

Clean ⚡ *Coalition*

Community Microgrids Renewables-driven Resilience



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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.

A Community Microgrid is a new approach for designing and operating the electric grid, stacked with local renewables and staged for resilience.

Key features:

- A targeted and coordinated distribution grid area served by one or more substations – ultimately including a transmission-distribution substation that sets the stage for Distribution System Operator (DSO) performance.
- Ability to utilize existing distribution grid infrastructure to serve the Community Microgrid during broader grid outages
- High penetrations of local renewables and other distributed energy resources (DER) such as energy storage and demand response.
- Staged capability for indefinite renewables-driven backup power for critical community facilities across the grid area – achieved by 25% local renewables mix.
- A solution that can be readily extended throughout a utility service territory – and replicated into any utility service territory around the world.

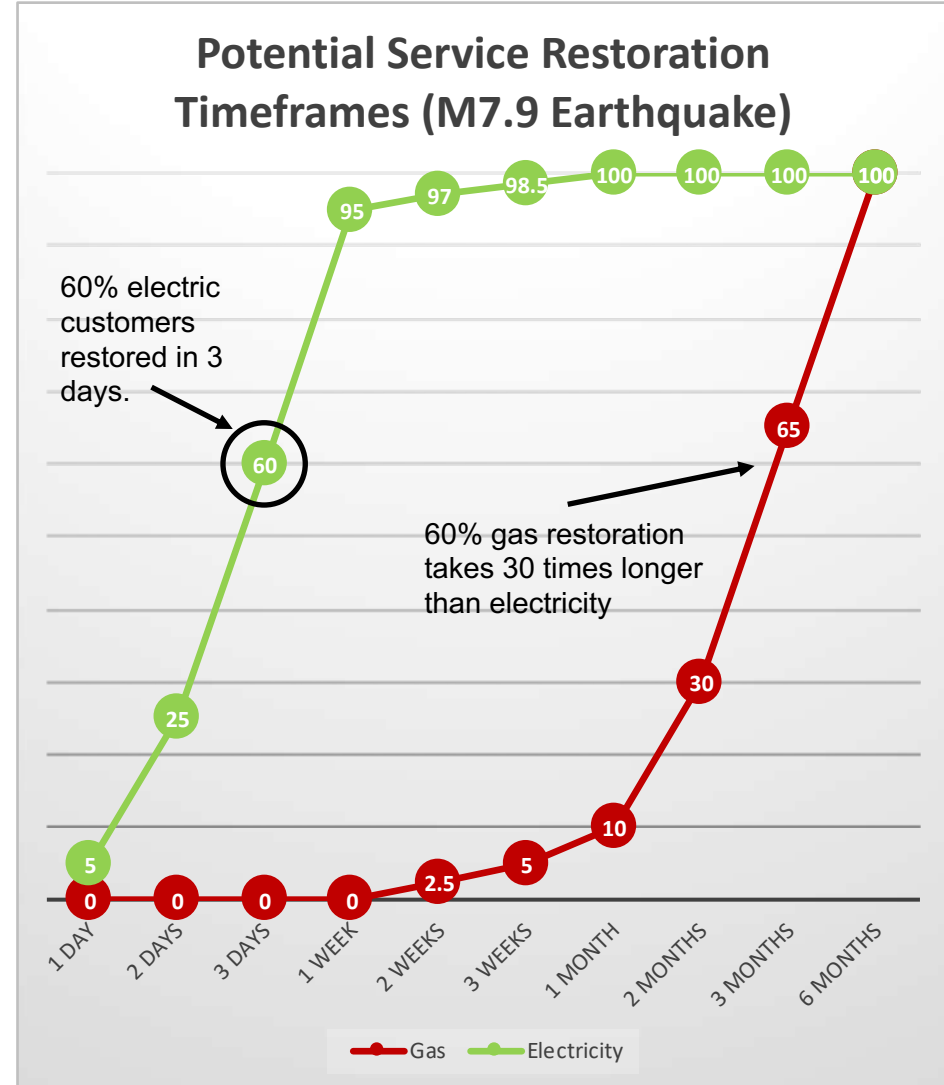


Natural gas infrastructure is not resilient

- **Assertion:** Gas-driven generation is often claimed to be resilient.
- **Reality:** Gas infrastructure is not resilient and takes much longer to restore than electricity infrastructure.
- **Threats:** Gas infrastructure can be flat-out dangerous and highly vulnerable to earthquakes, fires, landslides, and terrorism.



2010 San Bruno Pipeline Explosion



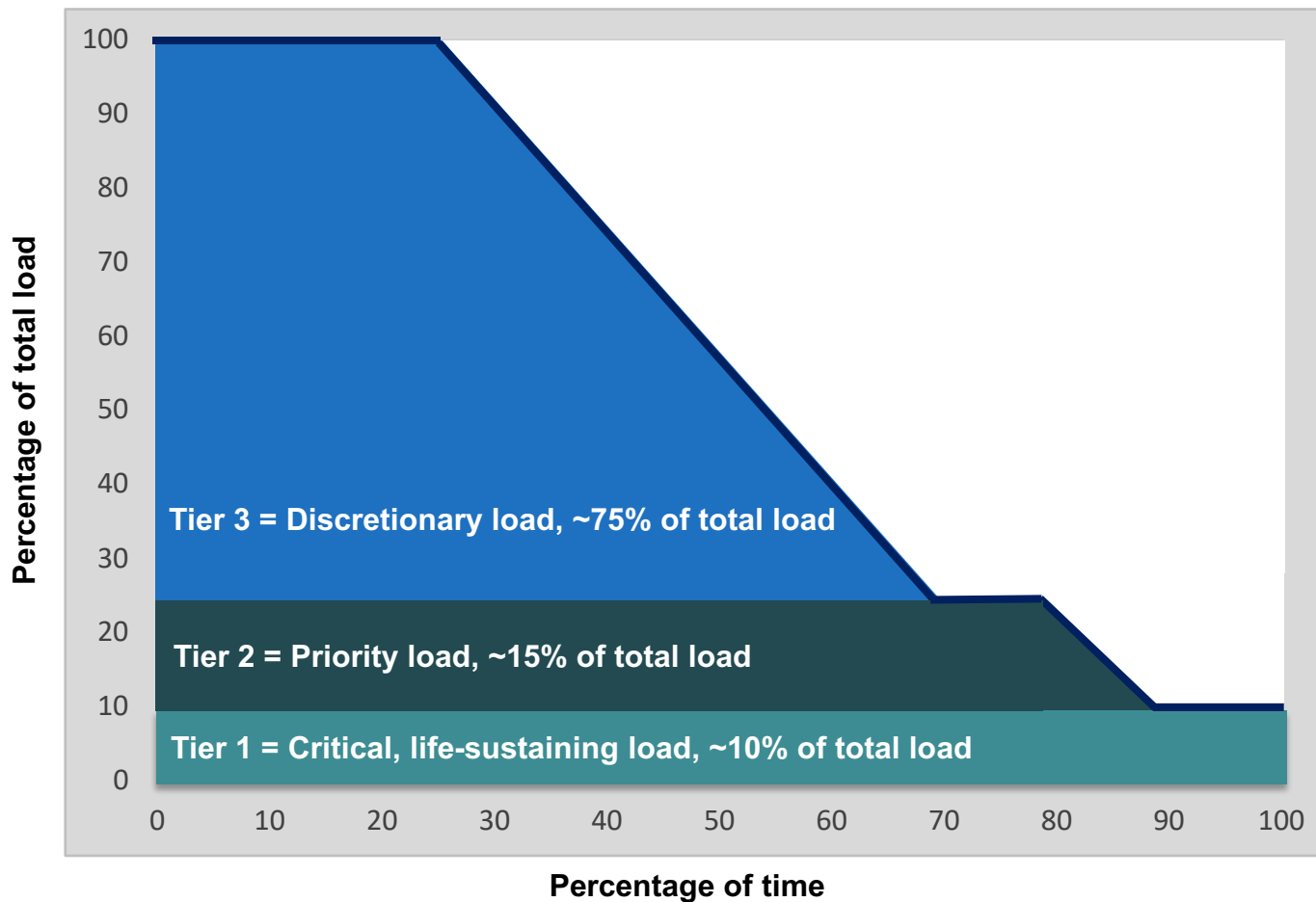
Source: The City and County of San Francisco Lifelines Study

Value of Resilience (VOR) depends on tier of load

- Everyone understands there is significant value to resilience provided by indefinite renewables-driven backup power
 - But, nobody has yet to quantify this value of unparalleled resilience.
 - Hence, there is an economic gap for innovative Community Microgrid projects while learning is still in the early stages.
- The Clean Coalition aims to establish 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 of 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 will establish standardized values for resilience of three tiers of loads:
 - Tier 1 are mission-critical and life-sustaining loads, crucial to keep operational at all times, including during grid outages. Tier 1 loads usually represent about 10% of the total load.
 - Tier 2 are priority loads that should be maintained as long as long as doing so does not threaten the ability to maintain Tier 1 loads. Tier 2 loads are usually about 15% of the total load.
 - Tier 3 are discretionary loads make up the remaining loads, usually about 75% of the total load, and are maintained when doing so does not threaten the ability to maintain Tier 1 & 2 loads.



Percentage of time online for Tier 1, 2, and 3 loads for net zero solar + 2 hours storage microgrid at UCSB



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.

Table VI-10
Final Selection Set to Solve LCR Need

Bidder	Project	Resource Type	Location	Capacity (MW)	Average Capacity Price (\$/kW-mo)	Commercial Online Date	Regulatory Approval Mechanism
Swell	SC/G	BTM-DR	S & G	14		January 2021	ACES AL
E.ON	Painter	ES-RA Only	G	10		March 2021	ACES AL
Strata	Saticoy	ES-RA Only	S	100		December 2020	LCR Application
Able Grid	Silverstran	ES-RA Only	S	11		March 2021	ACES AL
Ormat	Vallecito	ES-RA Only	G	10		December 2020	ACES AL
AltaGas*	Goleta	ES-RA Only	G	40		December 2020	ACES AL
Enel	Hollister	ES-RA Only	G	10		March 2021	ACES AL

Source: SCE LCR RFP April 22, 2019

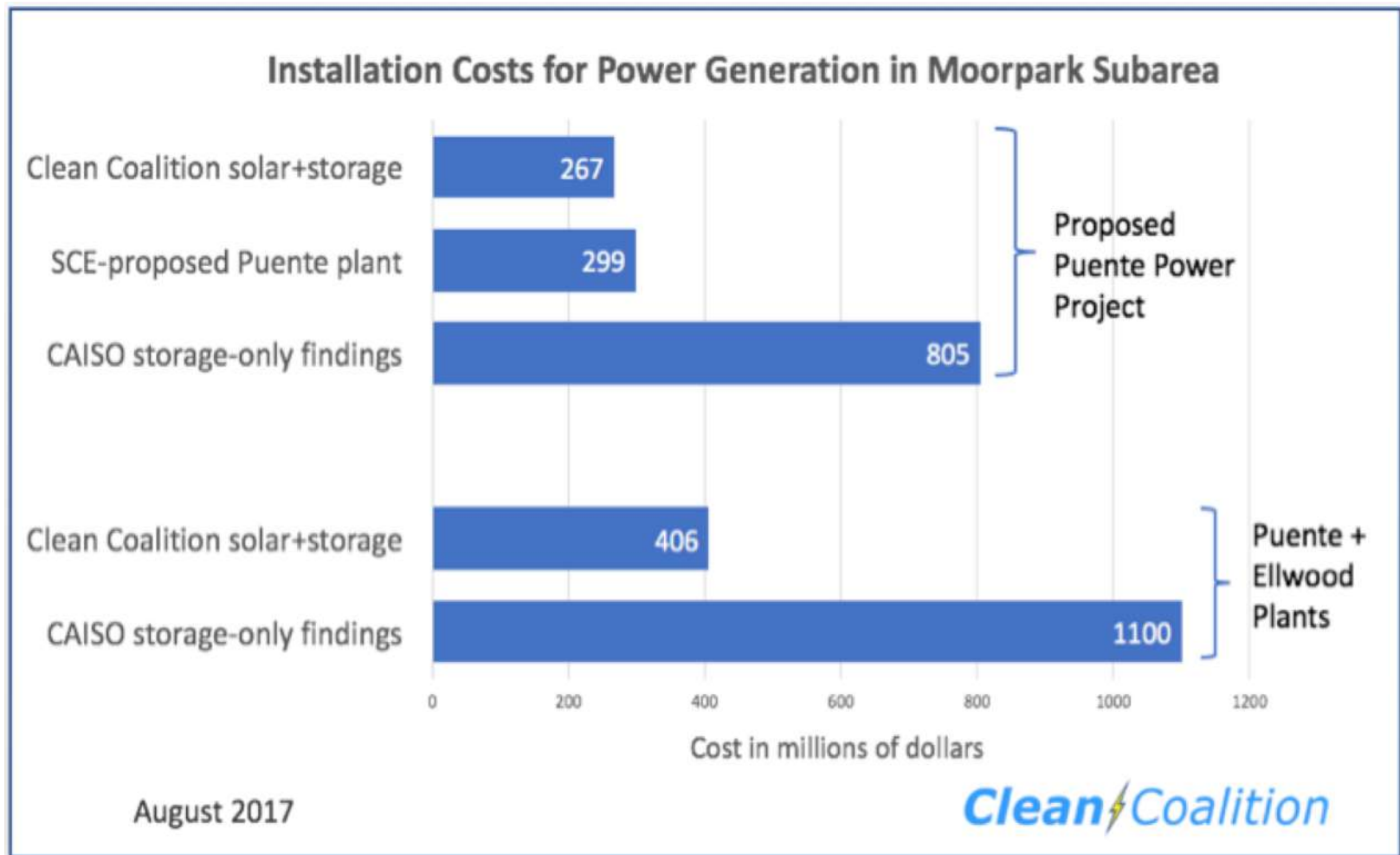
280 MWh (70 MW x 4-hour) of energy storage has been formally proposed by SCE to the CPUC for siting within the GLP, with online dates by March 2021

= within the GLP

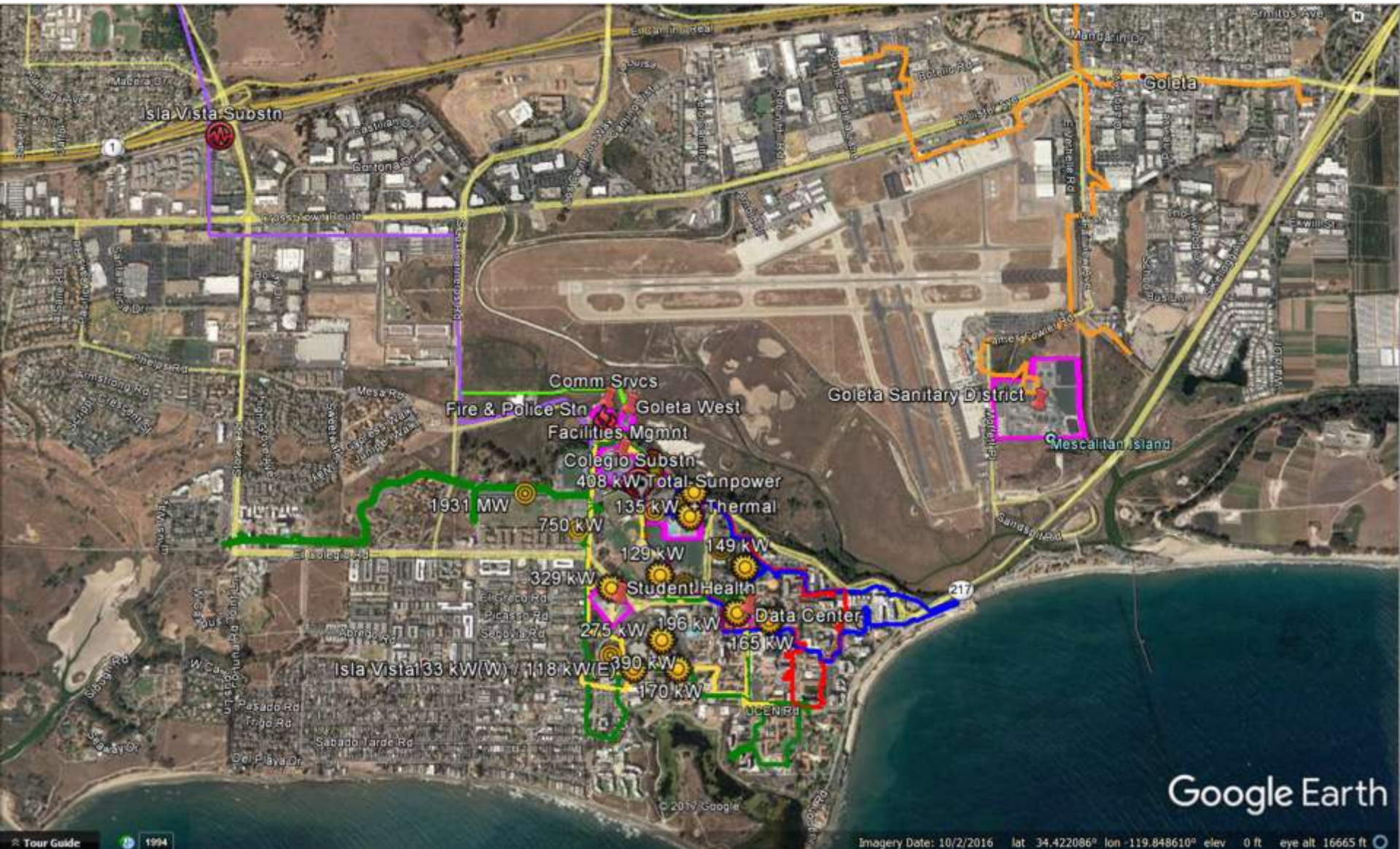
- Thanks in part to Clean Coalition analyses, California regulators blocked repowering of the Ellwood gas peaker in Goleta and constructing the massive Puente gas peaker in Oxnard.
- “Let’s take this opportunity to move the Oxnard community into the clean energy future — which is here already.” *Carmen Ramirez, Mayor of Oxnard*
- Significant opportunity to leverage this work to prevent future new gas plant proposals across the country

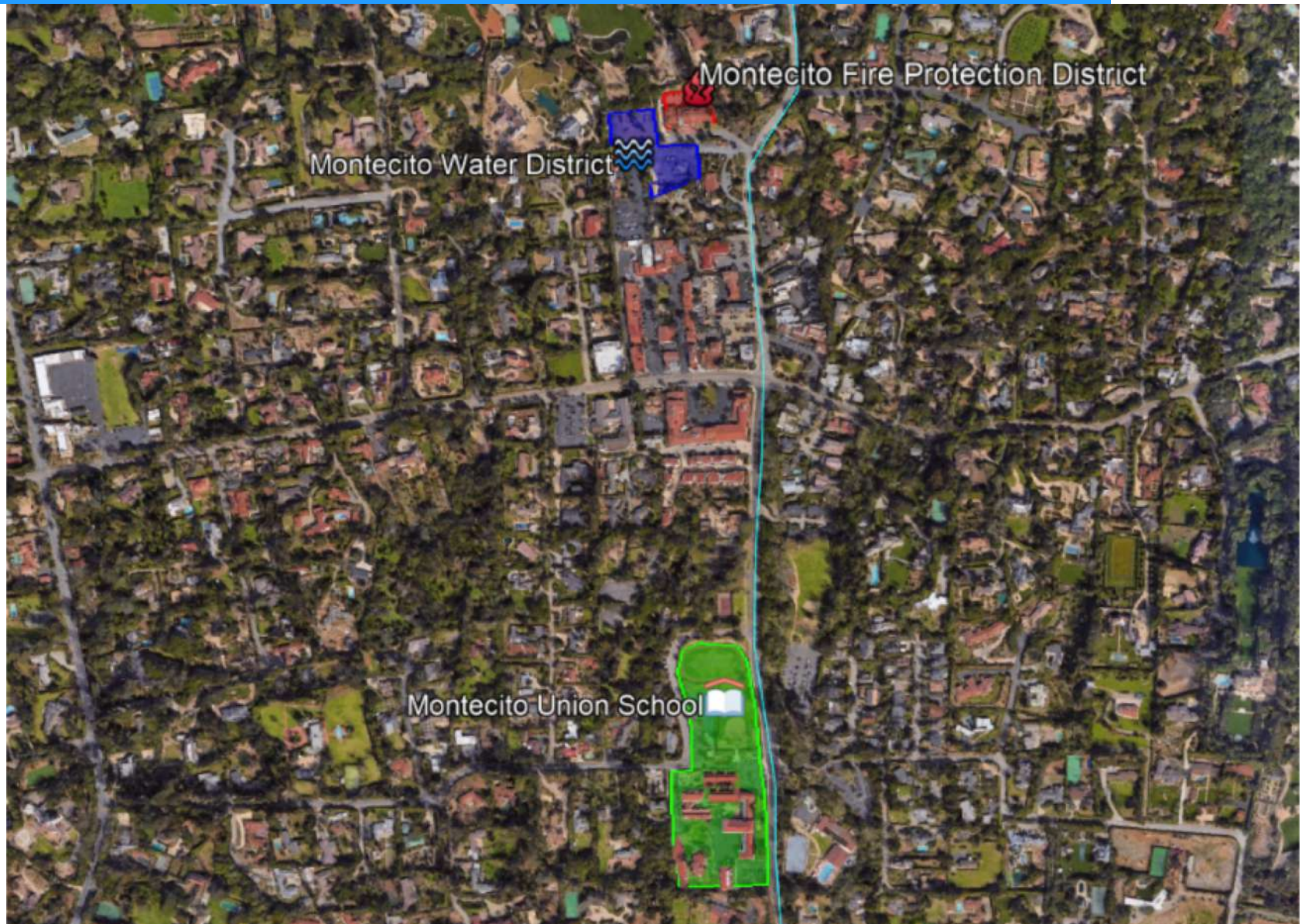


- Leveraging our technical and economic expertise, the Clean Coalition conducted an analysis to determine the viability of solar+storage as a better alternative





UCSB Community Microgrid – Area Map

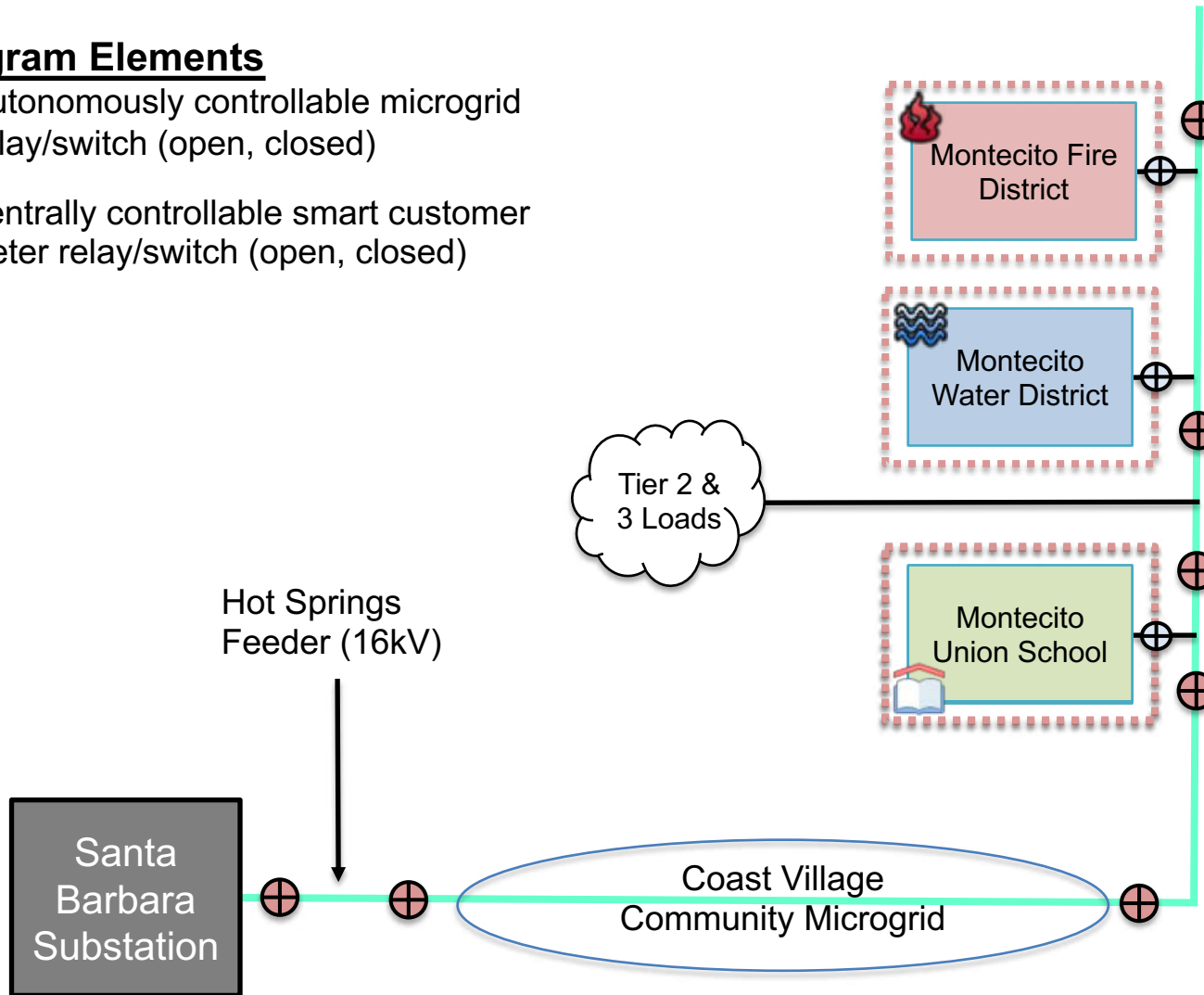


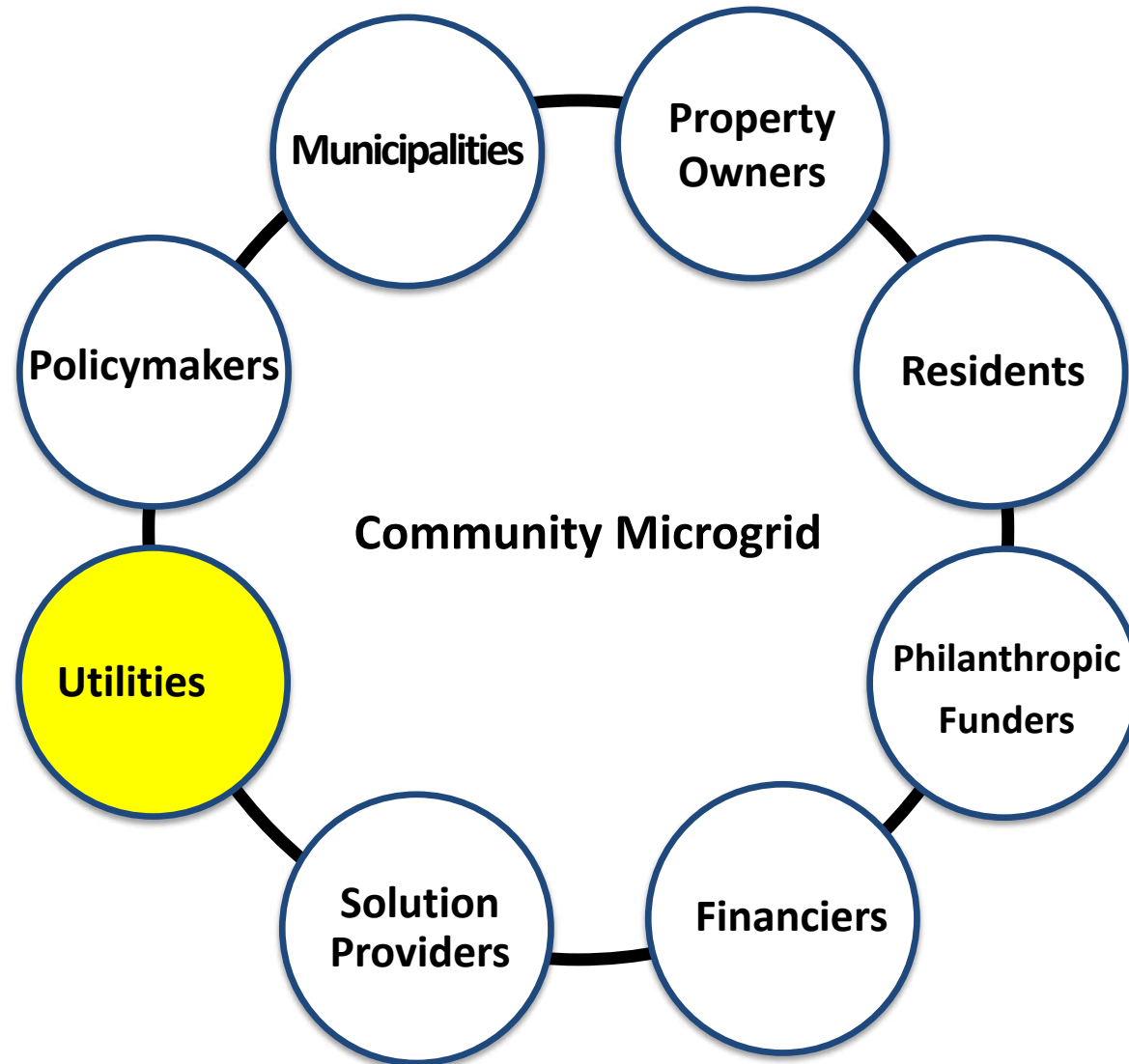


Upper Village Community Microgrid block diagram

Diagram Elements

-  Autonomously controllable microgrid relay/switch (open, closed)
-  Centrally controllable smart customer meter relay/switch (open, closed)





Solar Power World

TOP SOLAR CONTRACTORS

SOLAR+STORAGE



Clean Coalition helps Santa Barbara Unified School District start massive solar microgrid initiative

By Kelsey Misbrener | December 18, 2019

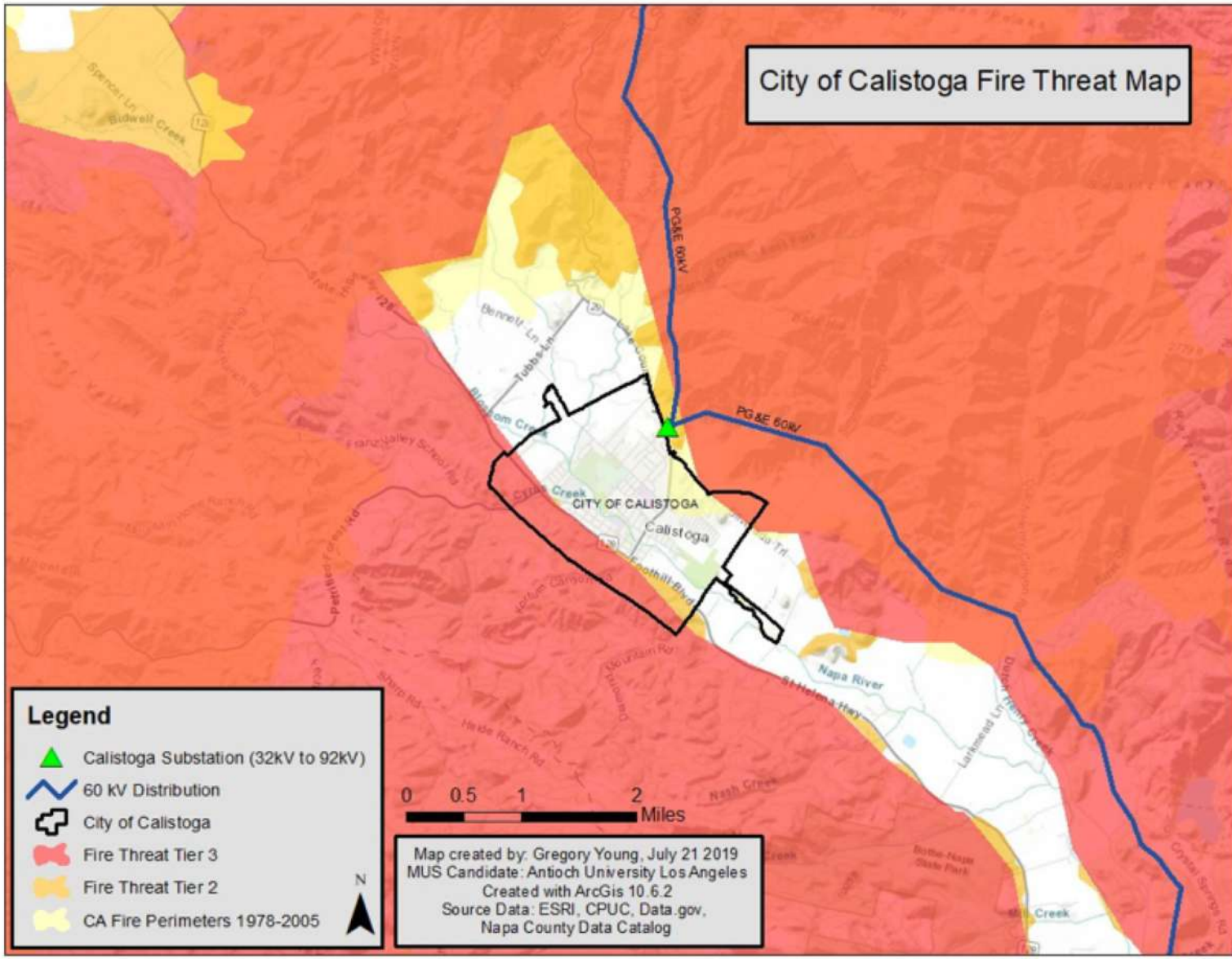


The Santa Barbara Unified School District (SBUSD) has unanimously approved an ambitious initiative with the Clean Coalition, a nonprofit organization, and Sage Energy Consulting to stage solar-driven microgrids and electric vehicle charging infrastructure (EVCI) at schools throughout the District. The microgrids will feature solar and energy storage that can provide long-duration resilience, along with EVCI that supports District staff and students during the day — and provides overnight charging options for neighbors who have challenges installing electric vehicle chargers where they live.

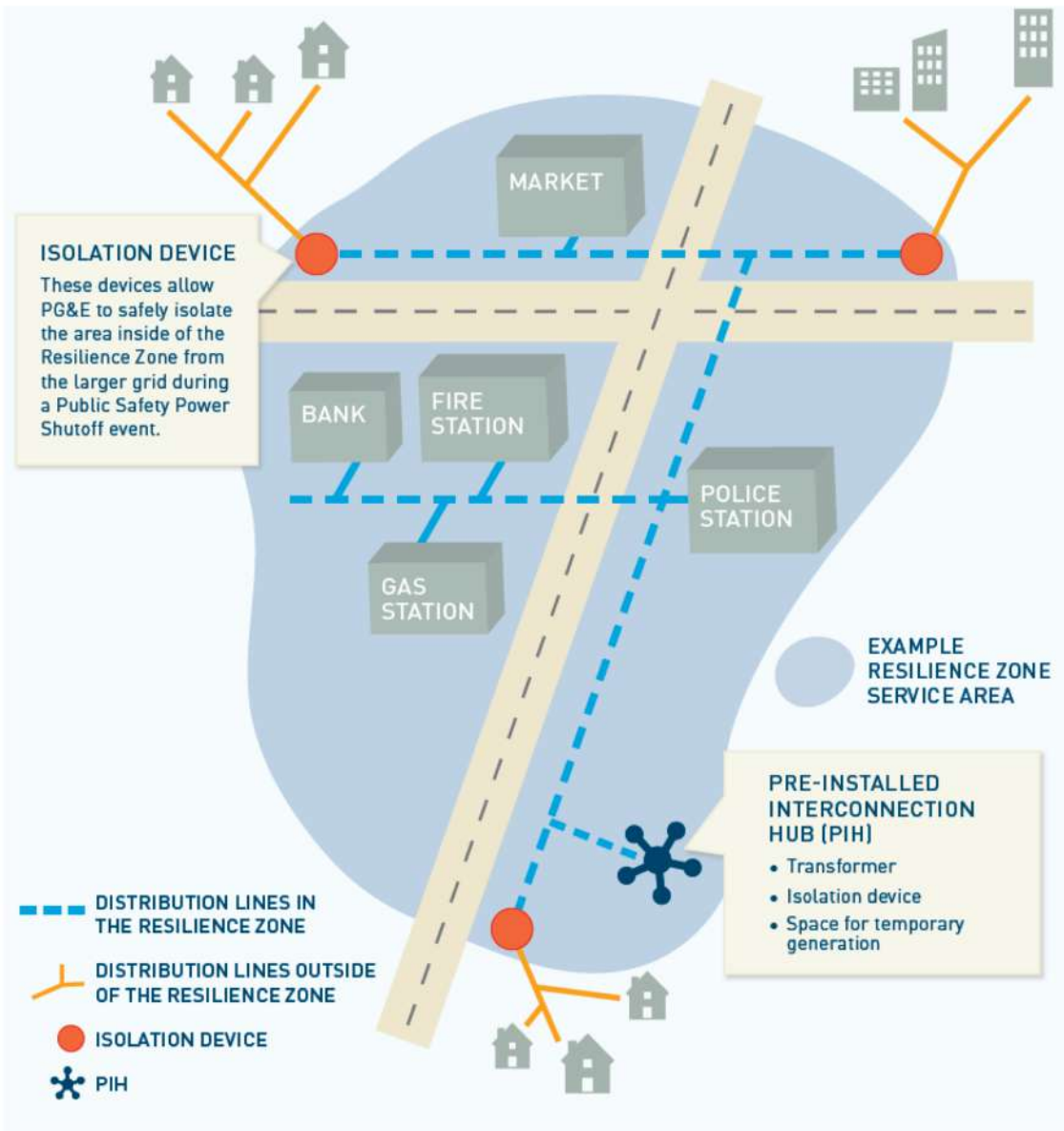


- Seamless grid isolation switch that islands the Community Microgrid without any electricity service interruption to any of the 20 customers.
- 2 MW of solar and 8 MWh of storage that are DC-coupled front-of-meter (FOM). The FOM solar+storage assets are owned by the Redwood Coast Energy Authority (RCEA), a Community Choice agency.
- 250 kW of behind-the-meter (BTM) solar.
- Bank of 8 Level-2 EV charging ports in a BTM configuration that is load controllable, including sheddable.
- Full PG&E control of the distribution grid at all times.
- All RCAM assets, both FOM & BTM, controlled by asset owners during normal grid operations and by PG&E for master control during Community Microgrid islanding operations.
- New tariff and business model innovations.

City of Calistoga area & fire threat map



PG&E Resilience Zones = Community Microgrids

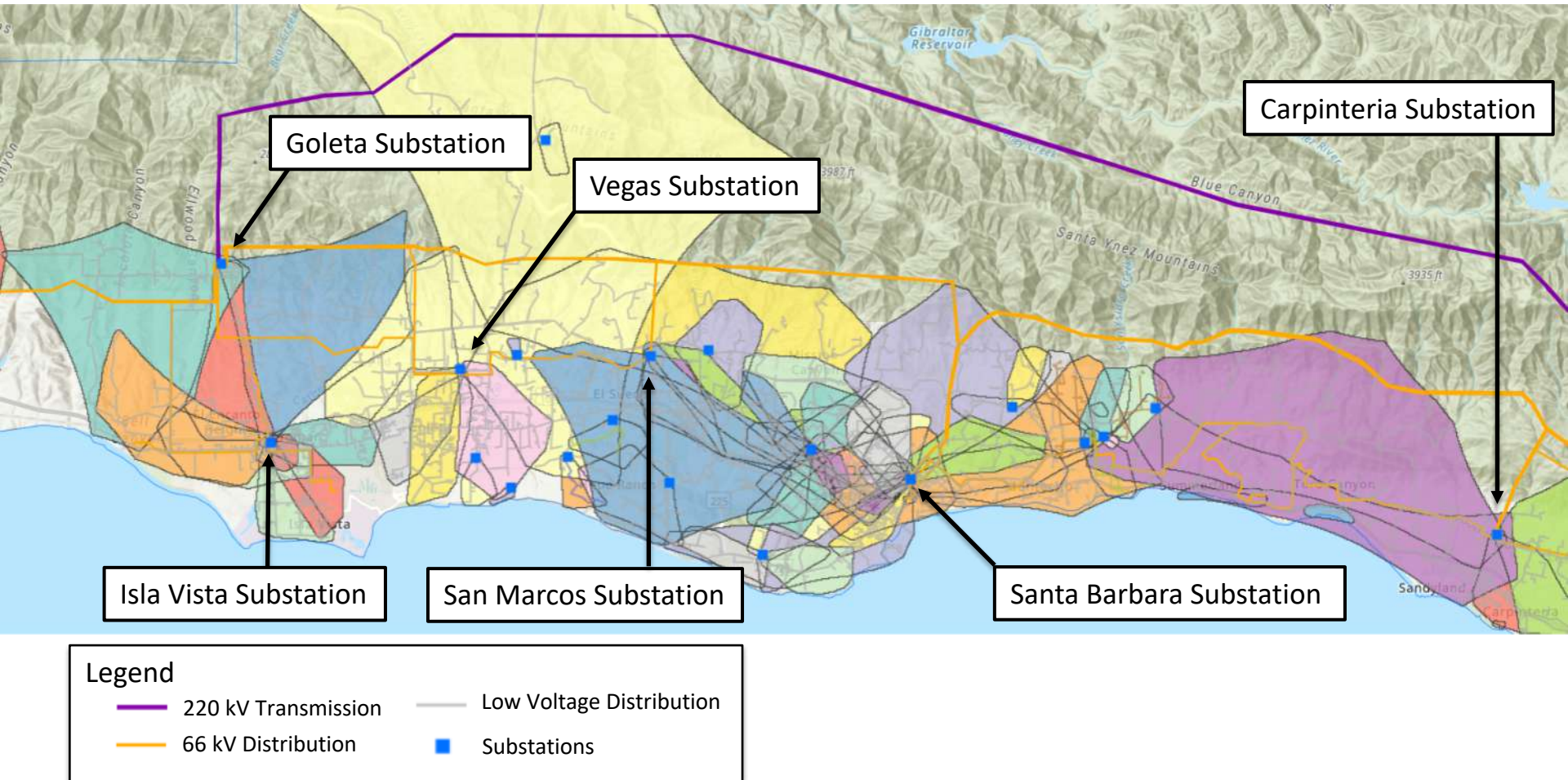


- PG&E is planning for a Resilience Zone powered by 7 MW of diesel generators.
- These diesel generators could be replaced by local solar and storage.

Source: PG&E, Jul2019

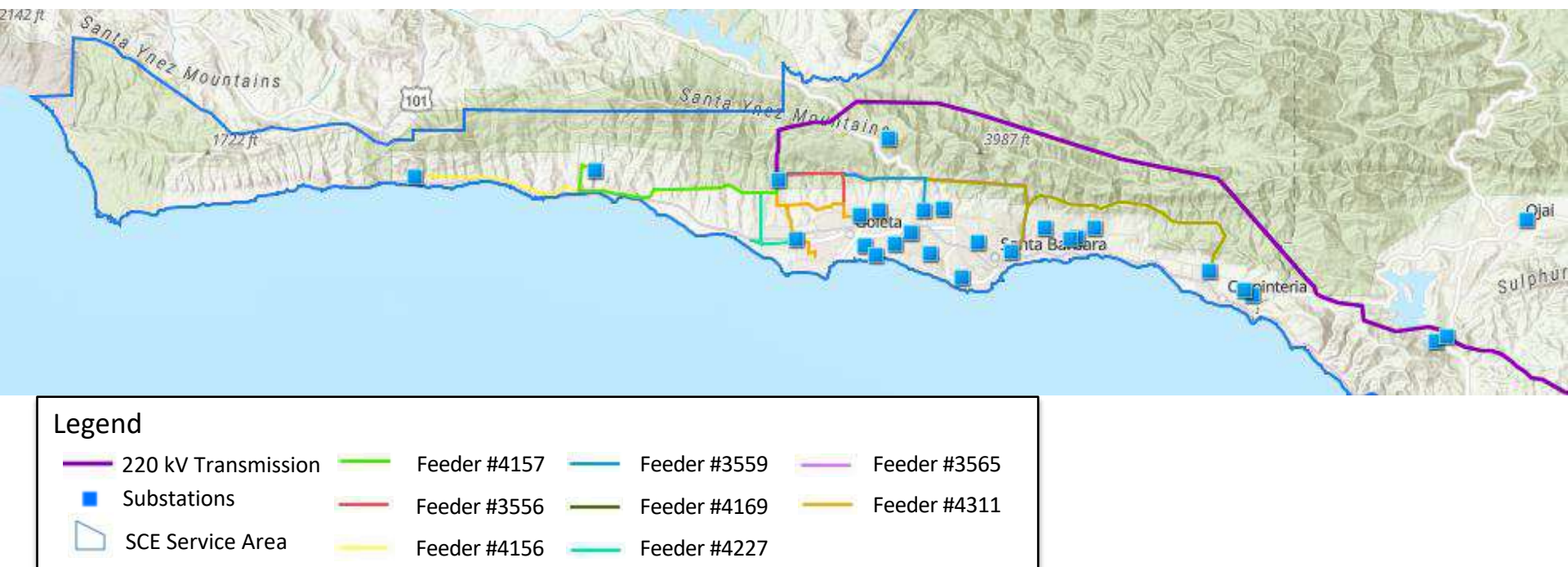


Core GLP with SCE grid layout & outage zones



Goleta Substation has eight – 66kV feeders

Goleta Substation has eight feeders, all 66kV, that serve the entire GLP



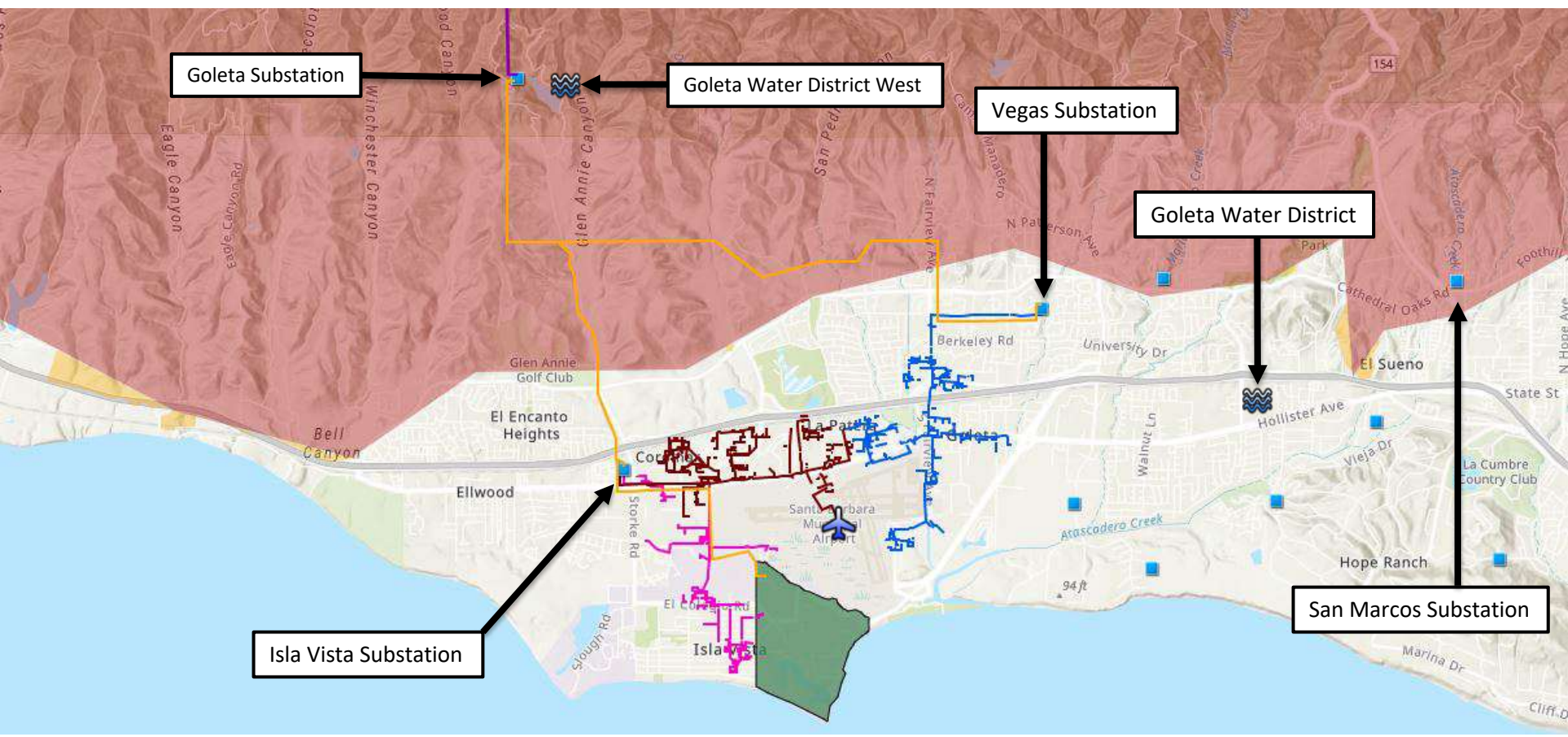
Core load area of the GLP



Legend

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

Target 66kV feeder area of the GLP



Legend

220 kV Transmission

66 kV Feeder #4311

Substations

16kV Gladiola Feeder

16kV Gaucho Feeder

16kV Professor Feeder

Tier 3 Fire Threat

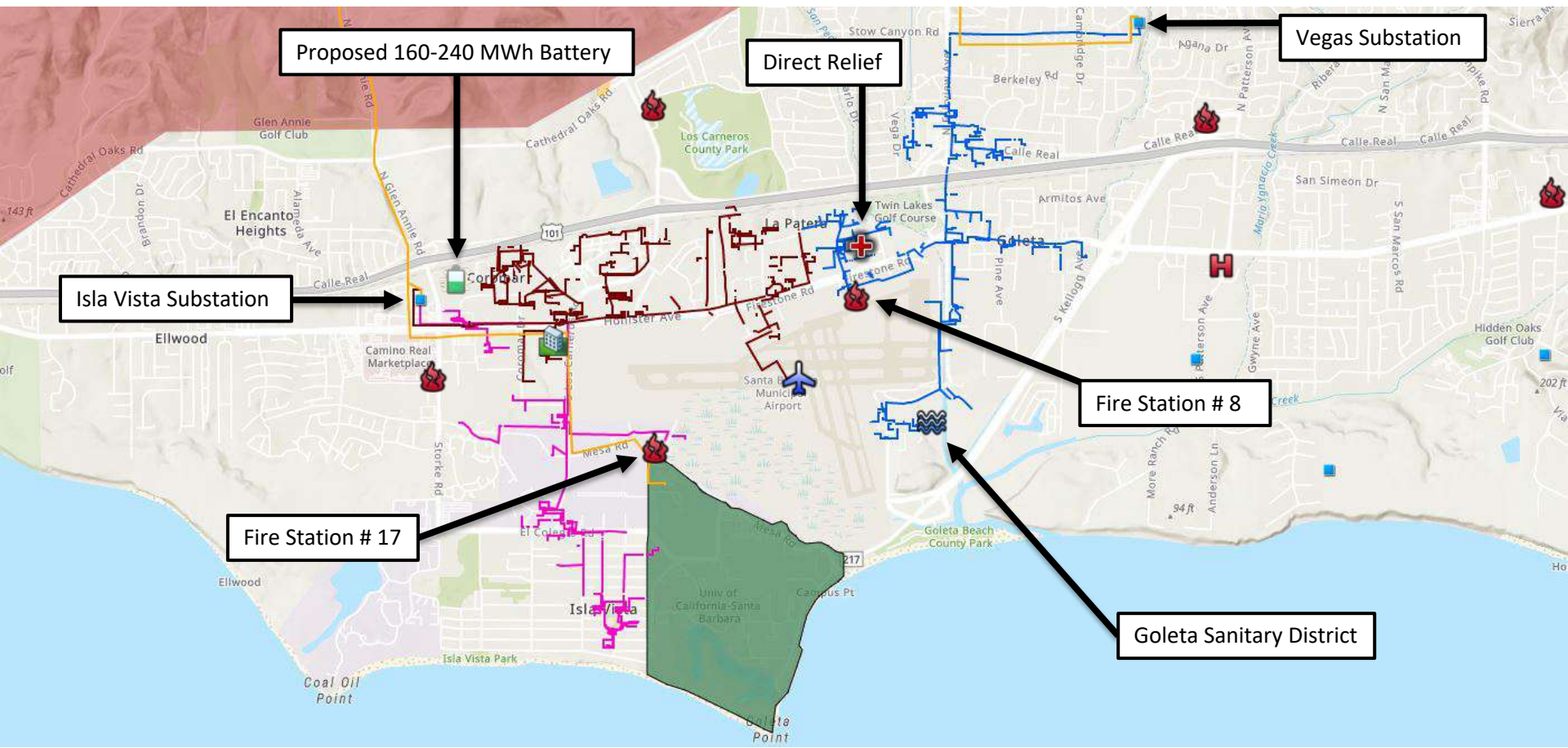
Tier 2 Fire Threat

University of California Santa Barbara (UCSB)

Santa Barbara Airport

Sanitary or Water Districts

Core target 66kV feeder area of the GLP



Legend

220 kV Transmission

66 kV Feeder #4311

Substations

16kV Gladiola Feeder

16kV Gaucho Feeder

16kV Professor Feeder

Santa Barbara Airport

Tier 3 Fire Threat

University of California Santa Barbara

Fire Stations

Sanitary or Water Districts

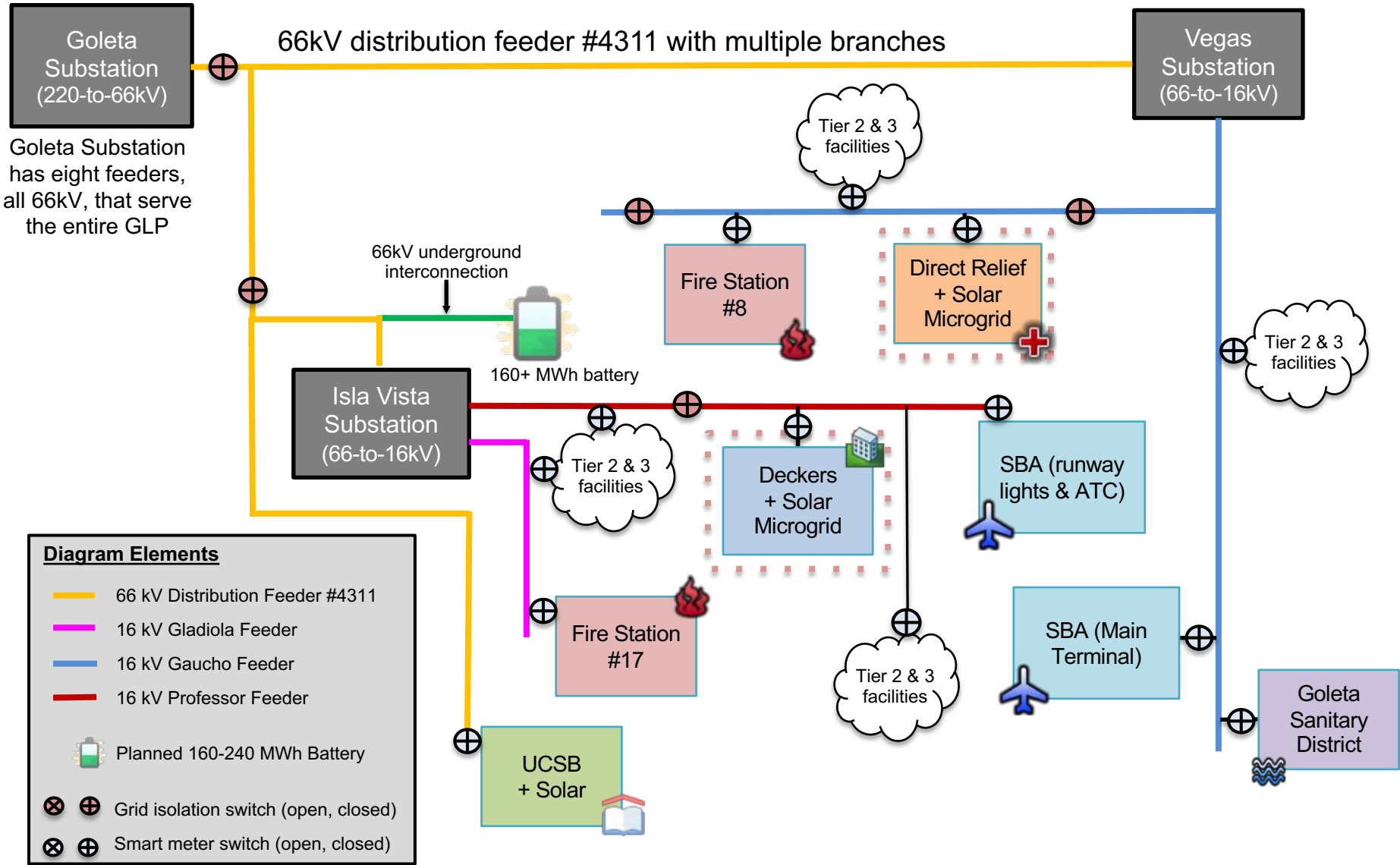
Goleta Valley Cottage Hospital

Direct Relief

Deckers

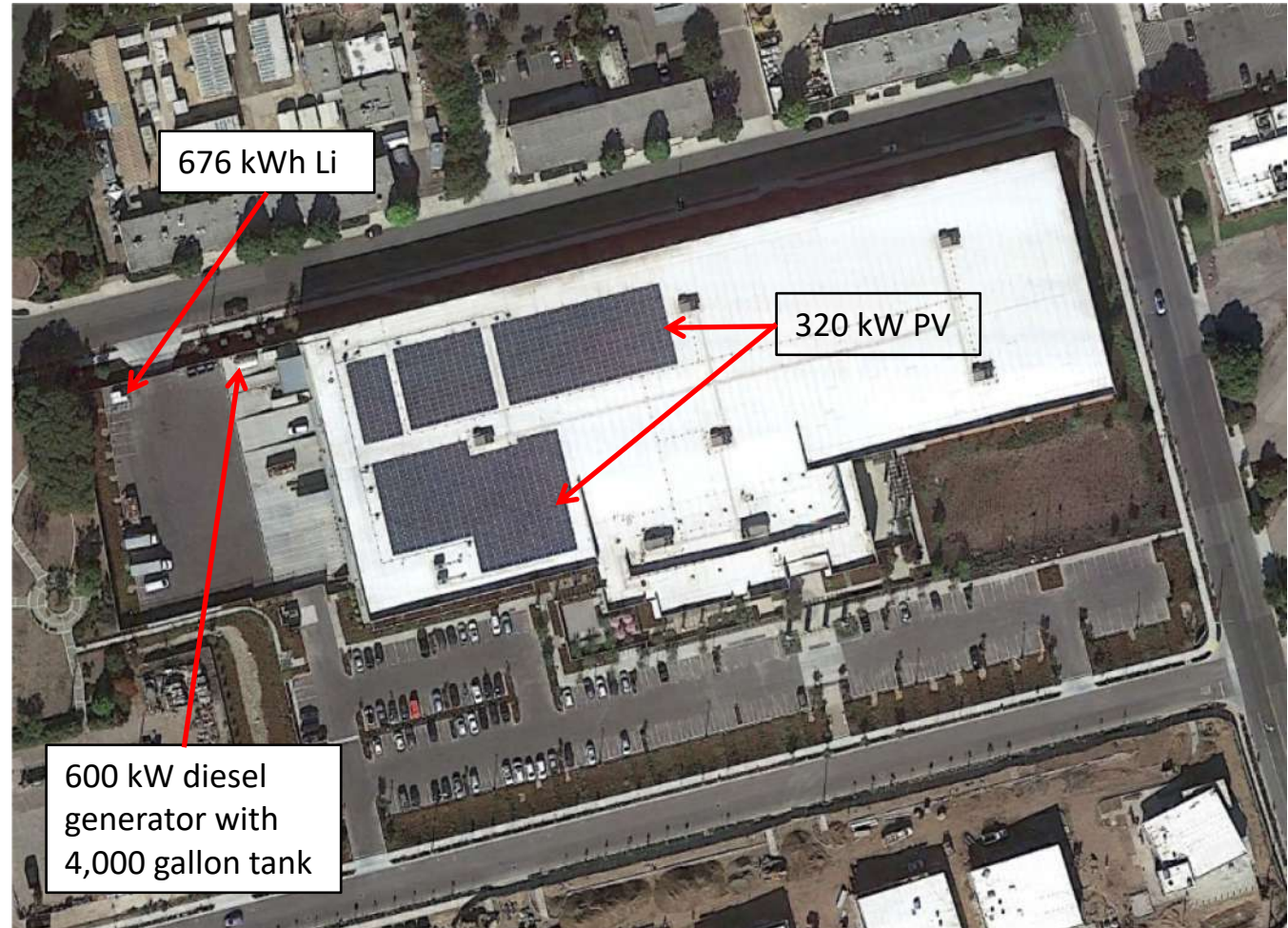
Proposed 160-240 MWh Battery

Target 66kV feeder grid area block diagram



Direct Relief offers a microgrid showcase

- Resilience is #1 concern:
 - **320 kW PV**
 - **676 kWh Storage**
 - 600 kW diesel generator
 - 4000 gallons of diesel fuel
- PV annual generation designed to cover annual consumption.
- Storage designed to time-shift the generation to more valuable times, and provide Resilience.
- Genset provides “back-up to the back-up”.
- Direct Relief Microgrid requirement is that the critical loads are operational indefinitely, even through local disasters that causes long-term interruptions to normal electricity service.



Microgrid only serves Direct Relief needs:

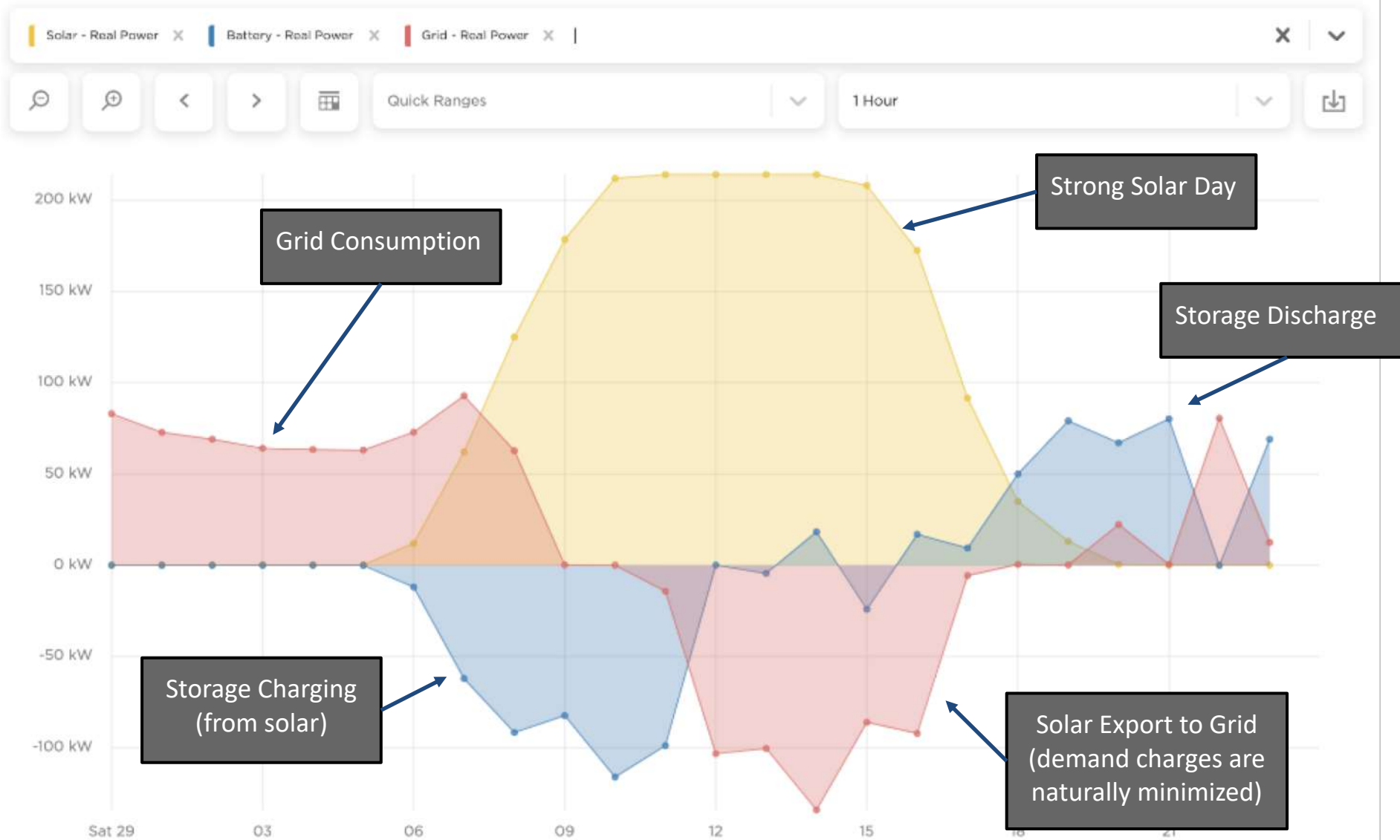
- 70% of roof and 100% of massive parking area solar potential is unused.
- Additional storage not able to be considered due to policy prohibitions around exporting energy from a battery to the grid – even though the energy is 100% stored solar.

Ready to do way more::

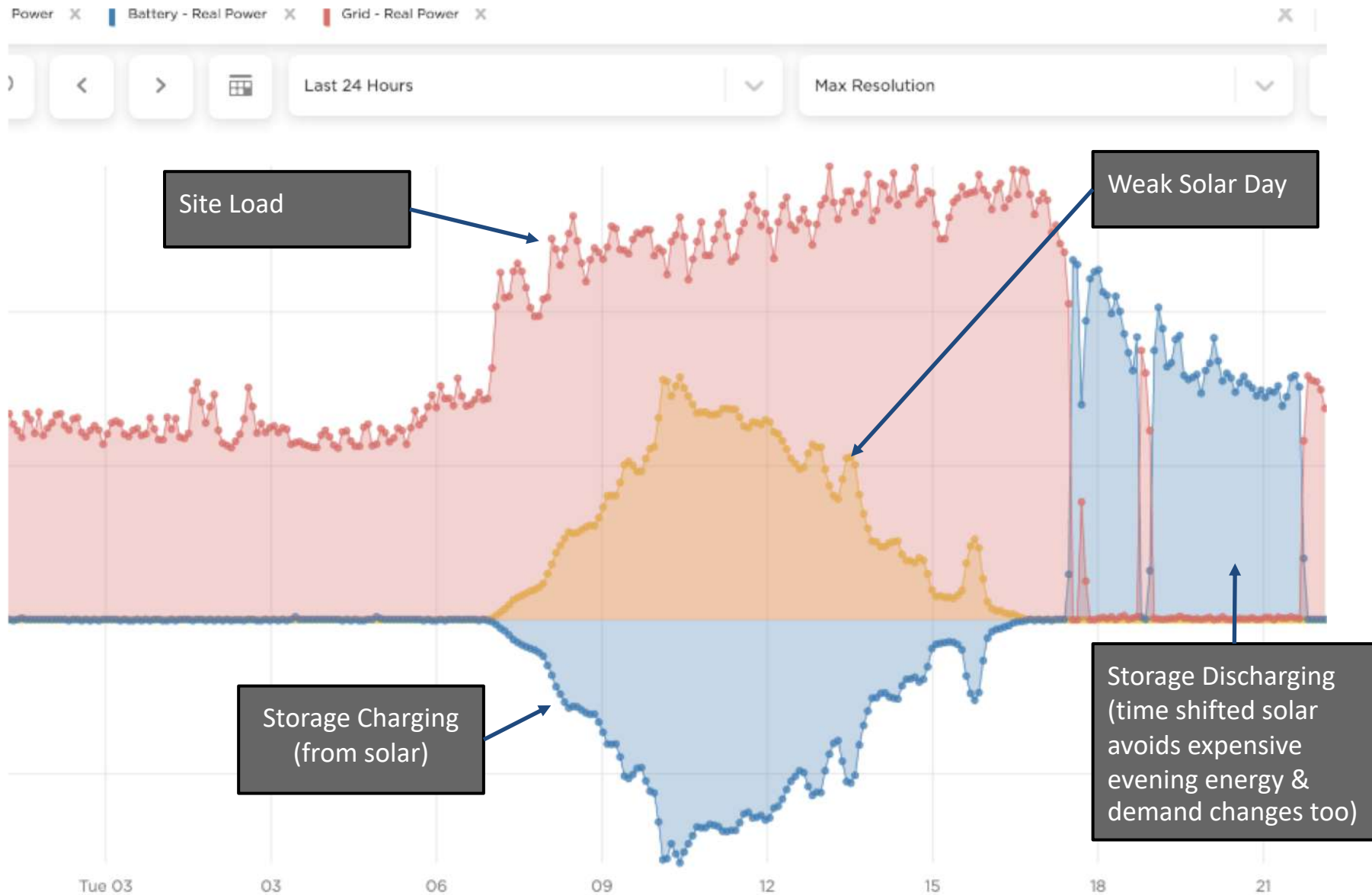
- 1,133 kW in total solar siting potential, 427 kW more rooftop and 386 kW in parking lots.
- Existing switch gear is already sized for the expansion and is just awaiting the policy innovation!



Strong solar day results is net zero energy



Weak solar day results in net imports



Economic Projection with 2x Microgrid (all new)

	Edison kWh	Edison Annual \$	Solar kWh	Microgrid Annual \$	Total Annual \$	Blended Rate/kWh
No Microgrid	889,693	\$132,564	0	0	\$132,564	\$0.149
2x Microgrid (old + new)	-77,307	-\$3,392	967,000	\$149,695	\$146,603	\$0.152
2x Microgrid (all new)	-77,307	-\$3,392	967,000	\$127,690	\$124,298	\$0.129

1. Expanded microgrid costs are estimated at about 30% reductions to the existing solar and storage, which were contracted in 2017. New costs assumed to be \$0.07/kWh for solar (vs \$0.10) and \$2,500/month for the storage capacity currently deployed (vs \$37,500).
2. The Net Energy Metering (NEM) credit scheme is applied to net exports.
3. Anticipated growth in EV charging will significantly increase load.

Microgrid expansion saves \$0.02/kWh vs SCE rates at the start, while saving more as SCE rates rise and providing indefinite solar-driven resilience for free.

Percentage of time online for Tier 1, 2, and 3 loads for net zero solar + 2 hours storage microgrids at UCSB

