# Clean Coalition

## Local large-scale Battery Energy Storage Systems (BESS)



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## Mission

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

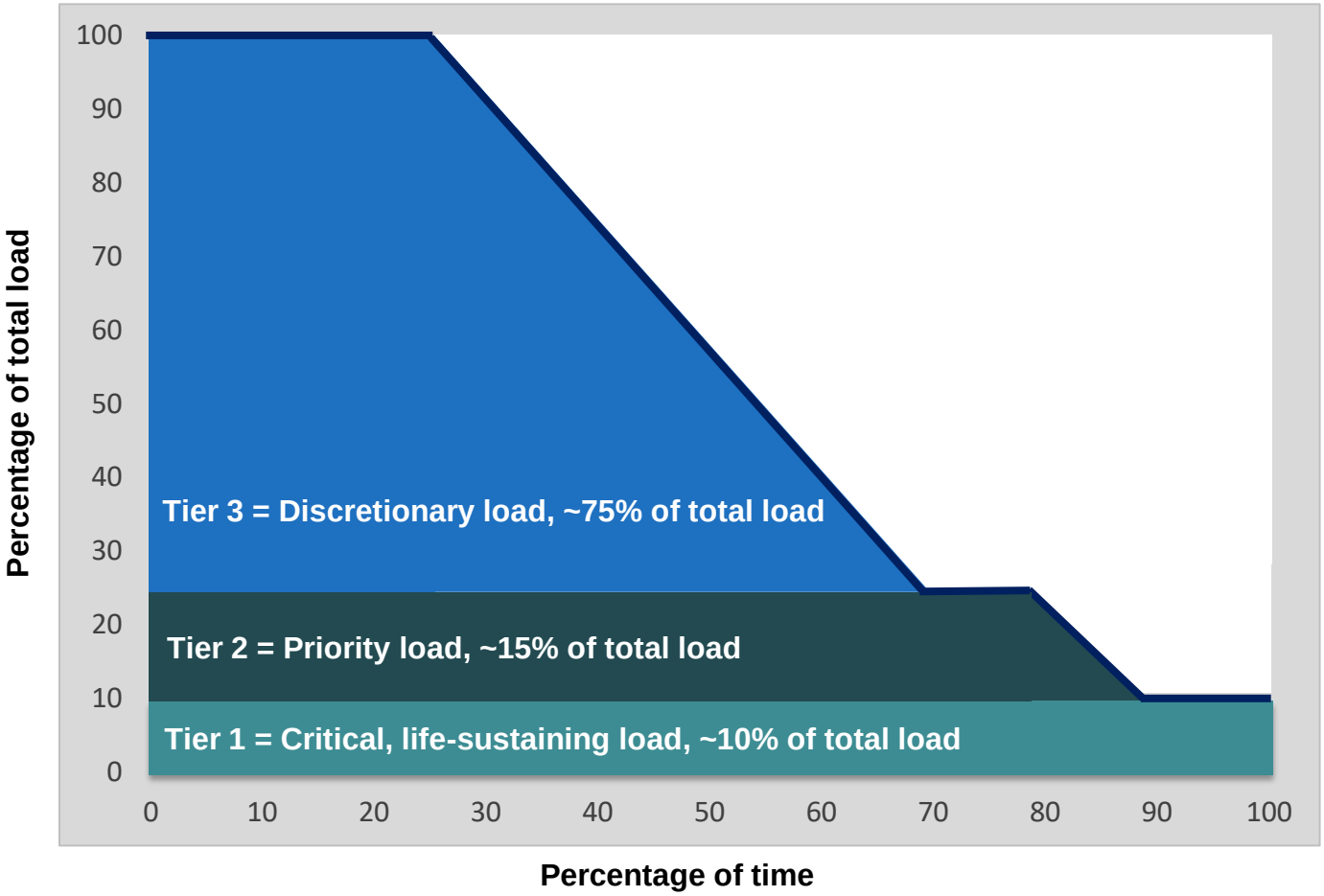
## Renewable Energy End-Game

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.

# Microgrids in the Clean Coalition's world

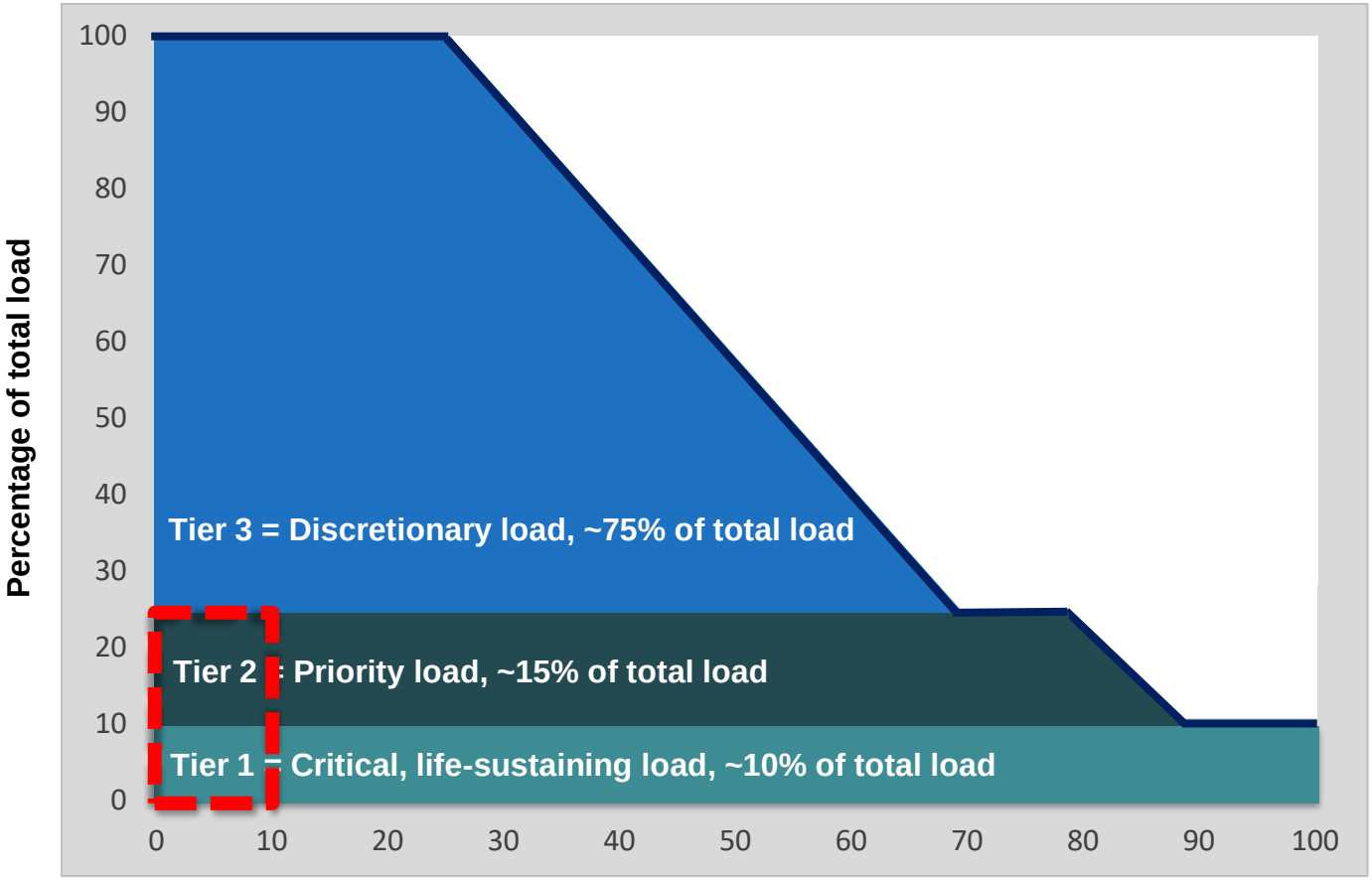
- A microgrid is a combination of energy resources, definitely including generation, that are coordinated to serve specified loads, including in an islanded fashion.
- A Solar Microgrid is a behind-the-meter (BTM) microgrid that solely relies on solar for energy generation when islanded.
- A Hybrid Solar 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.

# 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.

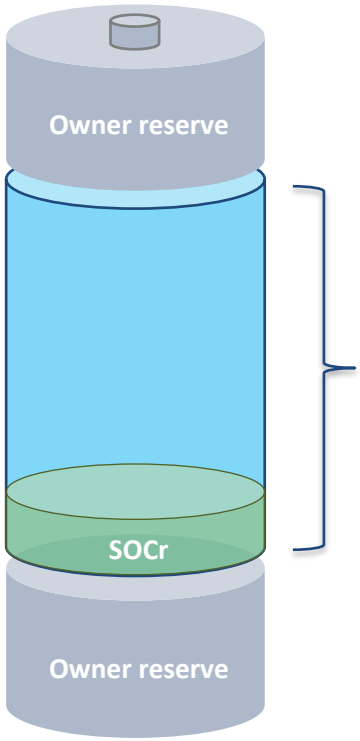
# Diesel generators are designed for limited resilience




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.

# Batteries 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.

# Community Microgrids are the grid of the future

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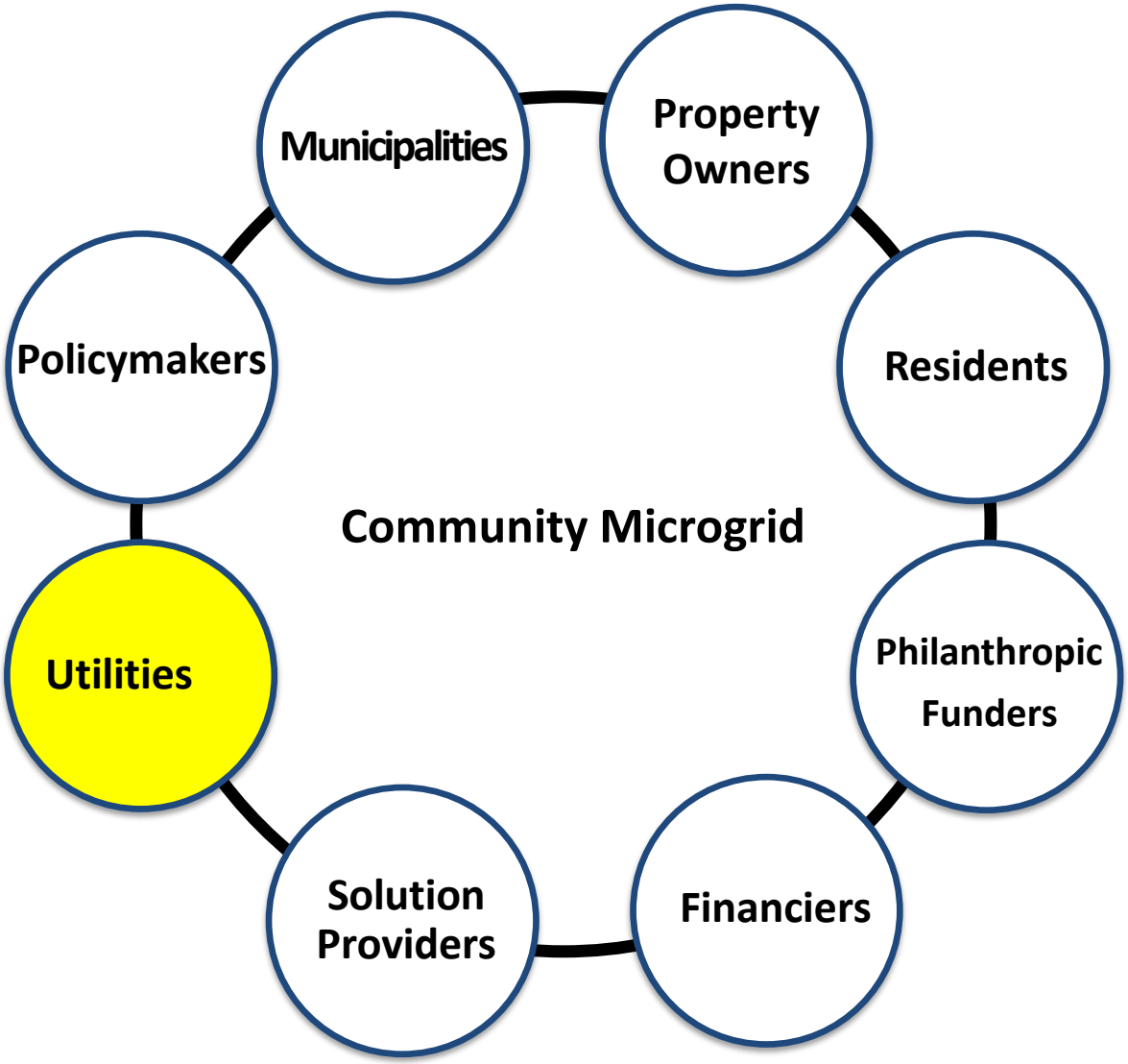
**A Community Microgrid is a new approach for designing and operating the electric grid, stacked with local renewables and staged for resilience.**

**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.

# Community Microgrid key stakeholders

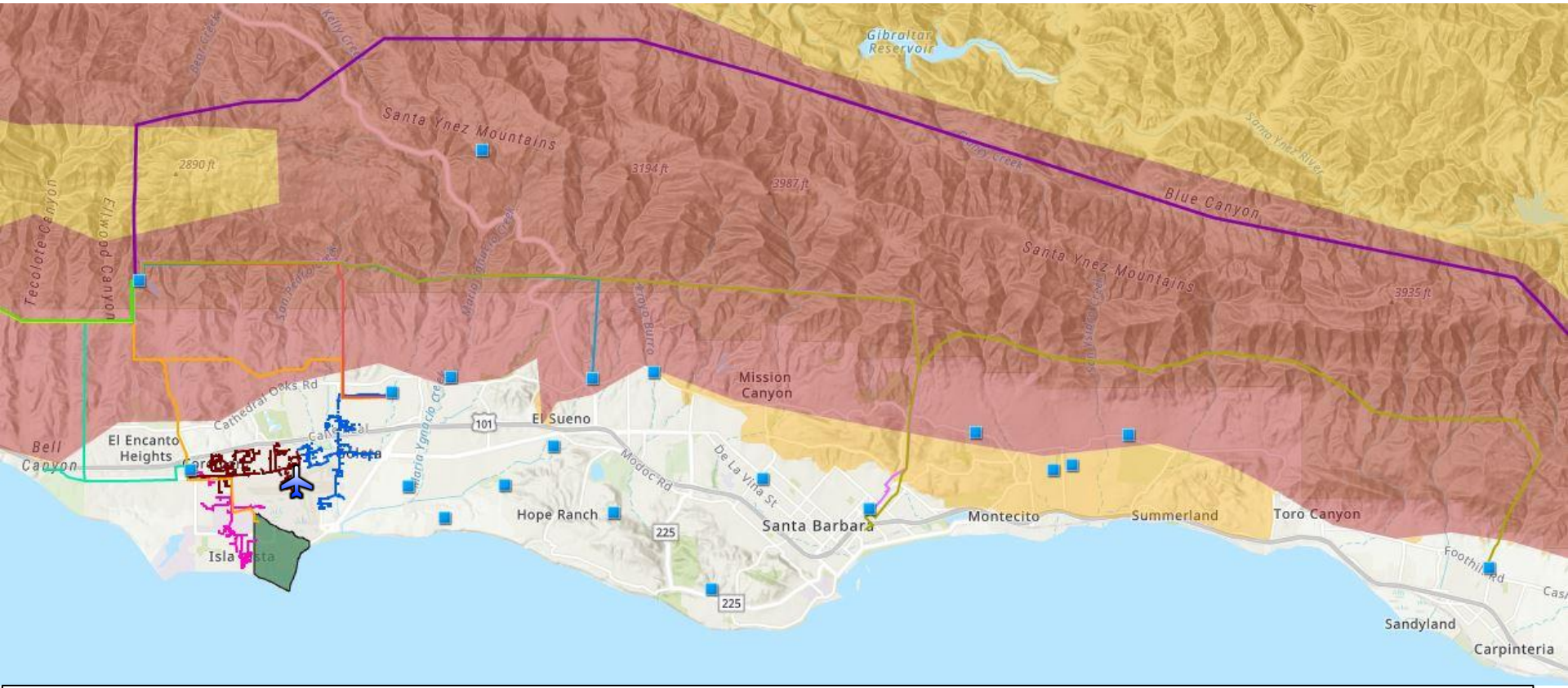


# Goleta Load Pocket (GLP)

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.

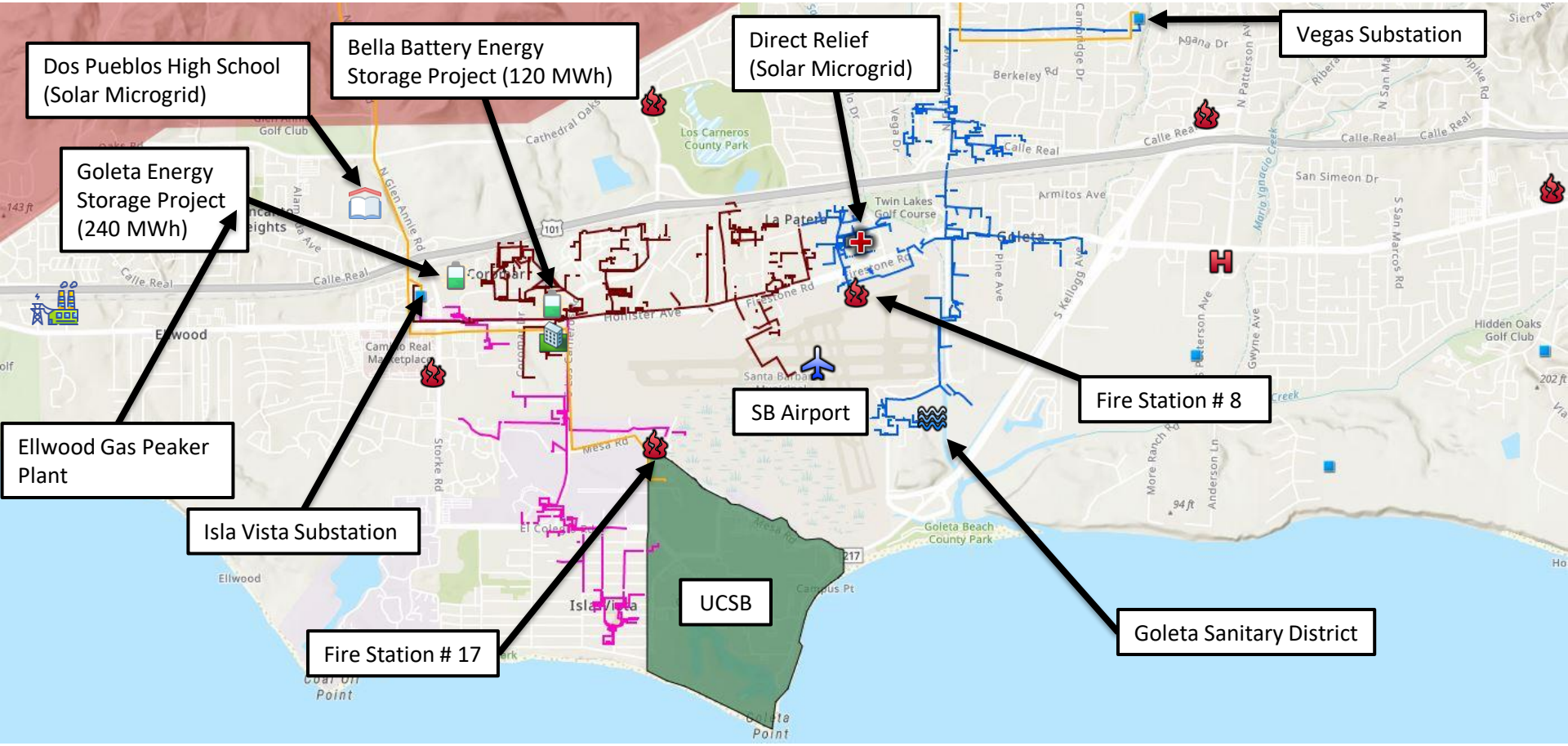
# Core load area of the GLP




**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



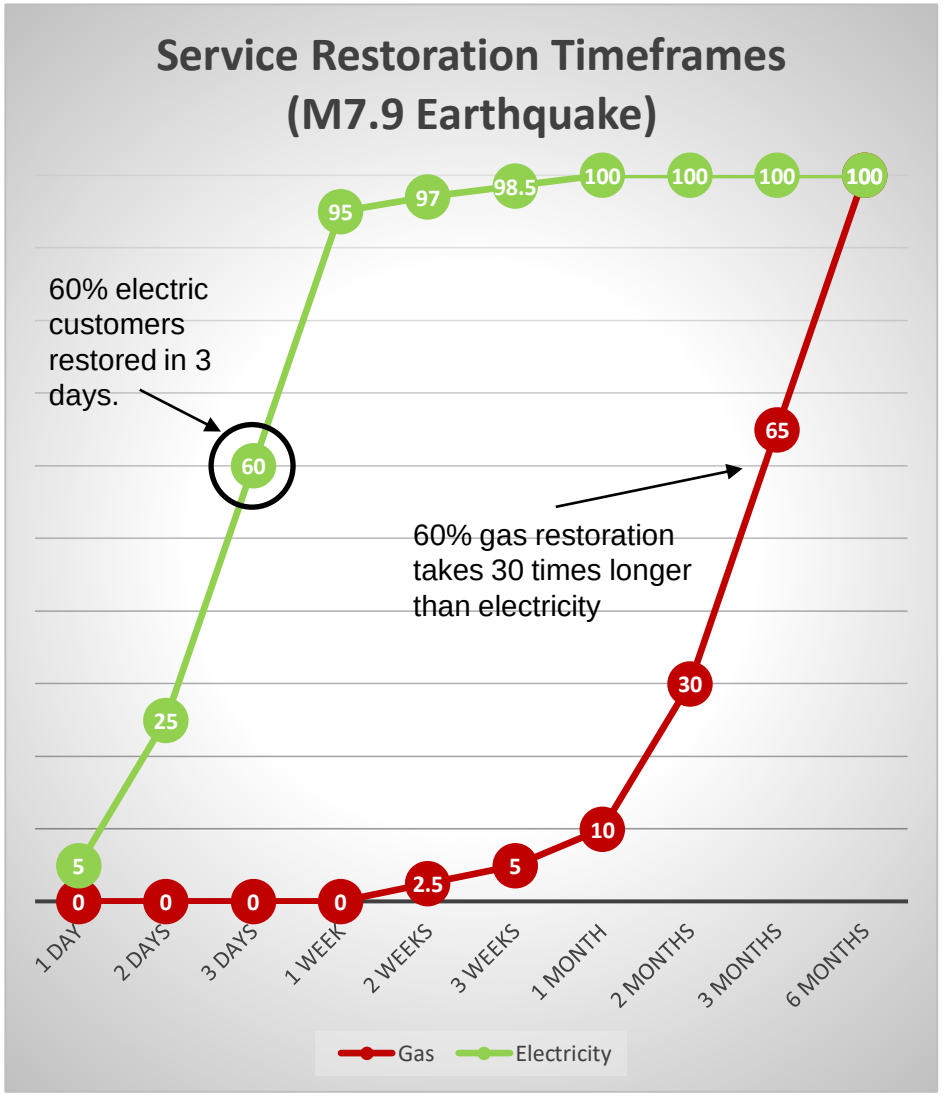

**Legend**

- 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

# 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**

# Target 66kV feeder grid area block diagram

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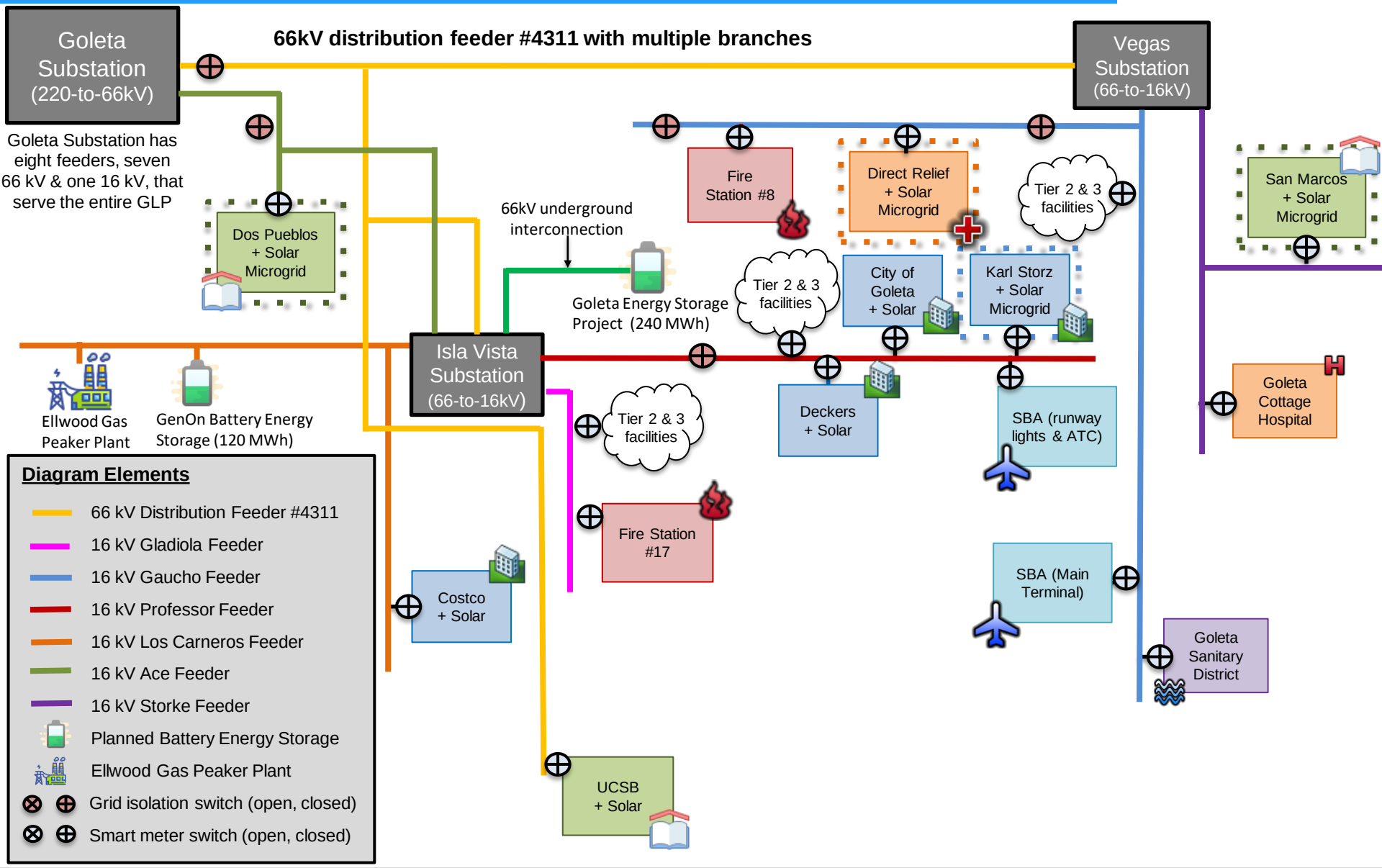
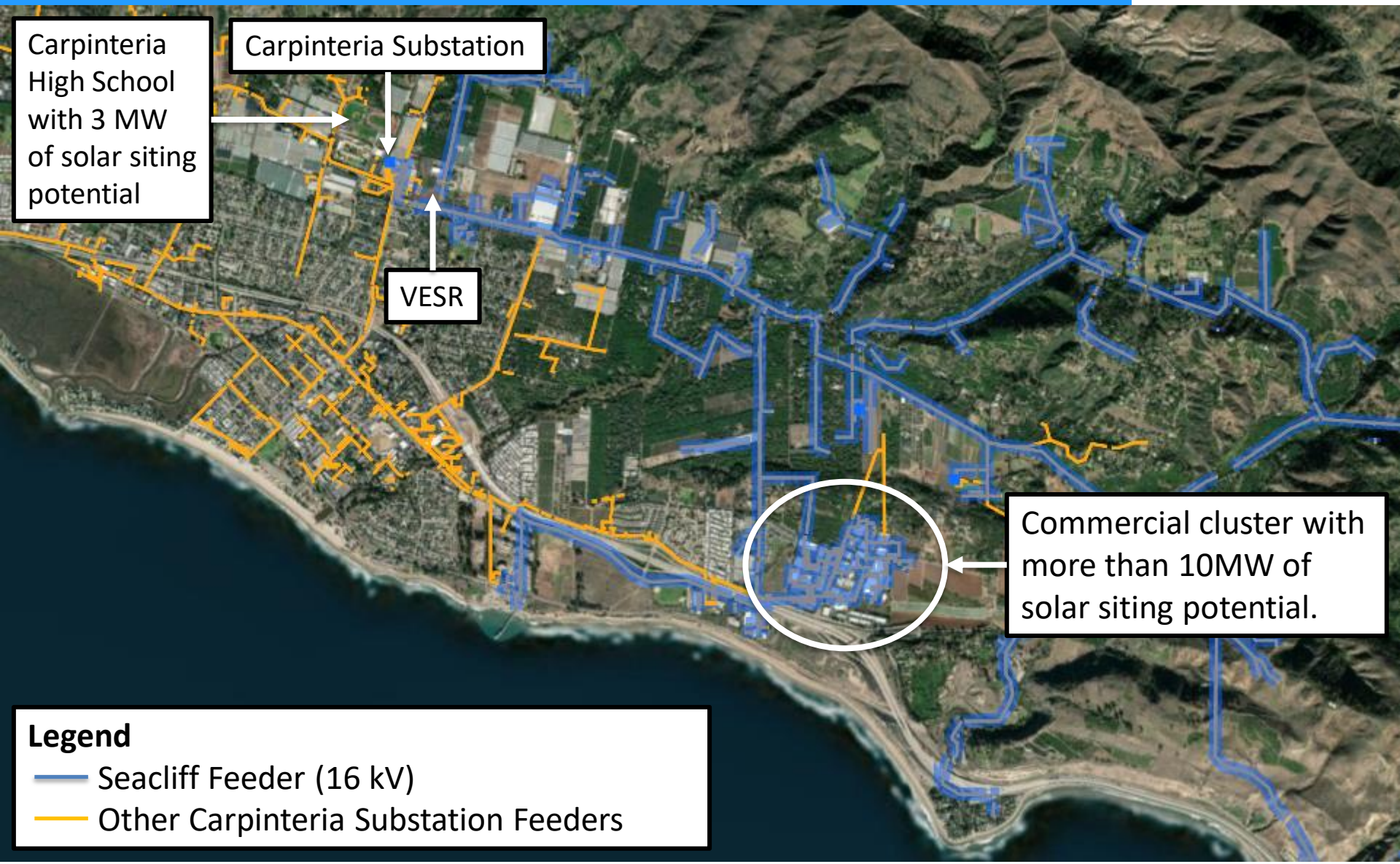
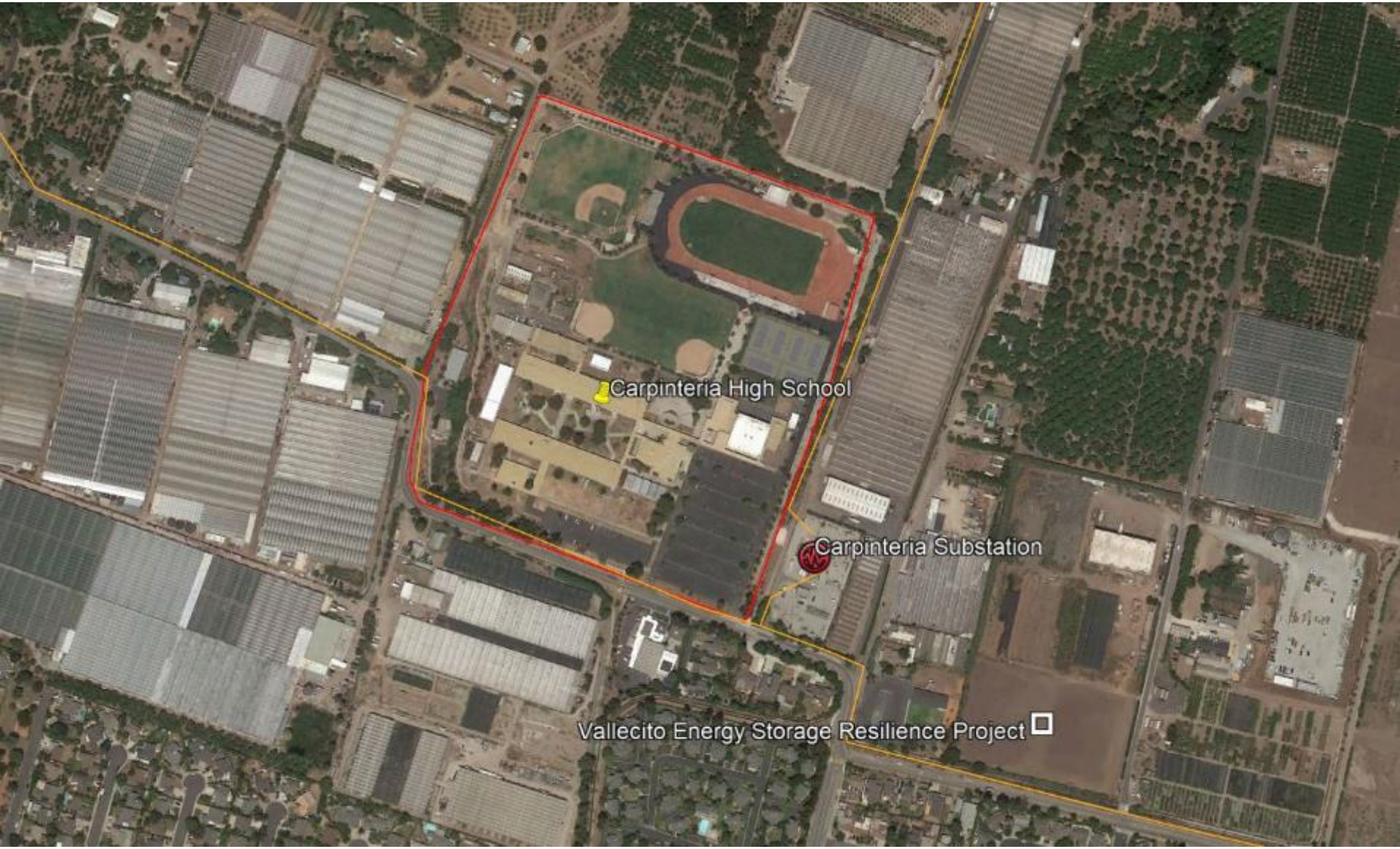


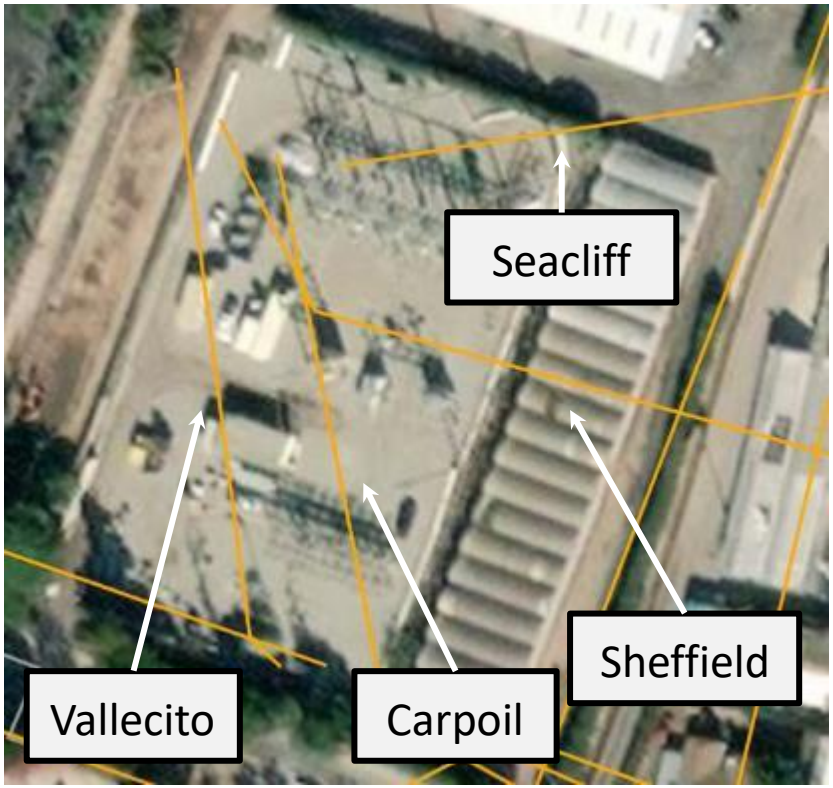
# VESR can enable resilience to the community



# Carpinteria High School, Substation, and ORMAT Battery



# Carpinteria Substation

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**Substations**

Information

| | |
|---|---|
| Substation Name | Carpinteria |
| Substation ID | 640 |
| Substation Type | D -- Distribution |
| System Name | Goleta 220/66 System |
| Existing Generation (MW) | 2.82 |
| Queued Generation (MW) | 30.45 |
| Total Generation (MW) | 33.27 |
| Projected Load | 32.6 |
| Penetration Level | 102.56 |
| Maximum Remaining Generation Capacity (MW) | 14.55 |
| Note | Interconnection studies in this area have identified adequate deliverability. |

The Carpinteria Substation powers multiple feeder circuits across the Eastern Goleta Load Pocket. Currently **2.82MW** of generation is connected to these circuits. Another 14**MW** of additional generation can be connected to the Carpinteria Substation.

# Carpinteria High School solar potential – 3MW