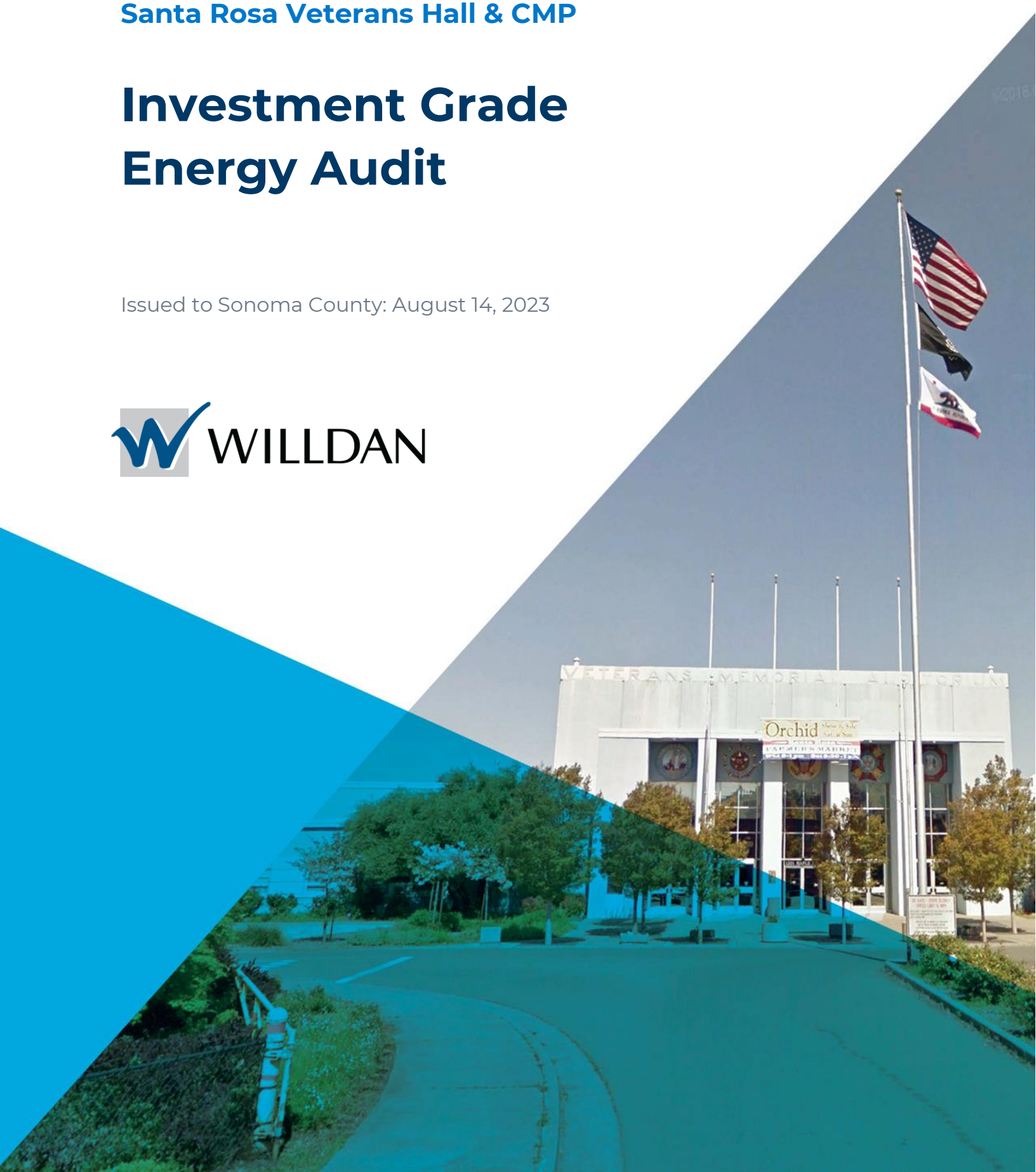
Sonoma County – PG&E SST Program - Phase 1

Santa Rosa Veterans Hall & CMP

Investment Grade Energy Audit

Issued to Sonoma County: August 14, 2023

WILLDAN



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Executive Summary

The Investment Grade Audit conducted by PG&E's Sustainable Solutions Turnkey Program and Willdan has focused in on several opportunities for Sonoma County's Santa Rosa Veterans Hall and the Central Mechanical Plant to improve its energy efficiency, resiliency, and facility performance through the implementation of a comprehensive turnkey improvement project. With assistance from County staff, we have worked together to engineer and develop these scopes of work which align with your long-term goals. In the following report and attached Appendices, you will find a summary of existing conditions and proposed scopes of work for the Santa Rosa Veterans Hall, along with a financial overview. While this opportunity would be considered a capital improvement project, Willdan has focused on providing the highest efficiency and energy savings scopes of work to minimize operational costs.

Many opportunities and options were identified by Willdan's Professional Engineers and Certified Energy Managers as they conducted this detailed study for the County. This information is intended to provide accurate projections of energy savings potential, detailed data regarding potential upgrades to building systems, and the resources to aid Sonoma County in implementing building improvements that represent optimal long-term solutions. The engineering drawings and detailed scopes are completed and have been competitively bid locally.

The next step, once permitting is completed, is to perform the installation of the scopes of work identified. During the construction phase of the project, Willdan's team will work diligently to ensure that the project is installed as designed, maximizing performance for long-term operation with no change orders to the agreed-upon scope of work.

Sincerely,

David Daniel
Vice President

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IGA Analysis Goal:

To provide a path to an energy efficient County emergency and community cooling center that is resilient, energy efficient, and has a low carbon footprint

Costs:

The costs provided in this report are based on the guaranteed maximum costs to complete the work through the PG&E SST program with Willdan as the general contractor. Specialty trades will be performed by well qualified subcontractors.

Introduction and Background

First, we would like to thank all members of the County staff for their time and efforts in helping Willdan understand the goals and objectives of Sonoma County as they relate to Santa Rosa Veterans Hall (SRVH) and the Central Mechanical Plant (CMP). This report presents detailed findings of an investment grade level analysis of energy savings and implementation costs for several specific Facility Improvements Measures (FIMs) identified at SRVH and a priority FIM recommended for the CMP at the County Admin Complex. All details of the CMP FIM will be self-contained within the FIM recommendation section.

This Investment Grade Audit was completed in coordination with PG&E's Sustainable Solutions Turnkey program (SST). PG&E acts as Sonoma County's partner and assists both the owner and Willdan throughout the entire Energy Savings Performance Contracting process.

Utility Rates

The following utility rates have been used in this report to determine the annual cost savings associated with each non-DER FIM and the CMP.

Utility Rates

Utility Company	Rate	Units
Fuel (Natural Gas)		
PG&E	$1.93	$/Therm
Electricity		
PG&E	$0.30	$/kWh

Utility Incentives & Investment Tax Credits Available

The Willdan team is leveraging three main sources of incentives and credits for this project to reduce up-front capital costs: PG&E's GK12 program, the Self-Generation Incentive Program (SGIP), and the Federal Investment Tax Credit (ITC). The first opportunity for incentives is PG&E's GK12 program, run by the Willdan GK12 team. This program offers incentives for customers within the public sector to improve the energy efficiency of their buildings while reducing ongoing operational and maintenance costs and will be used to subsidize the cost of moving from gas water heaters to electric heat pump water heaters. While PG&E's SGIP is not implemented by Willdan, Willdan will facilitate the incentive application and approval processes on the County's behalf. There may be the potential for future partnering opportunities with Sonoma Clean Power (SCP), which could result in an additional source of funding for these projects.

PG&E GK12

- Willdan is the authorized implementer of Pacific Gas and Electric Company's (PG&E's) Government K-12 (GK12) Energy Efficiency Program. The program is funded by the California ratepayer and administered by PG&E under the auspices of the California Public Utilities Commission (CPUC). GK12 is designed to support and incentivize local government, educational, and federal agency efforts to improve the energy efficiency of their buildings while reducing ongoing operational and maintenance costs. The GK12 team guides

agencies through each project step to ensure a smooth experience from enrollment to installation. This program will be used to subsidize the cost of moving from gas domestic water heaters to electric heat pump water heaters.

Battery and Energy Storage System (BESS) Incentives

- California's Self Generation Incentive Program (SGIP) is the best available option for BESS incentives. Sonoma County has already reserved an incentive at the Non-Residential Equity rate of $0.85/Wh in early 2021.
- The following table captures the approximate BESS sizes and the estimated incentive amounts for this project. As the initial SGIP reservation for the Santa Rosa Veteran's Hall was based upon the specifications of a product no longer in production (Tesla PowerPack), the proposed system size will vary slightly from the initial reservation. The reserved amount cannot be increased, and Willdan has proposed a system that will avoid any significant reduction in total incentive amount.
- The reserved incentive amount based on a 210 kWh system is $178,500. The County will also be eligible for the ITC, which will reduce the SGIP by 28% if claimed. Based on the proposed system size and SGIP reduction it is the estimated SGIP amount is $122,400. The actual SGIP incentive will be recalculated by the program at the time of submission.

Estimated SGIP Incentives

Location	System Size (kW/kWh)	Estimated Incentive
Santa Rosa Veterans Hall	80kW/220 kWh	$122,400

- For more information on SGIP, please visit their website at https://www.cpuc.ca.gov/sgip/.

Federal Investment Tax Credit (ITC):

- The Inflation Reduction Act, signed into law this year (2022), expanded and extended the ITC program
  - ITC was extended through 2024 and expanded to receive a 25.5% to 30% tax credit depending on how the project is funded
  - The IRA allows certain tax-exempt entities, such as Sonoma County, to receive a direct payment in lieu of tax credits
  - The ITC was expanded to include storage equipment (i.e. BESS)
  - Receiving ITC will reduce incentive available through SGIP

Recommended Facility Improvement Measure Summary Table

The following table summarizes the County selected package of FIMs and the energy and energy cost savings for the 6 recommended FIMs in this report.

			Cost, Savings, and Incentives								Yearly Energy and GHG Emission Reduction			
Scope #	Energy Conservation Measure	Scope of Work Summary	Turnkey Cost ($)	Utility Savings ($)	O&M Savings ($)	Total Savings ($)	Grants & Incentives ($)	Simple Payback (Years)	Resiliency/ Emergency Prepared	Microgrid	kWh Savings/ Generation	Natural Gas Savings (Therms)	Water Savings (kGal)	CO_2e Savings (Lbs)
1.1	LED Lighting Retrofit	Comprehensive type B LED lighting replacement	224,870	6,730	415	7,145	0	+20	-	-	22,430	0	0	1,530
3.2	HVAC Replacement	Replace hot water boiler serving auditorium with electric heat pump. Add three mini splits to front offices.	1,023,800	(7,410)	(1,800)	(9,210)	0	NP	✓	-	(24,710)	1,770	0	22,120
4.2	Car Canopy Solar	Install 110 kW car canopy PV array, North lot	974,790	39,010	(2,210)	36,800	248,570	18.5	✓	-	165,990	0	0	11,290
5	BESS	Install 80 kW / 220 kWh BESS	578,570	4,260	(2,700)	1,560	269,940	+20	✓	✓	(5,790)	0	0	(390)
7	BMS	Bring all building systems into one remotely controllable front end	396,260	0	0	0	0	NP	✓	✓	0	0	0	0
9	CMP Chiller Schedule Update	Provide CMP schedule and 3 years of quarterly M&V to confirm savings. Capturing 50% of the utility savings associated with this scope.	45,000	62,500	0	62,500	0	0.7			0	0	0	0
-	IGA	Phase 1 investment grade audit	2,750	-	-	-	-	-	-	-	-	-	-	-
Total			**3,246,040**	**105,090**	**(6,295)**	**98,795**	**518,510**	**+20**			**157,920**	**1,770**	**0**	**34,550**

Facility Analysis

General Building Information

General Use	Public assembly
Booked Hours	
Area	40,225 Sq. Ft
Year Built	1948
Energy Use Intensity (KBtu/ft2)	39.6
Energy Cost Index ($/ft2/yr)	$1.23

HVAC & Mechanical Systems

Cooling	N/A
Heating	Hydronic heating and duct heaters
Air Distribution	Constant volume
System Type	Split

Building Automation System

Building Automation System	Andover Controller serving auditorium AHU

Building Envelope

Roof	Concrete deck w/TPO membrane and no insulation
Windows	Single pane
Walls	Concrete and Stucco

Lighting Systems

Interior	Primarily T-8 fluorescent with some screw base incandescent and fluorescent
Exterior	Parking Lighting: LED
	Wallpacks: Mixture of LED and HPS being upgrading by building staff upon burnout

Plumbing Fixtures

Toilets & Urinals	Variable up to 1.6 GPF
Sinks	Variable up to 2.2 GPM
Commercial Dishwasher	1.53 Gallons per rack
Irrigation	Landscaping not being irrigated

General Overview

The Santa Rosa Veterans Hall is 40,225 sq ft. facility and was built in 1948. The building consists of an assembly hall used for concerts, events, and public gatherings, a club room with a wet bar used by the VFW, a number of other rentable gathering rooms including a dining room with a stage and a commercial kitchen, multipurpose rooms. In addition to rentable spaces there are 10 offices, a dressing room, numerous storage areas, a maintenance shop, a mechanical equipment mezzanine and a mechanical/electrical basement.

Santa Rosa Veterans Hall entrance

Occupancy

The building has historically had strong bookings for all spaces, however from 2020 through today (2022) bookings have been suppressed related to the Covid-19 pandemic. Indicators point towards a recovery to normal bookings in the future and all engineering and design have been directed with that assumption in mind. Comparative hours booked from selected periods in 2019 (the last normal operating year) to the current year (2022) are show below.

Existing first floor single-pane windows

Booked Hours

	2019	2022
January	497	211
February	827	130
September	691	324

Building Envelope

The building has been designated as a historical building and as such alterations to the exterior facade are not permitted. The single pane windows appear to be original to the building and are in poor to fair condition. Building exterior walls are made of stucco and concrete and are uninsulated. The roof of the building is a concrete deck with a white single ply TPO roofing that was replaced recently and is in good condition. The roof is also uninsulated. Existing hazardous materials testing reports show that much of the building envelope contains lead paint or asbestos.

Existing auditorium hot water boiler

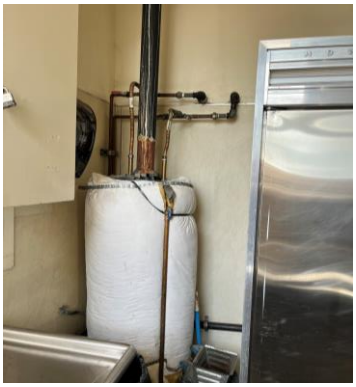
HVAC

The buildings various spaces are heated by a variety of gas based heating systems. The auditorium utilizes a hydronic heating boiler, while the remainder of the spaces in the hall utilize duct heaters. With the exception of the duct heater serving the club room, all equipment is approaching the end of its useful life. A few of the offices have installed window mounted A/C for occupant comfort, but beyond that there is no cooling in the building. Supply and exhaust ventilation needs are met through a variety of supply and exhaust fans throughout the building.

The existing HVAC system for the Auditorium is controlled by an Andover Controls system located in the same mechanical room as the primary AHU. The remaining fans and duct furnaces are controlled locally at the equipment and with thermostats and equipment enable timers in the occupied space.

A HVAC equipment schedule can be found in Appendix 1.4

Existing air handler serving auditorium



Club Room water heater

Janitor closet water heater

Sink missing aerator and no faucet controls

Dishwasher in commercial kitchen

Water

Domestic Hot Water (DHW) is supplied via a collection tank type and tankless water heaters. Hot water for the commercial kitchen is supplied from a gas tankless water heater located in the kitchen. Restrooms are supplied with hot water via a gas and electric tank type water heater in the mechanical mezzanine. The club room has its own dedicated gas tank type water heater. Hot water in the snack bar is provided by a small electric point of use water heater. Hot water at the mop sink in the janitor's closet is provided via an electric tank type water heater.

A DHW equipment schedule can be found in Appendix 1.4

Water fixtures ranged in flow rates and control types with some missing aerators and flow controls all together and others already having been updated. In the commercial kitchen there is an aging dishwasher that uses approximately 1.53 gallons per rinse rack which is almost double the current Energy Star standard of 0.89 gallons per rinse rack.

Toilets and urinals ranged in flush rates and control types with some flushing at rates as high as 1.6 GPM and possessing only manual controls with others having automatic flushers and low flow flush valves.

Landscaping is no longer being irrigated at this property.

Lighting & Electrical Systems

The interior lights of this building are primarily 28-Watt T8 fluorescent fixtures with electronic ballasts. Incandescent and compact fluorescent (CFL) lamps are also present in some areas. The exterior parking lights have all been replaced with LEDs, and a portion of the exterior wall packs have been re-lamped with corncob style LEDs. Any lighting that has not already been replaced with LEDs is a strong candidate for upgrades that will reduce operational expenditures while also improving lighting quality. A complete lighting audit can be found in Appendix 1.5

Electrical service from PGE enters at the rear of the building through a pad mounted 208V step down transformer that feeds bussing with a 1,200A main disconnect, which is then distributed to a number of sub panels throughout the building. This service is backed up by a 100kW generator and an automatic transfer switch to provide emergency power to the building during an outage. The generator and the main switchgear were replaced 2021 and sized to meet the current building load and use. The current generator would not be able to provide backup to a large new cooling load such as the for the Auditorium. To electrify and provide mechanical cooling the building, a new larger backup power will be needed.

Existing linear fluorescent bathroom fixtures

28w linear fluorescent fixture

Backup generator

Step down transformer, generator, and main switchgear

Utility Analysis

Summary Table of Overall Building Energy Use Intensity (EUI)

The following table shows a comparison of the Santa Rosa Veterans Hall EUI in 2019, the latest twelve months (current period), and the modeled EUI of the "Recommended Facility Improvement Measures – Good Package" was implemented. The benchmark is from the published 2012 EIA CBECS Public Assembly data. To account for no mechanically cooling in the space, an adjusted baseline was also included to remove this energy end use.

In 2019, the most recent year with no Covid impact, the facility's electricity consumption was significantly more efficient than the CBECS benchmark especially. This is attributed to the facilities low lighting power density, limited HVAC use, good energy efficiency behaviors, and low plug load usage. The facilities natural gas usage is slightly higher than the benchmark.

In the current period, Santa Rosa Veterans Hall uses roughly 60% of the electricity as it did in 2019. The gas usage is roughly the same between the years. The facility staff has adjusted the building operation to match the lower occupancy throughout the year.

Following the recommended improvements, the facility will increase energy consumption at the building level but the increase will be more than offset by the proposed solar PV.

Building EUI Summary Table

	Total EUI (kBTU/ft2)	**Electric EUI** (kBTU/ft2)	**Natural Gas EUI** (kBTU/ft2)	**Electric Usage** (kWh)	**Natural Gas Usage** (Therms)
CBECS Public Assembly benchmark	84.2	49.4	34.8	582,390	13,998
CBECS Public Assembly benchmark, cooling removed	66.5	31.7	34.8	373,720	13,998
Existing (2019)	39.6	13.6	26.0	160,380	10,463
Current Period	34.3	8.3	26.0	98,103	10,441
Proposed, before solar	35.4	13.7	21.7	162,025	8,718
Proposed, after solar	NA	NA	NA	3,383	8,718

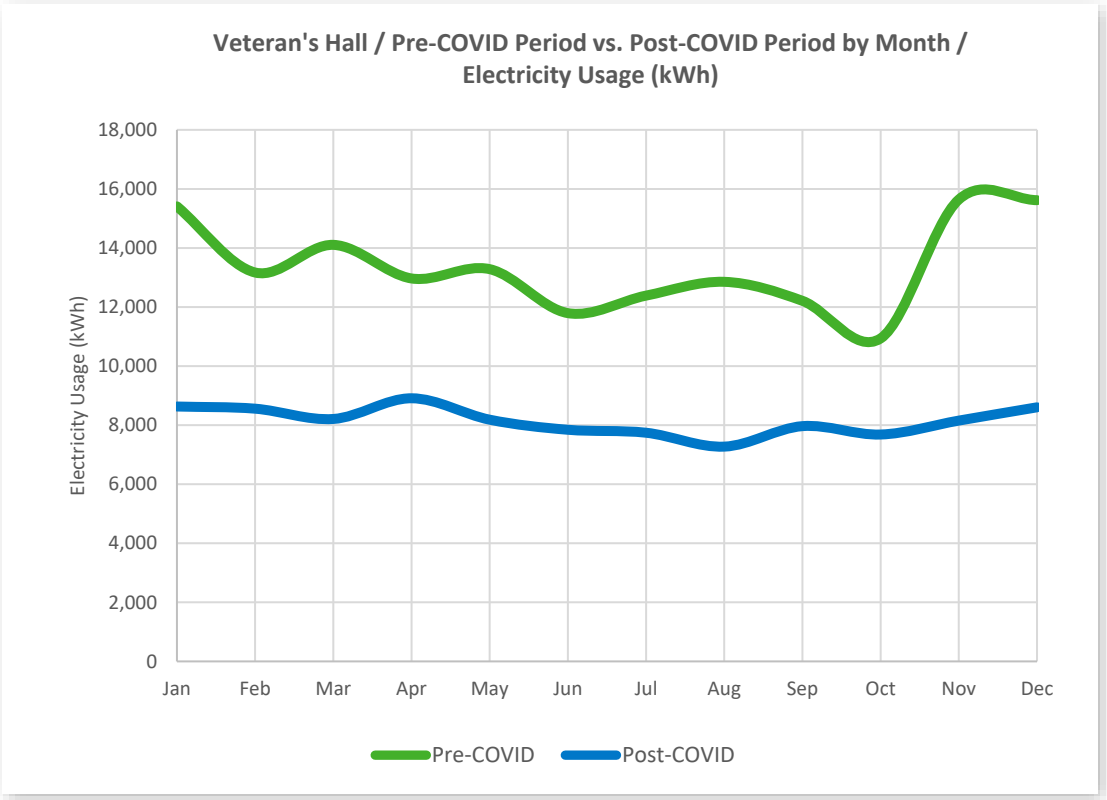
Electric Use

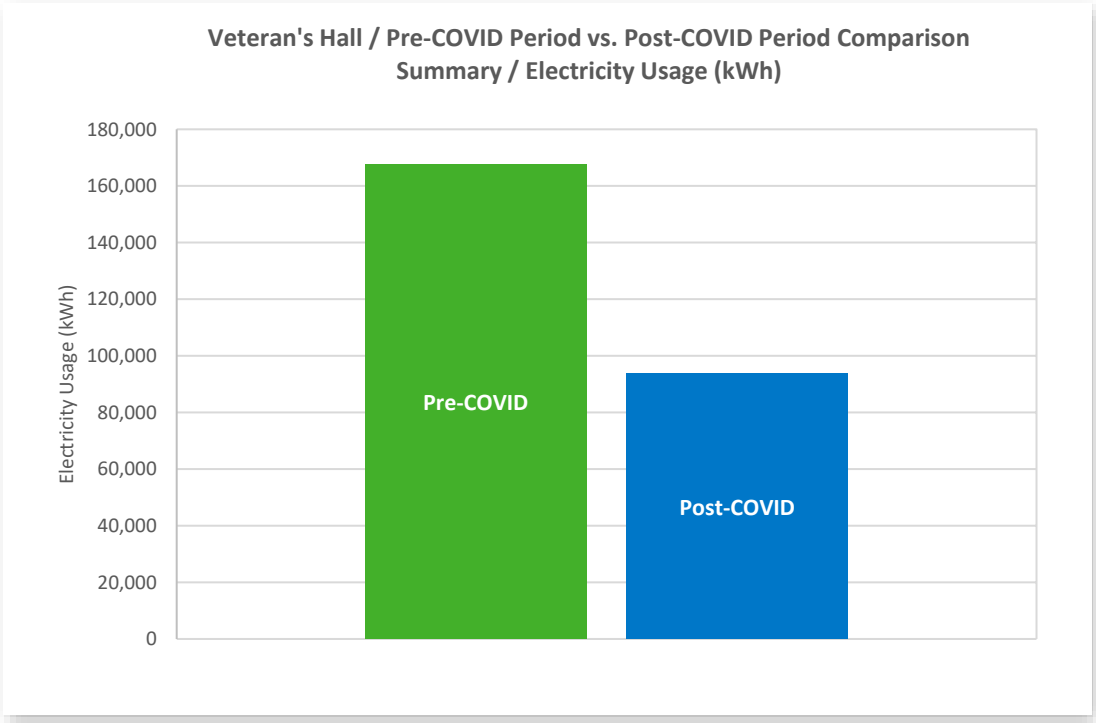
The Santa Rosa Veterans Hall is serviced with electrical power by SCP and PG&E. All electrical service is provided through a single meter. The building is on PG&E's B-10-S, Medium Demand General Service rate and SCP's B-10-S, Medium General Service rate with the Evergreen Premium option. The rates are as follows:

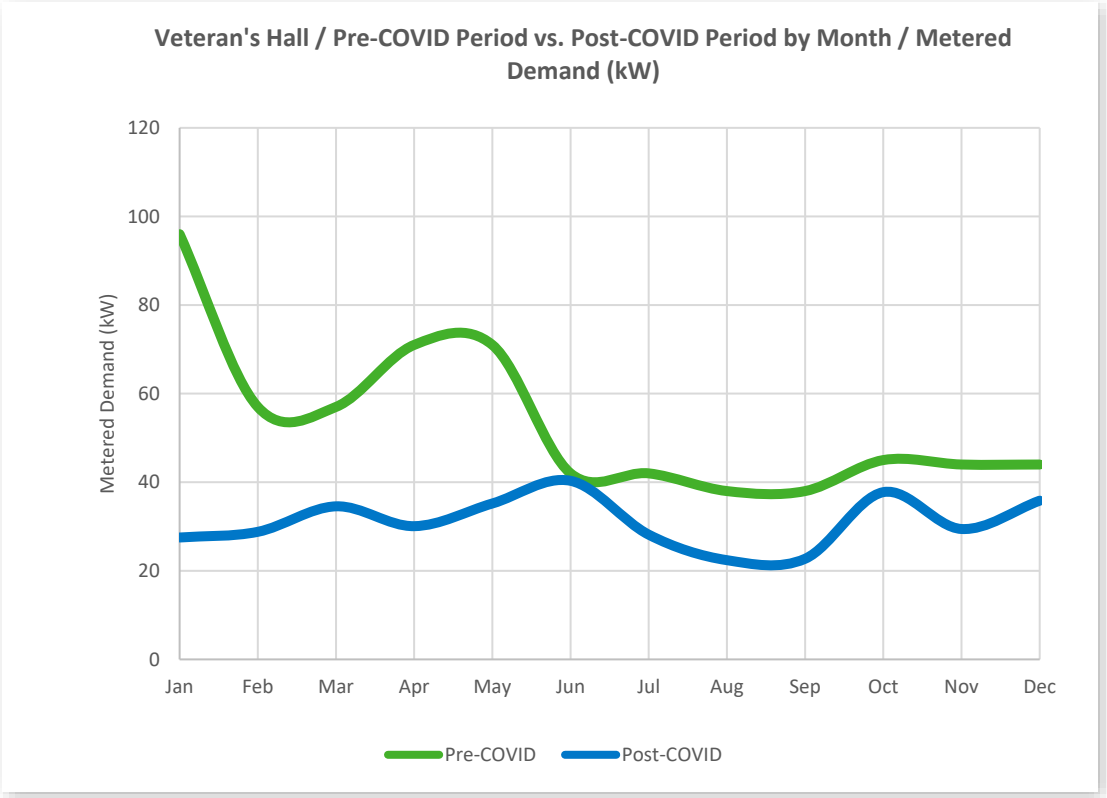
- Customer Charge: $ 6.42 daily billing
- Summer Consumption Charge (June 1st through September 30th)
  - On-Peak: $0.2148/kWh generated by SCP and an Evergreen Premium charge of $0.025/kWh. There is an additional charge of $ 0.05717/kWh distributed through PG&E.
  - Partial-Peak: $0.15311/kWh generated by SCP and an Evergreen Premium charge of $0.025/kWh. There is an additional charge of $ 0.05717/kWh distributed through PG&E.
  - Off-Peak: $0.12054/kWh generated by SCP and an Evergreen Premium charge of $0.025/kWh. There is an additional charge of $ 0.05717/kWh distributed through PG&E.
- Winter Consumption Charge (October 1st through May 31st)
  - On-Peak: $0.15675/kWh generated by SCP and an Evergreen Premium charge of $0.025/kWh. There is an additional charge of $ 0.03894/kWh distributed through PG&E.
  - Off-Peak: $0.12127/kWh generated by SCP and an Evergreen Premium charge of $0.025/kWh. There is an additional charge of $ 0.03894/kWh distributed through PG&E.
  - Super Off-Peak: $0.08493/kWh generated by SCP and an Evergreen Premium charge of $0.025/kWh. There is an additional charge of $ 0.03894/kWh distributed through PG&E.
- Demand Charge
  - All times of year are charged $17.47 per kilowatt (kW).

To evaluate the electric rates charged by PG&E, a blended rate is calculated to demonstrate the average cost paid by the County. When evaluating the billing for the facility, blended rates from the most recent 12 months (Sept 2021 through Sept 2022) were $0.30/kWh. These rates blend all fees and charges included on a monthly bill such as customer charge, consumption charges, and demand changes. The utility rate charged by PG&E is around 66% higher than the regional average. The average retail price of electricity in the commercial sector for the Pacific Continuous Region in August 2022 was $0.2067 per kWh (Energy Information Administration, Electric Power Monthly). This region includes California, Oregon, and Washington.

Electricity usage is fairly consistent throughout the year. With minor increases in the winter due to higher number of events being held at the Veterans Hall and resulting increases in lighting hours and fans to distribute heating.


Veteran's Hall / Pre-COVID Period vs. Post-COVID Period by Month / Electricity Usage (kWh)
Electricity Usage (kWh)
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Pre-COVID
Post-COVID


Veteran's Hall / Pre-COVID Period vs. Post-COVID Period Comparison Summary / Electricity Usage (kWh)
Electricity Usage (kWh)
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Pre-COVID
Post-COVID



Pre-Covid Period Electric Data (January 2017-December 2019)

Read Date	Bill Cost ($)	Consumption (kWh)	Demand (kW)
1/31/2017	$1,025	6,476.0	0.0
2/28/2017	$1,673	12,951.0	0.0
3/31/2017	$1,955	15,065.0	0.0
4/30/2017	$1,648	12,840.0	0.0
5/31/2017	$2,154	12,355.0	0.0
6/30/2017	$2,492	13,638.0	80.0
7/31/2017	$2,633	14,155.0	80.0
8/31/2017	$2,580	13,464.0	44.0
9/30/2017	$2,321	12,857.0	45.0
10/31/2017	$3,387	17,499.0	54.0
11/30/2017	$1,631	11,118.0	64.0
12/31/2017	$2,594	19,966.0	78.0
1/31/2018	$2,055	14,924.0	78.0
2/28/2018	$1,475	14,611.0	84.0
3/31/2018	$2,028	15,521.0	84.0
4/30/2018	$1,777	13,666.0	84.0
5/31/2018	$2,493	13,464.0	84.0
6/30/2018	$2,414	13,863.0	52.0
7/31/2018	$2,638	13,895.0	52.0
8/31/2018	$2,268	12,880.0	38.0

Read Date	Bill Cost ($)	Consumption (kWh)	Demand (kW)
9/30/2018	$2,438	13,395.0	39.0
10/31/2018	$2,999	14,819.0	53.0
11/30/2018	$2,141	15,262.0	56.0
12/31/2018	$2,166	14,928.0	96.0
1/31/2019	$2,112	15,409.0	96.0
2/28/2019	$1,833	13,169.0	57.0
3/31/2019	$1,949	14,106.0	57.0
4/30/2019	$1,678	12,968.0	71.0
5/31/2019	$2,307	13,283.0	71.0
6/30/2019	$3,030	11,794.0	42.0
7/31/2019	$3,011	12,387.0	42.0
8/31/2019	$3,083	12,854.0	38.0
9/30/2019	$3,530	12,210.0	38.0
10/31/2019	$3,131	10,939.0	45.0
11/30/2019	$3,281	15,642.0	44.0
12/31/2019	$3,323	15,619.0	44.0

Post-Covid Period Electric Data (September 2021-September 2022)

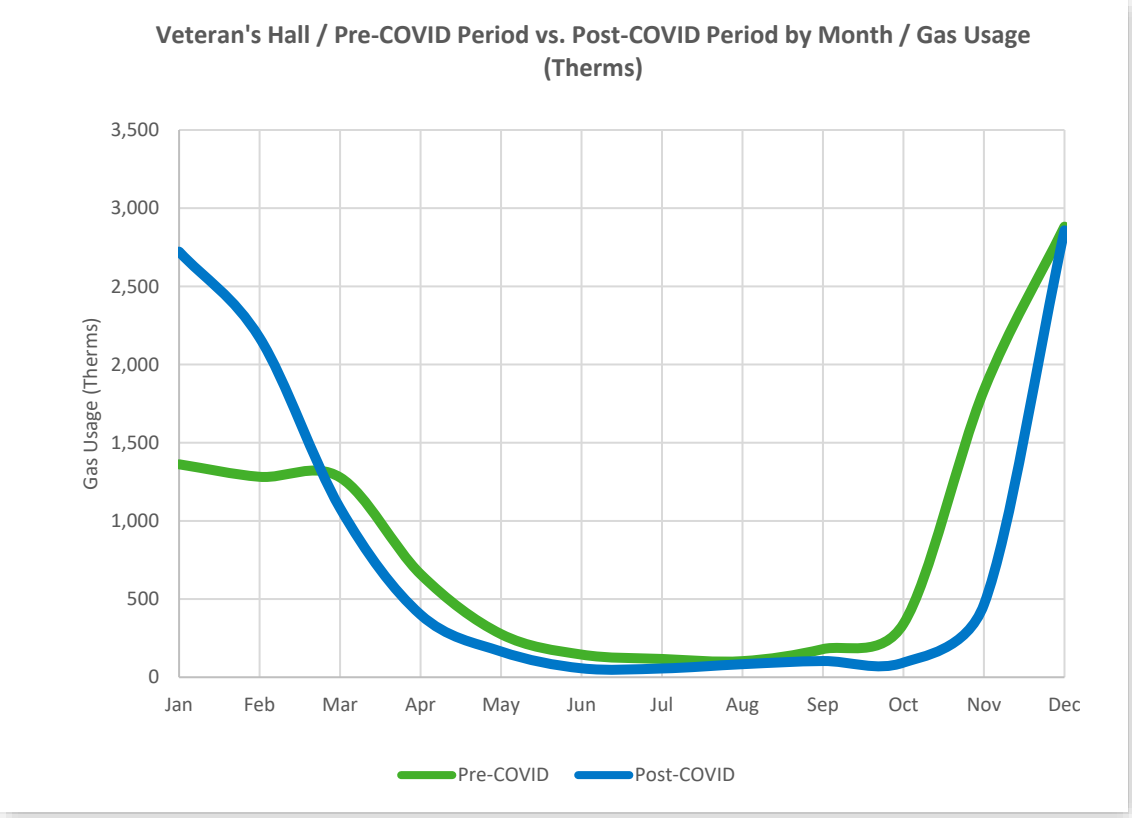
Read Date	Bill Cost ($)	Consumption (kWh)	Demand (kW)
10/4/2021	$2,182	7,628.0	12.8
11/2/2021	$2,161	7,683.0	37.8
12/3/2021	$2,128	8,155.0	29.4
12/31/2021	$2,303	8,604.0	35.8
2/1/2022	$2,339	8,631.0	27.5
3/3/2022	$2,305	8,558.0	28.8
4/1/2022	$2,001	8,210.0	34.6
5/3/2022	$2,609	8,910.0	30.1
6/2/2022	$2,542	8,185.0	35.2
7/1/2022	$2,986	7,844.0	40.3
8/1/2022	$2,723	7,744.0	28.2
8/31/2022	$2,476	7,273	22.4
10/2/2022	$2,907	8,306	32.6

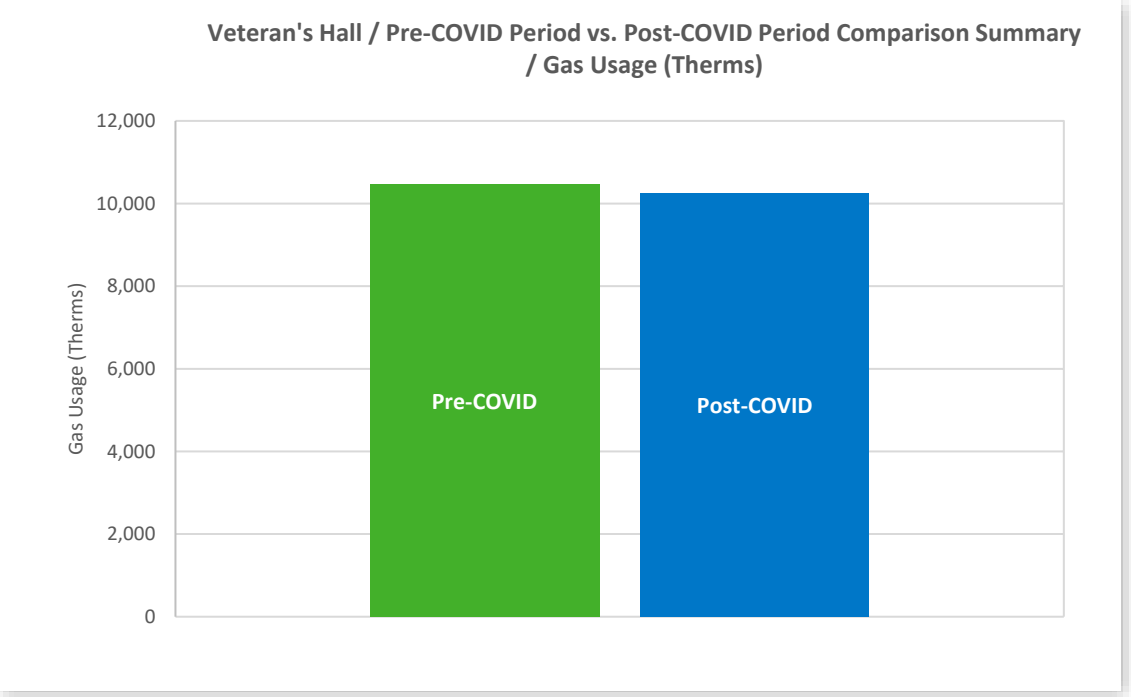
Fuel Use – Natural Gas

The Santa Rosa Veterans Hall is serviced with natural gas by PG&E. The County is billed according to the GNR1 – General Commercial Service rate schedule as follows:

- Summer Consumption Charge (April 1st through October 31st)
  - First 4,000 Therms: $1.80980 per Therm where Therm is the metered amount of natural gas consumed.
  - Excess Therms: $1.46163 per Therm where Therm is the metered amount of natural gas consumed.
- Winter Consumption Charge (November 1st through March 31st)
  - First 4,000 Therms: $1.97388 per Therm where Therm is the metered amount of natural gas consumed.
  - Excess Therms: $1.56435 per Therm where Therm is the metered amount of natural gas consumed

To evaluate natural gas rates charged by PG&E, an annual average rate is calculated to demonstrate the average cost paid by the County. When evaluating the billing for the facility, In the 3 years analyzed from January 2017 - December 2019, the average cost of natural gas used by the Veterans Hall was around $ 0.78 per Therm. In the most recent 12 months (September 2021 through September 2022) the average cost of natural gas has increased to $ 1.90 per Therm. Where a Therm is a unit of measure equaling 100,000 Btus of energy. A cubic foot of natural gas contains between 950 to 1,150 Btus of heat resulting from combustion, depending on environmental factors. As a comparison, the average retail price of natural gas in the commercial sector of the Pacific region is $ 1.000 per Therm (Energy Information Administration, Natural Gas Monthly). This region includes California, Oregon, and Washington. Overall, the cost of natural gas paid by the County is roughly 90% higher than what others are paying in the region.


Veteran's Hall / Pre-COVID Period vs. Post-COVID Period by Month / Gas Usage (Therms)
Gas Usage (Therms)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Pre-COVID
Post-COVID


Veteran's Hall / Pre-COVID Period vs. Post-COVID Period Comparison Summary / Gas Usage (Therms)
Gas Usage (Therms)
12,000
10,000
8,000
6,000
4,000
2,000
0
Pre-COVID
Post-COVID

The natural gas use has notable reduced usage during the summer months due to reduced need for heating in the building. Gas usage in the 12 months making up the post covid period has been comparable to 2019 in the pre covid period

Pre-Covid Period Natural Gas Data (January 2017-December 2019)

Read Date	Bill Cost ($)	Consumption (therms)
1/31/2017	$367	336.0
2/28/2017	$1,369	1,263.0
3/31/2017	$1,322	1,420.0
4/30/2017	$1,208	1,596.0
5/31/2017	$1,211	1,527.0
6/30/2017	$1,151	1,383.0
7/31/2017	$1,139	1,424.0
8/31/2017	$1,100	1,413.0
9/30/2017	$1,028	1,404.0
10/31/2017	$1,093	1,603.0
11/30/2017	$1,172	2,093.0
12/31/2017	$1,360	2,410.0
1/31/2018	$1,351	1,366.0
2/28/2018	$1,243	1,284.0
3/31/2018	$1,279	1,428.0
4/30/2018	$1,156	1,638.0
5/31/2018	$1,095	1,552.0
6/30/2018	$1,014	1,399.0
7/31/2018	$1,119	1,419.0
8/31/2018	$1,168	1,429.0
9/30/2018	$1,108	1,401.0
10/31/2018	$1,132	1,639.0
11/30/2018	$1,246	2,126.0
12/31/2018	$1,499	2,489.0
1/31/2019	$1,510	1,362.0
2/28/2019	$1,399	1,282.0
3/31/2019	$1,470	1,278.0
4/30/2019	$641	659.0
5/31/2019	$218	276.0
6/30/2019	$162	145.0
7/31/2019	$155	117.0
8/31/2019	$138	103.0
9/30/2019	$210	180.0
10/31/2019	$392	342.0
11/30/2019	$2,295	1,837.0
12/31/2019	$3,779	2,882.0

Post-Covid Period Natural Gas Data (September 2021 – September 2022)

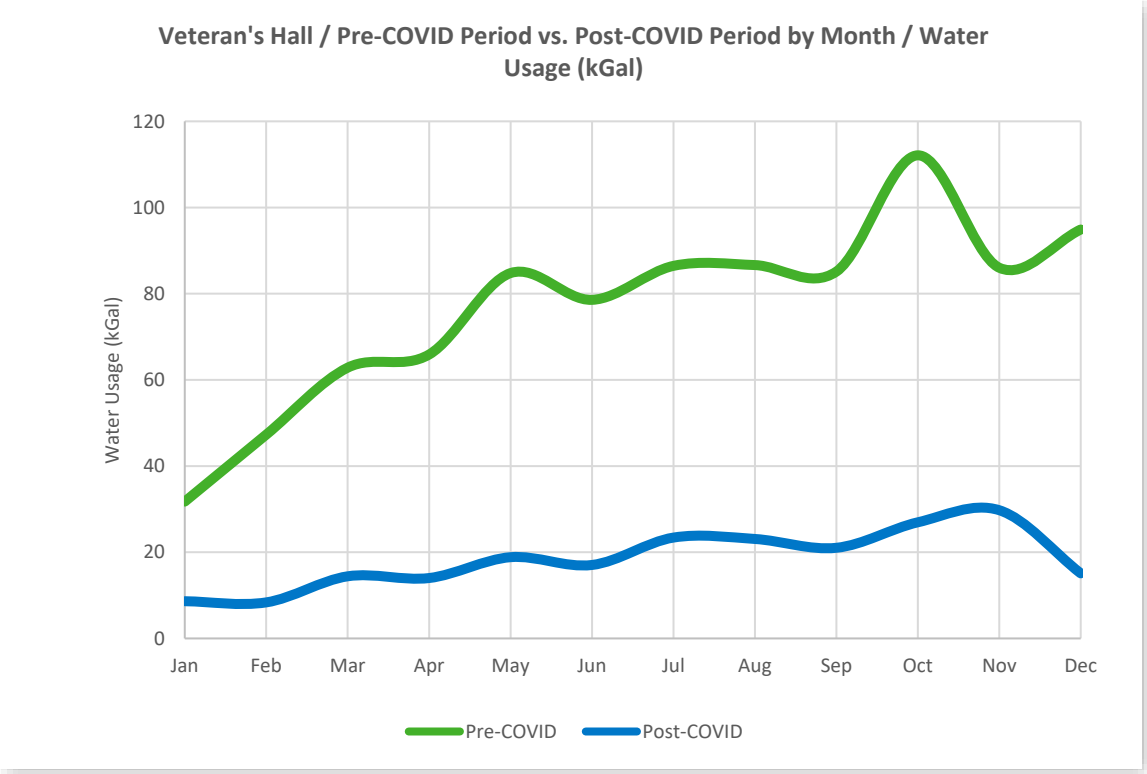
Read Date	Bill Cost ($)	Consumption (therms)
10/4/2021	$142	101.0
11/2/2021	$303	177.0
12/2/2021	$950	486.0
12/31/2021	$5,438	2,826.0
2/1/2022	$5,561	2,810.0
3/02/2022	$4,349	2,238.0
3/31/2022	$1,726	927.0
5/2/2022	$715	427.0
6/1/2022	$289	143.0
8/2/2022	$252	112.0
8/31/2022	$184	80.0
10/3/2022	$271	114.0

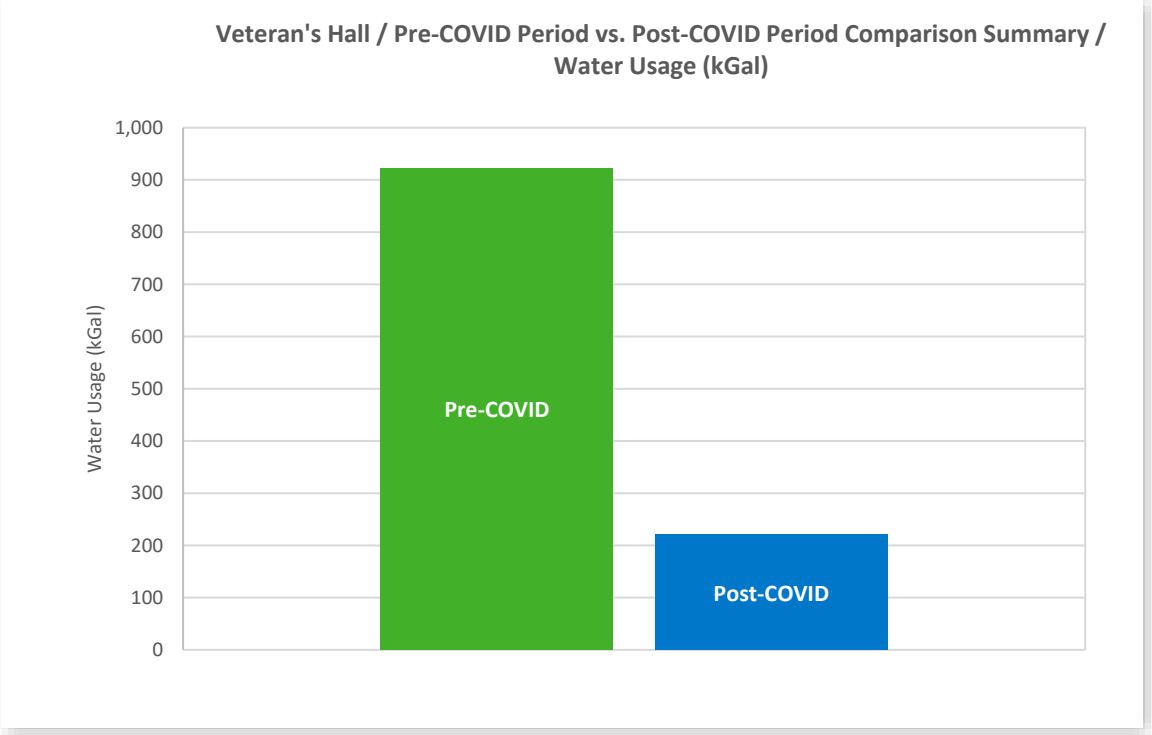
Water Consumption

Much of the Southwestern US is experiencing long term and severe drought, so water conservation is of the utmost importance. Some water conservation measures have already been implemented such as reducing irrigated landscaping at all County owned properties, and we have made additional recommendations around water fixtures inside the building.

The Santa Rosa Veterans Hall is serviced with water and sewer by the City of Santa Rosa. This service is billed at the following rates:

- Commercial Water Usage: $6.52/kgal
- Standard Strength Sewer Usage: $15.42/kgal
- 2" Water Meter Fixed Charge: $98.33/month
- 2" Water Meter Sewer Fixed Charge: $188.84/month





Pre-Covid Period Water Data (January 2017-December 2019)

Read Date	Bill Cost ($)	Consumption (Gallons)
1/31/2017	$277	37,000.0
2/28/2017	$553	73,733.0
3/31/2017	$604	79,267.0
4/30/2017	$602	81,290.0
5/31/2017	$733	102,710.0
6/30/2017	$670	91,545.0
7/31/2017	$778	109,909.0
8/31/2017	$836	115,812.0
9/30/2017	$811	113,948.0
10/31/2017	$1,151	170,149.0
11/30/2017	$536	69,103.0
12/31/2017	$612	79,352.0
1/31/2018	$308	29,448.0
2/28/2018	$342	35,467.0
3/31/2018	$564	72,517.0
4/30/2018	$611	79,095.0
5/31/2018	$576	75,890.0
6/30/2018	$580	72,523.0
7/31/2018	$590	73,508.0
8/31/2018	$635	79,921.0
9/30/2018	$472	65,625.0
10/31/2018	$646	82,607.0

Read Date	Bill Cost ($)	Consumption (Gallons)
11/30/2018	$556	80,477.0
12/31/2018	$562	56,385.0
1/31/2019	$346	34,052.0
2/28/2019	$332	32,667.0
3/31/2019	$380	36,727.0
4/30/2019	$356	37,273.0
5/31/2019	$608	75,759.0
6/30/2019	$579	71,648.0
7/31/2019	$609	75,951.0
8/31/2019	$552	64,195.0
9/30/2019	$610	75,823.0
10/31/2019	$656	83,591.0
11/30/2019	$814	108,501.0
12/31/2019	$719	148,962.0

Post-Covid Period Water Data (July 2021- July 2022)

Read Date	Bill Cost ($)	Consumption (kGal)
8/2/2021	$906	29
9/1/2021	$756	22
10/1/2021	$735	21
11/2/2021	$885	28
12/2/2021	$928	30
1/2/2022	$585	14
2/1/2022	$456	8
3/3/2022	$477	9
4/1/2022	$585	14
5/1/2022	$585	14
6/1/2022	$692	19
7/1/2022	$561	17
8/1/2022	$574	19

FIMs Recommended for Implementation

FIM-1.1: Type B LED Lighting Retrofit

Existing Conditions

The interior lights of this building are primarily 28-Watt T8 fluorescent fixtures with electronic ballasts. Incandescent and compact fluorescent (CFL) lamps are also present in some areas. The exterior parking lights have all been replaced with LEDs, and a portion of the exterior wall packs have been re-lamped with corncob style LEDs. Any lighting that has not already been replaced with LEDs is a strong candidate for upgrades that will reduce operational expenditures while also improving lighting quality. A complete lighting audit can be found in Appendix 1.5

Auditorium troffer

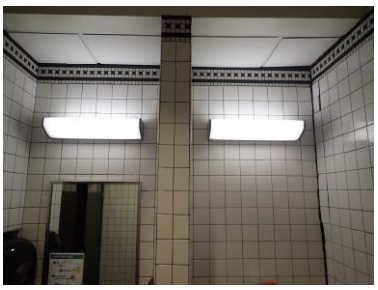
Decorative storage room fixture

Proposed Condition

This measure proposes to replace all existing non-LED lamps with new type B ballast bypassed lamps per the table below. This will provide a consistent look to lighting throughout the building and minimize ongoing maintenance requirement while re-using the existing fixtures. Where they exist, battery backed ingress and egress fixtures will retain that capability. Existing ballasts are to be removed and new lamps direct wired with line voltage and appropriate electrical connections. All lighting products will be Energy Star rated or DLC listed.

Auditorium lighting

As part of this retrofit, title 24 compliant lighting controls will be installed ensuring both occupant satisfaction as well as minimized lighting hours. These controls will be tied back to the building wide BMS (FIM-) to provide maximum controllability and operational insight.



Bathroom lighting

Scope of Work

Demo

- All ballasts will be removed from the light fixture system, including remote ballasts.

Installation Phase:

- All interior fluorescent, incandescent, halogen, and HID lamps shall be retrofitted with energy-efficient LED retrofit lamps, except those specifically listed as exclusions. Any fixtures that cannot be adequately retrofitted shall be replaced with a similar LED fixture.
- All existing fixtures with emergency backup ballasts shall retain that function with new UL 924 listed battery-powered backup drivers or UL 924 listed backup inverters.

- All switching schemes shall be updated to comply with California Energy Code, Title 24.
- Coordinate all lighting retrofit and replacement work with asbestos and lead abatement team.
- Any conductor that does not satisfy NFPA 70 shall be replaced. Blue, orange, and yellow conductors used in fluorescent fixtures shall be replaced with black/white conductors for 120V line voltage application. Any damaged conductor shall be replaced.
- Fluorescent sockets shall be listed for line-voltage LED tubes.
- Light levels shall be recorded in each space using the same handheld light meter used before the installation phase. Resulting light levels shall be equal to or greater than the measurement made before the installation phase. Target minimums are as follows:
  - Offices: 40 fc
  - Conference/Dining Rooms: 50 fc
  - Corridors / Entryways / Stairwells: 10 fc
  - Restrooms: 15 fc
  - Auditorium: 50 fc

Shop lights

North Room lighting

Lodge Room lighting

Hallway lighting

Savings Methodology and Assumptions

Savings for this measure were calculated by establishing an energy baseline and then comparing that against our proposed improved condition, The baseline was established by completing a detailed audit of all the existing lighting in the building. We then used the event data provided by building staff (listed in appendix 1.8) to determine operating hours for each fixture. This was by summing the number of hours each space was rented through the course of the year and then adding a time buffer to each discrete rental event to account for pre-event preparation and post-event cleaning. With the existing fixture wattages and burn hours for each fixture we are able to calculate annual lighting load. This calculated value was then compared against billing data to ensure accuracy and provide a means to further calibrate the calculations. The proposed lighting load was calculated in the same way, with the appropriate reductions in burn hours from Title 24 required lighting controls and wattage reductions from specified lighting replacements. The savings then is the difference between the existing and the proposed lighting loads.

Savings for this measure assume that the wattage reductions below are met and that all fixtures noted are upgraded. Real savings will be impacted by actual building operations, occupancy, and lamp burn hours.

2019 occupancy hours used for savings calculations:

- Office space – 4340

- Auditorium – 1724
- Club room -868
- Conference room 499
- Dining room – 1868
- Judge chamber – 542
- Kitchen – 1435
- Lodge room – 1482
- North Room – 1045
- Restrooms – 1868
- Lobby – 1868
- Storage / Utility / Mech rooms – 100

Exclusions

- Hazardous materials testing, removal, and abatement
- All exterior light fixtures are not in scope.
- The following shall be specifically excluded from the Scope of Services provided:
  - Existing LED lamps and fixtures
  - Theatrical lighting (theater house lighting is included in the project scope)
  - Dimming controls of auditorium house lights
  - Projection devices
  - Decorative lighting applications not otherwise specified in this document
  - Backlit signs
  - Exit signs
  - Abandoned fixtures
  - Task lighting on modular furniture
  - Existing emergency lighting battery backup units (bug-eye lights)

Room No.	Room Name	Fixture Description	Fixture Qty.	Existing Lamps	Type-B Retrofit Scope Description
1001	Lobby	Recessed Cans	8	Corncob LED	***Not in scope***
1002	Roof Access	Lampholder	1	A	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1003	Concessions	4' Wraparound	1	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1003	Concessions	Globe	1	A	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1005	Women	≈6" Recessed Downlights	2	2- or 4-pin CFL	Type A Retrofit: 2-lamp, CFL, 2- or 4-pin sockets to ballast-compatible LED equivalent.
1005	Women	8' Pointable Cylindrical Tandem Strips	4	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1007	Storage	1'×4' Prismatic Troffer	2	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1008	Conference Room	1'×4' Prismatic Troffer	4	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1009	United Veterans	1'×4' Prismatic Troffer	2	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1011	Hall	2'×2' Prismatic Troffer	5	2FT817W2L	Type B Retrofit: 2-lamp, 2ft, T8 fluorescent fixture to 2x7W LED tubes, remove ballast, install pre-wired socket kit.
1012	Hall	Globe or Lampholder	1	A	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1013	Stage	Downlight Pendants	3	BR30	Retrofit 1-lamp 65W BR30 floodlight with LED equivalent.
1015	Dining Room	4'×4' Custom Surface Mount	20	4FT828W4L	Type B Retrofit: 4-lamp, 4ft, T8 fluorescent fixture to 4x10W LED tubes, remove ballast, install pre-wired socket kit.
1016	Toilet	Pendant	1	A	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1017	Hall	2' Wraparound	1	2FT817W2L	Type B Retrofit: 2-lamp, 2ft, T8 fluorescent fixture to 2x7W LED tubes, remove ballast, install pre-wired socket kit.
1018	Storage	4' Wraparound	1	4FT828W4L	Type B Retrofit: 4-lamp, 4ft, T8 fluorescent fixture to 4x10W LED tubes, remove ballast, install pre-wired socket kit.
1019	Kitchen	4' Wraparound	6	4FT828W4L	Type B Retrofit: 4-lamp, 4ft, T8 fluorescent fixture to 4x10W LED tubes, remove ballast, install pre-wired socket kit.
1020	Hall	2'×2' Custom Surface Mount	2	2FT817W2L	Type B Retrofit: 2-lamp, 2ft, T8 fluorescent fixture to 2x7W LED tubes, remove ballast, install pre-wired socket kit.
1021	Men	2' Uplight/Downlight	8	2FT817W2L	Type B Retrofit: 2-lamp, 2ft, T8 fluorescent fixture to 2x7W LED tubes, remove ballast, install pre-wired socket kit.
1021	Men	4' Uplight/Downlight	1	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1021	Men	Recessed Downlight	3	2- or 4-pin CFL	Type A Retrofit: 2-lamp, CFL, 2- or 4-pin sockets to ballast-compatible LED equivalent.
1022	Women	2' Uplight/Downlight	5	2FT817W2L	Type B Retrofit: 2-lamp, 2ft, T8 fluorescent fixture to 2x7W LED tubes, remove ballast, install pre-wired socket kit.
1022	Women	4' Uplight/Downlight	1	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.

Room No.	Room Name	Fixture Description	Fixture Qty.	Existing Lamps	Type-B Retrofit Scope Description
1022	Women	Recessed Downlight	3	2- or 4-pin CFL	Type A Retrofit: 2-lamp, CFL, 2- or 4-pin sockets to ballast-compatible LED equivalent.
1023	Women	4' Wraparound	1	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1024	Storage	4' Strip with Reflector	2	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1025	Storage	4' Strip with Reflector	2	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1027	Kitchen	4' Wraparound	2	4FT828W4L	Type B Retrofit: 4-lamp, 4ft, T8 fluorescent fixture to 4x10W LED tubes, remove ballast, install pre-wired socket kit.
1028	Club Room	3'×3' Custom Surface Mount	12	3FT825W3L	Type B Retrofit: 3-lamp, 3ft, T8 fluorescent fixture to 3x12W LED tubes, remove ballast, install pre-wired socket kit.
1028	Club Room	≈6" Recessed Downlights	4	BR30	Retrofit 1-lamp 65W BR30 floodlight with LED equivalent.
1028	Club Room	Cooler Light			***Not in scope***
1029	Bar	≈2" Recessed Downlights	9	MR16	Retrofit 1-lamp 50W halogen MR16 with LED equivalent.
1030	Hall	2'×2' Custom Surface Mount	11	2FT817W2L	Type B Retrofit: 2-lamp, 2ft, T8 fluorescent fixture to 2x7W LED tubes, remove ballast, install pre-wired socket kit.
1032	Storage	Globe	1	A	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1033	Stairs	4' Wraparound	1	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1034	Mechanical / Electrical	Globe (glass missing)	2	A CFL	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1035	Storage	Recessed	1	BR30	Retrofit 1-lamp 65W BR30 floodlight with LED equivalent.
1036	Electric Input				***Not in scope***
1037	Service Yard	Wallpack	1		***Not in scope***
1038	Stage	Striplight	3	-	***Not in scope***
1039	Stairs	4' Wraparound	1	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1040	Storage	Globe	1	A	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1042	(In front of auditorium)	4' Wraparound	1	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1043	(In front of auditorium)	Globe or Lampholder	1	A	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1045	Auditorium	2'×4' Prismatic Troffer	12	4FT828W4L	Type B Retrofit: 4-lamp, 4ft, T8 fluorescent fixture to 4x10W LED tubes, remove ballast, install pre-wired socket kit.
1045	Auditorium	Large Can	12	Corncob LED	***Not in scope***
1045	Auditorium	Small Can	12	Corncob LED	***Not in scope***
1045	Auditorium	Large Perimeter Can	14	Corncob LED	***Not in scope***
1045	Auditorium	Medium Perimeter Can	14	Corncob LED	***Not in scope***

Room No.	Room Name	Fixture Description	Fixture Qty.	Existing Lamps	Type-B Retrofit Scope Description
1045	Auditorium	Small Perimeter Can	14	Corncob LED	***Not in scope***
1045	Auditorium	Stage light	-	-	***Not in scope***
1050	Janitor	4' Wraparound	1	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1051	Hall	4' Wraparound	2	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1052	Dressing	4' Wraparound	2	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1052	Dressing	Vanity	3	G CFL	Retrofit 1-lamp 40W incandescent G-type lamp with LED equivalent.
1053	Dressing	4' Wraparound	2	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1053	Dressing	Vanity	3	G CFL	Retrofit 1-lamp 40W incandescent G-type lamp with LED equivalent.
1054	Office	Warehouse Pendant	4	T	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1054	Office	4' Wraparound	5	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1055	Shop	4' Wraparound	1	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1055	Shop	Chain-Suspended 4' Strips with Reflector	4	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1056	North Room	4'×4' Custom Surface Mount	6	4FT828W4L	Type B Retrofit: 4-lamp, 4ft, T8 fluorescent fixture to 4x10W LED tubes, remove ballast, install pre-wired socket kit.
1056	North Room	Recessed Mushroom	12	A	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1060	Hall	2'×2' Custom Surface Mount	2	2FT817W2L	Type B Retrofit: 2-lamp, 2ft, T8 fluorescent fixture to 2x7W LED tubes, remove ballast, install pre-wired socket kit.
1061	Storage	Globe	1	A	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1062	Storage	Globe	1	A	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1063	Storage	Globe	1	A	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1064	Men	2' Uplight/Downlight	2	2FT817W2L	Type B Retrofit: 2-lamp, 2ft, T8 fluorescent fixture to 2x7W LED tubes, remove ballast, install pre-wired socket kit.
1064	Men	4' Uplight/Downlight	1	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1064	Men	Recessed Downlight	2	2- or 4-pin CFL	Type A Retrofit: 2-lamp, CFL, 2- or 4-pin sockets to ballast-compatible LED equivalent.
1065	Women	2' Uplight/Downlight	4	2FT817W2L	Type B Retrofit: 2-lamp, 2ft, T8 fluorescent fixture to 2x7W LED tubes, remove ballast, install pre-wired socket kit.
1065	Women	4' Uplight/Downlight	1	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.

Room No.	Room Name	Fixture Description	Fixture Qty.	Existing Lamps	Type-B Retrofit Scope Description
1065	Women	Recessed Downlight	2	2- or 4-pin CFL	Type A Retrofit: 2-lamp, CFL, 2- or 4-pin sockets to ballast-compatible LED equivalent.
1066	Storage	Globe	1	A	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1067	Coat Room	4' Wraparound	2	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1070	Lodge Room	4'×4' Custom Surface Mount	24	4FT828W4L	Type B Retrofit: 4-lamp, 4ft, T8 fluorescent fixture to 4x10W LED tubes, remove ballast, install pre-wired socket kit.
1071	Hall	2'×2' Custom Surface Mount	6	2FT817W2L	Type B Retrofit: 2-lamp, 2ft, T8 fluorescent fixture to 2x7W LED tubes, remove ballast, install pre-wired socket kit.
1081	Conference Room	1'×4' Prismatic Troffer	4	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1082	Office	1'×4' Prismatic Troffer	2	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1083	Office	1'×4' Prismatic Troffer	2	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1085	Men	≈6" Recessed Downlights	2	2- or 4-pin CFL	Type A Retrofit: 2-lamp, CFL, 2- or 4-pin sockets to ballast-compatible LED equivalent.
1086	Men	8' Pointable Cylindrical Tandem Strips	4	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1087	Box Office	2'×4' Prismatic Troffer	2	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
1088	Box Office	Lampholder	1	A	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
1090	Hall	2'×2' Custom Surface Mount	5	2FT817W2L	Type B Retrofit: 2-lamp, 2ft, T8 fluorescent fixture to 2x7W LED tubes, remove ballast, install pre-wired socket kit.
	Above East Hall	4' Strip	1	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.
	Above East Hall	Lampholder	1	A	Retrofit 1-lamp 60W incandescent A-type lamp with LED equivalent.
	Above Auditorium	4' Strip	6	4FT828W2L	Type B Retrofit: 2-lamp, 4ft, T8 fluorescent fixture to 2x10W LED tubes, remove ballast, install pre-wired socket kit.

FIM-3.2: Auditorium HVAC Replacement

Existing Condition

The buildings various spaces are heated by a variety of gas based heating systems. The auditorium utilizes a hydronic heating boiler, while the remainder of the spaces in the hall utilize duct heaters. With the exception of the duct heater serving the club room, all equipment is approaching the end of its useful life. A few of the offices have installed window mounted A/C units for occupant comfort, but beyond that there is no cooling in the building. Supply and exhaust ventilation needs are met through a variety of supply and exhaust fans throughout the building.

A HVAC equipment schedule can be found in Appendix 1.4

Existing auditorium hydronic boiler

Existing auditorium air handler

Proposed Condition

The base mechanical scope will consist of adding cooling capability to the auditorium so it can be used in for emergency gatherings. This will be done by removing the existing gas fired hydronic system and retrofitting the existing air handling unit with a new DX heating and cooling coil served by a new high efficiency VRF system.

VRF systems are highly efficient and can achieve a COP of up to 3.5, an EER of up 11.7, and an IEER of up to 23.2. Furthermore, removing the existing gas-fired boiler will substantially reduce the carbon footprint of the building which aligns with the County's decarbonization goals.

Scope of Work

Demo

- Demo existing gas-fired boiler
- Remove and dispose of all piping associated with the heating hydronic system
- Remove and dispose of HW coil in existing AHU

Installation

- Furnish and install three (3) new VRF condensing units
- Furnish and install two (2) new DX coils
- Furnish and install all refrigerant piping to connect the DX coils to the VRF condensing units
- Provide all new electrical service for new VRF condensing units
- Provide new concrete pad for new VRF condensing units

Ductwork serving auditorium

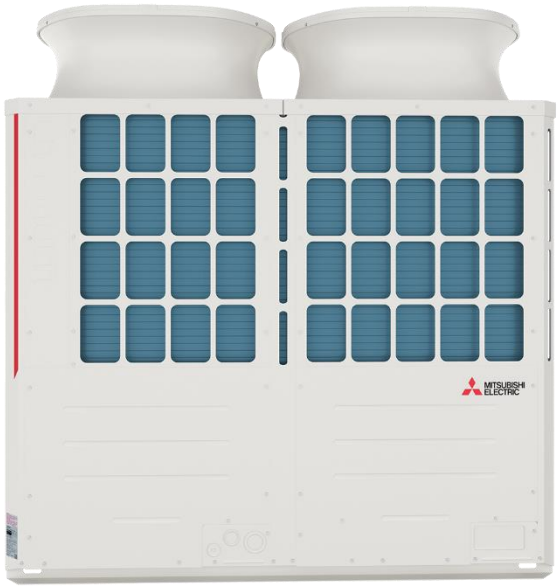
Savings Methodology and Assumptions

Energy projections for this measure were calculated by creating an EQuest model using existing equipment sizing and efficiencies and then comparing that existing model against one using the proposed space conditioning equipment. Because the addition of cooling to the auditorium is an added load, despite the improved heating efficiency, the net of this FIM is an increase in overall energy usage at the building that will result in an annual operating cost increase.

Energy calculations and cost for this measure assume a load profile consistent with the event data provided in Appendix 1.8. Real cost and energy consumption will be impacted by actual building operations moving forward and the resulting heating and cooling demands.

Exclusions

- Fire life safety
- Hazardous materials testing and abatement
- Duct cleaning
- Duct sealing



Belt driven fan

Existing ductwork

Duct heater serving club room

FIM-3.2: Ductless Mini-splits to Three Offices

Existing office window A/C unit

Proposed Condition

In addition to the auditorium mechanical scope, this measure provides improved heating and cooling to three offices, by removing the old window mounted ACs and installing new ductless mini split heat pumps in their place that will provide electric heating and cooling and improved occupant comfort and control. The selected units have a COP of 3.3 and a SEER of 17 which is significantly more efficient than the existing gas duct heater or the window mounted A/C.

This measure will reduce the load on a greenhouse gas producing system at the Veterans Hall and replace it with a unit that can take advantage of both the proposed solar array and carbon free retail electricity provided by SCP.

Scope of Work

Demo

- Remove and properly dispose of three (3) existing window mounted A/c units.

Installation

- Provide and install 3 new high wall mini splits and ground mounted condensing units.
- Provide and install new condensate drain lines to outside with pumps or gravity feed.
- Provide all electrical work for new split systems.

Savings and Assumptions

Savings for this measure were calculated by creating an EQuest model using existing equipment sizing and efficiencies and then comparing that existing model against one using the proposed space conditioning equipment. Cost and energy savings for this measure assume a load profile consistent with the event data provided in Appendix 1.8. Real cost and energy consumption will be impacted by actual building operations moving forward and the resulting heating and cooling demands.

FIM-4.2: Northern Parking Lot Solar Carport Canopy

Proposed Condition

This measure proposes to install a 110 kW solar carport with an 11' clearance height and EV capable infrastructure in the northern parking lot with sizing to approximately match 2019 electrical consumption. This system will interconnect to the existing 208V electrical service and be capable of delivering charge to the battery energy storage system proposed in FIM-5.

EV capable infrastructure means conduit will be laid and appropriate stub outs will be provided to cost share with trenching necessary for the carports and to enable future EV charging buildouts, however no conductors, breakers, or panels will be installed, and no electrical connections will be made at this time.

Scope of Work

Installation

- Provide temporary fencing for laydown areas near the building.
- Secure a soils report and Ground Penetrating Radar (GPR) survey of the site to verify underground conditions.
- Bore holes and pour concrete piers with galvanized steel posts.
- Provide and install a galvanized full cantilever style solar shade structure.
- Provide and install the modules on the racking system(s).
- The Inverter(s) and related equipment will be installed next to main electrical switchgear.
- Provide and install a PV Panel next to main electrical switchgear.
- Provide and install all AC and DC wire and conduit for the designed system
- Provide and install underground conduit, patch and repair asphalt where necessary and related to the conduit install.
- Provide and install under-canopy lighting.
- Provide and install a utility required Solar AC Disconnect.
- Provide and install (1) line side solar point of interconnection.
- Commission the system; Coordinate all utility and local permit inspections.
- Provide and install a cellular enabled Data Acquisition System (DAS) to monitor the PV system production

Savings Methodology and Assumptions

Generation potential for this system has been calculated by creating a model of the proposed system in helioscope and defining the relevant inputs that impact generation potential such as location, panel wattage, panel efficiency, inverter efficiency, and other system losses using manufacturer specified and industry standard values.

This system size will provide a roughly 100% offset of the Pre-Covid building load. Willdan has been directed to use the Pre-Covid period as a sizing guideline, however in the current period, the building electrical consumption is still far below that of the Pre-Covid period and will result in a sizable billing credit under current operating conditions.

Exclusions

- Guarantees of specific utility rates, tariffs, time-of-use periods, and/or associated utility savings.
- Any waterproofing, sealing, gutters, or filling the gaps between modules.
- Spread footings, excavating, compacting, or similar weak soil compensation measures.

- Wheel stops, abutments, bollards (drive aisle or otherwise), low clearance signage, or other protective measures around shade structure columns.
- Any upgrades, striping, or changes to the site that may be required for ADA compliance.
- During underground excavations, any additional costs due to caving, hard rock, refusal, obstructions, or water mitigation.

FIM-5: Battery Energy Storage System

Existing transformer, generator, and main service board

Existing Condition

Electrical service from PGE enters at the rear of the building through a pad mounted 208V step down transformer that feeds bussing with a 1,200A main disconnect, which is then distributed to a number of sub panels throughout the building. There is no battery energy storage system at the Veterans Hall currently.

Proposed Condition

A Current Energy 125kW / 220 kWh battery energy storage system is to be installed and interconnected to the existing 208v electrical service. This battery's primary function will be energy arbitrage and demand reduction to generate electric bill savings. Initially, Willdan reviewed the system to provide resiliency functionality in conjunction with a diesel generator. However, the battery has been sized to align with the SGIP reservation previously obtained by the County. As the SGIP program does not allow the inverter size (kW value) of the BESS to exceed the site's peak demand over the previous 12 months prior to system installation, the Battery System is unable to be sized appropriately to serve as a power source for the existing loads with new cooling loads. Currently, the 12 month peak demand is 80 kW, and therefore Willdan will work with the manufacturer to de-rate the system's inverter capacity from the nameplate rating. This will incorporate a firmware update that will not allow the system to discharge at a rate higher than is allowed by the SGIP program, therefore enabling the system to remain incentive-eligible.

Scope of Work

Installation

- Provide and install an equipment pad for the Energy Storage Unit next to the Energy Storage Panel.
- Provide and install an AC disconnecting means for the energy storage unit
- Provide and install a hard-wired Data Acquisition System (DAS) to monitor the Energy Storage system.
- Provide and install wiring between the battery bank and the energy storage inverter and/or automatic transfer switch.
- Provide and install monitoring for the energy storage system
- Provide and install all AC and DC wire and conduit for the designed system.
- Provide and install a utility required Storage AC Disconnect for the (1) interconnection.

- Provide and install a new Storage Circuit Breaker in existing Combiner Panel and connect to Storage Circuit Breaker as permitted by the National Electric Code for (1) interconnection.
- Provide and install the 480V to 208V transformer and associated balance of system.
- Provide install the Generation Combiner Panel and associated balance of system.

Savings Methodology and Assumptions

Savings for this measure were calculated by creating a system model in Energy Toolbase which utilizes the provided interval data, utility rate structures, and defined battery characteristics to determine the economic value of the battery on an annual basis.

Exclusions

- Guarantees of specific utility rates, tariffs, time-of-use periods, and/or associated utility savings.

FIM-7: Building Management System

Existing Conditions

The existing HVAC system for the Auditorium is controlled by an Andover Controls system located in the same mechanical room as the primary AHU. The remaining fans and duct furnaces are controlled locally at the equipment and with thermostats and equipment enable timers in the occupied space.

Existing Andover Control system for HVAC control

Proposed Conditions

This measure proposes to replace the existing HVAC control with a new Automated Logic Controls (ALC) Building Management System (BMS) capable of remotely monitoring and controlling all systems within the Veterans Hall. This would include all new and existing HVAC systems, the lighting system, PV monitoring, battery energy storage monitoring, and the backup generator. Future expansion of EV charging and security systems could be integrated into this system as they are installed. This system will also integrate into the County's existing WebCtrl platform.

Existing Andover Controls system for HVAC control

Scope of Work

Demo

- Remove existing Andover controller

Installation

- Furnish and install controls for new split VRF system w/DX coils.
- Furnish and install controls for (7) existing supply and exhaust fans.
- Furnish and install connection of control cabling to lighting BACnet interface.
- Furnish and install connection of PV system controller to BACnet interface.
- Furnish and install connection of battery energy storage system controller to BACnet interface.
- Furnish and install connection of new generator system to BACnet interface
- Furnish and install (1) Building Control Panels for connection to BMS IT Network.
- Furnish and install BMS Infrastructure including BMS Network Switches
- Furnish and install Network cabling to connect the BMS Controllers to the BMS infrastructure

Savings Methodology and Assumptions

There is an existing HVAC control, so this upgrade will not convey any additional direct energy savings. It will however improve operational insights and efficiency by centralizing equipment control and improving visibility of building systems.

It is assumed that the county's existing WebCtrl platform is version 7.0 or higher and is the full version not limited to 500 points.

Exclusions

- Software upgrades of WebCtrl
- Rigid conduit, copper tubing, stainless steel panels
- Any work related to line voltage power over 30VAC
- Any temporary controls

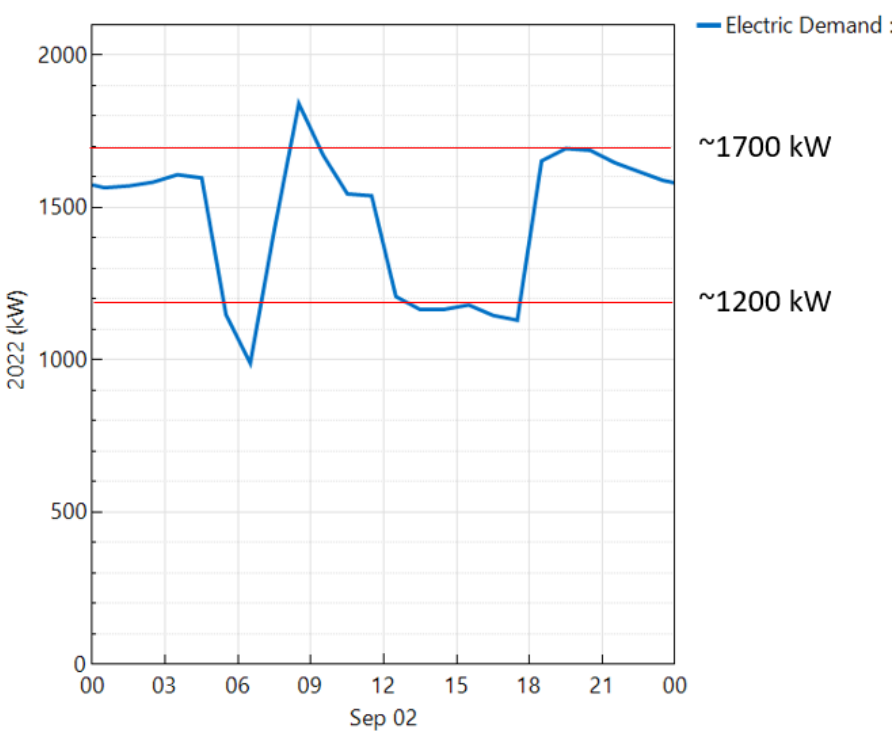
FIM-9: CMP Chiller Schedule Update

Existing Conditions

The existing Central Mechanical Plant (CMP) at the County Admin Complex has 4 chillers with a peak cooling capacity of ~1000 tons. On peak cooling days, the plant demands approximately 750 kW of power.

The chilled water (CHW) storage tank has a 650k gallon nominal capacity. The chilled water storage tank allows for chilled water to be generated during more cost-effective periods of the day as well as manage maximum demand charges due to PG&E's Time-of-Use rates.

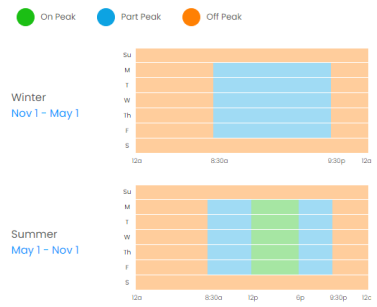
At the time of the investigation, the chillers were scheduled to be off from 12PM to 6PM during the weekdays and no scheduling on the weekends. This schedule matched a previous max demand period but was never updated to a new max demand period set by the utility. The graphs below show the load shift by using chilled water during the day from the CHW storage tank.



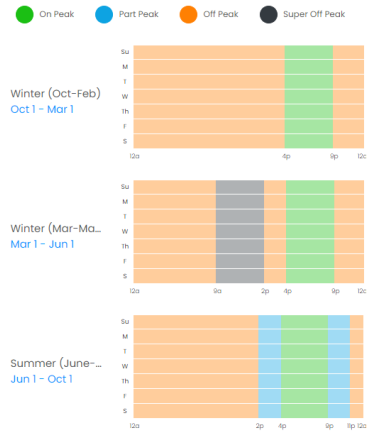
CHW STORAGE TANK ALLOWS A SHIFT OF 500KW OF DEMAND ON 9/2/2022

Existing chiller at CMP

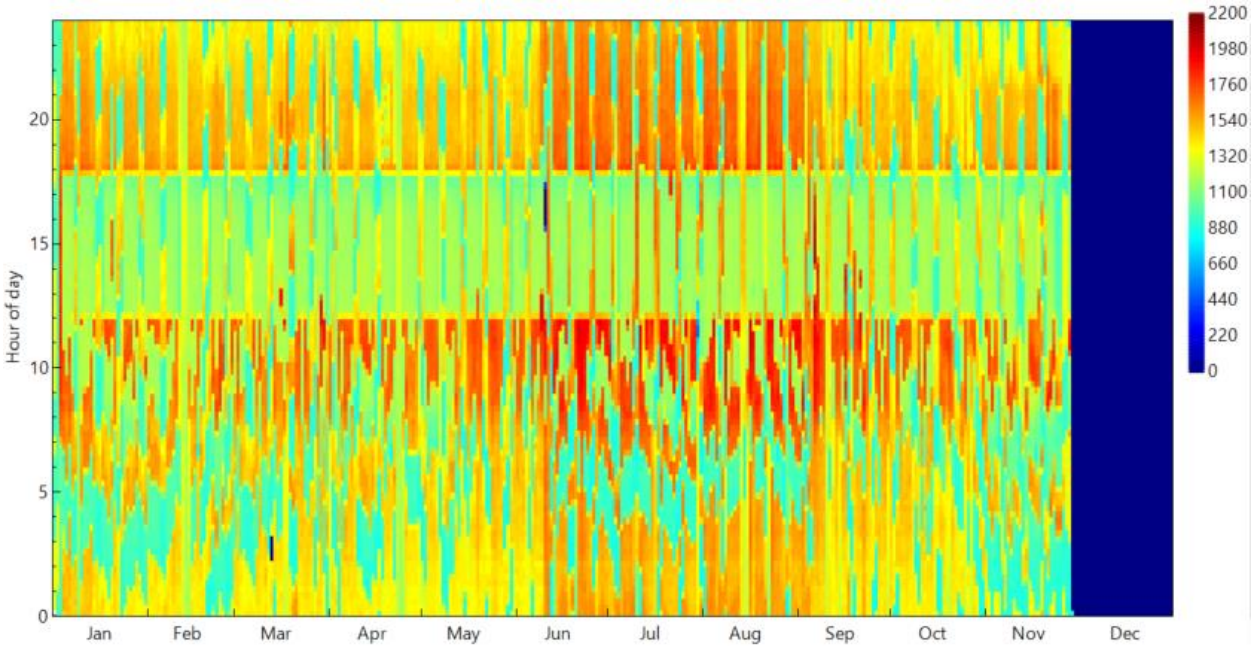
Existing chilled water tank at CMP



PG&E on-peak hours prior to April 2021, shows peak period was 12pm to 6pm



PG&E on-peak hours after to April 2021, shows peak period is now 4pm to 9pm, including weekends



ELECTRICAL DEMAND (KW) HEAT MAP FOR 2022 SHOWING CHILLERS OFF FROM 12PM TO 6PM

Proposed Conditions

This measure will update the central plant schedule to control the chillers off during peak demand periods as seen below.

Times of the year and times of the day are defined as follows:

SUMMER - Service from June 1 through September 30:

Peak:	4:00 p.m. to 9:00 p.m.	Every day, including weekends and holidays
Partial-peak:	2:00 p.m. to 4:00 pm AND 9:00 p.m. to 11:00 p.m.	Every day, including weekends and holidays
Off-peak:	All other Hours.	

WINTER - Service from October 1 through May 31:

Peak:	4:00 p.m. to 9:00 p.m.	Every day, including weekends and holidays
Super Off-Peak	9:00 a.m. to 2:00 p.m.	Every day in March, April and May, including weekends and holidays
Off-peak:	All other Hours.	

Scope of Work

Installation

- Provide CMP operators chiller schedules to avoid max peak utility demand periods. CHW storage tank to provide cooling during peak utility demand periods.
- Provide three (3) years of quarterly measurement and verification and reporting, following the International Performance Measurement and Verification (IPMVP) protocols.

Savings Methodology and Assumptions

- Average observed maximum demand shift potential, through main electrical meter interval data, was 400 kW. Demand charges that can be avoided:
  - Winter: 5 months X 400 kW X $25.44 = $50,880
  - Summer: 7 months X 400 kW X $32.41 = $90,748
  - Total annual potential savings = $141,628
  - Conservative annual potential savings = $125,000
  - Savings applied to this phase of the project = $125,00*0.5=**$62,500**
- Using IPMVP Option B, trending and or additional monitoring will be used to quantify electric load shift resulting from chillers.

Clarifications:

- Continued access to CMP electrical meter interval data during M&V period.
- CMP operator support on implementing schedules. If further changes need to be made, facility staff to be available to work with Willdan staff. Schedules must keep chillers off during peak periods to avoid peak demand charges.
- Read only access to CMP controls web interface or support from Sonoma Facility staff to access trends and reporting available in BMS.

Exclusions

- Software upgrades of WebCtrl
- CMP retrocommissioning

Additional FIMs Evaluated

FIM-1.3: LED New Fixture Replacement

Proposed Condition

This measure proposes to replace existing fixtures with new hard wired LED retro-fit kits that re-use the belly pan while replacing other components, rather than re-lamping existing fixtures with LED tubes as in the base scope. This approach will result in a higher cost but will provide a more modern and uniform look to fixtures while providing a similar level of energy savings and improved lighting quality as in the base scope. Lighting controls will be installed consistent with Title 24 requirements and be integrated with the BMS (FIM-6). Some rooms have vintage fixtures and those are to remain. In the auditorium, the surface mounted troffers will be removed in favor or returning to the recessed style of lights in the original building design.

Vintage fixtures that will remain

Vintage fixtures that will remain

Surface mounted auditorium lighting troffer that will be removed

Scope of Work

Demo

- All ballasts will be removed from the light fixture system, including remote ballasts.
- All lens, lamps, and tombstones will be removed from the fixture.
- Surface mounted auditorium lighting will be removed

Installation Phase:

- All non-decorative interior fluorescent, incandescent, halogen, and HID fixtures shall be retrofitted with energy-efficient LED retrofit kits, except those specifically listed as exclusions.
- All decorative interior fluorescent, incandescent, halogen, and HID lamps shall be retrofitted with energy-efficient LED retrofit lamps.
- All existing fixtures with emergency backup ballasts shall retain that function with new UL 924 listed battery-powered backup drivers or UL 924 listed backup inverters.
- All switching schemes shall be updated to comply with California Energy Code Title 24.
- Coordinate all lighting retrofit and replacement work with asbestos and lead abatement team.
- Any conductor that does not satisfy NFPA 70 shall be replaced. Any damaged conductor shall be replaced.

- Light levels shall be recorded in each space using the same handheld light meter used before the installation phase. Resulting light levels shall be equal to or greater than the measurement made before the installation phase. Target minimums are as follows:

Savings Methodology and Assumptions

Savings for this measure will be largely consistent with those of FIM 1.1, however slight variations in new fixture wattages relative to retrofit lamp wattages may slightly impact annual savings. Real savings will be impacted by actual building operations, occupancy, and lamp burn hours.

Exclusions

- Hazardous materials testing, removal, and abatement
- All exterior light fixtures are not in scope.
- The following shall be specifically excluded from the Scope of Services provided:
  - Existing LED lamps and fixtures
  - Theatrical lighting (theater house lighting is included in the project scope)
  - Dimming controls of auditorium house lights
  - Projection devices
  - Decorative lighting applications not otherwise specified in this document
  - Backlit signs
  - Exit signs
  - Abandoned fixtures
  - Task lighting on modular furniture
  - Existing emergency lighting battery backup units (bug-eye lights)

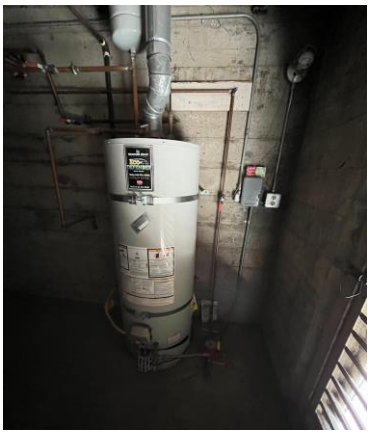
FIM-2: Heat Pump Water Heaters

Existing Conditions (at time of audit)

Domestic Hot Water (DHW) is supplied via a collection tank type and tankless water heaters. Hot water for the commercial kitchen is supplied from a gas tankless water heater located in the kitchen. Restrooms are supplied with hot water via a gas and electric tank type water heater in the mechanical mezzanine. The club room has its own dedicated gas tank type water heater. Hot water in the snack bar is provided by a small electric point of use water heater. Hot water at the mop sink in the janitor's closet is provided via an electric tank type water heater.

A DHW equipment schedule can be found in Appendix 1.4

One of the existing gas water heaters utilizes a recirculation pump and hot water loop to ensure reasonable hot water delivery times at water fixtures. This pump is currently controlled by a timer, and when controlled in this fashion, these types of pumps can account for up to a third of the total hot water load. Particularly in a building like this that experiences periods of high demand followed by no demand for extended periods of time, a time based control makes little sense.



Existing gas tank type water heater

Timeclock controlled recirculation pump

Proposed Conditions (Post audit, select DHW heaters have been converted to heat pumps)

This measure proposes to replace all existing gas and one electric resistance water heater with tank type heat pump water heaters. Heat pump water heaters are 3-5x as efficient as the equipment currently being used for domestic water heating. This approach will fully decarbonize the water heating system at the veteran's hall and result in operational cost savings.

All gas water heaters are eligible for replacement with electric heat pump water heaters (HPHW) with full cost coverage through the GK12 program, while the electric water heaters are only eligible for limited incentives under that program. For that reason, we are proposing to replace the electric water heater in the Janitors Closet based on its age, but to leave the other newer electric water heaters in place.

This measure also proposes to install a demand-based controller on the existing recirculation pump. A flow switch and a thermistor will communicate with the pump, only turning it on when there is an actual call for hot water or when the temperature in the loop falls below an acceptable level.

Tankless water heater serving commercial kitchen

Scope of Work

Water Heater

- Drain, remove, and dispose of existing electric water heater in the Janitor's Closet
- Furnish and install new Heat Pump Water Heater
- Furnish and install new drain pan
- Furnish and install new earthquake strap

- Furnish and install new TPR valve and pipe

Plumbing

- Furnish and install copper pipe
- Furnish and install 2 Dielectric Unions
- Furnish and install PVC drain pipe into adjacent slop sink
- Furnish and install all other copper, brass, and miscellaneous fittings around water heater location
- Furnish and install 5' of insulation on Hot and Cold lines attached to water heater
- Recirculation Pump
- Remove existing timeclock recirculation pump control
- Install demand based recirculation pump control
- Install flow sensor on cold water supply line into water heater
- Attach thermistor to return line

Existing electric resistance water heater to remain

Club water gas tank type water heater to be replaced by GK12

Electric resistance water heater in Janitor's Closet to be replaced

Savings Methodology and Assumptions

Savings for this measure were calculated by disaggregating the water heating load from the rest of the gas using equipment at the property. This was done by averaging the summer months where it can be assumed that no space heating is taking place in order to establish a monthly water heating load. This water heating load was then extrapolated to the rest of the year to determine an annualized water heating load. Using nameplate listed efficiencies of the existing equipment, the actual energy output of that equipment was established. Using specified heat pump water heater efficiencies, we calculated the electrical input required to produce that same water heating output. The difference between the existing and the proposed values are the savings.

Water heating load for the electric water heater in the Janitors closet is event driven and was calculated by tabulating the number of events in 2019 (997) and assuming a 5 gallon per event hot water draw ~5,000 gallons/yr.

Cost and energy savings for this measure assume a certain load profile. Real savings will be impacted by actual building operations and hot water demand.

Exclusions

- Changes to the janitors closet existing electric water heater circuit

FIM-3.3: Heat Pump RTU Serving the Club Room

Existing Club Room furnace

Proposed Condition

This measure provides new cooling capacity and electrified heating to the Club Room by demolishing the existing furnace serving that space and installing a new heat pump rooftop unit to heat and cool the area electrically. The selected unit has a COP of 3.2, an EER of 9.7, and a IEER of 12.0 which is significantly more efficient that the existing furnace serving the club room. This measure will remove a significant greenhouse gas producing system at the Veterans Hall and replace it with a unit that can take advantage of both the proposed solar array and carbon free retail electricity provided by SCP.

Scope of Work

Demolition:

- Remove and properly dispose of existing supply fan, return fan, and gas furnace unit
- Demo OA duct and cap at roofline
- Remove gas piping back to main. Cap remaining gas pipe at tee.
- Remove flue and cap flue at roofline
- Remove associated controls and thermostat

Installation

- Provide and install 1 new 20 ton HVAC heat pump unit and curb.
- Provide new garland roofing materials and labor only at new roof location and provide warranty
- Provide and install new steel structural supports
- Provide 2 concrete saw cutouts for new ductwork penetrations for new 20 ton unit.
- Provide and install new sheetemtal ductwork into the building and tie into the existing ductwork at interior location.
- Provide electrical to the new 20 ton unit.
- Provide and install new condensate line from unit to nearest roof drain.
- Provide air balance test at unit roof level

Savings and Assumptions

Savings for this measure were calculated by creating an EQuest model using existing equipment sizing and efficiencies and then comparing that existing model against one using the proposed space conditioning equipment. Cost and energy savings for this measure assume a load profile consistent with the event data provided in Appendix 1.8. Real cost and energy consumption will be impacted by actual building operations moving forward and the resulting heating and cooling demands.

Exclusions

This added scope will exceed the electrical capacity of the existing infrastructure serving the building and will require upgrading the electrical service at the building. This would include replacing PG&E's pad mounted transformer with one capable of supporting the added building loads. We have as of yet been unable to determine PG&E's cost to perform this work. As such, all electrical infrastructure work has been excluded from this scope item.

FIM-4.1: Rooftop Solar Array

Proposed rooftop array location

Existing Conditions

The roof of the building is an uninsulated concrete deck with a white single ply TPO roofing membrane that was replaced recently and is in excellent condition.

Proposed Condition

This measure proposes to install a 103.68 kW net metered rooftop solar array sized to cover the majority of the existing building electrical load. This system will interconnect to the existing 208V electrical service and be capable of delivering charge to the battery energy storage system proposed in FIM-5.

Scope of Work

Installation

- Provide and install a ballasted racking system, slip sheets, and modules on roof.
- Provide and install the modules on the racking system.
- Provide and install inverter and related equipment
- Provide and install a PV Panel at the rear exterior north wall of building
- Provide and install all AC and DC wire and conduit for the designed system
- Provide and install a utility required Solar AC Disconnect for the (1) interconnection for PV.
- Provide and install (1) line side solar point of interconnection for PV.
- Provide and install a cellular enabled Data Acquisition System (DAS) to monitor the PV system production

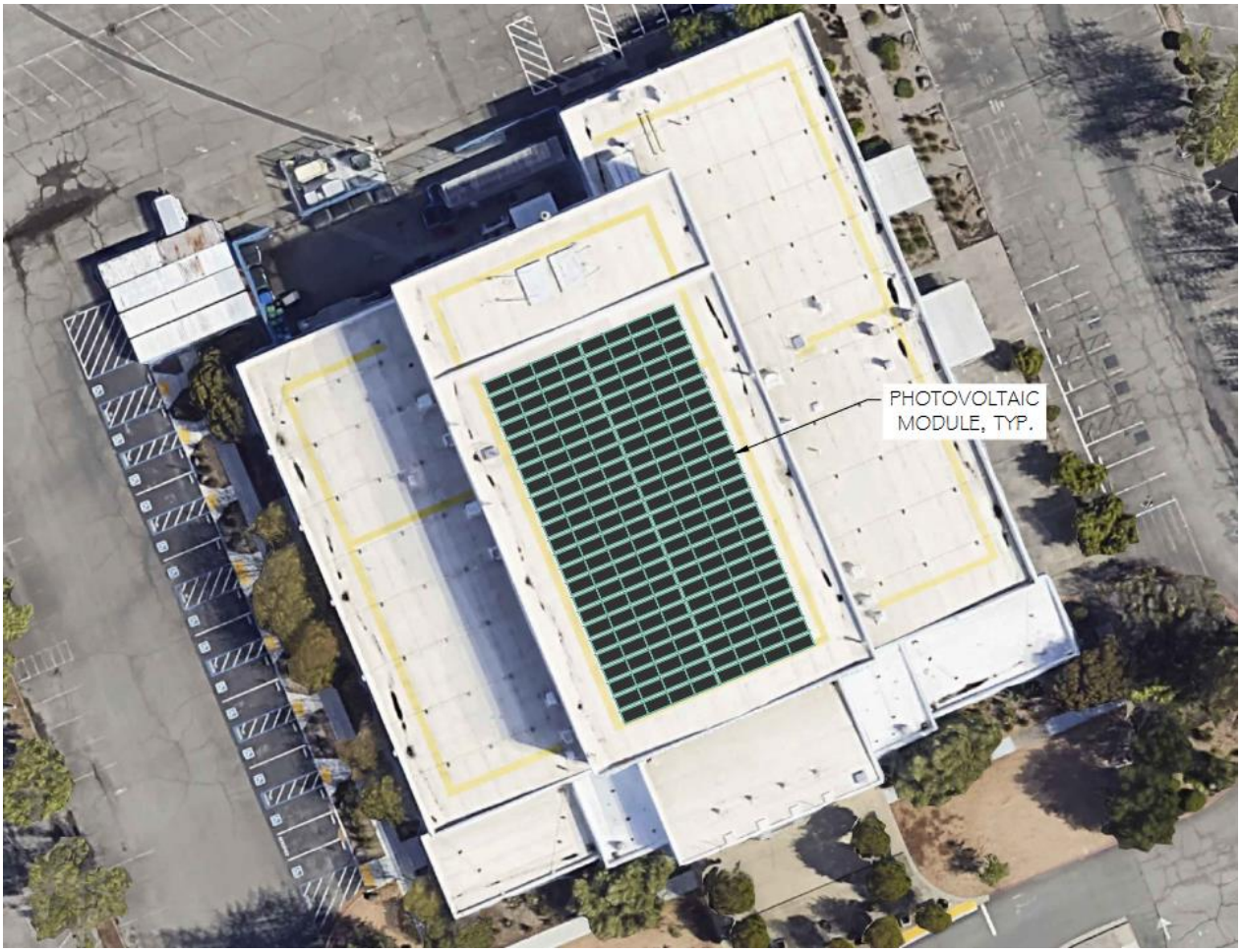
Savings Methodology and Assumptions

Generation potential for this system has been calculated by creating a model of the proposed system in Helioscope and defining the relevant inputs that impact generation potential such as location, panel wattage, panel efficiency, inverter efficiency, and other system losses using manufacturer specified and industry standard values.

This system size will provide a roughly 98% offset of the Pre-Covid building load. Willdan has been directed to use the Pre-Covid period as a sizing guideline, however in the current period, the building electrical consumption is still far below that of the Pre-Covid period and will result in a sizable billing credit under current operating conditions.

Exclusions

- Guarantees of specific utility rates, tariffs, time-of-use periods, and/or associated utility savings.



FIM-4.3: Western Parking Lot Solar Carport Canopy

Proposed Condition

This measure proposes to install a 162 kW solar carport with an 11' clearance height and EV capable infrastructure in the western parking lot sized to accommodate the new added electrical loads from the base mechanical scope. This system will interconnect to the existing 208V electrical service and be capable of delivering charge to the battery energy storage system proposed in FIM-5.

EV capable infrastructure means conduit will be laid and appropriate stub outs will be provided to cost share with trenching necessary for the carports and to enable future EV charging buildouts, however no conductors, breakers, or panels will be installed, and no electrical connections will be made at this time.

Scope of Work

Installation

- Provide temporary fencing for laydown areas near the building.
- Secure a soils report and Ground Penetrating Radar (GPR) survey of the site to verify underground conditions.
- Bore holes and pour concrete piers with galvanized steel posts.
- Provide and install a galvanized full cantilever style solar shade structure.
- Provide and install the modules on the racking system(s).
- The Inverter(s) and related equipment will be installed next to main electrical switchgear.
- Provide and install a PV Panel next to main electrical switchgear.
- Provide and install all AC and DC wire and conduit for the designed system
- Provide and install underground conduit, patch and repair asphalt where necessary and related to the conduit install.
- Provide and install under-canopy lighting.
- Provide and install a utility required Solar AC Disconnect the (1) interconnection.
- Provide and install (1) line side solar point of interconnection.
- Commission the system; Coordinate all utility and local permit inspections.
- Provide and install a cellular enabled Data Acquisition System (DAS) to monitor the PV system production

Savings Methodology and Assumptions

Generation potential for this system has been calculated by creating a model of the proposed system in helioscope and defining the relevant inputs that impact generation potential such as location, panel wattage, panel efficiency, inverter efficiency, and other system losses using manufacturer specified and industry standard values.

This system was sized to offset the new added cooling load and other potential loads such as EV charging. It will provide a generation capacity of roughly 145% of the existing building load. Willdan has been directed to use the Pre-Covid period as a sizing guideline, however in the current period, the building electrical consumption is still far below that of the Pre-Covid period and this system will result in a sizable generation credit under current operating conditions.

Exclusions

- Guarantees of specific utility rates, tariffs, time-of-use periods, and/or associated utility savings.
- Any waterproofing, sealing, gutters, or filling the gaps between modules.
- Spread footings, excavating, compacting, or similar weak soil compensation measures.
- Wheel stops, abutments, bollards (drive aisle or otherwise), low clearance signage, or other protective measures around shade structure columns.
- Any upgrades, striping, or changes to the site that may be required for ADA compliance.
- During underground excavations, any additional costs due to caving, hard rock, refusal, obstructions, or water mitigation.

162 kW Solar Carport Canopy in West Parking Lot

FIM-6: High Efficiency Water Fixtures

Existing Conditions

Water fixtures ranged in flow rates and control types with some missing aerators and flow controls all together and others already having been updated. In the commercial kitchen there is an aging dishwasher that uses approximately 1.53 gallons per rinse rack which is almost double the current Energy Star standard of 0.89 gallons per rinse rack.

Toilets ranged in flush rates and control types with some flushing at rates as high as 1.6 GPF and possessing only manual controls with others having automatic flushers and low flow flush valves.

Urinals ranged in flush rates and control types with some flushing at rates as high as 0.5 GPF and possessing only manual controls with others having automatic flushers and low flow flush valves.

Landscaping is no longer being irrigated at this property.

Commercial dishwasher


High flow two handle sink

Proposed Conditions

This measure proposes to replace all water fixtures not consistent with current Title 24 flow standards. This will include Watersense certified low flow fixtures and/or aerators at each bathroom sink, sink faucet controls, low flow toilet and urinal valves along with flush controls, and in the commercial kitchen a pre-rinse spray valve and EnergyStar commercial dishwasher with integrated water temperature booster for sanitization.


High flow push button sink

Scope of Work

Installation

- Provide and install 22 Watersense certified toilets with a maximum flush rate of 1.28 Gallons Per Flush.
- Provide and install 8 Watersense certified urinals with a maximum flush rate of 0.5 Gallons Per Flush.
- Provide and install 19 Watersense certified bathroom sink aerators with a maximum flow rate of 0.5 Gallons Per Minute.
- Provide and install 2 Watersense certified pre-rinse spray valve in the commercial kitchen will have a maximum flow rate of 0.6 Gallons Per Minute.
- Provide and install Energystar rated stationary door type commercial dishwasher will have a maximum water consumption of 0.67 Gallon per rack of capacity.


High flow pre-rinse sprayer

Savings Methodology and Assumptions

Water savings for this measure were calculated by overlaying water billing data and rental occupancies to establish a water use per occupant profile to help calibrate our calculations. Then using existing flow rates, baseline consumption values were calculated for each end use (sinks, toilets, and urinals). Those values were then checked against our occupant profile to help ensure accuracy. Proposed consumption was then calculated by using the same use profile with the proposed reduced flow rates. The savings calculated are then the difference between the existing and proposed water consumption calculations.

Cost and water savings for this measure assume a use profile consistent with the event data provided in Appendix 1.8. Real cost and water consumption will be impacted by actual building operations moving forward and the resulting use of water fixtures.

2.2 GPM aerator

1.6 GPF toilet

Push button sink missing aerator

Exclusions

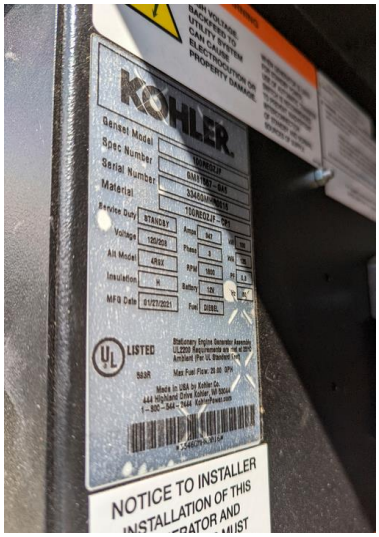
- Broken toilet flanges. We have accounted for the repair of 5% of broken flanges in our price. Flange repairs in quantities over 5% will result in additional charges.
- Broken carriers for wall mount toilets and urinals
- Failed isolation valves
- Broken angle stops. We have accounted for replacement of 10% of angle stops. Angle stop replacement beyond that will result in additional charges.
- Painting, tile work, and wall repair outside of fixture footprints
- Water hammer and other infrastructure related conditions

Any conditions not meeting applicable codes or existing deficiencies in the Customer's plumbing system will be brought to the Customer's attention. Any work required to upgrade code violations or plumbing system deficiencies will be at an additional cost to the Customer

FIM-8: Generator

Existing Conditions

A new 100 kW / 125 kVA generator was installed in 2021 was the intention of providing uninterrupted backup power to the Veterans Hall so that it could operate as a community emergency center. However with the addition of cooling capacity and electrified heating, that generator is no longer sufficient to backup the building. As such, a new generator will be required to enable the building to fulfill its desired emergency center function. This measure will provide a new generator sized to accommodate all new added loads at the building.



Existing generator nameplate

Proposed Conditions

This measure will provide a new 350 kW generator sized to accommodate all new added loads at the building. The existing generator being removed can be resold or repurposed at another location by the county.

Existing generator

Scope of Work

Demo

- Remove existing 100 kW generator

Installation

- Provide and install new 350 kW generator
- Provide and install all necessary wiring and connections

Generator fuel shutoff alarm

Savings Methodology and Assumptions

This FIM should be considered as a capital improvement which does not bring with it any energy savings. It is a required resiliency measure to provide back up the new HVAC cooling to the building.

Exclusions

- Reinstallation or resale of existing generator

General Scope Exclusions

The following items are to be excluded from Willdan's scope of work

- Spare conduits.
- Temp building power.
- Traffic control.
- Unforeseen subterranean boulder/ rock demolition and dewatering.

- Replacement of existing paving, landscape, striping, irrigation, wheel stops outside of scope directly affected by this project.
- Repairs to/ relocation of existing electrical equipment, breakers and infrastructure.
- UL recertification of existing electrical gear.
- Arc-Flash testing of existing electrical.
- Time clocks for lighting.
- Replacement of interconnection gear.
- Utility interconnection fees.
- Utility transformer upgrade fees
- Force Majeure material price increases.
- Protection of uninstalled and installed product from damage from public.

Other scope opportunities not evaluate past the preliminary effort

The following energy saving and infrastructure opportunities are not included in this report, primarily because of the long paybacks. They are briefly described here, along with the reason why they are not included.

Window Inserts - Install window inserts into all window openings, improving thermal comfort, reducing noise, and improving occupant satisfaction. This measure was discussed with the County to improve the aging single pane windows without triggering any historical building requirements and to avoid the need for installing costly HVAC window interlocks. The HVAC scopes under consideration no longer warrant this approach. The County has fresh air concerns around losing the windows operability as well as concerns over long term durability and vandalism.

EV Charging Stations **-** Install 10 dual port level 2 EV charging stations. This measure was discussed with the County during our rough order of magnitude pricing meeting. Given the high implementation cost and the low utilization rates of the existing EV chargers, this item was removed from the proposed scope. However, EV charging stations at SRVH will be further evaluated in the larger County wide IGA effort.

To take advantage of potential cost sharing from the carport PV arrays, we have opted to include EV capable infrastructure including conduit, stub outs, and electrical infrastructure sized for future expansion into those alternate scope proposals.

Project Financials

The table below shows the guaranteed project costs to install the measures studied at this site. The upgrades included here are based on our understanding of the County's needs, goals, and addresses underperforming equipment in the facility.

It is our goal to provide the County with the information it needs to make informed decisions on the system and upgrade solutions that make the most sense for the County and best fit into its goals for the future.

The numbers in this table are **current** costs to install these projects. If the County desires to move forward and proceed to have Willdan implement any of these FIMs then the next step is to move forward with a Construction Services Agreement.

Building Equipment Assessed:

- HVAC system
- Lighting System
- Control system
- Water System
- DER

Selected FIMs

Sonoma County, Santa Rosa Veterans Hall Building Upgrades

Projects	Turn-key Cost
FIM-1.1: Type B LED Lighting Retrofit	$224,870
FIM-3.2: Auditorium & Office HVAC work	$1,023,800
FIM-4.2: Car Canopy Solar Array	$974,790
FIM-5: Battery Energy Storage System	$578,570
FIM-7: Building Management System	$396,260
FIM-9: CMP Schiller Schedule Update	$45,000
Phase 1 IGA cost	$2,750
Total	$3,246,040

Illustrative Cashflow Overview

The following tables show the financing assumptions and an indicative cash flow overview of the selected project. This example uses part County contribution and indicative TELP financing.

Financing Assumptions	
Total Project Cost including IGA	$3,246,040
County Contribution	$1,467,800
Financing IDC, related to construction schedule	$81,600
Total Financed with TELP or Bond	$1,859,840
Financing Term, years	20
Indicative Financing Interest Rate	4.54%
Utility Escalation	5.00%
Solar Degradation	0.50%
Solar ITC credit	25.50%
BESS ITC credit	25.50%
NEM 3.0 Reduction @ 20 years	30.00%
O&M Escalation Rate	3.00%

Sonoma County - Indicative Financial Proforma w/ 20-Year Tax Exempt Lease Purchase											
Year	Energy Savings	SGIP Incentive	ITC	Incentives (SGIP & ITC)	Total Yearly Savings	Principle Payment	Interest Payment	Lease Payments	O & M Cost (Solar, EV, etc.)	Total Yearly Program Costs	Yearly Net Savings
Year 1	$110,128	$61,200	$396,110	$457,310	$567,438	$59,037	$84,437	$143,473	$6,484	$149,957	$417,481
Year 2	$115,408	$20,400		$20,400	$135,808	$61,717	$81,756	$143,473	$6,678	$150,152	-$14,343
Year 3	$120,943	$20,400		$20,400	$141,343	$64,519	$78,955	$143,473	$6,879	$150,352	-$9,009
Year 4	$126,743	$20,400		$20,400	$147,143	$67,448	$76,025	$143,473	$7,085	$150,558	-$3,416
Year 5	$132,822				$132,822	$70,510	$72,963	$143,473	$8,457	$151,930	-$19,108
Year 6	$139,194				$139,194	$73,711	$69,762	$143,473	$7,517	$150,990	-$11,796
Year 7	$145,871				$145,871	$77,058	$66,416	$143,473	$7,742	$151,215	-$5,344
Year 8	$152,871				$152,871	$80,556	$62,917	$143,473	$7,974	$151,448	$1,423
Year 9	$160,206				$160,206	$84,213	$59,260	$143,473	$8,214	$151,687	$8,520
Year 10	$167,895				$167,895	$88,037	$55,437	$143,473	$9,804	$153,277	$14,618
Year 11	$175,954				$175,954	$92,034	$51,440	$143,473	$8,714	$152,187	$23,767
Year 12	$184,401				$184,401	$96,212	$47,261	$143,473	$8,975	$152,448	$31,952
Year 13	$193,254				$193,254	$100,580	$42,893	$143,473	$9,244	$152,718	$40,536
Year 14	$202,533				$202,533	$105,146	$38,327	$143,473	$9,522	$152,995	$49,538
Year 15	$212,259				$212,259	$109,920	$33,553	$143,473	$11,365	$154,839	$57,420
Year 16	$222,453				$222,453	$114,910	$28,563	$143,473	$10,102	$153,575	$68,878
Year 17	$233,138				$233,138	$120,127	$23,346	$143,473	$10,405	$153,878	$79,260
Year 18	$244,338				$244,338	$125,581	$17,892	$143,473	$61,790	$205,263	$39,075
Year 19	$256,077				$256,077	$131,282	$12,191	$143,473	$11,038	$154,512	$101,566
Year 20	$268,382				$268,382	$137,243	$6,231	$143,473	$11,369	$154,843	$113,539
Year 25	$81,990				$81,990				$4,627	$4,627	$77,363
Year 30	$102,052				$102,052				$5,364	$5,364	$96,688
Year 35	$127,024				$127,024				$6,219	$6,219	$120,805
Total	**$4,992,545**	**$122,400**	**$396,110**	**$518,510**	**$5,511,055**	**$1,859,840**	**$1,009,626**	**$2,869,466**	**$305,822**	**$3,175,289**	**$2,335,766**

Notes: Willdan is not a financial advisor. The stated project cost is a turnkey price to perform the project including PG&E SST program fees. The interest and cashflow is based on an indicative rate and not a representation of final financing terms. Final financing terms to be determined. No prepayment premiums have been included (typically 200 to 300 bps). Prepayment from incentives within the first performance year may be eligible for no prepayment premiums. The value of incentives is based on the County's SGIP reservation for storage and an illustrative ITC direct payment. The County will be responsible for securing the Investment Tax Credit Direct Payment. Value of SGIP rebate was reduced to account for the ITC payment. The emissions reduction is based on 2021 Sonoma Clean Power Emissions Intensity of 68 lbs CO2e and 13.446 lbs per therm C02e for natural gas. Yearly Net Savings = Total Yearly Savings – Total Yearly Program Costs.

Assumptions: Energy escalation rate of 5%. O&M escalation rate of 3%. Solar assumed to produce electricity for 35 years with output degrading 0.5% per year. Value of solar production assumed to decrease by 30% after NEM 2.0 rate period in year 20. Solar and BESS ITC direct payment assumed to be 25.5% of price. Expected useful life of the lighting retrofit, new heat pumps, BESS, and load shift to be 20 years. Expected useful life of the BMS to be 25 years. Value of emissions reduction estimated to be $120 per metric ton of C02e avoided and a constant emissions intensity. Net zero electricity based on 2019 consumption. Additional yearly O&M assumed to cost $6,295 and cost assumed to escalate 3% per year. Assumed solar inverter replacement in year 18 and UPS (maintenance item on BESS) replaced in years 5, 10 and 15.