# Clean Coalition

# Renewables-driven Microgrids are Key to Future Energy Systems


Craig Lewis
Executive Director
650-796-2353 mobile
craig@clean-coalition.org

## Mission

To accelerate the transition to renewable energy and a modern grid through technical, policy, and project development expertise.

## Renewable Energy End-Game

100% renewable energy; 25% local, interconnected within the distribution grid and ensuring resilience without dependence on the transmission grid; and 75% remote, fully dependent on the transmission grid for serving loads.

# Renewables-driven Microgrids deliver a trifecta of benefits

Clean Coalition

1. Economic

   **Savings** via grid efficiency and lower bills

2. Environmental

   **Sustainability** via renewable energy

3. Resilience

   **Safety** via energy availability

# Various configurations of Solar and/or Storage

- Solar-only provides solar energy and delivers economic & environmental benefits. The solar will turn off during grid outages and there are no resilience benefits from solar-only.
- Storage-only allows energy to be time-shifted and provides economic and **limited resilience** benefits. Because storage-only simply time-shifts grid energy, solar-only deployments deliver no substantial environmental benefits. The resilience benefits will only last as long as the amount of energy that was stored at the time of a grid outage allows – then it's lights out.
- Solar+Storage combines solar & storage to deliver economic, environmental, and **limited resilience** benefits.
- Solar Microgrid combines to deliver economic, environmental, and **indefinite resilience** benefits. The solar provides an ongoing energy source, which is required for ongoing resilience.

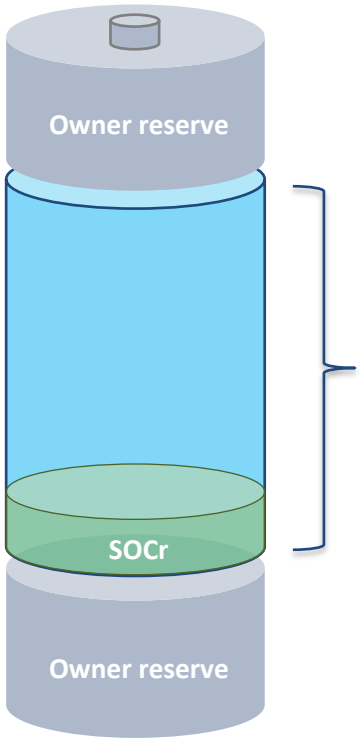
# Various types of Solar Microgrids

- A microgrid is a combination of energy resources, definitely including generation, that are coordinated to serve specified loads, including in an islanded fashion.
- A Solar Microgrid is a behind-the-meter (BTM) microgrid that solely relies on solar for energy generation when islanded.
- A Hybrid Solar Microgrid is a Solar Microgrid that includes additional sources of energy generation, beyond just solar.
- A Community Microgrid a microgrid that covers a target grid area and relies on existing distribution feeders (ie, power lines) to operate when islanded. Community Microgrids typically include both front-of-meter (FOM) and BTM resources, including Solar Microgrids, and require effective participation from utilities, which have mostly erected barriers to date.

# Storage, Resilience, Value-of-Resilience (VOR), and Load Management

# Storage is optimized for economics & resilience

Top owner reserve is often in place to absorb battery energy storage system (BESS) degradation over time, while still delivering the contracted daily cycling energy capacity.

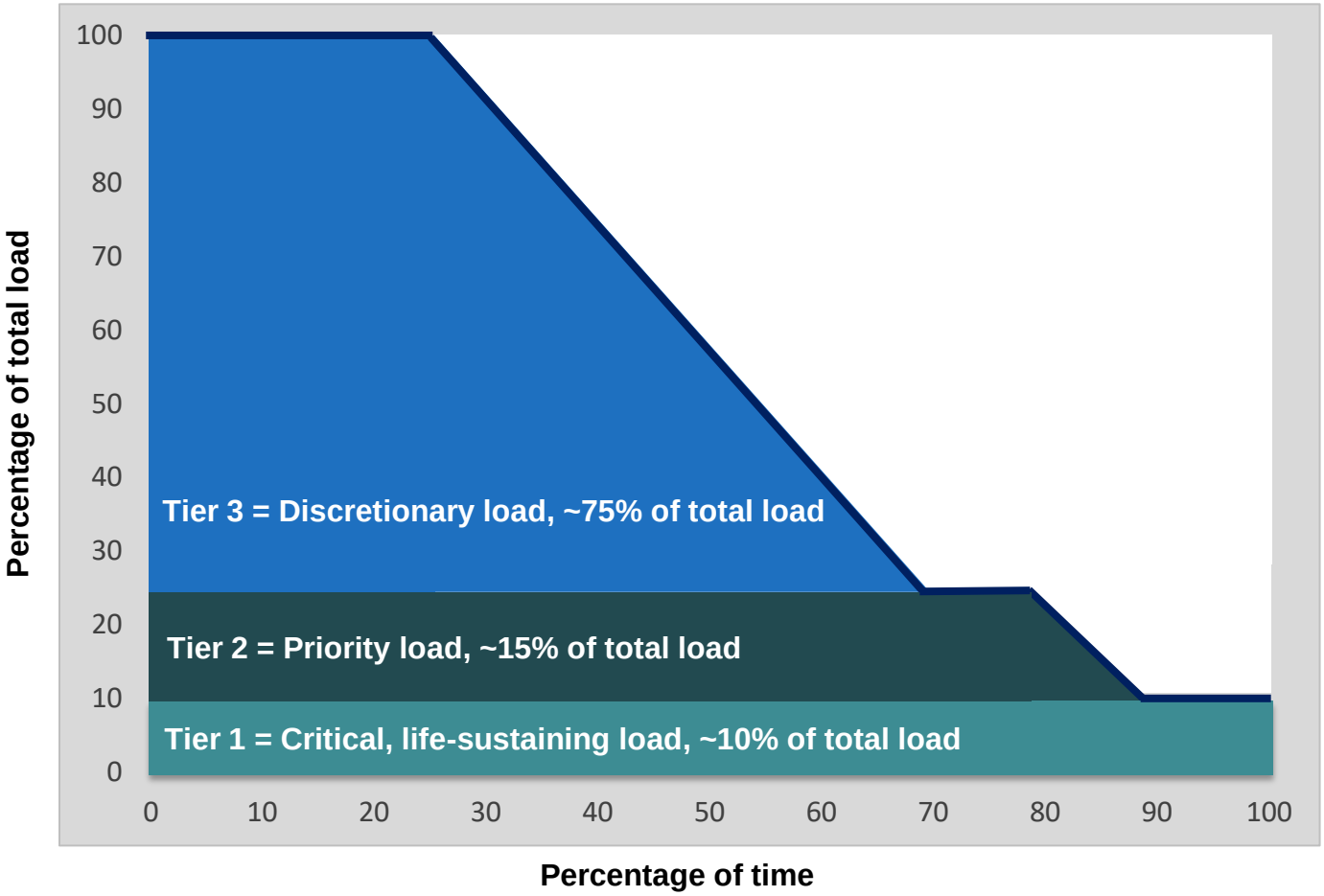



SOCr = the minimum state-of-charge (SOC) that is reserved for provisioning resilience. The SOCr can be dynamic and/or resized to between 0% and 100% of the contracted BESS energy capacity. A lower SOCr facilitates BESS operations that optimize daily economic performance, while a higher SOCr facilitates the provisioning of greater resilience.

Contracted BESS energy capacity (kWh) that must be available for daily cycling over the contract duration for achieving specified economic & resilience performance.

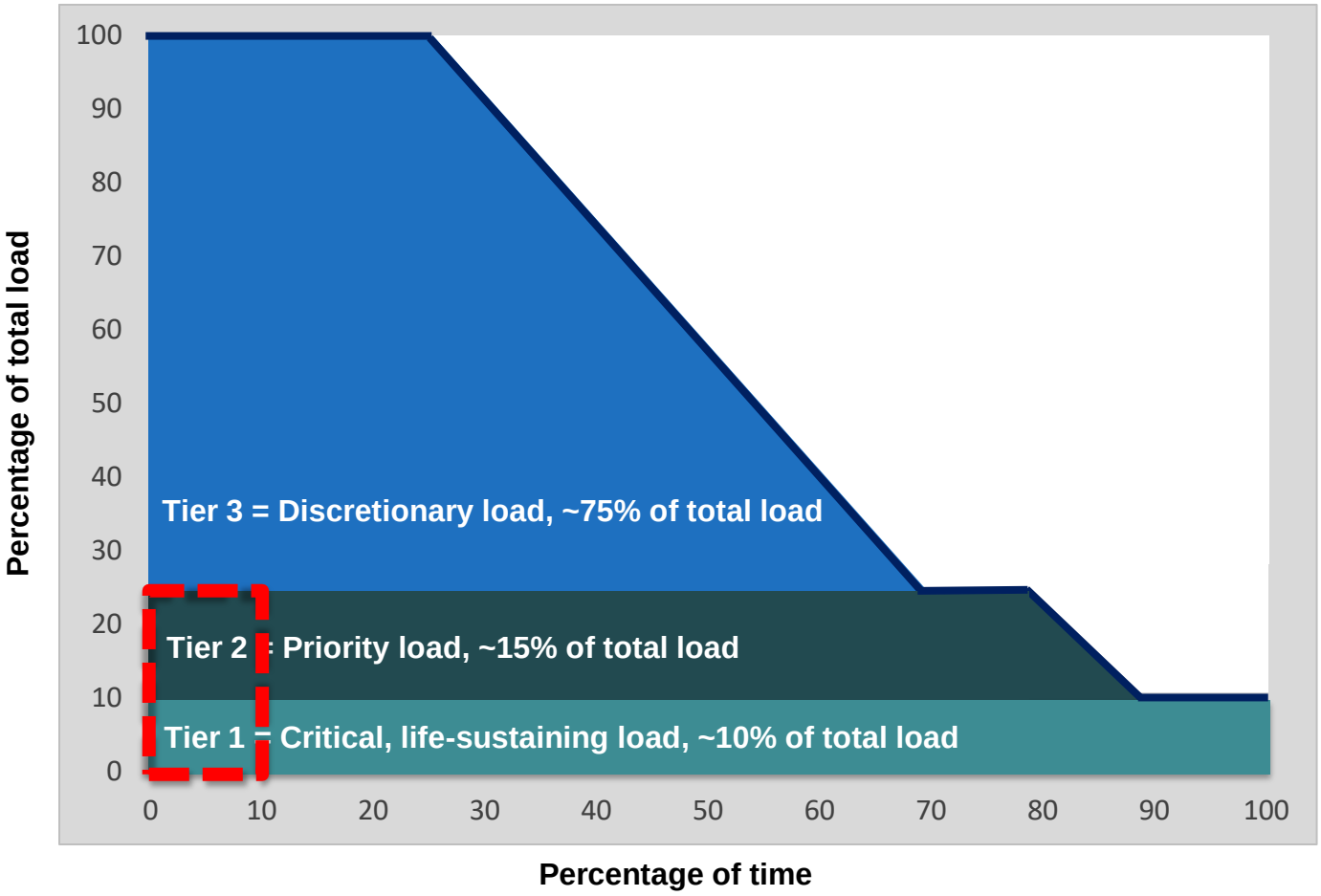
Bottom owner reserve is often required to meet BESS warranty requirements that are imposed by BESS vendors.

# Typical load tier resilience from Solar Microgrids




Percentage of time online for Tier 1, 2, and 3 loads for a Solar Microgrid designed for the University of California Santa Barbara (UCSB) with enough solar to achieve net zero and 200 kWh of energy storage per 100 kW solar.

# Diesel generators are designed for limited resilience




A typical diesel generator is configured to maintain 25% of the normal load for two days. If diesel fuel cannot be resupplied within two days, goodbye. This is hardly a solution for increasingly necessary long-term resilience. In California, Solar Microgrids provide a vastly superior trifecta of economic, environmental, and resilience benefits.

# Value-of-Resilience (VOR) depends on tier of load

- Everyone understands there is significant value to resilience provided by indefinite renewables-driven backup power, especially for the most critical loads
  - But, this value-of-resilience (VOR) has yet to be quantified in a straightforward methodology.
  - Hence, VOR is often given no value, leaving a dangerously short-sighted economic gap.
- The Clean Coalition aims to establish a standardized value-of-resilience (VOR) for critical, priority, and discretionary loads that will help everyone understand that premiums are appropriate for indefinite renewables-driven backup power to critical loads and almost constant backup power to priority loads, which yields a configuration that delivers backup power to all loads a lot of the time
- The Clean Coalition's VOR approach standardizes resilience values for three tiers of loads:
  - Tier 1 are mission-critical & life-sustaining loads and warrant 100% resilience. Tier 1 loads usually represent about 10% of the total load with a 3x energy value.
  - Tier 2 are priority loads that should be maintained as long as doing so does not threaten the ability to maintain Tier 1 loads. Tier 2 loads usually represent about 15% of the total load and get a 1.5x energy value.
  - Tier 3 are discretionary loads comprising the remaining loads, usually about 75%. Tier 3 loads possess no extra value and are only maintained when Tier 1 & 2 are secure.

# Value-of-Resilience (VOR) details

## VOR123

VOR123 is the value-of-resilience (VOR) from Solar Microgrids methodology that the Clean Coalition has developed to normalize VOR across all types of facilities & geographies. The VOR normalization is founded in tiering loads into three categories: Tier 1 (critical), Tier 2 (priority), and Tier 3 (discretionary). Since each Tier has its own resilience requirement and VOR, this methodology is called VOR123.

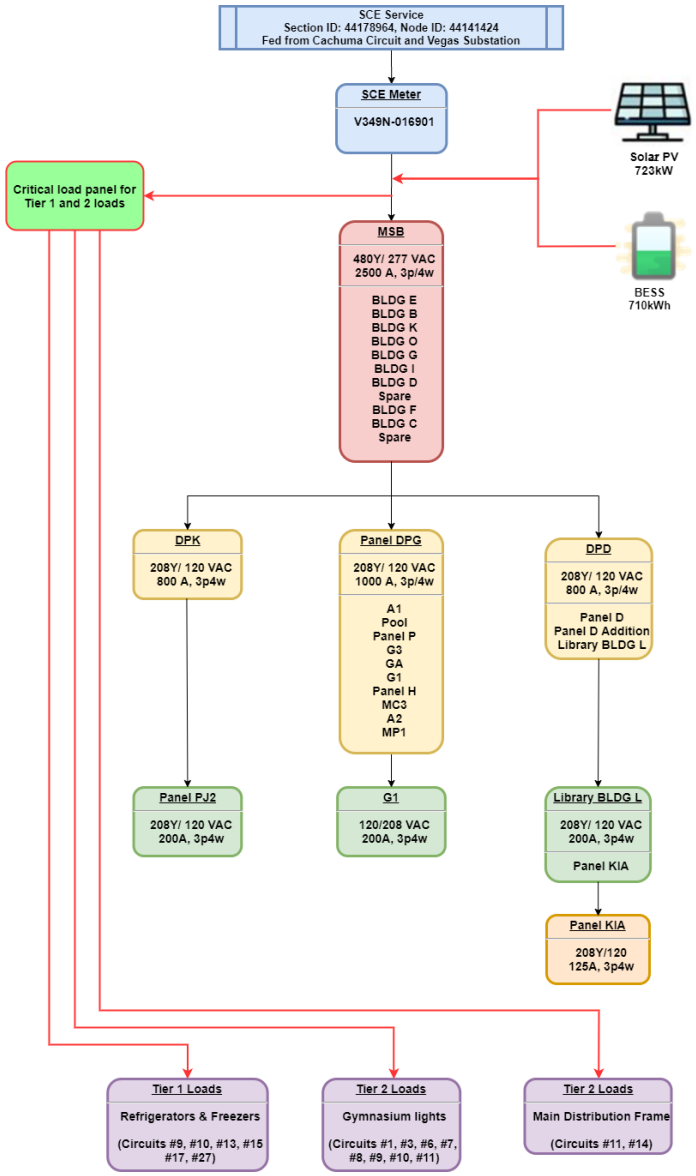
## VOR123 webinar

https://clean-coalition.org/news/webinar-valuing-resilience-solar-microgrids-thursday-5-nov-2020/

# Load Management is fundamental to VOR123

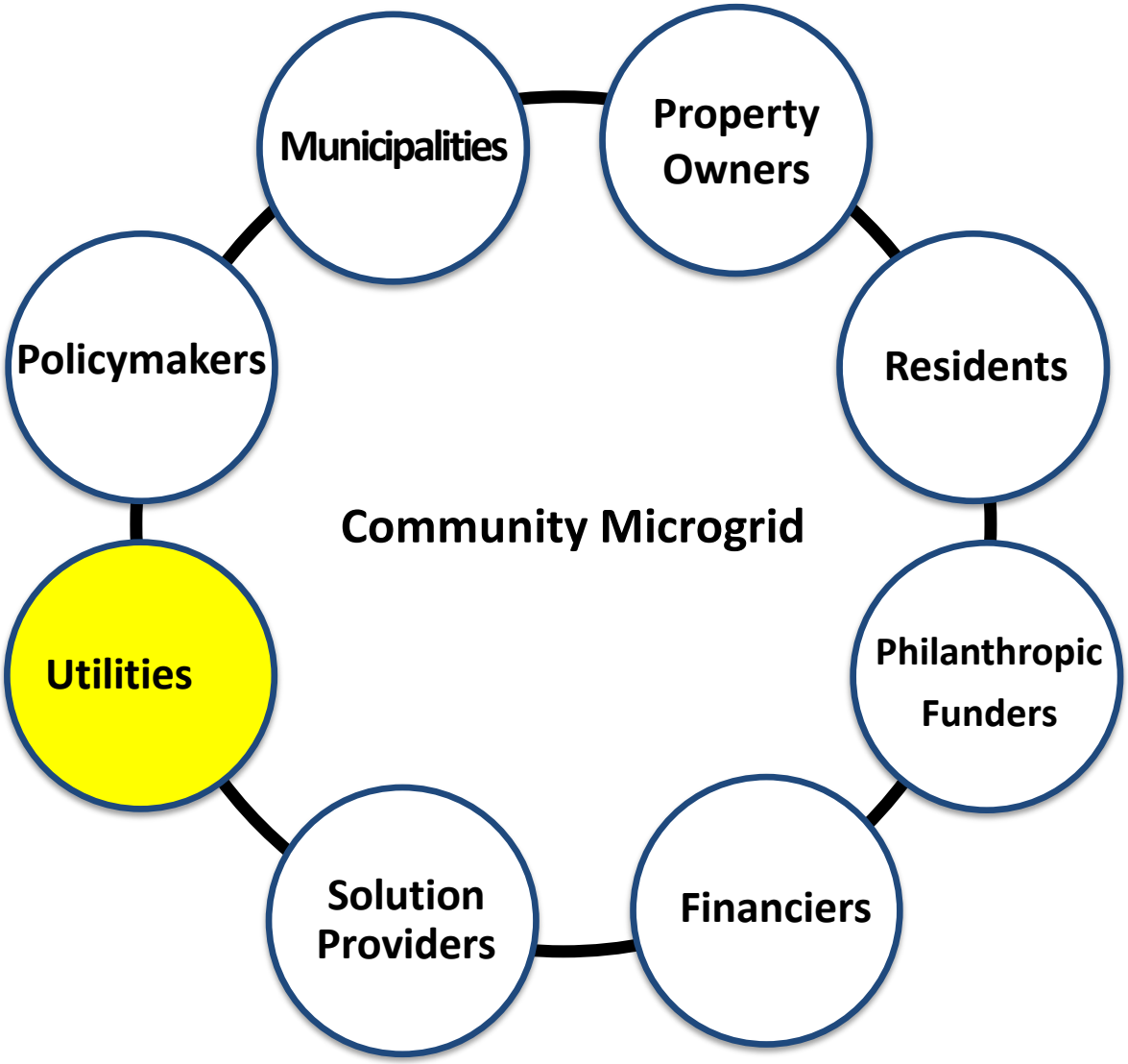
Although there are multiple potential Load Management configurations, the minimal functionality anticipated to be cost-effectively implemented is referred to as **the Critical Load Panel (CLP) approach**.

The CLP name reflects the requirement for a smart critical load panel that maintains Tier 1 loads indefinitely and toggles Tier 2 loads. In the CLP approach, Tier 3 loads will be toggled as a group by toggling power to the Main Service Board (MSB). Figure 9 illustrates the CLP approach for SMHS, with Tier 1 and Tier 2 loads being served by new dedicated wire runs that connect to a new smart critical load panel.



Getting things done = aligning stakeholders

# Community Microgrid stakeholders



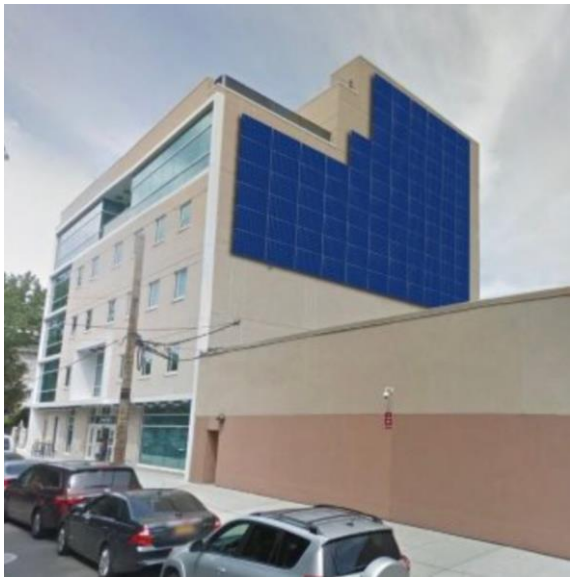
# Remember that all stakeholders are human

1. Humans like things to be simple
   - Make sure that objectives & analyses are effectively presented.
2. Most humans are capitalists
   - Economics are fundamental to all stakeholder decisions.
   - With utilities, follow the money.
   - With policymakers, hold them accountable.
3. Success requires multi-pronged action combined with courageous & relentless pursuit
   - Perform comprehensive analyses.
   - Tell the story effectively – which usually means colorfully.
   - Repeat the messaging courageously and ad nauseum.

Think Vertical for maximizing winter solar

# Solar sizing and generation per 1,000 sf by orientation type

Example Façade (Not as shown in table)

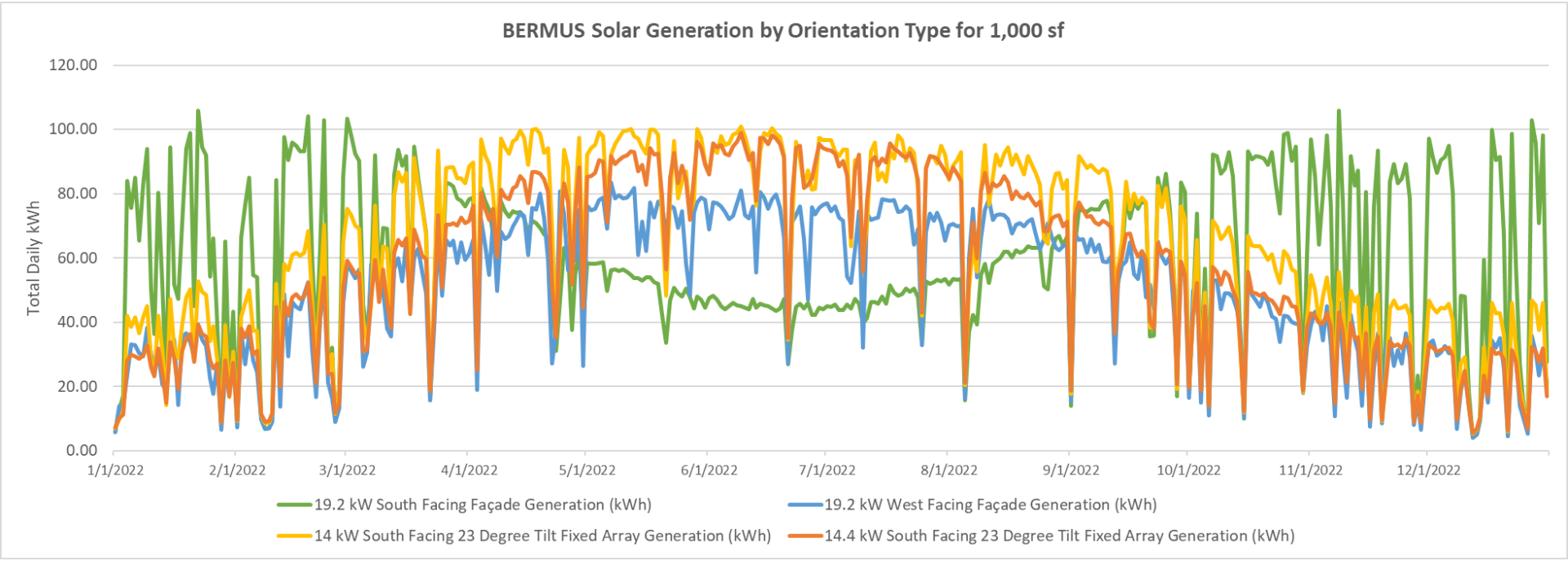


Fixed Tilt South Facing

Fixed Tilt West Facing

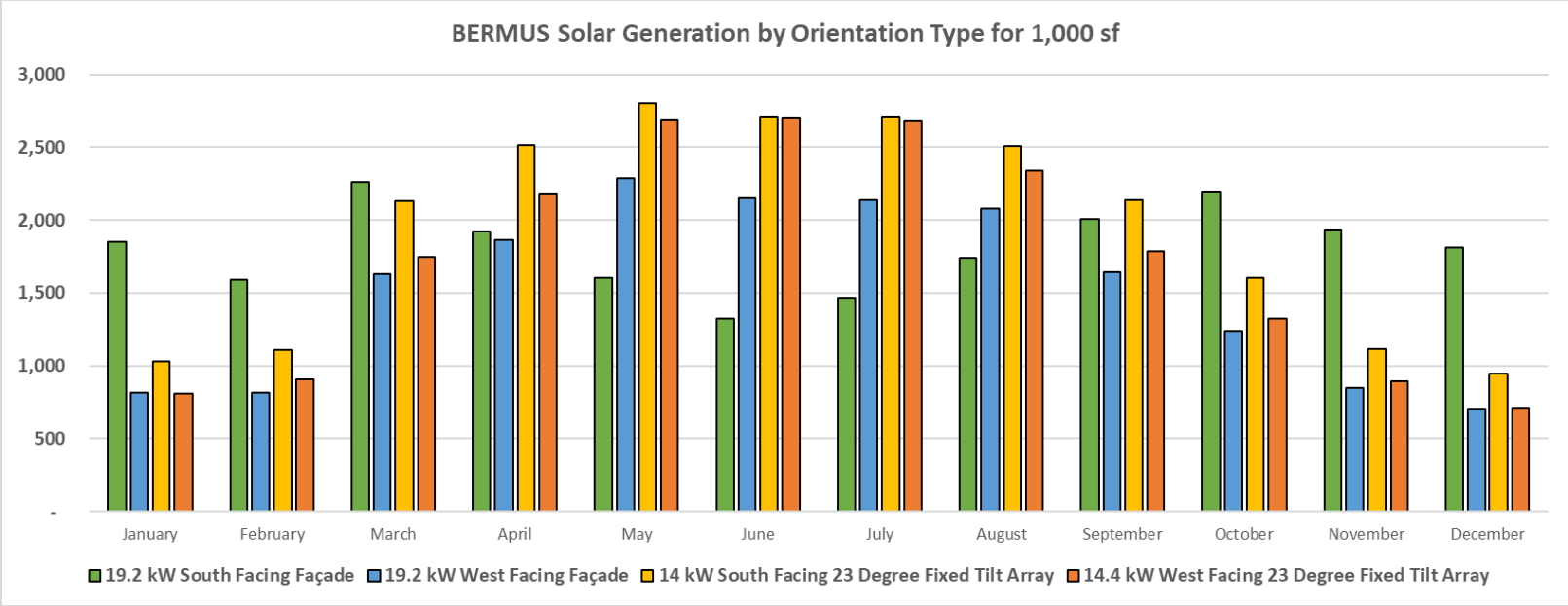
| BERMUS Solar Generation by Orientation Type for 1,000 SQFT | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Orientation Type | System Size and Annual Generation | | | Summer and Winter Generation | | | | System Layout Details | | | | | | |
| | PV System Size (kWdc) | Annual Generation (kWh) | Annual kWh/kWp | 21 June Generation (kWh) | 21 June kWh/kWp | 21 December Generation (kWh) | 21 December (kWh/kWp) | Module Type | Number of Modules | Azumith (Degrees) | Tilt (Degrees) | Row Spacing (Feet) | Panel Orientation | Field Segment Size in Feet (Length x Width) |
| Façade South Facing | 19.20 | 21,701 | 1,130 | 26.89 | 1.40 | 4.47 | 0.23 | Q Cells (400W) | 48 | 180 | 89 | 0 | Portrait | - |
| Façade West Facing | 19.20 | 18,221 | 949 | 27.09 | 1.41 | 4.61 | 0.24 | Q Cells (400W) | 48 | 270 | 89 | 0 | Portrait | - |
| Fixed Tilt (Rooftop Canopy) South Facing | 14.00 | 23,323 | 1,666 | 34.54 | 2.47 | 5.92 | 0.42 | Q Cells (400W) | 35 | 180 | 23 | 2.4 | Portrait | 25 x 40 |
| Fixed Tilt (Rooftop Canopy) West Facing | 14.40 | 20,789 | 1,444 | 35.04 | 2.43 | 6.17 | 0.43 | Q Cells (400W) | 36 | 270 | 23 | 1 | Portrait | 25 x 40 |

# Daily generation by orientation type




| BERMUS - Max and Min Daily Solar Generation by Orientation Type and Date for 1,000 sf | | | | | |
|---|---|---|---|---|---|
| Time Period | | 19.2 kW South Facing Façade | 19.2 kW West Facing Façade | 14 kW South Facing 23 Degree Fixed Tilt Array | 14.4 kW West Facing 23 Degree Fixed Tilt Array |
| Max Daily (kWh) | Annual | 106 | 83 | 101 | 99 |
| Max Day | | 11/8/2022 | 5/7/2022 | 6/9/2022 | 6/9/2022 |
| Min Daily (kWh) | | 4 | 4 | 5 | 6 |
| Min Day | | 12/12/2022 | 12/12/2022 | 12/12/2022 | 12/12/2022 |
| Max Daily (kWh) | November - March | 105.93 | 67.41 | 93.43 | 73.21 |
| Max Day | | 11/8/2022 | 3/24/2022 | 3/24/2022 | 3/24/2022 |
| Min Daily (kWh) | | 4 | 4 | 44 | 6 |
| Min Day | | 12/12/2022 | 12/12/2022 | 12/12/2022 | 12/12/2022 |

# Monthly generation by orientation type




| BERMUS - Total, Max, Average, and Min Daily Solar Generation by Orientation Type and Month for 1,000 sf | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Month | 19.2 kW South Facing Façade | | | | 19.2 kW West Facing Façade | | | | 14 kW South Facing 23 Degree Fixed Tilt Array | | | | 14.4 kW West Facing 23 Degree Fixed Tilt Array | | | |
| | Total Generation (kWh) | Max Daily Generation (kWh) | Average Daily Generation (kWh) | Min Daily Generation (kWh) | Total Generation (kWh) | Max Daily Generation (kWh) | Average Daily Generation (kWh) | Min Daily Generation (kWh) | Total Generation (kWh) | Max Daily Generation (kWh) | Average Daily Generation (kWh) | Min Daily Generation (kWh) | Total Generation (kWh) | Max Daily Generation (kWh) | Average Daily Generation (kWh) | Min Daily Generation (kWh) |
| January | 1,853 | 106 | 60 | 6 | 816 | 39 | 26 | 6 | 1,033 | 53 | 33 | 7 | 812 | 39 | 26 | 7 |
| February | 1,594 | 104 | 56 | 7 | 816 | 53 | 28 | 7 | 1,112 | 70 | 39 | 9 | 904 | 54 | 32 | 9 |
| March | 2,261 | 103 | 73 | 16 | 1,632 | 67 | 52 | 16 | 2,131 | 93 | 68 | 19 | 1,747 | 73 | 56 | 19 |
| April | 1,920 | 82 | 65 | 25 | 1,867 | 81 | 63 | 19 | 2,514 | 100 | 85 | 30 | 2,185 | 88 | 74 | 25 |
| May | 1,603 | 59 | 52 | 34 | 2,290 | 83 | 74 | 48 | 2,801 | 100 | 90 | 48 | 2,693 | 96 | 87 | 56 |
| June | 1,325 | 48 | 44 | 27 | 2,150 | 81 | 71 | 27 | 2,713 | 101 | 90 | 35 | 2,704 | 99 | 90 | 35 |
| July | 1,464 | 53 | 47 | 33 | 2,141 | 78 | 69 | 32 | 2,710 | 98 | 87 | 42 | 2,688 | 96 | 87 | 43 |
| August | 1,738 | 67 | 56 | 16 | 2,078 | 78 | 67 | 16 | 2,508 | 95 | 81 | 20 | 2,341 | 88 | 76 | 21 |
| September | 2,006 | 86 | 66 | 14 | 1,642 | 67 | 55 | 15 | 2,135 | 92 | 71 | 18 | 1,789 | 77 | 60 | 19 |
| October | 2,194 | 99 | 71 | 10 | 1,238 | 54 | 40 | 10 | 1,601 | 71 | 52 | 12 | 1,323 | 57 | 43 | 12 |
| November | 1,934 | 106 | 65 | 8 | 850 | 46 | 29 | 7 | 1,117 | 56 | 38 | 9 | 892 | 43 | 30 | 9 |
| December | 1,814 | 103 | 59 | 4 | 706 | 36 | 23 | 4 | 948 | 47 | 31 | 5 | 712 | 33 | 23 | 6 |
| Total | 21,706 | 85 | 60 | 17 | 18,226 | 64 | 50 | 17 | 23,323 | 81 | 64 | 21 | 20,790 | 70 | 57 | 22 |

Solar Microgrids for Schools need support

# Solar Microgrid Methodology for feasibility studies

Clean Coalition

## 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).

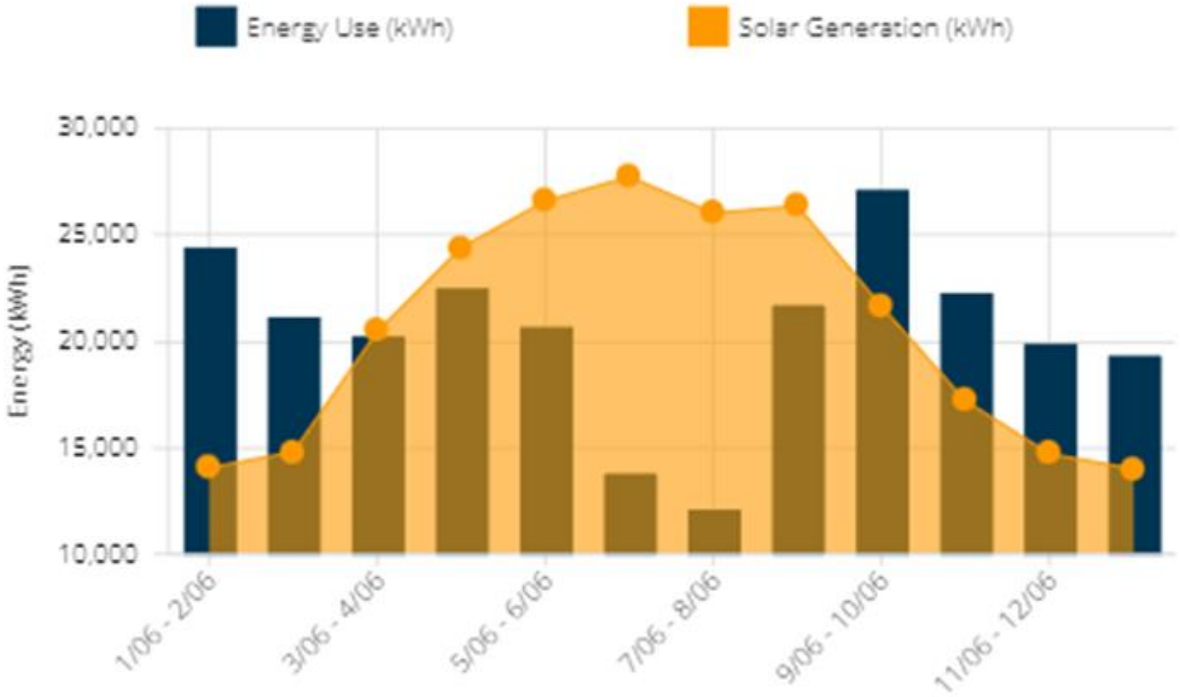
## Step 5

**Reporting & Recommendations**

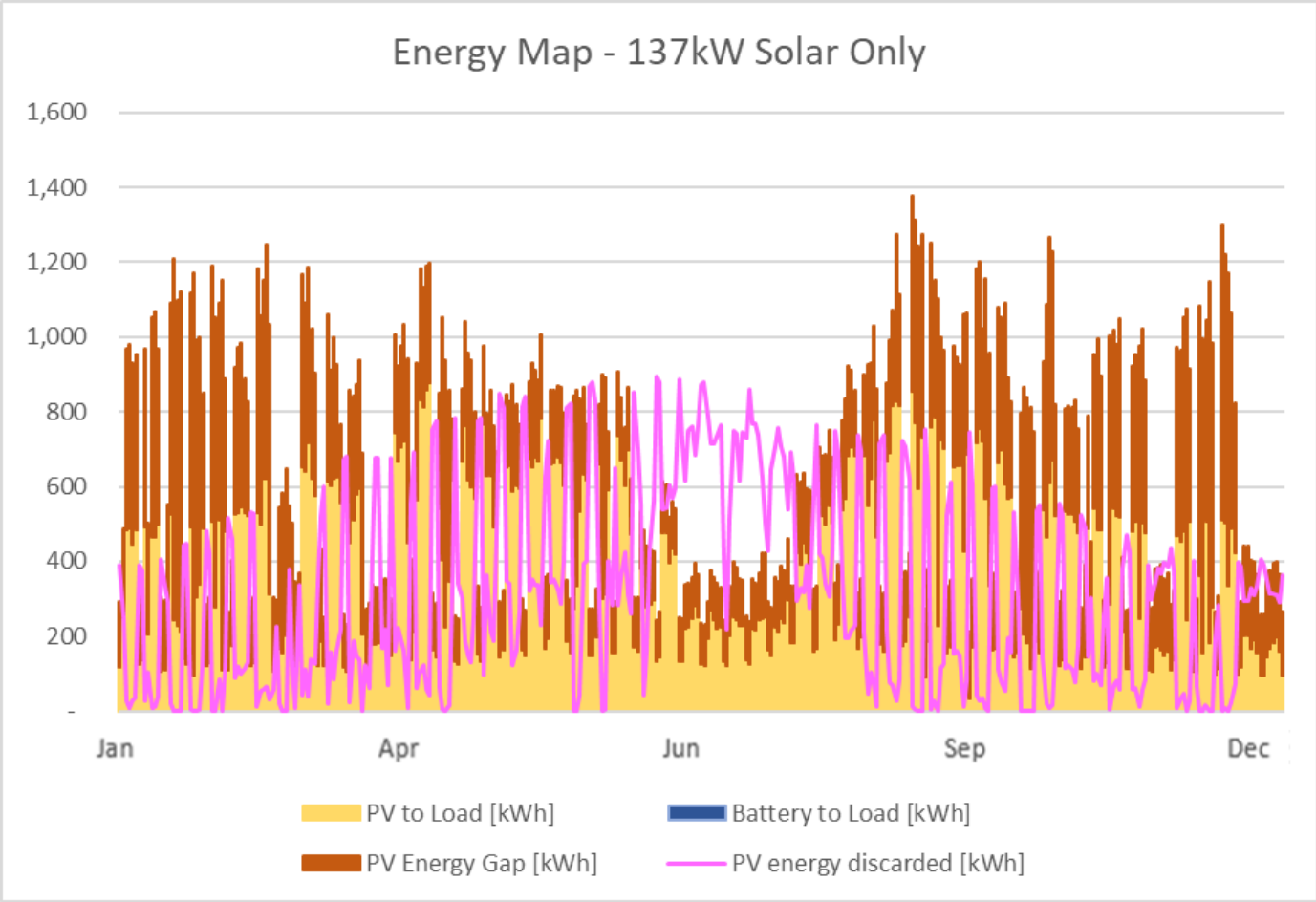
- Project Review Meetings.
- Reports and Presentations.
- Recommended options & next steps.

# 137 kW solar only billing analysis

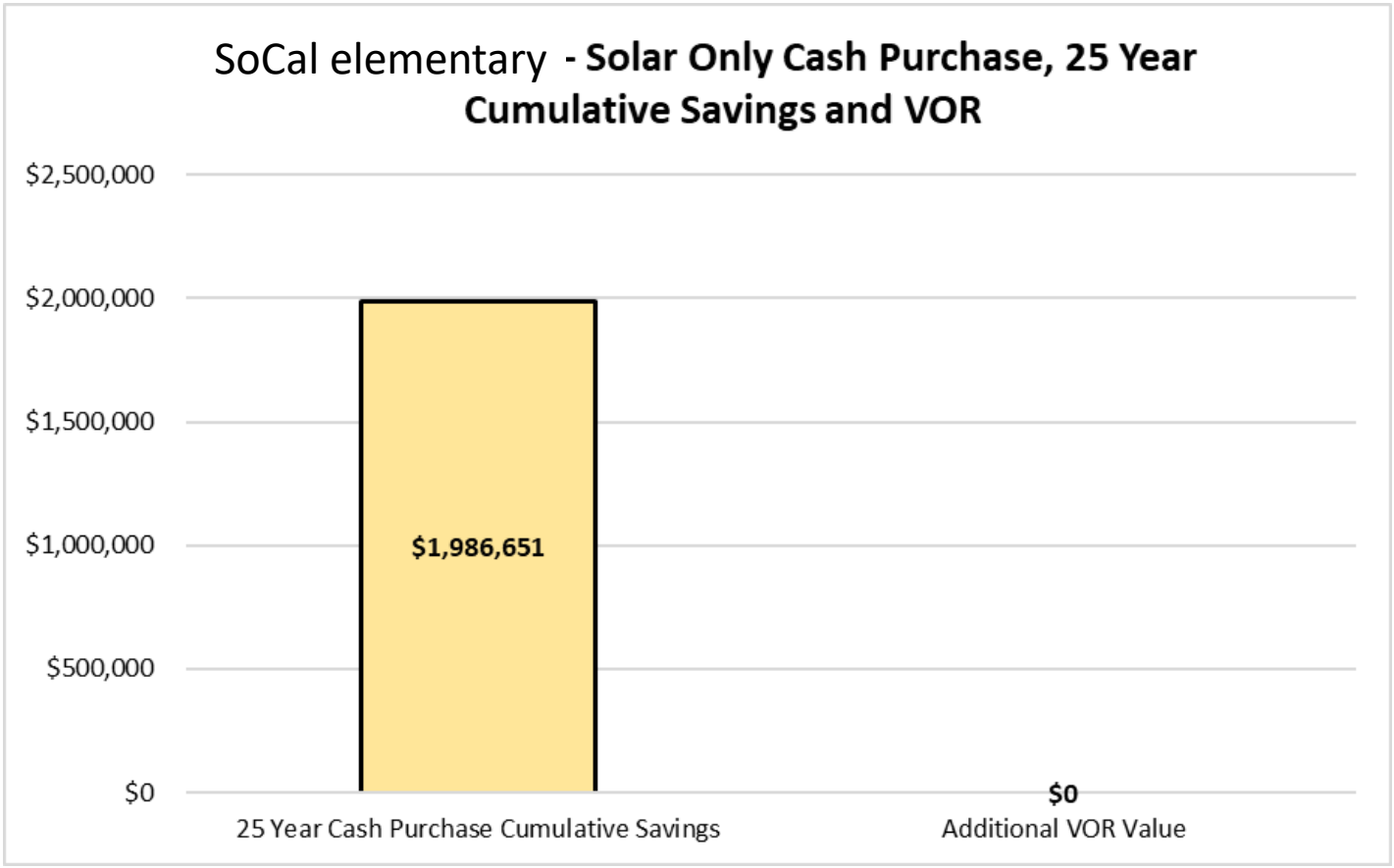
- 200,000 kWh annual load.
- 50,000 kWh from new anticipated EV chargers.
- 250,000 kWh modeled load.
- 175 kW modeled peak load with EV chargers.
- $21,000 modeled annual bill (more than 50% demand charges)



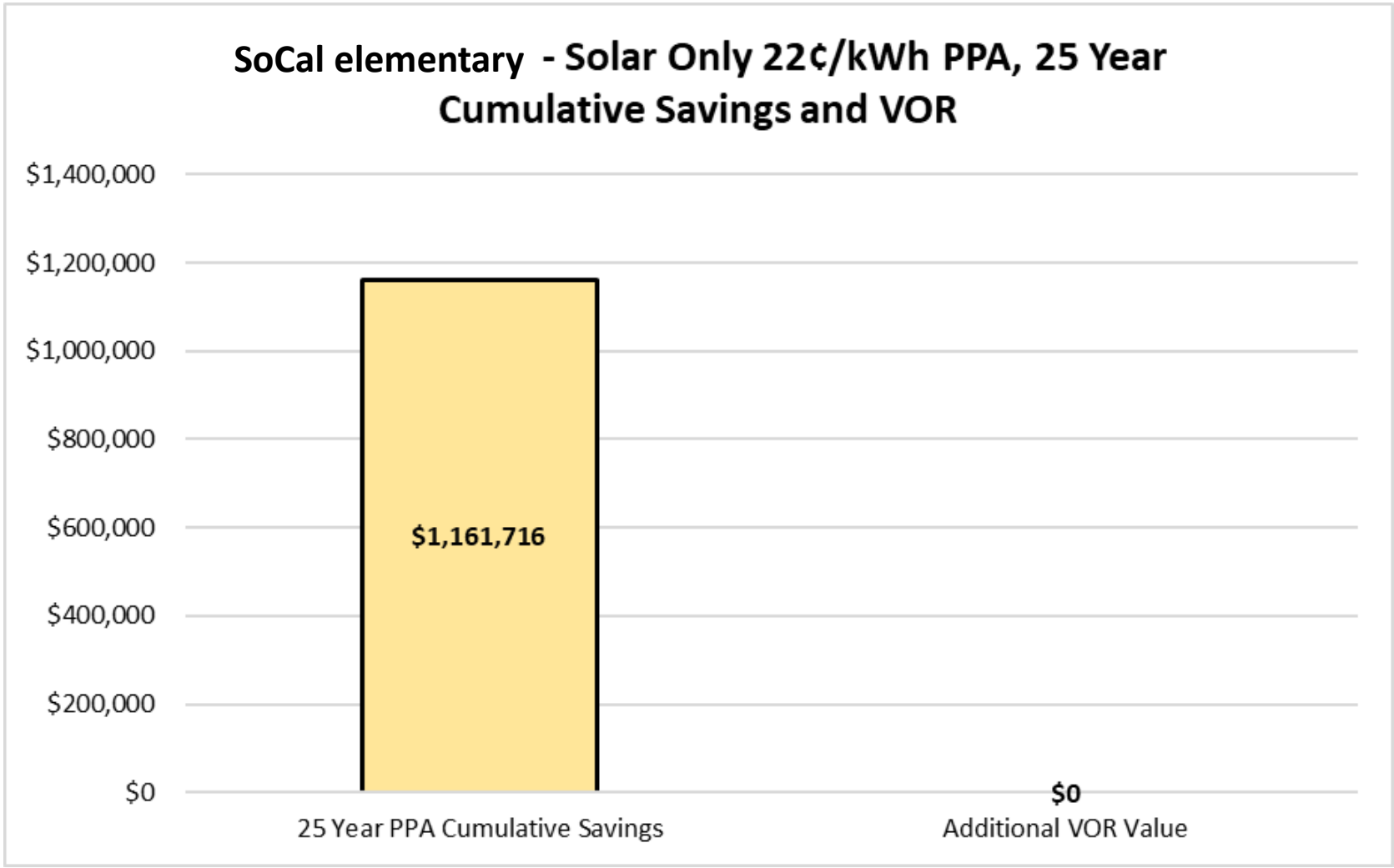
# Energy Flow for 137 kW solar



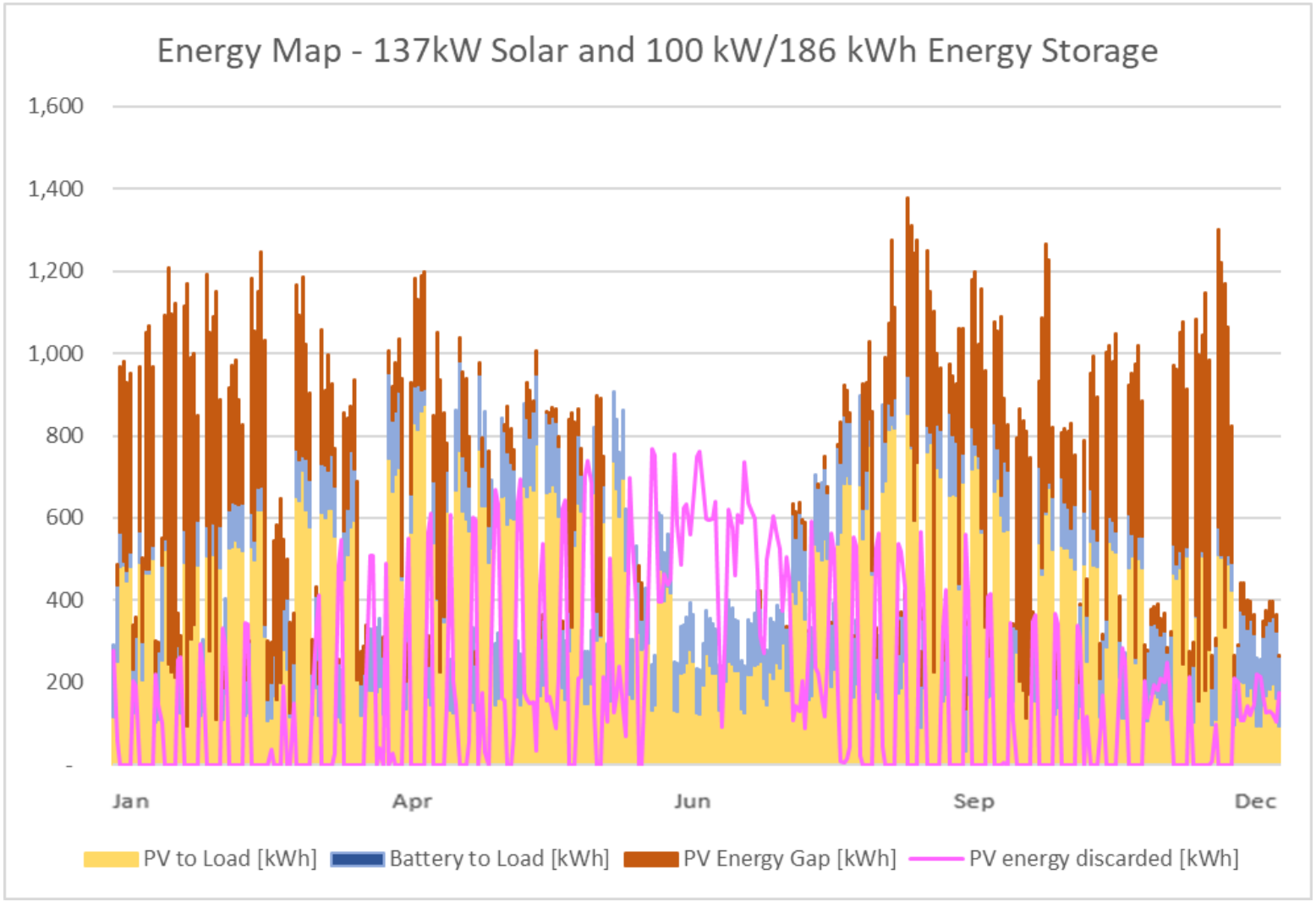
# 137 kW solar, 25-year cash purchase economics



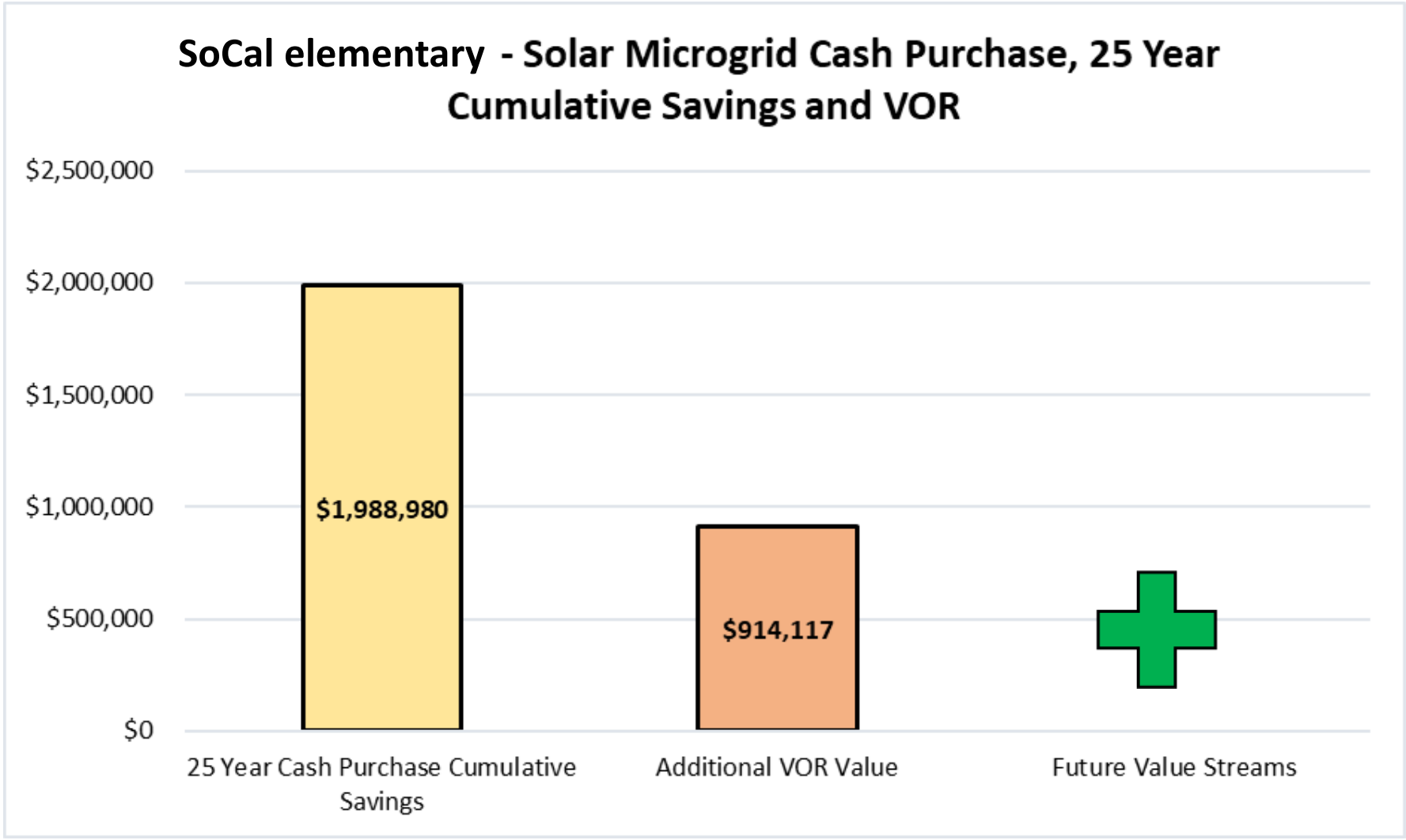
# 137 kW solar, 25-year PPA economics



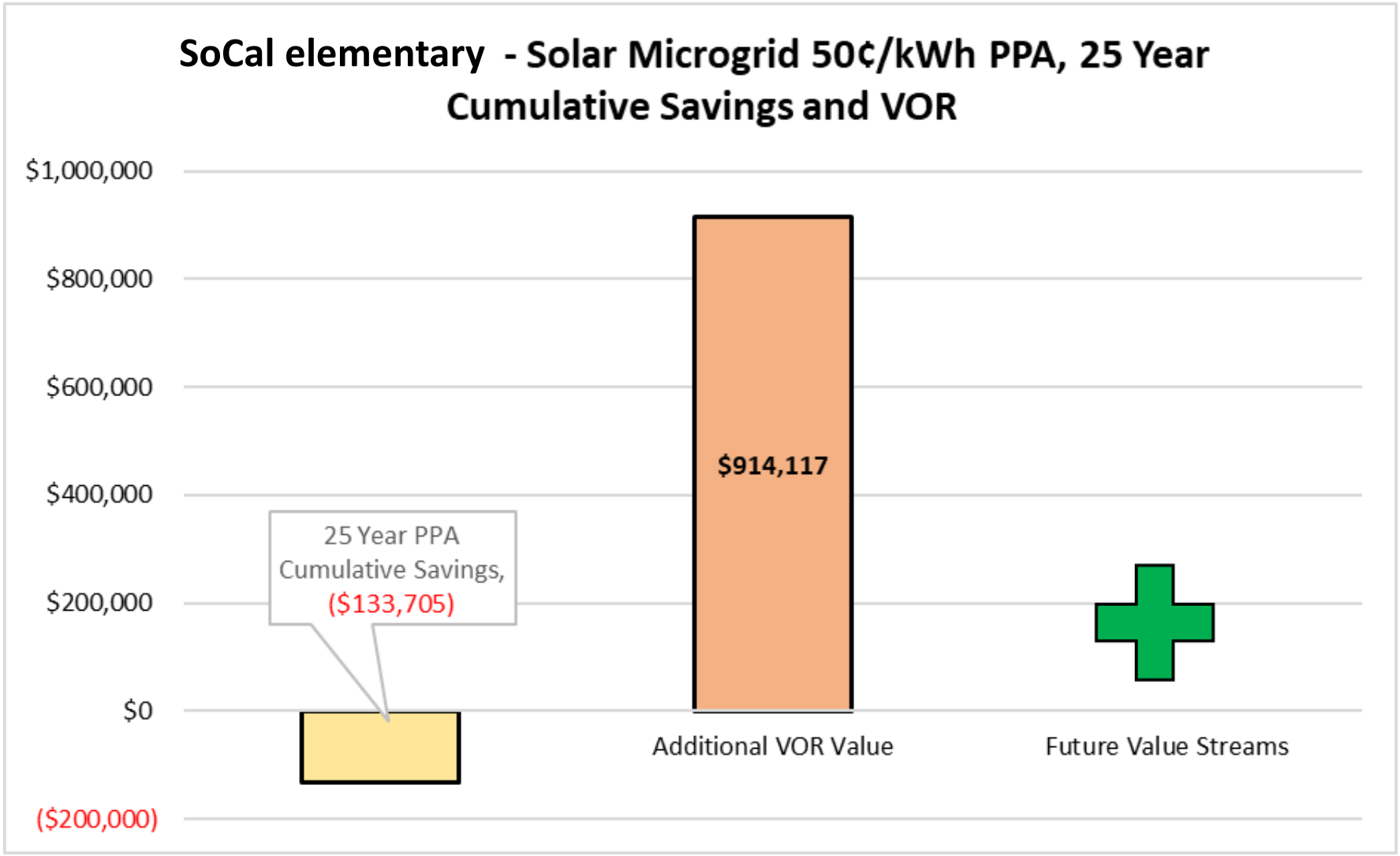
# Energy Flow for 137 kW solar and 100 kW / 186 kWh storage Solar Microgrid



# Solar Microgrid 25-year cash purchase economics

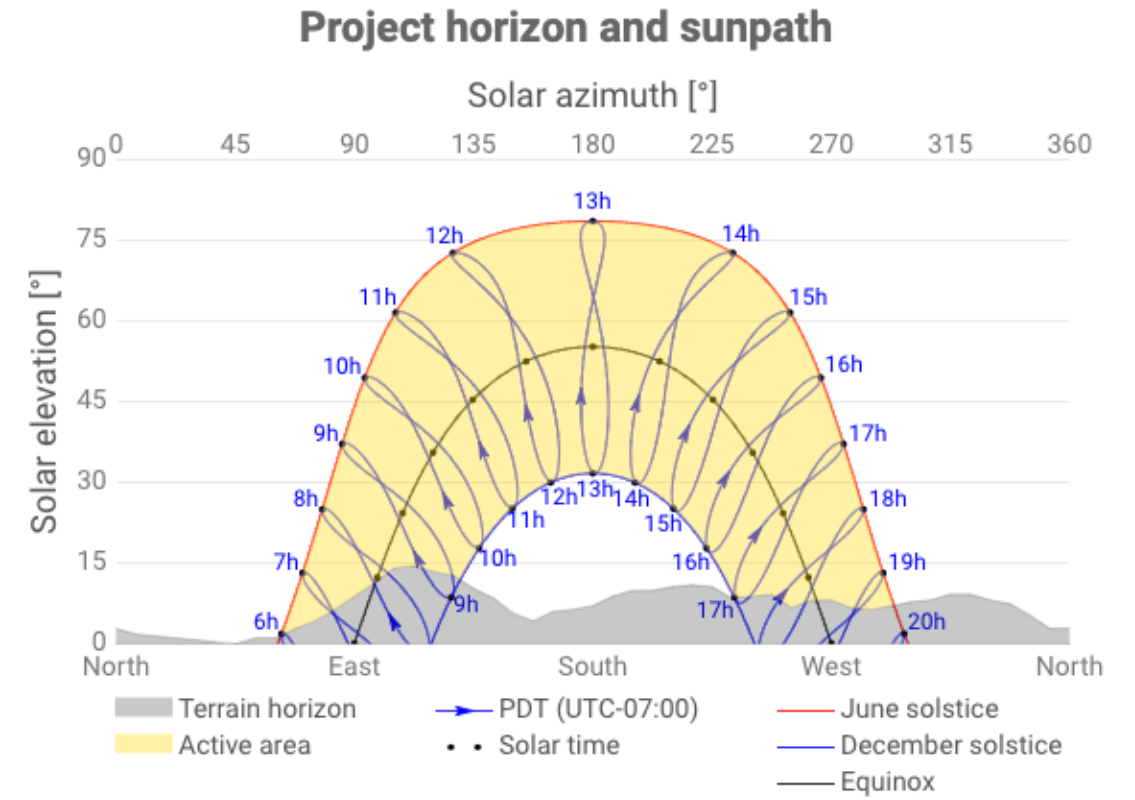


# Solar Microgrid 25-year PPA economics



Solar Microgrids for off-grid facilities

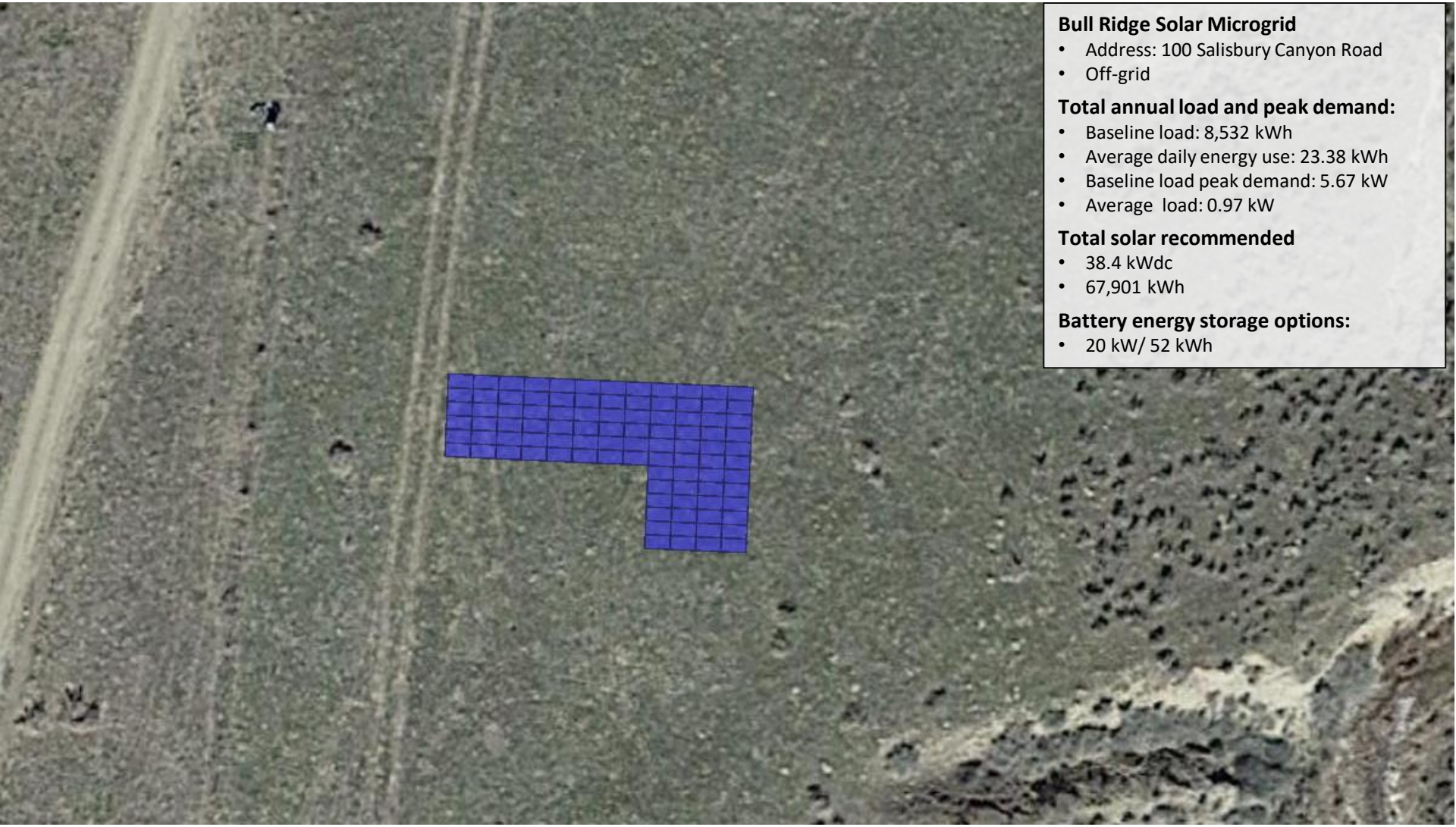
# Bull Ridge horizon profile




| | Energy input kWh/m² | Energy loss/gain kWh/m² | Energy PVOUT specific kWh/kWp | Energy loss/gain kWh/kWp | Energy loss % |
|---|---|---|---|---|---|
| **Global horizontal irradiation (GHI) theoretical** | **2106.9** | | | | |
| Horizon shading (terrain + horizon objects) | 2095.8 | -11.1 | | | -0.5 |
| **Global horizontal irradiation site specific** | **2095.8** | **-11.1** | | | **-0.5** |

The image above depicts the terrain at Bull Ridge Ranch and its impact on the active annual solar area available for solar pv production. The total loss of solar energy production due to surrounding terrain is estimated to be 0.5%

# Bull Ridge solar layout– 38.4 kW



**Bull Ridge Solar Microgrid**

- Address: 100 Salisbury Canyon Road
- Off-grid

**Total annual load and peak demand:**

- Baseline load: 8,532 kWh
- Average daily energy use: 23.38 kWh
- Baseline load peak demand: 5.67 kW
- Average load: 0.97 kW

**Total solar recommended**

- 38.4 kWdc
- 67,901 kWh

**Battery energy storage options:**

- 20 kW/ 52 kWh

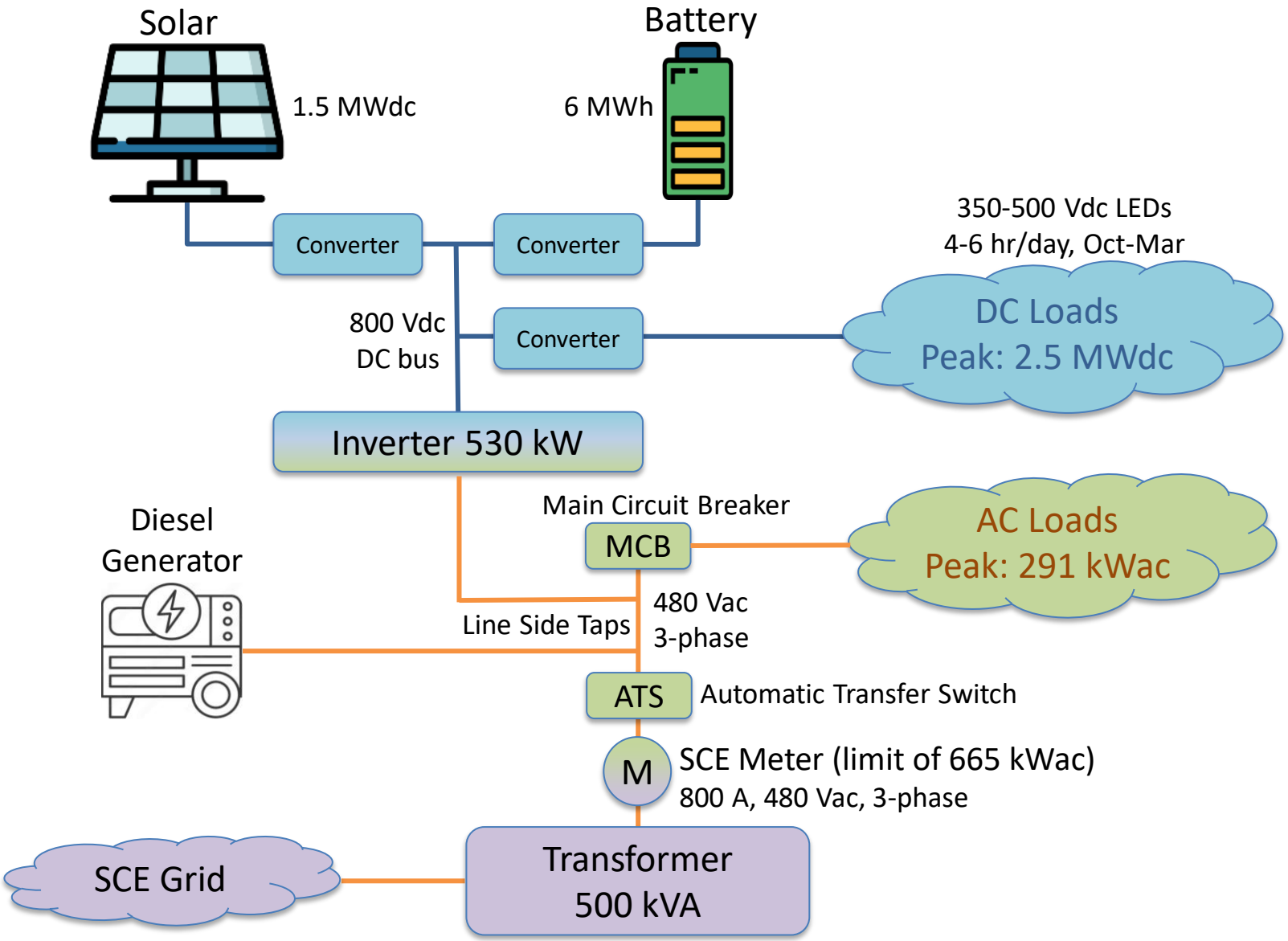
# Bull Ridge Solar Microgrid – resilience matrix

| Bull Ridge Solar Microgrid Resilience | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Solar size (kWdc) | Solar production (kWh) | Baseline load (kWh) | 200% Baseline load (kWh) | 300% Baseline load (kWh) | Battery size (kWh) | Percentage of resilience at baseline load | Percentage of resilience at 200% baseline load | Percentage of resilience at 300% baseline load |
| 38.4 | 67,901 | 8,532 | 17,065 | 25,597 | 20 | 99.00% | 77.01% | 58.26% |
| | | | | | 30 | 99.87% | 93.28% | 71.10% |
| | | | | | 40 | 99.98% | 97.68% | 84.13% |
| | | | | | 50 | 100.00% | 98.75% | 91.21% |
| | | | | | 60 | 100.00% | 99.46% | 93.52% |

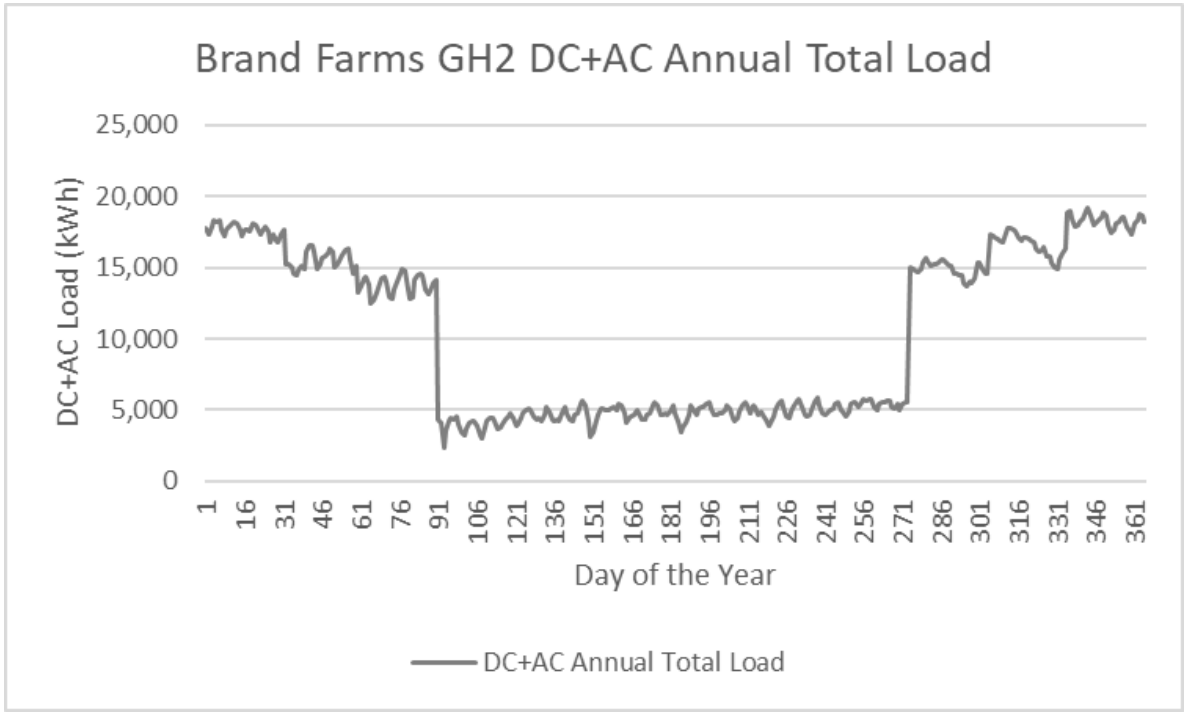
# Solar Microgrids for grid-constrained load growth

# DC-coupled Solar Microgrid to serve 2.5 MWdc of added DC loads to GH2 meter

Clean Coalition



# GH2 economics assuming all future AC & DC loads can be served by the grid

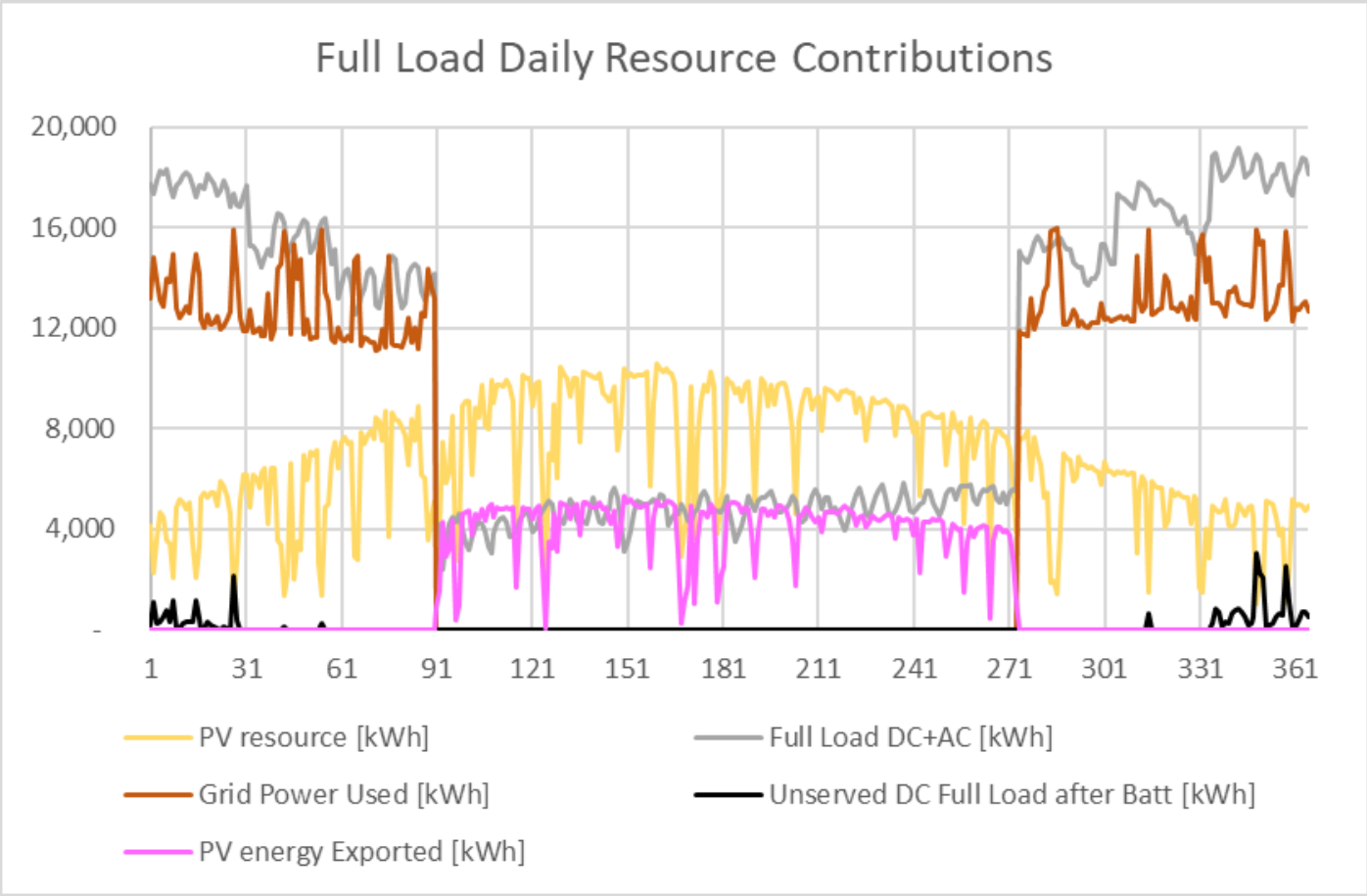



| Brand Farms Greenhouse 2 (DC + AC Loads) Business-As-Usual Electricity Bill Cost Based on TOU-8-D and 3CE Rates | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Meter | Scenario Types | Business-As-Usual Blended Utility Rate Over Time at a 5% Utility Price Increase (¢/kWh) | | | 25 Year Electricity Bill Cost | | | |
| | | Year 1 | Year 10 | Year 25 | Year 1 Total Electricity Bill Cost | Year 10 Electricity Bill Cost | Year 25 Electricity Bill Cost | Total Cumulative 25 Year Electricity Bill Cost |
| Greenhouse 2 (DC + AC) | No Solar or Storage | $0.15 | $0.23 | $0.47 | $1,038,158 | $1,610,524 | $3,348,163 | $49,548,269 |

# Greenhouse 2 Energy Flow after addition of DC-coupled Solar Microgrid and 2.5 MWdc of DC loads

Clean Coalition

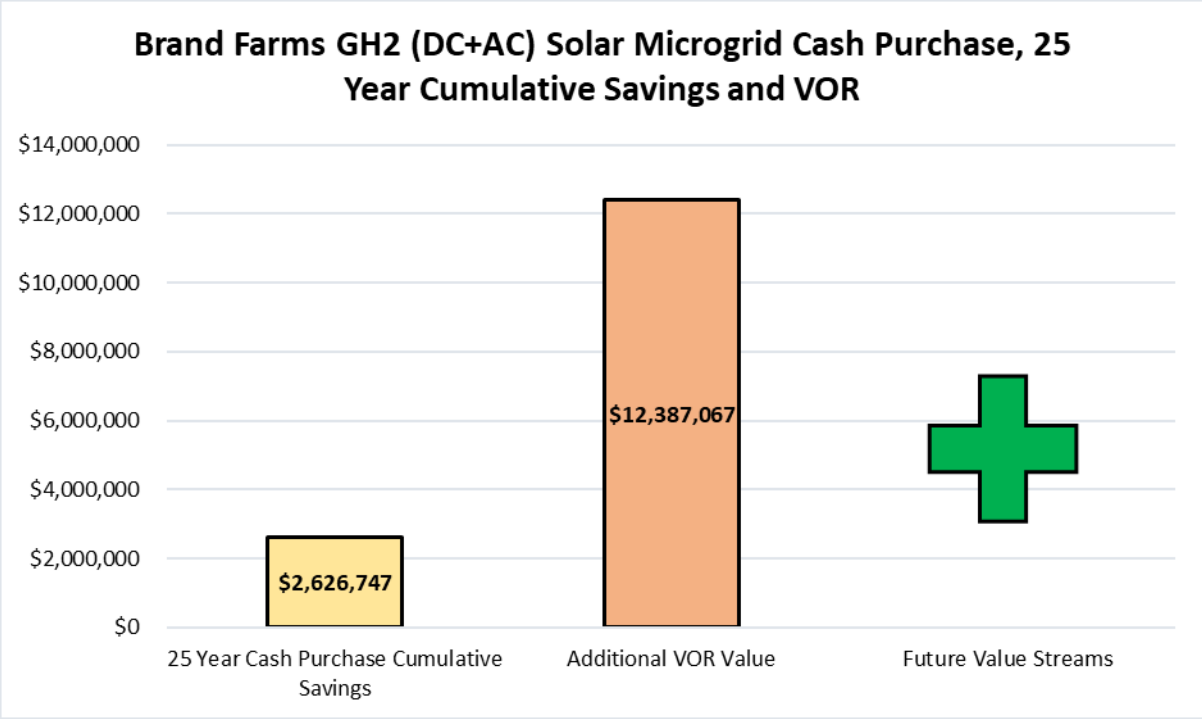
Energy Flow Diagram
1.5 MW solar and 3 MW / 6 MWh energy storage



# Solar Microgrid 25 year cash purchase economics

| Brand Farms GH2 (DC+AC) - Solar Microgrid 25 Year Cash Purchase Economic Details | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Facility | Annual Electricity Bill Cost (Pre-Solar Microgrid) | Solar Microgrid Cash Purchase - 25 Year Costs and Savings | | | | | | Value of Resilience |
| | | Capital Expenditure (Capex) | Operational Expenditure (Opex) | Incentives | Net Total Project Cost | Cumulative Utility Bill Savings | Net Cumulative Savings | 25 Year Value |
| GH2 (DC+AC) | $1,038,158 | ($8,250,000) | ($5,080,045) | $5,238,750 | ($8,091,295) | $10,718,042 | **$2,626,747** | $12,387,067 |

Cash purchase economics use $2.50/W for solar, $750/kWh for storage, 5% annual utility escalator, 30% ITC, and Federal & California MACRS



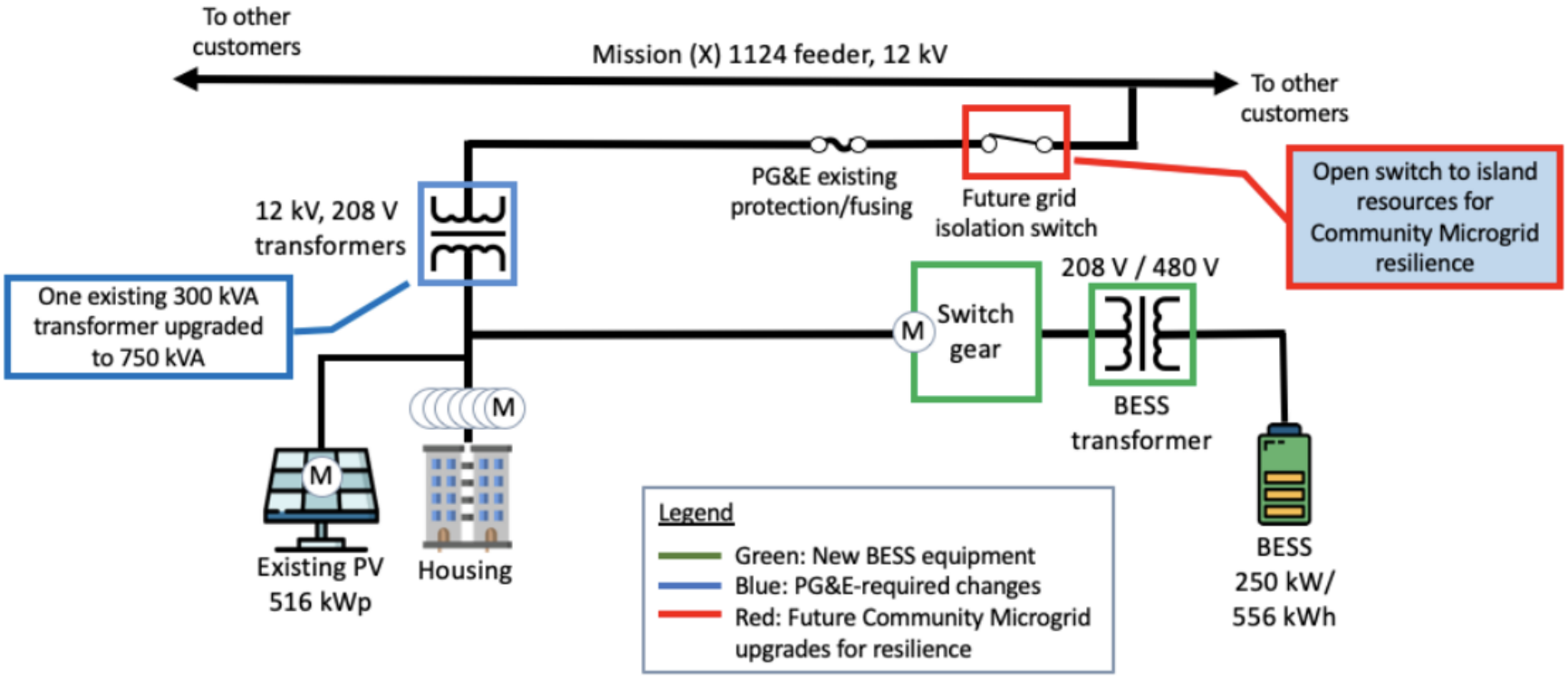
Clean Coalition

# Community Microgrids need policy innovation

# Valencia Gardens Apartments in San Francisco

Clean Coalition

# Future VGES Community Microgrid opportunity

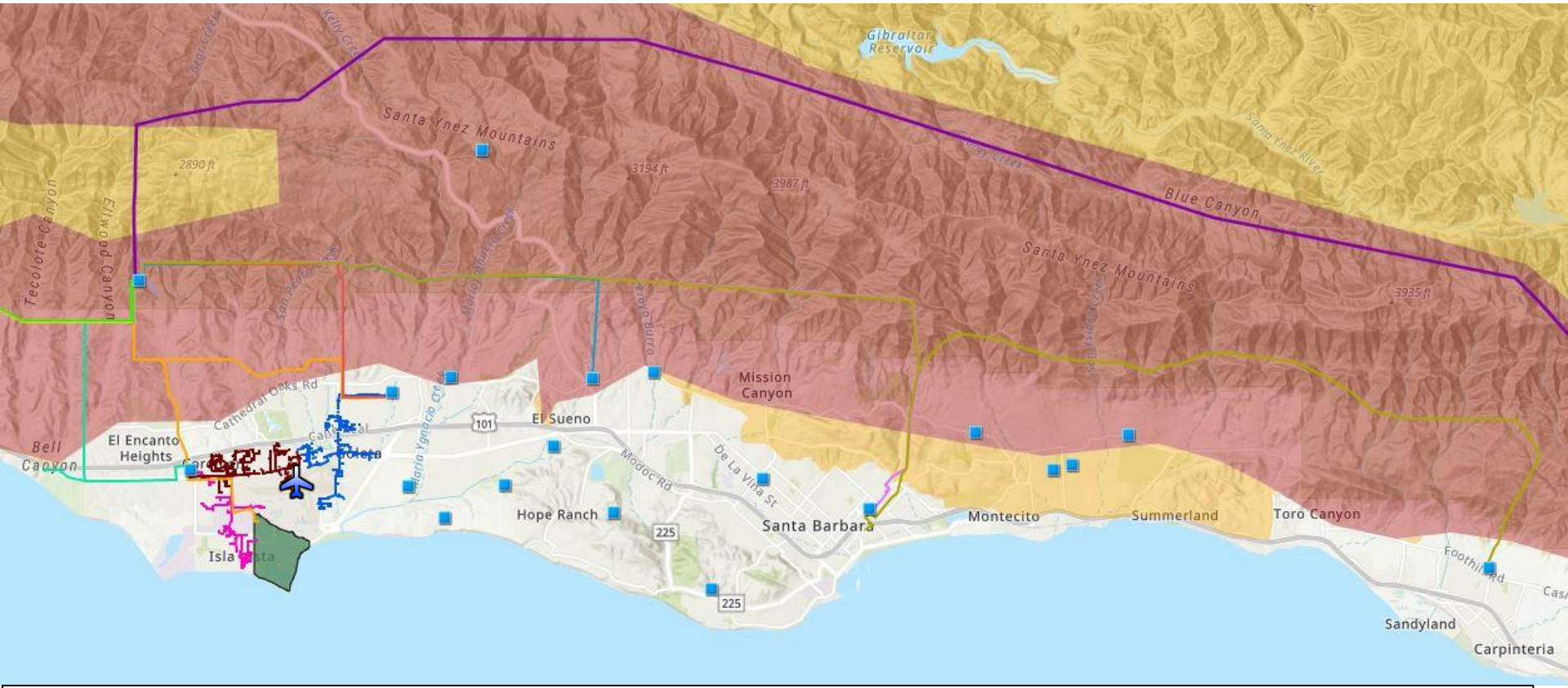


# Goleta Load Pocket (GLP)

The GLP is the perfect opportunity for a comprehensive Community Microgrid


- GLP spans 70 miles of California coastline, from Point Conception to Lake Casitas, encompassing the cities of Goleta, Santa Barbara (including Montecito), and Carpinteria.
- GLP is highly transmission-vulnerable and disaster-prone (fire, landslide, earthquake).
- **200 megawatts (MW) of solar and 400 megawatt-hours (MWh) of energy storage** will *provide 100% protection to GLP against a complete transmission outage ("N-2 event").*
  - 200 MW of solar is equivalent to about 5 times the amount of solar currently deployed in the GLP and represents about 25% of the energy mix.
  - Multi-GWs of solar siting opportunity exists on commercial-scale built-environments like parking lots, parking structures, and rooftops; and 200 MW represents about 7% of the technical siting potential.
  - Other resources like energy efficiency, demand response, and offshore wind can significantly reduce solar+storage requirements.

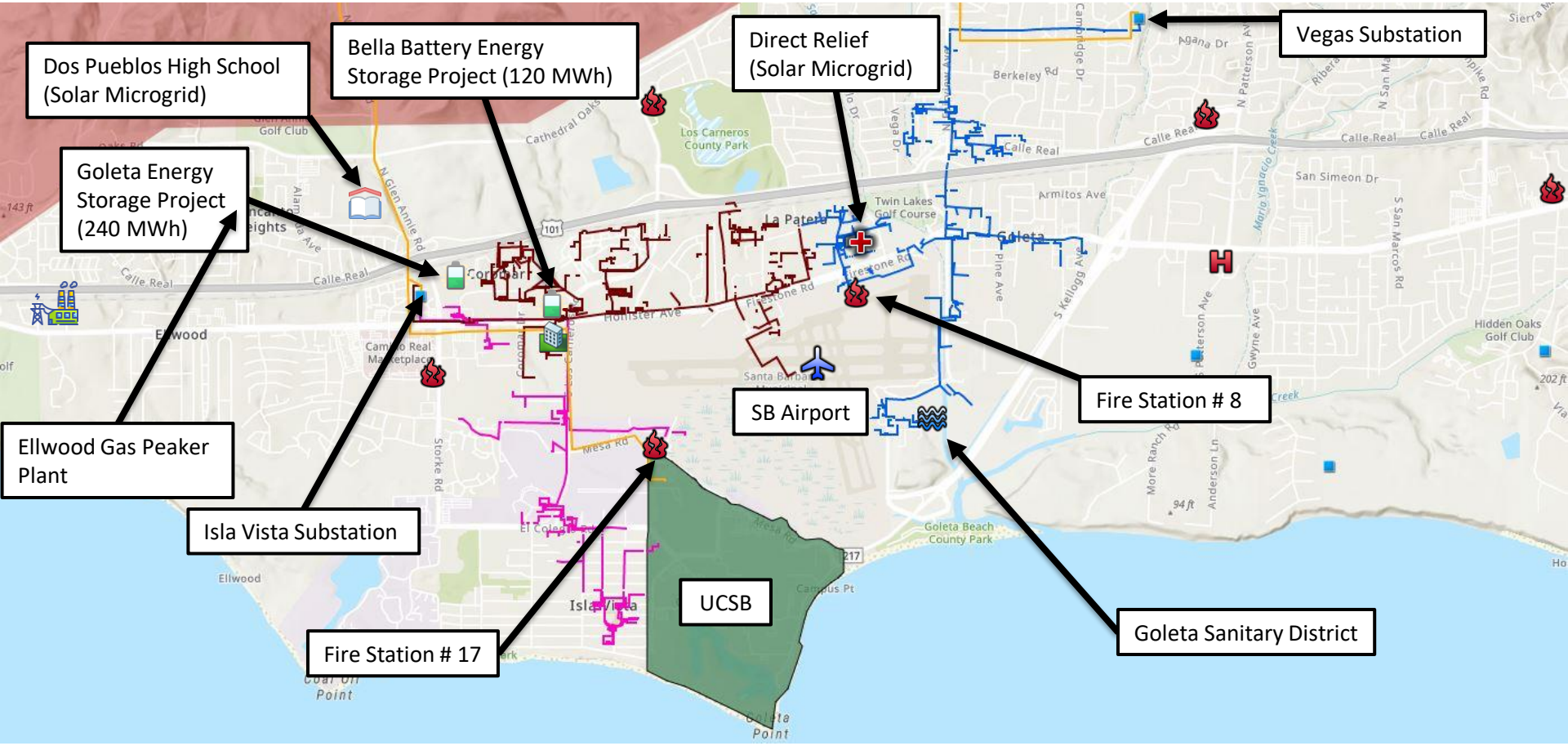
# Core load area of the GLP




**Legend**

- 220 kV Transmission
- Santa Barbara Airport
- Substations
- Tier 3 Fire Threat
- Tier 2 Fire Threat
- UCSB
- 16kV Gladiola Feeder
- 16kV Gaucho Feeder
- 16kV Professor Feeder
- Feeder #4157
- Feeder #3556
- Feeder #4311
- Feeder #3559
- Feeder #4169
- Feeder #4227
- Feeder #3565

# Target 66kV feeder serves critical GLP loads

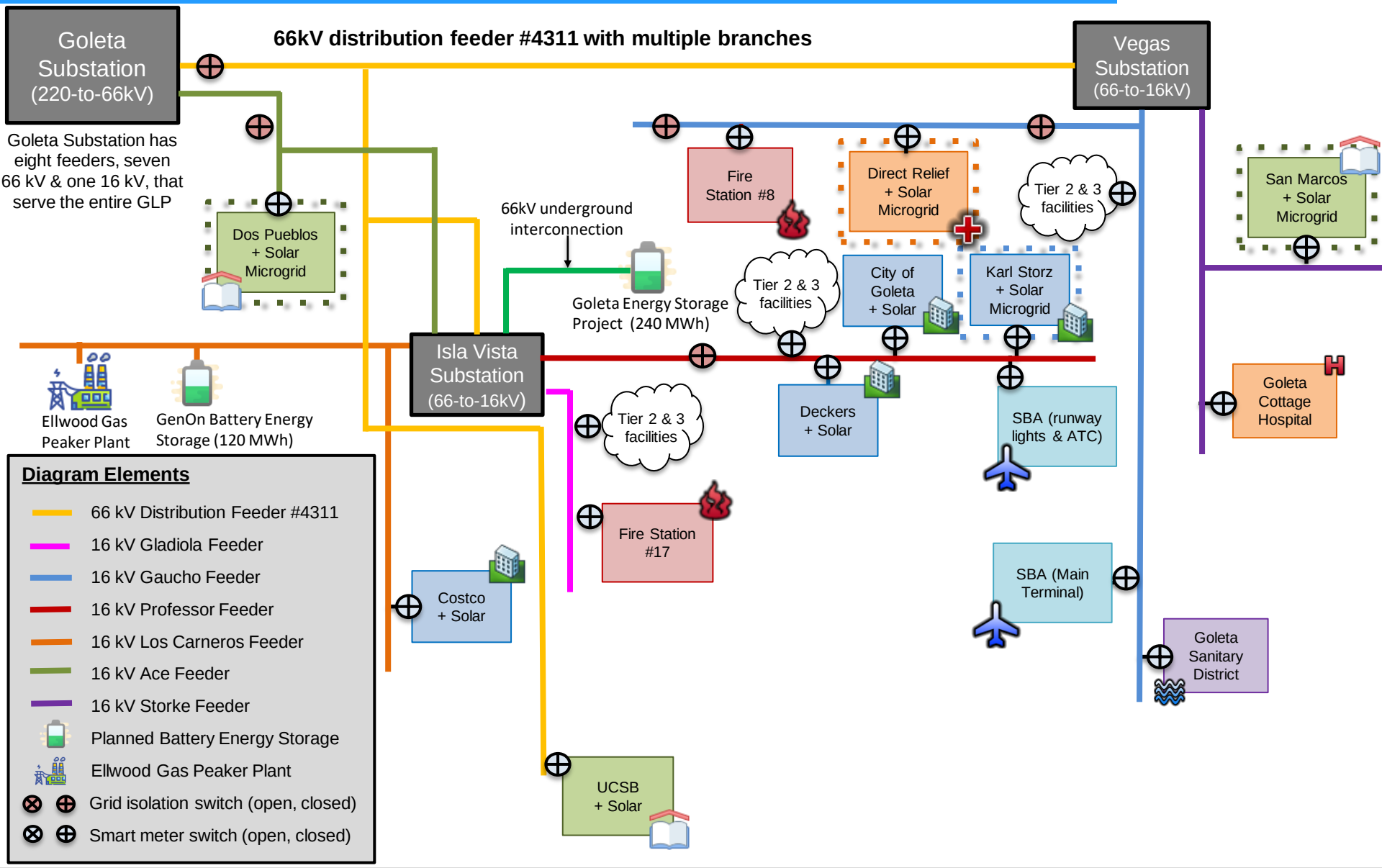



**Legend**

- 66 kV Feeder #4311
- Substations
- Tier 3 Fire Threat
- 16kV Gladiola Feeder
- 16kV Gaucho Feeder
- 16kV Professor Feeder
- Santa Barbara Airport
- University of California Santa Barbara
- Dos Pueblos High School
- Fire Stations
- Goleta Sanitary District
- Goleta Valley Cottage Hospital
- Direct Relief
- Deckers
- Planned Battery Energy Storage

# Target 66kV feeder grid area block diagram

Clean Coalition



Backup slides

# Load Profiles

# DignityMoves SM – load profiles

Clean Coalition

## Baseline Load Profile

- Using LifeMoves Mountain View as proxy, the baseline load profile is calculated based on the ratio between the LifeMoves Mountain View total annual load and the forecasted DignityMoves Santa Maria total annual load as provided by DignityMoves.
  - LifeMoves Mountain View's total 2021 actual annual load was 207,122 kWh
  - DignityMoves Santa Maria's forecasted total annual load (per DignityMoves) is 333.97 estimated daily kWh, equaling 121,899 kWh annually.
- Thus, DignityMoves Santa Maria is expected to be roughly 58% of LifeMoves Mountain View's total annual load.
- 58% of every 15-minute interval for LifeMoves Mountain View was taken to form DignityMoves Santa Maria's baseline load profile.

| DM Santa Maria - Current Rate and Billing Analysis Based on Baseline Load Profile | | | | | | | |
|---|---|---|---|---|---|---|---|
| PG&E and 3CE's Rate Schedule | Annual Load from Baseline Load Profile (kWh) | Peak Demand (kW) | Effective Blended Rate ¢/kWh | Total Annual Bill | Energy Charges | Demand Charges | Fixed Charges |
| B1 | 121,899 | 41 | 28.9 | $35,215 | $31,739 | $0 | $3,476 |

# DignityMoves SM – critical load profile

**Key Points:**

- LifeMoves Mountain View Critical Load Profile was used as the basis for Santa Maria and would include the following critical loads: food and community services, bathrooms, restrooms, security lighting, exterior lights, office lights, reception lights, parking lot lights.
- See actual critical load breakdown for Mountain View in next slide, as example for Santa Maria.
- **HOWEVER: Note that for the on-grid scenario with 2 BESS containers, the total percentage of loads kept on indefinitely is 35%, much higher than 11.4%.**

| Tier: | All tiers | 1 | 2 | 3 |
|---|---|---|---|---|
| Watts (VA): | 570,273 | 65,243 | 26,352 | 444,499 |
| Tiering by Watts %: | 100.0% | 11.4% | 9.5% | 77.9% |

| | |
|---|---|
| Clean Coalition's VOR 123 Methodology | *At the Clean Coalition, we've developed a standardized Value of Resilience (VOR)* metric. Our VOR123 methodology makes it simple to quantify VOR by standardizing *VOR for three tiers of loads — critical, priority, and discretionary loads — across all* facility types: |
| **Tier 1:** | *Mission-critical, life-sustaining loads that warrant 100% resilience — usually about 10% of a facility's total load.* |
| **Tier 2:** | Priority loads that should be maintained as long as doing so does not threaten the *ability to maintain Tier 1 loads — usually about 15% of the total load.* |
| **Tier 3:** | Discretionary loads that should be maintained only when doing so does not threaten *Tier 1 and Tier 2 resilience — usually about 75% of the total load.* |

# Example for Santa Maria – LifeMoves MV Critical load profile and tiering

Clean Coalition

| Electrical Panels and Loads | | | | Watts (VA) | Percentage of Total Load | Percentage of T1 Load | Tier 1 | Tier 2 | Tier 3 |
|---|---|---|---|---|---|---|---|---|---|
| MSB | CDP1 | | Food SVC Module FS-1 | | 29,952 | 5.25% | | X | | |
| | | | Food SVC Module FS-2 | | 27,248 | 4.78% | | | X | |
| | | | Food SVC Module FS-3 | Refrigerator<br>Microwave (Prep -CTR RH)<br>Microwave (Prep - CTR LH)<br>Conven Outlet (Prep - LH)<br>General LTS & Vent Fan<br>Conven Outlet (Flex - Rear wall)<br>Campus Lighting (exerior)<br>Conven Outlet (exterior)<br>Microwave (Prep - LH)<br>Air Conditioning (x2)<br>Conven Outlet (IT RM - LH wall)<br>Conven Outlet (IT RM - Entry & RH)<br>Conven Outlet (IT RM - Server LWR)<br>Conven Outlet (IT RM - Server UPR)<br>Conven Outlet (IT RM - Rear Wall)<br>Microwave (Prep Area - RH) | 12,272 | 2.15% | 18.8% | X | | |
| | | | Module Laundry | | 24,274 | 4.26% | | | | X |
| | | | Storage - North | | 2,080 | 0.36% | | | | X |
| | | | Community Bldg PNL | | 7,904 | 1.39% | 12.1% | X | | |
| | | | Module 24/TS-1L - Bathrooms | | 6,448 | 1.13% | 9.9% | X | | |
| | | | Module 24/TS-1R - Bathrooms | | 6,448 | 1.13% | | | | |
| | | | Module Restroom | | 5,616 | 0.98% | 8.6% | X | | |
| | | Falcon PNL A | Intake/Security Lights | | 84 | 0.01% | 0.1% | x | | |
| | | | Exterior Lights | | 138 | 0.02% | 0.2% | x | | |
| | | | Intake Reception Room | | 360 | 0.06% | 0.6% | x | | |
| | | | Security Rec | | 360 | 0.06% | 0.6% | X | | |
| | | | Packaged Terminal Air Conditioner (PTAC) | | 2,304 | 0.40% | | | x | |
| | | Falcon PNL B (North Support Services) | Offices/Staff Break Lights | | 147 | 0.03% | | | | x |
| | | | Exterior Lights (3 brkrs) | | 345 | 0.06% | 0.5% | x | | |
| | | | Flex (multipurpose) Office Reception (3 brkrs) | | 2,160 | 0.38% | | | | x |
| | | | Staff Break Reception | | 540 | 0.09% | | | x | |
| | | | Nurse Medical Reception | | 720 | 0.13% | | | x | |
| | | | Packaged Terminal Air Conditioner (PTAC) | | 9,216 | 1.62% | | | | x |
| | | | Offices Lights | | 84 | 0.01% | | | x | |
| | | | Offices/Nurse/Medical Lights | | 147 | 0.03% | 0.2% | x | | |
| | | | IWH - 1 (2 units) | | 12,480 | 2.19% | | | X | |
| | | | Medical Fridge | | 1,200 | 0.21% | 1.8% | x | | |
| | | | Refrigerator | | 1,200 | 0.21% | | | X | |
| | | | Disposal | | 1,200 | 0.21% | | | | x |
| | | | Coffee Maker | | 1,200 | 0.21% | | | | x |
| | | | Microwave | | 1,200 | 0.21% | | | x | |
| | | Falcon PNL C (South Support Services) | Offices/Meeting Lights | | 147 | 0.03% | | | x | |
| | | | Exterior Lights | | 483 | 0.08% | 0.7% | | x | |
| | | | Flex (multipurpose) Office Reception | | 2,160 | 0.38% | | | | x |
| | | | Meeting Reception Room | | 1,440 | 0.25% | | | | x |
| | | | Lounge Reception (Family room for managing families) | | 1,080 | 0.19% | | | x | |
| | | | Microwave | | 1,200 | 0.21% | | | | x |
| | | | Coffee Maker | | 1,200 | 0.21% | | | | x |
| | | | IWH-1 | | 6,240 | 1.09% | | | X | |
| | | | Disposal | | 864 | 0.15% | | | | x |
| | | | Office Lights | | 84 | 0.01% | | | x | |
| | | | Lounge /Offices/Meeting Lights | | 273 | 0.05% | | | x | |
| | | | Packaged Terminal Air Conditioner (PTAC) | | 11,520 | 2.02% | | | | x |
| | RDP1 | | Module Panel - Single Family Unit 1, 7 | | 35,360 | 6.20% | | | | X |
| | | | Module Panel - Two Family Unit 2, 3, 4, 5, 6 | | 95,470 | 16.74% | | | | X |
| | | | Electrical Vehicle Charging Station - 1, 2 | | 13,312 | 2.33% | | | | X |
| | | | Reception - Main Service Area | | 180 | 0.03% | 0.3% | X | | |
| | | | Storage South | | 8,320 | 1.46% | | | | X |
| | | | Parking Lot Lights | | 237 | 0.04% | 0.4% | X | | |
| | DP2 | | 4 Bed Unit 1,2,3,4,5,6,7,8,9,10,11 | | 116,688 | 20.46% | | | | X |
| | DP3 | | 4 Bed Unit 12,13,14,15,16,17,18,19,20,21,22 | | 116,688 | 20.46% | | | | X |

**Legend**

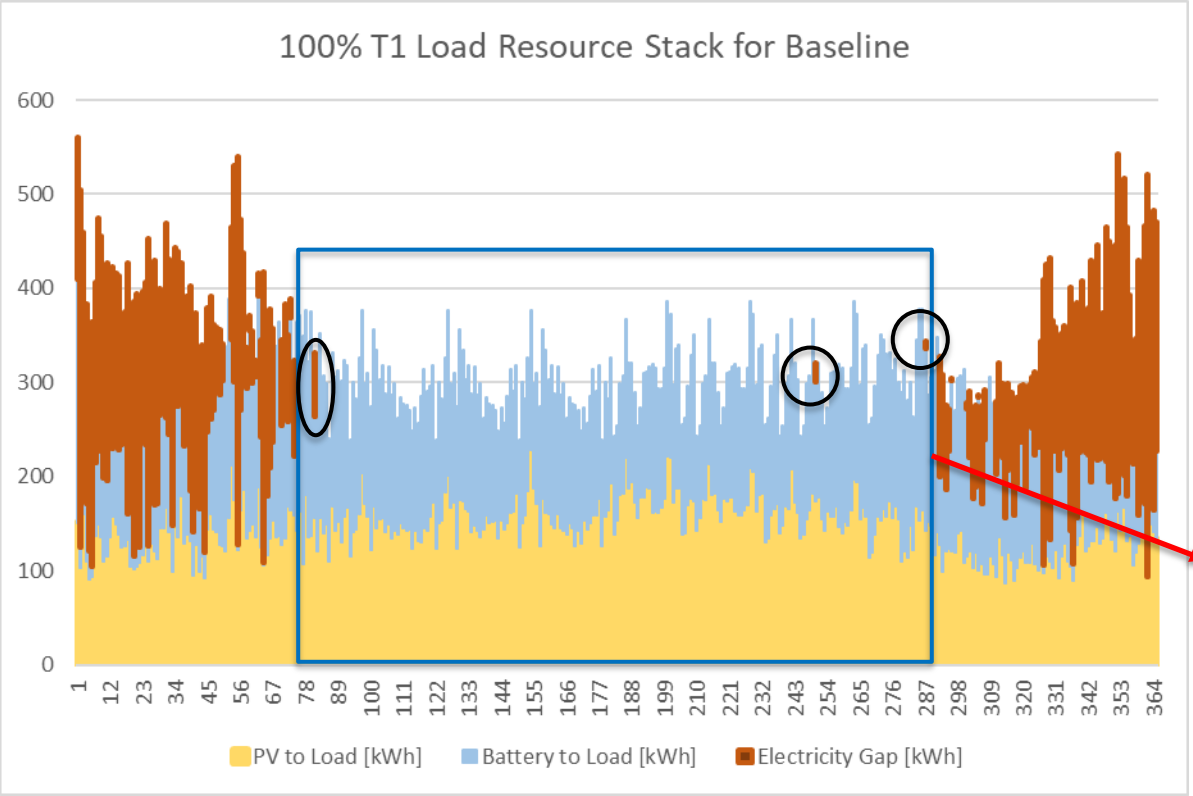
X: Clean Coalition choice based on new loads discovered during site walk

x: LifeMoves original choice

# DignityMoves SM – Battery sizing (2 BESS) with solar on Boss Cubez units

Clean Coalition

| DignityMoves Santa Maria - On-Grid HomeGrid Battery Energy Storage Sizing, System Cost, and Resilience | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Recommended Battery System Size | | Battery System Cost | | Indefinite Resilience | |
| Baseline Load Profile Peak Demand (kW) | Solar System Size (kW) | Standard Option Battery Power Capacity (kW) | Standard Option Battery Energy Capacity (kWh) | Total Battery Energy Storage System Cost | Battery Energy Storage System Cost per kWh | Total Percentage of Load Kept Online Indefinitely (Year 1) | Total Percentage of Load Kept Online Indefinitely (Year 15 - before replacement) |
| 41 | 86.4 | 150 | 307 | $269,717 | $878 | 40.0% | 35.0% |




The total annual energy gap is 22,159 kWh. When on-grid, this energy gap is supplied by the grid. When off-grid, this energy gap would require 1,773 gallons of diesel fuel for 1 year – see diesel generator details in next slide.

For mid-March through October, solar and storage should be enough to cover 100% of the site's electrical load, except for the following three days:

- Date – 22 March (67 kWh)
- Date – 7 September (20 kWh)
- Date – 14 October (8 kWh)