	$14,000
EEM Annual Utility Savings[c]:	$548
EEM Annual Maintenance Savings[d]:	$420
EEM Estimated Incentives:	$0
EEM Simple Payback:	14.46

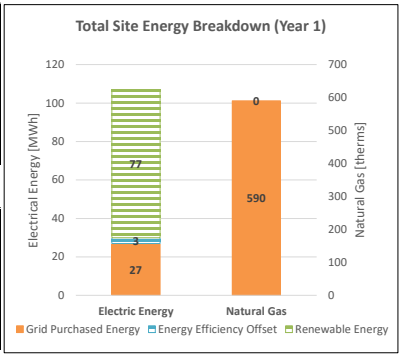


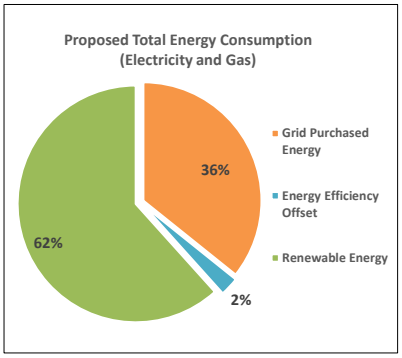


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	106,843
Grid Purchased Energy (kWh)	*27,078*
Energy Efficiency Offset (kWh)	*3,198*
Renewable Energy (kWh)	*76,567*
Total Baseline Natural Gas (therms)	590
Grid Purchased Energy (therms)	*590*
Energy Efficiency Offset (therms)	*0*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	33
Lifetime Natural Gas Savings (therms):	0
Lifetime GHG Emissions Reduction (MT CO2):	7
Net Present Value (NPV):	-$3,865.94
Internal Rate of Return (IRR):	-0.30%
Return on Investement (ROI):	-27.6%
Savings to Investment Ratio:	0.724





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

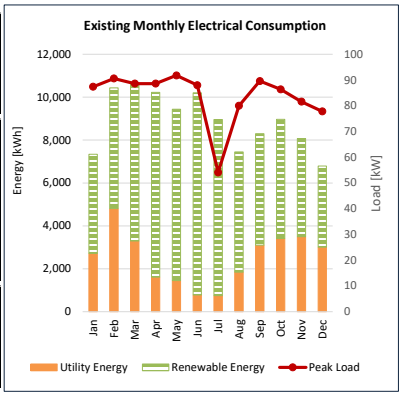
4.15 Fire Station 1

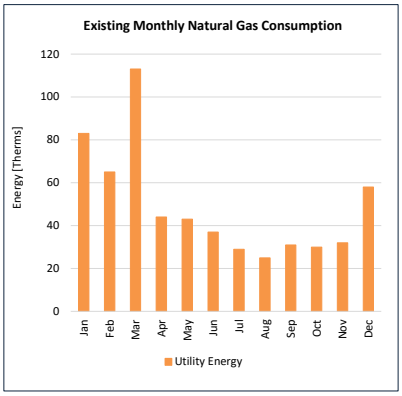
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	19,500
Building(s) Vintage:	2,006
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	4.30

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	680997906
Utility Rate Tariff:	SDGE - DG-R-CPP: Primary
Energy Purchased (kWh):	30,276
Peak Power (kW):	92
Blended Utility Rate:	$0.75
Solar PV Capacity (kW):	47
Renewable Energy (kWh):	76,567

CURRENT NATURAL GAS BILLING DATA	
Service Account:	680995822
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	590
Utility Rate:	$0.94





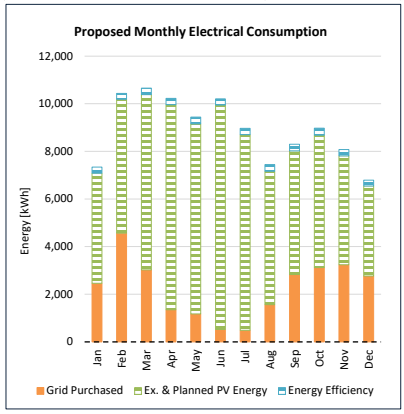
ENERGY EFFICIENCY

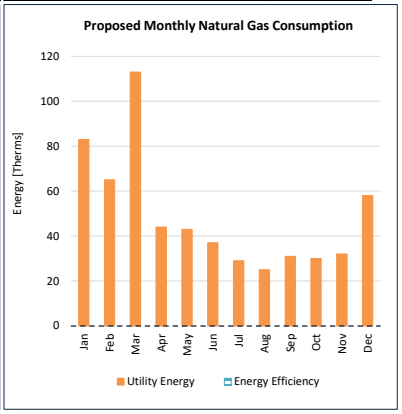
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	3,198
Annual Demand Reduction (kW):	1.71
Annual Natural Gas Savings (therms):	0
Annual GHG Reductions (MT CO_2)[b]:	1
EEM Implementation Cost:	$14,000
EEM Annual Utility Savings[c]:	$548
EEM Annual Maintenance Savings[d]:	$420
EEM Estimated Incentives:	$0
EEM Simple Payback:	14.46

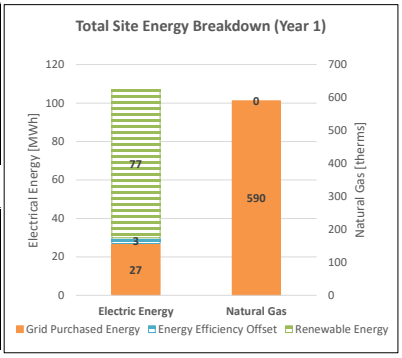


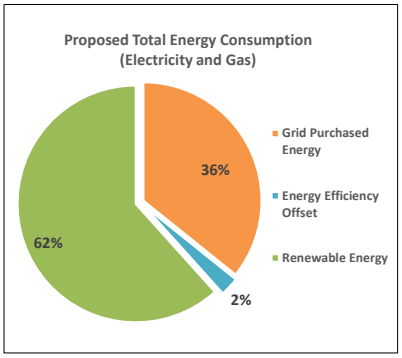


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	106,843
Grid Purchased Energy (kWh)	*27,078*
Energy Efficiency Offset (kWh)	*3,198*
Renewable Energy (kWh)	*76,567*
Total Baseline Natural Gas (therms)	590
Grid Purchased Energy (therms)	*590*
Energy Efficiency Offset (therms)	*0*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[c, f, g]	
Lifetime Electricity Savings (MWh):	33
Lifetime Natural Gas Savings (therms):	0
Lifetime GHG Emissions Reduction (MT CO2):	7
Net Present Value (NPV):	-$3,865.94
Internal Rate of Return (IRR):	-0.30%
Return on Investement (ROI):	-27.6%
Savings to Investment Ratio:	0.724





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

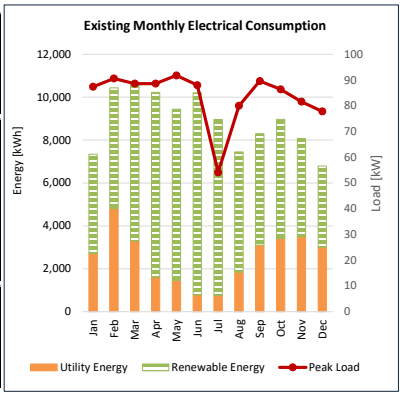
4.16 Fire Station 2

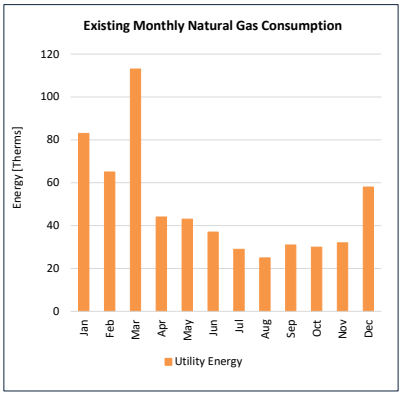
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	19,500
Building(s) Vintage:	2,006
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	4.30

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	680997906
Utility Rate Tariff:	SDGE - DG-R-CPP: Primary
Energy Purchased (kWh):	30,276
Peak Power (kW):	92
Blended Utility Rate:	$0.75
Solar PV Capacity (kW):	47
Renewable Energy (kWh):	76,567

CURRENT NATURAL GAS BILLING DATA	
Service Account:	680995822
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	590
Utility Rate:	$0.94





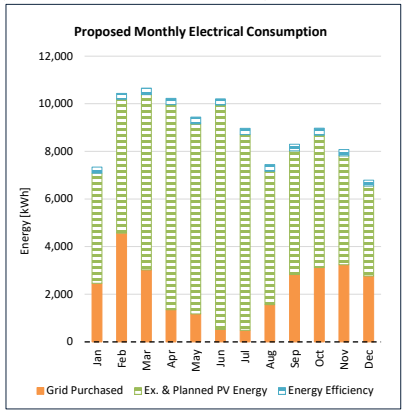
ENERGY EFFICIENCY

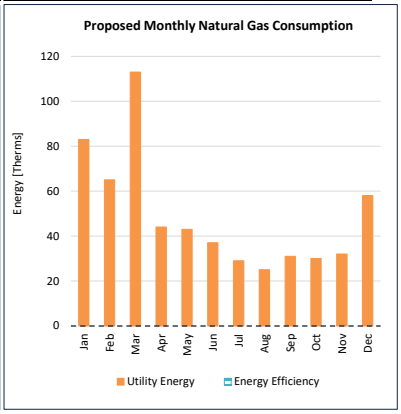
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	3,198
Annual Demand Reduction (kW):	1.71
Annual Natural Gas Savings (therms):	0
Annual GHG Reductions (MT CO_2)[b]:	1
EEM Implementation Cost:	$14,000
EEM Annual Utility Savings[c]:	$548
EEM Annual Maintenance Savings[d]:	$420
EEM Estimated Incentives:	$0
EEM Simple Payback:	14.46

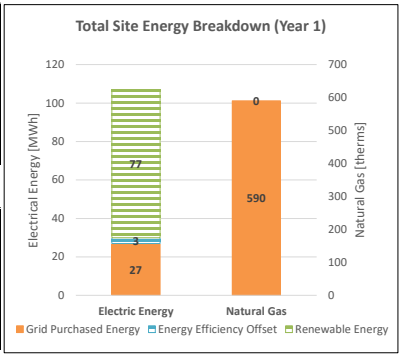


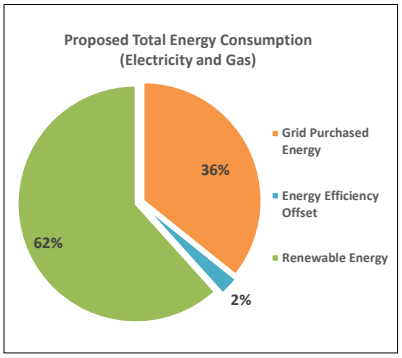


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	106,843
Grid Purchased Energy (kWh)	*27,078*
Energy Efficiency Offset (kWh)	*3,198*
Renewable Energy (kWh)	*76,567*
Total Baseline Natural Gas (therms)	590
Grid Purchased Energy (therms)	*590*
Energy Efficiency Offset (therms)	*0*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	33
Lifetime Natural Gas Savings (therms):	0
Lifetime GHG Emissions Reduction (MT CO2):	7
Net Present Value (NPV):	-$3,865.94
Internal Rate of Return (IRR):	-0.30%
Return on Investement (ROI):	-27.6%
Savings to Investment Ratio:	0.724





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

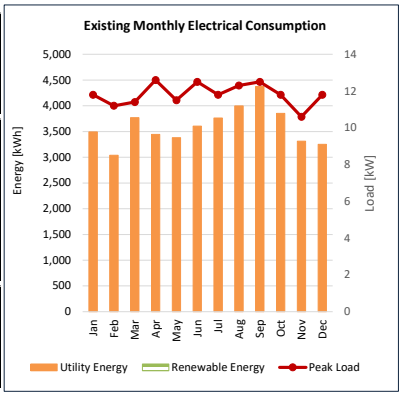
4.17 Fire Station 3

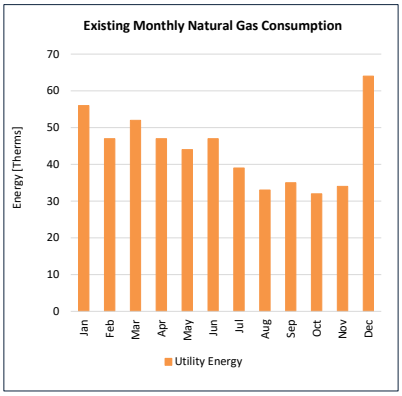
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	4,050
Building(s) Vintage:	2,000
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	113.10

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	6160887923
Utility Rate Tariff:	SDGE - TOU-A-P: Secondary
Energy Purchased (kWh):	43,277
Peak Power (kW):	13
Blended Utility Rate:	$0.25
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

CURRENT NATURAL GAS BILLING DATA	
Service Account:	6160887923
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	530
Utility Rate:	$0.96





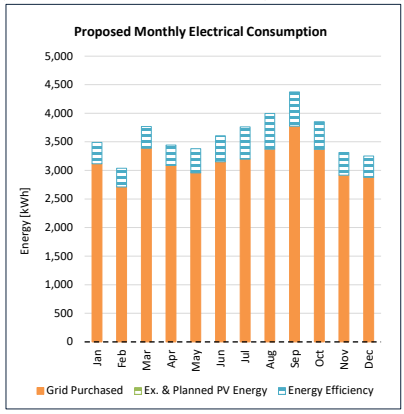
ENERGY EFFICIENCY

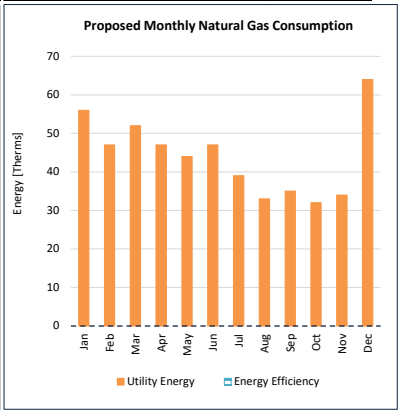
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-3	Split System to VRF Conversion
EEM-9	HVAC Controls - EMS
EEM-19	Weatherization (Tints)
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	5,363
Annual Demand Reduction (kW):	0.94
Annual Natural Gas Savings (therms):	0
Annual GHG Reductions (MT CO2)[b]:	1
EEM Implementation Cost:	$17,400
EEM Annual Utility Savings[c]:	$1,290
EEM Annual Maintenance Savings[d]:	$522
EEM Estimated Incentives:	$732
EEM Simple Payback:	9.60

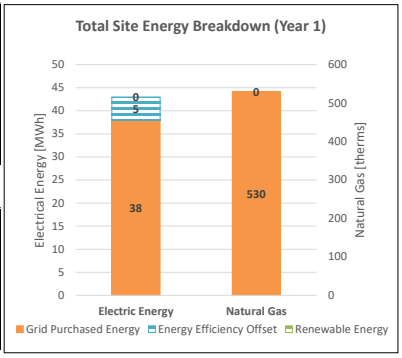


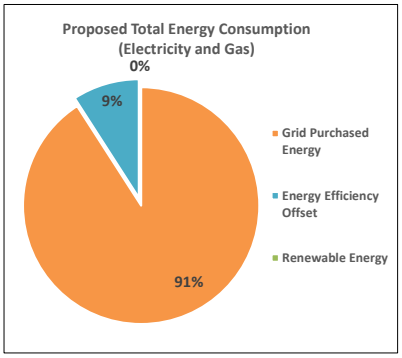


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	43,277
Grid Purchased Energy (kWh)	*37,914*
Energy Efficiency Offset (kWh)	*5,363*
Renewable Energy (kWh)	*0*
Total Baseline Natural Gas (therms)	530
Grid Purchased Energy (therms)	*530*
Energy Efficiency Offset (therms)	*0*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	77
Lifetime Natural Gas Savings (therms):	0
Lifetime GHG Emissions Reduction (MT CO2):	14
Net Present Value (NPV):	$7,018.67
Internal Rate of Return (IRR):	10.28%
Return on Investement (ROI):	42.1%
Savings to Investment Ratio:	1.421





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

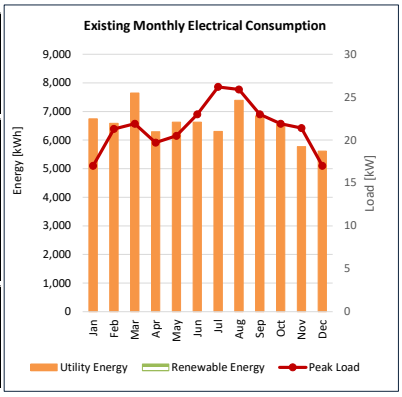
4.18 Fire Station 4

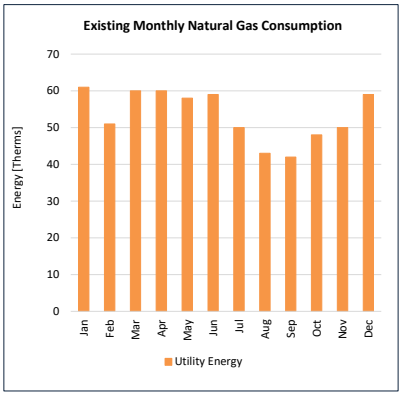
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	8,906
Building(s) Vintage:	2,000
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	84.50

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	7642837079
Utility Rate Tariff:	SDGE - TOU-A-P: Secondary
Energy Purchased (kWh):	79,003
Peak Power (kW):	26
Blended Utility Rate:	$0.25
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

CURRENT NATURAL GAS BILLING DATA	
Service Account:	7642837079
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	641
Utility Rate:	$0.92





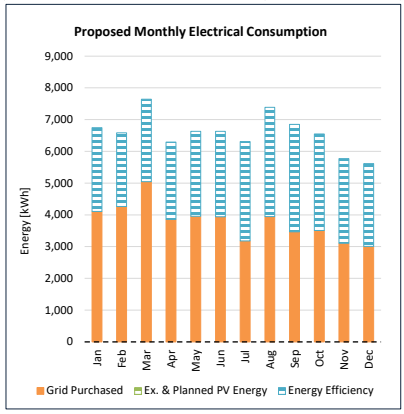
ENERGY EFFICIENCY

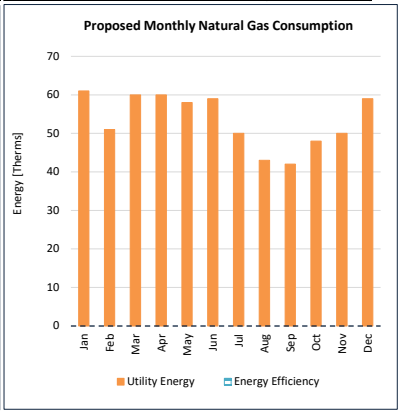
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-3	Split System to VRF Conversion
EEM-9	HVAC Controls - EMS
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
EEM-17	Appliance Replacement
EEM-19	Weatherization (Tints)
-	-
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	33,622
Annual Demand Reduction (kW):	7.12
Annual Natural Gas Savings (therms):	-10
Annual GHG Reductions (MT CO2)[b]:	7
EEM Implementation Cost:	$86,200
EEM Annual Utility Savings[c]:	$7,962
EEM Annual Maintenance Savings[d]:	$2,586
EEM Estimated Incentives:	$2,902
EEM Simple Payback:	8.18

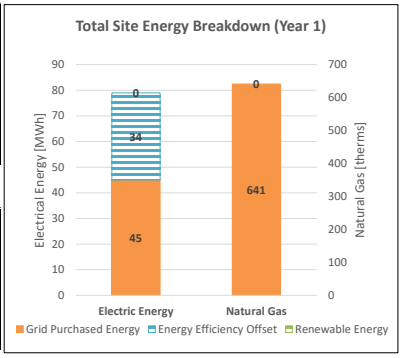


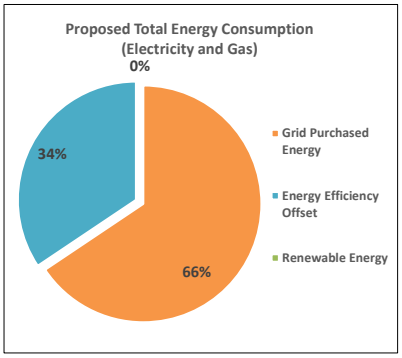


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	79,003
Grid Purchased Energy (kWh)	*45,381*
Energy Efficiency Offset (kWh)	*33,622*
Renewable Energy (kWh)	*0*
Total Baseline Natural Gas (therms)	641
Grid Purchased Energy (therms)	*641*
Energy Efficiency Offset (therms)	*0*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	438
Lifetime Natural Gas Savings (therms):	-99
Lifetime GHG Emissions Reduction (MT CO2):	83
Net Present Value (NPV):	$45,905.93
Internal Rate of Return (IRR):	12.11%
Return on Investement (ROI):	55.1%
Savings to Investment Ratio:	1.551





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

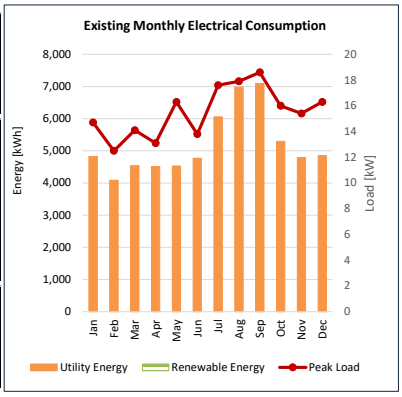
4.19 Fire Station 6

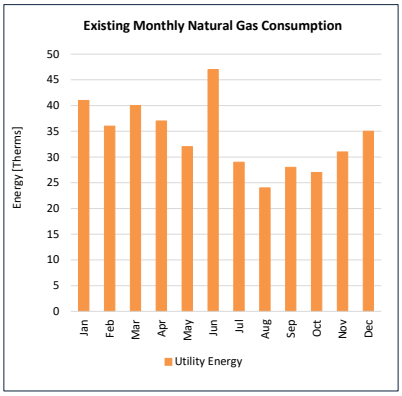
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	6,400
Building(s) Vintage:	2,000
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	96.10

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	1684177287
Utility Rate Tariff:	SDGE - TOU-A-P: Secondary
Energy Purchased (kWh):	62,315
Peak Power (kW):	19
Blended Utility Rate:	$0.26
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

CURRENT NATURAL GAS BILLING DATA	
Service Account:	1684177287
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	407
Utility Rate:	$1.02





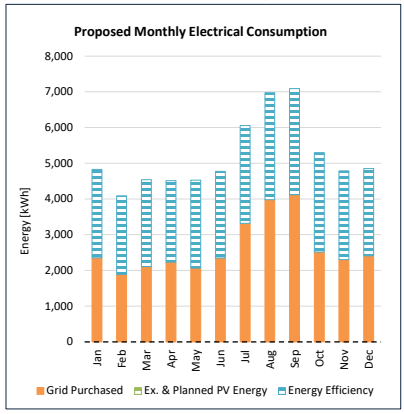
ENERGY EFFICIENCY

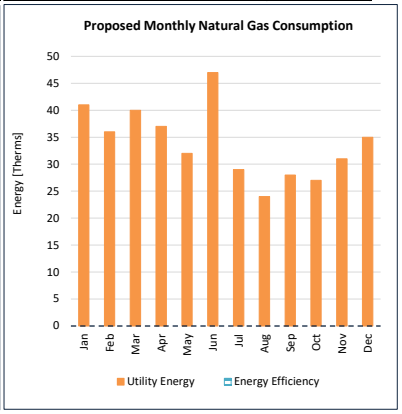
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-3	Split System to VRF Conversion
EEM-9	HVAC Controls - EMS
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
EEM-17	Appliance Replacement
EEM-19	Weatherization (Tints)
-	-
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	30,670
Annual Demand Reduction (kW):	8.25
Annual Natural Gas Savings (therms):	-16
Annual GHG Reductions (MT CO_2)[b]:	6
EEM Implementation Cost:	$50,650
EEM Annual Utility Savings[c]:	$7,228
EEM Annual Maintenance Savings[d]:	$1,520
EEM Estimated Incentives:	$1,810
EEM Simple Payback:	5.80

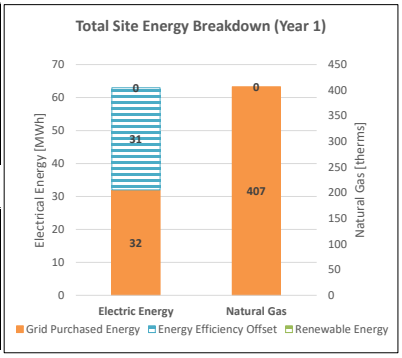


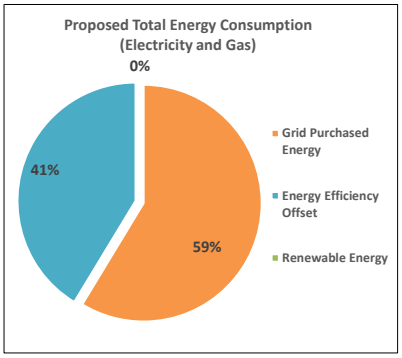


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	62,315
Grid Purchased Energy (kWh)	*31,645*
Energy Efficiency Offset (kWh)	*30,670*
Renewable Energy (kWh)	*0*
Total Baseline Natural Gas (therms)	407
Grid Purchased Energy (therms)	*407*
Energy Efficiency Offset (therms)	*0*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	391
Lifetime Natural Gas Savings (therms):	-190
Lifetime GHG Emissions Reduction (MT CO2):	74
Net Present Value (NPV):	$55,970.67
Internal Rate of Return (IRR):	18.86%
Return on Investement (ROI):	114.6%
Savings to Investment Ratio:	2.146





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

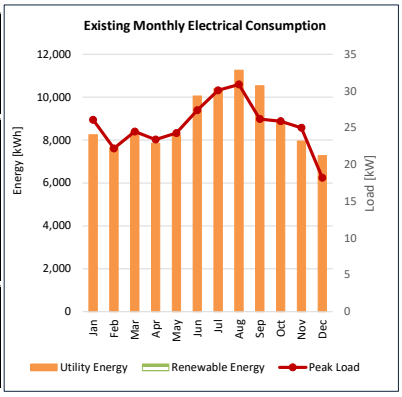
4.20 Fire Station 7

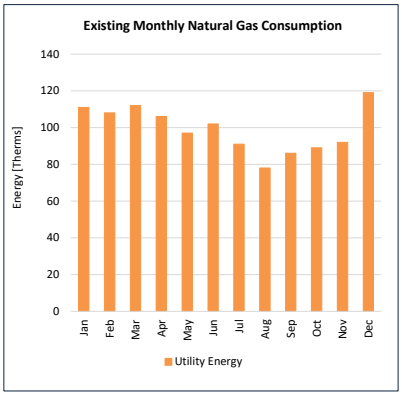
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	13,947
Building(s) Vintage:	2,003
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	75.20

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	6294357703
Utility Rate Tariff:	SDGE - AL-TOU-CPP: Secondary
Energy Purchased (kWh):	106,706
Peak Power (kW):	31
Blended Utility Rate:	$0.24
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

CURRENT NATURAL GAS BILLING DATA	
Service Account:	6294357703
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	1,191
Utility Rate:	$0.83





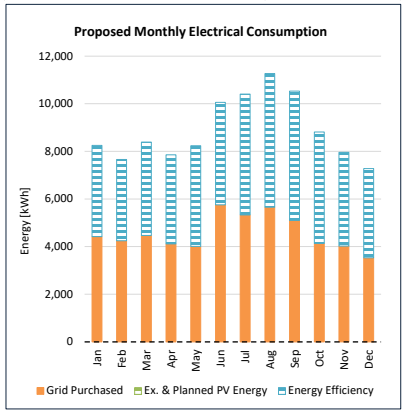
ENERGY EFFICIENCY

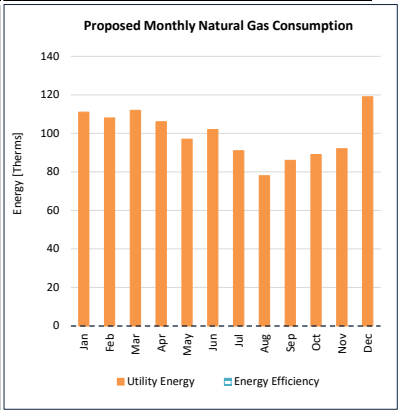
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-3	Split System to VRF Conversion
EEM-9	HVAC Controls - EMS
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
EEM-17	Appliance Replacement
EEM-19	Weatherization (Tints)
-	-
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	51,919
Annual Demand Reduction (kW):	11.65
Annual Natural Gas Savings (therms):	-22
Annual GHG Reductions (MT CO_2)[b]:	10
EEM Implementation Cost:	$150,600
EEM Annual Utility Savings[c]:	$8,594
EEM Annual Maintenance Savings[d]:	$4,518
EEM Estimated Incentives:	$4,874
EEM Simple Payback:	11.50

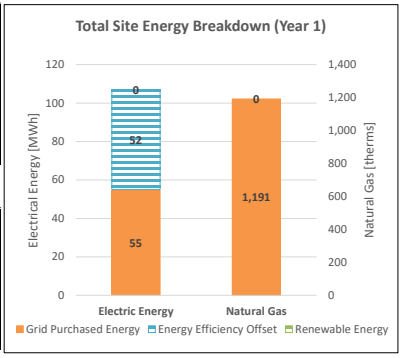


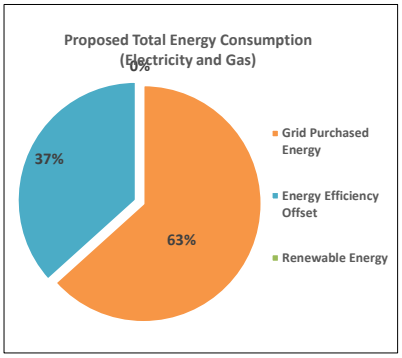


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	106,706
Grid Purchased Energy (kWh)	*54,787*
Energy Efficiency Offset (kWh)	*51,919*
Renewable Energy (kWh)	*0*
Total Baseline Natural Gas (therms)	1,191
Grid Purchased Energy (therms)	*1,191*
Energy Efficiency Offset (therms)	*0*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	702
Lifetime Natural Gas Savings (therms):	-256
Lifetime GHG Emissions Reduction (MT CO2):	132
Net Present Value (NPV):	$18,967.44
Internal Rate of Return (IRR):	6.81%
Return on Investement (ROI):	13.0%
Savings to Investment Ratio:	1.130





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

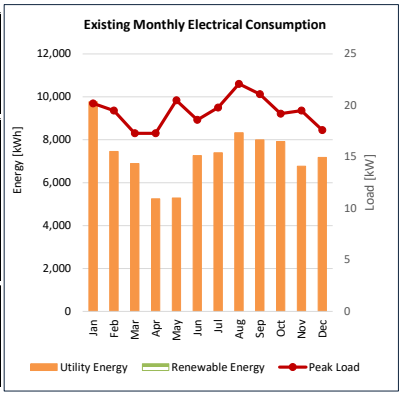
4.21 Fire Station 8

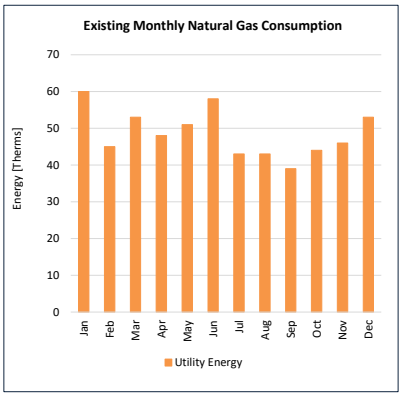
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	8,800
Building(s) Vintage:	2,007
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	97.50

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	3053837123
Utility Rate Tariff:	SDGE - AL-TOU-CPP: Secondary
Energy Purchased (kWh):	87,494
Peak Power (kW):	22
Blended Utility Rate:	$0.25
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

CURRENT NATURAL GAS BILLING DATA	
Service Account:	3053837123
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	583
Utility Rate:	$0.94





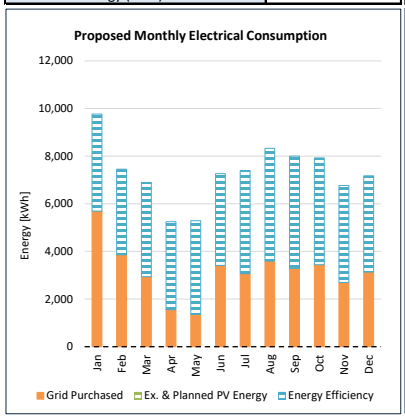
ENERGY EFFICIENCY

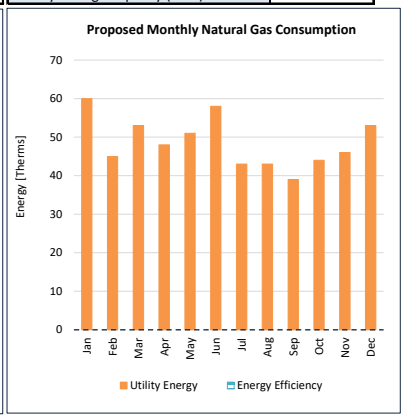
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-3	Split System to VRF Conversion
EEM-9	HVAC Controls - EMS
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
EEM-17	Appliance Replacement
EEM-19	Weatherization (Tints)
-	-
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	49,469
Annual Demand Reduction (kW):	13.69
Annual Natural Gas Savings (therms):	-9
Annual GHG Reductions (MT CO2)[b]:	10
EEM Implementation Cost:	$83,900
EEM Annual Utility Savings[c]:	$8,327
EEM Annual Maintenance Savings[d]:	$2,517
EEM Estimated Incentives:	$2,622
EEM Simple Payback:	7.74

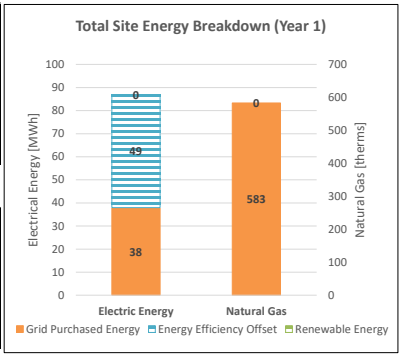


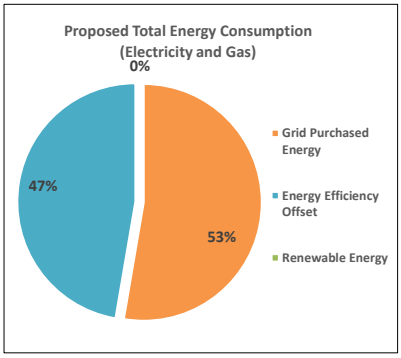


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	87,494
Grid Purchased Energy (kWh)	*38,025*
Energy Efficiency Offset (kWh)	*49,469*
Renewable Energy (kWh)	*0*
Total Baseline Natural Gas (therms)	583
Grid Purchased Energy (therms)	*583*
Energy Efficiency Offset (therms)	*0*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	615
Lifetime Natural Gas Savings (therms):	-94
Lifetime GHG Emissions Reduction (MT CO2):	118
Net Present Value (NPV):	$47,216.63
Internal Rate of Return (IRR):	12.72%
Return on Investement (ROI):	58.1%
Savings to Investment Ratio:	1.581





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

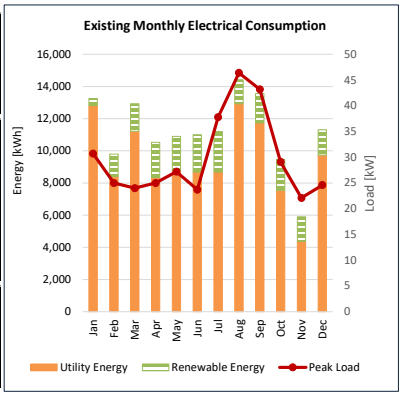
4.22 Animal Shelter

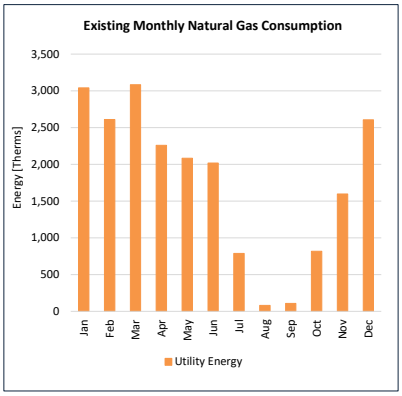
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	8,285
Building(s) Vintage:	1,989
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	4.30

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	4881094457
Utility Rate Tariff:	SDGE - AL-TOU-CPP: Secondary
Energy Purchased (kWh):	113,213
Peak Power (kW):	46
Blended Utility Rate:	$0.25
Solar PV Capacity (kW):	16
Renewable Energy (kWh):	21,021

CURRENT NATURAL GAS BILLING DATA	
Service Account:	4881095561
Utility Rate Tariff:	GN3
Energy Purchased (Therms):	21,096
Utility Rate:	$0.66





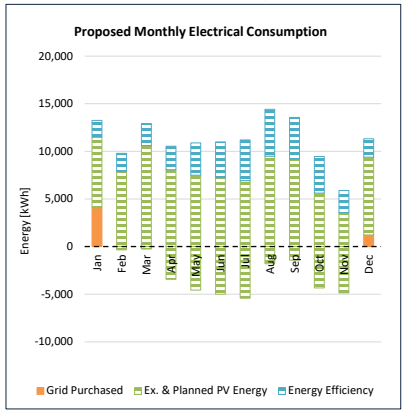
ENERGY EFFICIENCY

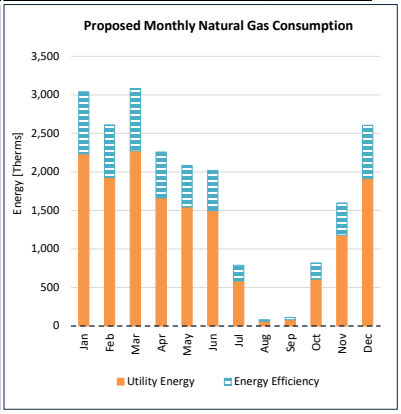
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-2	Packaged Unit Replacements
EEM-4	Space Heater Replacement
EEM-9	HVAC Controls - EMS
EEM-17	Appliance Replacement
EEM-18	Plug Load Controls
EEM-22	Demand Management - Thermal Energy Storage
-	-
-	-
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	60
Renewable Energy (kWh):	102,084

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	37,283
Annual Demand Reduction (kW):	57.60
Annual Natural Gas Savings (therms):	5,517
Annual GHG Reductions (MT CO_2)[b]:	37
EEM Implementation Cost:	$148,500
EEM Annual Utility Savings[c]:	$7,557
EEM Annual Maintenance Savings[d]:	$3,615
EEM Estimated Incentives:	$7,077
EEM Simple Payback:	10.02

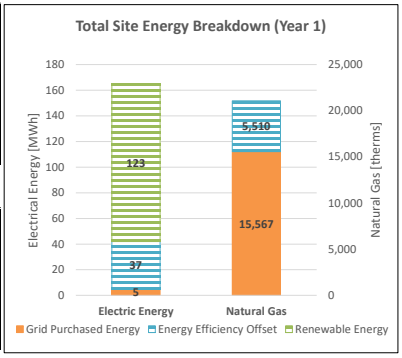


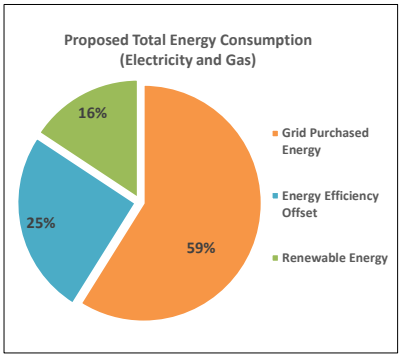


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	165,680
Grid Purchased Energy (kWh)	*5,295*
Energy Efficiency Offset (kWh)	*37,280*
Renewable Energy (kWh)	*123,105*
Total Baseline Natural Gas (therms)	21,096
Grid Purchased Energy (therms)	*15,567*
Energy Efficiency Offset (therms)	*5,510*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	554
Lifetime Natural Gas Savings (therms):	109,984
Lifetime GHG Emissions Reduction (MT CO2):	717
Net Present Value (NPV):	$74,597.10
Internal Rate of Return (IRR):	10.81%
Return on Investement (ROI):	52.7%
Savings to Investment Ratio:	1.527





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

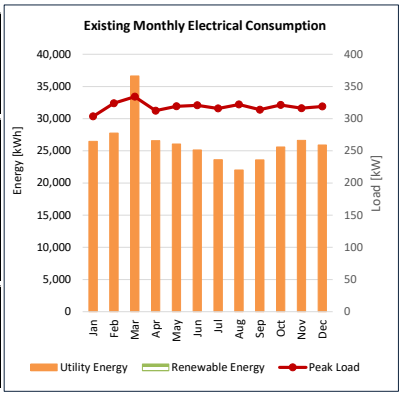
4.23 Park Lighting

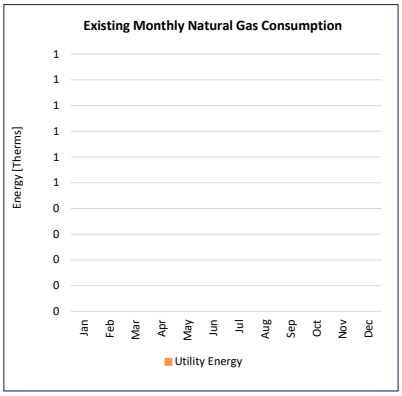
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	0
Building(s) Vintage:	0
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	19/15.3

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	0
Utility Rate Tariff:	SDGE - OL-2: Lighting
Energy Purchased (kWh):	315,974
Peak Power (kW):	334
Blended Utility Rate:	$0.27
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

CURRENT NATURAL GAS BILLING DATA	
Service Account:	0
Utility Rate Tariff:	0
Energy Purchased (Therms):	0
Utility Rate:	$0.00





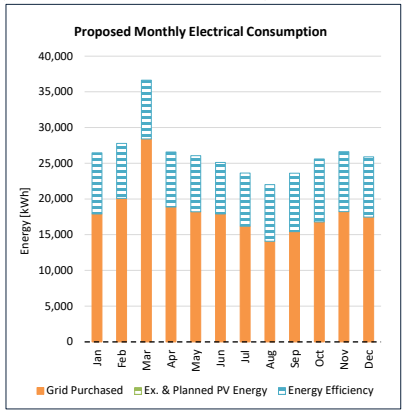
ENERGY EFFICIENCY

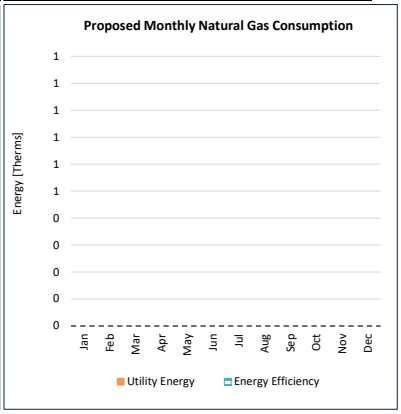
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)[a]	
Annual Electricity Savings (kWh):	96,397
Annual Demand Reduction (kW):	24.17
Annual Natural Gas Savings (therms):	0
Annual GHG Reductions (MT CO_2)[b]:	19
EEM Implementation Cost:	$97,000
EEM Annual Utility Savings[c]:	$21,800
EEM Annual Maintenance Savings[d]:	$2,910
EEM Estimated Incentives:	$0
EEM Simple Payback:	3.93

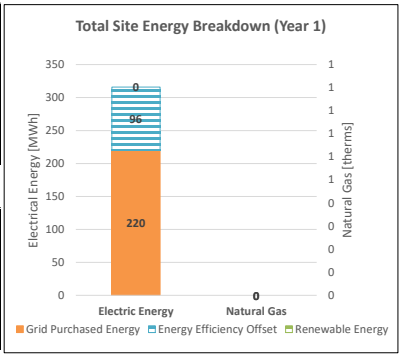


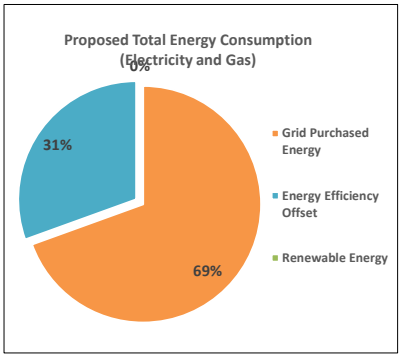


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	315,974
Grid Purchased Energy (kWh)	*219,577*
Energy Efficiency Offset (kWh)	*96,397*
Renewable Energy (kWh)	*0*
Total Baseline Natural Gas (therms)	0
Grid Purchased Energy (therms)	*0*
Energy Efficiency Offset (therms)	*0*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS[e, f, g]	
Lifetime Electricity Savings (MWh):	957
Lifetime Natural Gas Savings (therms):	0
Lifetime GHG Emissions Reduction (MT CO2):	191
Net Present Value (NPV):	$143,773.53
Internal Rate of Return (IRR):	26.22%
Return on Investement (ROI):	148.2%
Savings to Investment Ratio:	2.482





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

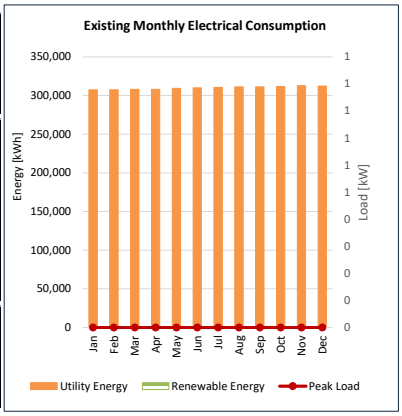
4.24 Street Lighting

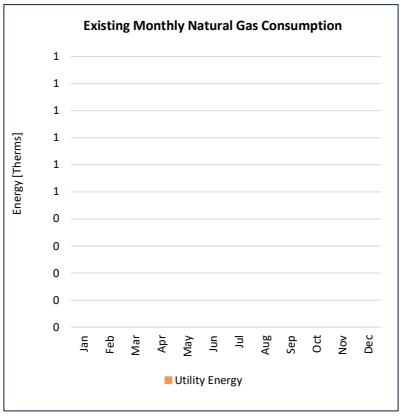
SITE & BASELINE CONDITIONS

SITE INFORMATION	
Building(s) Area (sf):	N/A
Building(s) Vintage:	Various
Energy Star Score:	N/A
Energy Star Site EUI (kBTU/sf):	4.30

CURRENT ELECTRICITY BILLING & PV DATA	
Service Account Number:	4334227908, 7709227900
Utility Rate Tariff:	SDGE - OL-2: Lighting
Energy Purchased (kWh):	3,719,300
Peak Power (kW):	0
Blended Utility Rate:	$0.15
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

CURRENT NATURAL GAS BILLING DATA	
Service Account:	N/A
Utility Rate Tariff:	N/A
Energy Purchased (Therms):	0
Utility Rate:	$0.00





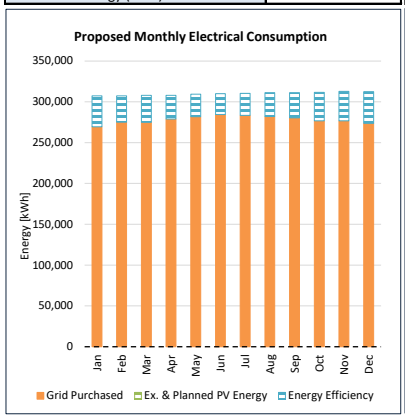
ENERGY EFFICIENCY

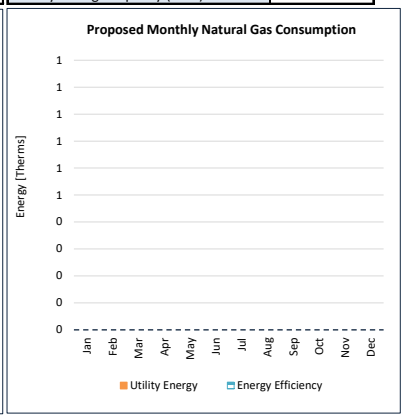
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)$_a$	
EEM-23	Streetlight Dimming Controls
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-

PLANNED SOLAR PV INSTALLATIONS	
Solar PV Capacity (kW):	0
Renewable Energy (kWh):	0

PLANNED BATTERY STORAGE INSTALLATIONS	
Battery Capacity (kW)	
Battery Storage Capacity (kWh)	

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)$_a$	
Annual Electricity Savings (kWh):	381,589
Annual Demand Reduction (kW):	0.00
Annual Natural Gas Savings (therms):	0
Annual GHG Reductions (MT CO2)$_b$:	76
EEM Implementation Cost:	$2,124,744
EEM Annual Utility Savings$_c$:	$105,047
EEM Annual Maintenance Savings$_d$:	$63,742
EEM Estimated Incentives:	$45,791
EEM Simple Payback:	12.59

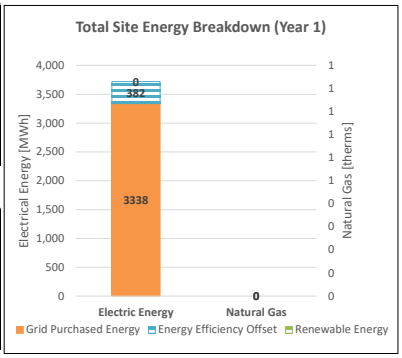


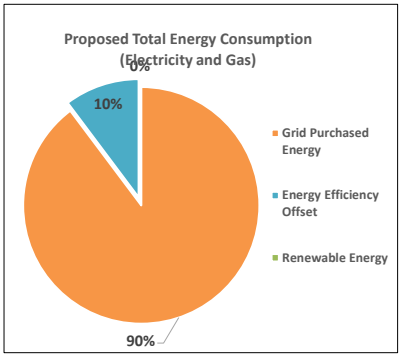


SUMMARY AND LIFETIME ENERGY IMPACTS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (kWh)	3,719,300
Grid Purchased Energy (kWh)	*3,337,711*
Energy Efficiency Offset (kWh)	*381,589*
Renewable Energy (kWh)	*0*
Total Baseline Natural Gas (therms)	0
Grid Purchased Energy (therms)	*0*
Energy Efficiency Offset (therms)	*0*

EEM 20 YR LIFETIME SAVINGS AND FINANCIALS$_{e,f,g}$	
Lifetime Electricity Savings (MWh):	5,724
Lifetime Natural Gas Savings (therms):	0
Lifetime GHG Emissions Reduction (MT CO2):	1,072
Net Present Value (NPV):	$244,299.21
Internal Rate of Return (IRR):	6.52%
Return on Investement (ROI):	11.8%
Savings to Investment Ratio:	1.118





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

5 Proposed EEMs

TRC audited all the major facilities listed in Section 2 including the Police Department HQ, Civic Center Buildings, Public Works, South Chula Vista Library, Norman Park Senior Center, and Animal Shelter, and TRC sampled a few of the Fire Stations and Recreation Center buildings. In addition to the data collected during the site walks, TRC also referenced data from the previous energy audits conducted at the City facilities and the existing equipment inventory maintained by the City.

In order to estimate savings from the mechanical EEMs, TRC created building energy models using eQuest for all the major City buildings listed above. TRC created representative eQuest models for a fire station and recreation center building-type and prorated the results based on capacity (i.e., tonnage) to account for the savings obtained in the remaining fire station and recreation center buildings, respectively.

The implementation cost estimate presented in the Table below entail all material costs, labor costs, demolition costs, and costs associated with rental equipment required for the installation process. The cost also accounts for sales tax, overhead and profit markups, 20% contingency and location multiplier. The soft costs associated with the City's in-house staff time are not included.

The following sub sections present the portfolio-wide EEM opportunities and economics. Table 4 summarizes all the measures, savings, and costs identified.

EEM #	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual GHG Reductions	Annual Utility Cost Savings	Implementation Cost	Estimated Incentives	Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
EEM-1	AC unit Overhauls	167,166	56	2,489	46	$43,561	$395,000	$31,571	8.30
EEM-2	Packaged Unit Replacements	35,135	11	287	9	$10,328	$125,000	$0	12.10
EEM-3	Split System to VRF Conversion	94,649	20	0	19	$27,445	$270,350	$14,385	9.30
EEM-4	Space Heater Replacement	0	0	5,448	29	$4,356	$25,000	$6,811	4.20
EEM-5	Air Handler Replacements	760,195	152	21,143	263	$238,926	$2,885,000	$140,727	11.5
EEM-6	Chiller Plant Upgrades	185,213	30	0	37	$47,046	$320,000	$26,797	6.20
EEM-7	Boiler Replacements	0	0	11,959	63	$15,512	$220,000	$14,948	13.20
EEM-8	Pumping System Upgrades	162,296	24	0	17	$29,751	$118,000	$23,019	3.20
EEM-9	HVAC Controls - EMS	715,277	261	45,822	385	$216,421	$1,599,000	$174,321	6.60
EEM-10	Hot Water Heater Replacement	See Electrification							

EEM #	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual GHG Reductions	Annual Utility Cost Savings	Implementation Cost	Estimated Incentives	Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
EEM-11	Data Center Upgrades	22,344	6	0	4	$4,317	$15,000	$3,592	2.60
EEM-12	Parking Garage Exhaust Fan VFDs	20,002	0	0	4	$6,452	$20,000	$2,400	2.70
EEM-13	Interior Lighting Retrofits	191,809	95	0	38	$43,294	$193,000	$0	4.50
EEM-14	Exterior Lighting Retrofits	195,337	50	0	39	$47,951	$343,000	$0	7.20
EEM-15	Lighting Controls - Occupancy Sensors	318,047	68	0	63	$72,844	$254,500	$0	3.50
EEM-16	Automatic Pool Covers	0	0	11,194	59	$11,042	$95,000	$13,993	7.30
EEM-17	Appliance Replacement	5,694	1	0	1	$2,247	$38,100	$821	16.60
EEM-18	Plug Load Controls (Vending Misers and Power Strips)	56,183	0	0	11	$12,754	$36,050	$6,754	2.30
EEM-19	Weatherization (Tints)	41,958	14	409	11	$10,501	$195,200	$7,669	17.90
EEM-20	Emergency Generator Block Heater	3,124	0	0	1	$679	$1,250	$375	1.30
EEM-21	Demand Response	0	293	0	0	$27,737	$66,000	$32,538	1.20
EEM-22	Demand Management - Thermal Energy Storage	129,557	307	0	26	$36,151	$733,000	$0	20.30
EEM-23	Streetlight Dimming Controls	381,589	0	0	76	$168,790	$2,124,744	$45,791	12.30

Table 4: EEM Description

5.1 EEM 1: Air Conditioning (AC) Unit Overhauls

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
167,166	56	2,489	46	$43,561	$395,000	$31,571	8.30

Table 5: EEM 1 Savings and Cost

Some of the City's AC units are older than 10 years, but they are still in good operating condition and do not warrant a complete replacement of the unit. For these units, TRC recommends replacing the old inefficient components including the compressors, evaporator coils, fan motors, and belts with new energy efficient components. TRC recommends upgrading the existing units with variable speed compressors and smart or electronically commutated (EC) fan motors to facilitate variable speed operation, if the units have constant speed operation. This EEM also proposes restoring the economizer operation for AC units with broken damper linkages and non-operational damper actuators.



Figure 1: Typical Fan Motor and Belt



Figure 2: Typical Evaporator Coil Section

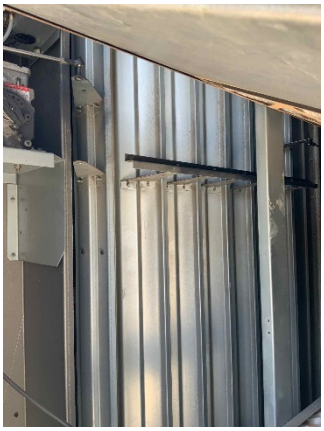


Figure 3: Broken Economizer (OAD) Linkage

5.1.1 Civic Center Buildings (Building 100, 200, and 300)

The scope includes restoring economizer operation and overhauling all the existing AC units with new variable speed compressors, evaporator coils, fan motors, and belts. The measure also proposes installing a smart motor on the packaged heat pump serving the City Hall Council Chambers to facilitate variable air volume (VAV) operation.

5.1.2 South Chula Vista Library

The scope of this project only includes adding smart motors to the new packaged AC units to facilitate variable speed operation.

5.1.3 Norman Park Senior Center

The scope of this project only includes adding EC motors to the small AC units to facilitate variable speed operation.

5.1.4 Recreation Centers

The scope includes restoring economizer operation and overhauling the existing AC units at Montevalle Recreation Center and packaged heat pump at Park Way Community Center with new variable speed compressors, evaporator coils, fan motors, and belts.

The savings of this measure were developed using eQuest. Calculated energy savings for this measure assumed a conservative degradation in original install efficiency based on the equipment age. The implementation cost includes the cost for new evaporator coils, variable speed compressors, new fan belts and motors, damper actuators, associated refrigerant piping and electrical modifications, commissioning and disposal. The EEM applies to the all the HVAC units that have not been proposed to be replaced, listed in the following table.

Site Name - Building Name	Equipment Type	Qty.	Make & Model Number	Age (yr.)	Cooling Tons
Civic Center – Building 100	Package AC	2	Trane SXHFC5540778A8BD9001A0Z000H000N0T078000	14	55.0
	Package AC	1	Trane WCD240B40AGA	14	20.0
Civic Center - Building 200	Package AC	1	Trane SXHGC90E0Z86CDDD9001A0Z000000NRT0700	13	90.0
Civic Center Building 300	Package AC	1	Trane SXHFFC6040A67A8AD9001A0W00GH0000RT008000#	11	60.0
	Package AC	1	Trane SXHFFC7540A66A9AD9001A0W000H0000RT008000#	11	75.0
Norman Park Senior Center	Package AC	1	Trane YSC090F3RLA080004	5	7.5

Site Name - Building Name	Equipment Type	Qty.	Make & Model Number	Age (yr.)	Cooling Tons
	Package AC	1	Trane 4YCC3030C1075AB	5	2.5
	Package AC	1	Trane	7	2.0
South Chula Vista Library	Package AC	1	Trane YHD150G4RLB0GK7	0	12.5
	Package AC	1	Trane YHC074F4RLA0LK	2	6.0
Montevalle Recreation Center	Split AC	1	Carrier 38AKS044 -601/ Carrier 39MN30B005B1Z11XXS	13	35.8
	Split AC	1	Carrier 38HDC060-621	13	5.0
Park Way Community Center - Gymnasium	Package HP	1	Carrier 50HJQ005---531--	11	4.0

Table 6: Existing Equipment Impacted by EEM 1

Refer to Appendix C: Proposed EEM Savings and Cost per Building for a breakdown of energy savings and cost, per building, and to Appendix B: Existing Equipment Inventory for more detailed information on the existing HVAC equipment of each building.

5.2 EEM 2: Packaged Unit Replacements

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
35,135	11	287	9	$10,328	$125,000	$0	12.10

Table 7: EEM 2 Savings and Cost

For packaged units greater than 15 years old, or those which show major degradation, TRC recommends new packaged units. The new efficient units have Title 24 compliant efficiencies and high efficiency indoor fan motors with variable speed operation. The new units will be installed with new unit controllers and new damper actuators.



Figure 4: Typical Packaged RTU

TRC developed the savings of this measure using eQuest models. Calculated energy savings for this measure assumed a conservative degradation in original install efficiency based on the equipment age. The implementation cost includes the cost for demolition and installation of new units, associated refrigerant piping and electrical modifications, commissioning, TAB, and disposal. The table below shows the baseline packaged unit equipment that is being proposed for replacement.

Site Name - Building Name	Equipment Type	Qty.	Make & Model Number	Age (yr.)	Cooling Tons
Lauderbach Recreation Center	Package HP	2	Trane WSC090E3R0A90000	8	7.5
	Package AC	2	American Standard YCC018F1L0BE	20	1.5
Parkway Community Center	Package AC	2	RHEEM RKKA-A06JK10X	22	5.0
	Package AC	1	RHEEM RKKA-AO48JK08X	22	4.0
Parkway Community Center - Pool	Package AC	1	Carrier 48HJE004---331--	21	3.0
	Package AC	1	Carrier 48SS-024040311	21	2.0
Animal Shelter	Package AC	1	Trane YCCO42F3MOBF	18	3.5
	Package AC	2	Trane YCCO60F3MOBH	18	5.0
	Package AC	1	Trane 4WCC3018A1000AA	11	1.5
	Package AC	1	Sanyo STW1223H1	2	1.0
	Package AC	2	Crispaire AVP36HPA05N-1000 BI 06906	7	2.9
	Package AC	1	Bard W60H1-A05VPxxx	8	5.0

Table 8: Existing Equipment Impacted by EEM2

Refer to Appendix C: Proposed EEM Savings and Cost per Building for a breakdown of energy savings and cost, per building, and to Appendix B: Existing Equipment Inventory for more detailed information on the existing HVAC equipment of each building.

5.3 EEM 3: Split System to Variable Refrigerant Flow (VRF) Conversion

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
94,649	20	0	19	$27,444	$270,325	$14,385	9.30

Table 9: EEM 3 Savings and Cost

This measure proposes to replace the spilt air conditioning systems at all fire stations with a VRF system. VRF systems are multi-zone units that circulate refrigerant from an outdoor compressor to multiple indoor evaporator units. VRFs incorporate inverter-driven compressors that modulate the flow of refrigerant in the system, and ECM fans that adjust air flow in response to the actual cooling and heating demand. Thus, they provide significantly better partial-load performance over conventional packaged and split-systems, while maintaining more precise temperature control. VRF systems control each zone by modulating the amount of refrigerant that is delivered to each evaporator fan coil unit within the zone. Refrigerant is delivered to each zone depending on its need, and zones with intermittent demand can be turned down or completely off during times of little to no cooling or heating demand. The inverter-controlled compressor responds to changing demand by varying its speed, effectively reducing capacity and energy consumption during partial-load conditions.



Figure 5: Typical Outdoor Condensing Units

TRC developed the savings for this EEM using eQuest model. Calculated energy savings for this measure assumed a conservative degradation in original install efficiency based on the equipment age. The implementation cost includes the cost for demolition of existing split heat pump systems, installation of new VRF systems, associated refrigerant piping and electrical modifications, commissioning, TAB, and disposal. The table below shows the baseline equipment that is being proposed for replacement.

Site Name - Building Name	Equipment Type	Qty.	Make & Model Number	Age (yr.)	Cooling Tons
Fire Station 1	Split Heat Pump	1	RHEEM RA1636AJ1NA	3	3.0
	Split Heat Pump	3	Trane 2TWR2018A1000AB	16	3.0

Site Name - Building Name	Equipment Type	Qty.	Make & Model Number	Age (yr.)	Cooling Tons
Fire Station 2	Split Heat Pump	1	Trane YCC018F1L0Bh	16	3.0
Fire Station 3	Split Heat Pump	1	Trane 2TWB3030A1000CA	18	2.5
	Split Heat Pump	1	Trane TWR018C100A4	11	1.5
Fire Station 4	Split Heat Pump	2	Trane TWP036C100A3	13	3.0
	Split Heat Pump	1	Trane TWP024C100A4	11	2.5
	Split Heat Pump	1	Trane TWP048C100A4	11	5.0
	Split Heat Pump	1	Trane TWP036C300A1	19	3.0
Fire Station 6	Split Heat Pump	2	Trane 38YRA036331	15	3.0
	Split Heat Pump	1	Trane 38YRA030341	15	2.5
Fire Station 7	Split Heat Pump	4	Carrier 38YXA024320	17	2.1
	Split Heat Pump	2	Carrier 38YXA036330	16	3.0
	Split Heat Pump	1	Carrier 38YXA030330	16	2.4
	Split Heat Pump	1	Carrier 38YXA048320	16	3.9
	Split Heat Pump	1	Carrier 38YXA060	16	4.8
Fire Station 8	Split Heat Pump	3	Carier 38YXA024320	12	2.0
	Split Heat Pump	1	Carier 38YXA030330	12	2.5
	Split Heat Pump	3	Carier 38YXA036330	12	3.0
	Split Heat Pump	1	Carier 38YXA048320	12	4.0
	Split Heat Pump	1	Carier 38YXA060320	12	5.0

Table 10: Existing Equipment Impacted by EEM 3

Refer to Appendix C: Proposed EEM Savings and Cost per Building for a breakdown of energy savings and cost, per building, and to Appendix B: Existing Equipment Inventory for more detailed information on the existing HVAC equipment of each building.

5.4 EEM 4: Space Heater Replacement

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
0	0	5,448	29	$4,356	$25,000	$6,811	4.20

Table 11: EEM 4 Savings and Cost

Gas-fired radiant heaters keep the animals warm in the outdoor kennels at the Chula Vista Animal Shelter. Based on the gas consumption at the facility, the heaters seem to run at full load for a considerable portion of the year. The existing space heaters have degraded in efficiency due to their age and heavy use. This measure recommends replacing the heaters with new high-efficiency gas-fired units. In addition to realizing significant cost savings, this measure will achieve large GHG reductions.



Figure 6: Existing Radiant Heater

TRC developed the EEMs savings for this EEM using eQuest model. Calculated energy savings for this measure assumed a conservative degradation in original install efficiency based on the equipment age. The implementation cost includes the cost for demolition and installation of new units, associated gas piping and electrical modifications, commissioning, and disposal. The table below shows the baseline equipment that is being proposed for replacement.

Site Name - Building Name	Equipment Type	Qty	Make & Model Number	Age [Years]	Heating Output [Btu/hr]
Animal Shelter	Space Heater	8	Reznor TR-50	19	50,000

Table 12: Existing Equipment Impacted by EEM2

5.5 EEM 5: Air Handler Replacements

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
760,195	152	21,143	263	$238,926	$2,885,000	$140,727	11.50

Table 13: EEM 5 Savings and Cost

This measure proposes replacing air handling units (AHUs) with new energy efficient Title 24 code compliant units, for all sites with degraded units. The new AHUs would include new cabinets, premium efficiency motors, new fans, chilled water coils, and hot water coils (where needed). The units will be installed with new controllers, damper and valve actuators, and temperature sensors.



Figure 7: Typical Fan Motor and Belt



Figure 8: Typical Coil Section



Figure 9: Broken Economizer (OAD) Linkage

TRC developed this measure's savings using eQuest building models. Calculated energy savings for this measure assumed a conservative degradation in original install efficiency based on the equipment age. The implementation cost includes the cost for demolition and installation of new units, associated refrigerant piping and electrical modifications, commissioning, TAB, and disposal. The table below shows the baseline equipment that is being proposed for replacement.

Site Name - Building Name	Equipment Type	Qty.	Make & Model Number	Age (yr.)	Supply Fan HP	VFD?
Police Department HQ	AHU	1	Trane MCCB050UA0C0UB	15	25	Yes
	AHU	1	Trane MCCA066	17	30	Yes
	AHU	1	Trane MCCB025	17	15	Yes
	AHU	1	Trane TSCA012	16	7.5	Yes
	AHU	1	Trane TSCA021	16	15	Yes
	AHU	1	Trane TSCA030	16	20	Yes
	AHU	1	Trane TSCX025	16	15	Yes
	AHU	1	Trane TSCA025	16	15	Yes
	AHU	1	Trane TSCA021	16	15	Yes
	AHU	1	Trane TSCX030	16	20	Yes
	AHU	1	Trane TSCA010	16	7.5	Yes
	AHU	1	Trane TSCA017	16	10	Yes
	AHU	1	Trane TSCA010	16	5	Yes
	AHU	1	Trane TSCA012	16	7.5	Yes
	AHU	1	Trane MCCB050UA0C0UB	15	25	Yes
	AHU	1	Trane MCCA066	17	30	Yes
	AHU	1	Trane MCCB025	17	15	Yes
	AHU	1	Trane TSCA012	16	7.5	Yes
	AHU	1	Trane TSCA021	16	15	Yes
	AHU	1	Trane TSCA030	16	20	Yes
Civic Center Library	AHU	4	Westernaire WMZ-150	16	7.5	No

Site Name - Building Name	Equipment Type	Qty.	Make & Model Number	Age (yr.)	Supply Fan HP	VFD?
	AHU	1	Westernaire WMZ-150-S	16	15	No
	AHU	1	Westernaire WAH-60	16	5	No
	AHU	2	Westernaire WAH-30	16	1	No
Public Works – Admin	AHU	1	Bohn HCS36BLA	32	15	Yes
	AHU	1	Bohn HCS26CMF	32	15	Yes
	AHU	1	Trane TSCA025BBB0DAA000000AA	17	15	Yes
	AHU	1	Trane TSCA010U0A000000000A00A276.0	17	5	Yes
Public Works – Shops	AHU	1	Trane TSCA010GAB0BAC0CAE0EAAECAC00000000AA0C	17	5	Yes
	AHU	1	Trane TSCA008NBA0BHG0ABB00B06000000	17	5	Yes

Table 14: Existing Equipment Impacted by EEM 5

Refer to Appendix C: Proposed EEM Savings and Cost per Building for a breakdown of energy savings and cost, per building, and to Appendix B: Existing Equipment Inventory for more detailed information on the existing HVAC equipment of each building.

5.6 EEM 6: Chiller Plant Upgrades

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
185,213	30	0	37	$47,046	$320,000	$26,797	6.20

Table 15: EEM 6 Savings and Cost

5.6.1 Police Department Headquarters

This measure proposes to optimize the central plant chiller operating sequence. The scope of this project includes upgrading the controller for the chiller without drives (Chiller 1), so it can communicate with the energy management system (EMS) system. The modified chiller sequence of operations should be as follow:

1. Building load less than or equal to 170 tons: Chiller 2 will handle the entire building load.
2. Building load between 170 tons and 210 tons: Chiller 2 will ramp down and Chiller 1 will serve the building load.
3. Building load greater than 210 tons: Chiller 1 will be the lead chiller and Chiller 2 will act as trim chiller.

With the new sequence, Chiller 1 will always operate at full load, which corresponds to the optimum efficiency for a constant speed chiller.

The scope of this measure also includes replacing the chilled water piping insulation in the central plant. During the site visit, TRC observed condensation on the outer surface of the pipe insulation. Replacing the insulation will result in chiller energy savings.

The implementation cost for this measure includes cost to add the Chiller to EMS, programming, commissioning, and replacing the insulation for the chilled water piping in the central plant.



Figure 10: Condensate on the Pipe Insulation (Police Department HQ)

Site Name - Building Name	Equipment Type	Qty.	Make & Model Number	Age (yr.)	Tons	VFD?
Police Department HQ	Chiller	1	Trane RTHC B2-C2-D2	17	216.8	No
	Chiller	1	Trane RTHC B2-C2-D2	17	216.8	Yes

Table 16: Existing Equipment (Police Department HQ) Impacted by EEM 6

5.6.2 Public Works

The scope of this measure includes replacing the exiting chiller serving the Public Works Admin and Shops AHUs with new energy efficient chiller equipped with variable speed drives. The chiller is original to the building but was retrofitted with Turbocor compressors.



Figure 11: Existing Chiller (Public Works)

Site Name - Building Name	Equipment Type	Qty.	Make & Model Number	Age (yr.)	Tons	VFD?
Public Works Yard	Chiller	1	Trane RTAC 1404	14	140	Yes

Table 17: Existing Equipment (Public Works) Impacted by EEM 6

TRC developed this measure's savings using eQuest building models. Calculated energy savings for this measure assumed a conservative degradation in original install efficiency based on the equipment age. The implementation cost includes the cost for demolition and installation of new chiller, associated piping and electrical modifications, water balancing, new isolation valves, design and permits, commissioning, and disposal.

Refer to Appendix C: Proposed EEM Savings and Cost per Building for a breakdown of energy savings and cost, per building, and to Appendix B: Existing Equipment Inventory for more detailed information on the existing HVAC equipment of each building.

5.7 EEM 7: Boiler Replacements

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
0	0	11,959	63	$15,512	$220,000	$14,948	13.20

Table 18: EEM 7 Savings and Cost

This measure proposes replacing the heating hot water boilers with new high efficiency Title 24 compliant boiler equivalents. The existing boilers are nearing the end of their effective useful life and are not operating at peak efficiency. This measure results in considerable natural gas savings and GHG reduction from the improved boiler efficiency.



Figure 12: Typical Outdoor Boiler Installation

TRC developed this measure's savings using eQuest building models. Calculated energy savings for this measure assumed a conservative degradation in original install efficiency based on the equipment age. The implementation cost includes the cost for demolition and installation of new boilers, associated piping and electrical modifications, installation of isolation valves, and disposal. The table below shows the baseline equipment that is being proposed for replacement.

Site Name - Building Name	Equipment Type	Qty.	Make & Model Number	Age (yr.)	Heating Output Capacity [(Btu/h)/Unit]
Police Department HQ	Boiler	2	Rite 350WG	16	2,800,000
Public Works Yard	Boiler	1	Rite 90WG	32	720,000
Civic Center Library	Boiler	1	Raypak H2-1571	18	1,900,000

Table 19: Existing Equipment Impacted by EEM 7

Refer to Appendix C: Proposed EEM Savings and Cost per Building for a breakdown of energy savings and cost, per building, and to Appendix B: Existing Equipment Inventory for more detailed information on the existing HVAC equipment of each building.

5.8 EEM 8: Pumping System Upgrades

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
162,296	24	0	17	$29,751	$118,000	$23,019	3.20

Table 20: EEM 8 Savings and Cost

This measure proposes replacing chilled water and heating hot water pumps and adding variable speeds drives to larger pumps to convert constant flow loops to a variable-flow systems. The scope for each site is highlighted below:

5.8.1 Police Department Headquarters

The existing heating hot water pumps are original to the building and past their useful life. TRC observed the pump casing to be corroded. TRC recommends replacing these pumps with new, energy efficient pumps and premium efficiency motors. TRC also recommends upgrading the heating hot water pumping system to variable flow. As a part of the variable heating hot water pumping effort, bypass hot water flow at the VAV boxes and AHUs will need to be disabled, and differential pressure control will need to be utilized to modulate the hot water pump VFDs. Also, the units should be equipped with two-way heating hot water valves for convert the constant flow system to variable flow.

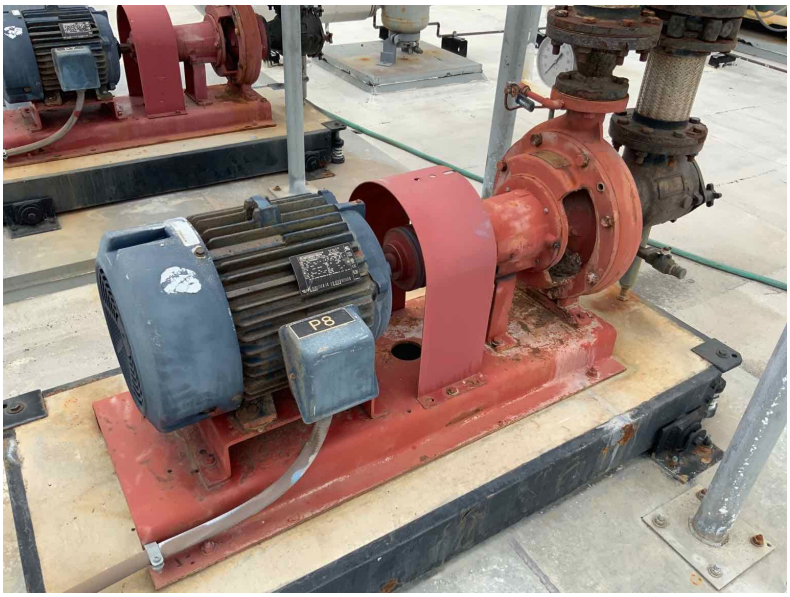


Figure 13: Heating Hot Water Pumps at Police Department HQ

5.8.2 Public Works

This measure proposes to replace the existing primary chilled water pumps and heating hot water pumps with new energy efficient pumps. As theses pumps are 5-hp or less in size, and TRC does not recommend adding variable speed drives to the pumps.



Figure 14: Heating Hot Water Pumps at Public Works



Figure 15: Primary Chilled Water Pumps at Public Works

5.8.3 Civic Center Library

The existing chilled water pumps are original to the building and past their useful life. TRC recommends replacing these pumps with new energy efficient pumps and premium efficiency motors. TRC recommends installing variable frequency drives to the pumps and converting the constant flow chilled water loop to a variable flow system. As a part of the variable chilled water pumping effort, the air handlers are required to be equipped with two-way valves.



Figure 16: Chilled Water Pumps at Civic Center Library

5.8.4 South Chula Vista Library

This measure proposes to replace the existing heating hot water pumps with new energy efficient pumps. As these pumps are 5-hp or less in size, TRC does not recommended adding variable speed drives to the pumps.

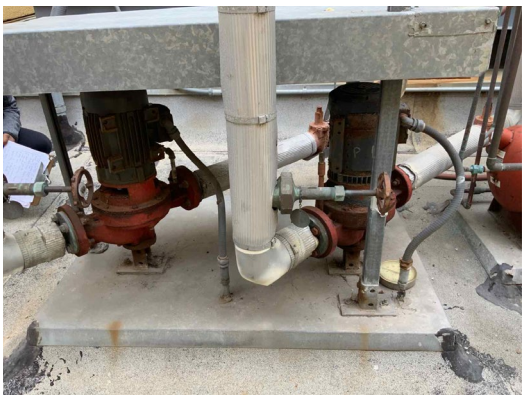


Figure 17: Heating Water Pumps at South Chula Vista Library

TRC developed this measure's savings using eQuest building models. Calculated energy savings for this measure assumed a conservative degradation in original install efficiency based on the equipment age. The implementation cost includes the cost for demolition and installation of new units, VFDs if applicable, differential pressure sensors for pumps with new VFDs, associated electrical modifications, programming, commissioning. The table below shows the baseline equipment that is being proposed for replacement.

Site Name - Building Name	Equipment Type	Qty	Make & Model Number	Age [Years]	Supply Fan HP	Install VFD?
Police Department Headquarters	Heating Hot Water Pump	2	Weinman 2BH3B150P24-D	16	15	Yes
Public Works Yard	Heating Hot Water Pump	2	Peerless	17	5	No
	Primary Chilled Water Pump	2	Armstrong 4x3x8 4030	32	5	No
Civic Center Library	Heating Hot Water Pump	1	Baldor JMM3511T	10	3	No
	Chilled Water Pump	2	US Electric A923A	10	10	No
South Chula Vista Library	Heating Hot Water Pump	2	WEG 00158ES3E145JM	14	1.5	No

Table 21: Existing Equipment Impacted by EEM 8

Refer to Appendix C: Proposed EEM Savings and Cost per Building for a breakdown of energy savings and cost, per building, and to Appendix B: Existing Equipment Inventory for more detailed information on the existing HVAC equipment of each building.

5.9 EEM 9: HVAC Controls - EMS

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
715,277	261	45,822	385	$216,421	$1,599,000	$174,321	6.60

Table 22: EEM 9 Savings and Cost

5.9.1 Fully Integrated Direct Digital Control (DDC) EMS

This measure proposes installing a fully integrated, DDC EMS. DDC systems are electronically controlled systems that can provide direct damper/valve controlling based on inputs such as zone temperature, duct static pressures, and more. DDC controllers make use of proportional integral and derivative functions that offer precise controlling of physical damper/valve positions, which can be directly correlated to space conditioning requirements. Another major advantage of DDC systems is that the points controlled through DDC EMS can be viewed/controlled through a remote workstation, which will result in on-going and easy maintenance of systems. As a part of the DDC upgrade measure, the control measures listed below are proposed:

1. Optimized Start/Stop
2. Supply Air Temperature (SAT) Setpoint Reset
3. Occupancy-based Zone Scheduling through EMS Programming
4. Duct Static Reset
5. Chilled Water Supply Temperature Reset
6. Variable Air Volume Operation for Units with New Smart Motors or VFDs

Optimized Start Stop

This strategy utilizes the EMS to determine the duration of time required to bring each zone from current temperature to occupied set point, based on the historical performance of how quickly the zone has been able to warm up or cool down. The EMS will start the HVAC system in time so that the temperature in each zone reaches occupied setpoint just in time for occupancy.

SAT Setpoint Reset

The HVAC units are programmed to supply air to the zone at a constant temperature when in operation. This strategy proposes to reset the SAT based on the outdoor air conditions. This will result in cooling energy savings when outdoor air conditions are mild.

Occupancy Based Setback

This strategy proposes to set back the heating and cooling set point by 2 – 3°F when no occupancy is detected in the zone. The new DDC thermostats will be capable of taking input from the occupancy sensors in the zones. When the zone is unoccupied for more than 30 minutes, the thermostat will set back the heating and cooling set points. The set points shall be restored when the zone is occupied.

Duct Static Reset

The HVAC systems currently operate to maintain a constant duct static differential pressure set point. With this strategy, the duct static set point will be reset based on the number of air requests and the position of the maximum open VAV damper. This will result in fan energy savings.

Chilled Water Temperature Reset

The chillers supply chilled water at a constant temperature when in operation. This strategy proposes to reset the chilled water set point, reducing the energy consumption of the chiller. This strategy would raise the chilled water set point when the building load is less than design conditions. Producing warmer chilled water lessens the burden on the compressor, which results in reduced energy use.

Variable Air Volume Control

The EMS system shall be programmed to vary the supply air flow based on zone temperatures. For the existing VAV systems, the boxes will reduce the flow to the zones when the zone temperature set point is met, and the HVAC unit will modulate the total supply air flow based on the VAV box damper positions. For the single zone HVAC units, the EMS will set the supply air flow to minimum flow when the zone set points are met.

Proposed control elements to be added at the minimum under this measure are:

1. **Sensors**: Duct static pressure, temperature
2. **Thermostats**: Zone level DDC thermostats
3. **Actuators**: Valve and damper actuators
4. **Flowmeters**: Chilled water and heating hot water flow
5. **Unit controller** at each equipment and mixing boxes
6. **Building EMS controller**

The new DDC system will be capable to taking input from proposed advanced lighting control system (ALCS) and integrating the systems City-wide on a common web-based platform. The system shall be capable of monitoring real time data from the HVAC and lighting equipment, so City staff can connect to each site to identify any issues or alarms and make any modifications to the control strategies.

The new fully integrated DDC EMS system is proposed at the following facilities:

1. Police Department Headquarters
2. Public Works
3. Civic Center Building 100
4. Civic Center Building 200
5. Civic Center Building 300
6. Civic Center Library
7. South Chula Vista Library
8. Norman Park Senior Center

5.9.2 Smart Thermostats

For all the smaller facilities where a fully integrated DDC EMS is not cost effective, it is recommended to install smart thermostats that are compatible with the proposed City-wide EMS system. As a result, these facilities can be monitored and managed from the common web-based platform.

These thermostats offer several energy savings and non-energy savings benefits including enhanced controls strategies such as programmable temperature setbacks, optimal start/stop, occupancy-based temperature setbacks, and cloud-based network connectivity. These strategies allow the thermostats to react dynamically to changing weather and occupancy. Additionally, the thermostats can be used to collect trend data that can be utilized for savings tracking. This measure also accounts for adding new controllers to the HVAC equipment which will also be integrated on the City-wide EMS platform.

Smart thermostats are recommended at the following facilities:

1. Montevalle Recreation Center
2. Otay Recreation Center
3. Park Way Recreation Center Complex
4. Lauderbach Recreation Center
5. Fire Station 1
6. Fire Station 2
7. Fire Station 4
8. Fire Station 6
9. Fire Station 7
10. Fire Station 8
11. Animal Shelter

TRC developed this measure's savings using eQuest models. The implementation cost includes the cost for installing new controllers, valve and damper actuators, temperature sensors, thermostats, communication wiring, associated electrical modifications, controls drawings, EMS hardware and software, programming, commissioning, TAB, and training.

Refer to Appendix C: Proposed EEM Savings and Cost per Building for a breakdown of energy savings and cost, per building.

5.10 EEM 10: Hot Water Heater Replacement

See Section 5.24 Electrification Analysis.

5.11 EEM 11: Data Center Upgrades

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
22,344	6	0	4	$4,317	$15,000	$3,592	2.60

Table 23: EEM 11 Savings and Cost

Civic Center Building 300 has two small data centers, served by four Liebert computer room air conditioning (CRAC) units. This measure proposes various strategies to reduce energy consumption while maintaining resiliency of the data centers.

Data Center Consolidation

Currently, these data centers are not fully utilized. This measure proposes consolidating the both data centers into one large server room in order to take advantage of the full CRAC unit capacity and reduce cooling costs. Additionally, to reduce implementation costs, the CRAC units in the abandoned data center room can be left in place, ready for future expansion or upgrades to the servers.

Variable Speed Fan Control

The scope of this measure also includes adding smart motors to the supply air fans and modulate the fan speed based on the zone temperature. This will result in additional fan energy savings.

Hot/Cold Air Aisle Management

Information technology (IT) equipment can produce a large amount of heat very quickly, and removal of this heat is critical to achieve maximum performance and reliability of the equipment. One strategy to improve cooling performance of a data center is to implement hot/cold air aisle containment strategies. Hot/cold air aisle management keeps the cold supply air separate from the hot exhaust air from the IT racks to eliminate hot spots and provide more even cooling. To keep the hot and cold air aisles separate, the IT racks must be arranged with the front of the racks facing each other, creating alternating aisles of hot and cold air as shown in Figure 18 below. By eliminating the mixing of hot and cold air and eliminating hot spots, savings are achieved by raising the cooling SAT setpoint while still allowing the IT equipment to operate within safe operating temperatures.

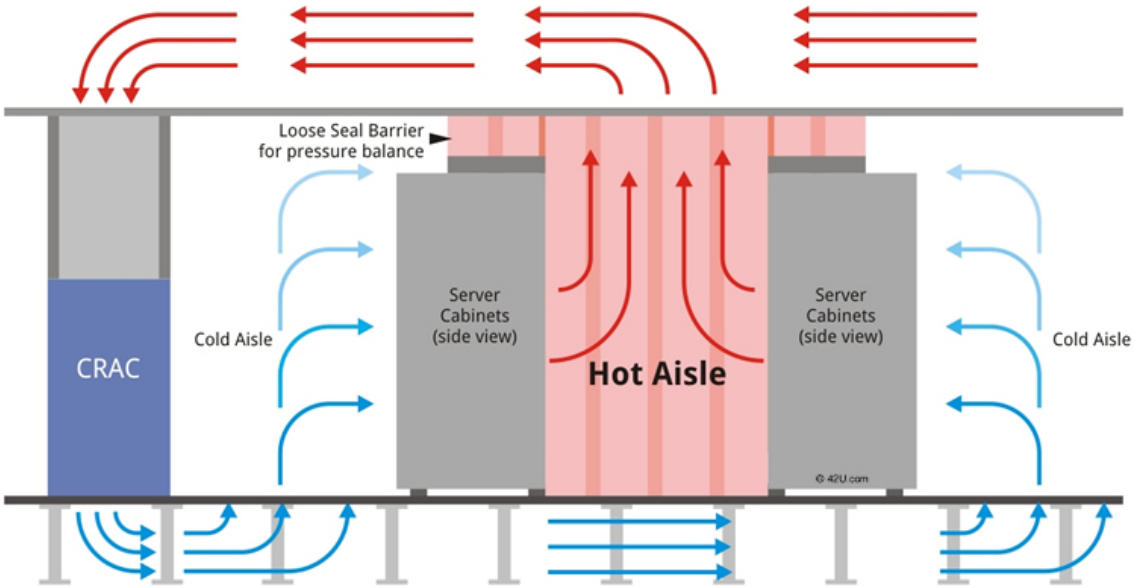


Figure 18: Hot Cold Air Aisle Management

TRC developed this measure's savings using eQuest models.

Refer to Appendix B: Existing Equipment Inventory for more detailed information on the existing HVAC equipment of each building.

5.12 EEM 12: Parking Garage Exhaust Fan VFDs

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
20,002	0	0	4	$6,452	$20,000	$2,400	2.70

Table 24: EEM 12 Savings and Cost

The two exhaust fans serving the parking garage at the Police Department Headquarters operate at constant speed. The exhaust fans are operated intermittently based on the CO monitor reading. However, when the exhaust fans are signaled ON, they operate at full speed. It is recommended to add variable speed drives to the exhaust fans. The exhaust fan speed will be modulated based CO sensor reading.

TRC developed this measure's savings using Excel-based calculations. The implementation cost includes the cost of new smart motors, relocating the servers, implementing hot/cold aisle system and associated electrical modifications. The table below shows the equipment impacted by this measure.

Site Name - Building Name	Equipment Type	Qty	Make & Model Number	Age [Years]	Fan HP
Police Department HQ	Exhaust Fan	2	Century 460-3	15	15

Table 25: Existing Equipment Impacted by EEM 12

Refer to Appendix C: Proposed EEM Savings and Cost per Building for a breakdown of energy savings and cost, per building, and to Appendix B: Existing Equipment Inventory for more detailed information on the existing HVAC equipment of each building.

5.13 EEM 13: Interior Lighting Retrofits

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
191,809	95	0	38	$43,294	$193,000	$0	4.50

Table 26: EEM 13 Savings and Cost

Much of Chula Vista's interior lighting has already been replaced with UL Type B TLED tubes. However, a large opportunity still exists for the replacement of the remaining interior lighting. The majority of the remaining interior lighting consists of plug-in compact fluorescent lamps (CFL), which would also be replaced with UL Type B LED replacement lamps. Type B lamps require the removal of the existing fluorescent ballasts prior to install. This improves the efficiency of the LEDs and reduces maintenance costs by removing the ballast as a future point of failure. However, most Type B LEDs are not dimmable, so additional dimming controls will not be possible if this measure is installed.

The City also has several existing metal halide and induction bay fixtures at the Public Works and various recreation centers. These fixtures can be retrofitted with new LED corn cob lamps and block retrofit kits.

Type B LED corn cob lamps can be installed in the existing fixture and, similar to the Type B plug-in LEDs, they bypass the existing ballast. As induction lamps do not have mogul or Edison lamp holders, LED block retrofit kits are being proposed instead of corn cob LEDs. LED block retrofit kits remove the ballast and lamp holder and are installed via a bracket in the existing fixtures.

Costs for this measure includes demolition and recycling of existing lamps, ballast, and fixtures and material and labor costs for the new LED lamps and retrofit kits.

LED lamps and retrofit kits are cost-effective ways to retrofit fixtures while maintaining existing fixture housings. They also have expected lives several times longer than incumbent lighting sources, while reducing required power consumption by 68 percent.



Figure 19: Proposed Type B LED Plug-in Lamps

Note: TRC did not audit the existing lighting equipment. All recommendations were updated based on the inventory and proposed equipment selection provided by the previous consultant.

5.14 EEM 14: Exterior Lighting Retrofits

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
195,337	50	0	39	$47,951	$343,000	$0	7.20

Table 27: EEM 14 Savings and Cost

The City's building exteriors and parks are lit by a number of lighting types such as LED, plug-in CFL, metal halide, high pressure sodium (HPS), and induction lamps in wallpack, flood, recessed can, canopy, and pole-mounted fixtures. This measure proposed retrofitting the remaining non-LED lighting with LED lamps, retrofit kits, or new fixtures.

The plug-in CFLs, metal halide, and HPS lamps can be replaced with UL Type B LED Lamps. Similar to those used in the interior LED retrofits, this retrofit includes removing existing ballasts and installing LED lamps in the existing fixtures. For higher output and induction fixtures, LED block retrofit kits and new fixtures are being proposed. Due to 2019 Title 24 requirements, the proposed fixtures and retrofit kits over 40-Watt are proposed to be equipped with integrated motion sensors.

Costs for this measure includes demolition and recycling of existing lamps, ballast, and fixtures and material and labor costs for the new LED lamps, retrofit kits, and fixtures.

LED fixtures and lamps offer many benefits over incumbent technologies, including much higher efficiency, greater CRI, and no warm up time. The proposed LED lamps, retrofit kits, and fixtures will decrease average power required by 67 percent, 50 percent and 62 percent, respectively. They also offer much longer lifetimes, leading to lower maintenance costs.



Figure 20: Proposed Type B LED Corn Cobs



Figure 21:Proposed LED Retrofit Kit

Note: TRC did not audit the existing lighting equipment. All recommendations are based on the inventory and proposed equipment provided by the previous consultant.

5.15 EEM 15: Lighting Controls

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
318,047	68	0	63	$72,844	$254,500	$0	3.50

Table 28: EEM 15 Savings and Cost

Most lighting systems found at the City's facilities are controlled either manually or scheduled by a central lighting management system. This measure proposes the installation of an advanced lighting controls system (ALCS) at most of the City's sites.

The ALCS package proposed in this audit includes high-precision occupancy sensors capable of detecting miniscule movements. The sensors will turn off their dependent lighting fixtures when they sense that their space is unoccupied. The system also offers mobile and online platforms to view and control lighting systems remotely. It is also BACNet compatible, so it can be integrated into the building's future EMS to communicate occupancy status to the HVAC systems and operate in accordance with auto demand response (ADR) events.

Since the majority of the City's interior lighting features non-dimmable UL Type B, TLEDs dimming switches or daylighting sensors were not assumed in the cost of the measure.

Costs for this measure include all features associated with the ALCS such as wall and ceiling occupancy sensors, wireless switches, power packs, wireless hubs, and commissioning of sensors in the new ALCS.



Figure 22: Example of Proposed Advanced Lighting Control System

5.16 EEM 16: Pool Covers

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
0	0	11,194	59	$11,042	$95,000	$13,993	7.30

Table 29: EEM 16 Savings and Cost

Pool covers are protection and insulation products that slow heat loss and evaporation. This results in a reduction in heating costs and water usage as less water is required to make up for evaporation losses. Currently, the pools being used in the City do not have pool covers. This measure involves installing retractable pool covers on the Loma Verde and Park Way Pool facilities. There are three main types of pool covers: bubble/solar, vinyl, and insulated vinyl. Costs and savings for this measure were adopted from SDG&E's Pool Cover workpaper (WPSCGNRWH150309A) for insulated vinyl pool covers.



Figure 23: Existing Loma Verde Pool

5.17 EEM 17: Appliance Replacements

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
5,694	1	0	1	$2,247	$38,100	$821	16.60

Table 30: EEM 17 Savings and Cost

TRC identified various plug load equipment that can be upgraded to achieve energy savings. The equipment includes refrigerators, dish washers, ice machines, clothes washers, and clothes dryers. The measure case equipment evaluated for replacement is ENERGY STAR® certified, an evaluation based on equipment efficiency and longevity. Plug load equipment is generally easy to upgrade, because most of the equipment is designed to allow non-professionals to perform the installation. Because the equipment is located inside the buildings, the sites can realize additional air conditioning savings, because the new energy-efficient units will disperse less heat-waste into their spaces.

Sites	Refrigerators	Dish Washers	Ice Machines	Washers	Dryers
Fire Station 1	4	1	0	0	0
Fire Station 2	3	0	0	0	0
Fire Station 4	4	1	1	2	1
Fire Station 7	4	1	0	1	1
Fire Station 6	3	0	0	0	0
Fire Station 8	3	0	0	0	0
Norman Park Sr Center	1	1	0	0	0
Montevalle Park	2	0	0	0	0
Otay Recreation Center	1	0	0	0	0
Civic Center	1	0	0	0	0
Police Dept HQ	1	0	0	0	0
S. Chula Vista Library	1	0	0	0	0
Civic Center Building 100	2	0	0	0	0
Civic Center Library	1	0	0	0	0
Public Works	3	0	0	0	0
Animal Shelter	1	0	0	2	3

Table 31: EEM Inventory of Existing Appliances

Energy savings and costs for these measures were based off the following California Investor Owned Utility workpapers: ENERGY STAR Refrigerators: PGECOAPP124-R3, ENERGY STAR Dishwashers: SCE17AP018.0 A1, ENERGY STAR Ice Machines: PGECOFST108 R0, ENERGY STAR Clothes Washers: PGECOAPP127 R4, and ENERGY STAR Clothes Dryers SWAP003-01.

5.18 EEM 18: Plug Load Controls (Vending Misers and Power Strips)

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
56,183	0	0	11	$12,754	$36,050	$6,754	2.30

Table 32: EEM 16 Savings and Cost

Plug loads account for nearly 10 percent of commercial building electricity consumption. However, much of the time plugged-in equipment is not being actively used. The followings EEMs describe controls measures that address this issue.

5.18.1 Vending Misers

Multiple vending machines were found during the audit process, including snack vending machines and refrigerated beverage machines. These vending machines do not have any type of smart controls installed. In the proposed measure, vending misers, will power down the machine when it determines the area is unoccupied via an occupancy sensor. Vending Miser powers up the machine when people return and at regular intervals to keep the product cold. When equipped with the Vending Miser, refrigerated beverage vending machines use less energy and are comparable in daily energy performance to new ES qualified machines. A total of 21 vending machines were identified, 11 of which are refrigerated.

Site	Refrigerated	Non-Refrigerated
Norman Park Senior Center	1	0
Montevalle Park	1	0
Otay Recreation Center	1	1
Civic Center	3	4
Police Dept Headquarters	2	2
Civic Center Building 100	1	1
Public Works	1	1
Animal Shelter	1	1

Table 33: Inventory of Existing Vending Machines

5.18.2 Advanced Power Strips

Advanced power strips save energy by automatically powering down equipment when not in use. The power strips typically operate in two ways. First, when power is not being used by the main piece of equipment (TV or PC), the peripheral equipment is shut off to avoid vampire loads (appliances continue to use a miniscule amount of electricity, even when powered off). Secondly, an external occupancy sensor is installed to automatically turn off the main equipment when vacancy is detected for a predetermined period of time. This technology is useful for controlling audio-visual equipment, such as TVs or projectors, computer work stations, and copy machines.

Cost estimates are based on the number of computers the City has noted in ENERGY STAR Portfolio Manager (ESPM) and SDG&E's deemed measure costs for advanced power strips. Savings estimates are calculated based on assumptions that the advanced power strips only shutoff idle computer monitors during unoccupied hours.

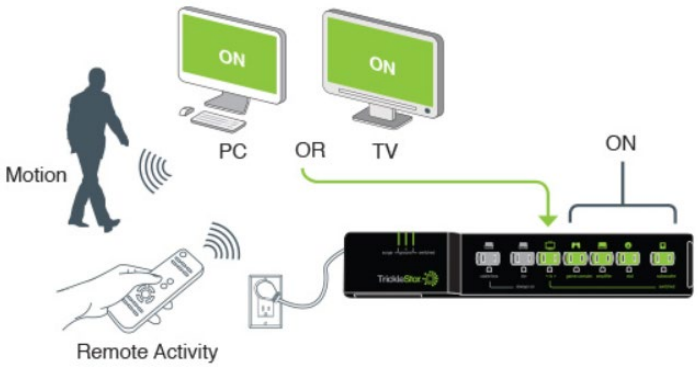


Figure 24: Typical Schematic of Advanced Power Strip Control

Site	# Computers
Norman Park Senior Center	20
Police Dept Headquarters	300
Civic Center Building 100	106
Civic Center Building 200	99
Civic Center Building 300	80
Civic Center Library	50
Public Works	100

Table 34: Inventory of Existing Computers

5.19 EEM 19: Weatherization (Tints)

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
41,958	14	409	11	$10,501	$195,200	$7,669	17.90

Table 35: EEM 19 Savings and Cost

This measure proposes replacing the existing window film with new low-E reflective film on the south, east, and west faces of the building. The existing window film is at the end of its effective useful life and has a reduced efficiency due to aging. Window film technology has improved over the years and offers improved performance that reduces the amount of heat transfer into the building space.

The energy savings from this measure will come from the reduced HVAC cooling load in the perimeter building zones.

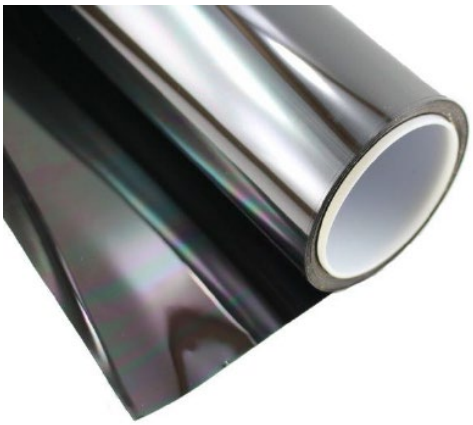


Figure 25: Low-E Reflective Window Film

This measure is recommended for the following buildings:

1. Civic Center Library
2. Montevalle Recreation Center
3. Park Way Recreation Center Complex
4. Lauderbach Recreation Center
5. Fire Station 1
6. Fire Station 2
7. Fire Station 4
8. Fire Station 6
9. Fire Station 7
10. Fire Station 8

TRC developed this measure's savings using eQuest models. The implementation cost includes the cost to remove any existing window film and installation of new window film.

Refer to Appendix C: Proposed EEM Savings and Cost per Building for a breakdown of energy savings and cost, per building.

5.20 EEM 20: Emergency Generator Block Heater

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
3,124	0	0	1	$679	$1,250	$375	1.30

Table 36: EEM 20 Savings and Cost

Block heaters typically consist of a simple resistance heater affixed at one of several locations to the engine of the emergency generator. These thermosiphon block heaters circulate coolant fluid by convection, which requires large and consistent resistive heating loads. This measure proposes replacing the thermosiphon heaters on emergency diesel generator serving critical facilities with circulating block heaters. The circulating block heaters include a smaller resistive heater and circulate coolant using a small pump, ensuring that there is a minimal temperature difference between the supply and return

temperatures. The savings from this measure come from the reduced resistive load of the circulating block heater.

Costs and savings for this measure are based on deemed values from SCE's SCE17HC055 "Circulating Block Heater" workpaper.



Figure 26: Example of Circulating Block Heater

Refer to Appendix C: Proposed EEM Savings and Cost per Building for a breakdown of energy savings and cost, per building.

5.21 EEM 21: Demand Response

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
0	293	0	0	$27,737	$66,000	$32,538	1.20

Table 37: EEM 21 Savings and Cost

Auto Demand Response (ADR) measures allow the City to receive requests from SDG&E or an ADR aggregator to participate in electrical demand reduction events. These events are enabled in order to reduce load on the grid during particularly stressed times to avoid power outages but can also result in utility bill savings and incentives for the City.

Using the City's new HVAC and lighting EMS, the City will be able to receive ADR signals and implement demand response measures. TRC's analysis estimated the City's potential demand (kW) reduction for each site based on a handful of standardized measures:

- Zone Temperature Setbacks
- SAT Setbacks
- Reduce Fan Speeds
- Reduce/Shutoff non-critical lighting

TRC estimated HVAC measure demand reduction using eQuest, while TRC estimated lighting using spreadsheet calculations. The ADR on-bill energy savings were calculated assuming the City enrolled in the Capacity Bidding Program rate tariff and participated in the Day-Ahead option between the months of May and October. In addition, TRC calculated an estimated ADR incentive based on the potential demand and was used to reduce the installed project cost. On-bill energy savings from the buildings normal electricity bill were not calculated for ADR events. The implementation cost includes cost for the auto DR controller capable to receive event requests from the grid and EMS programming costs for

demand reduction strategies. The implementation of this project assumes that the new EMS system proposed in EEM-9 has been installed.

5.22 EEM 22: Demand Management - Thermal Energy Storage

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
129,557	307	0	26	$36,151	$733,000	$0	20.30

Table 38: EEM 22 Savings and Cost

ICE Bear is a smart thermal battery that integrates with the building's cooling system. During off-peak hours, the ICE Bear system stores the cooling energy by freezing water in an insulated storage tank while the conventional AC continues to provide cooling to the building. During peak hours when the electricity rates are high, the ice chilled refrigerant from the ICE Bear circulates to the air conditioning system to provide cooling to the building. This eliminates the need to run the energy intensive compressors during on-peak hours.

The ICE Bear systems significantly reduce peak demand loads. Additionally, due to the milder ambient temperature at night, the AC compressor operates at a better efficiency while charging the ICE Bear system. This results in cooling energy savings in addition to the peak demand savings.

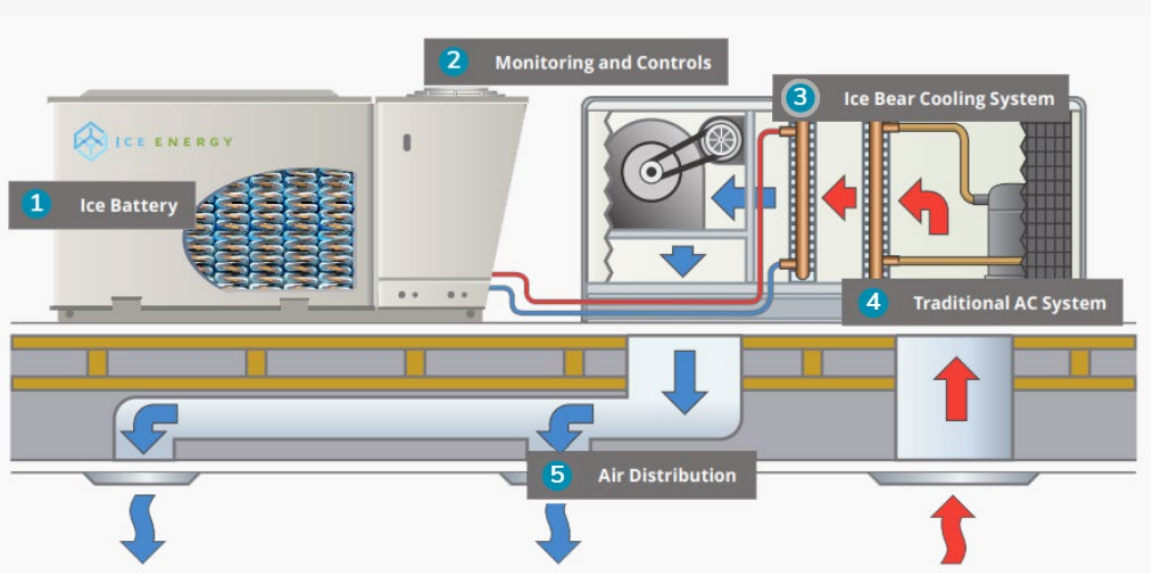


Figure 27: Typical ICE Bear System Schematic

TRC recommends installing ICE Bear Systems at sites with considerable DX cooling equipment. The table below lists all the sites impacted by this measure and the proposed ICE Bear System size. The implementation cost includes the equipment and installed cost for new ICE Bear systems based on actual manufacturer quote.

Site Name - Building Name	ICE Bear Size [Tons]
Civic Center Building 100	120
Civic Center Building 200	100
Civic Center Building 300	160
Norman Park Senior Center	40
Montevalle Recreation Center	60
Lauderbach Recreation Center	20
Park Way Recreation Complex	20
Animal Shelter	40

Table 39: Existing Equipment Impacted by EEM 10

Refer to Appendix C: Proposed EEM Savings and Cost per Building for a breakdown of energy savings and cost, per building

5.23 EEM 23: Street Lighting Control Upgrades

Electricity Savings	Electric Demand Reduction	Natural Gas Savings	GHG Reductions	Annual Cost Savings	Implementation Cost	Estimated Incentives	Net Simple Payback Period
(kWh/yr)	(kW)	(thm/yr)	(MT CO2e/yr)	($/yr)	($)	($)	(yr)
381,589	0	0	76	$168,790	$2,124,744	$45,791	12.30

Table 40: EEM 23 Savings and Cost

The City has already achieved great energy savings by retrofitting roughly ten thousand streetlights to LEDs. However, its LED streetlights still constitute 25 percent of the City's total electrical consumption. This measure proposes implementing timed dimming controls on the existing streetlights using networked streetlight nodes. The nodes can be wirelessly connected either through a mesh or mobile network, to be controlled from a central system. The system can program specific streetlights to dim down to a predetermined level during certain periods of operation, reducing energy consumption. SDG&E also features a special dimming streetlight rate (LS-2D), which allows the City to reduce their power bill on their unmetered LS-2 fixtures. This savings for this measure assumes that all streetlights be dimmed down by 30 percent for four hours each night.

In addition to the energy savings aspect of this measure, the smart nodes open the door to various smart city features such as pole fall detection, fixture fault detection, and parking analysis. The City of San Diego has recently installed several thousand smart streetlight nodes.

Note: This measure depends on the ability of the existing streetlights to be dimmed via either a 0-10V signal or a NEMA 7-pin photocell. Based on preliminary review of existing fixtures, this may not be the case. Furthermore, it is recommended that the City closely investigate any potential safety and security impacts that could result from lowering streetlight levels.

5.24 Electrification Analysis

With the City's current inventory of equipment, in order to meet its goal of portfolio-wide ZNE, the City would either need to locally generate gaseous fuel, such as biogas, or compensate for gas burning equipment with an abundance of onsite electricity generation. Both of these options would be costly and face a number of feasibility challenges.

An alternative would be electrification, which involves replacing existing natural gas equipment with electric-only equipment. Electrification measures would impact the gas HVAC equipment, like boilers or furnaces, gas electric packaged units, domestic hot water systems, and pool heating systems. The section below describes the City's electrification potential savings and costs.

Gas-Electric Packaged Units

The City can replace all existing gas electric packaged units with packaged heat pumps. During cooling mode, the heat pump will operate similar to a normal packaged AC unit, where the refrigerant cools the warm indoor air by absorbing heat. The warm refrigerant will then reject heat to the outdoor air in the condenser section. In heating mode, the heat pump reverses the refrigeration cycle, making the outside coil act as evaporator and indoor coil as the condenser. The refrigerant absorbs heat from the outdoor air and rejects heat in the indoor section, warming the indoor circulating air. Heat pumps are a good option for climate zones with milder winter temperatures.

Furnaces/Heating Units

The gas furnaces or other space heaters can be replaced with electric resistance heating equipment. Electric furnaces would generate heat by the passage of current through an internal resistance coil. Electric resistance heating is 100 percent energy efficient as all the incoming electric energy is converted to heat. Electric resistance equipment is proposed for replacements instead of heat pumps due to lower infrastructure cost.

Domestic Hot Water Heater

The gas fired domestic hot water equipment can replaced with heat pump water heaters (HPWHs), which heat water using a heat pump, allowing them to achieve much higher efficiency (energy factor) compared to electric-resistance water heaters. Similar to electric-resistance water heaters, most HPWHs consist of a glass-lined steel tank with foam insulation. Heat pump waters water heaters are typically equipped with supplemental electric-resistance elements for periods of high demand.

HVAC Boilers and Pool Water Heating Boilers

Electric boilers are typically one-quarter to one-half the size of fuel fired boilers with similar BTU per hour output. The smaller footprint reduces the overall boiler room space. With minimum radiation losses and not having the losses associated with combustion equipment the electric boiler will provide nearly 100 percent efficiency at all operating points. The boilers providing space heating to the larger City building range from 650 – 3500 MBH in capacity. A possible challenge can be the added electric load to sites, which may require additional electrical infrastructure/modifications.

The following table represents the impact on the natural gas and electricity consumption resulting from electrification measures. Please note, that the electrification calculations take in to account the implementation of all the proposed EEMs except any gas-fired unit replacements.

Existing Gas Equipment Type	Gas Capacity Range	Quantity	Electric Equipment Equivalent	Potential Gas Energy Savings	Potential Electric Energy Impact	Estimated Conversion Cost	GHG savings	Utility Cost Impact
				[therms/ yr]	[kWh/yr]	($)	(MTCO 2e)	($)
Packaged RTUs w/ Gas Heat	12 - 280 kBtuh	20	Packaged Heat Pumps	5,479	-97,877	$404,000	10	-$17,267
Furnaces/ Heating Units	50-320 kBtuh	19	Electric Resistance Heater	22,557	-422,514	$79,000	36	-$75,194
DHW Heaters	30 - 80 gallons	13	Heat Pump Water Heater	8,063	-134,098	$91,000	16	-$23,323
HVAC HHW Boiler	675 - 3500 kBtuh	10	Electric Resistance Water Heater	28,740	-441,622	$289,000	65	-$75,497
Pool Water Heating Boiler**	1000 - 2000 kBtuh	3	Electric Resistance Water Heater	60,256	-925,911	$108,000	135	-$158,287
Total				**125,095**	**-2,022,020**	**$971,000**	**262**	**-$349,567**

* The utility cost will increase as a result of Electrification. Payback is not calculated due to utility savings impact. The cost impact of GHG emissions is not considered.

** It is recommended to investigate the natural gas usage at Park Way Recreation Center Complex. For electrification analysis, the pool water heating boiler at the Park Way Recreation Center is assumed to have similar load as the Loma Verde Recreation Center Boiler It is recommended to investigate the natural gas usage at Park Way Recreation Center Complex.

Table 41: Impacts of Electrification

5.25 Total EEM Financial Metrics

	Electric Energy	Electric Demand	Natural Gas	GHG Reductions	Cost Savings
	[MWh]	[MW]	[therms]	[MTCO2e]	[$]
1st Year	3,486	1.4	132,762	1,398	$1.08M
Lifetime (20 Years)	49,213	1.4	1,409,936	17,265	$13.57M

Table 42: Lifetime Savings Metrics

Implementation Cost	Estimated Incentive	Annual Cost Savings	Simple Payback	NPV	IRR	ROI	SIR
[$]	[$]	[$/yr]	[yr]	[$]	[%]	[%]	
$10.07M	$546,510	$1.08M	8.84	$4.63M	10.9%	48.6%	1.49

Table 43: EEM Project Financial Metrics

5.25.1 Financial Metrics Definitions

- **Net Present Value (NPV)**: The measure of the projects present value dollars of the net cost savings over its lifetime. It includes initial project costs, utility savings, and maintenance cost savings while discounting future cash flows. It takes into account the time value of money and indicates what a project's lifetime cash flow is worth today. NPV estimates the amount of money in today's dollars that would have to be invested at the discount rate to reproduce the savings cash flow from the measures, minus the installed cost. A cost effective project has an NPV greater than zero. NPV was calculated as follows:

$$NPV = \sum_{t=0}^{n} \frac{R_t}{(1+i)^t}$$

  Where:

  R_t = net cash flows per year, i = discount rate, and t = number of years. The number of years "t" was determined using the Estimated Useful Life (EUL) for each measure, with a maximum EUL = 20 years.

- **Return on Investment (ROI)**: The annual percentage return from a project, where annual cost savings include the net present value of both utility cost savings and maintenance cost savings over the life of the project minus the net installed cost. ROI is calculated as follows:

$$ROI = \frac{NPV}{Net\ Project\ Cost}$$

  Where:

  NPV = Net Present Value (as calculated above) and the *Net Project Cost* = Project cost minus rebates and other grants.

- **Savings-to-Investment Ratio (SIR):** The value of benefits from a project divided by its cost. As defined by the CEC for energy projects in Proposition 39:

$$SIR = \frac{NPV + Net\ Project\ Cost}{Net\ Project\ Cost}$$

  Where:

- *NPV* = Net Present Value (as calculated above), the *Net Project Cost* = Project cost minus rebates, other grants, and Net Energy Benefits. TRC did not include Non-energy Benefits in the SIR.

- **Internal Rate of Return (IRR):** The internal rate of return is the interest rate that would be required to produce the financial savings from an EEM if the cost for implementing the EEM had been invested. In effect, the IRR is the discount rate which yields a Net Present Value of zero. Attractive projects have an IRR greater than the cost of money.

- **Simple Payback Period:** Also known as the break even point, the simple payback period is the time required to recover the costs of a project through savings. If the simple payback is less than the projects lifetime, it can be viewed as economically feasible. Simple payback calculation does not account for the time value of money. Simple payback period it is calculated as

$$Simple\ Payback = \frac{Project\ Cost - Rebates - Grants}{Total\ Annual\ Savings}$$

- Where:

  Total Annual Savings = Utility savings and estimated maintenance savings.

- Table 44 below shows the factors used to calculate the financial metrics described above.

Factor	Value	Relevant Financial Metrics	Source/Notes
Discount Rate	5.0%	NPV, ROI, SIR	CEC Prop 39 Assumptions
Annual Electric Utility Escalation Rate	4.0%	Electric Utility Savings	CEC Prop 39 Assumptions
Annual Gas Utility Escalation Rate	4.0%	Gas Utility Savings	CEC Prop 39 Assumptions
Estimated Maintenance Savings	3.0%	Maintenance Savings	CEC Prop 39 Assumptions
Annual Labor Inflation Rate	3.0%	Maintenance Savings	Average annual increase from RSMeans Historical Cost Index for San Diego (2000-2018)
Measure Lifetimes (years)	Varies	NPV, ROI, SIR, IRR	Standard measure lifetimes were selected from the Database of Energy Efficiency Resources

Table 44: Financial Metrics Calculation Factors

5.26 Utility Incentives and Rebates

San Diego Gas & Electric (SDGE) has various incentives/rebates programs available to municipalities. Each is described briefly below:

Rebates

Instant rebates are available on select lighting products, at authorized participating distributors. To receive the rebate, customers must complete a simple Purchase Acknowledgement Form and the rebate is applied to the cost of the equipment at the time of purchase. Based on the limited availability of these incentives and the City's project implementation timelines, these rebates were not analyzed.

SDGE also offers **Energy Efficiency Business Rebates** for non-residential retrofit projects, in which cash rebates are offered to business customers (which would include cities) who install select energy efficiency equipment. The program offers rebates for the purchase of qualifying refrigeration, food service, gas and other technologies that improve the efficiency of the building. Qualifying equipment must be purchased new and leased equipment may be eligible for rebate if the term of the lease agreement is five years or greater. The rebates are paid by check directly to the customer or a third party payee as designated by the customer. The amount of the rebate is dependent upon the equipment installed. A Consolidated Products Catalogue detailing the qualifying equipment is available on the website https://www.sdge.com/businesses/savings-center/rebates-incentives/non-lighting-rebates. There is a limited budget for this program which is scheduled to end on December 7, 2018 and funding is distributed on a first-come, first-served basis until funds are no longer available or December 7th, whichever comes first.

Energy Efficiency Business Incentives

SDGE's **Energy Efficiency Business Incentives** program offers incentive payments for projects involving the installation of new, high efficiency equipment or systems. The incentives are intended to influence a customer's decision to move forward with a project by offsetting a portion of the project cost. A project may consist of the retrofit of existing systems or the installation of equipment associated with new or added load. To estimate energy savings and incentive values, estimation software or engineering calculations are used depending upon the type of energy efficiency measure to be installed. Incentives are paid based upon the quantity of kilowatt hours (kWh) or therms saved as a result of the installation of new equipment/systems.

This program is funded through the end of this year, and again, funds are available on a first come, first served basis. Pre installation inspections are required, and no equipment should be installed until an official approval has been received from SDGE. Prior to the incentive being issued after installation, a post-installation inspection will also be conducted, and some projects also require a post-installation monitoring period to verify persistent energy savings. Currently, SDGE is offering 20% incentive bonus for "comprehensive projects" – those that include three measures from different program categories. The bonus is capped at $25,000 per project.

EEM #	Energy Efficiency Measure	Estimated Incentives*
EEM-1	AC unit Overhauls	$31,571
EEM-2	Packaged Unit Replacements	$0
EEM-3	Split System to VRF Conversion	$14,385
EEM-4	Space Heater Replacement	$6,811
EEM-5	Air Handler Replacements	$140,727
EEM-6	Chiller Plant Upgrades	$26,797
EEM-7	Boiler Replacements	$14,948
EEM-8	Pumping System Upgrades	$23,019
EEM-9	HVAC Controls - EMS	$174,321
EEM-10	Hot Water Heater Replacement	$0
EEM-11	Data Center Upgrades	$3,592
EEM-12	Parking Garage Exhaust Fan VFDs	$2,400
EEM-13	Interior Lighting Retrofits	$0
EEM-14	Exterior Lighting Retrofits	$0
EEM-15	Lighting Controls - Occupancy Sensors	$0
EEM-16	Automatic Pool Covers	$13,993
EEM-17	Appliance Replacement	$821
EEM-18	Plug Load Controls (Vending Misers and Power Strips)	$6,754
EEM-19	Weatherization (Tints)	$7,669
EEM-20	Emergency Generator Block Heater	$375
EEM-21	Demand Response	$32,538
EEM-22	Demand Management - Thermal Energy Storage	$0
EEM-23	Streetlight Dimming Controls	$45,791

*Incentives are based in current program offerings. TRC recommends the City to confirm the incentives at the time of implementation

Table 45: Applicable Incentives

5.27 Project Funding Opportunities

5.27.1 Measure P Funding

Chula Vista voters approved Measure P – a temporary, ten-year, half-cent sales tax to fund priority infrastructure needs. The Infrastructure, Facilities and Equipment Expenditure Plan [7] outlines the projected spending of $178 million Measure P funding collected over a period of ten years.

The City currently has $1 million of approved Measure P funding dedicated towards implementing energy efficiency measures associated with HVAC systems for City-wide facilities.

5.27.2 California Energy Commission Energy Conservation Assistance Act (ECAA) Low-interest loan[8]

The California Energy Commission's Energy Conservation Assistance Act (ECAA) program provides 1 percent interest loans to cities, counties, special districts, public colleges and universities, public care institutions, and public hospitals. This program is designed to finance energy efficiency and energy generation projects. Eligible projects which can be funded through the ECAA loan are listed below:

- Lighting systems
- Heating, ventilation and air conditioning equipment
- Streetlights and LED traffic signals
- Energy management systems and equipment controls
- Pumps and motors
- Building envelope and insulation
- Energy generation, including renewable energy and combined heat and power projects
- Water and waste water treatment equipment
- Load shifting projects, such as thermal energy storage

The maximum loan amount allocated per application is $3 million. Applications are accepted first-come, first-served basis. The loan can fund 100% of the project cost within 17-year simple payback and it must be repaid within a maximum of 20 years. Also, the loan tern cannot exceed the useful life of the loan funded equipment. Partial funding can also be provided for projects that exceed the simple payback.

The City of Chula Vista was awarded ECAA funding worth $4 million for the lighting upgrades and photovoltaic system in 2010. The City can apply for additional funding to implement the energy efficiency projects which cannot be covered with the Measure P funding.

5.27.3 CPUC Public Sector Programs

California's Long-Term Energy Efficiency Strategic Plan has served as a roadmap to integrate cost–effective, energy-efficiency practices through 2020 and beyond. The current Local Government Partnership Program (LGP) is a CPUC regulated collaboration between investor owned utilities and numerous organizations to help local governments become leaders in reducing energy use and emissions. The City of Chula Vista has been a part of this energy solution through its partnership with SDG&E since

[7] https://www.chulavistaca.gov/home/showdocument?id=14294

[8] https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans

2010. Through its partnership with SDG&E, the City of Chula Vista has created innovative approaches to advance municipal and community energy efficiency projects and practices. Further, the City was recognized as the first Southern California local government to comprehensively embrace Climate Adaptation, a strategy to counter the inevitable impacts of climate change while complementing efforts to reduce greenhouse gas (GHG) emissions.

The current Partnership relationship between the City of Chula Vista and SDGE will end in December of 2020. SDGE will be issuing a competitive Requests for Abstract (RFA) for local governments interested in continuing to work collaboratively with the utility to advance energy efficiency in their communities. While the specifics of the RFA remain unknown, it is anticipated that the existing program design allowing for funding to be used for non-resource programs and services – meaning the actual savings that result from the City's efforts are not calculated and reported to the CPUC – will not be an eligible approach. Rather, based upon direction from the CPUC, it is expected that the utility will be looking for abstracts that provide cost effective program designs using financial incentives to influence the implementation of projects at municipal facilities with measurable and reportable energy savings. The EEMs identified in this report have been developed to support such a program design. To achieve minimally required cost-effectiveness, program incentives should be set commensurate with the projected energy savings and the cost of delivering the program. The selection and/or packaging of EEMs to be a part of a program design will ultimately depend upon a cost effectiveness evaluation. The amount of funding that the City may qualify for remains to be determined. Inevitably, there will be a gap in the cost of the installed measures. To offset this gap, the City of Chula Vista may consider the other funding options identified.

5.27.4 Energy Efficiency-as-a-Service

This funding opportunity does not require any capital investment from the City for project implementation. It has a pay-for-performance structure where the City can enter in to an agreement with the service provider to share the savings generated by the installed efficiency upgrades for a certain period of time. The savings will be calculated using customized measurement and verification protocol for the efficiency upgrade. At the end of the agreement, the City will have an option of buying the equipment from the service provider at fair market price or can extend the agreement for an incremental time period. The City can also choose to terminate the equipment and have the relevant equipment removed.

5.27.5 Energy Services Companies (ESCOs)

Government Code Section 4217 authorizes local governments to enter into energy contracts on terms that are found to be "in the best interests" of the agency, "notwithstanding any other provision of law." In essence, this law allows a city to single-source an energy contract so long as the anticipated cost for the energy project or efficiency services are less than the anticipated energy cost savings to be derived from those services. This code is commonly used by Energy Service Companies (ESCOs) that pursue single-source contracts with local government agencies for energy services contracts. ESCOs typically structure payment for projects to be recognized through the resulting energy cost savings. The types of projects may include comprehensive lighting upgrades, street lighting, and mechanical system retrofit projects.

5.27.6 Grant Funding

Many state and federal agencies, such as the Department of Energy and the California Energy Commission, offer competitive grant solicitations throughout the year for funding energy projects, typically including

energy efficiency and renewable energy projects. TRC has assisted municipalities throughout the state and across the country in receiving grant funding to cover the costs of facilities upgrades that include LED lighting retrofits, advanced lighting controls systems, automated window shading, development of a zero net energy roadmap for municipal facilities, and solar/battery storage microgrid improvements. Generally, these grants do require significant match funding (20% or greater) but the match funding can include equipment discounts from participating vendors, fully burdened staff time, and funding from other resources (such as utility incentives and rebates).

5.28 Project Prioritization

The following table represents how the funding opportunities identified above can be utilized to implement the energy efficiency measures proposed in this report.

❖ **Measure P Funding: $1 million**	
Sites: • Police Department HQ – AHU Replacement and HVAC Controls **Combined Implementation Costs:** $2.0M **Annual GHG Reduction:** 155 MT CO_{2e}	Due to the limited Measure P funding availability, the City will not be able to fully implement the major EEMs at the Police Department HQ. The air handler replacement project and controls upgrade at the Police Department HQ have an implementation cost of $2.0M. We recommend the City to leverage other possible funding options such as capital improvement budgets or maintenance budgets to prioritize HVAC replacement and controls upgrade at Police Department HQ.
❖ **CEC ECAA 1% Loan: $3 Million**	
Sites: • Police Department HQ – remaining measures • Public Works • Civic Center Library • Norman Park Senior Center **Combined Implementation Costs:** $2.9 M **Annual GHG Reduction:** 350 MT CO_{2e}	The City can choose to apply for the CEC ECAA loan capped at $3 million to install energy efficiency upgrades for the buildings that are not included in the Measure P package. This can include the proposed energy efficiency projects at the Police Department HQ (other than AHU replacement and controls upgrades), Public Works, Civic Center Library and Norman Park Senior Center.

❖ CPUC Public Sector Programs ❖ ESCOs	❖ Energy Efficiency-as-a-Service ❖ Grant Funding
Sites: • All remaining **Combined Implementation Costs:** $5.1 M **Annual GHG Reduction:** 466 MT CO_{2e}	The remaining projects can be supported through the CPUC Public Setor Programs based a competitive selection process and the availability of funding. The projects that are not covered by the CPUC Program can by funded through ESCOs, Energy Efficiency-as-a-Service agreements, or other Grant Funding opportunities.

Table 46: Project Funding Prioritization

6 Renewable Energy

Solar photovoltaic (PV) takes advantage of the abundant amount of sunshine available that would otherwise be wasted. It is one of the most effective strategies a City can take to achieve its ZNE goal. PV systems can reduce or even eliminate the utility energy consumed during the day, and excess electricity generated can be sold back to the grid through net-metering.

The City has installed, or is planning to install, an impressive 3.875 MW of solar capacity throughout its portfolio. Additionally, 180 kW and 411 kWh of battery storage capacity is being installed at three of its facilities. These distributed generation resources are instrumental in the City's goal of portfolio-wide ZNE. Table 47 shows City's current and planned PV and storage equipment.

Site Name	Current PV Capacity [kWdc]	Planned PV Capacity [kWdc]	BESS Capacity [kW]	BESS Capacity [kWh]	Current PV Generation [kWh/yr]	Add'l Planned Generation [kWh/yr]
Police Dept HQ	3.66	343	60	137	0	577,840
Civic Center - Building 100	253	698			81,751	1,163,683
Civic Center - Building 200	6	0			31,131	0
Civic Center - Building 300	48	0			102,190	0
Civic Center – Library	0	368			0	613,518
Public Works – Yard	815	323	60	137	570,366	551,710
South Chula Vista Library	0	187			0	318,161
Norman Park - Senior Center	24.8	0			34,722	0
Parkway Recreation Complex	34	85			50,502	141,709
Montevalle Recreation Center	47	79	60	137	84,662	136,557
Otay Recreation Center	33	0			51,674	0
Loma Verde - Swimming Pool	46	112			79,526	190,556
Living Coast Discovery Center	7.2	0			12,628	0

Site Name	Current PV Capacity [kWdc]	Planned PV Capacity [kWdc]	BESS Capacity [kW]	BESS Capacity [kWh]	Current PV Generation [kWh/yr]	Add'l Planned Generation [kWh/yr]
Animal Shelter	16	60			21,021	102,084
Veterans Park	47	0			76,567	0
Mt Miguel Park	0	64			0	108,394
Salt Creek park	47	44			71,755	76,057
Heritage Park	14	0			12,755	0
Sunset View park	0	70			0	118,857
TOTAL	**1,438**	**2,433**	**180**	**411**	**1,281,250**	**4,099,125**

Table 47: Total Renewable Energy and Battery Storage

Figure 28 on the next page shows the City's current solar PV generation along with estimates of potential PV generation for planned PV installation. Current generation values were pulled from the City's ESPM. Generation for planned systems were estimated using PV Watts online calculation tool.

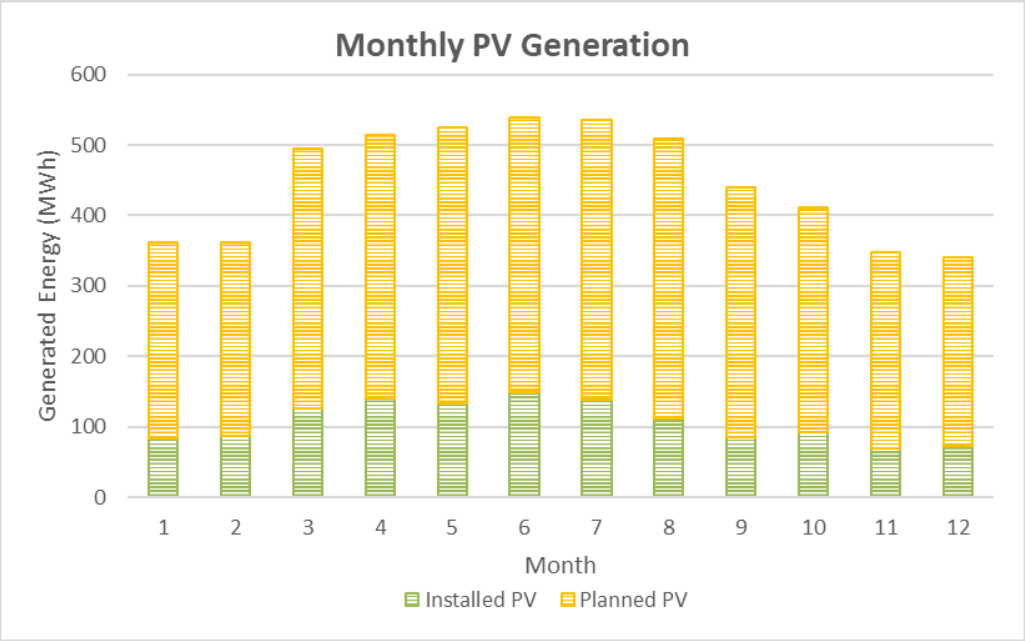


Figure 28: Existing and Planned Solar PV Generation

Based on site visits and communications with City staff, issues have arisen that has caused some of the PV systems to become inoperable. Discrepancies were also noticed in the generation provided in ESPM. The table below shows a comparison of the generation from ESPM and calculations from PV Watts using the existing PV capacity and standard PV Watts inputs. As shown, some sites show a large difference between the actual production and expected production. In the case of Public Works, a difference of over 800,000 kWh is observed. In order for the City to take full advantage of its existing PV systems and further its ZNE goals, TRC suggests that the City develop a solar maintenance program so that these issues with the solar PV systems be investigated and addressed.

Site Name	Current PV Capacity [kWdc]	Current PV Generation [kWh/yr]	Est. PV Generation [kWh/yr]	Difference in Generation [kWh/yr]	Percent Difference
Civic Center - Building 100	253	81,751	298,488	-216,737	-265%
Civic Center - Building 200	6	31,131	7,079	24,052	77%
Civic Center - Building 300	48	102,190	56,630	45,560	45%
Public Works - Yard	815	570,366	1,392,085	-821,719	-144%
Norman Park - Senior Center	24.8	34,722	41,653	-6,931	-20%
Parkway Recreation Complex	34	50,502	56,684	-6,182	-12%
Montevalle Recreation Center	47	84,662	81,242	3,420	4%
Otay Recreation Center	33	51,674	56,146	-4,472	-9%
Loma Verde - Swimming Pool	46	79,526	78,264	1,262	2%
Living Coast Discovery Center	7.2	12,628	12,298	330	3%
Animal Shelter	16	21,021	27,222	-6,201	-30%
Veterans Park	47	76,567	81,242	-4,675	-6%
Salt Creek park	47	71,755	81,242	-9,487	-13%
Heritage Park	14	12,755	23,927	-11,172	-88%
TOTAL	**1,438**	1,281,250	2,294,203	-1,012,953	-79%

Figure 29: ESPM and PV Watts Energy Generation Comparison

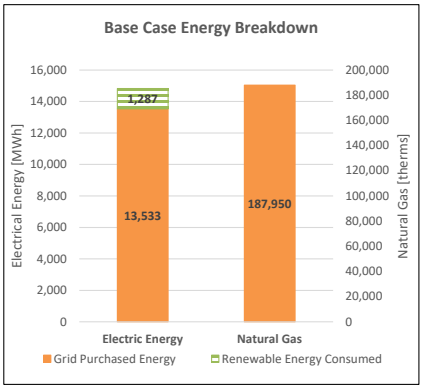
7 ZNE Roadmap

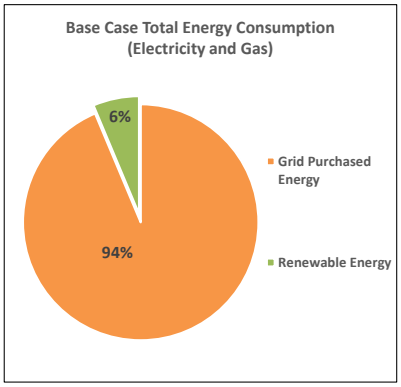
PORTFOLIO BASELINE CONDITIONS

SITE INFORMATION	
Quantity of Sites	36
Total Building Square Footage	1.09 M
Total Population	268,000+

CURRENT ELECTRICITY BILLING & PV DATA	
Quantity of Service Accounts:	670
Total Energy Purchased (MWh)	13,533
Total Electric Bill Cost ($)	$2,832,508
Blended Utility Rate ($/kWh)	$0.21
Renewable Energy Generated (MWh)	1,287
Solar PV Capacity (MW)	1.44

CURRENT NATURAL GAS BILLING DATA	
Quantity of Service Accounts:	47
Total Energy Purchased (therms)	187,950
Total Gas Bill Cost ($)	$126,567
Blended Utility Rate ($/therms)	$0.67





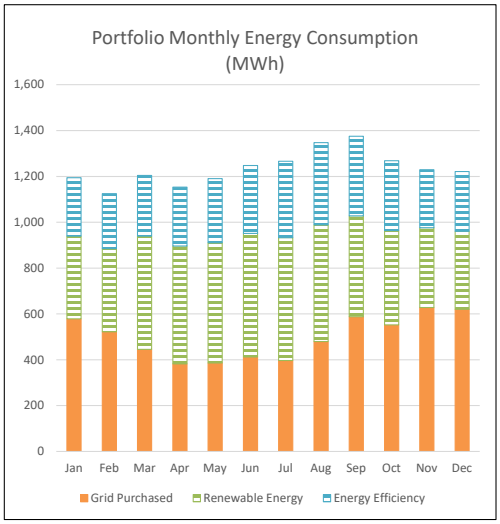
ENERGY EFFICIENCY AND RENWABLE ENERGY

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)a	
EEM-1	AC Unit Overhauls
EEM-2	Packaged Unit Replacements
EEM-3	Split System to VRF Conversion
EEM-4	Space Heater Replacement
EEM-5	Air Handler Replacements
EEM-6	Chiller Plant Upgrades
EEM-7	Boiler Replacements
EEM-8	Pumping System Upgrades
EEM-9	HVAC Controls - EMS
EEM-10	Hot Water Heater Replacement
EEM-11	Data Center Upgrades
EEM-12	Parking Garage Exhaust Fan VFDs
EEM-13	Interior Lighting Retrofits
EEM-14	Exterior Lighting Retrofits
EEM-15	Lighting Controls
EEM-16	Automatic Pool Covers
EEM-17	Appliance Replacement
EEM-18	Plug Load Controls
EEM-19	Weatherization (Tints)
EEM-20	Emergency Generator Block Heater
EEM-21	Demand Response
EEM-22	Demand Management - Thermal Energy Storage
EEM-23	Streetlight Smart Controls

TOTAL EEM ANNUAL POTENTIAL SAVINGS	
Electricity Savings (MWh):	3,486
Demand Reduction (MW):	1.39
Natural Gas Savings (therms):	132,762
GHG Reductions (MT CO2):	1,398
EEM Electric Savings:	$0.73M
EEM Gas Savings:	$0.07M
EEM Maintenance Savings:	$0.28M

TOTAL EEM FINANCIAL METRICS	
EEM Implementation Cost	$10.07M
EEM Annual Total Cost Savings	$1.08M
EEM Estimated Incentives	$0.55M
Simple Payback (Yrs)	8.84
Net Present Value (NPV)	$4.63M
Internal Rate of Return (IRR)	11%
Return on Investement (ROI)	49%
Savings to Investment Ratio	1.49

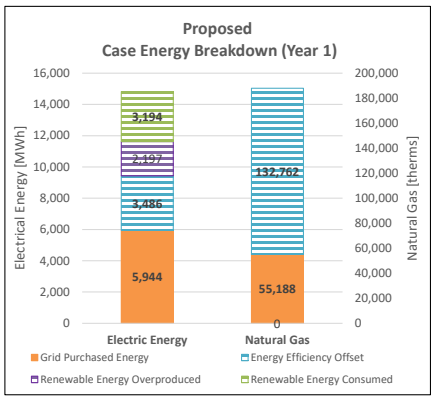
PLANNED SOLAR PV AND BATTERY STORAGE	
Solar PV Capacity (kW)	3,486
Renewable Energy (MWh)	4,093
Battery Capacity (kW)	180
Battery Storage Capacity (kWh)	411

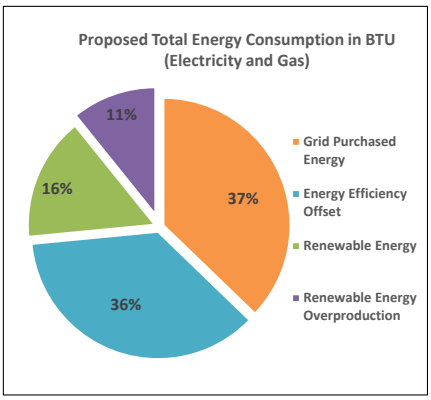


ZERO NET ENERGY (ZNE) METRICS

TOTAL ENERGY BREAKDOWN (YEAR 1)	
Total Baseline Electrical Energy (MWh)	14,821
Grid Purchased Energy (MWh)	*5,944*
Energy Efficiency Offset (MWh)	*3,486*
Renewable Energy (MWh)	*3,194*
Renewable Energy Over Produced (MWh)	*2,197*
Total Baseline Natural Gas (therms)	187,950
Grid Purchased Energy (therms)	*55,188*
Energy Efficiency Offset (therms)	*132,762*

LIFETIME IMPACTS (20 YEARS)	
Energy Efficiency Offsets (GWh)	49.2
Energy Efficiency Offsets (1000 therms)	1,410
Renewable Energy Generation (GWh)	108
GHG Reductions (MTCO2e)	36,370
EEM Cost Savings ($)	$13.57M
Renewable Energy Cost Savings ($)	$18.76M
Total Cost Savings ($)	$32.33M





a) Refer to the "Proposed Energy Efficiency Measures" section of the report for a detailed description of each of the proposed EEM, as well as for the savings and cost associated to the implementation of each measure.
b) Conversion factors for kWh to CO2 equivalent are CEC 2018 values, extrapolated for years 2019-2037. Conversion for therms to CO2 Equivalent provided by U.S. EIA.
c) On-bill utility cost savings calculated using building specific 2019 SDG&E TOU rates and hourly savings from energy models.
d) Maintenance Savings estimates assumed to be 3% of installed cost annually, based on CA Prop 39 Cost Effectiveness Assumptions
e) Assumed rates used in cash flow analysis: Inflation = 3%,Discount Rate = 5%, Electric Utility Escalation Rate = 4%, Gas Utility Escalation Rate = 4%.
f) Measure lifetime savings is based on individual measure estimated useful lives (EULs). Savings are not assumed beyond measure EULs, with a maximum assumed EUL of 20 years.
g) No degradation in savings is assumed for renewable energy sources or EEMs over the lifetime of the project.

7.1 ZNE Goal

The goal of the study was to identify the feasibility of achieving portfolio level ZNE for the City. Where, portfolio is a combination (aggregate) of all the city energy consuming end-users. For purposes of this study, ZNE can be defined as the actual annual delivered (electricity and gas) energy is less than or equal to the on-site renewable exported energy. This study uses a site energy ZNE metric, no source energy considerations are made. This metric was chosen, as opposed to source energy ZNE, because it more closely reflects how the City's efforts will impact its finances and operations. The following can be used as a visual aide for understanding ZNE boundaries:

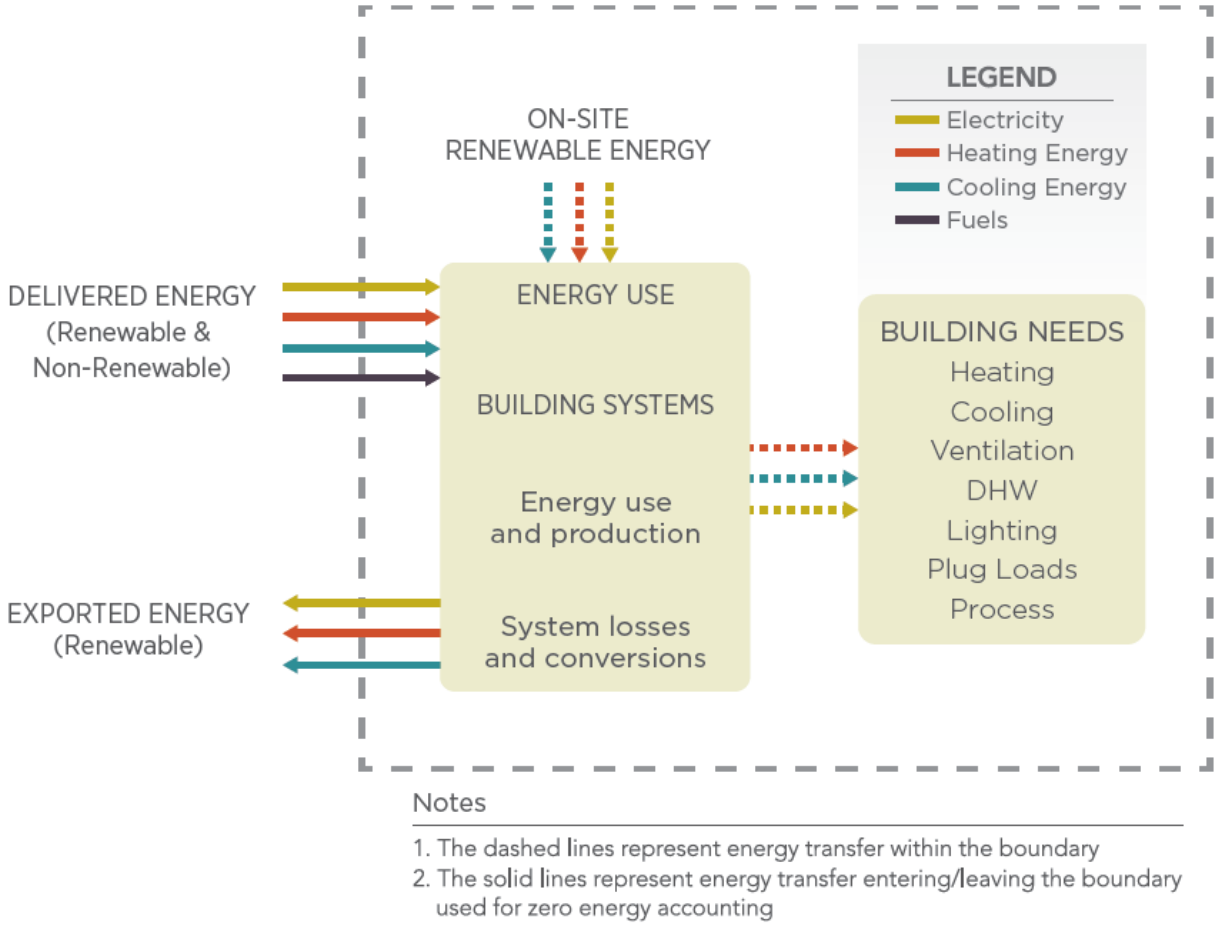


Figure 30: ZNE Energy Flow Diagram

7.2 Energy Savings and Portfolio ZNE Potential

TRC developed in-house customized tools to evaluate the City's existing energy performance and potential for ZNE. This section summarizes the overall energy savings that could be achieved if the EEMs proposed in Sections 5 are implemented.

7.2.1 Annual Savings

	Energy Efficiency Offsets		Renewable Energy Generated		Remaining Utility Energy Consumed		Percent to ZNE
	[MWh/yr]	[thm/yr]	Consumed [MWh/yr]	Overproduced [MWh/yr]	[MWh/yr]	[thm/yr]	(%)
Baseline	0	0	1,287	0	13,533	187,950	94%
Proposed	3,486	132,762	3,194	2,197	5,944	55,188	37%

Table 48: EEM, Renewable, Utility, and Total Energy Consumed in Baseline and Proposed Cases

Table 48 summarizes the estimates for the City's annual savings in utility energy consumption as well as the renewable energy generation. As presented in the Table 48, if the EEMs proposed in Sections 5 are implemented, the City will be approximately 37% away from achieving ZNE.

As presented in this study, the City would need to achieve an additional 42 percent and 33 percent of its electric and gas portfolio ZNE goals, respectively. These values were determined using the following formula. The lower the percent away, the closer a building is to being ZNE.

$$\%\ to\ ZNE_{Remaining} = \frac{Energy\ Consumed_{Baseline} - Energy\ Saved_{EEMs} - Energy\ Generated_{Renewable}}{Energy\ Consumed_{Baseline}}$$

The City would need to generate approximately 5.9 GWh more renewable energy to entirely meet its electric portfolio ZNE goal. However, it would need to generate an additional 7.56 GWh of renewable energy to completely offset its electrical and natural gas consumption. In other words, additional renewables need to be generated to entirely offset the proposed utility energy consumption, presented in Table 48.

Unless the City decides to electrify most of their gas-fired equipment, it will be challenging to meet their overall ZNE goal. Alternatively, the City can choose to generate renewable natural gas in order to provide the amount of natural gas energy currently used by the City or generate additional renewable electricity to offset the energy used by the City's gas-fired equipment, which can involve heavy capital investment. Generating renewable natural gas (biogas) through composting or landfill gas is possible but run into feasibility problems when considering the amount of gas required, citywide distribution requirements, and gas equipment compatibility. With that said, recent policy changes will allow for electrification rebates in the state of California. TRC recommends the City implement electrification as rebates and funding becomes available.

The implementation of the described EEMs and future renewable energy will have a large impact on the City's carbon footprint. As noted in Table 49 below, the City can reduce its annual carbon emissions by 2,215 MTCO2e annually.

	Energy Efficiency Offsets		Renewable Energy	Remaining Utility Energy		Total Energy
	Electric Emissions [MT CO2e]	Gas Emissions [MT CO2e]	Electric Emissions [MT CO2e]	Electric Emissions [MT CO2e]	Gas Emissions [MT CO2e]	[MT CO2e]
Baseline	0	0	-256	2,693	997	3,690
Proposed	-694	-704	-1,073	1,183	293	1,476
Reductions						2,215

Table 49: Carbon Emissions Savings Summary

7.2.2 Lifetime Savings

The energy savings over the entire project lifetime[9], presented in Table 50, would contribute significantly toward the City's climate and energy goals, introduced in Section 3. The City would be an example to other California cities for its commitment to achieving these environmental and energy goals.

Energy saved through EEM		Renewable Energy Generated		GHG savings	Cost Savings
(GWh)	(1000 therms)	(GWh)	(1000 therms)	($MTCO_2e$)	($)
49.2	1,410	107.8	0.0	36,370.0	$32.33M

Table 50: Chula Vista ZNE Project Lifetime Savings

7.3 Benefits to Ratepayers

The ZNE effort would support California's legislative and regulatory goals to reduce GHG emissions, support energy reliability and resiliency, and facilitate higher levels of distributed generation. It also would provide multiple benefits to the City's ratepayers including energy, environmental, and cost savings; economic impacts; emergency response and recovery services; and direct and immediate support for the community.

7.4 Potential ZNE Buildings

As detailed above, portfolio ZNE is not achievable in the absence of a very large solar PV installation(s). However, several buildings within the City portfolio are good ZNE *building* candidates.

Targeting these buildings will allow for early successes that can be used for ZNE progress recognition purposes. Declaring a building as ZNE can be used as a tactic to re-engage city officials and the general public.

ZNE verification can be performed in a number of ways, however, the TRC recommend approach can be summarized with the following graphic:

[9] Project lifetime for building EEMs is assumed to be 20 years.

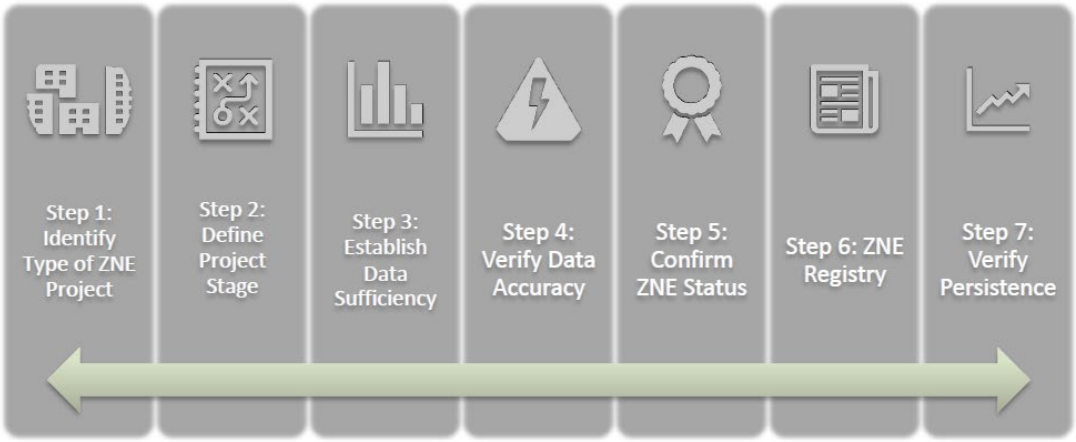


Figure 31: ZNE Verification Process

Table 51 below shows the percent remaining to achieve ZNE each site analyzed. TRC can provide additional details on the ZNE verification progress as the City progresses towards its goals.

Site Name	Energy Efficiency Offset		Total PV Capacity	Total PV Generation	Remaining Energy Consumption		Percent to ZNE (%)
	[MWh/yr]	[therms/yr]	[kWdc]	[MWh/yr]	[MWh/yr]	[therms/yr]	
Chula Vista Police Dept	959	51,655	347	578	776	9,587	26%
Chula Vista Civic Center Building 100	183	1,464	951	1,245	0	428	3%
Chula Vista Civic Center Building 200	119	1,288	6	31	60	264	43%
Chula Vista Civic Center Building 300	277	5,532	48	102	276	469	43%
Civic Center Library	252	4,224	368	614	0	1,226	10%
Chula Vista Public Works	615	11,822	1,138	1,122	4	545	5%
South Chula Vista Library	83	858	187	318	197	279	30%
Norman Park Senior Center	47	682	25	35	28	89	30%
Loma Verde Recreation Center	0	48,766	158	270	1	8,984	13%
Montevalle Recreation Center	108	897	126	221	22	1,608	17%
Otay Recreation Center	28	0	33	52	0	393	13%
Parkway Recreation Center Complex	64	0	119	192	8	658	10%
Sant Creek Recreation Center	31	0	91	148	15	106	15%
Veterans Recreation Center	3	9	47	76	27	501	25%
Animal Shelter	37	5,510	76	123	6	3,475	59%
Heritage Park	0	0	14	13	37	364	79%

Site Name	Energy Efficiency Offset		Total PV Capacity	Total PV Generation	Remaining Energy Consumption		Percent to ZNE (%)
	[MWh/yr]	[therms/yr]	[kWdc]	[MWh/yr]	[MWh/yr]	[therms/yr]	
Mt Miguel Park	0	0	64	108	29	0	21%
Living Coast Discovery Center	0	0	7	13	354	60,787	99%
Sunset View Park	0	0	70	119	0	0	79%

Table 51: High Potential ZNE Buildings

7.5 ZNE Portfolio Strategies

7.5.1 Virtual Net Metering and Aggregation

Based on existing and planned solar PV generation, some sites such as Civic Center Building 100, have the potential to generate more energy than they consume. To take advantage of this excess generation the City can enroll in SDG&E's Virtual Net Metering and Aggregation (NEM) rate tariff. This tariff allows a generating site to share excess generation, as energy (kWh), with adjacent sites that do not have generation. This strategy has some caveats that limit its effectiveness, such as:

- Sites must be along adjacent or contiguous plot lines as described in SDG&E's NEM rate tariff.
- The benefitting sites (site receiving excess generation) cannot be on the NEM rate. This is important because it means that if the City wanted to share generation between two sites that both have generation, one of the sites would need to move to a non-NEM rate.

Even with these limitations in mind, the Virtual Net Metering provides a great opportunity for the City to benefit from their large solar arrays and more additional sites towards ZNE. The graph below shows the estimated monthly loads if Building A were connected to Fire Station 1.

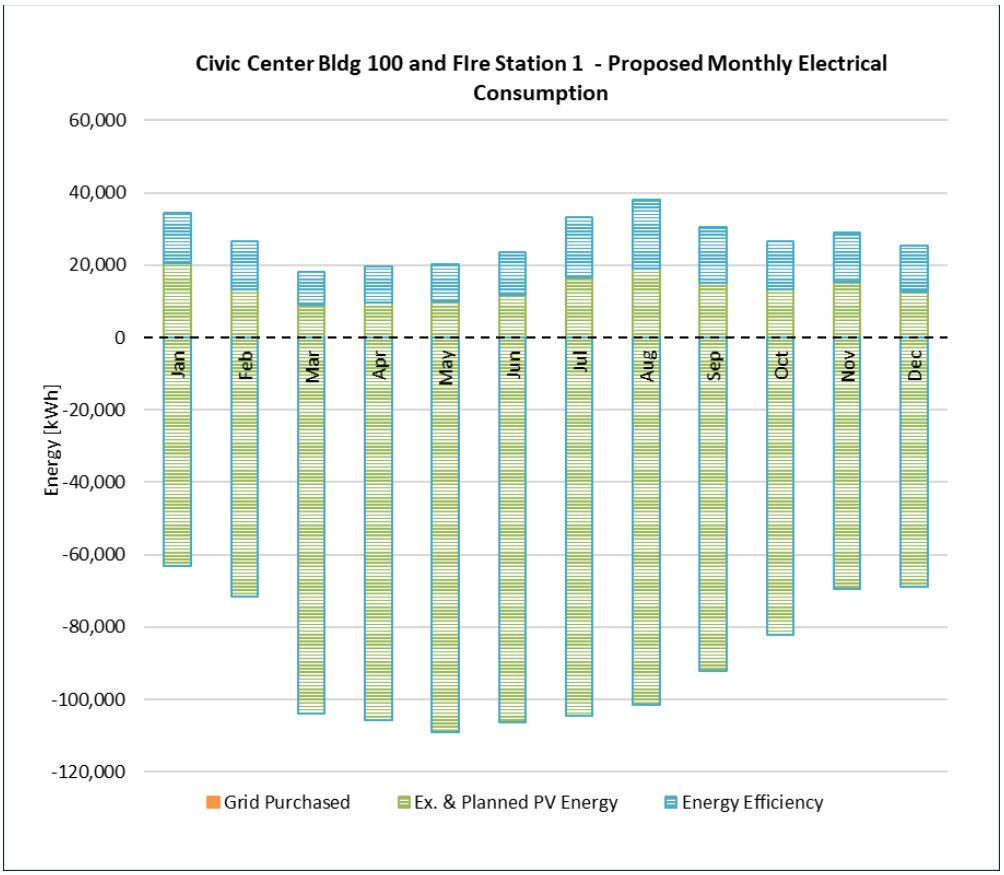


Figure 32: Civic Center Building 100 and Fire Station 01 Virtual Net-Metering Monthly Energy Consumption

7.5.2 Microgrids

For sites within a close proximity, microgrid systems could be set up to take advantage of the large existing and planned PV arrays and battery storage capacity. Microgrid systems could reduce the City's dependency on grid-supplied energy and improve the resiliency of critical buildings. The Civic Center complex, consisting of City Hall, Public Services North and South, Fire Station 1, the Police Station, and Civic Center Library, is a promising location for a microgrid. It already has 310 kW installed PV, 1,409 kW of planned PV, and 137 kWh of planned battery storage capacity. By implementing the EEMs in Section 5, this complex has the potential to reduce its consumption to a level where the proposed PV systems, with additional battery storage, could meet all electrical energy needs.

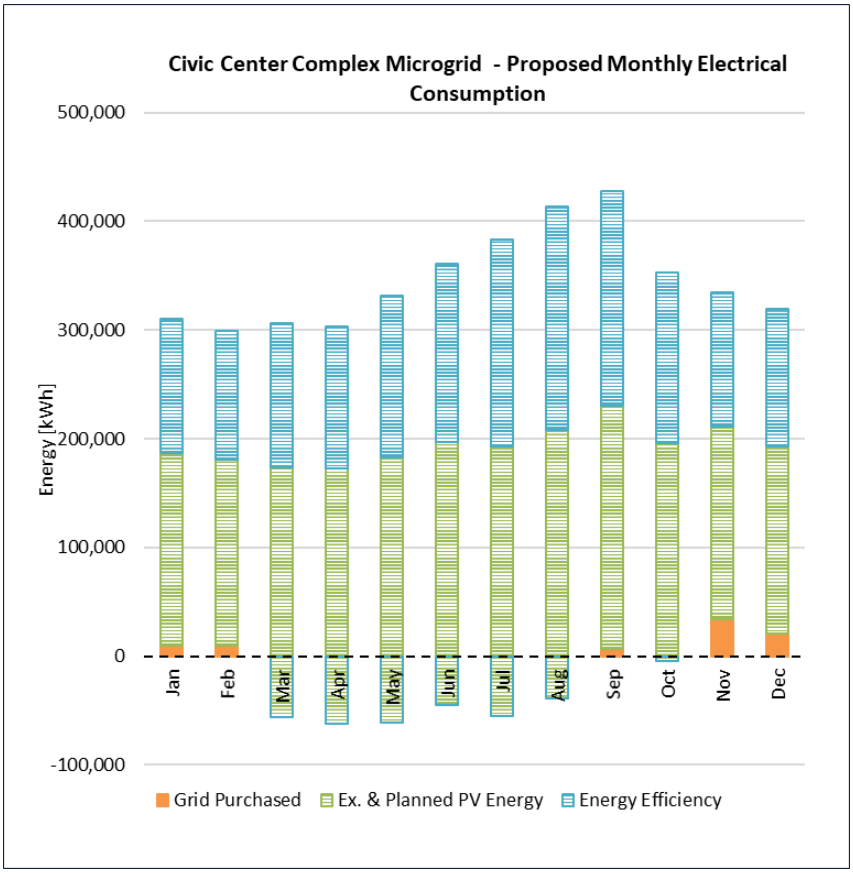


Figure 33: Civic Center Complex Microgrid Monthly Energy Consumption

7.5.3 Additional Renewable Generation

Of Chula Vista's 15 GWh of annual energy consumption, 4.5 GWh (30 percent) is consumed by streetlight and traffic control infrastructure. The distributed nature of these systems make generation at the point of use difficult. In order to achieve portfolio-wide ZNE, the City would need to offset the consumption from these sources with additional renewable generation. If the City set up a large stand-alone PV system, it could leverage SDG&E's RES-BCT overproduction rate. This rate allows generating sites to export energy to a predetermined list of benefitting sites. A large enough solar array could be set up to offset and pay for the energy consumption of the street and traffic control lights.

7.5.4 Strategic Solar and Storage Implementation

Based on the review of existing systems, energy efficiency potential and existing and planned solar, Chula Vista has number of sites with the potential for excess generation. Due to the constraints and costs of aggregation rates and microgrid systems, it may not be feasible to effectively capture over production at some sites. In these situations, onsite battery storage can address the issue of overgeneration at peak solar times and provide energy to the buildings when sun is not available. Additionally, for future solar installations a holistic approach considering existing load, energy efficiency opportunities, solar potential, and battery storage should be taken in order effectively monetize the City's solar PV investment.

Appendix A: Site General Descriptions

Police Department HQ

The Chula Vista Police Department Headquarters serves as the center of operation for Chula Vista's police force. Its operations include office space, evidence and equipment storage, training grounds, and jail space. The building is conditioned by 14 AHUs, 13 fan coil units, two parking garage exhaust fans, two computer room AC units, two hermetic chillers, two conventional boilers, and a two-cell cooling tower. The building is provided with energy from 24,000 sq. ft. of solar panels on the roof and its parking structure's solar canopies.



Figure 34: Police Department HQ

Day of the week	Opens at	Closes at	Total Hours
Monday	12:00 AM	12:00 AM	24
Tuesday	12:00 AM	12:00 AM	24
Wednesday	12:00 AM	12:00 AM	24
Thursday	12:00 AM	12:00 AM	24
Friday	12:00 AM	12:00 AM	24
Saturday	12:00 AM	12:00 AM	24
Sunday	12:00 AM	12:00 AM	24
Annual	**Operating**	**Hours**	**8760**

Table 52: Police Dept HQ Operating Hours

Chula Vista Civic Center

The Chula Vista Civic Center is composed of three buildings, which operate as spaces for the City Hall, City Clerk, and Finance Department. The three buildings combined are 76,000 sq. ft. and operate from 9:00 am to 5:00 pm Monday through Friday. Building 100 is conditioned by three package AC units and two split AC units, Building 200 is conditioned by one package AC unit and two split AC units, and Building 300 is conditioned by six package AC units and four computer room AC units. The buildings' rooftops and solar canopies hold 9,300 sq. ft. of solar panels.



Figure 35: Civic Center

Day of the week	Opens at	Closes at	Total Hours
Monday	10:00 AM	8:00 PM	10
Tuesday	10:00 AM	8:00 PM	10
Wednesday	10:00 AM	8:00 PM	10
Thursday	10:00 AM	8:00 PM	10
Friday	10:00 AM	5:00 PM	7
Saturday	10:00 AM	5:00 PM	7
Sunday	1:00 PM	5:00 PM	4
Annual	**Operating**	**Hours**	**2933**

Table 53: Civic Center Operating Hours

Civic Center Library

The Chula Vista Civic Center Library operates from 10:00 am to 8:00 pm and contains areas for book stacks, reading, community events, and computer use. The 55,000 sq. ft. library is conditioned by a centrifugal chiller serving seven AHUs. The library's parking lot is currently under construction with the addition of solar canopies; no other generation exists onsite.



Figure 36: Civic Center Library

Day of the week	Opens at	Closes at	Total Hours
Monday	10:00 AM	8:00 PM	10
Tuesday	10:00 AM	8:00 PM	10
Wednesday	10:00 AM	8:00 PM	10
Thursday	10:00 AM	8:00 PM	10
Friday	10:00 AM	5:00 PM	7
Saturday	10:00 AM	5:00 PM	7
Sunday	1:00 PM	5:00 PM	4
Annual	**Operating**	**Hours**	**2933**

Table 54: Civic Center Library Operating Hours

Norman Park Senior Center

The Norman Park Senior Center is a 21,000 sq. ft. community facility that focuses on offering social activities, health classes, and exercise space to senior members of the Chula Vista community. The facility consists of a two-floor assembly building and a gymnasium, which operate from 8:00 am to 7:00 pm. The first floor of the assembly building is used for social events and classes, while the second floor is rented to tenants as an office space. Conditioning is provided by four packaged units and four split AC units. The facility generates energy via roughly 2,700 sq. ft. of solar panels.



Figure 37: Norman Park Senior Center

Day of the week	Opens at	Closes at	Total Hours
Monday	8:00 AM	7:00 PM	11
Tuesday	8:00 AM	7:00 PM	11
Wednesday	8:00 AM	7:00 PM	11
Thursday	8:00 AM	7:00 PM	11
Friday	8:00 AM	5:00 PM	9
Saturday	8:00 AM	7:00 PM	11
Sunday	8:00 AM	7:00 PM	11
Annual	**Operating**	**Hours**	**3793**

Table 55: Civic Center Library Operating Hours

Chula Vista Fire Stations

Chula Vista is served by nine fire stations. The fire stations are residential-style buildings with modifications made to accommodate additional bedrooms, office spaces, and gymnasiums. In addition, all the fire stations have large, ventilated garages. Air conditioning to the fire stations is provided by package and split AC units. None of the fire stations are equipped with solar panels. In order to provide protection to the city, the fire stations are occupied during all hours of the day, every day of the year.

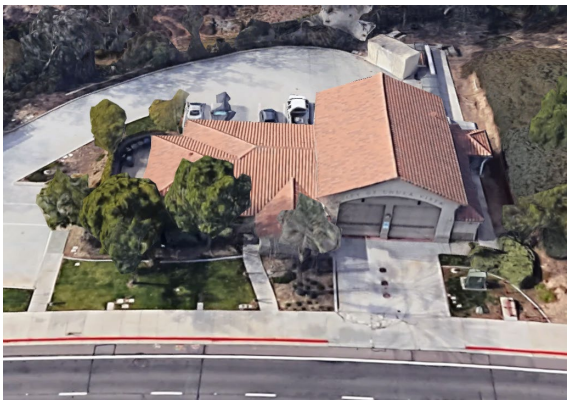


Figure 38: Fire Station 3

Fire Station	Address
Station 1	447 F Street
Station 2	80 East J Street
Station 3	1410 Brandywine
Station 4	850 Paseo Ranchero
Station 5	391 Oxford
Station 6	605 Mount Miguel Road
Station 7	1640 Santa Venitia Road
Station 8	1180 Woods Drive
Station 9	**266 East Oneida**

Table 56: Fire Station Locations

Loma Verde Recreation Center

The Loma Verde Recreation Center consists of 23,500 sq. ft. of interior space and a 12,000 sq. ft. pool. Inside the buildings are classrooms, offices, showers, a kitchen, and a gymnasium. Solar panels with a capacity of 46 kW are located on the roof of the site, as well as over the site's parking area. Interior spaces are conditioned by four package AC units and two furnaces. The recreation center's roof is currently planned for major construction. Hours of use vary greatly based on the season.



Figure 39: Loma Verde Recreation Center

Day of the week	Opens at	Closes at	Total Hours
Monday	8:00 AM	7:00 PM	11
Tuesday	8:00 AM	7:00 PM	11
Wednesday	8:00 AM	7:00 PM	11
Thursday	8:00 AM	7:00 PM	11
Friday	8:00 AM	6:00 PM	10
Saturday	Closed	Closed	-
Sunday	Closed	Closed	-
Annual	**Operating**	**Hours**	**2,808**

Table 57: Loma Verde Recreation Ctr. Operating Hours

Parkway Community Center

The Parkway Community Center is a 23,500 sq. ft. recreational facility with a 10,000 sq. ft. pool. Indoor amenities offered include a basketball court, classrooms, and exercise rooms. Heating and cooling to the building is provided by fix package AC units and three furnace units. The facility has 34kW in solar panels on its roof and above select parking spaces. Hours of use vary greatly based on the season.



Figure 40: Parkway Community Center

Day of the week	Opens at	Closes at	Total Hours
Monday	9:00 AM	8:00 PM	11
Tuesday	9:00 AM	8:00 PM	11
Wednesday	9:00 AM	8:00 PM	11
Thursday	9:00 AM	8:00 PM	11
Friday	9:00 AM	6:00 PM	9
Saturday	Closed	Closed	-
Sunday	Closed	Closed	-
Annual	**Operating**	**Hours**	**2,756**

Table 58: Parkway Comm Ctr. Operating Hours

Otay Recreation Center

The Otay Recreation Center is a 14,600 sq. ft. recreational facility that includes basketball courts, exercise rooms, and games rooms. The rooms are conditioned by two package AC systems and two furnace units. The center is served by a 33kW solar panel system located on its roof. Hours of use vary greatly based on the season.

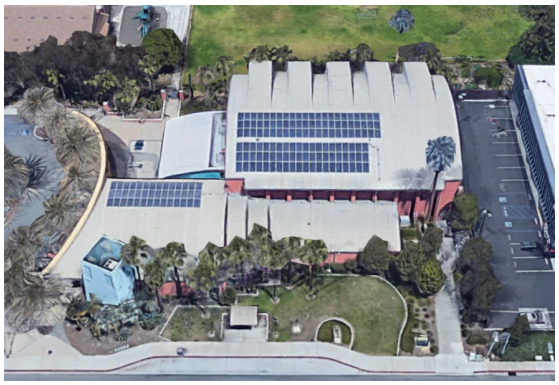


Figure 41: Otay Recreation Center

Day of the week	Opens at	Closes at	Total Hours
Monday	8:00 AM	7:00 PM	11
Tuesday	8:00 AM	7:00 PM	11
Wednesday	8:00 AM	7:00 PM	11
Thursday	8:00 AM	7:00 PM	11
Friday	8:00 AM	5:00 PM	9
Saturday	12:00 AM	4:00 PM	4
Sunday	1:00 PM	4:00 PM	3
Annual	**Operating**	**Hours**	**2,548**

Table 59: Otay Recreation Ctr. Operating Hours

Lauderbach Community Center

The Lauderbach Community Center is a 8,500 sq. ft. building located in Lauderbach Park. The building is currently closed, and is awaiting renovations. The community center is constructed to be used for classes and events. Air conditioning for the community center is provided by four package AC units, one split AC unit, and three indoor wall heaters. The site has no solar generation.

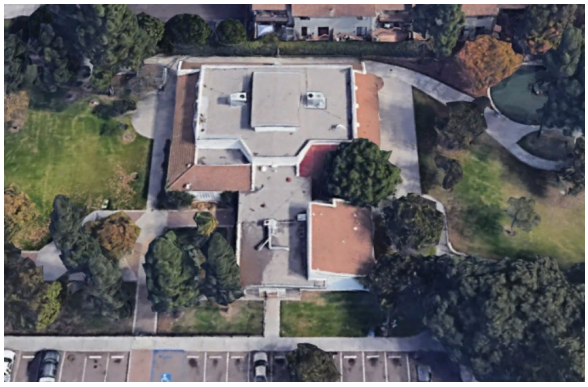


Figure 42: Lauderbach Community Center

Day of the week	Opens at	Closes at	Total Hours
Monday	Closed	Closed	-
Tuesday	Closed	Closed	-
Wednesday	Closed	Closed	-
Thursday	Closed	Closed	-
Friday	Closed	Closed	-
Saturday	Closed	Closed	-
Sunday	Closed	Closed	-
Annual	**Operating**	**Hours**	**0**

Table 60: Lauderbach Comm Ctr. Operating Hours

Montevalle Recreation Center

The Montevalle Recreation Center is a 21,100 sq. ft. recreational facility consisting of two separate buildings. The interior of the facilities offer basketball courts, classrooms, kitchen areas, and exercise rooms. The rooms are conditioned by two split AC systems, two package AC systems, and two furnace units. The exterior of the site includes three outdoor basketball courts, two tennis courts, a baseball field, soccer field, and football field, all of which are illuminated with sports lighting fixtures. A solar panel system, 47kW in size, is located on the site's rooftops and above its parking spaces. Hours of use vary greatly based on the season.



Figure 43: Montevalle Recreation Center

Day of the week	Opens at	Closes at	Total Hours
Monday	11:00 AM	8:00 PM	9
Tuesday	9:00 AM	8:00 PM	11
Wednesday	11:00 AM	8:00 PM	9
Thursday	9:00 AM	8:00 PM	11
Friday	9:00 AM	8:00 PM	11
Saturday	8:00 AM	4:00 PM	8
Sunday	Closed	Closed	-
Annual	**Operating**	**Hours**	**3,068**

Table 61: Montevalle Recreation Ctr. Operating Hours

Appendix B: Existing Equipment Inventory

Existing HVAC Equipment Inventory

The table below summarizes all the HVAC equipment currently used to condition each of the buildings. Please note that the buildings that are part of the current effort but not listed below are the ones deemed as unconditioned.

The rated efficiency of each of the units listed has been adjusted based on their age according to the formula below obtained from an efficiency degradation study[10] carried out by the NREL. The Maintenance factor, also determined from the referenced document, has been varied between 5 – 10 percent, depending on the equipment type analyzed.

$$\text{Adjusted}_{\text{Efficiency}} = \text{Rated}_{\text{Efficiency}} * (1 - \text{Maintenance Factor})^{(\text{Equipment age})}$$

Site Name - Building Name	Equipment Type	Qty	Make & Model Number (Year)	Age	Cooling Fuel Used	Cooling Output Capacity [Ton/ Unit]	Adjusted Cooling Efficiency [EER]	Heating Fuel Used	Heating Output Capacity [(Btu/h)/ Unit]	Adjusted Heating Efficiency [COP/ AFUE]	Supply Fan QTY	Supply Fan HP	Return Fan Qty
Animal Shelter	Package AC	1	Trane YCCO42F3MOBF	18	Electric	3.5	8.51	Natural Gas	80,000	N/A	1	0.33	1
Animal Shelter	Package AC	2	Trane YCCO60F3MOBH	18	Electric	5	8.51	Natural Gas	100,000	N/A	1	0.75	1
Animal Shelter	Package AC	1	Trane 4WCC3018A1000AA	11	Electric	1.5	9.85	Natural Gas	12,800	N/A	1	0.125	1
Animal Shelter	Split AC	1	York YD120C00A2AAA2A	8	Electric	10	9.23	N/A	N/A	N/A	1	0.75	N/A
Animal Shelter	Package AC	1	Sanyo STW1223H1	2	Electric	1	11	Electric	12,000	3.22	2	0.25	N/A
Animal Shelter	Package AC	2	Crispaire AVP36HPA05N-1000 BI 06906	7	Electric	2.92	8.6	Electric	17000	2.52	1	0.25	N/A

[10] "Building America Performance Analysis Procedures for Existing Homes", Robert Hendron; May 2006; NREL/TP-550-38238

Site Name - Building Name	Equipment Type	Qty	Make & Model Number (Year)	Age	Cooling Fuel Used	Cooling Output Capacity [Ton/ Unit]	Adjusted Cooling Efficiency [EER]	Heating Fuel Used	Heating Output Capacity [(Btu/h)/ Unit]	Adjusted Heating Efficiency [COP/ AFUE]	Supply Fan QTY	Supply Fan HP	Return Fan Qty
Animal Shelter	Package AC	1	Bard W60H1-A05VPxxx	8	Electric	5	11	Electric	17000	3.22	1	0.5	N/A
Animal Shelter	Furnace	8	Reznor TR-50	19	N/A	N/A	N/A	Natural Gas	50,000	63%	1	0.125	N/A
Animal Shelter	AHU	1	Alliance Air 2NS-8.3-FF-DX-GD-DW-CU	18	Electric	3.5	8.51	Natural Gas	80,000	N/A	1	5	N/A
Civic Center - Building 100	Package AC	2	Trane SXHFC5540778A8BD9001 A0Z000H000N0T078000	14	Electric	55	9.5	N/A	N/A	N/A	1	30	1
Civic Center - Building 100	Package AC	1	Trane WCD240B40AGA	14	Electric	20	9.5	N/A	N/A	N/A	1	7.5	N/A
Civic Center - Building 100	Split AC	4	Trane 2TWB0024A1000AB	14	Electric	2	7.99	Electric	24,000	3.13	4	0.5	N/A
Civic Center - Building 200	Split AC	2	Trane 2TWA3043A3000AA	14	Electric	4	9.81	Electric	43,500	3.07	1	0.2	N/A
Civic Center - Building 200	Package AC	1	Trane SXHGC90E0Z86CDDD9001 A0Z000000NRT0700	13	Electric	90	9.4	N/A	N/A	N/A	1	20	2
Civic Center - Building 300	Package AC	1	Trane SXHFFC6040A67A8AD900 1A0W00GH0000RT008000 #	11	Electric	60	9.8	N/A	N/A	N/A	1	30	1
Civic Center - Building 300	Package AC	1	Trane SXHFFC7540A66A9AD900 1A0W000H	11	Electric	75	9.5	N/A	N/A	2.78	1	40	1
Civic Center - Building 300	CRAC Condenser	2	Liebert HMU28A0AAES7357	12	Electric	8	9.7	Electric	100,900	2.83	2	2.2	N/A
Civic Center - Building 300	CRAC Condenser	2	Liebert BU067A-AAE17356	12	Electric	5.58	9.7	Electric	88,700	2.83	1	2	N/A

Site Name - Building Name	Equipment Type	Qty	Make & Model Number (Year)	Age	Cooling Fuel Used	Cooling Output Capacity [Ton/ Unit]	Adjusted Cooling Efficiency [EER]	Heating Fuel Used	Heating Output Capacity [(Btu/h)/ Unit]	Adjusted Heating Efficiency [COP/ AFUE]	Supply Fan QTY	Supply Fan HP	Return Fan Qty
Civic Center - Building 300	CRAC	2	Liebert CSF165-A/HMU28A	12	Electric	14.4	9.7	N/A	N/A	N/A	2	2	N/A
Civic Center - Building 300	CRAC	2	Liebert CSF104-Z/BU067A	12	Electric	8.9	9.7	N/A	N/A	N/A	2	2	N/A
Civic Center Library	AHU	1	Westernaire WMZ-150-S	16	Electric	N/A	N/A	N/A	N/A	N/A	1	15	N/A
Civic Center Library	AHU	2	Westernaire WMZ-150	16	Electric	N/A	N/A	N/A	N/A	N/A	1	15	N/A
Civic Center Library	AHU	1	Westernaire WMZ-150	16	Electric	N/A	N/A	N/A	N/A	N/A	1	7.5	N/A
Civic Center Library	AHU	1	Westernaire WAH-60	16	Electric	N/A	N/A	N/A	N/A	N/A	1	5	N/A
Civic Center Library	AHU	1	Westernaire WAH-30	16	Electric	N/A	N/A	N/A	N/A	N/A	1	0.75	N/A
Civic Center Library	AHU	1	Westernaire WAH-30	16	Electric	N/A	N/A	N/A	N/A	N/A	1	1.25	N/A
Fire Station 1	Split AC	1	RHEEM RA1636AJ1NA	3	Electric	3	12.61	Electric	36,000	3.70	1	1	N/A
Fire Station 1	Split AC	3	Trane 2TWR2018A1000AB	16	Electric	3	8.99	Electric	18,000	2.63	1	1	N/A
Fire Station 2	Package AC	1	Trane YCC018F1L0Bh	16	Electric	3	9.37	Electric	72,000	2.75	1	1	N/A
Fire Station 3	Split AC	1	Trane 2TWB3030A1000CA	18	Electric	2.5	9.33	Electric	30,000	2.73	1	0.75	N/A
Fire Station 3	Split AC	1	Trane TWR018C100A4	11	Electric	1.5	10.70	Electric	18,000	3.14	1	0.5	N/A
Fire Station 4	Split AC	2	Trane TWP036C100A3	13	Electric	3	9.37	Electric	33,600	2.75	1	1	N/A

Site Name - Building Name	Equipment Type	Qty	Make & Model Number (Year)	Age	Cooling Fuel Used	Cooling Output Capacity [Ton/ Unit]	Adjusted Cooling Efficiency [EER]	Heating Fuel Used	Heating Output Capacity [(Btu/h)/ Unit]	Adjusted Heating Efficiency [COP/ AFUE]	Supply Fan QTY	Supply Fan HP	Return Fan Qty
Fire Station 4	Split AC	1	Trane TWP024C100A4	11	Electric	2.5	10.01	Electric	33,000	2.93	1	0.75	N/A
Fire Station 4	Split AC	1	Trane TWP048C100A4	11	Electric	5	9.84	Electric	60,000	2.88	1	1.5	N/A
Fire Station 4	Split AC	1	Trane TWP036C300A1	19	Electric	3	8.82	Electric	33,600	2.58	1	1	N/A
Fire Station 5	Split AC	1	Trane 2TWR2042A1000AA	16	Electric	3.5	9.60	Electric	42,000	2.81	1	1	N/A
Fire Station 5	Split AC	1	Trane 2TWR2018A1000AB	16	Electric	1.5	9.60	Electric	18,000	2.81	1	0.5	N/A
Fire Station 6	Split AC	2	Trane 38YRA036331	15	Electric	3	8.56	Electric	33,600	2.03	1	1	N/A
Fire Station 6	Split AC	1	Trane 38YRA030341	15	Electric	2.5	9.29	Electric	30,000	1.98	1	0.75	N/A
Fire Station 7	Split AC	4	Carrier 38YXA024320	17	Electric	2.1	9.61	Electric	24,800	2.82	1	0.5	N/A
Fire Station 7	Split AC	2	Carrier 38YXA036330	16	Electric	3.0	10.43	Electric	28,600	3.06	1	1	N/A
Fire Station 7	Split AC	1	Carrier 38YXA030330	16	Electric	2.4	10.69	Electric	28,600	3.13	1	0.75	N/A
Fire Station 7	Split AC	1	Carrier 38YXA048320	16	Electric	3.9	9.06	Electric	46,400	2.66	1	1.25	N/A
Fire Station 7	Split AC	1	Carrier 38YXA060	16	Electric	4.8	8.41	Electric	58,000	2.46	1	1.5	N/A
Fire Station 8	Split Heat Pump	3	Carier 38YXA024320	12	Electric	2	10.60	Electric	25,000	3.11	1	0.5	N/A
Fire Station 8	Split Heat Pump	1	Carier 38YXA030330	12	Electric	2.5	10.60	Electric	30,000	3.11	1	0.75	N/A

Site Name - Building Name	Equipment Type	Qty	Make & Model Number (Year)	Age	Cooling Fuel Used	Cooling Output Capacity [Ton/ Unit]	Adjusted Cooling Efficiency [EER]	Heating Fuel Used	Heating Output Capacity [(Btu/h)/ Unit]	Adjusted Heating Efficiency [COP/ AFUE]	Supply Fan QTY	Supply Fan HP	Return Fan Qty
Fire Station 8	Split Heat Pump	3	Carier 38YXA036330	12	Electric	3	10.60	Electric	36,000	3.11	1	1	N/A
Fire Station 8	Split Heat Pump	1	Carier 38YXA048320	12	Electric	4	10.60	Electric	48,000	3.11	1	1.25	N/A
Fire Station 8	Split Heat Pump	1	Carier 38YXA060320	12	Electric	5	10.60	Electric	60,000	3.11	1	1.5	N/A
Fire Station 9	Window AC	1	Freidrich YL24L35-A	13	Electric	2	8.76	Electric	22,000	2.57	1	0.5	N/A
Fire Station 9	Window AC	1	Comfort Aire RAH-183C	13	Electric	1.5	8.69	Electric	16,000	2.55	1	0.5	N/A
Lauderbach Recreation Center	Package HP	2	Trane WSC090E3R0A90000	8	Electric	7.5	9.32	Electric	88,000	2.95	1	1	N/A
Lauderbach Recreation Center	Package AC	2	American Standard YCC018F1L0BE	20	Electric	1.5	9.00	Electric	40,000	65%	1	0.125	N/A
Lauderbach Recreation Center	Split AC	1	Trane	20	Electric	0.5	9.00	Electric	N/A	N/A	1	0.125	N/A
Lauderbach Recreation Center	Wall Heaters	3	Sigler	20	N/A	N/A	N/A	Natural Gas	36,000	N/A	1	1	N/A
Montevalle Recreation Center	Split AC	1	Carrier 38AKS044/ Carrier MN30B005B1Z11XXS	13	Electric	35.8	8.86	N/A	N/A	N/A	1	30	N/A
Montevalle Recreation Center	Split AC	1	Carrier 38HDC060-621	13	Electric	5	9.65	N/A	N/A	N/A	1	1	1

Site Name - Building Name	Equipment Type	Qty	Make & Model Number (Year)	Age	Cooling Fuel Used	Cooling Output Capacity [Ton/ Unit]	Adjusted Cooling Efficiency [EER]	Heating Fuel Used	Heating Output Capacity [(Btu/h)/ Unit]	Adjusted Heating Efficiency [COP/ AFUE]	Supply Fan QTY	Supply Fan HP	Return Fan Qty
Montevalle Recreation Center	Package AC	1	Carrier 48TCDD12A2A5A0A0G0	1	Electric	10	10.99	Natural Gas	90,000	75%	1	5	N/A
Montevalle Recreation Center	Package AC	1	Carrier 48TCDA07A2A6A0A0A0	3	Electric	6	10.67	Natural Gas	59,000	82%	1	3	N/A
Montevalle Recreation Center	Furnace	1	Carrier 58STX135 - 121222	13	N/A	N/A	N/A	Natural Gas	107,000	71%	1	0.125	N/A
Montevalle Recreation Center	Furnace	1	Reznor	13	N/A	N/A	N/A	Natural Gas	102,000	70%	1	0.125	N/A
Norman Park Senior Center	Split AC	1	Trane TWD718B100A2	27	Electric	1.5	7.62	Electric	20000	2.23	1	1	N/A
Norman Park Senior Center	Split AC	2	Trane TWD730B100A0	27	Electric	2.5	7.62	Electric	20000	2.23	1	1.5	N/A
Norman Park Senior Center	Split AC	1	RHEEM RCGA36A2GH17B	21	Electric	3	8.02	Electric	36000	2.35	1	1.5	N/A
Norman Park Senior Center	Package AC	1	Trane YSC090F3RLA0800040000 00000000C0000000000	5	Electric	7.5	10.46	Natural Gas	96,000	N/A	2	3	N/A
Norman Park Senior Center	Package AC	1	Trane 4YCC3030C1075AB	5	Electric	2.5	10.46	Natural Gas	60,500	N/A	1	0.5	1
Norman Park Senior Center	Package AC	1	Trane YCD360BELJ2A2EE400000 F0H0000J000	7	Electric	30	9.41	Natural Gas	283,500	N/A	3	10	2

Site Name - Building Name	Equipment Type	Qty	Make & Model Number (Year)	Age	Cooling Fuel Used	Cooling Output Capacity [Ton/ Unit]	Adjusted Cooling Efficiency [EER]	Heating Fuel Used	Heating Output Capacity [(Btu/h)/ Unit]	Adjusted Heating Efficiency [COP/ AFUE]	Supply Fan QTY	Supply Fan HP	Return Fan Qty
Norman Park Senior Center	Package AC	1	Trane	7	Electric	2	10.46	Natural Gas	48,400	N/A	1	0.5	1
Norman Park Senior Center	Furnace	1	RHEEM RGPH-07EAUER	7	N/A	N/A	N/A	Natural Gas	60,000	65%	1	0.125	N/A
Otay Recreation Center	Package AC	1	Lennox LGA120H Y	20	Electric	10	9.09	Natural Gas	185,700	65%	1	3.00	N/A
Otay Recreation Center	Package HP	1	Carrier 50HJQ005---531--	11	Electric	4	9.89	Electric	46,000	2.05	1	2.00	N/A
Otay Recreation Center	Furnace	2	Reznor HXE-200-8-E	19	N/A	N/A	N/A	Natural Gas	200000	N/A	1	0.125	N/A
Parkway - Community Center	Package AC	2	RHEEM RKKA-A06JK10X	22	Electric	5	7.46	Natural Gas	81,000	65%	1	0.75	N/A
Parkway - Community Center	Package AC	1	RHEEM RKKA-AO48JK08X	22	Electric	4	7.86	Natural Gas	62,500	64%	1	0.75	N/A
Parkway Community Center - Gymnasium	Package HP	1	Carrier 50HJQ005---531--	11	Electric	4	9.89	Electric	46,000	2.05	1	2.00	N/A
Parkway Community Center - Gymnasium	Furnace	2	Reznor HX400-8-2-E	11	N/A	N/A	N/A	Natural Gas	320,000	63%	1	0.125	N/A

Site Name - Building Name	Equipment Type	Qty	Make & Model Number (Year)	Age	Cooling Fuel Used	Cooling Output Capacity [Ton/ Unit]	Adjusted Cooling Efficiency [EER]	Heating Fuel Used	Heating Output Capacity [(Btu/h)/ Unit]	Adjusted Heating Efficiency [COP/ AFUE]	Supply Fan QTY	Supply Fan HP	Return Fan Qty
Parkway Community Center - Pool	Package AC	1	Carrier 48HJE004---331--	21	Electric	3	9.07	Natural Gas	57,100	66%	1	2	N/A
Parkway Community Center - Pool	Package AC	1	Carrier 48SS-024040311	21	Electric	2	8.10	Natural Gas	32,800	66%	1	0.25	N/A
Parkway Community Center - Pool	Furnace	1	Reznor HCRGB75-2	21	N/A	N/A	N/A	Natural Gas	75,000	62%	1	0.125	N/A
Police Department HQ	CRAC	1	Larkin 9WL56T11013E P	15	Electric	19.5	8.8	Electric	25 kW	N/A	1	5	N/A
Police Department HQ	CRAH	1	Liebert 3-UW376C	15	CHW	19.50	N/A	Electric	25 kW	N/A	1	5	N/A
Police Department HQ	AHU	1	Trane MCCB050UA0C0UB	15	CHW	19.06	N/A	HHW	770,500	N/A	1	25	N/A
Police Department HQ	AHU	1	Trane MCCA066	17	CHW	65.58	N/A	HHW	1,392,700	N/A	1	30	N/A
Police Department HQ	AHU	1	Trane MCCB025	17	CHW	29.43	N/A	HHW	350,900	N/A	1	15	1
Police Department HQ	AHU	1	Trane TSCA012	16	CHW	12.33	N/A	HHW	101,000	N/A	1	7.5	1
Police Department HQ	AHU	1	Trane TSCA021	16	CHW	23.50	N/A	HHW	180,600	N/A	1	15	1

Site Name - Building Name	Equipment Type	Qty	Make & Model Number (Year)	Age	Cooling Fuel Used	Cooling Output Capacity [Ton/ Unit]	Adjusted Cooling Efficiency [EER]	Heating Fuel Used	Heating Output Capacity [(Btu/h)/ Unit]	Adjusted Heating Efficiency [COP/ AFUE]	Supply Fan QTY	Supply Fan HP	Return Fan Qty
Police Department HQ	AHU	1	Trane TSCA030	16	CHW	26.58	N/A	HHW	231,900	N/A	1	20	1
Police Department HQ	AHU	1	Trane TSCX025	16	CHW	21.83	N/A	HHW	183,100	N/A	1	15	1
Police Department HQ	AHU	1	Trane TSCA025	16	CHW	35.83	N/A	HHW	575,000	N/A	1	15	N/A
Police Department HQ	AHU	1	Trane TSCA021	16	CHW	24.42	N/A	HHW	192,000	N/A	1	15	1
Police Department HQ	AHU	1	Trane TSCX030	16	CHW	28.67	N/A	HHW	220,400	N/A	1	20	1
Police Department HQ	AHU	1	Trane TSCA010	16	CHW	13.92	N/A	HHW	102,500	N/A	1	7.5	1
Police Department HQ	AHU	1	Trane TSCA017	16	CHW	13.08	N/A	HHW	83,800	N/A	1	10	1
Police Department HQ	AHU	1	Trane TSCA010	16	CHW	9.50	N/A	HHW	70,800	N/A	1	5	1
Police Department HQ	AHU	1	Trane TSCA012	16	CHW	19.58	N/A	HHW	262,500	N/A	1	7.5	N/A
Police Department HQ	Fan Coil	1	Trane BCHB036	16	CHW	3.25	N/A	HHW	37,300	N/A	1	0.33	N/A

Site Name - Building Name	Equipment Type	Qty	Make & Model Number (Year)	Age	Cooling Fuel Used	Cooling Output Capacity [Ton/ Unit]	Adjusted Cooling Efficiency [EER]	Heating Fuel Used	Heating Output Capacity [(Btu/h)/ Unit]	Adjusted Heating Efficiency [COP/ AFUE]	Supply Fan QTY	Supply Fan HP	Return Fan Qty
Police Department HQ	Fan Coil	1	Trane BCHB054	16	CHW	4.33	N/A	HHW	48,100	N/A	1	0.75	N/A
Police Department HQ	Fan Coil	1	Trane BCHB036	16	CHW	3.42	N/A	HHW	40,400	N/A	1	0.75	N/A
Police Department HQ	Fan Coil	1	Trane BCHB0541GF	15	CHW	4.17	N/A	HHW	N/A	N/A	1	1.5	N/A
Police Department HQ	Fan Coil	1	Trane BCHB0241GF	16	CHW	1.50	N/A	N/A	N/A	N/A	1	0.5	N/A
Police Department HQ	Fan Coil	1	Trane BCHB0361GF	16	CHW	3.00	N/A	N/A	37,800	N/A	1	0.5	N/A
Police Department HQ	Fan Coil	1	Trane BCHB0721GF	15	CHW	7.17	N/A	HHW	30,800	N/A	1	1	N/A
Police Department HQ	Fan Coil	1	Trane BCHB0121GF	16	CHW	0.58	N/A	N/A	N/A	N/A	1	0.5	N/A
Police Department HQ	Fan Coil	1	Trane BCHB0181GF	16	CHW	1.08	N/A	N/A	N/A	N/A	1	0.5	N/A
Police Department HQ	Fan Coil	1	Trane BCHB0121GF	16	CHW	0.67	N/A	N/A	N/A	N/A	1	0.5	N/A
Police Department HQ	Fan Coil	1	Trane BCHB0121GF	16	CHW	1.08	N/A	N/A	N/A	N/A	1	0.5	N/A

Site Name - Building Name	Equipment Type	Qty	Make & Model Number (Year)	Age	Cooling Fuel Used	Cooling Output Capacity [Ton/ Unit]	Adjusted Cooling Efficiency [EER]	Heating Fuel Used	Heating Output Capacity [(Btu/h)/ Unit]	Adjusted Heating Efficiency [COP/ AFUE]	Supply Fan QTY	Supply Fan HP	Return Fan Qty
Police Department HQ	Fan Coil	1	Trane BCHB036	16	CHW	3.92	N/A	HHW	52,200	N/A	1	0.5	N/A
Police Department HQ	Fan Coil	1	Trane LPCAA10	16	CHW	15.08	N/A	HHW	210,700	N/A	1	2	N/A
Police Department HQ	Exhaust Fan	2	Century 460-3	15	N/A	N/A	N/A	N/A	N/A	N/A	1	15	N/A
Public Works - Admin	Split AC	1	Sanyo C2672R	17	Electric	2	13.40	N/A	N/A	N/A	1	0.25	N/A
Public Works - Admin	Split AC	1	Sanyo CHX05252	17	Electric	4.5	14.58	N/A	N/A	N/A	1	0.75	N/A
Public Works - Admin	Split AC	1	LG LUU367HV	1	Electric	3	17	N/A	N/A	N/A	1	0.25	N/A
Public Works - Admin	AHU	1	Bohn HCS36BLA	32	CHW	32.54	N/A	HHW	250,100	N/A	1	15	1
Public Works - Admin	AHU	1	Bohn HCS26CMF	32	CHW	23.50	N/A	HHW	180,600	N/A	1	15	1
Public Works - Admin	AHU	1	Trane TSCA025BBB0DAA000000AA	17	CHW	23.50	N/A	HHW	180,600	N/A	1	15	1
Public Works - Admin	AHU	1	Trane TSCA010U0A000000000A00A276.0	17	CHW	23.50	N/A	HHW	180,600	N/A	1	5	1
Public Works - Shops	AHU	1	Trane TSCA010GAB0BAC0CAE0EAAECAC00000000AA0C	17	CHW	23.50	N/A	HHW	180,600	N/A	1	5	N/A

Site Name - Building Name	Equipment Type	Qty	Make & Model Number (Year)	Age	Cooling Fuel Used	Cooling Output Capacity [Ton/ Unit]	Adjusted Cooling Efficiency [EER]	Heating Fuel Used	Heating Output Capacity [(Btu/h)/ Unit]	Adjusted Heating Efficiency [COP/ AFUE]	Supply Fan QTY	Supply Fan HP	Return Fan Qty
Public Works - Shops	AHU	1	Trane TSCA008NBA0BHG0ABB00B06000000	17	CHW	23.50	N/A	HHW	180,600	N/A	1	5	N/A
Public Works - Shops	Heating Ventilator	1	Trane GRAA20GFME0N2JN102A1	17	N/A	N/A	N/A	Natural Gas	160,000	67%	1	2	N/A
Public Works - Shops	Heating Ventilator	1	Trane GRAA30GFME0N2QC102A1	17	N/A	N/A	N/A	Natural Gas	240,000	67%	1	1	N/A
Public Works - Shops	Heating Ventilator	1	Trane GRAA20GFME0N2CP102A1	17	N/A	N/A	N/A	Natural Gas	160,000	67%	1	3	N/A
Public Works - Shops	Heating Ventilator	1	Trane GRAA25GFME0N2CP102A1	17	N/A	N/A	N/A	Natural Gas	200,000	67%	1	3	N/A
Public Works - Shops	Heating Ventilator	1	Trane GRAA60GFME0N2JT102A1	17	N/A	N/A	N/A	Natural Gas	480,000	67%	1	10	N/A
Public Works - Shops	Heating Ventilator	1	Trane GRAA25GFME0N2JP102A1	17	N/A	N/A	N/A	Natural Gas	200,000	67%	1	3	N/A
Public Works - Shops	Heating Ventilator	1	Trane GRAA25GFME0N2JP102A1	17	N/A	N/A	N/A	Natural Gas	200,000	67%	1	3	N/A
Public Works - Receiving	Split AC	1	Carrier 38TH048320	32	Electric	4	6.96	N/A	N/A	N/A	1	0.75	N/A
Public Works - Maintenance	Package AC	1	Trane YCH048F4RLA1R000R0000000C0000000	2	Electric	4	9.8	Natural Gas	48,000	N/A	1	0.6	N/A
Public Works - Maintenance	Package AC	1	Trane YCH120F4RLA0H00040000000E0000000	2	Electric	10	9.8	Natural Gas	120,000	N/A	1	3	N/A

Site Name - Building Name	Equipment Type	Qty	Make & Model Number (Year)	Age	Cooling Fuel Used	Cooling Output Capacity [Ton/ Unit]	Adjusted Cooling Efficiency [EER]	Heating Fuel Used	Heating Output Capacity [(Btu/h)/ Unit]	Adjusted Heating Efficiency [COP/ AFUE]	Supply Fan QTY	Supply Fan HP	Return Fan Qty
Public Works - Maintenance	Heating Ventilator	1	Trane AHOA400F0E000JT202A1C	17	N/A	N/A	N/A	Natural Gas	320000	67%	1	0.125	N/A
Public Works - Maintenance	Heating Ventilator	1	Trane AHOA400F0E000JU202A1C	17	N/A	N/A	N/A	Natural Gas	320000	67%	1	0.125	N/A
Public Works - Maintenance	Heating Ventilator	1	Trane GRAA70GFME0N2JT102A1	17	N/A	N/A	N/A	Natural Gas	560,000	67%	1	0.125	N/A
Public Works - Maintenance	Heating Ventilator	1	Trane AHOA400FOE000JT202A1C	17	N/A	N/A	N/A	Natural Gas	320000	67%	1	0.125	N/A
Public Works - Maintenance	Heating Ventilator	1	Trane AHOA400FOE000JU202A1C	17	N/A	N/A	N/A	Natural Gas	320000	67%	1	0.125	N/A
Public Works - Fire Department	Split AC	1	N/A	17	Electric	N/A	N/A	N/A	N/A	N/A	1	N/A	N/A
South Chula Vista Library	Package AC	1	Trane YHD150G4RLB0GK7	0	Electric	12.5	11	Natural Gas	122,000	N/A	2	3	N/A
South Chula Vista Library	Package AC	1	Trane YHC074F4RLA0LK	2	Electric	6	10.98	Natural Gas	64,800	N/A	1	0.7	N/A
South Chula Vista Library	AHU	1	Pace PF-36AF SWSI	25	Electric	N/A	N/A	N/A	N/A	N/A	1	27.9	N/A
Civic Center - Building 100	Package AC	2	Trane SXHFC5540778A8BD9001A0Z000H000N0T078000	14	Electric	55	9.5	N/A	N/A	N/A	1	30	1

Table 62: Existing Air-side HVAC Equipment Inventory

Site Name - Building Name	Inspected Unit Location	Equipment Type	Qty	Make & Model Number (Year)	Age [Years]	Heating Fuel Used	Heating Capacity [(Btu/h)/Unit]	Adjusted Heating Thermal Efficiency [%]
Civic Center Library	Outdoor (Roof)	Boiler	1	Raypak H2-1571	18	Natural Gas	1,900,000	68%
Police Department HQ	Outdoor (Roof)	Boiler	2	Rite 350WG	16	Natural Gas	3,500,000	68%
Public Works Yard	Indoor	Boiler	1	Rite 90WG	32	Natural Gas	720,000	58%
South Chula Vista Library	Outdoor (Roof)	Boiler	1	Raypak H8-0992B	6	Natural Gas	990,000	79%
Civic Center - Building 100	Outdoor (Roof)	Boiler	1	Raypak H1-0824	14	Natural Gas	675,000	71%
Civic Center - Building 200	Outdoor (Roof)	Boiler	1	Raypak H1-0824	13	Natural Gas	675,000	72%
Civic Center - Building 300	Outdoor (Roof)	Boiler	1	Raypak H1-0824	11	Natural Gas	675,000	73%
Norman Senior Park Center	Outdoor (Roof)	Boiler	2	Unknown Unknown	Unknown	Unknown	Unknown	Unknown

Table 63: Existing Boiler Inventory

Site Name - Building Name	Inspected Unit Location	Equipment Type	Qty	Make & Model Number (Year)	Age [Years]	Cooling Fuel Used	Cooling Output Capacity [Ton/Unit]	Adjusted Cooling Efficiency [EER]	VSD?
Civic Center Library	Outdoor (Roof)	Chiller	1	Smardt A 058-2BG7-34V	10	Electric	150	9.28	Yes
Police Department HQ	Indoor	Chiller	1	Trane RTHC B2-C2-D2	17	Electric	216.8	14.83	No
Police Department HQ	Indoor	Chiller	1	Trane RTHC B2-C2-D2	17	Electric	216.8	19.57	Yes
Public Works Yard	Outdoor (Roof)	Chiller	1	Trane RTAC 1404	14	Electric	140	9.98	Yes
South Chula Vista Library	Outdoor (Roof)	Chiller	1	Trane CGAM 100F 2K02 AXD2 A1A1 A1AX XA1D 1A4X XX8B XBXZ	5	Electric	100	14.5	Yes

Table 64: Existing Chiller Inventory

Site Name - Building Name	Inspected Unit Location	Equipment Type	Qty	Make & Model Number (Year)	Age [Years]	GPM	Fan Qty	Fan HP [HP/Unit]	VFD?
Police Department HQ	Outdoor (Roof)	Cooling Tower	2	Evapco USS-29-818	16	660	1	15	Yes

Table 65: Existing Cooling Tower Inventory

Site Name - Building Name	Inspected Unit Location	Equipment Type	Qty	Make & Model Number (Year)	Age [Years]	HP	VFD?
Civic Center Library	Indoor	Chilled Water Pump	2	US Electric A923A	10	10	No
Civic Center Library	Indoor	Heating Hot Water Pump	1	Baldor JMM3511T	10	3	No
Police Department HQ	Indoor	Condenser Water Pump	1	Nidec H25120	16	25	Yes
Police Department HQ	Indoor	Condenser Water Pump	1	Emerson H25P2B BL83	16	25	Yes
Police Department HQ	Indoor	Primary Chilled Water Pump	1	US Electric D10P2B AY06	16	10	No
Police Department HQ	Indoor	Primary Chilled Water Pump	1	Nidec H10P2D DE24	16	10	No
Police Department HQ	Indoor	Secondary Chilled Water Pump	2	US Electric D20P2B J364	16	25	Yes
Police Department HQ	Outdoor (Roof)	Heating Hot Water Pump	2	Weinman 2BH3B150P24-D	16	15	No
Public Works Yard	Indoor	Heating Hot Water Pump	2	Peerless	17	5	No
Public Works Yard	Indoor	Primary Chilled Water Pump	2	Armstrong 4x3x8 4030	32	5	No
Public Works Yard	Indoor	Secondary Chilled Water Pump	2	Armstrong 3x2.5x10 4030	17	10	Yes
South Chula Vista Library	Indoor	Heating Hot Water Pump	2	WEG 00158ES3E145JM	14	1.5	No
Civic Center - Building 100	Indoor	Heating Hot Water Pump	2	Baldor	14	1	No
Civic Center - Building 200	Indoor	Heating Hot Water Pump	2	Bell & Gosset	14	1	No

Table 66: Existing Pump Inventory

Site Name - Building Name	Inspected Unit Location	Equipment Type	Qty	Make & Model Number (Year)	Age [Years]	Heating Fuel Used	Heating Capacity [(Btu/h)/Unit]	Adjusted Heating Thermal Efficiency [%]
Loma Verde Recreation Center	Indoor	Boiler	2	Raypak P-2002B	11	Natural Gas	1,560,000	70%
Park Way Recreation Center Complex	Indoor	Boiler	1	Raypak WHP-2005	22	Natural Gas	1,560,000	65%

Table 67: Existing Pool Water Heating Boiler Inventory

Existing Lighting Equipment Inventory

Existing fixture description	Qty.
1x1 Recessed Troffer	24
1x2 Fluorescent Recessed Troffer	45
1x4 Recessed Troffer	131
2ft LED (1)	51
2x2 Recessed Troffer - Fluorescent	158
2x4 Recessed Troffer - LED	2732
3x3 Recessed Troffer	146
4' T8 LED Tube	1022
Bollard Fixture - HID	39
CFL Wall Pack	142
Decorative CFL	68
HID Flood Light	106
HID Wall Pack	249
High Bay HID	151
High Bay Induction	104
Induction Shoebox	20
Landscape CFL	124
LED Corncob	14
LED Decorative	77
LED Post Top	98
LED Striplight 4'	211
LED T8 Lamp (1)	31
LED T8 Lamp (2)	71
LED T8 Lamp (3)	157
LED Wall Pack	5
Low Bay Induction	9
Maxlite LED Wrap	159
Maxlite Vaportite 4 ft	153
Pole Top Area Fixture - HID	171
Pole Top Area Fixture - Induction	542
Recessed Can 6"	692
Recessed Can 8"	911
Surface Mount CFL	4
Task Lighting	123
Uplight - Metal Halide	24
TOTAL Number of fixtures & lamps	**8,764**

Table 68: Existing Lighting Equipment Inventory

Existing Domestic Hot Water Heaters Inventory

Site Name - Building Name	Inspected Unit Location	Equipment Type	Qty	Make & Model Number (Year)	Age [Years]	Heating Fuel Used	Size	Adjusted Heating Thermal Efficiency [%]
Civic Center Library	Indoors	DW Heater	1	AO Smith ECT 30 200	16	Electric	80 gallons	N/A
Chula Vista City Hall	Indoors	DW Heater	1	N/A	14	Electric	80 gallons	N/A
Civic Center Building 200	Indoors	DW Heater	1	N/A	14	Electric	80 gallons	N/A
Civic Center Building 300	Indoors	DW Heater	1	N/A	12	Natural Gas	181,000	73%
PD HQ	Not inspected	DW Heater	1	Raypak	16	Natural Gas	80 gallons	68%
Chula Vista Fire Station 1	Indoors	DW Heater	1	AO Smith BT 80 300	16	Natural Gas	80 gallons	72%
Chula Vista Fire Station 2	Indoors	DW Heater	2	AO Smith BT 80 300	16	Natural Gas	80 gallons	72%
Chula Vista Fire Station 4	Indoors	DW Heater	3	AO Smith FCG 100 300	11	Natural Gas	80 gallons	72%
Chula Vista Fire Station 6	Indoors	DW Heater	4	AO Smith FCG 100 300	15	Natural Gas	80 gallons	72%
Chula Vista Fire Station 7	Indoors	DW Heater	5	Lochinvar EWN200PM	17	Natural Gas	80 gallons	72%
Chula Vista Fire Station 8	Indoors	DW Heater	6	Lochinvar EWN200PM	12	Natural Gas	80 gallons	72%
Norman Park Senior Center	Indoors	DW Heater	2	N/A	7	Natural Gas	80 gallons	76%
Lauderback Recreation Center	Not inspected	DW Heater	1	Raypak H1-0926C-CEAHCAA	20	Natural Gas	759,320	67%
Otay Recreation Center	Indoors	DW Heater	1	Not available	20	Natural Gas	156,000	64%

Table 69: Existing Domestic Hot Water (DHW) Heaters Inventory

Appendix C: Proposed EEM Savings and Cost per Building

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Police Department HQ	Air Handler Replacements	413,289	70.47	17,610	$128,472	$82,177	$1,520,000	11.19
	Chiller Plant Upgrades	33,682	4.61	0	$6,582	$4,734	$10,000	0.80
	Boiler Replacements	0	0.00	6,077	$9,320	$7,596	$165,000	16.89
	Pumping System Upgrades	101,102	11.75	-2,772	$16,587	$13,895	$55,000	2.48
	HVAC Controls - EMS	234,096	60.01	30,741	$75,281	$75,519	$475,000	5.31
	Parking Garage Exhaust Fan VFDs	20,002	0.00	0	$6,452	$2,400	$20,000	2.73
	Interior Lighting Replacements	36,864	7.52	0	$8,407	$0	$19,000	2.26
	Lighting Controls - Occupancy Sensors	99,013	13.35	0	$23,210	$0	$72,000	3.10
	Appliance Replacement	60	0.01	-3	$32	$8	$700	21.78
	Plug Load Controls (Vending Misers and Power Strips)	21,086	0.00	0	$4,903	$2,530	$14,000	2.34
	Demand Response	0	49.75	0	$4,305	$5,250	$7,000	0.41
Total		**959,195**	**217.47**	**51,652**	**$283,551**	**$194,110**	**$2,357,700**	**7.63**
Impacted by RFP		**847,500**	**155.57**	**51,655**	**$252,870**	**$179,187**	**$2,287,000**	**8.34**

Table 70: Proposed EEM Savings and Cost – Police Department

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Civic Center Building 100	AC Unit Overhauls	42,643	14.88	234	$11,314	$7,642	$125,000	10.37
	HVAC Controls - EMS	76,589	66.48	1,230	$19,230	$20,699	$145,000	6.46
	Interior Lighting Retrofits	11,628	6.37	0	$3,104	$0	$21,000	6.77
	Exterior Lighting Retrofits	7,453	1.82	0	$1,396	$0	$5,000	3.58
	Lighting Controls	17,813	6.29	0	$4,843	$0	$49,000	10.12
	Plug Load Controls	7,604	0.00	0	$1,798	$912	$5,000	2.27
	Demand Response	0	47.95	0	$5,763	$5,250	$7,000	0.30
	Demand Management - Thermal Energy Storage	19,113	72.00	0	$3,938	$0	$170,000	43.17
Total		**182,843**	**215.79**	**1,464**	**$51,385**	**$34,504**	**$527,000**	**9.58**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 71: Proposed EEM Savings and Cost – Civic Center Building 100

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Civic Center Building 200	AC Unit Overhauls	22,372	5.82	193	$6,257	$3,799	$85,000	12.98
	HVAC Controls - EMS	34,243	46.27	1,094	$11,821	$12,418	$110,000	8.26
	Interior Lighting Retrofits	3,725	1.92	0	$893	$0	$3,000	3.36
	Exterior Lighting Retrofits	31,466	10.52	0	$6,644	$0	$29,000	4.36
	Lighting Controls	3,976	0.91	0	$924	$0	$7,000	7.58
	Plug Load Controls	7,136	0.00	0	$1,778	$856	$4,000	1.77
	Demand Response	0	32.35	0	$2,873	$5,250	$7,000	0.61
	Demand Management - Thermal Energy Storage	15,715	54.00	0	$4,924	$0	$140,000	28.43
Total		**118,633**	**151.80**	**1,288**	**$36,115**	**$22,323**	**$385,000**	**10.04**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 72: Proposed EEM Savings and Cost – Civic Center Building 200

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Civic Center Building 300	AC Unit Overhauls	61,646	19.58	1,815	$15,028	$12,603	$130,000	7.81
	HVAC Controls - EMS	93,247	73.58	3,717	$23,340	$26,873	$170,000	6.13
	Data Center Upgrades	22,344	6.07	0	$4,317	$3,592	$15,000	2.64
	Interior Lighting Retrofits	21,353	9.39	0	$4,238	$0	$14,000	3.30
	Exterior Lighting Retrofits	12,219	4.02	0	$2,121	$0	$8,000	3.77
	Lighting Controls	12,184	2.07	0	$2,340	$0	$13,000	5.56
	Plug Load Controls	6,012	0.00	0	$1,263	$721	$3,600	2.28
	Emergency Generator Block Heater	3,124	0.00	0	$679	$375	$1,250	1.29
	Demand Response	0	44.51	0	$3,873	$5,250	$7,000	0.45
	Demand Management - Thermal Energy Storage	44,455	72.00	0	$9,685	$0	$225,000	23.23
Total		**276,585**	**231.21**	**5,532**	**$66,884**	**$49,415**	**$586,850**	**8.04**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 73: Proposed EEM Savings and Cost – Civic Center Building 300

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Civic Center Library	Air Handler Replacements	110,309	12.80	-199	$39,993	$15,157	$700,000	17.12
	Boiler Replacements	0	0.00	2,678	$3,474	$3,347	$37,000	9.69
	Pumping System Upgrades	33,359	6.08	0	$7,069	$4,915	$41,000	5.10
	HVAC Controls - EMS	40,953	-10.88	1,637	$15,585	$6,961	$185,000	11.42
	Interior Lighting Retrofits	27,556	11.04	0	$5,288	$0	$16,000	3.03
	Exterior Lighting Retrofits	5,049	1.17	0	$1,261	$0	$15,000	11.90
	Lighting Controls	17,593	3.17	0	$3,819	$0	$25,000	6.55
	Appliance Replacement	60	0.01	-3	$29	$8	$700	23.86
	Plug Load Controls	3,340	0.00	0	$649	$401	$2,200	2.77
	Weatherization (Tints)	13,864	5.57	109	$2,360	$2,635	$41,000	16.25
	Demand Response	0	11.75	0	$1,177	$2,350	$7,000	3.95
Total		**252,083**	**40.72**	**4,221**	**$80,704**	**$35,775**	**$1,069,900**	**12.81**
Impacted by RFP		**202,214**	**11.17**	**4,116**	**$69,941**	**$30,380**	**$988,000**	**13.69**

Table 74: Proposed EEM Savings and Cost – Civic Center Library

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Public Works	Air Handler Replacements	236,597	68.90	3,733	$70,461	$43,393	$665,000	8.82
	Chiller Plant Upgrades	151,531	25.86	0	$40,464	$22,063	$310,000	7.12
	Boiler Replacements	0	0.00	3,204	$2,717	$4,005	$18,000	5.15
	Pumping System Upgrades	23,484	5.00	-135	$5,216	$3,567	$17,000	2.58
	HVAC Controls - EMS	108,741	5.74	5,020	$35,534	$20,185	$215,000	5.48
	Interior Lighting Retrofits	46,379	34.34	0	$10,062	$0	$27,000	2.68
	Exterior Lighting Retrofits	13,021	3.24	0	$3,030	$0	$20,000	6.60
	Lighting Controls	27,883	6.40	0	$6,493	$0	$31,000	4.77
	Appliance Replacement	181	0.02	-9	$93	$25	$2,100	22.25
	Plug Load Controls	7,203	0.00	0	$1,587	$864	$5,000	2.61
	Demand Response	0	87.42	0	$7,405	$5,250	$7,000	0.24
Total		**615,020**	**236.92**	**11,814**	**$183,062**	**$99,354**	**$1,317,100**	**6.65**
Impacted by RFP		**548,236**	**111.90**	**11,823**	**$160,885**	**$93,214**	**$1,256,000**	**7.23**

Table 75: Proposed EEM Savings and Cost – Public Works

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
South Chula Vista Library	AC Unit Overhauls	1,824	4.74	0	$510	$930	$5,000	7.98
	Pumping System Upgrades	4,351	0.79	0	$879	$641	$5,000	4.96
	HVAC Controls - EMS	59,655	-15.85	858	$14,341	$8,231	$125,000	8.14
	Interior Lighting Retrofits	3,370	1.95	0	$941	$0	$8,000	8.50
	Exterior Lighting Retrofits	3,991	0.65	0	$1,295	$0	$28,000	21.62
	Lighting Controls	10,187	2.59	0	$2,570	$0	$15,000	5.84
	Appliance Replacement	60	0.01	-3	$31	$8	$700	22.08
	Demand Response	0	7.82	0	$854	$1,565	$7,000	6.37
Total		**83,438**	**2.71**	**855**	**$21,422**	**$11,375**	**$193,700**	**8.51**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 76: Proposed EEM Savings and Cost – South Chula Vista Library

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Norman Park Senior Center	AC Unit Overhauls	1,227	0.00	0	$352	$147	$5,000	13.77
	HVAC Controls - EMS	19,008	2.00	682	$5,438	$3,433	$55,000	9.48
	Interior Lighting Retrofits	2,903	0.66	0	$621	$0	$4,000	6.44
	Exterior Lighting Retrofits	2,411	0.57	0	$501	$0	$4,000	7.99
	Lighting Controls	5,804	1.27	0	$1,362	$0	$12,000	8.81
	Plug Load Controls	2,378	0.08	0	$441	$297	$1,000	1.59
	Weatherization (Tints)	4,817	0.08	0	$782	$590	$25,000	31.21
	Demand Management - Thermal Energy Storage	8,496	17.78	0	$3,585	$0	$55,000	15.34
Total		**47,044**	**22.43**	**682**	**$13,082**	**$4,468**	**$161,000**	**11.97**
Impacted by RFP		**24,812**	**3.27**	**682**	**$6,800**	**$3,433**	**$67,000**	**9.85**

Table 77: Proposed EEM Savings and Cost – Norman Park Senior Center

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Montevalle Recreation Center	Packaged RTU Overhauls	34,049	9.98	201	$9,207	$5,834	$40,000	3.71
	HVAC Controls - EMS	19,726	18.42	561	$6,650	$0	$30,000	4.51
	Interior Lighting Replacements	1,537	1.10	0	$447	$0	$3,000	6.71
	Exterior Lighting Replacements	12,258	2.91	0	$2,815	$0	$19,000	6.75
	Lighting Controls - Occupancy Sensors	12,914	3.48	0	$3,061	$0	$2,000	0.65
	Appliance Replacement	121	0.02	-6	$65	$17	$1,400	21.38
	Plug Load Controls (Vending Misers and Power Strips)	378	0.00	0	$95	$45	$250	2.15
	Weatherization (Tints)	6,318	3.29	135	$1,680	$1,421	$25,000	14.04
	Demand Response	0	8.41	0	$902	$1,683	$7,000	5.89
	Demand Management - Thermal Energy Storage	20,775	28.80	0	$8,578	$0	$85,000	9.91
Total		**108,076**	**76.41**	**891**	**$33,500**	**$9,000**	**$212,650**	**6.08**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 78: Proposed EEM Savings and Cost – Montevalle Recreation Center

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Otay Recreation Center	HVAC Controls - EMS	3,350	6.15	22	$1,362	$0	$15,000	11.02
	Interior Lighting Retrofits	1,877	1.51	0	$771	$0	$11,000	14.26
	Exterior Lighting Retrofits	9,852	2.13	0	$3,026	$0	$26,000	8.59
	Lighting Controls	12,335	3.25	0	$2,961	$0	$2,000	0.68
	Appliance Replacement	60	0.01	-3	$32	$8	$700	21.48
	Plug Load Controls	523	0.00	0	$138	$63	$500	3.17
Total		**27,997**	**13.04**	**19**	**$8,291**	**$71**	**$55,200**	**6.65**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 79: Proposed EEM Savings and Cost – Otay Recreation Center

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Park Way Recreation Center Complex	AC Unit Overhauls	3,405	1.00	46	$893	$616	$5,000	4.91
	Packaged Unit Replacements	15,023	5.83	251	$4,670	$0	$45,000	9.64
	HVAC Controls - EMS	10,803	9.11	235	$3,893	$0	$30,000	7.71
	Interior Lighting Retrofits	1,704	1.41	0	$790	$0	$15,000	18.99
	Exterior Lighting Retrofits	6,567	1.51	0	$1,585	$0	$12,000	7.57
	Lighting Controls	8,751	2.40	0	$1,866	$0	$4,000	2.14
	Automatic Pool Covers	0	0.00	4,234	$4,921	$5,293	$35,000	6.04
	Weatherization (Tints)	7,470	3.89	221	$1,610	$1,757	$30,000	17.54
	Demand Response	0	3.46	0	$584	$691	$10,000	15.93
	Demand Management - Thermal Energy Storage	10,230	10.67	0	$2,959	$0	$30,000	10.14
Total		**63,953**	**39.27**	**4,987**	**$23,770**	**$8,356**	**$216,000**	**8.74**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

It is recommended to investigate the natural gas usage at Park Way Recreation Center Complex. The pool water heating boiler and considerable space heating equipment. However, the natural gas usage is very low for a recreation center this size.

Table 80: Proposed EEM Savings and Cost – Park Way Recreation Center Complex

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Loma Verde Recreation Center	AC Unit Overhauls	0	0.00	6,960	$6,121	$8,700	$60,000	8.38
Total		**0**	**0.00**	**6,960**	**$6,1210**	**$8,700**	**$60,000**	**8.38**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 81: Proposed EEM Savings and Cost – Loma Verde Recreation Center

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Salt Creek Recreation Center	Interior Lighting Retrofits	3,757	2.78	0	$1,069	$0	$14,000	13.10
	Exterior Lighting Retrofits	10,726	2.27	0	$3,133	$0	$48,000	15.32
	Lighting Controls	16,227	4.38	0	$2,922	$0	$4,000	1.37
Total		**30,710**	**9.43**	**0**	**$7,123**	**$0**	**$66,000**	**9.27**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 82: Proposed EEM Savings and Cost – Salt Creek Recreation Center

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Veterans Recreation Center	Interior Lighting Retrofits	1,521	1.12	0	$563	$0	$10,000	17.78
	Exterior Lighting Retrofits	271	0.13	0	$73	$0	$1,000	13.73
	Lighting Controls	1,406	0.46	0	$333	$0	$3,000	9.01
Total		**3,198**	**1.71**	**0**	**$968**	**$0**	**$14,000**	**14.46**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 83: Proposed EEM Savings and Cost – Veterans Recreation Center

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Fire Station 1	Split System to VRF Conversion	15,756	3.36	0	$4,496	$2,395	$45,000	9.48
	HVAC Controls - EMS	1,722	-0.08	0	$162	$0	$4,000	24.70
	Interior Lighting Replacements	490	0.17	0	$113	$0	$500	4.41
	Exterior Lighting Replacements	194	0.05	0	$53	$0	$1,000	18.79
	Lighting Controls - Occupancy Sensors	1,156	0.16	0	$263	$0	$1,000	3.81
	Appliance Replacement	257	0.03	-12	$177	$36	$4,600	25.80
	Weatherization (Tints)	1,765	0.16	-11	$657	$236	$11,000	16.39
Total		**21,340**	**3.85**	**-23**	**$5,921**	**$2,666**	**$67,100**	**10.88**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 84: Proposed EEM Savings and Cost – Fire Station 1

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Fire Station 2	Split System to VRF Conversion	3,151	0.67	0	$1,049	$479	$9,000	8.12
	HVAC Controls - EMS	344	-0.02	0	$93	$0	$1,000	10.71
	Interior Lighting Replacements	1,663	1.37	0	$511	$0	$4,000	7.83
	Exterior Lighting Replacements	1,011	0.26	0	$320	$0	$3,000	9.36
	Lighting Controls - Occupancy Sensors	2,179	0.44	0	$542	$0	$1,000	1.84
	Appliance Replacement	181	0.02	-9	$96	$25	$2,100	21.62
	Weatherization (Tints)	620	0.06	-4	$260	$83	$9,000	14.66
Total		**9,149**	**2.81**	**-13**	**$2,872**	**$586**	**$24,000**	**8.15**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 85: Proposed EEM Savings and Cost – Fire Station 2

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Fire Station 3	Split System to VRF Conversion	4,202	0.90	0	$1,398	$639	$12,000	8.12
	HVAC Controls - EMS	459	-0.02	0	$115	$0	$1,000	8.73
	Weatherization (Tints)	703	0.06	0	$299	$94	$4,400	14.38
Total		**5,363**	**0.94**	**0**	**$1,812**	**$732**	**$17,400**	**9.20**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 86: Proposed EEM Savings and Cost – Fire Station 3

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Fire Station 4	Split System to VRF Conversion	15,756	3.36	0	$5,244	$2,395	$45,000	8.12
	HVAC Controls - EMS	1,722	-0.08	0	$467	$0	$5,000	10.71
	Interior Lighting Replacements	627	0.44	0	$177	$0	$1,000	5.64
	Exterior Lighting Replacements	6,976	1.76	0	$2,011	$0	$14,000	6.96
	Lighting Controls - Occupancy Sensors	4,897	1.19	0	$1,227	$0	$2,500	2.04
	Appliance Replacement	2,148	0.33	0	$796	$307	$9,700	11.80
	Weatherization (Tints)	1,497	0.13	-10	$618	$200	$9,000	14.24
Total		**33,622**	**7.12**	**-10**	**$10,539**	**$2,902**	**$86,200**	**7.90**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 87: Proposed EEM Savings and Cost – Fire Station 4

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Fire Station 6	Split System to VRF Conversion	10,802	2.30	0	$3,595	$1,642	$30,850	8.12
	HVAC Controls - EMS	1,180	-0.06	0	$337	$0	$4,000	11.86
	Interior Lighting Replacements	6,600	3.37	0	$1,612	$0	$2,000	1.24
	Exterior Lighting Replacements	8,012	2.15	0	$1,917	$0	$3,000	1.56
	Lighting Controls - Occupancy Sensors	2,819	0.37	0	$723	$0	$2,000	2.77
	Appliance Replacement	181	0.02	-9	$97	$25	$2,100	21.46
	Weatherization (Tints)	1,076	0.10	-7	$450	$144	$6,700	14.56
Total		**30,670**	**8.25**	**-16**	**$8,731**	**$1,810**	**$50,650**	**5.59**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 88: Proposed EEM Savings and Cost – Fire Station 6

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Fire Station 7	Split System to VRF Conversion	29,201	6.23	0	$7,590	$4,438	$83,400	10.40
	HVAC Controls - EMS	3,191	-0.16	-1	$501	$0	$10,000	19.95
	Interior Lighting Replacements	11,520	4.46	0	$2,421	$0	$15,000	6.19
	Exterior Lighting Replacements	1,095	0.27	0	$254	$0	$3,000	11.82
	Lighting Controls - Occupancy Sensors	3,712	0.49	0	$725	$0	$3,000	4.14
	Appliance Replacement	851	0.13	-6	$326	$122	$6,200	18.63
	Weatherization (Tints)	2,349	0.21	-15	$1,275	$314	$30,000	23.28
Total		**51,919**	**11.65**	**-22**	**$13,093**	**$4,874**	**$150,600**	**11.13**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 89: Proposed EEM Savings and Cost – Fire Station 7

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Fire Station 8	Split System to VRF Conversion	15,782	3.36	0	$4,071	$2,399	$45,100	10.49
	HVAC Controls - EMS	1,724	-0.08	0	$428	$0	$9,000	21.03
	Interior Lighting Replacements	6,735	4.21	0	$1,265	$0	$5,500	4.35
	Exterior Lighting Replacements	16,356	4.33	0	$3,201	$0	$10,000	3.12
	Lighting Controls - Occupancy Sensors	7,210	1.72	0	$1,267	$0	$3,000	2.37
	Appliance Replacement	181	0.02	0	$93	$25	$2,100	22.41
	Weatherization (Tints)	1,479	0.13	-9	$508	$197	$9,200	17.71
Total		**49,469**	**13.69**	**-9**	**$10,835**	**$2,622**	**$83,900**	**7.50**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 90: Proposed EEM Savings and Cost – Fire Station 8

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Animal Shelter	Packaged Unit Replacements	20,112	5.17	36	$5,659	$0	$80,000	14.14
	Space Heater Replacement	0	0.00	5,448	$4,356	$6,811	$25,000	4.18
	HVAC Controls - EMS	4,525	0.42	26	$1,842	$0	$10,000	5.43
	Appliance Replacement	1,350	0.23	6	$381	$204	$5,000	12.60
	Plug Load Controls	523	0.00	0	$103	$63	$500	4.25
	Demand Management - Thermal Energy Storage	10,772	51.79	0	$2,483	$0	$28,000	11.28
Total		**37,283**	**57.60**	**5,517**	**$14,823**	**$7,077**	**$148,500**	**9.54**
Impacted by RFP		**20,112**	**5.17**	**36**	**$5,659**	**$0**	**$80,000**	**14.14**

Table 91: Proposed EEM Savings and Cost – Animal Shelter

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Park Lighting	Exterior Lighting Retrofits	46,408	10.66	0	$13,315	$0	$94,000	7.06
	Lighting Controls	49,988	13.51	0	$11,395	$0	$3,000	0.26
Total		**96,397**	**24.17**	**0**	**$24,710**	**$0**	**$97,000**	**3.93**
Impacted by RFP		**0**	**0.00**	**0**	**$0**	**$0**	**$0**	**0.00**

Table 92: Proposed EEM Savings and Cost – Park Lighting

Site Name - Building Name	Energy Efficiency Measure (EEM)	Electricity Savings	Electric Demand Reduction	Natural Gas Savings	Annual Utility Cost Savings	Estimated Incentives	Implementation Cost	Net Simple Payback Period
		(kWh/yr)	(kW)	(thm/yr)	($/yr)	($)	($)	(yr)
Street Lighting	Streetlight Dimming Controls	381,589	0.00	0	$168,790	$45,791	$2,124,744	12.32

Table 93: Proposed EEM Savings and Cost – Street Lighting