



Value-of-resilience from Solar Microgrids

VOR123 Methodology

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Mission

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

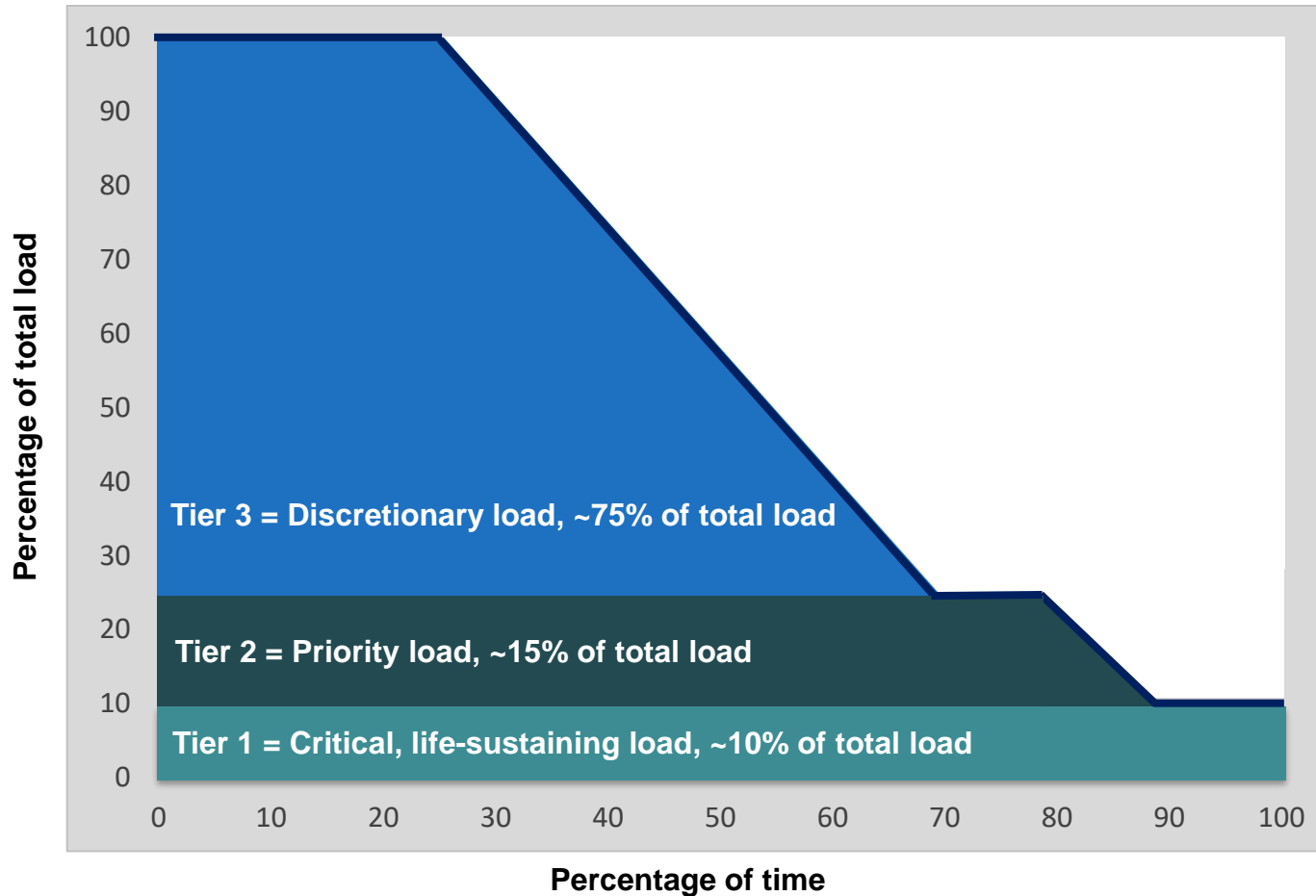
100% renewable energy end-game

- 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.

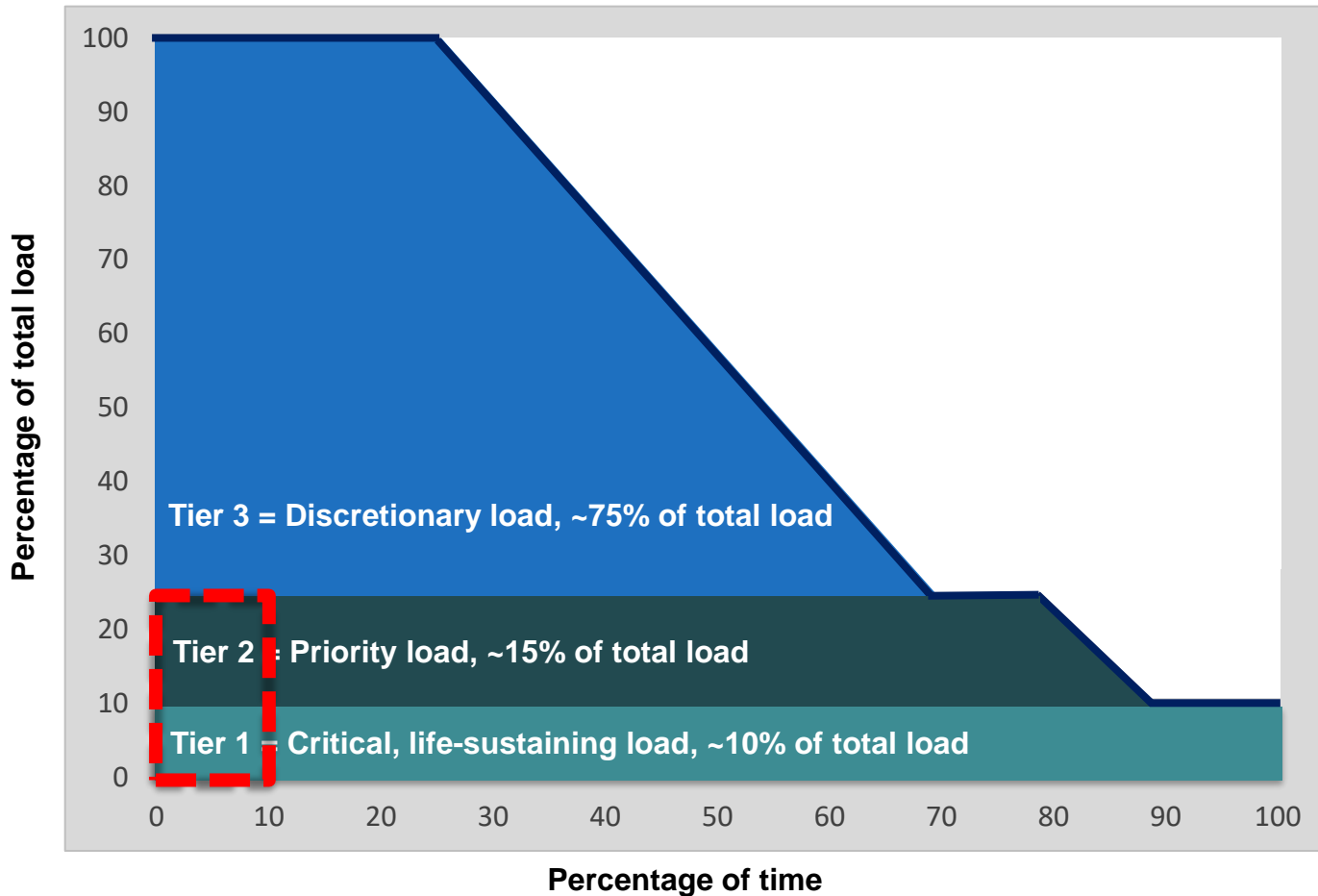
There are different VOR multipliers for each of the three load tiers. The following valuation ranges are typical for most sites:

- **Tier 1:** 100% resilience is worth 3 times the average price paid for electricity. In other words, indefinite energy resilience for critical loads is worth 3 times the average price paid for electricity. Given that the typical facility has a Tier 1 load that is about 10% of the total load, applying the 3x VOR Tier 1 multiplier warrants a 20% adder to the electricity bill.
- **Tier 2:** 80% resilience is worth 1.5 times the normal price paid for electricity. In other words, energy resilience that is provisioned at least 80% of the time for priority loads is worth 1.5 times the average price paid for electricity. Given that the typical facility has a Tier 2 load that is about 15% of the total load, applying the 1.5x VOR Tier 2 multiplier warrants a 7.5% adder to the electricity bill.
- **Tier 3:** Although a standard-size Solar Microgrid can provide backup power to Tier 3 loads a substantial percentage of the time, Tier 3 loads are by definition discretionary, and therefore, a Tier 3 VOR multiplier is negligible and assumed to be zero.

Taken together, the Tier 1 and Tier 2 premiums for a standard load tiering situation yields an effective VOR of between 25% and 30%. Hence, the **Clean Coalition uses 25% as the typical VOR123 adder that a site should be willing to pay**, including for indefinite renewables-driven backup power to critical loads — along with renewables-driven backup for the rest of the loads for significant percentages of time.



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.



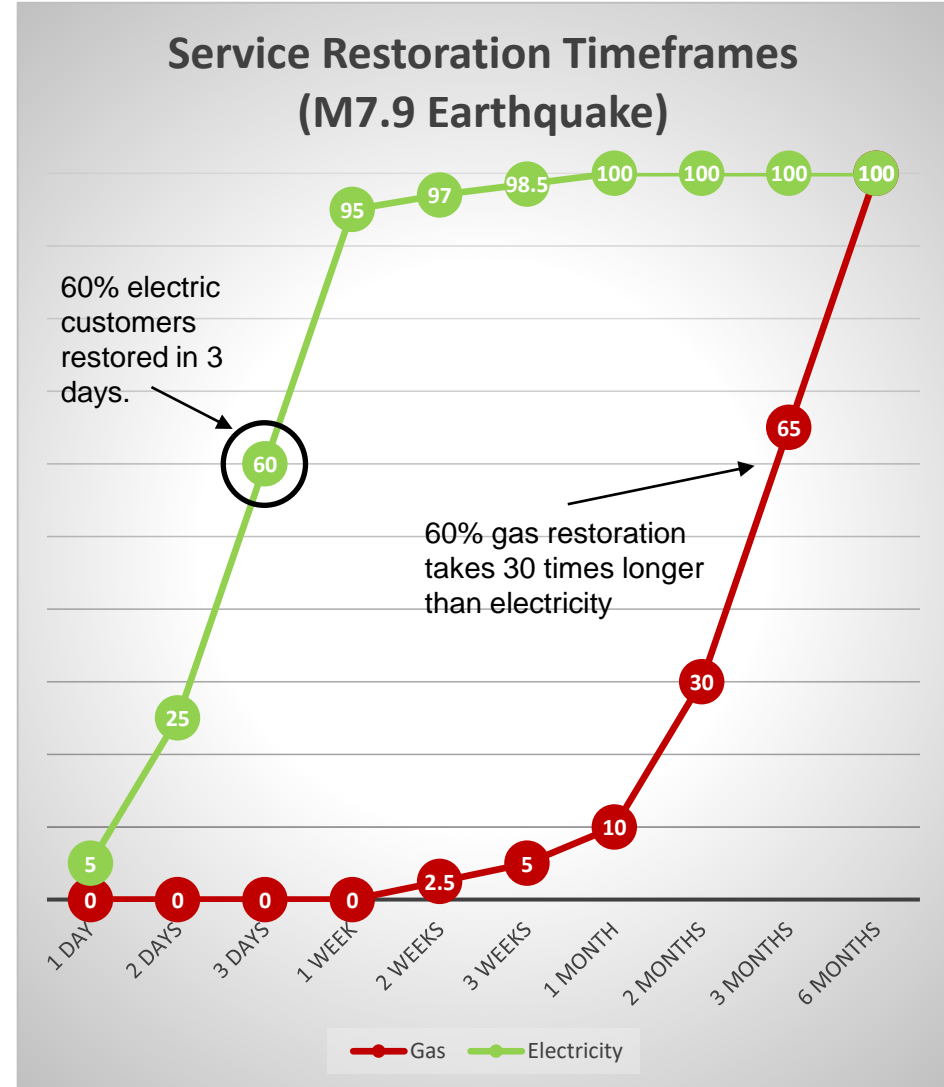
A typical diesel generator is configured to maintain 25% of the normal load for two days. If diesel fuel cannot be resupplied within two days, goodbye. This is hardly a solution for increasingly necessary long-term resilience. In California, Solar Microgrids provide a vastly superior trifecta of economic,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

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

Goleta Load Pocket (GLP)
Community Microgrid
case study

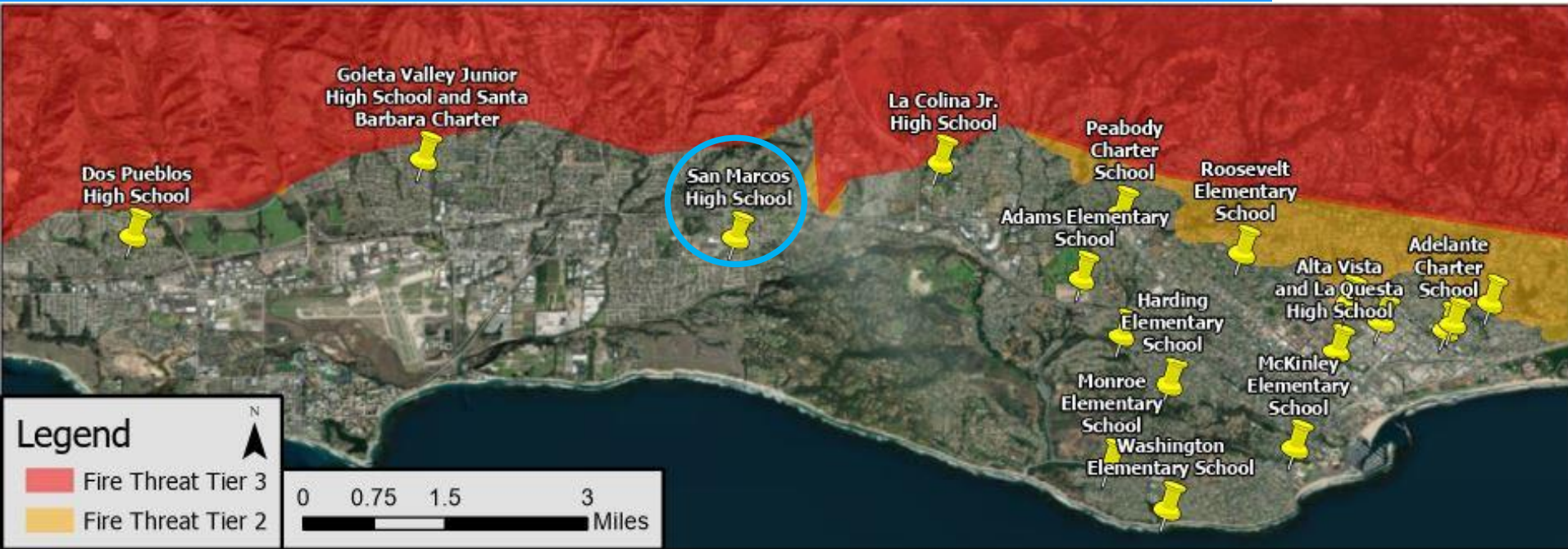
Goleta Load Pocket (GLP) and attaining resilience

The GLP is the perfect opportunity for a comprehensive Community Microgrid



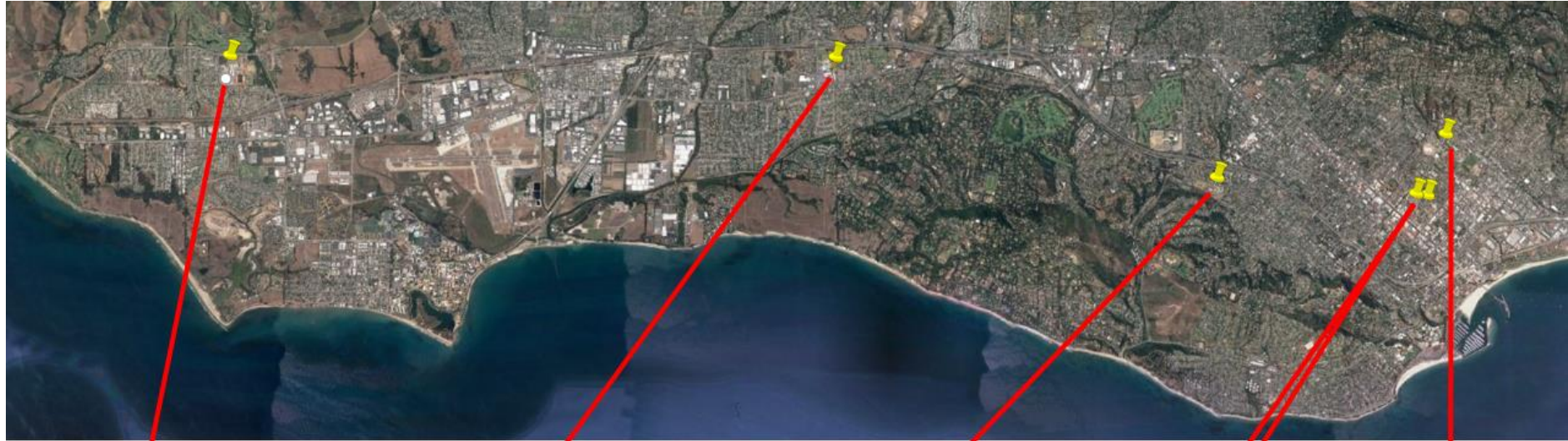
- GLP spans 70 miles of California coastline, from Point Conception to Lake Casitas, encompassing the cities of Goleta, Santa Barbara (including Montecito), and Carpinteria.
- GLP is highly transmission-vulnerable and disaster-prone (fire, landslide, earthquake).
- **200 megawatts (MW) of solar and 400 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.

Santa Barbara Unified School District (SBUSD) case study



- 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



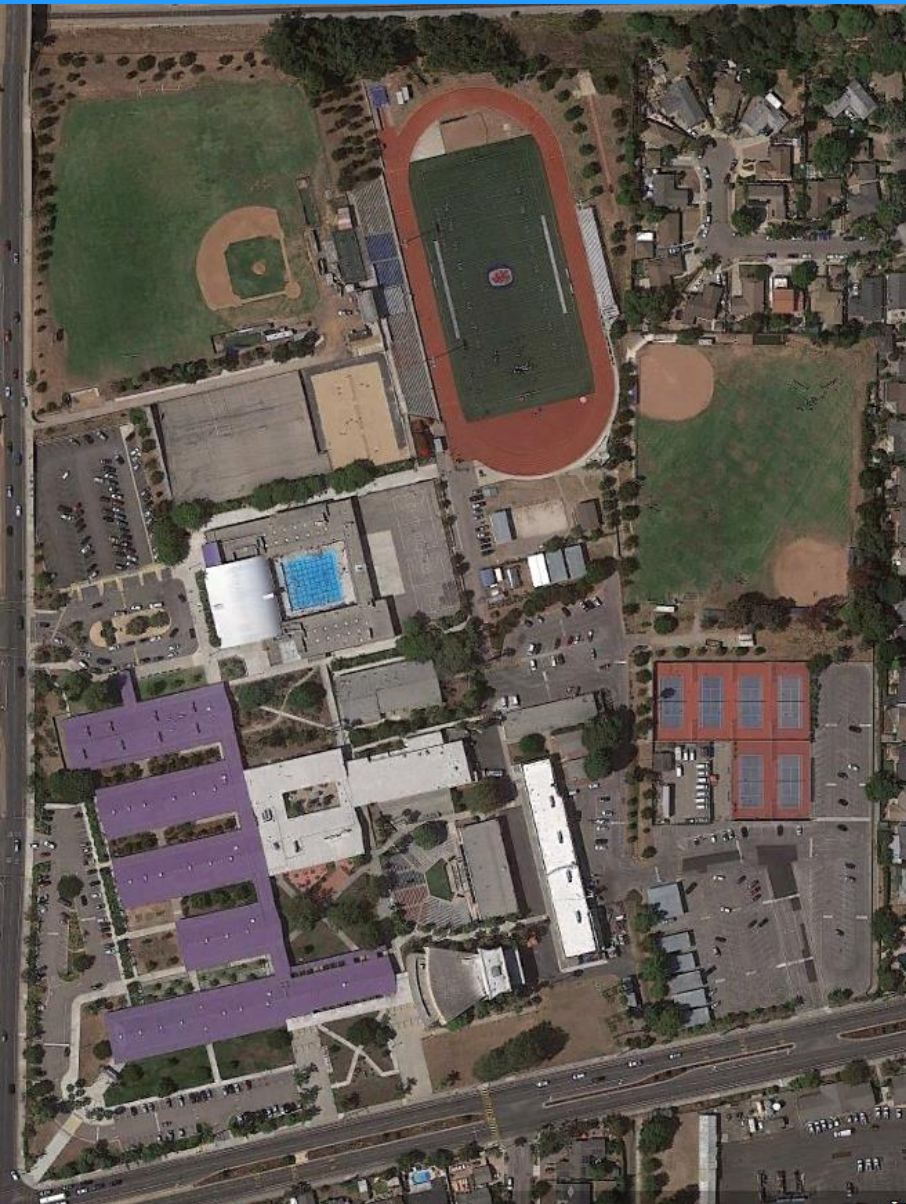
La Cumbre Junior High School



District Food Warehouse
& District Office



Santa Barbara High School



- 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.

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

Lifetime (28-year) Bill Savings and Added Value of Resiliency

