Clean Coalition

Solar Microgrids & Community Microgrids

Unparalleled energy resilience

Craig Lewis
Executive Director
Clean Coalition
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.

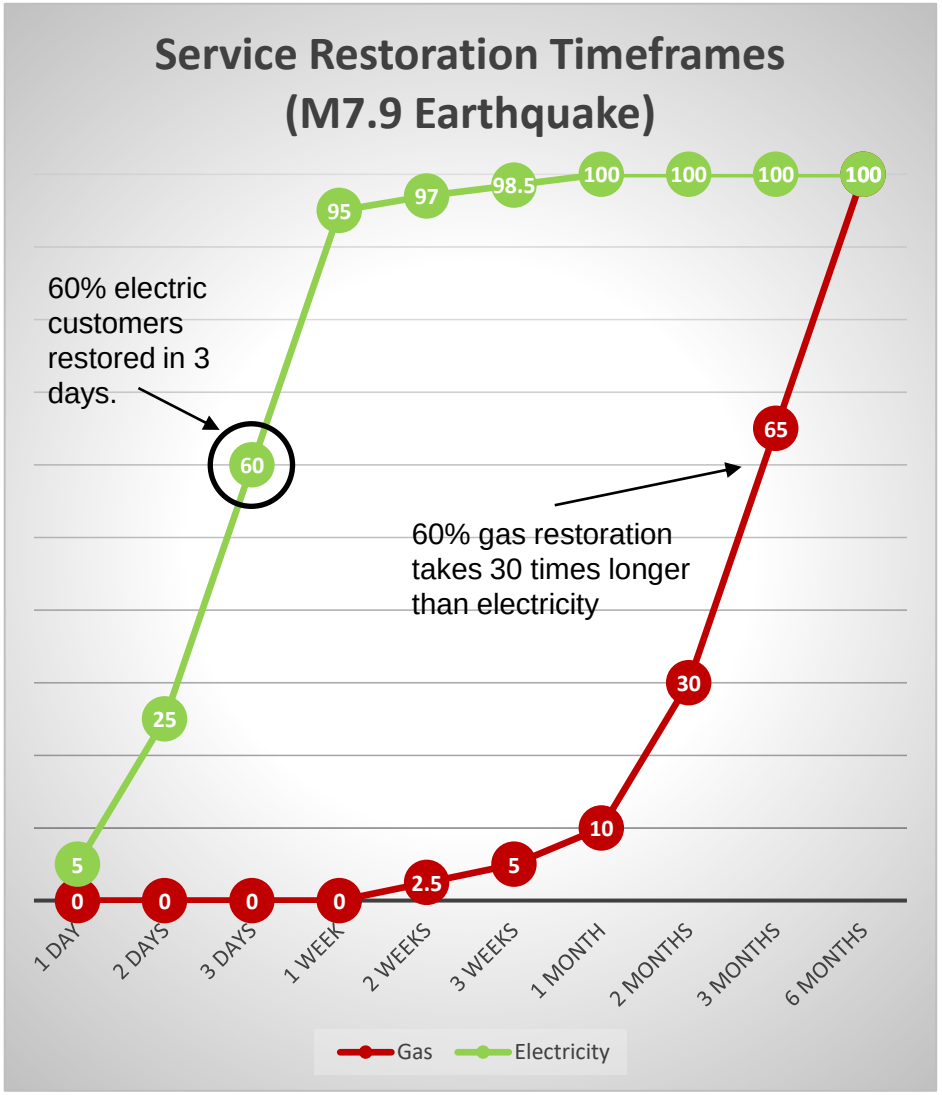
100% renewable energy end-game

- 25% local, interconnected within the distribution grid and facilitating resilience without dependence on the transmission grid.
- 75% remote, dependent on the transmission grid for serving loads.

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 is highly vulnerable to earthquakes, fires, landslides, and terrorism.

2010 San Bruno Pipeline Explosion

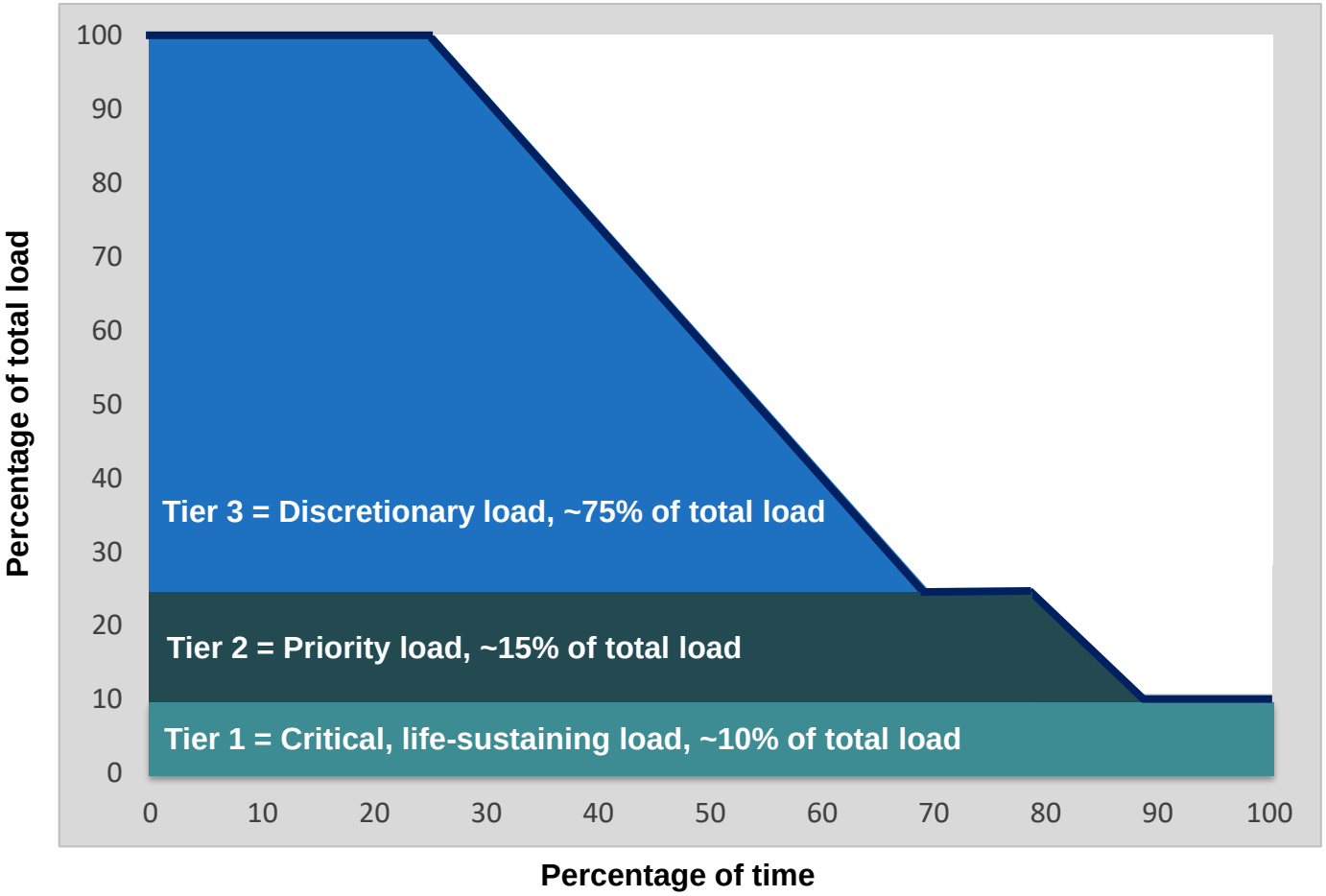


Source: The City and County of San Francisco Lifelines Study

Value-of-resilience (VOR) depends on tier of load

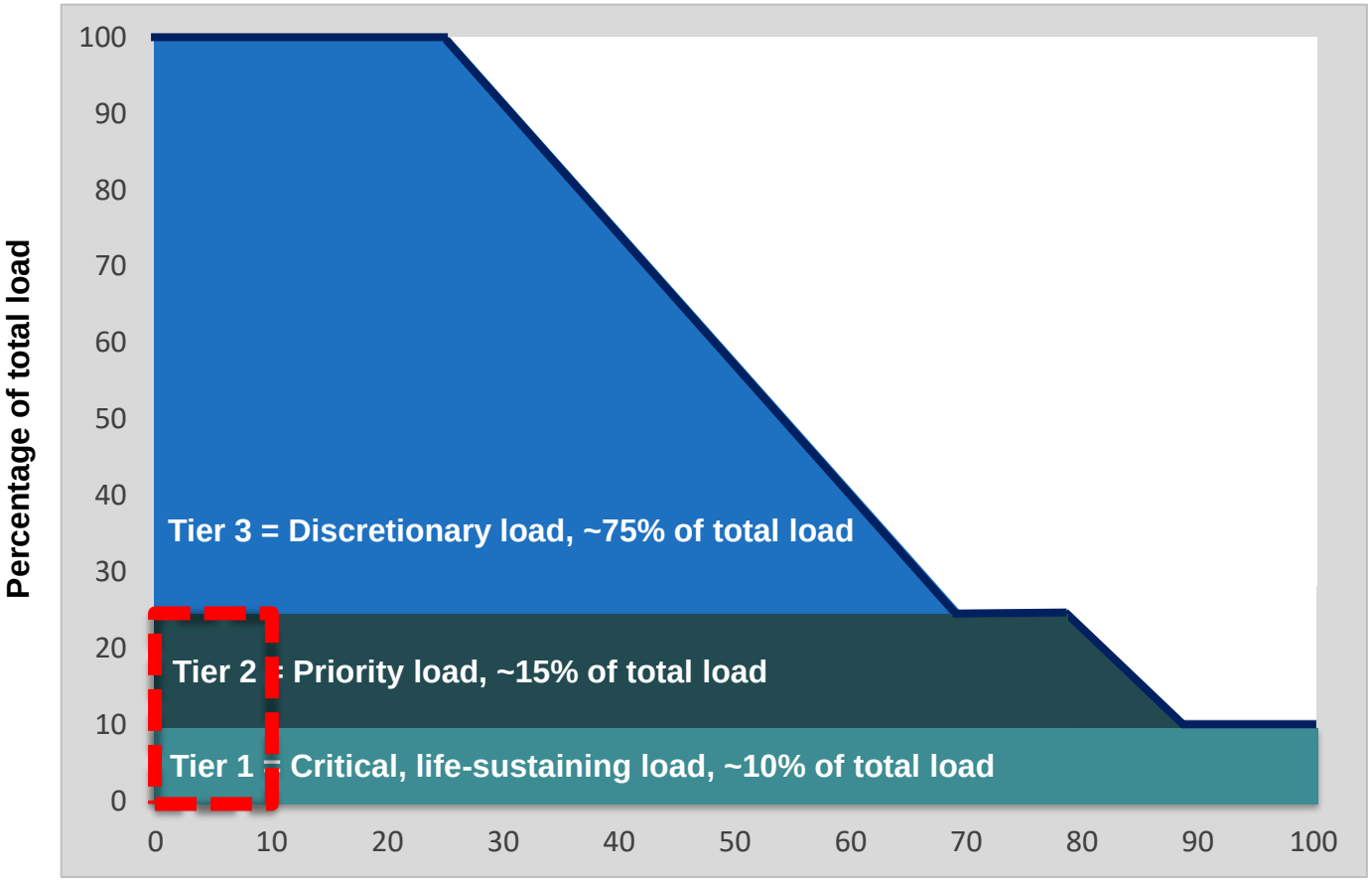
- Everyone understands there is significant value to resilience provided by indefinite renewables-driven backup power, especially for the most critical loads
  - But, nobody has quantified this value of unparalleled resilience.
  - Hence, there is a substantial economic gap for renewables-driven microgrids.
- 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 aims to standardize 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.
  - 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 usually represent about 15% of the total load.
  - Tier 3 are discretionary loads make up the remaining loads, usually about 75% of the total load. Maintained when doing so does not threaten Tier 1 & 2 resilience.

Typical load tier resilience from a Solar Microgrid



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.

Goleta Load Pocket (GLP)

Community Microgrid

case study

Goleta Load Pocket (GLP) and attaining resilience

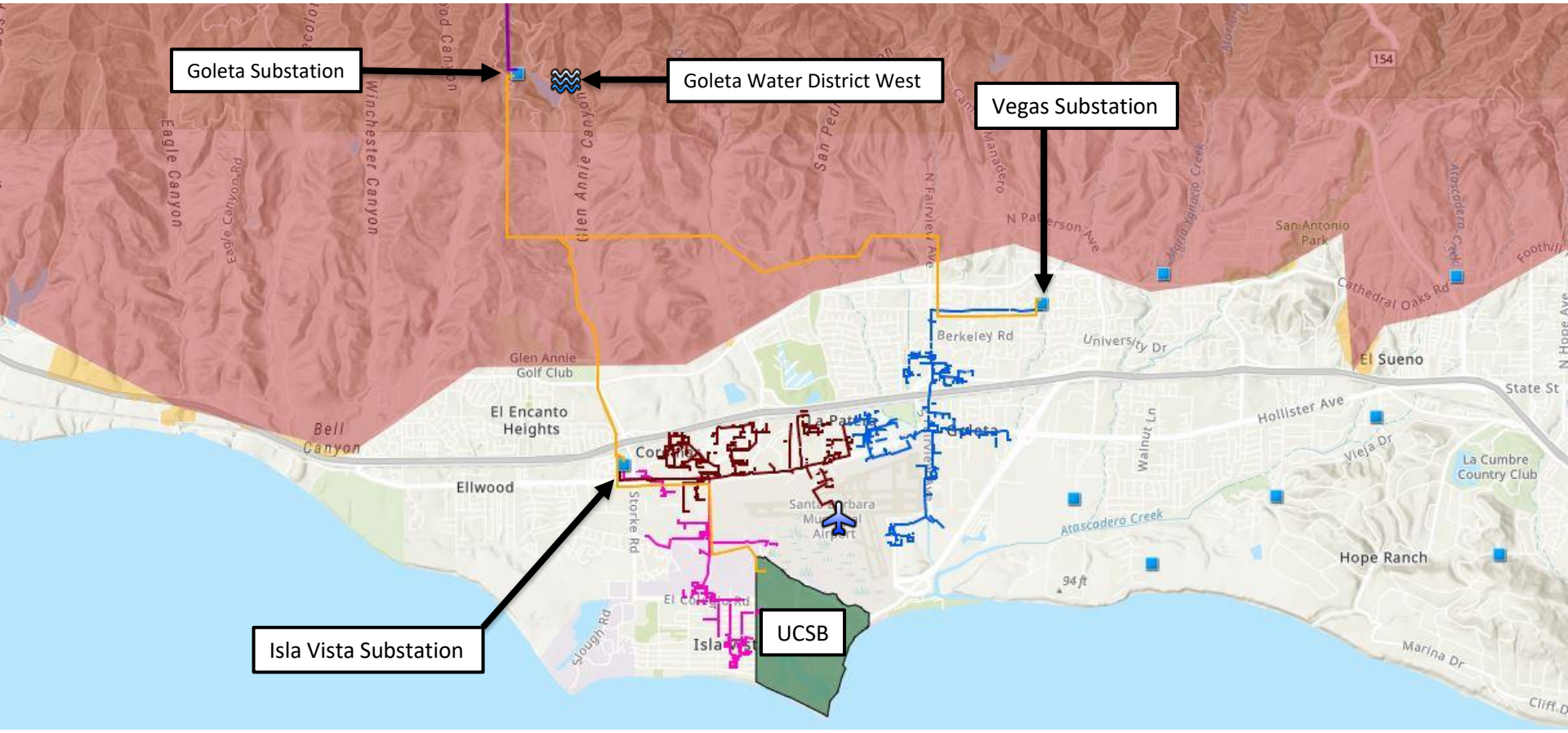
Clean Coalition

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.

Target 66kV feeder at the core of the GLP

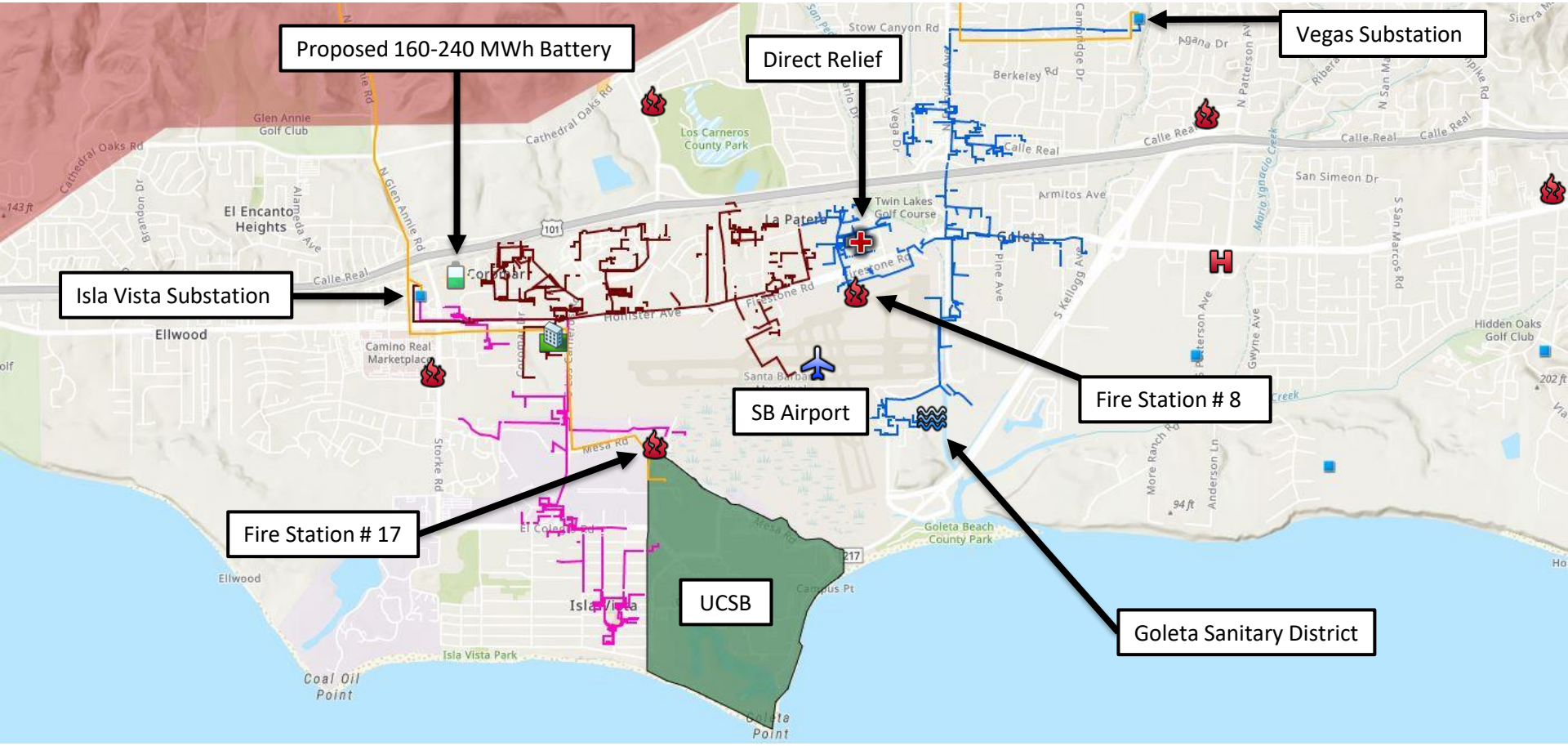
Clean Coalition



Legend

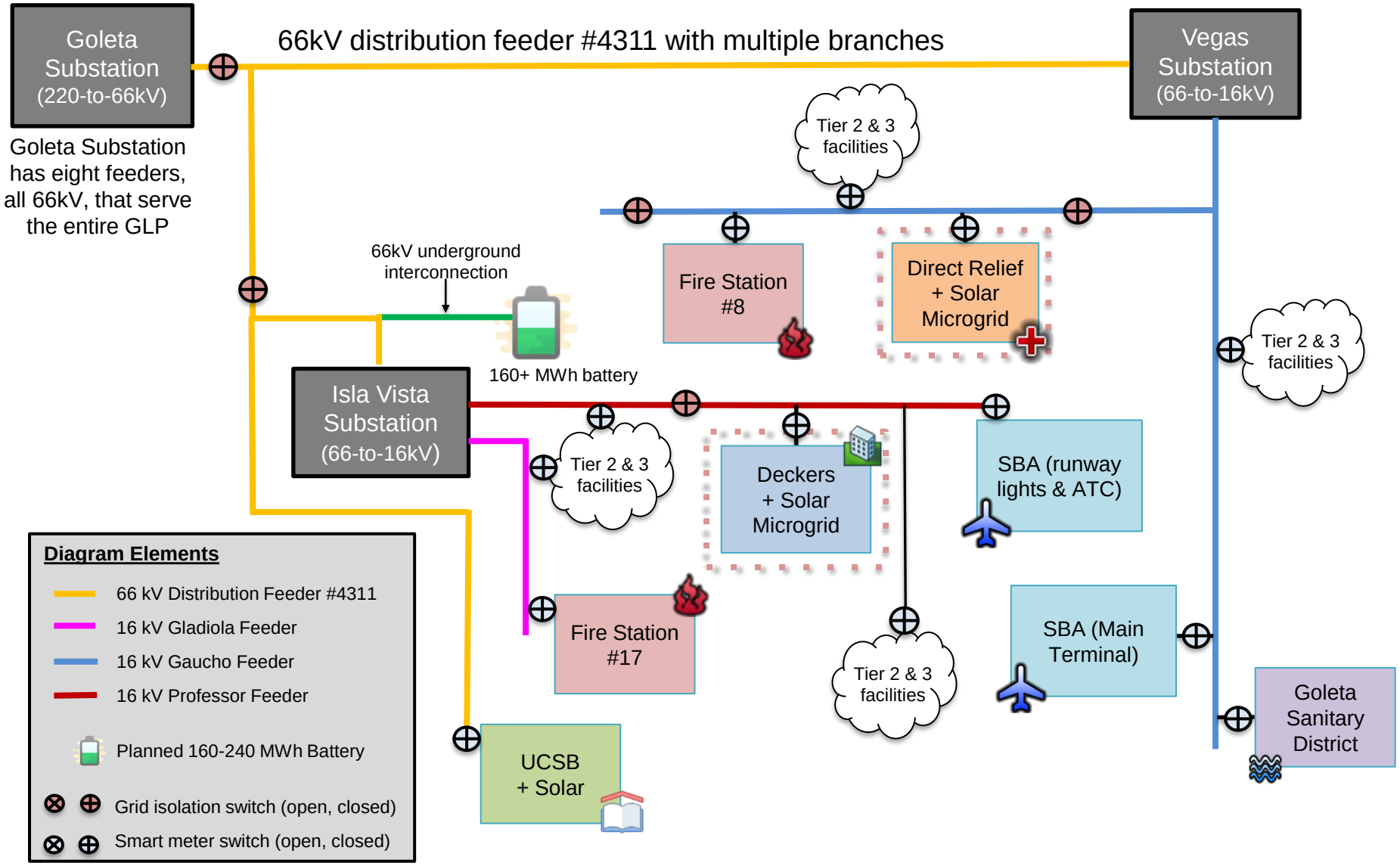
- 220 kV Transmission
- 66 kV Feeder #4311
- Substations
- 16kV Gladiola Feeder
- 16kV Gaucho Feeder
- 16kV Professor Feeder
- Tier 3 Fire Threat
- Tier 2 Fire Threat
- University of California Santa Barbara (UCSB)
- Santa Barbara Airport
- Sanitary or Water Districts

Target 66kV feeder serves critical GLP loads



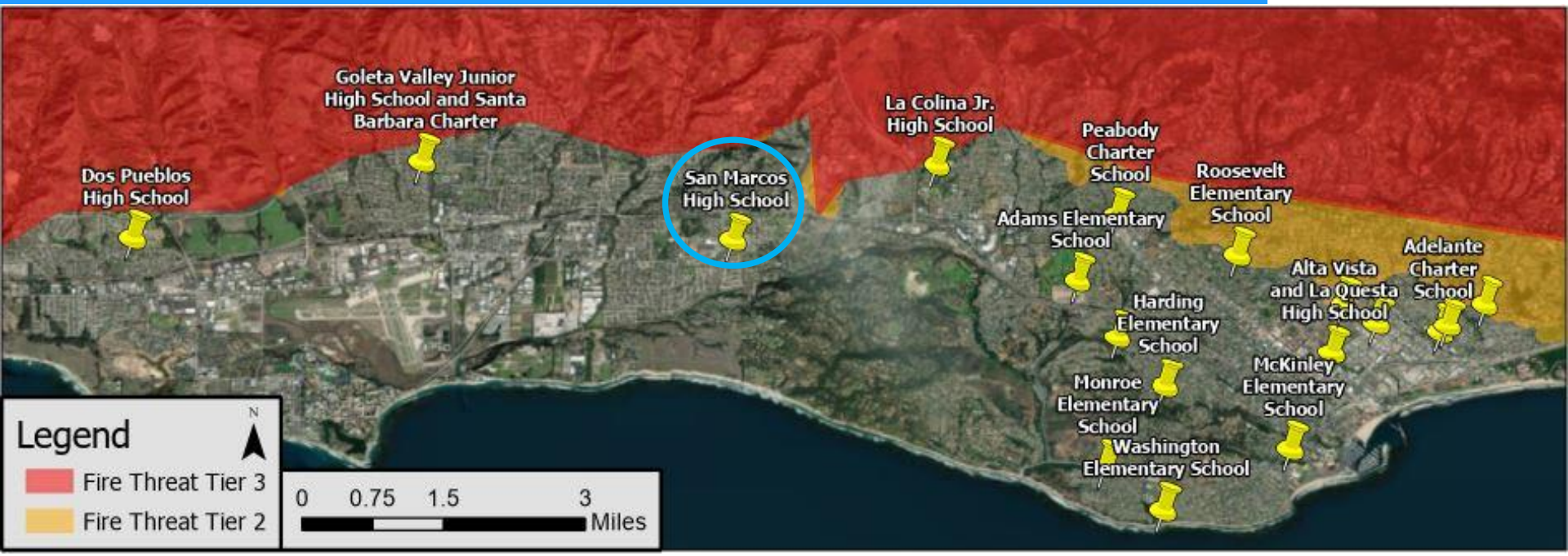
Target 66kV feeder grid area block diagram

Clean Coalition



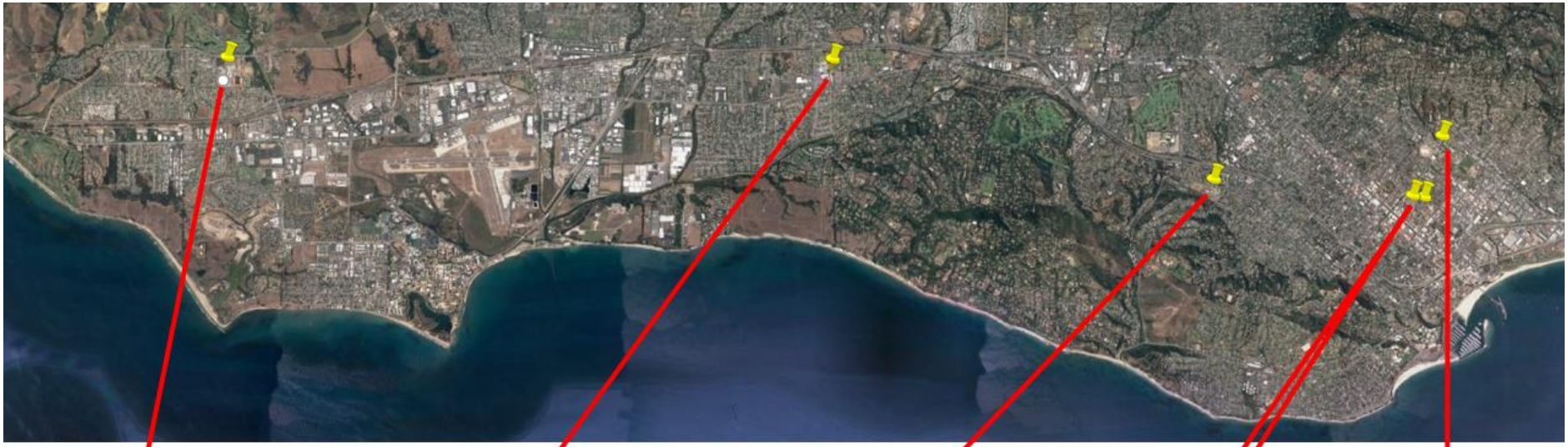
Santa Barbara Unified School District (SBUSD) case study

Santa Barbara Unified School District (SBUSD)



- The entire Santa Barbara region is surrounded by extreme fire risk (earthquake & landslide risk too) and is extremely vulnerable to electricity grid outages.
- The SBUSD is a major school district that increasingly recognizes the value-of-resilience (VOR) and has embraced the Clean Coalition's vision to implement Solar Microgrids at a number of its key schools and other critical facilities.
- SMHS is in the middle of the extensive SBUSD service area.

Six SBUSD Solar Microgrid sites



Dos Pueblos High School

San Marcos High School

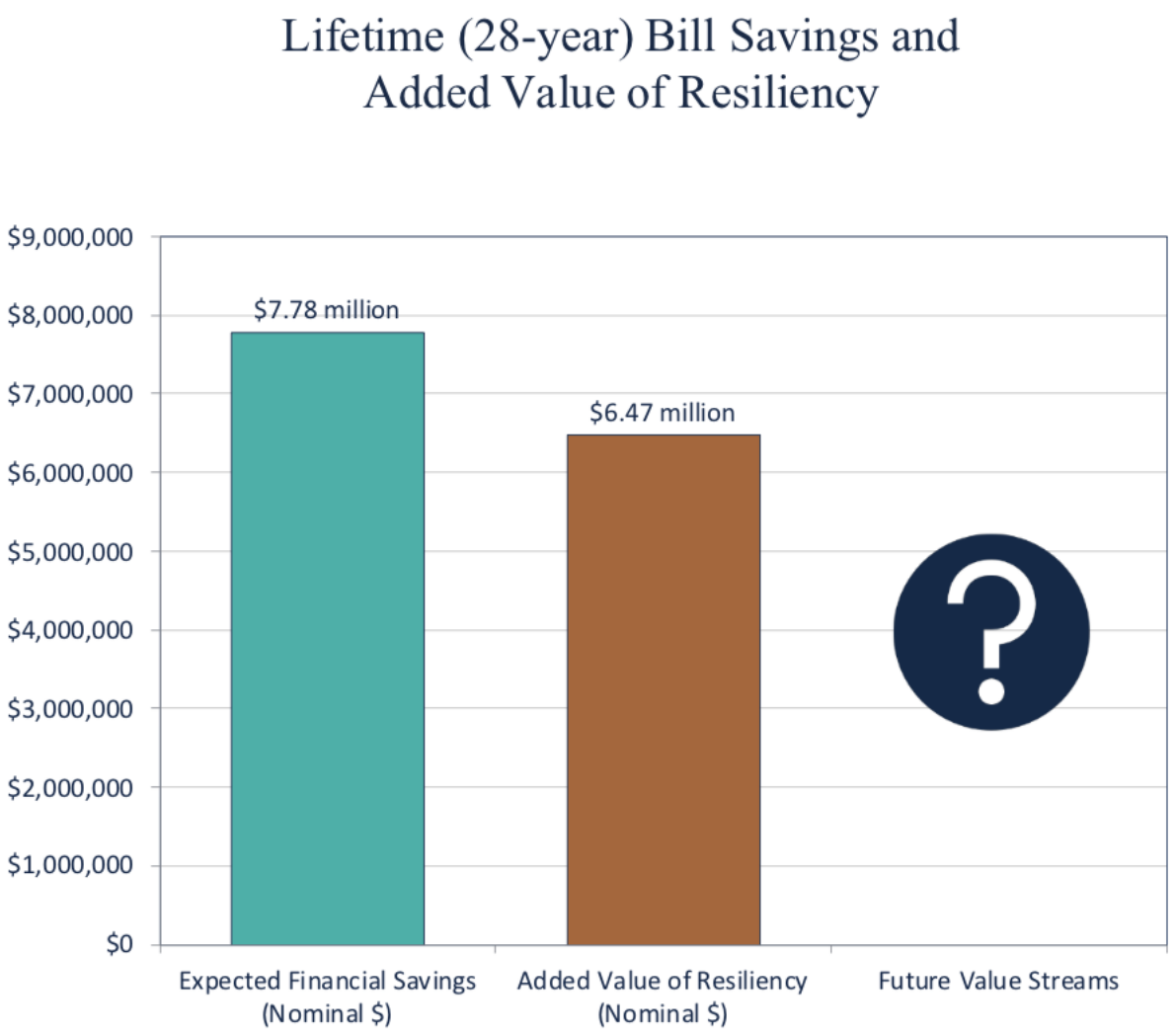
La Cumbre Junior High School

District Food Warehouse
& District Office

Santa Barbara High School

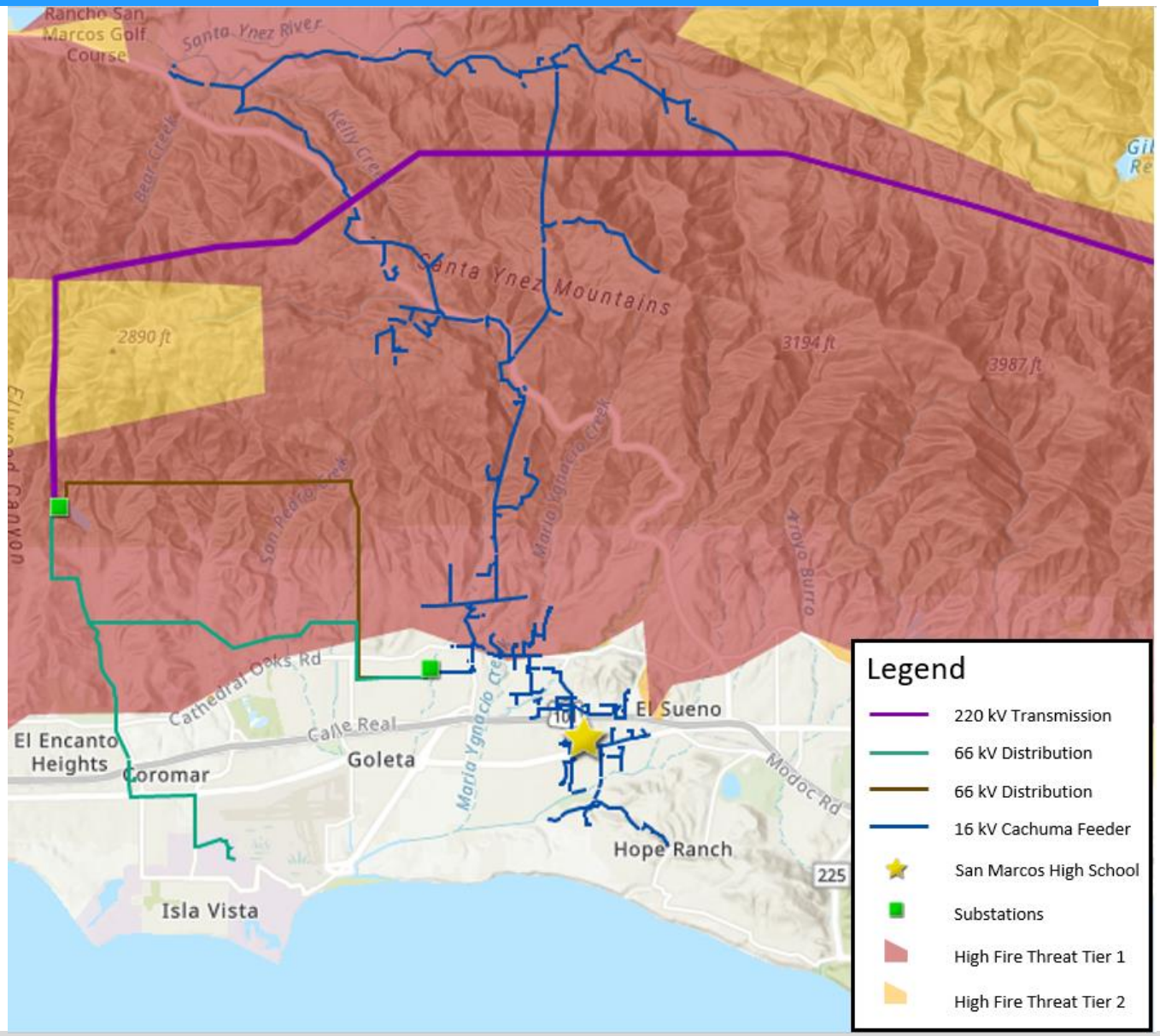
Guaranteed SBUSD bill savings and free VOR

Clean Coalition



San Marcos High School (SMHS) case study

SMHS is vulnerable to distribution outages too



San Marcos High School (SMHS)

- SMHS is a large public high school serving 2,000+ students in grades 9 through 12.
- Red Cross designated facility.
- School features include:
  - Array of classroom buildings
  - Large pool
  - Gymnasium
  - Football stadium
  - Multiple baseball fields
  - Cafeteria
  - Outdoor Greek theater
  - Auditorium
  - Numerous tennis & basketball courts
- Craig Lewis in the Class of 1981.

SMHS Solar Microgrid overview

The SMHS Solar Microgrid is intended to enable the school to operate independently during grid outages of any duration with **indefinite resilience for the most critical loads** and **resilience for all loads for significant percentages of time**.

- **Solar**
  - 725 kWp
  - Solar is entirely in the form of solar parking canopies
  - Net Zero Energy (NZE) is exceeded at 101%
- **Battery Energy Storage System (BESS)**
  - 700 kWh energy capacity
  - 350 kW power capacity
- **Critical (Tier 1) loads**
  - Food service refrigerators & freezers, maintained indefinitely
  - 4.36 kW of average load
  - 3.44% of total average load
- **Priority (Tier 2) loads**
  - Gym lights and Main Distribution Frame, maintained at least 80% of the time
  - 4.32 kW of average load
  - 3.41% of total average load

San Marcos High School – site layout

Clean Coalition

San Marcos HS

4750 Hollister Ave, Santa Barbara CA 93110

Solar PV

Annual PV Production Target: 1,164,000 kWh

Battery Energy Storage Resiliency

Average State of Charge Reserve (SOCr): 28.50 kWh
Tier 1 Average Load: 4.36 kW
Tier 2 Average Load: 4.32 kW

EV Charging Infrastructure

Stalls	ADA Stalls	Non-ADA Stalls	Existing EVSEs	5-Year Install
514	22	492	0	37

Notes

1. This site is a designated community resilience center and Red Cross emergency shelter.
2. No lighting in main lot (some perimeter).
3. Main parking lot to be redesigned and existing portables relocated prior to solar construction. Will need to add ADA stalls under solar canopy and POT as part of main parking lot reconfiguration.
4. Will need to cover existing ADA stalls in NW Lot with the south ends of canopies C-5 and C-6 and two existing light poles will need to be removed.
5. Long homerun through campus from canopies C-5 and C-6, approximately 1,450'. Short homerun of approximately 150' crossing drainage swale from main parking lot to POI.
6. Small parking area under C-4 may be challenging to cover/upgrade ADA compliance.
7. Good BESS location adjacent to main service enclosure.
8. Suggest participation in future SCE EV Charge program. Due to location of EV charging areas, SCE likely to drop a new dedicated service feed.

Santa Barbara Unified School District
District-Wide Solar PV Energy and Resiliency RFP
PV, BESS, and EV Charge Site Plan

5/18/2020

Solar Microgrids coming to Camarillo Critical Community Facilities (CCFs)

Solar Microgrids targeted for 5 Camarillo CCFs