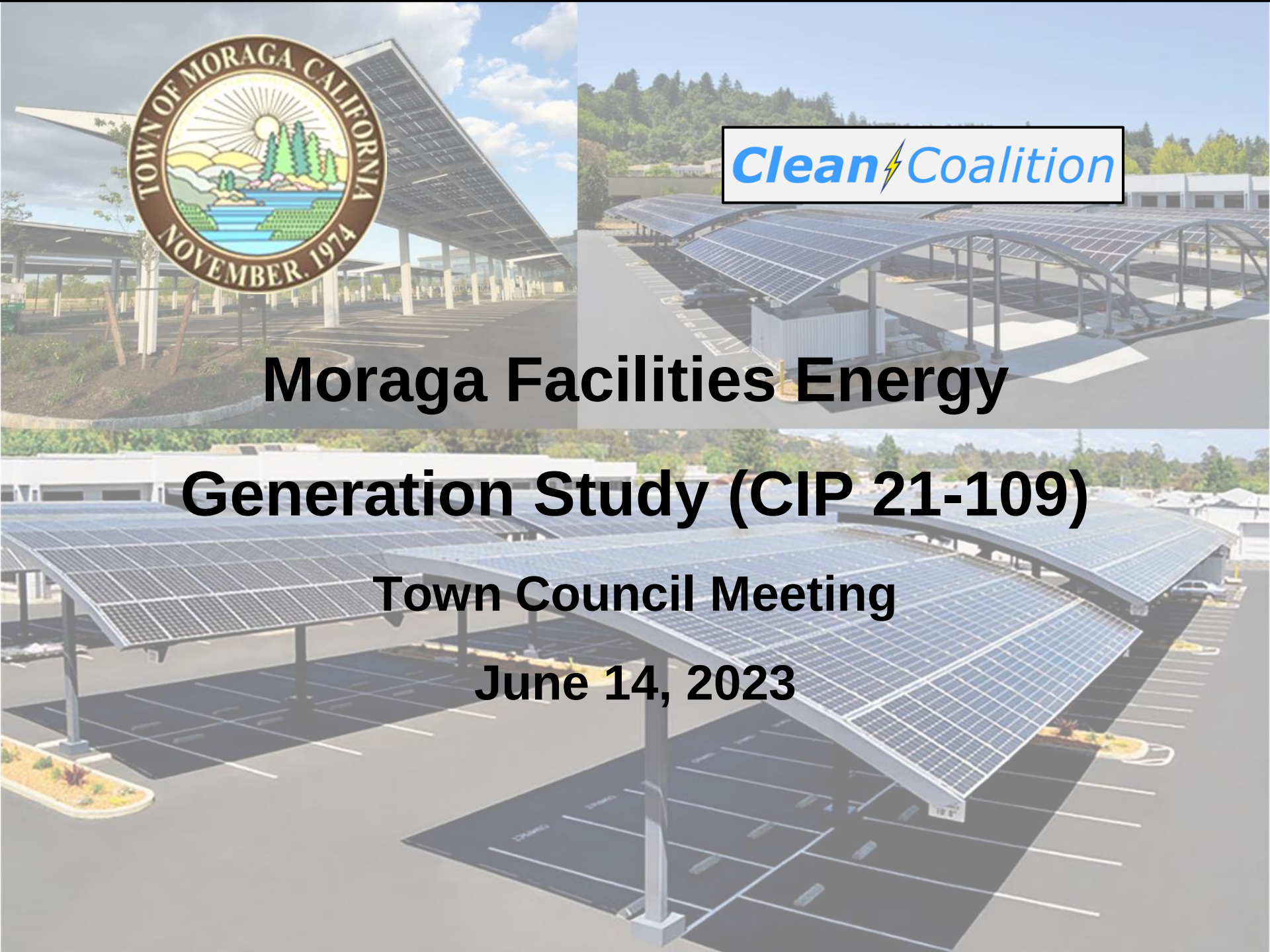


Moraga Facilities Energy Generation Study (CIP 21-109)

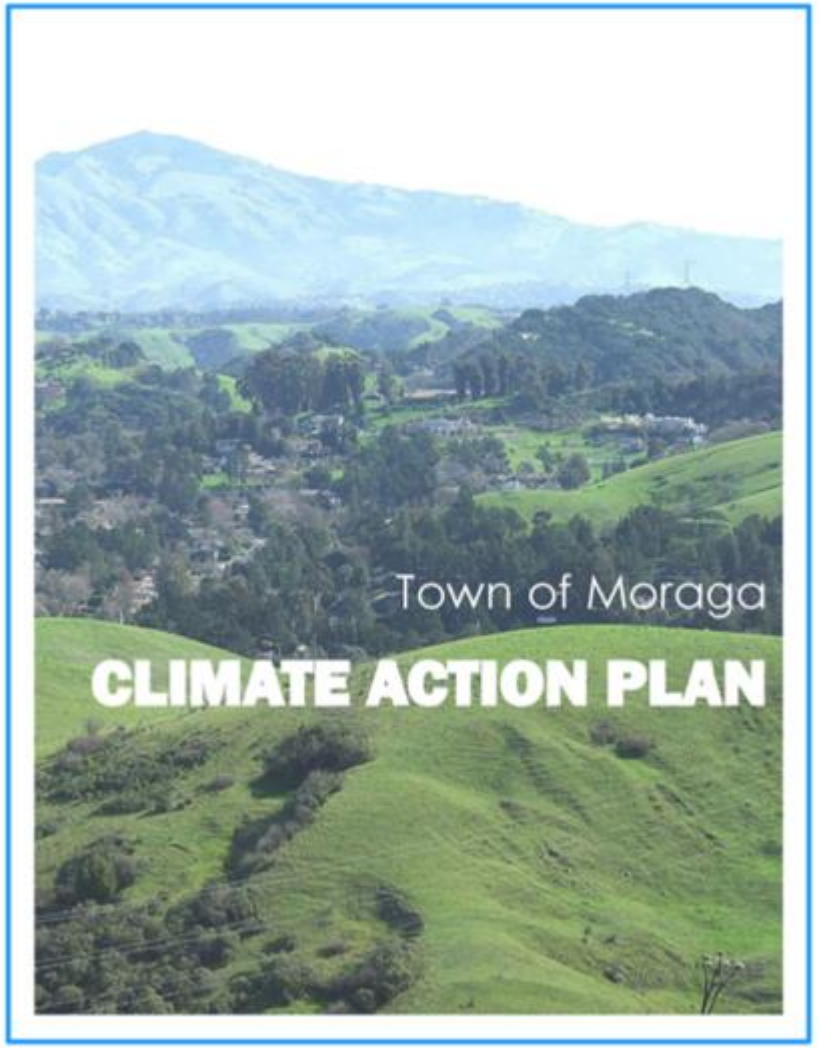
Town Council Meeting

June 14, 2023

Study's alignment with Town Goals and Facility Needs

2023 Town Goal 5: Support high-quality police and emergency response services, including by securing energy alternatives for emergencies, and coordinate with MOFD on fire safety and planning.

2023 Town Goal 12: Lessen the Town's impact on the environment by continuing to implement sustainability and resiliency initiatives and viable strategies in Moraga's Climate Action Plan and in the Town's Facility Energy Generation Study.



Emergency Response Capabilities

- Power Outages
- Wildfires
- Other Natural or Manmade Disasters

Changes made since May 2022

Since the last presentation on May 24, 2022, changes have been made to this presentation in order to reflect current electricity rates, solar policies, solar & storage costs, PPA pricing, and incentives. Updates include:

1. **Latest utility rates, which have increased 16% for the Town of Moraga sites since May 2022.**
2. **Solar policy change from Net Energy Metering 2 (NEM2) to NEM3, which reduces the value of exported solar energy (solar exported to the grid).**
3. **Current solar & battery pricing and associated Power Purchase Agreement (PPA) pricing.**
4. **Direct Pay feature of the Inflation Reduction Act that allows tax-exempt entities, including municipalities, to reap federal Investment Tax Credit (ITC) opportunities. In the case of Moraga, a 30% ITC is available on the Solar Microgrid components (solar, batteries, load management solutions, and associated electrical upgrades is covered, which means that everything assessed in the Study results is covered except diesel generators).**

Solar will comply with Moraga Code and Architectural Preferences

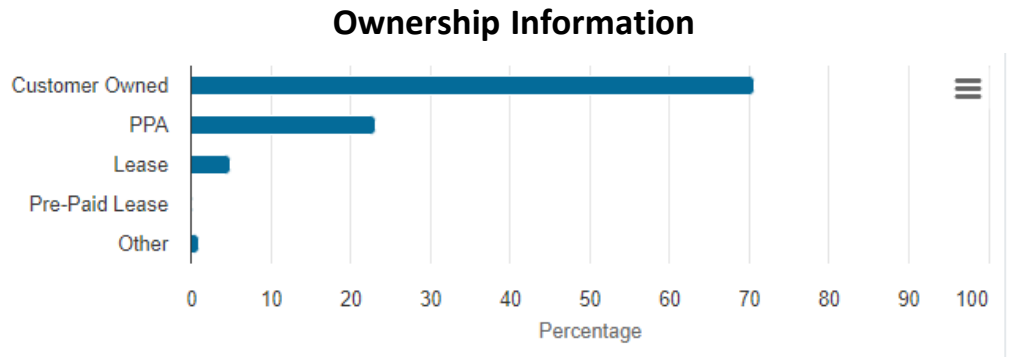
Roof mount solar on angled roof

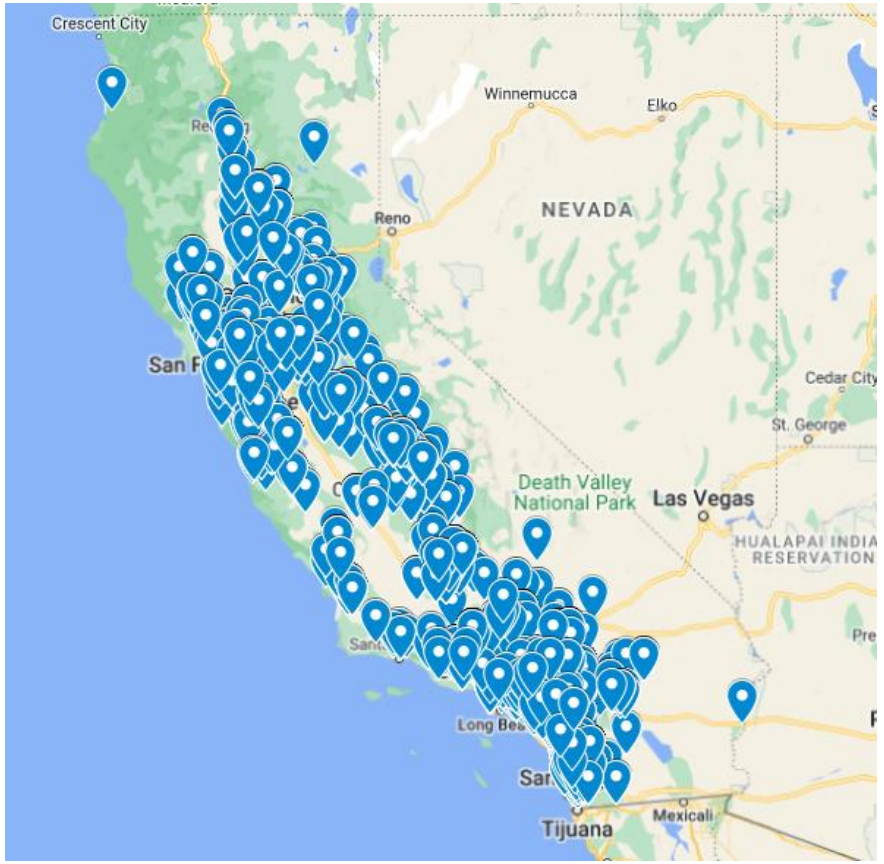
Example of solar canopy architectural design in Montecito, CA.

Distributed Energy Project PPAs are abundant throughout California

There are over **310,000 Distributed Solar, Battery Storage, and Fuel Cell PPAs** in California.

PPA's are the second most common financing method, behind customer ownership.





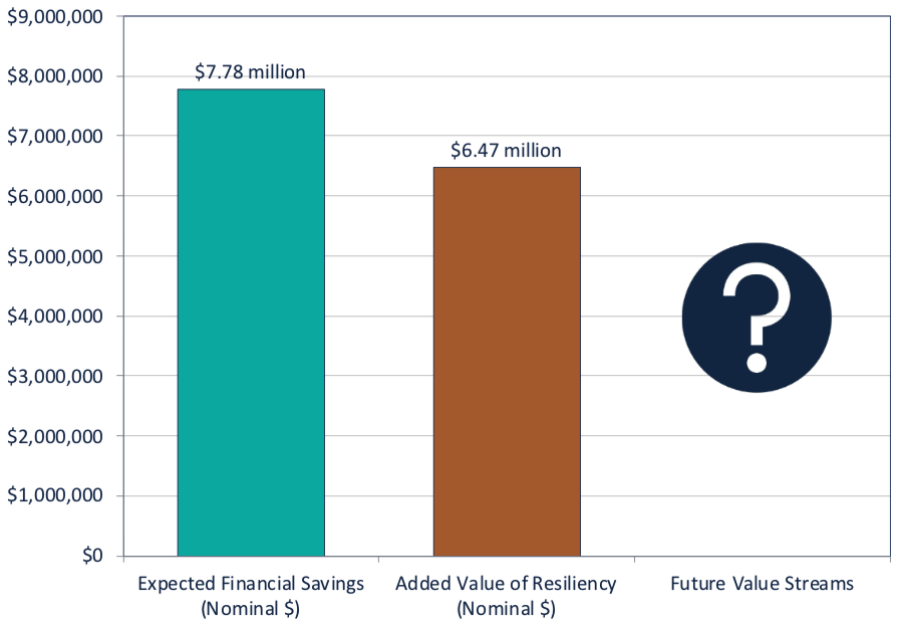
[California Distributed Generation Statistics](www.californiadgstats.ca.gov)

www.californiadgstats.ca.gov

Solar & Solar Microgrid PPAs for the Santa Barbara Unified School District

Project details

- 28-year power purchase agreement (PPA)
- $7.78 million in expected financial savings
- $6.47 million in Value of Resilience (VOR)
- 14 solar projects
- 6 Solar Microgrids
- 4.2 MWdc solar
- 1.9 MW / 3.8 MWh battery storage
- The Solar Microgrid sites will provide their Tier 1 loads (10% of the site's loads) with indefinite resilience during a grid outage, along with significantresilience for the rest of the loads.



Recommendation Rankings

(covering Town Hall & Police, Council Chambers & Corp Yard, and Library)

Clean Coalition

Solar + Battery Storage + Diesel Generator

- Total 25-Year value: $520,560
  - 25-Year Net Bill Savings: $295,388
  - Value of Resilience: $225,172 (avoided diesel-related costs)
- Indefinite resilience for the most critical loads with substantial resilience for all other loads too
- Continued operation if diesel fuel runs dry

Solar + Diesel Generator

- Total 25-Year value : $465,109
  - 25-Year Net Bill Savings: $465,109
  - Value of Resilience: $0
- Solar turns off during grid outages
- If onsite diesel fuel cannot be resupplied, it will be “lights out” when the diesel runs dry

Diesel Generator

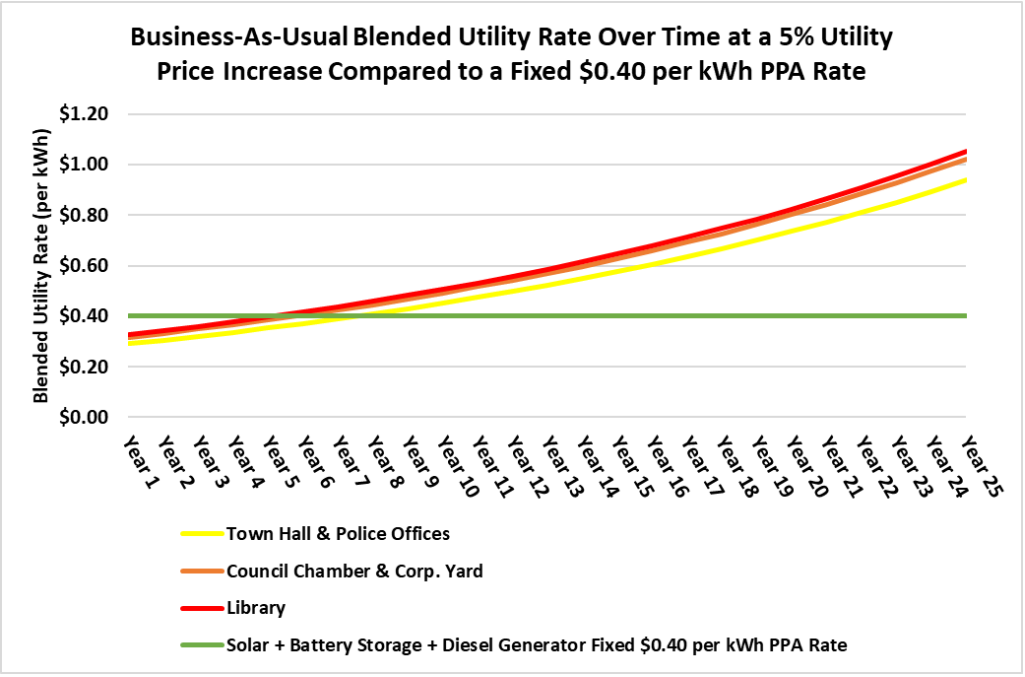
- 25-Year Total Cost: $897,292 (this is the cost of achieving the 5-day resilience requirements)
- If onsite diesel fuel cannot be resupplied, it will be “lights out” when the diesel runs dry

Sizing results of recommended scenario: Solar + Battery Storage + Diesel Generator

Solar + Battery Storage + Diesel Generator Sizing										
Site	Peak Demand (kW)	Solar Sizing		Battery Storage Sizing		Diesel Generator Sizing			Indefinite Resilience	
		System Size (kW)	Percentage of Net Zero Energy	Power Capacity (kW)	Energy Capacity (kWh)	Capacity Rating (kW)	Minimum Fuel Tank Size (gal)	Gallons Needed to Meet Resilience	Percentage of Baseline Load	Percentage of Master Load
Town Hall & Police Offices	63	173	100%	65	172	80	510	311	42%	20%
Council Chamber & Corp. Yard	79	61	46%	80	211	100	350	213	100%	13%
Library	80	113	100%	80	211	100	350	211	31%	22%
Totals & Averages	**74**	**348**	**82%**	**225**	**594**	**280**	**1,210**	**735**	**58%**	**18%**

Economic details

Moraga PPA Economic Details									
Scenario Options	Site	Business-As-Usual Blended Utility Rate Over Time at a 5% Utility Price Increase (per kWh)			Fixed PPA Pricing (per kWh)	PPA Economic Details			
		Year 1	Year 10	Year 25		25 Year Electrical Bill Savings	25 Year PPA Cost	25 Year Net Savings	Value of Resilience (VOR)
Solar + Battery Storage + Diesel Generator	Town Hall & Police Offices	$0.291	$0.451	$0.939	$0.40	$2,275,810	($2,503,411)	($227,601)	$92,626
	Council Chamber & Corp. Yard	$0.317	$0.492	$1.022	$0.40	$1,181,890	($875,343)	$306,547	$52,612
	Library	$0.326	$0.506	$1.051	$0.40	$1,887,452	($1,671,010)	$216,442	$79,934
	Total and Averages	**$0.311**	**$0.483**	**$1.004**	**$0.40**	**$5,345,152**	**($5,049,764)**	**$295,388**	**$225,172**
Solar + Diesel Generator	Town Hall & Police Offices	$0.291	$0.451	$0.939	$0.40	$1,818,041	($1,752,388)	$65,653	$0
	Council Chamber & Corp. Yard	$0.317	$0.492	$1.022	$0.40	$689,948	($612,740)	$77,208	$0
	Library	$0.326	$0.506	$1.051	$0.40	$1,491,955	($1,169,707)	$322,248	$0
	Total and Averages	**$0.311**	**$0.483**	**$1.004**	**$0.40**	**$3,999,944**	**($3,534,835)**	**$465,109**	**$0**



Diesel Generator - Economic Analysis Results, 25 Years			
Site	Finance Option A Cash Purchase		
	Total Capex	Total 25 Year Opex	Total 25 Year Cost
Town Hall & Police Offices	($214,864)	($83,279)	($298,143)
Council Chamber & Corp. Yard	($200,680)	($83,279)	($283,959)
Library	($231,912)	($83,279)	($315,191)
Total	**($647,456)**	**($249,836)**	**($897,292)**

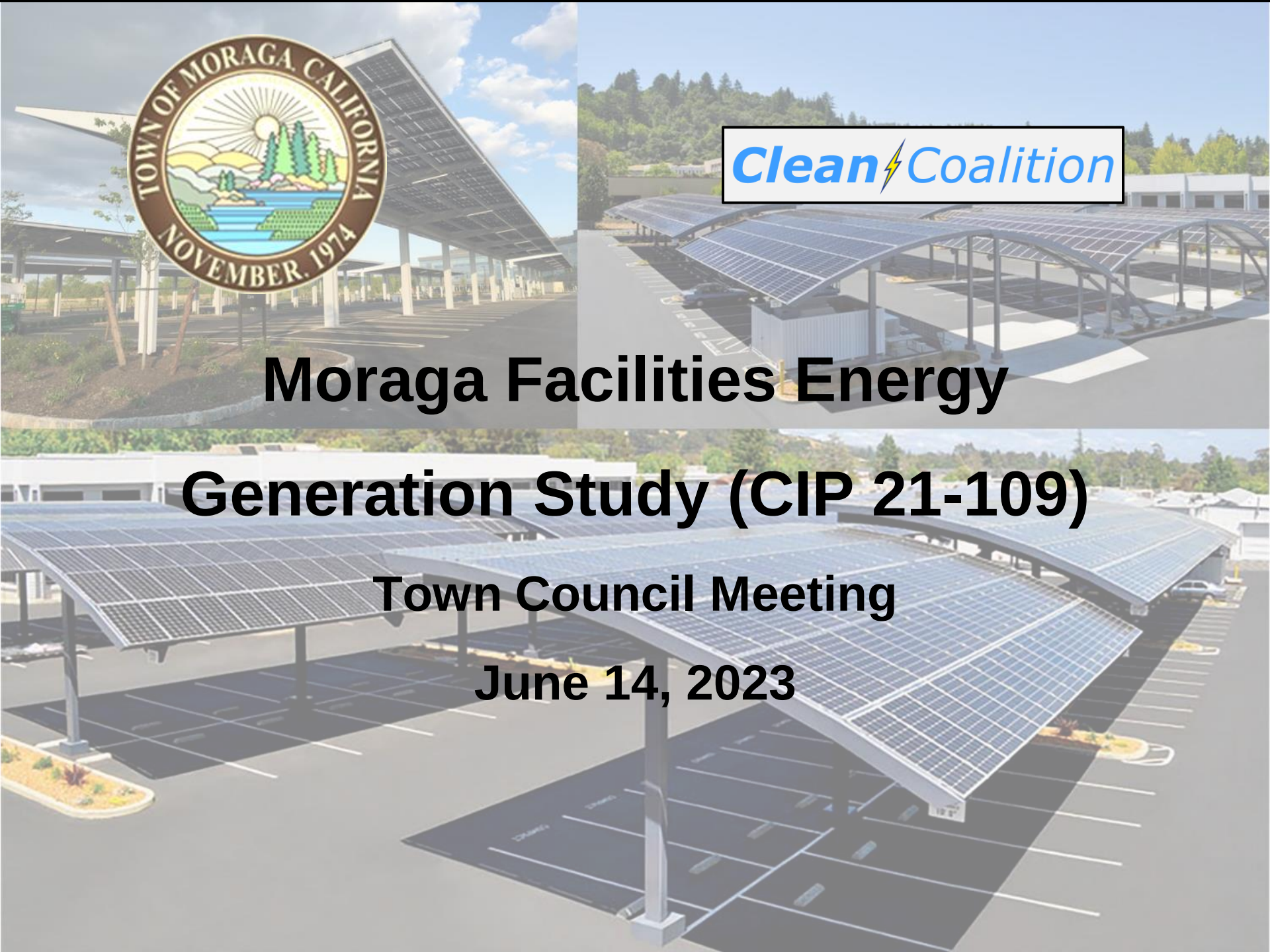
Energy resource scenario benefits

Benefits	Solar + Storage + Diesel Generator PPA	Solar + Storage + Diesel Generator Cash Purchase	Solar + Diesel Generator PPA	Solar + Diesel Generator Cash Purchase	Diesel Generator Only Cash Purchase	Business-as-usual
Economic						
Direct economic value	X	**X**	X	X		
Local economic stimulation	**X**	**X**	X	X		
No burden Moraga capex & opex	X		X			
Environmental						
100% Renewables	X	X	X	X	X	X
Efficiency (no transmission losses)	**X**	**X**	X	X		
Preservation of Habitat	**X**	**X**	X	X		
Resilience						
Indefinite energy supply	**X**	**X**				
Self-reliance	**X**	**X**				
Grid Citizenship						
Dispatchable load profile	**X**	**X**				
Grid services opportunities (Demand Response)	**X**	**X**				
Operational						
Low Moraga burden O&M	**X**		**X**			

Solar + Storage + Diesel Generator is recommended

Clean Coalition

Appendix – analytical details



Moraga Facilities Energy Generation Study (CIP 21-109)

Town Council Meeting

June 14, 2023

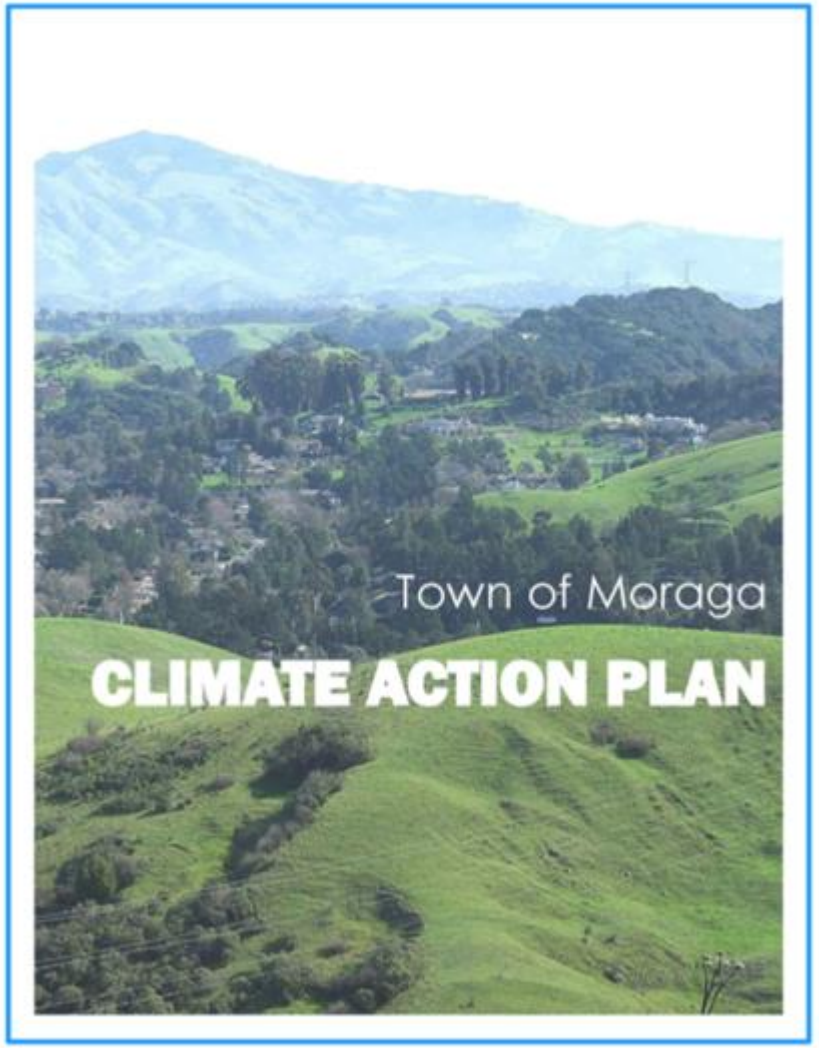
Study's Alignment with Town Goals and Facility Needs

2023 Town Goal 5: Support high-quality police and emergency response services, including by securing energy alternatives for emergencies, and coordinate with MOFD on fire safety and planning.

2023 Town Goal 12: Lessen the Town's impact on the environment by continuing to implement sustainability and resiliency initiatives and viable strategies in Moraga's Climate Action Plan and in the Town's Facility Energy Generation Study.

Emergency Response Capabilities

- Power Outages
- Wildfires
- Other Natural or Manmade Disasters



Moraga Facility Resiliency Deficiencies

Town Hall and Police Offices:

- Police Generator – Propane 15 kW
- Town Hall – Army Surplus Diesel 23 kW

Council Chambers, Corp Yard and EOC:

- Building – propane 16kW

Library:

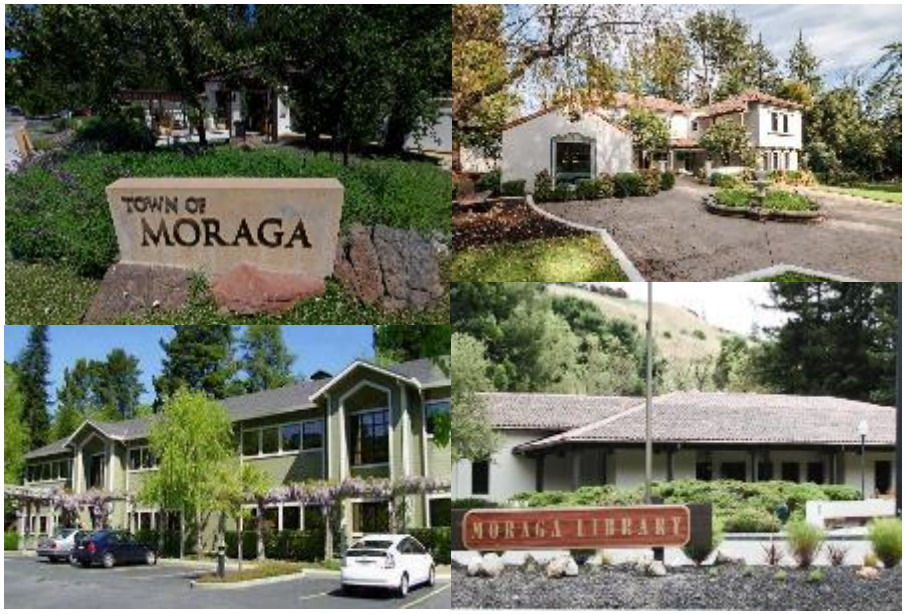
- No generator

Moraga Facility Energy Generation Study: Project Overview

Obtain and analyze energy usage at each of the three Town properties. **Study and model options to provide energy resilience for critical and essential services at each site**. Consider renewable energy and fossil fuel resources.

Provide a detailed report analyzing the power needs for each property and proposing various alternatives for independent and emergency backup power generation for each site.

Recommend the best options considering the Town's program and project goals for climate change, energy provider mix of resources, resilience, sustainability, financing, and affordability.



1) Town Hall & Police Offices: 329 Rheem Boulevard
2) Council Chamber & Corp. Yard: 335 Rheem Boulevard
3) Library: 1500 St. Mary's Road

Recommendation & Results

The specific recommendations in this analysis enable the Town of Moraga to proceed with onsite energy generation at the three targeted community facilities that will provide these **two substantial benefits**:

1. **Keeping critical and essential services such as town operations, healthcare, police, comfort, food, internet access, etc. active during grid outages**, which are becoming more frequent and intense – **AND**

2. **Improving the Town's budget by saving substantial costs on the Town's utility bills**, **resulting in a projected net savings of over $500k.**

Changes Made Since May 2022

Since the last presentation on May 24 2022, changes have been made to this presentation in order to reflect current electricity rates, solar policies, solar & storage costs, PPA pricing, and incentives:

1. **Updated utility rates, which have increased 16% since May 2022.**
2. **Solar industry has transition from Net Energy Metering 2 (NEM2) to NEM3, a policy change that reduced the economic value of solar.**
3. **Updated cash purchase costs for the solar and battery storage systems, along with PPA pricing due to the current economy.**
4. **The Direct Pay 30% Investment Tax Credit (ITC) has been made available to municipalities from the Inflation Reduction Act.**

Moraga Facility Energy Generation Study: Project Steps/Methodology

Step 1

Load Profiles

- Baseline: recent annual loads.
- Master: adds future expected loads, e.g. EV charging.
- Critical: loads required to be maintained during outages.

Industry Tools:

- Clean Coalition: load analysis calculators.
- UtilityAPI: 15-minute load intervals.

Step 2

Resource Scenarios

- Optimal solar, storage, and other potential onsite resources.
- Sizing and combinations to achieve the required critical load and economic outcomes.

Industry Tools:

- Helioscope: solar siting.
- Energy Toolbase: resource sizing.

Step 3

Site Layouts

- Specific locations & sizing for solar, storage, and any other viable resources.
- Location of key electrical assets, e.g. panels, etc.
- Energy usage profiles including load profiles.

Industry Tools:

- Clean Coalition: site layout tool.

Step 4

Economic Analysis

- Costs and financing options covering each viable resource scenario.
- Added resilience value.

Industry Tools:

- Energy Toolbase: economic analysis.
- Clean Coalition: resilience calculator (e.g. avoided diesel).

Step 5

Reporting & Recommendations

- Project Review Meetings.
- Reports and Presentations.
- Recommended options & next steps.

Key load related terms

Load Type	Definition
Baseline load profile	The historical annual usage of electrical loads per site that forms the basis for creating the master load profile.
Master load profile	The forecasted annual load profile used for this study's analysis, created from the baseline load profile plus adjustments for anticipated EV Charging Infrastructure (EVCI), electrification, energy efficiency, and new facilities.
Critical loads	Electrical loads that are necessary to be provided with 100% energy resilience during grid outages
Critical load profile	Annual load profile of the critical loads.
Total Critical Load Required (TCLR)	**Total amount of energy required to serve the critical loads over the specified time period, e.g. 5 consecutive days.**

Resilience Load Type & Scenarios

Sites	Resilience Load Type	Resilience Scenario
Town Hall & Police Offices	Master Load Profile	Resource scenarios for these sites were designed to provide energy resilience for five consecutive days.
Council Chambers & Corp. Yard	Master Load Profile	
Library	Baseline Load Profile	

Town of Moraga Annual Loads, Peak Demands, and Electric Vehicle (EV) Charging Station Counts

Site	Baseline Load Profile Peak Demand & Annual Load		Existing & New EV Charging Stations Counts			New EV Charging Station's Peak Demand & Annual Load		Master Load Profile Peak Demand & Annual Load	
	Peak Demand (kW)	Total Annual Load (kWh)	Existing Level 2 EV Charging Station Ports	New Level 2 EV Charging Station Ports	New Level 3 EV Charging Station Ports	New Level 2 EV Charging Station's Peak Demand	Total Annual Load from New EV Charging (kWh)	Peak Demand (kW)	Total Annual Load (kWh)
Town Hall & Police Offices	43	116,337	2	2	0	20	144,303	63	260,640
Council Chamber & Corp. Yard	15	14,523	0	2	2	64	177,012	79	191,535
Library	52	107,621	0	4	0	28	67,852	80	175,473
Totals & Averages	37	238,481	2	8	2	37	389,167	74	627,648

Resource Scenarios

Resource Scenarios	Feasible for Study?
Solar + battery storage	Yes, feasible for detailed study.
Solar + battery storage + diesel generator	Yes, feasible for detailed study.
Solar + diesel generator	Yes, feasible for detailed study.
Diesel generator only	Yes, feasible for detailed study.
Solar only	Not feasible. No resilience due to solar being automatically shut off when the grid goes out.
Battery storage only	Not feasible. Too large and costly to provide resilience without onsite energy generation.
Run of river hydro	Not feasible. Insufficient local hydro resources.
Geothermal	Not feasible. Insufficient local resources, uneconomical.
Biofuel	Not feasible. Nonexistent local supply, uneconomical to create.
Pipeline fueled generators	Not feasible. Pipes disrupted in earthquakes & extreme weather
Propane	Not feasible. Requires extra, separate tank vs. diesel

Key economic related terms

Economic term	Definition
Electrical Bill Savings	The amount of utility bills savings occurring over a 25 year period. • This includes energy savings from using solar energy in real-time, instead of energy from the grid, or from NEM credits. • It also includes demand savings from demand reduction, which is reducing the demand charges associated to sites max demand. • A 5% annual utility cost escalator was also included, assuming that utility rates for electricity will likely go up 5% a year for the next 25-Years.
Capital Expenditure (Capex)	The total amount of money needed to design and build the solar, storage, and/or diesel generators.
Operational Expenditure (Opex)	The operations and maintenance expenses for the solar, storage, and/or diesel generators over a 25 year period. In terms of solar & storage, the Opex includes annual panel cleanings to remove soiling and equipment replacement, which typically happens on average at year 15.
30% Direct Pay Investment Tax Credit (ITC)	The Inflation Reduction Act (IRA) of 2022 contains a "direct pay" provision that enables certain tax-exempt customers, including state and local government, to receive a direct cash payment in lieu of an investment tax credit (ITC). Entities that qualify for direct pay are eligible to receive a 30% direct payment, assuming they meet the IRA established prevailing wage and apprenticeship requirements in order to qualify for the full 30% “increased rate”, rather than a 6% “base rate”. The 30% Direct Pay ITC only applies to solar and storage.
Cash Purchase Net Savings	The sum of the electrical bill savings, Capex, Opex, and 30% ITC over a 25 year period.
Power Purchase Agreement (PPA) Cost	The total 25 Year cost under a Power Purchase Agreement, where The Town agrees to pay the PPA provider a fixed $/kWh for energy that’s delivered to them. The Town does not pay if no energy is delivered.
PPA Net Savings	The sum of the electrical bill savings and PPA costs over a 25 year period.
Value of Resilience (VOR)	Clean Coalition's VOR Methodology states that a typical Solar Microgrid that meets Net Zero Energy is generally worth a 25% adder to the annual electricity bill.

Electric Vehicle (EV) Policy and Regulatory Drivers

Existing Electric Vehicle Policies

- Executive Order B-48-18 - This executive order implements the Governor Brown's call for a new target of 5 million ZEVs in California by 2030, announced in his State of the State address on Jan 25 2018, and will help significantly expand vehicle charging infrastructure.

- Executive Order N-79-20 - This rule establishes a year-by-year roadmap so that by 2035 100% of new cars and light trucks sold in California will be zero-emission vehicles (ZEVs), including plug-in hybrid electric vehicles. The regulation on August 25 2022 realizes and codifies the light-duty vehicle goals set out by Governor Newsom.

- CARB Advanced Clean Trucks (ACT) – requires OEMs to sell minimum % of MD/HD ZEVS each year based on body type and weight class

- CARB Innovative Clean Transit (ICT) – transit must be 100% ZE by 2040, cannot purchase ICE after 2028

Electric Vehicle Policies in Development

- CARB Advanced Clean Fleets (ACF) – still under development but will require large MD/HD fleets 50+ vehicles and ALL public MD/HD fleets to go all electric, 100% ZEV goals 2035-2045

- CARB developing off-road ZE requirement legislation

Resource Scenario Site Layouts

Town Hall & Police Offices – recommended site layout

Town Hall & Police Station Offices

329 Rheem Boulevard

Solar sizing by location:

- R-1 (Rooftop): 39.2 kWdc
- C-1 (Carport): 56.7 kWdc
- C-2: 66.2 kWdc
- C-3 (Carport): 10.9 kWdc
- **TOTAL: 173 kWdc**

Solar to NZE:

- Baseline load profile: 76 kWdc
- **Master load profile: 173 kWdc**

Battery Storage Sizing:

- 65 kW / 172 kWh

Critical loads

- Police offices, Town offices, and Emergency Operations Services for Town functions.
- 100% of load is critical.

Electric vehicle charging

- EV-1: Two existing L2 SemiConnect ports for employee and public use
- EV-2: Two new L2 ports for police station use.
- Estimated annual load of four L2 charging ports – 144,302 kWh

Notes

- ADA requires some ratio of shading and EVCI coverage.
- Solar carports require tree trimming or removal.
- Existing generators should be replaced; insufficient for critical load requirement, requires manual connections – not automatic, must manually shut down circuits

Council Chamber & Corp. Yard – recommended site layout

Council Chamber & Corp. Yard

335 Rheem Boulevard

Solar sizing by location:

- R-1 (Rooftop): 6 kWdc
- C-1 (Carport): 23 kWdc
- C-2 (Carport): 32 kWdc
- **TOTAL: 61 kWdc**

Solar to NZE:

- Baseline load profile: 10 kWdc
- **Baseline+L2 load profile: 61kWdc**
- Master load profile: 113 kWdc

Battery Storage Sizing:

- 80 kW / 211 kWh

Critical loads:

- Town council chambers, repair facilities, and Emergency Operation Center
- 100% of baseline load is critical as is some EV charging in specific scenarios

Electric vehicle charging:

- EV-1: Two new L2 ports for employee & municipal fleet only
- EV-2: Two new L3 ports for employee & municipal fleet only
- Estimated annual load of two new L2 ports: 67,510 kWh
- Estimated annual load of two new L3 ports managed as one: 109,500 kWh

Notes:

- Solar carports require tree trimming or removal.
- Existing generator insufficient; public meetings can not be televised currently during outages; circuits must be manually turned off

Library – recommended site layout

Library

1500 St. Mary's Road

Solar sizing by location:

- C-1 (Carport): 46.2 kWdc
- C-2 (Carport): 39.9 kWdc
- C-3 (Carport): 27.3 kWdc
- **TOTAL: 113.4 kWdc**

Solar to NZE:

- Baseline load profile: 69 kWdc
- **Master load profile: 113.4 kWdc**

Battery Storage Sizing:

- 80 kW / 211 kWh

Critical loads:

- Can operate during outages for Town with internet, lighting, cooling/heating, plug loads
- 100% of load is critical

Electric vehicle charging:

- EV-1: Two new level-2 EV charging ports for employees and public
- EV-2: Two new level-2 EV charging ports for employees and public
- Estimated annual load of four new Level-2 charging ports: 67,851 kWh

Notes:

- ADA requires some ratio of shading and EVCI coverage.
- Solar carports require tree trimming or removal.

Visual examples

Roof mount solar on angled roof

Source: Pablo Davis Elder Living Center

Solar in parking lot as carport

Visual examples

Example of solar canopy architectural design in Montecito, CA.

Solar + Battery Storage + Diesel Generator

Sizing results of recommended scenario: Solar + Battery Storage + Diesel Generator

Solar + Battery Storage + Diesel Generator Sizing										
Site	Peak Demand (kW)	Solar Sizing		Battery Storage Sizing		Diesel Generator Sizing			Indefinite Resilience	
		System Size (kW)	Percentage of Net Zero Energy	Power Capacity (kW)	Energy Capacity (kWh)	Capacity Rating (kW)	Minimum Fuel Tank Size (gal)	Gallons Needed to Meet Resilience	Percentage of Baseline Load	Percentage of Master Load
Town Hall & Police Offices	63	173	100%	65	172	80	510	311	42%	20%
Council Chamber & Corp. Yard	79	61	46%	80	211	100	350	213	100%	13%
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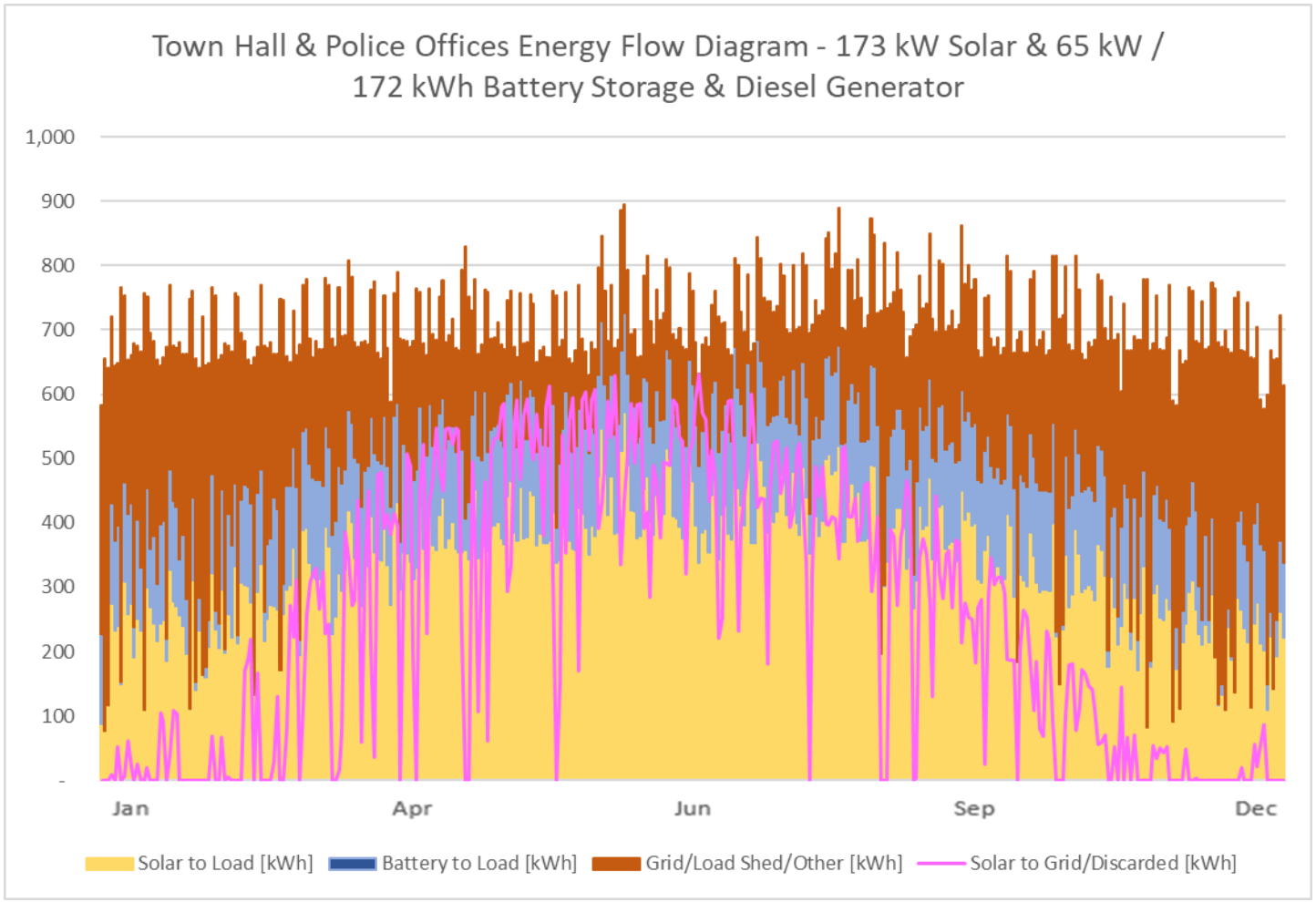
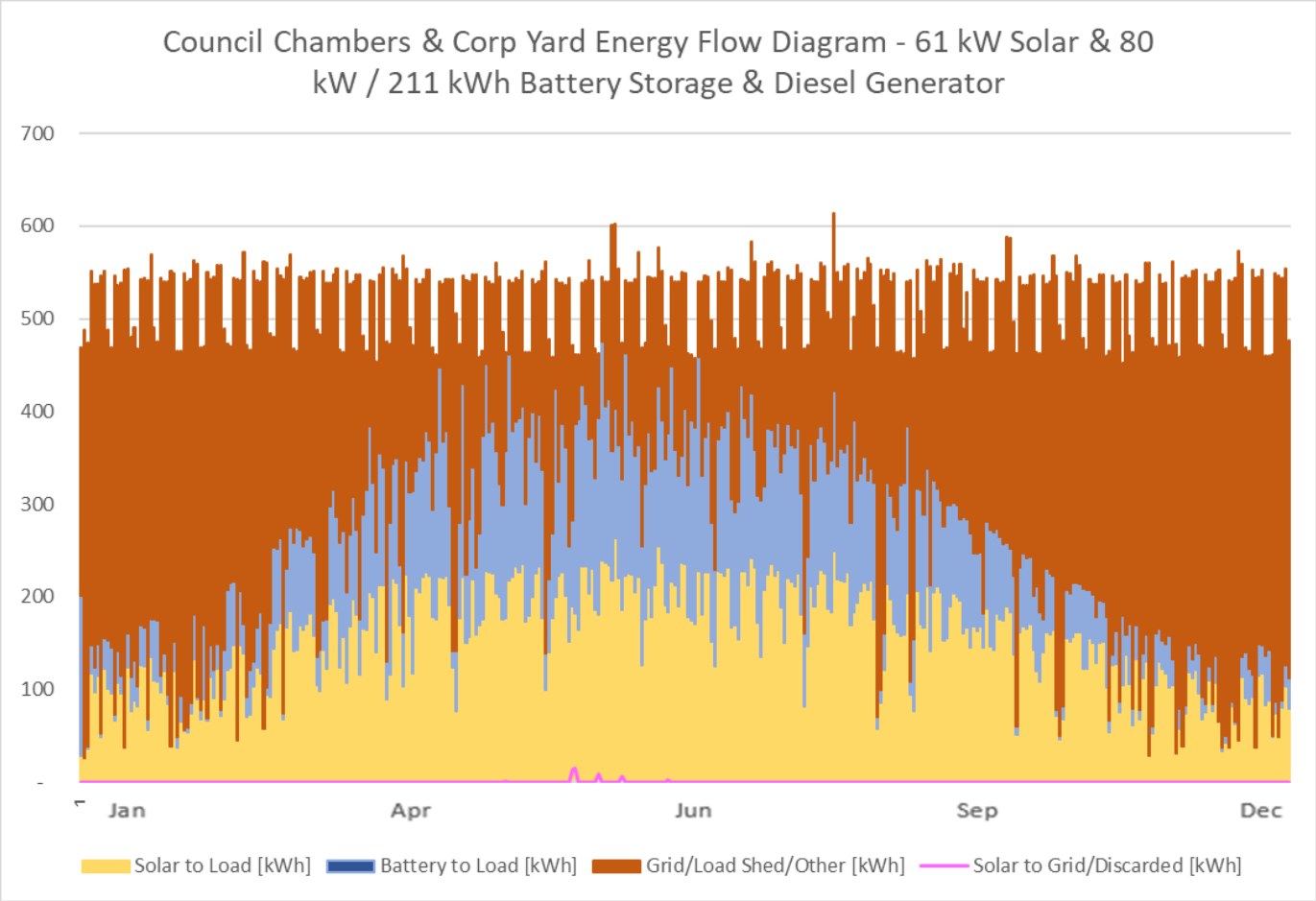
Totals & Averages	**74**	**348**	**82%**	**225**	**594**	**280**	**1,210**	**735**	**58%**	**18%**

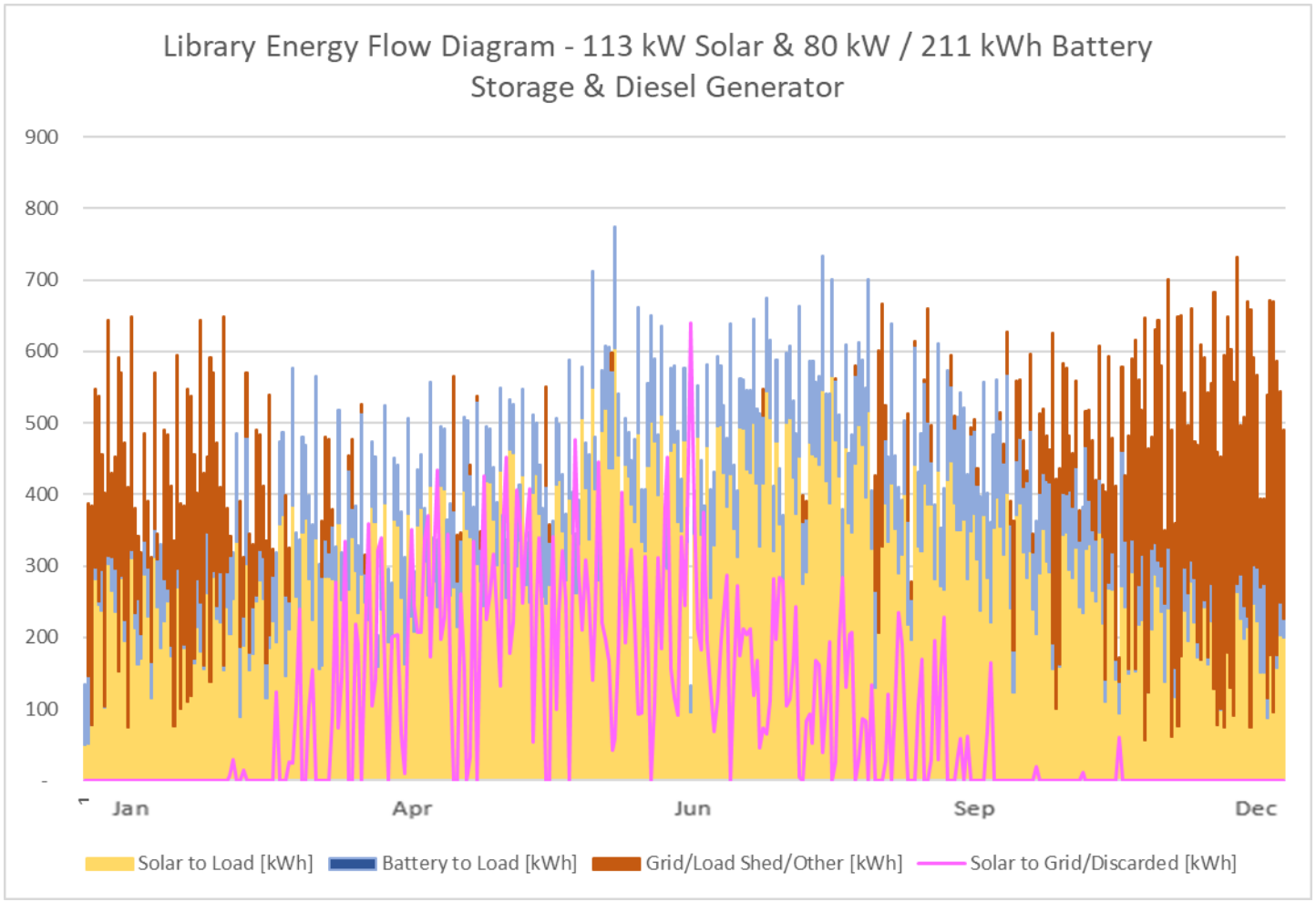
Town Hall & Police Offices Solar + Storage + Diesel Generator energy flow diagram



Council Chambers & Corp Yard Solar + Battery Storage + Diesel Generator energy flow diagram



Library Solar + Storage + Diesel Generator energy flow diagram



Economic results: Solar + Battery Storage + Diesel Generator

Solar + Battery Storage + Diesel Generator Economic Analysis Results, 25 Years									
Site	Electrical Bill Savings	Finance Option A Cash Purchase					Finance Option B $0.40/kWh PPA		
		Total Capex	Total 25 Year Opex	30% ITC Direct Pay	Total Cost	25 Year Net Savings	25 Year PPA Cost	25 Year Net Savings	Savings Year 1
Town Hall & Police Offices	$2,275,810	($1,234,753)	($237,724)	$305,967	($1,166,510)	$1,109,300	($2,503,411)	($227,601)	($53,655)
Council Chamber & Corp. Yard	$1,181,890	($787,813)	($233,678)	$176,140	($845,351)	$336,539	($875,343)	$306,547	($8,975)
Library	$1,887,452	($1,048,806)	($242,055)	$245,068	($1,045,793)	$841,659	($1,671,010)	$216,442	($27,206)
Totals	**$5,345,152**	**($3,071,372)**	**($713,457)**	$727,175	**($3,057,654)**	**$2,287,498**	**($5,049,764)**	**$295,388**	**($89,836)**

A single PPA price for all three sites would be solicited from PPA providers during the RFP process, similar to how we have presented the PPA price above. This PPA price may appear high for the larger sites and low for the smaller sites.

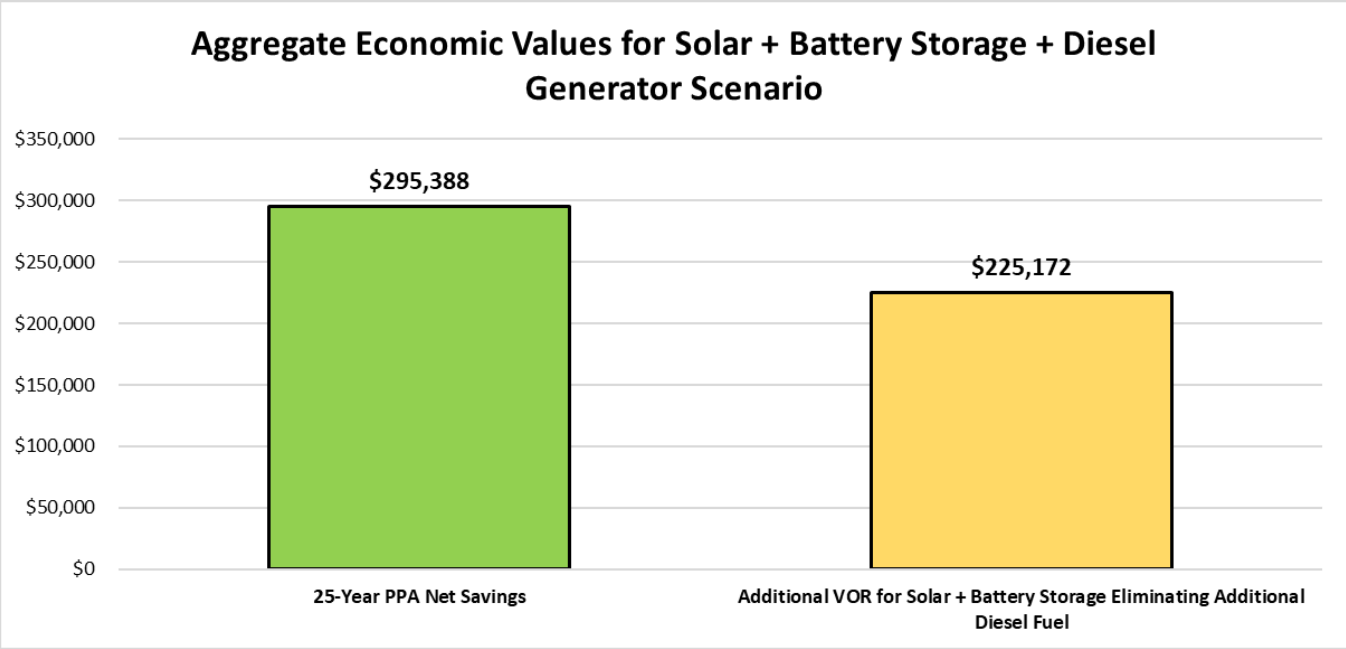
Value of Resilience (VOR): avoided diesel tanks and fuel costs due to onsite solar + battery storage

With this VOR calculation, the Town of Moraga would receive an additional value per site in the table below, equating to a total additional value across the sites of $ $225,172 over the 25 years.

Town of Moraga - Value of Resilience (VOR) Avoided Diesel Tanks and Fuel Costs

Site	Load Profile	Annual Load [kWh]	30-day highest load [kWh]	Indef % load supported from solar + storage	30-day TCLR (indef %) [kWh]	30-day full load diesel fuel required [gal]	Genset rating [kW]	30-day TCLR (indef %) fuel required [gal]	30-day TCLR (indef %) tank size [gal]	Add'l tank purchase price [$]	Add'l tank install cost [$]	Maintenance [$/yr]	30-day TCLR (indef %) fuel cost [$]	25 yr total VOR [$]
Town Hall + Police Station	Master	260,640	23,204	20%	4,641	1,928	80	386	500	$ 5,065	$ 5,065	$ 600	$ 2,70(	$ 92,626
Corp Yard	Master	191,535	16,072	13%	2,089	1,336	100	174	250	$ 3,612	$ 3,612	$ 600	$ 1,21(	$ 52,612
Library	Master	175,473	17,128	22%	3,768	1,423	100	313	500	$ 5,065	$ 5,065	$ 600	$ 2,19:	$ 79,934
Totals and Averages	-	627,648	56,404	18%	10,498	4,688	280	873	1,250	$13,742	$13,742	$1,800	$6,108	$225,172

Economic value: Solar + Battery Storage + Diesel Generator



Note: additional potential values from EV charging and energy storage services to utilities

Solar + Battery Storage + Diesel Generator Aggregate Economic Values			
Site	**PPA Savings Year 1**	**25-Year PPA Net Savings**	**Additional VOR for Solar + Battery Storage Eliminating Additional Diesel Fuel**
Town Hall and Police Offices	($53,655)	($227,601)	$92,626
Council Chamber & Corp. Yard	($8,975)	$306,547	$52,612
Library	($27,206)	$216,442	$79,934
Total	($89,836)	$295,388	$225,172

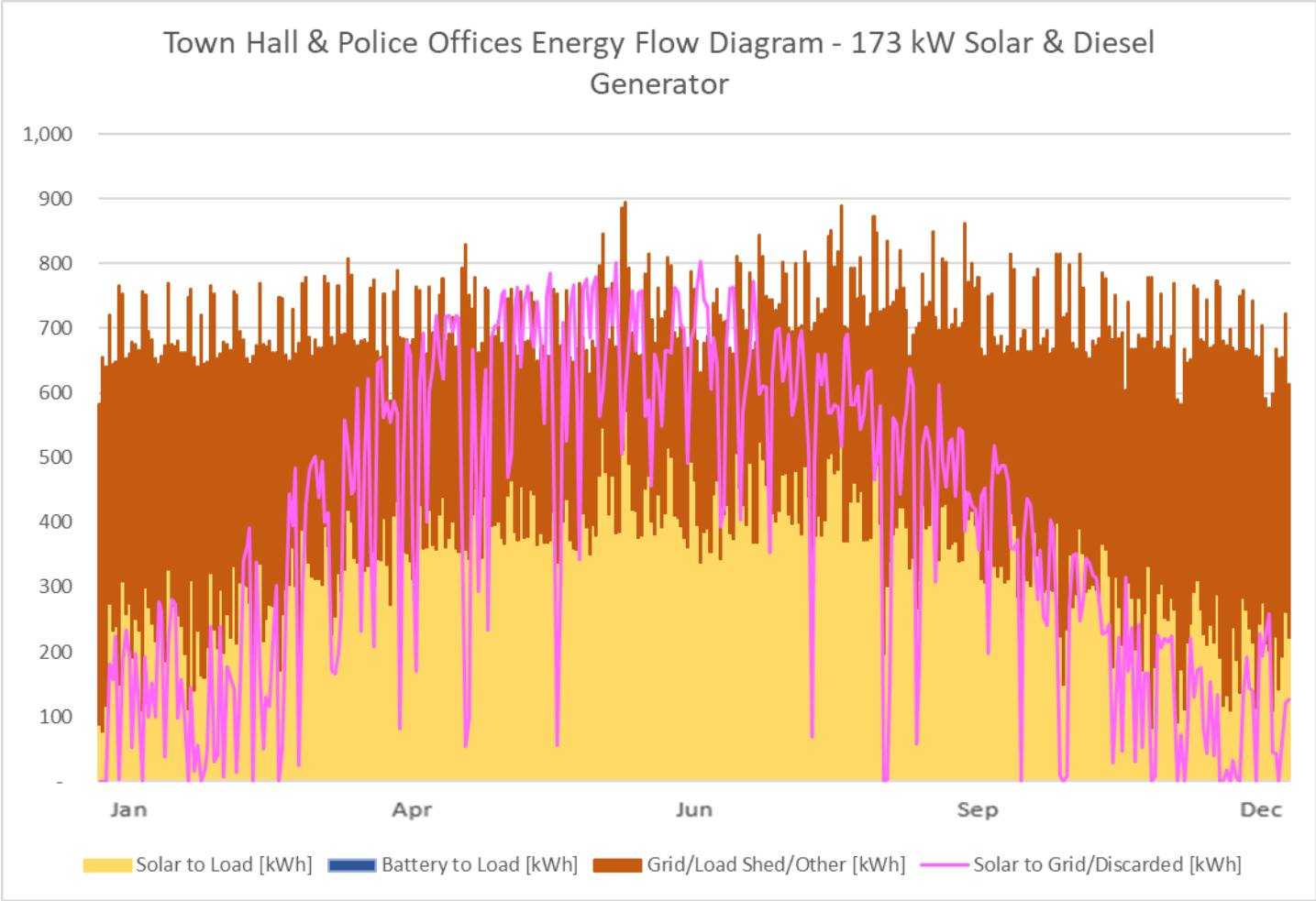
Solar + Diesel Generator

Sizing results: Solar + Diesel Generator

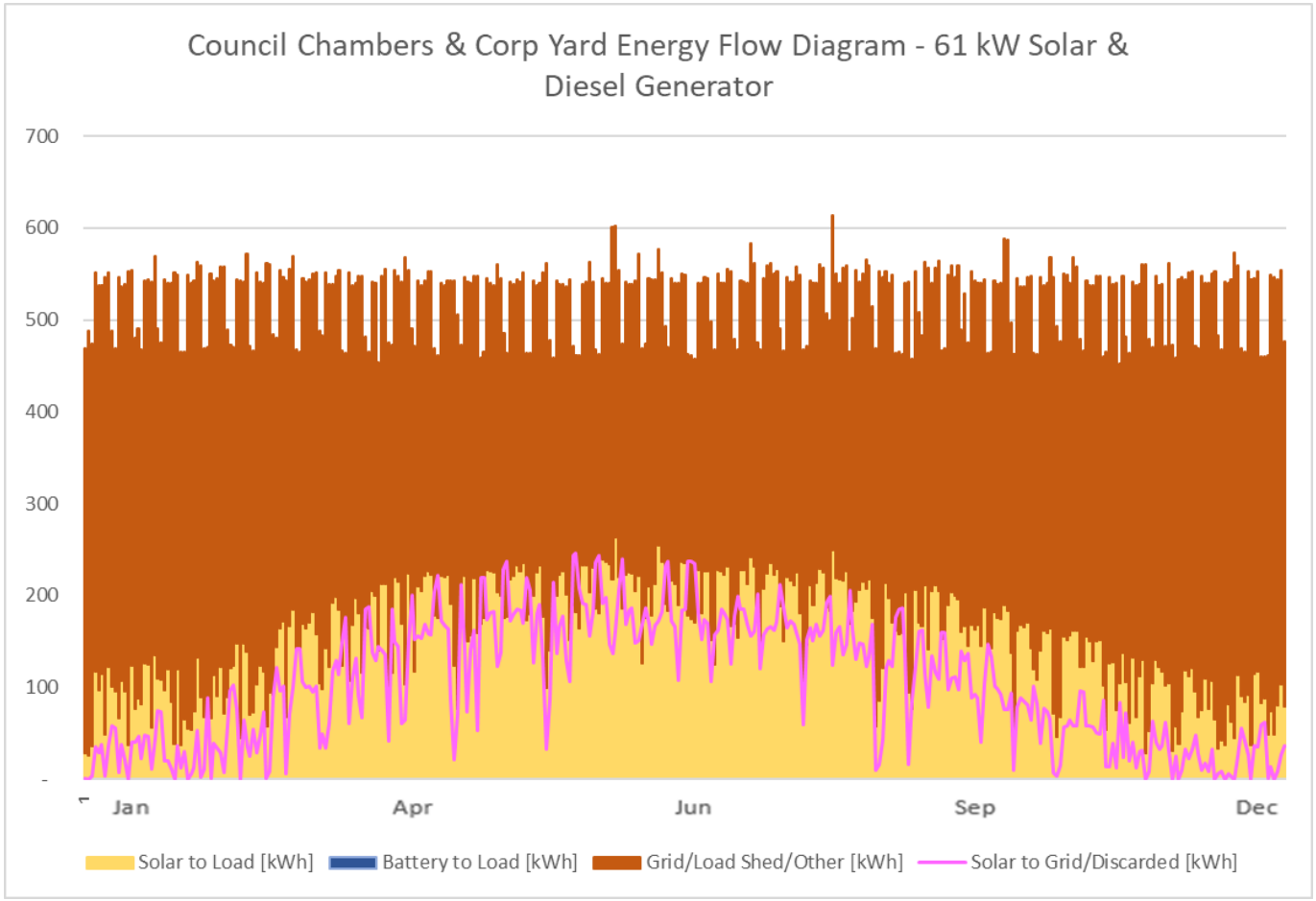
Solar + Diesel Generator Sizing						
Site	Peak Demand (kW)	Solar Sizing		Diesel Generator Sizing		
		System Size (kW)	Percentage of Net Zero Energy	Capacity Rating (kW)	Minimum Fuel Tank Size (gal)	Gallons Needed to Meet Resilience
Town Hall & Police Offices	63	173	100%	80	510	388
Council Chamber & Corp. Yard	79	61	46%	100	350	238
Library	80	113	100%	100	350	233
Total	**74**	**348**	**82%**	**280**	**1,210**	**859**

An extra 144 gallons of diesel fuel will be needed to meet the resilience requirements when compared to the Solar + Storage + Diesel Generator scenario

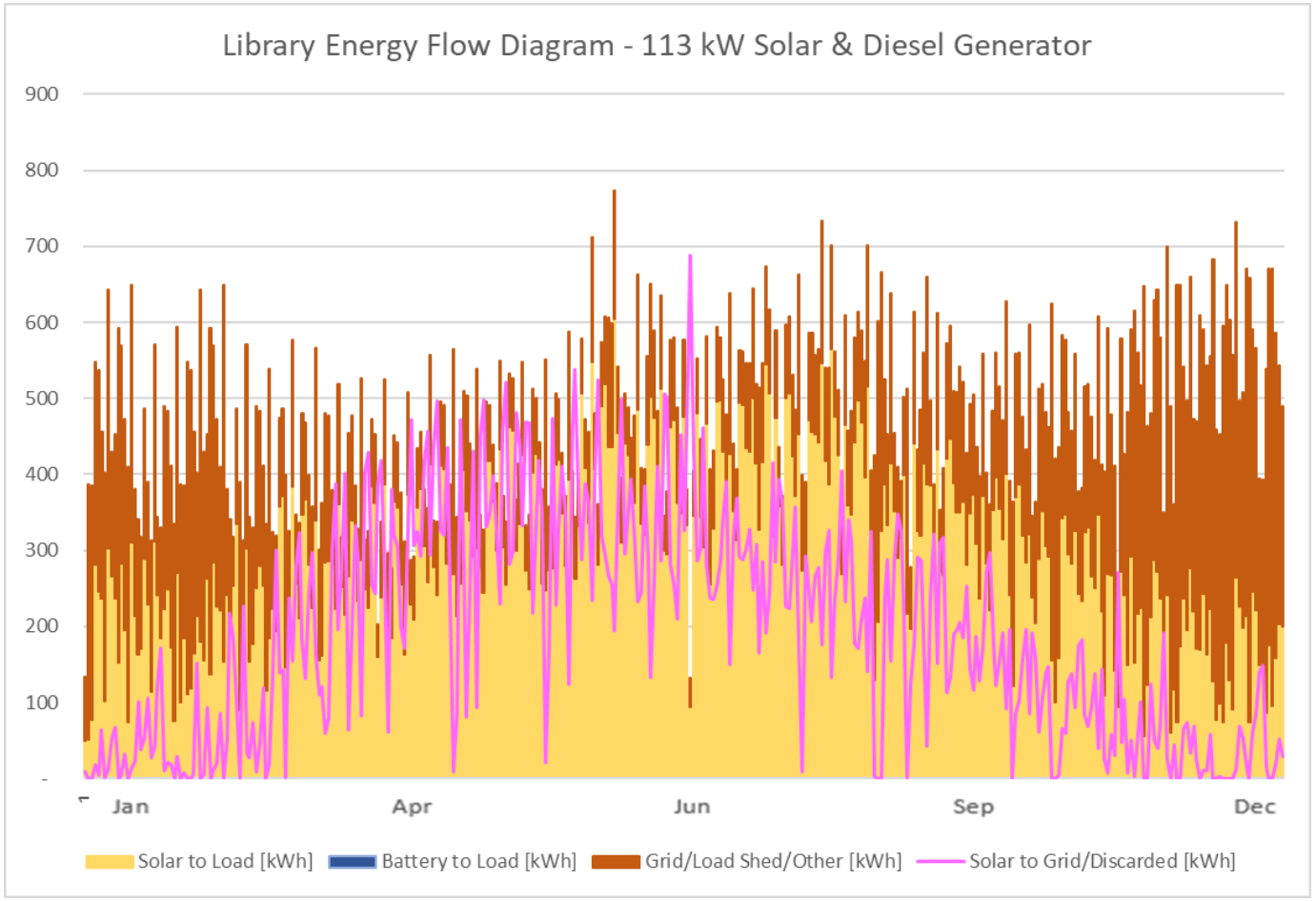
Town Hall & Police Offices Solar + Diesel Generator energy flow diagram



Council Chambers & Corp Yard Solar + Diesel Generator energy flow diagram



Library Solar + Diesel Generator energy flow diagram

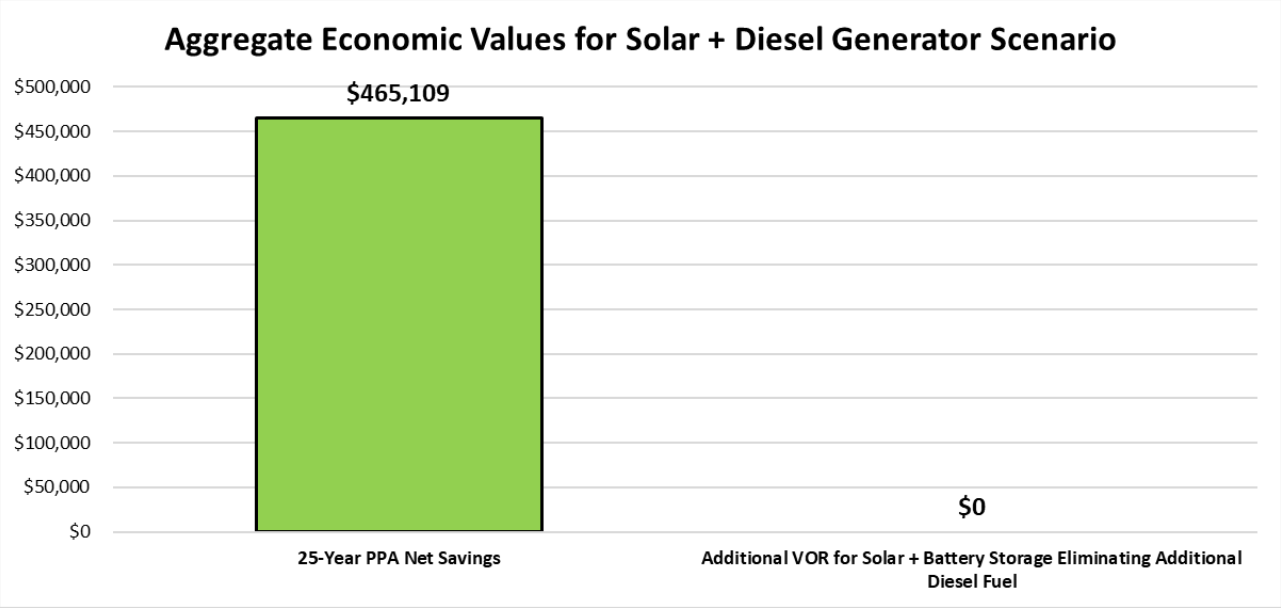


Economic results: Solar + Diesel Generator

Solar + Diesel Generator Economic Analysis Results, 25 Years									
Site	25 Year Electrical Bill Savings	Finance Option A Cash Purchase					Finance Option B $0.28/kWh PPA		
		Total Capex	Total 25 Year Opex	30% ITC Direct Pay	Total Cost	25 Year Net Savings	25 Year PPA Cost	25 Year Net Savings	Savings Year 1
Town Hall & Police Offices	$1,818,041	($977,353)	($146,334)	$228,747	($894,940)	$923,101	($1,752,388)	$65,653	($33,505)
Council Chamber & Corp. Yard	$689,948	($471,013)	($121,198)	$81,100	($511,111)	$178,837	($612,740)	$77,208	($10,490)
Library	$1,491,955	($732,006)	($129,575)	$150,028	($711,553)	$780,402	($1,169,707)	$322,248	($16,075)
Total	**$3,999,944**	**($2,180,372)**	**($397,107)**	$459,875	**($2,117,604)**	**$1,882,340**	**($3,534,835)**	**$465,109**	**($60,070)**

A single PPA price for all three sites would be solicited from PPA providers during the RFP process, similar to how we have presented the PPA price above. This PPA price may appear high for the larger sites and low for the smaller sites.

Economic value: Solar + Diesel Generator



Note: additional potential values from EV charging and energy storage services to utilities

Solar + Diesel Generator Aggregate Economic Values			
Site	**PPA Savings Year 1**	**25-Year PPA Net Savings**	**Additional VOR for Solar + Battery Storage Eliminating Additional Diesel Fuel**
Town Hall and Police Offices	($33,505)	$65,653	$0
Council Chamber & Corp. Yard	($10,490)	$77,208	$0
Library	($16,075)	$322,248	$0
Total	($60,070)	$465,109	$0

Diesel Generator

Sizing results: Diesel Generator

Diesel Generator Sizing				
Site	Peak Demand (kW)	Diesel Generator Sizing		
		Capacity Rating (kW)	Minimum Fuel Tank Size (gal)	Gallons Needed to Meet Resilience
Town Hall & Police Offices	63	80	510	388
Council Chamber & Corp. Yard	79	100	350	238
Library	80	100	350	233
Total	**74**	**280**	**1,210**	**859**

Diesel Generator Costs

Diesel Generator Equipment, Design, Permitting, Installation, and Main Panel Upgrade Costs									
Site	Sizing		Costs						Total Cost
	Generator Size (kW)	ATS Rating (Amps)	Generator and Fuel Tank	Add Level 2 Sound Enclosure	Service Entrance Grade ATS	Tax and Shipping	Estimated Base Design, Permitting, and Installation Cost	Additional Cost to Replace or Upgrade Main Electrical Distribution Panel	Total Project Cost W/O PG&E Costs
Town Hall And Police Offices	80	800	$40,373	$4,037	$16,000	$6,041	$119,612	$28,800	$214,864
Council Chamber & Corp. Yard	100	400	$45,405	$4,541	$9,600	$5,955	$117,900	$17,280	$200,680
Library	100	800	$45,405	$4,541	$16,000	$6,595	$130,572	$28,800	$231,912
Totals	280	2,000	$131,183	$13,118	$41,600	$18,590	$368,085	$74,880	$647,456

Economic results: Diesel Generator

Diesel Generator - Economic Analysis Results, 25 Years			
Site	Finance Option A Cash Purchase		
	Total Capex	Total 25 Year Opex	Total 25 Year Cost
Town Hall & Police Offices	($214,864)	($83,279)	($298,143)
Council Chamber & Corp. Yard	($200,680)	($83,279)	($283,959)
Library	($231,912)	($83,279)	($315,191)
Total	**($647,456)**	**($249,836)**	**($897,292)**

Recommendation Rankings

(Town Hall & Police Offices, Council Chambers & Corp. Yard, & Library),

Clean Coalition

Solar + Battery Storage + Diesel Generator

- Total 25-Year value: $520,560
  - 25-Year Net Bill Savings: $295,388
  - Value of Resilience: $225,172 (avoided diesel-related costs)
- Indefinite Resilience for a percentage of the load
- Continued operation without the need of diesel fuel

Solar + Diesel Generator

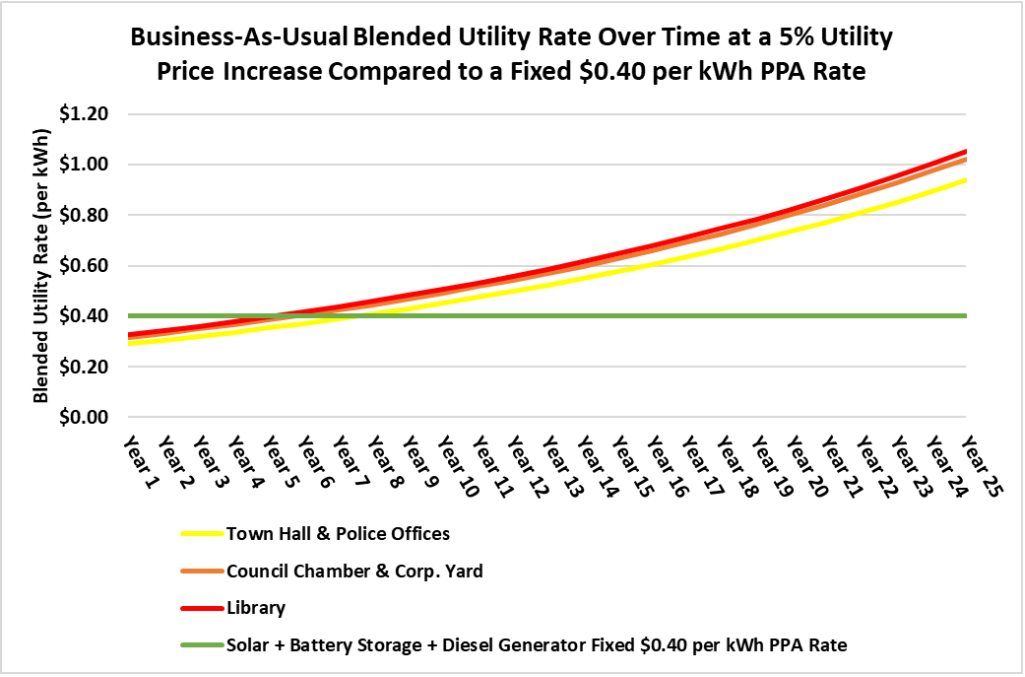
- Total 25-Year value : $465,109
  - 25-Year Net Bill Savings: $465,109
  - Value of Resilience: $0
- During a grid outage the solar will turn off
- If onsite diesel fuel cannot be resupplied all sites will be lights out

Diesel Generator

- 25-Year Total Cost: $897,292 (this is the cost of achieving resilience requirements)
- If onsite diesel fuel cannot be resupplied all sites will be lights out

Economic details

Moraga PPA Economic Details									
Scenario Options	Site	Business-As-Usual Blended Utility Rate Over Time at a 5% Utility Price Increase (per kWh)			Fixed PPA Pricing (per kWh)	PPA Economic Details			
		Year 1	Year 10	Year 25		25 Year Electrical Bill Savings	25 Year PPA Cost	25 Year Net Savings	Value of Resilience (VOR)
Solar + Battery Storage + Diesel Generator	Town Hall & Police Offices	$0.291	$0.451	$0.939	$0.40	$2,275,810	($2,503,411)	($227,601)	$92,626
	Council Chamber & Corp. Yard	$0.317	$0.492	$1.022	$0.40	$1,181,890	($875,343)	$306,547	$52,612
	Library	$0.326	$0.506	$1.051	$0.40	$1,887,452	($1,671,010)	$216,442	$79,934
	Total and Averages	**$0.311**	**$0.483**	**$1.004**	**$0.40**	**$5,345,152**	**($5,049,764)**	**$295,388**	**$225,172**
Solar + Diesel Generator	Town Hall & Police Offices	$0.291	$0.451	$0.939	$0.40	$1,818,041	($1,752,388)	$65,653	$0
	Council Chamber & Corp. Yard	$0.317	$0.492	$1.022	$0.40	$689,948	($612,740)	$77,208	$0
	Library	$0.326	$0.506	$1.051	$0.40	$1,491,955	($1,169,707)	$322,248	$0
	Total and Averages	**$0.311**	**$0.483**	**$1.004**	**$0.40**	**$3,999,944**	**($3,534,835)**	**$465,109**	**$0**



Diesel Generator - Economic Analysis Results, 25 Years			
Site	Finance Option A Cash Purchase		
	Total Capex	Total 25 Year Opex	Total 25 Year Cost
Town Hall & Police Offices	($214,864)	($83,279)	($298,143)
Council Chamber & Corp. Yard	($200,680)	($83,279)	($283,959)
Library	($231,912)	($83,279)	($315,191)
Total	**($647,456)**	**($249,836)**	**($897,292)**

Energy resource scenario benefits

Benefits	Solar + Storage + Diesel Generator PPA	Solar + Storage + Diesel Generator Cash Purchase	Solar + Diesel Generator PPA	Solar + Diesel Generator Cash Purchase	Diesel Generator Only Cash Purchase	Business-as-usual
Economic						
Direct economic value	X	**X**	X	X		
Local economic stimulation	**X**	**X**	X	X		
No burden Moraga capex & opex	X		X			
Environmental						
100% Renewables	X	X	X	X	X	X
Efficiency (no transmission losses)	**X**	**X**	X	X		
Preservation of Habitat	**X**	**X**	X	X		
Resilience						
Indefinite energy supply	**X**	**X**				
Self-reliance	**X**	**X**				
Grid Citizenship						
Dispatchable load profile	**X**	**X**				
Grid services opportunities (Demand Response)	**X**	**X**				
Operational						
Low Moraga burden O&M	**X**		**X**			

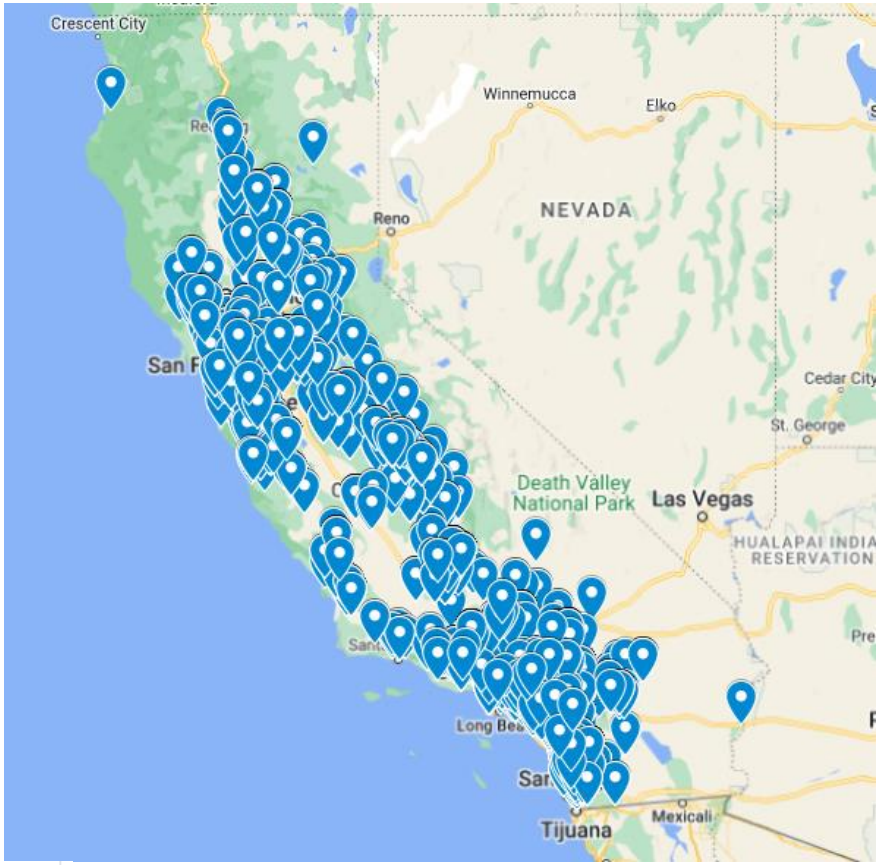
Solar + Storage + Diesel Generator is recommended

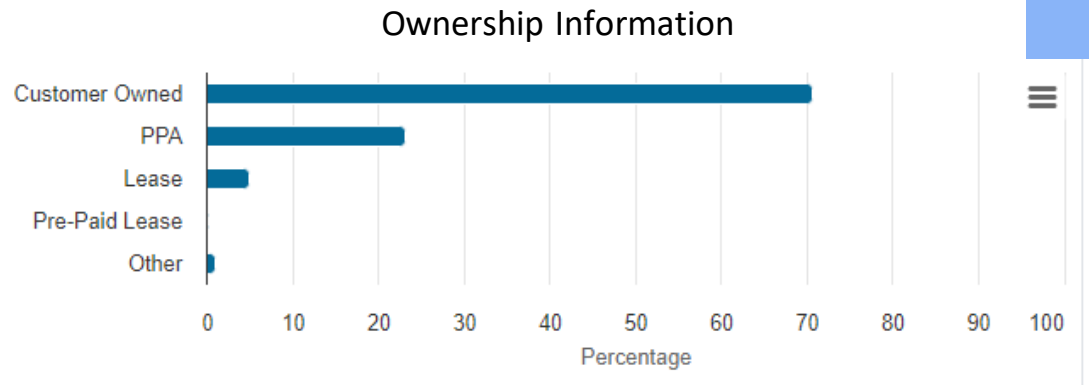
Solar Microgrid & Solar PPA examples

Distributed Energy Project PPAs are abundant throughout California

There are over **310,000 Distributed Solar, Battery Storage, and Hydrogen PPAs** in California.

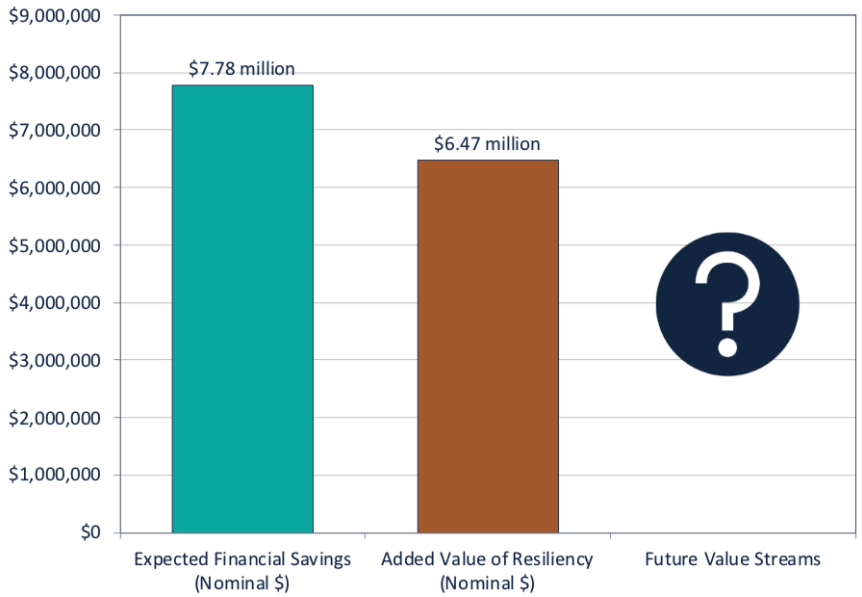
PPA's are the second most common financing method, behind customer ownership.





[California Distributed Generation Statistics]

Santa Barbara Unified School Districts



- Santa Barbara Unified School District Solar Microgrids
  - On 12 January, the SBUSD Board voted unanimously on a contract with Engie Systems for Solar Microgrids at six school sites and standalone solar at another eight sites. Engie will build, own, and operate the systems under a 28-year power purchase agreement (PPA), and the District will reap massive benefits in guaranteed bill savings from the deployments, while enjoying an almost equivalent amount of free resilience value from the Solar Microgrids.
  - System details
    - 4,152 kWdc Solar
    - 1,896 kW / 3,791 kWh Battery Storage

City of Goleta

- City of Goleta Monarch 1 Solar Project
  - The Monarch 1 Solar project will generate 210 kw of solar power, which will power nearly 100% of City Hall's energy usage with clean, renewable energy produced on-site. Monarch 1 is wired to be micro-grid ready and includes pre-wiring for six electric vehicle charging stations to be installed in the future. Anticipated savings for the City over the 25-year lifespan of the project are estimated to be more than $270,000.

Montecito School District

- Montecito School District Solar
  - Looking to create an immersive indoor and outdoor environment for students to experience and explore STEAM activities, the Montecito Union School District (USD) partnered with Ameresco to design and install a Nature Lab “Collaboratory.” The solar installation will generate more than 300,000 kWh per year, creating an environmentally sustainable learning space while exposing the many benefits of renewable energy to the next generation.