

California renewables market update

Solar Power International 2019



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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 distribution grid, ensuring resilience without dependence on transmission grid
- 75% remote, dependent on transmission grid for serving loads

Trends we'll cover:

- **Resilience and wildfire mitigation**
- **Renewables+storage microgrids**
- **Electrification**

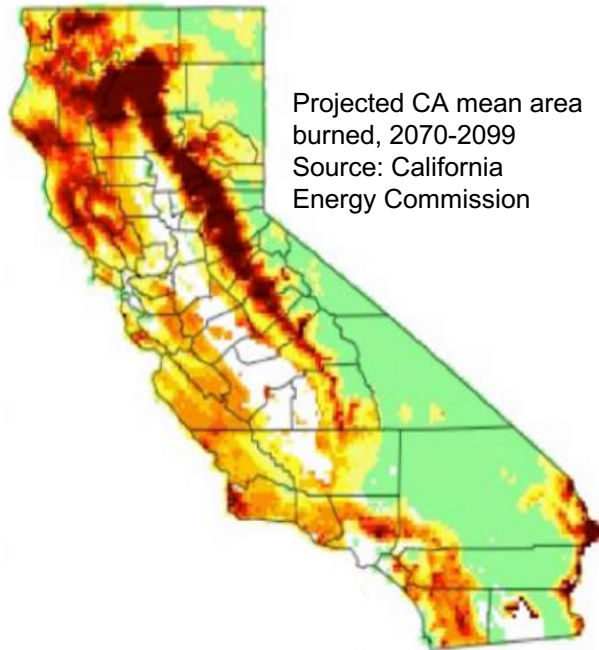
Other significant trends:

- [Demise of gas plants](#)
- [Rise of CCAs](#)
- [Increased grid transparency](#)
- [Changes to net metering](#)



California renewable energy trends: Resilience and microgrids

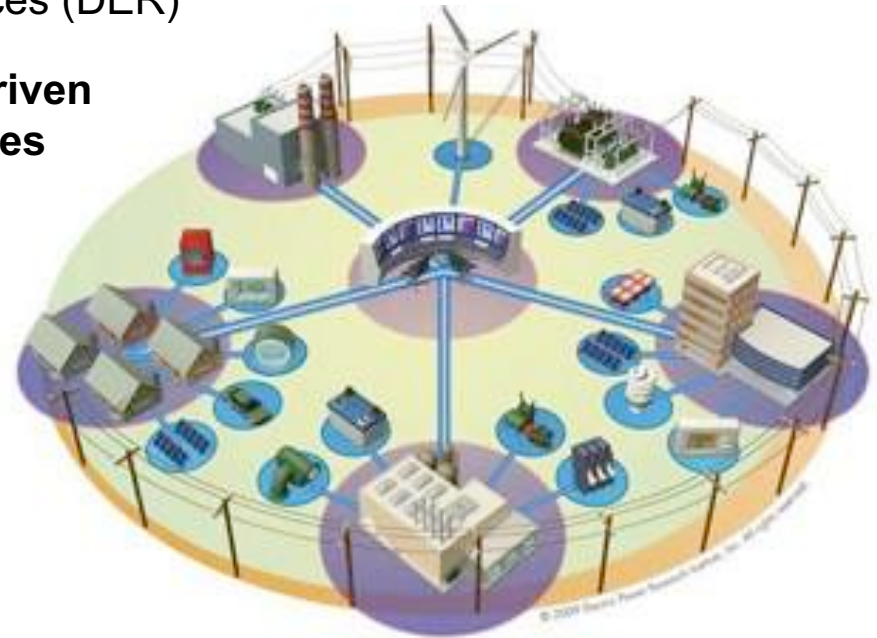
- Resilience and wildfire mitigation
 - Wildfires and other natural disasters highlight the need for resilience
 - In California, Public Safety Power Shutoffs (PSPS) add to this need
- Renewables+storage microgrids
 - [Community Microgrids](#) can keep critical facilities online **indefinitely**
 - Provide unparalleled economic, environmental, and resilience benefits to communities



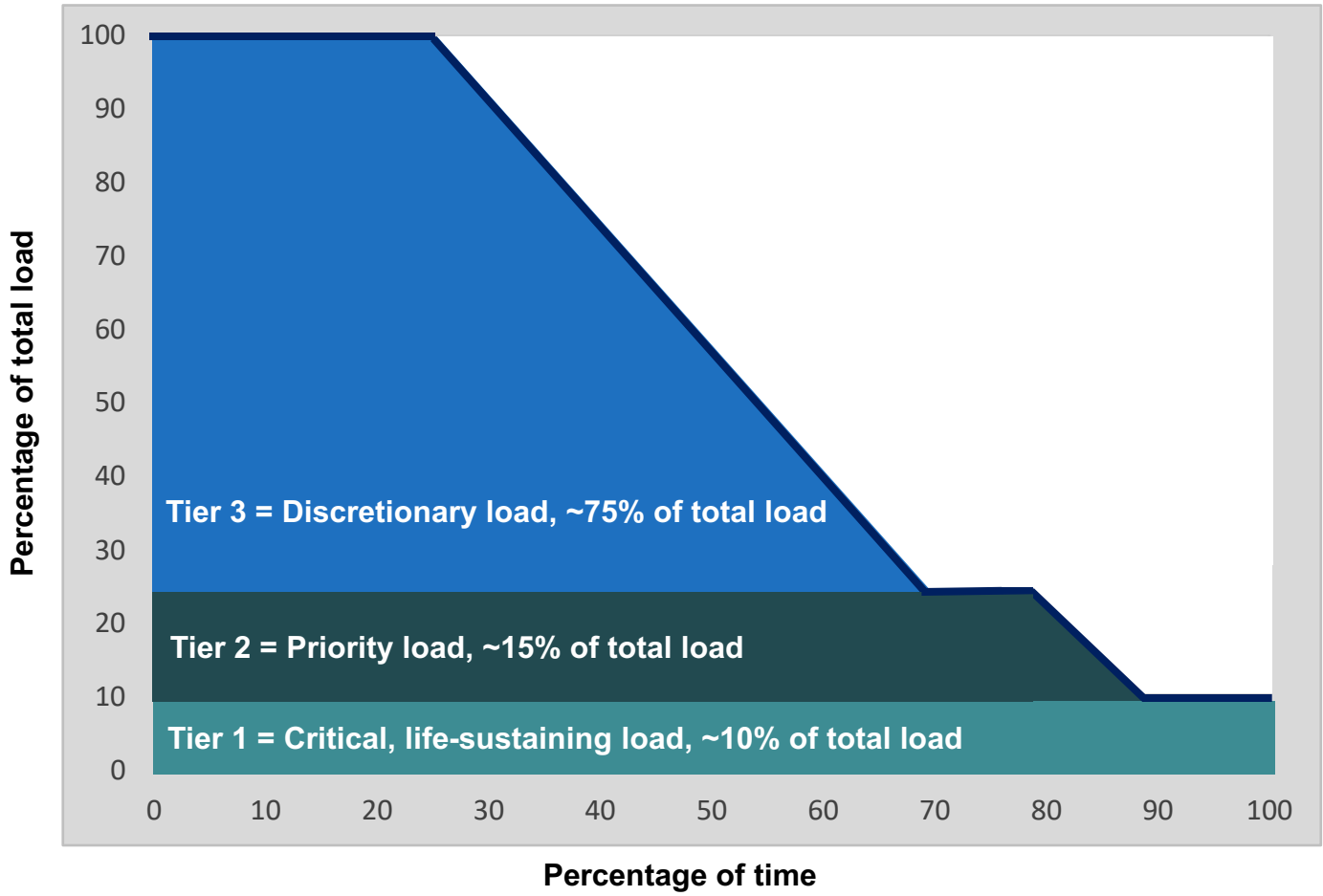
A Community Microgrid is a new approach for designing and operating the electric grid, stacked with local renewables and staged for resilience.

Key features:

- A targeted and coordinated distribution grid area served by one or more substations
- High penetrations of distributed energy resources (DER)
- Staged capability for **indefinite renewables-driven backup power for critical community facilities**
- A replicable solution



Percentage of time online for Tier 1, 2, and 3 loads for net zero solar+storage microgrids in California



- Berkeley has banned gas in new buildings; 50+ other California cities may follow suit
- The Clean Coalition's [Electrification and Community Microgrid Ready \(ECMR\) guidelines](#) make it easy to prepare for an all-electric, Community Microgrid future



- Expand behind-the-meter solar and storage in current market
 - Net energy metering (NEM)
 - Self-Generation Incentive Program (SGIP)
- Design and stage facility microgrids at individual locations
- Ensure facility microgrids are ready to connect to future Community Microgrids
 - Serve entire substation grid area
 - Keep critical facilities online indefinitely
 - ECOMR guidelines will facilitate readiness
- Advance [policies and market mechanisms](#) to proliferate Community Microgrids

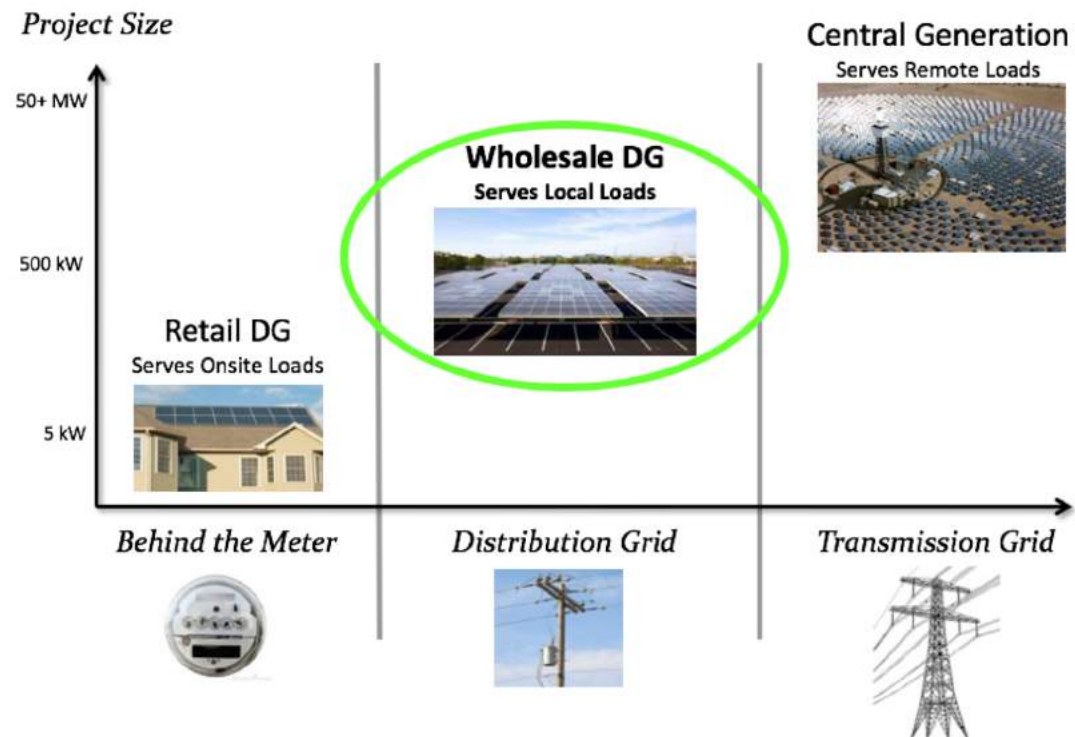


Policy and market mechanisms to proliferate Community Microgrids

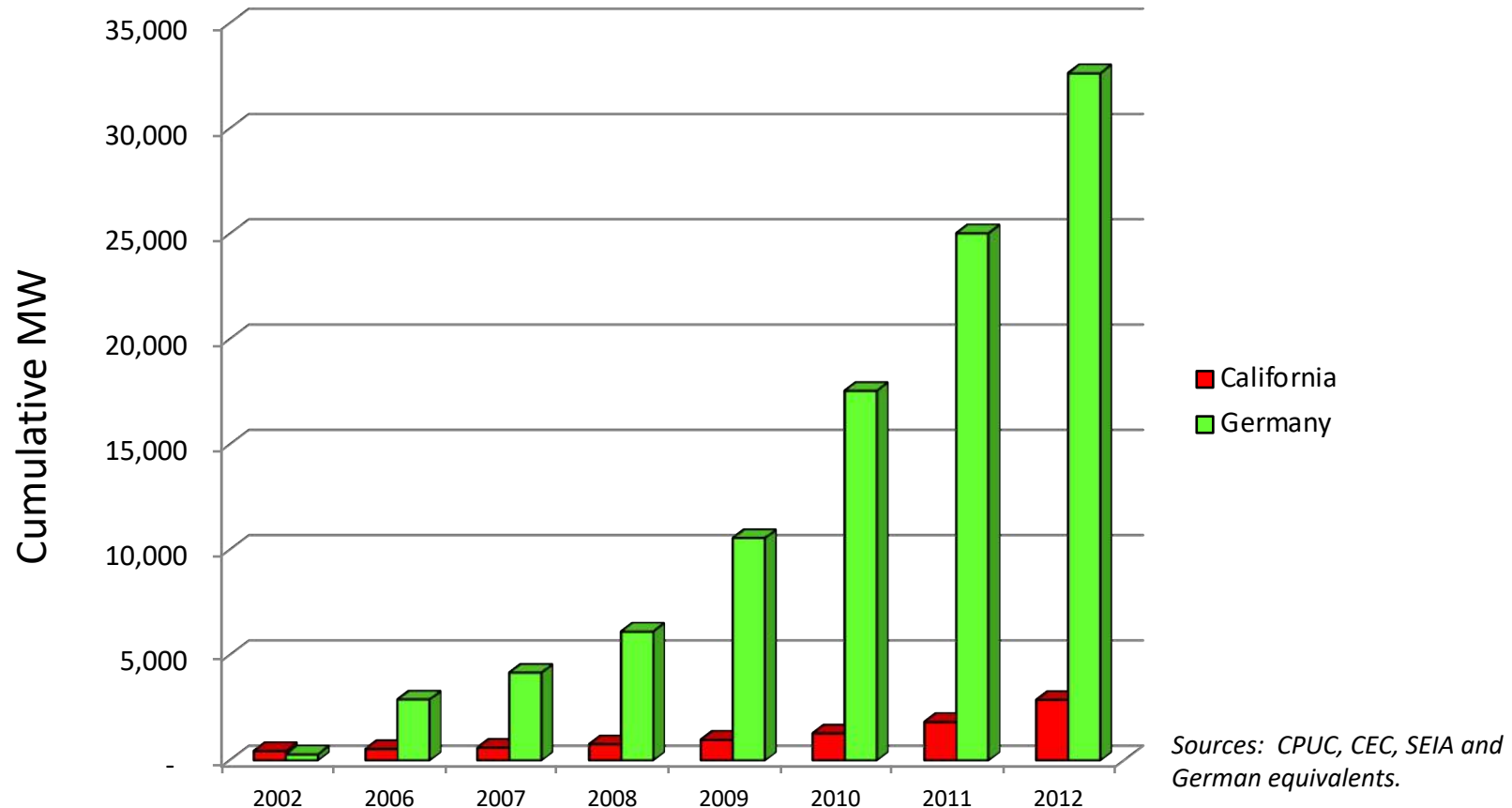
Unleash [wholesale distributed generation](#) (WDG) and utilize the existing distribution grid during transmission system outages

WDG = Front-of-the-meter (FOM) distributed energy generation — often commercial-scale solar — that interconnects to the distribution grid and serves local loads, avoiding use of the transmission grid

- Implement a market-responsive, cost-effective [Feed-In Tariff](#) (FIT)
- Streamline [WDG interconnection](#)
- Ensure full & fair valuation for WDG
 - [Transmission Access Charges](#) (TAC) Campaign
 - [Value of Resilience](#) (VOR123)
 - [Dispatchable Energy Capacity Services](#) (DECS)

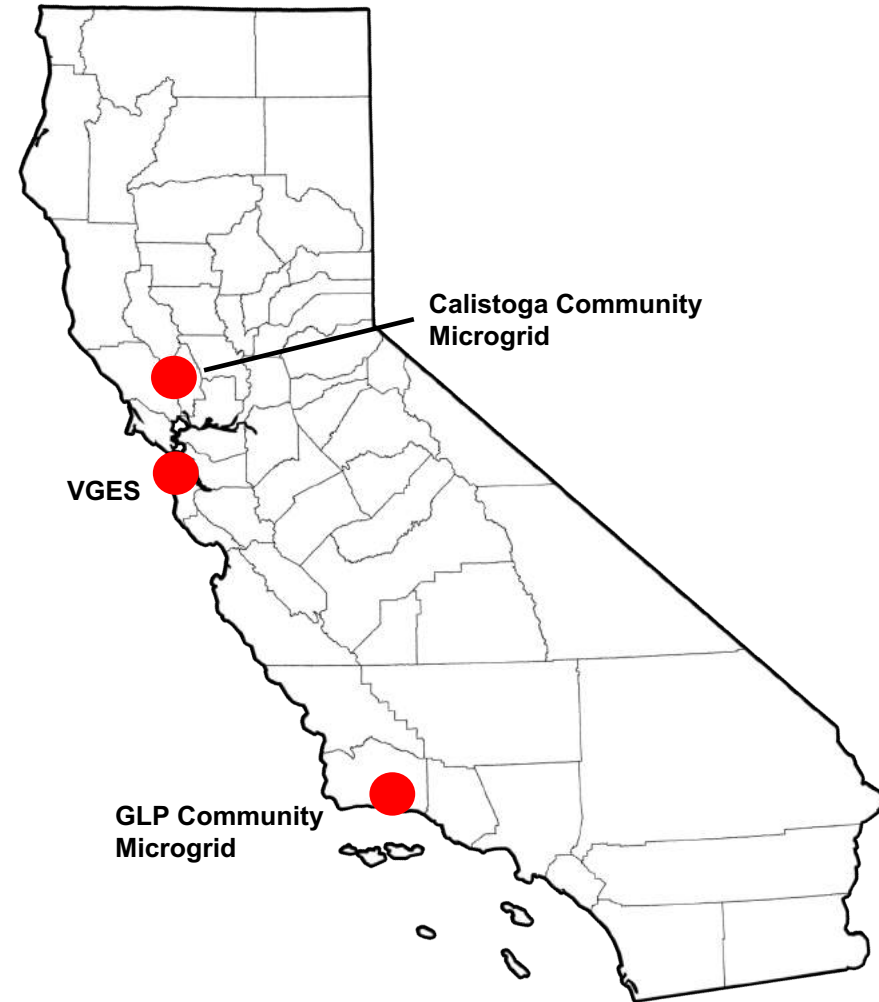


Solar Markets: Germany vs. California (2002-2012)



Germany deployed over 10 times more solar than California in the decade from 2002 — despite California having 70% better solar resource.

- [Goleta Load Pocket \(GLP\) Community Microgrid](#): Response to wildfire and debris flow disasters; [Montecito Community Microgrid](#) is first building block
- [Calistoga Community Microgrid](#): Proactive effort by city to provide resilience in the face of planned utility power shutoffs
- [Valencia Gardens Energy Storage Project \(VGES\)](#): First front-of-the-meter (FOM) merchant energy storage project in CA



Valencia Gardens Energy Storage Project

Questions?

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More information:

- Clean Coalition website: clean-coalition.org
- For an overview of Clean Coalition work, view webinar and download slides on the GLP Community Microgrid: clean-coalition.org/news/goleta-webinar-july-2019
- To stay informed, subscribe to the Clean Coalition newsletter: clean-coalition.org/newsletters



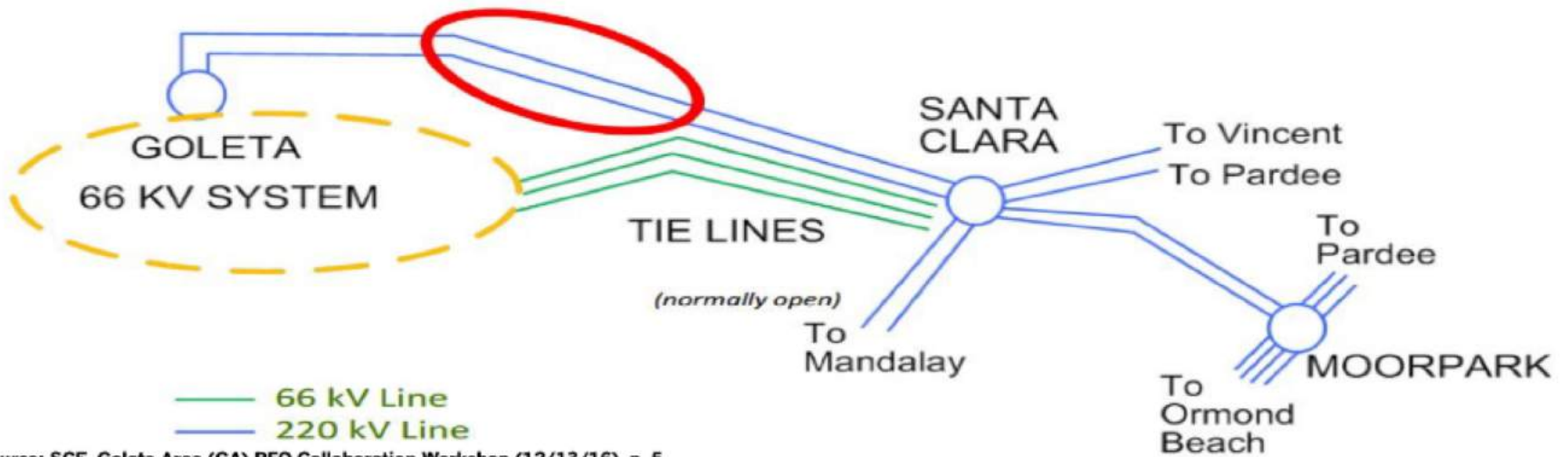
The GLP is the perfect opportunity for a comprehensive Community Microgrid



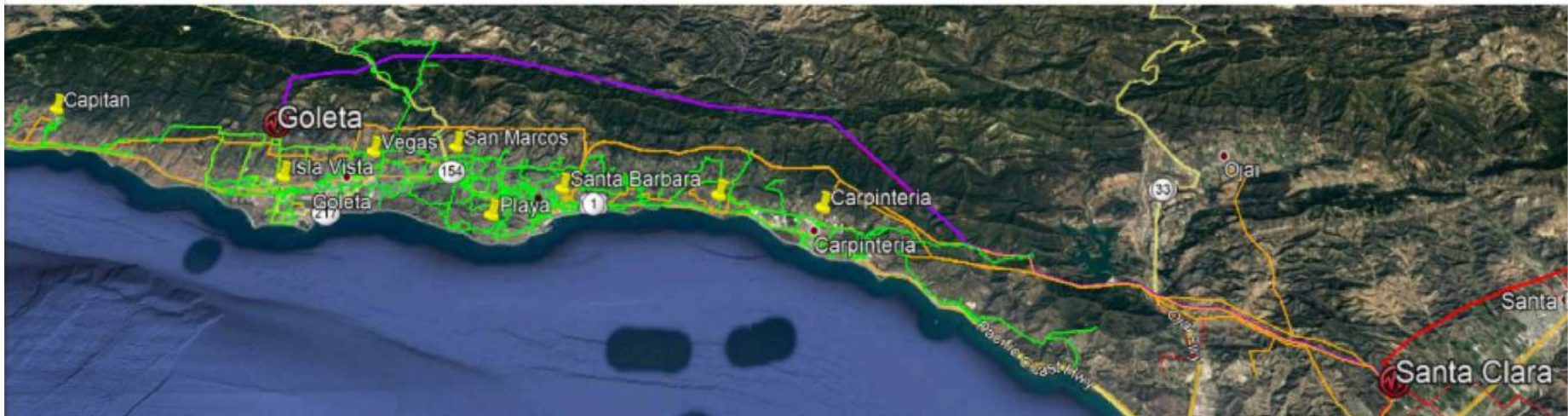
- GLP spans 70 miles of California coastline, including cities of Goleta, Santa Barbara, and more.
- GLP is highly transmission-vulnerable and disaster-prone (fire, landslide, earthquake).
- **200 megawatts (MW) of solar and 400 megawatt-hours (MWh) of energy storage** will provide 100% protection to 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.

GLP is critically transmission-vulnerable

Just one set of transmission lines serves the entire area.



Source: SCE, Goleta Area (GA) RFO Collaboration Workshop (12/13/16), p. 5



Need for resilience in GLP — similar to much of California



- May 2016: Edison Fire (multiple lines threatened)
- December 2017: Thomas Fire (multiple outages)
- Today: Transmission lines subject to preemptive shutoffs

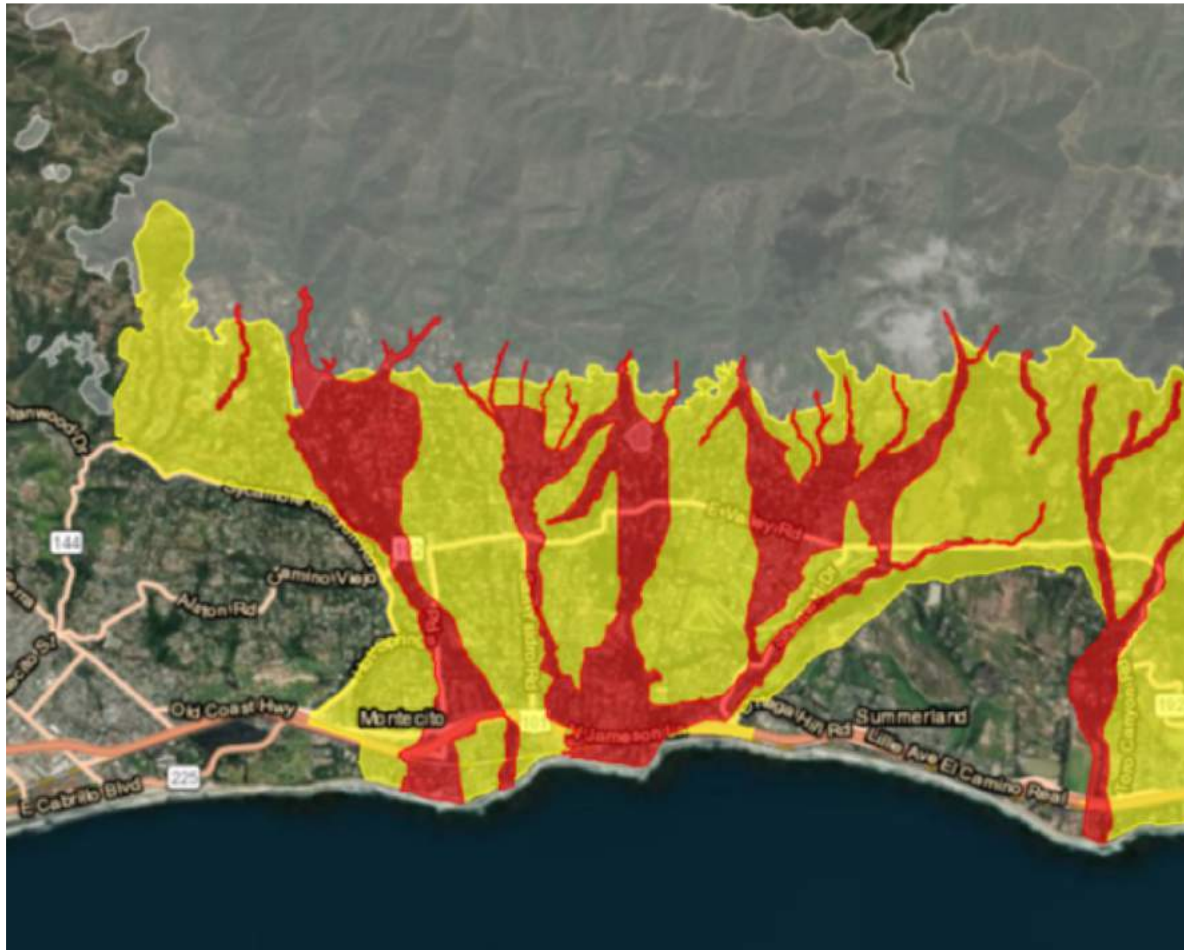


PUBLIC SAFETY POWER SHUTOFF | Last resort public safety measure to mitigate wildfire risk

4-7 DAYS AHEAD	3 DAYS AHEAD	2 DAYS AHEAD	1 DAY AHEAD	POWER SHUTOFF	POWER RESTORATION
When forecasts indicate extreme weather, SCE will begin a predictive modeling to assess potential impact.	SCE monitors fire weather watch alerts from the National Weather Service (NWS) and continues to refine predictive models.	Extreme fire weather conditions forecasted and NWS Red Flag Warning issued. Coordinate with local government and agencies (e.g. emergency responders) to pre-identify customer notification or possible power shutoff.	Extreme fire weather conditions forecasted and more accurate forecasts determine affected areas. Dispatch to controllers and communicate with local government, agencies and customers of possible power shutoff.	Extreme fire weather present and dangerous conditions validated by field resources; notify local government, agencies and customers of power shutoff.	Extreme fire weather subsides to safe levels and conditions validated by field resources. Inspectors and patrols of equipment begin; out power is restored to affected communities; agencies and customers notified of power restoration.
PLANNING AND MONITORING				OUTAGE	

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Montecito, CA offers opportunity for initial demonstration: First building block for GLPCM



Areas at extreme & high risk for debris flows in the event of major storms.

Source: Santa Barbara County OEM

Montecito Community Microgrid – overview

Overall goals:

- To provide renewables-driven energy resilience to critical community facilities in Montecito
- To showcase the benefits of Community Microgrids for communities around the world

Initial facilities:

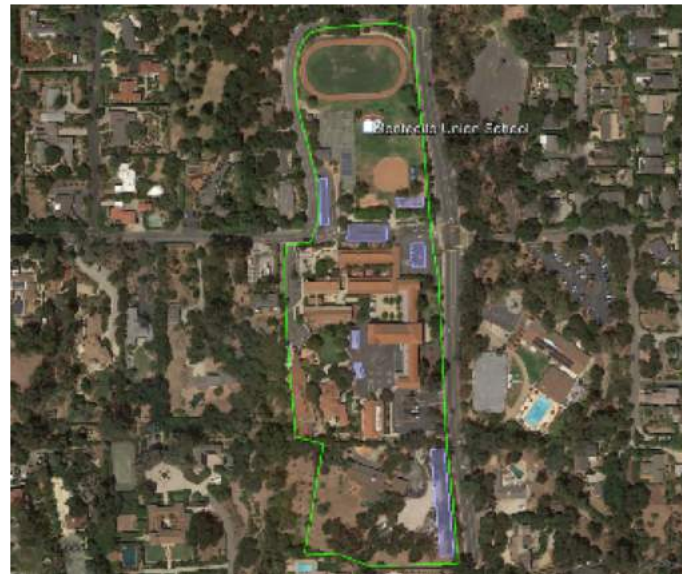
- Montecito Fire Protection District headquarters & primary fire station
- Montecito Water District headquarters & critical pumps
- Montecito Union School

Each site is anticipated to have an independent microgrid with enough solar+storage to be net zero and deliver indefinite renewables-driven backup power to the most critical loads:

- 10% of the load 100% of the time
- 100% of the load at least 25% of the time



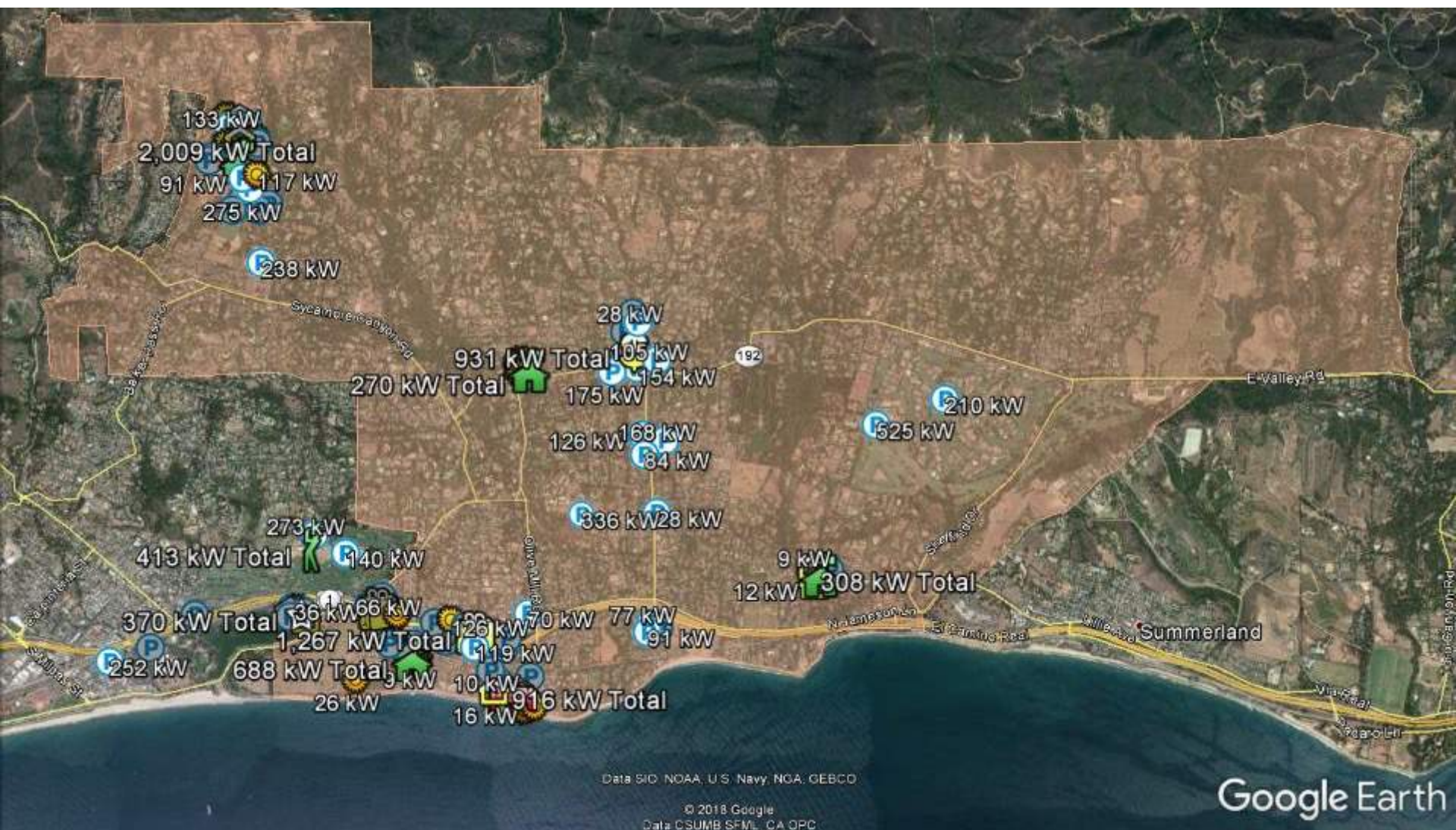
Montecito Fire and Water Districts



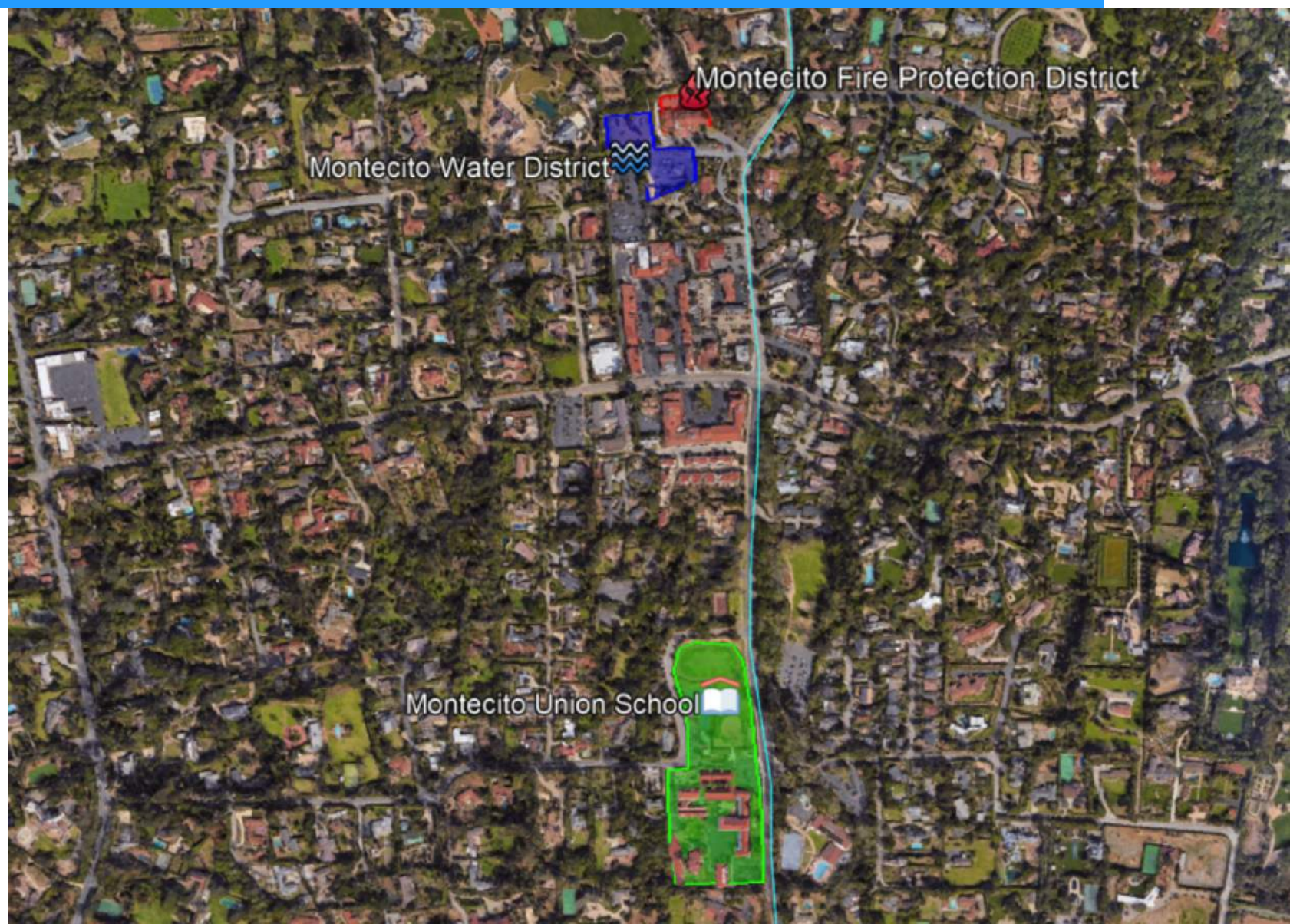
Montecito Union School

Solar Siting Survey (SSS) for Montecito

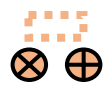
There is significant technical siting potential for commercial-scale solar in the area.

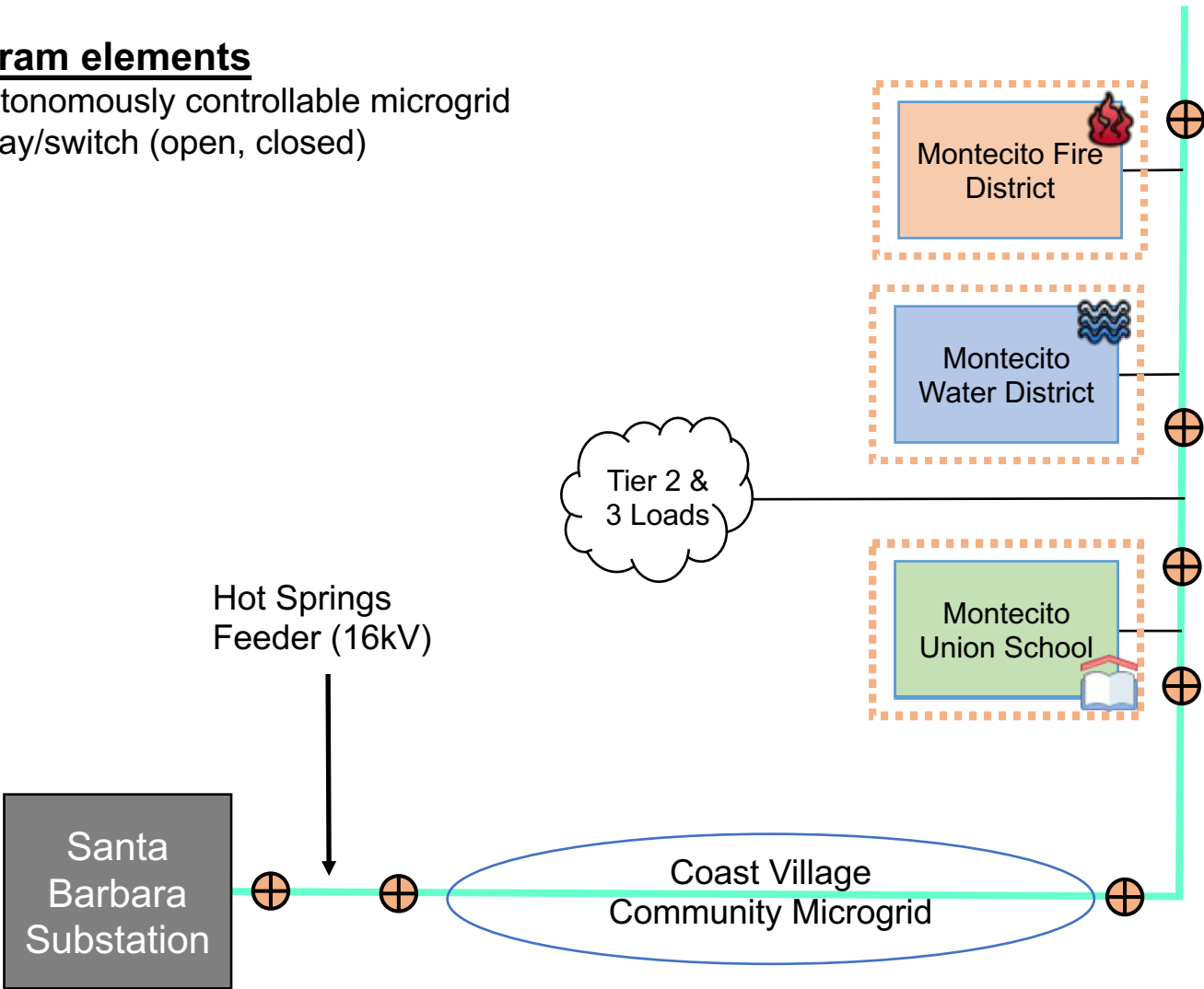


Montecito Upper Village has a concentration of critical community facilities (fire, water, shelter)



Montecito Community Microgrid block diagram

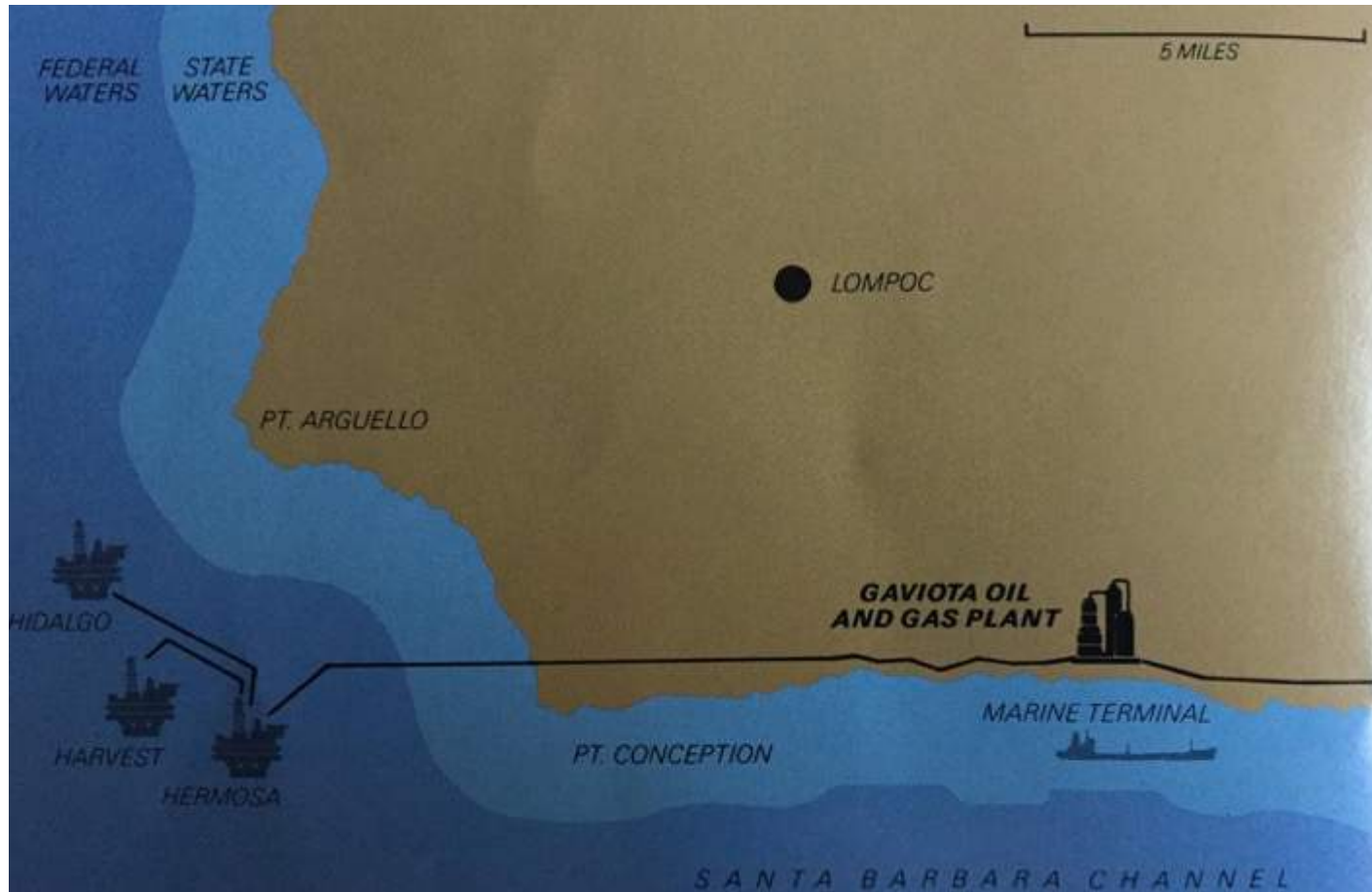
 **Diagram elements**
Autonomously controllable microgrid relay/switch (open, closed)

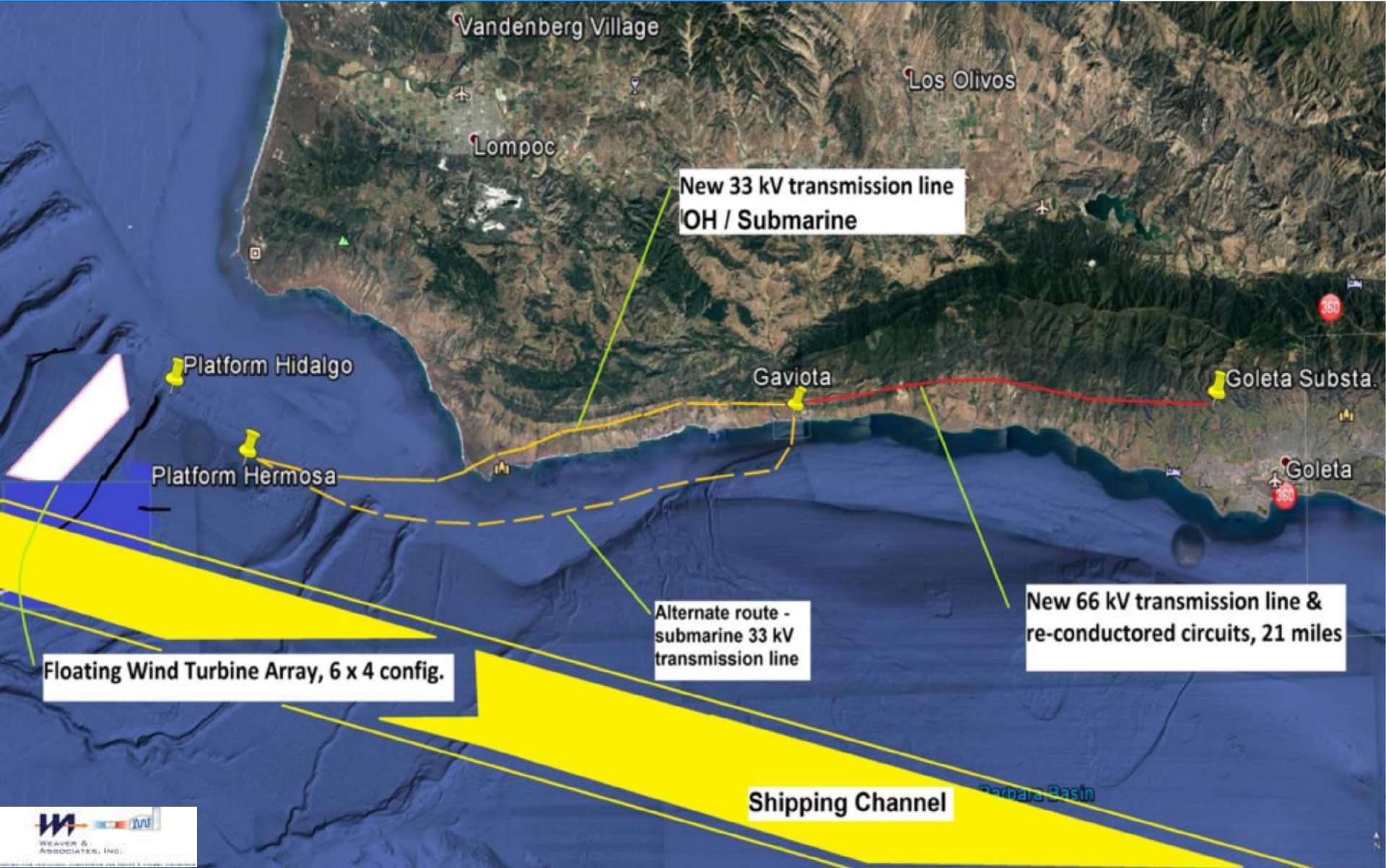


Point Conception and Gaviota offshore wind potential



Existing Gaviota oil and gas site infrastructure





Case study illustrating need for FITS: Direct Relief Microgrid should expand greatly

- Location: Santa Barbara, CA
- Owner: Direct Relief (one of the largest disaster recover/supply nonprofits in the world).
- Brand-new 155,000-square-foot pharmaceutical warehouse.
- Ships direct to disasters zones, internationally. Cold storage cannot be without power.
- Needed a microgrid for indefinite renewables-driven backup power.



- Resilience is #1 concern:
 - 320 kW PV
 - 676 kWh Storage
 - 600 kW generator
 - 4000 gal. of 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 “backup to the backup.”
- Direct Relief’s mission is to stay operational in the event of a local disaster that causes interruption of electricity.



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.

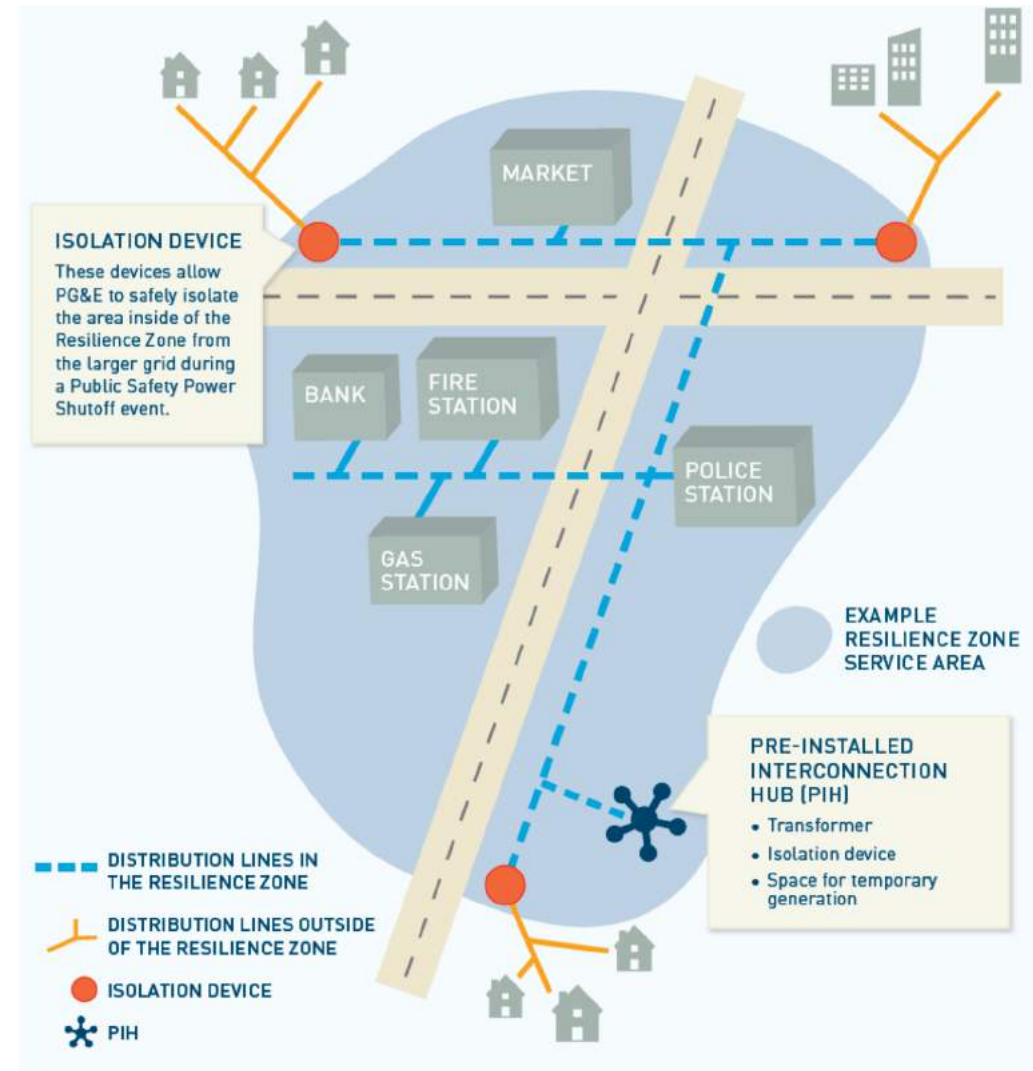
Ready to do way more:

- 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!



PG&E pre-installed interconnection hubs (PIH) set stage for Community Microgrids

- PIH enable mobile energy sources to be interconnected for resilience during a grid outage
- PIH can facilitate islandable Community Microgrids & Resilience Zones



Source: PG&E, Jul 2019