Achieving Community Resilience through Microgrids

NARUC-NASEO Microgrids State Working Group Webinar

JAN. 13, 2021| 3:00 – 4:00 PM ET

MEMBERS-ONLY DISCUSSION 4:00 – 4:30 PM ET

NARUC-NASEO BRIEFING PAPERS RELEASED

User Objectives and Design Approaches for Microgrids: Options for Delivering Reliability and Resilience, Clean Energy, Energy Savings, and Other Priorities

Private, State, and Federal Funding and Financing Options to Enable Resilient, Affordable, and Clean Microgrids

View press releases:

https://www.naseo.org/news-article?NewsID=3562

https://www.naruc.org/about-naruc/press-releases/new-naruc-naseo-reports-on-microgrid-financing-and-use-cases/

NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS · DEDICATED TO PUBLIC SERVICE · 1889

NASEO
National Association of State Energy Officials

Speakers:

- **Mike Gravely**, Research Program Manager, California Energy Commission
- **Jana Ganion**, Sustainability and Government Affairs Director, Blue Lake Rancheria, California
- **Craig Lewis**, Executive Director, Clean Coalition

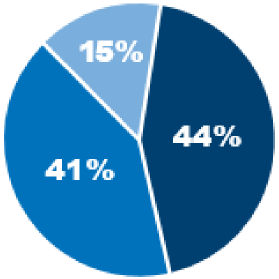
EPIC Program | Enabling a 100% Clean Energy Future

California Energy Commission

Accelerating Clean Energy Innovation

$718 MILLION AWARDED

TO 328 PROJECTS



2012-2020

Funding Distribution by Area

- Applied Research & Development
- Technology Demonstrations & Development
- Market Facilitation

Early Stage R&D → **Prototype/ Proof of Concept** → **Pilot/Demo** → **Early Adoption** → **Scaling** → **Maturity**

Research to develop new technologies | Demonstrating in real-world applications | Moving technologies to market

A Decade of Microgrid Research

2009 – 2015

Early Stage Microgrid Development

- Developed approaches to integrating multiple DERs
- Supported controller development

2015 – 2019

Overcoming Integration Challenges

- Demonstrated resiliency value for critical facilities
- Integrated large number of resources
- Refined controller designs

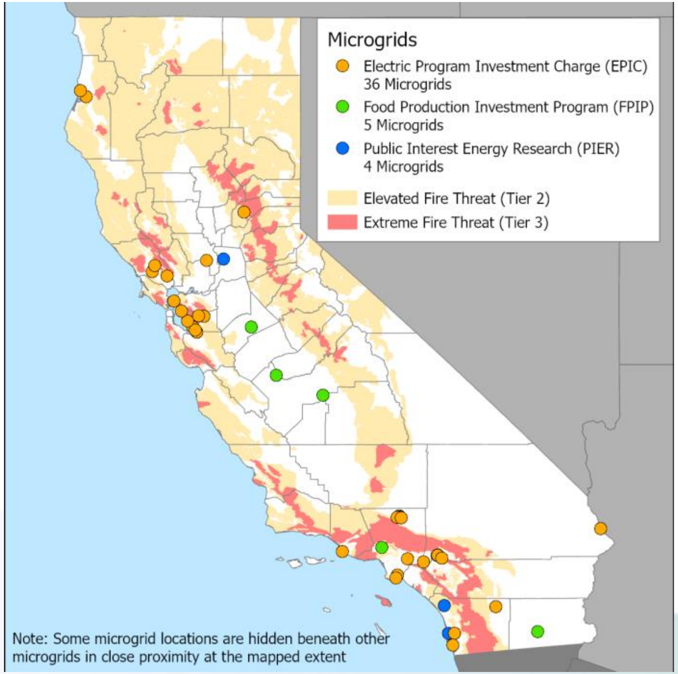
2018 – 2023

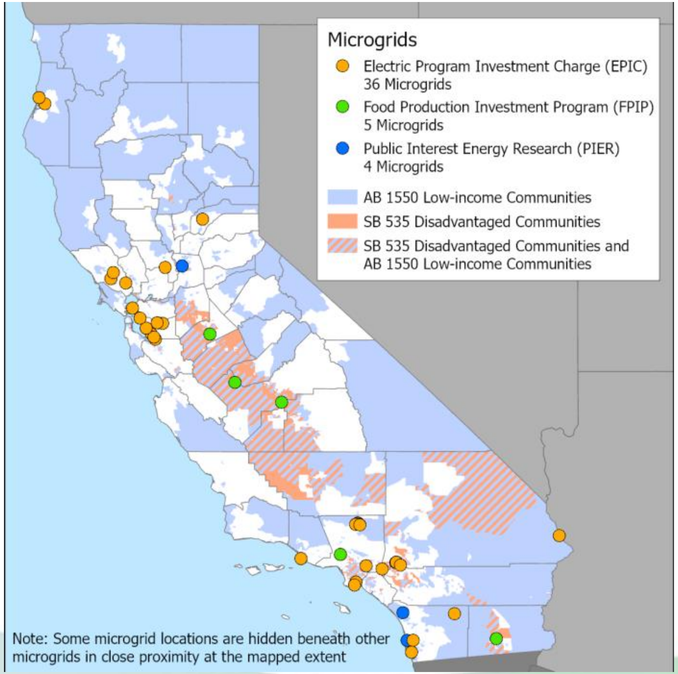
Developing Commercialization Pathways

- Creating business plans and commercialization pathways for microgrids in California

Providing Critical Functions

34 microgrid projects - $91M invested - $75M match





A Diverse Portfolio

*Microgrid Sizes**

Small (Under 1000 kW)
Public institutions
Commercial
Fire Stations
Hospital

Medium (1000 kW – 5000 kW)
Campus
Airports
Ports

Large (5000 kW – 20,000 kW)
Industrial
Utility/Community

AC Coupled

Configurations

DC Coupled


End User


3rd Party


Utility

*Total inverter size

A Diverse Portfolio

Critical Facilities


Shelter


Medical Center


Fire Stations


City Hall, Police HQ, and Community Centers


Waste Water Treatment Plant


Airport

Ports

Military

Communities

Industrial


Digester


Distribution Center

Community Microgrid at Blue Lake Rancheria

Microgrid Design

Solar: 420 kW AC PV ground-mounted array

Energy Storage: 500 kW / 950 kWh lithium-ion battery storage

Software & Controls: Siemens Spectrum Power 7 Microgrid Management System and Schweitzer Engineering Laboratories Protection Relays

Other Infrastructure: Purchased distribution system infrastructure to create a new point of common coupling with the grid, integrating six buildings into the microgrid behind one electric meter

Technology Integration: The Schatz Energy Research Center at Humboldt State University

UNIQUE PROJECT ASPECTS

- ✓ American Red Cross shelter
- ✓ Successfully islanded during several unplanned utility outages due to weather and nearby wildfires
- ✓ Can deploy five levels of load shedding depending on the outage and system conditions
- ✓ Achieving cost savings: 58% overall energy

SCHATZ ENERGY RESEARCH CENTER

Emergency Microgrids for Fire Stations

Microgrid Design

Solar: 38 kW solar PV at Fire Station 11, 43 kW each at Fire Stations 6 and 7

Energy Storage: 110 kWh li-ion battery storage at each

Software & Controls: Gridscape Solutions' cloud-based predictive distributed energy resource management software (DERMS) and energy management system – EnergyScope

Technology Integration: Gridscape Solutions

UNIQUE PROJECT ASPECTS

- ✓ Displaces diesel generation and extends fuel reserves in emergency, keeping the fire station online longer as a viable first responder
- ✓ System design refined over deployments.
- ✓ Demonstrated more than 10 hours of islanding capability
- ✓ Gridscape expanding to other communities

Redwood Coast Airport Microgrid

Humboldt State Univeristy

- Collaborative design and operation
  - RCEA – 2.2MW PV & 2.2MW/8.8 MWh storage (CAISO participation) & 320 KW PV (reduces airport electricity bill)
  - PG&E – FTM microgrid
- Community-scale system – multiple customers, including USCG Air Station
- Create experimental tariffs/agreements for fair allocation of costs & compensation of third party generator
- Participate in CAISO wholesale market
- Create a replicable business model

CEC: $5M Match: $6.3M

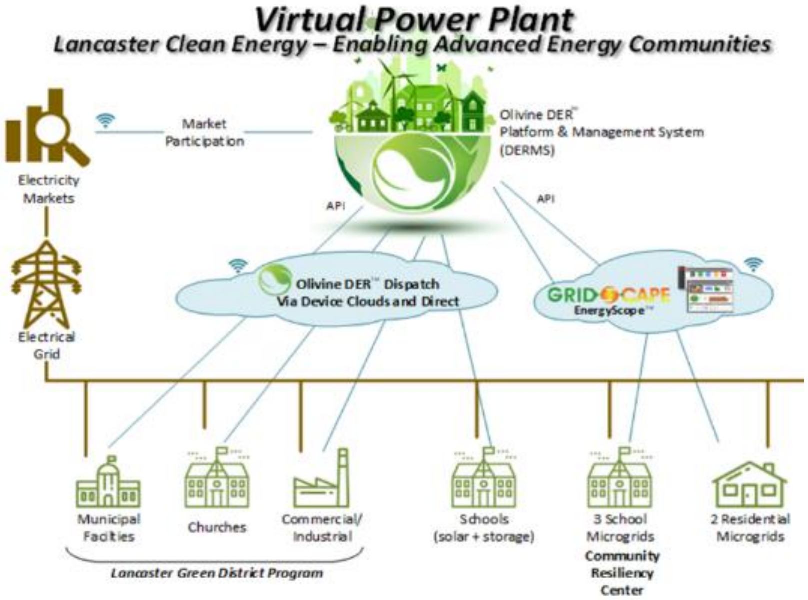
REDWOOD COAST EnergyAuthority

SCHATZ ENERGY RESEARCH CENTER

Lancaster Advanced Energy Community

Zero Net Energy (ZNE) Alliance

- Developing a virtual power plant of connected DERs
  - 5 MW PV & 10 MWh storage
- 2 ZNE affordable housing developments
  - 70 unit – 780 KWh Li-ion
  - 164 unit – 500 KWh flywheel
- 3 school microgrids
- Partner with Lancaster Green District to deploy more BTM storage

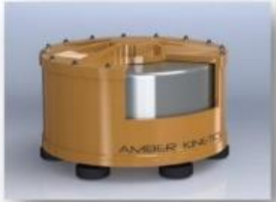


CEC: $5.0M **Match: $5.7M**

LANCASTER Choice ENERGY THE POWER TO CHOOSE

Energy Storage Research – A Critical Microgrid Enabler

Diversify



Demonstrate

Derisk*

CABAN SYSTEMS

SEPION TECHNOLOGIES

CUBERG

SOUTH 8 TECHNOLOGIES

*Lower manufacturing costs

Questions

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Achieving Community Resilience Through Microgrids

NARUC-NASEO Microgrids State Working Group

1/13/2021

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BLUE LAKE RANCHERIA

A Federally Recognized Tribal Government

Blue Lake Rancheria Overview

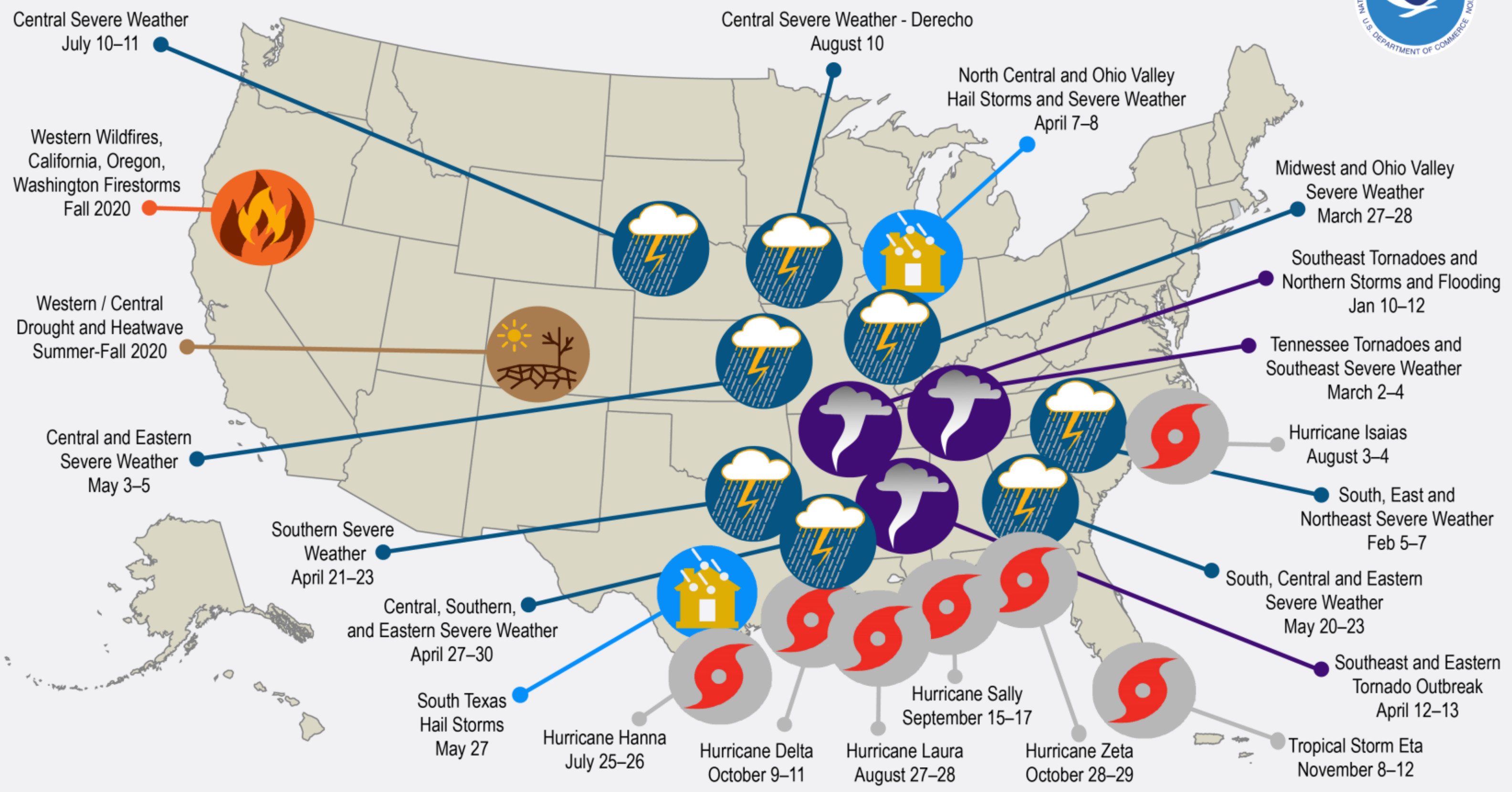
- Tribal government; nation; community
- Federally recognized 1908
- Terminated 1958; Restored 1983
- Governed by elected, five-member Tribal Business Council
- ~100 acres of trust land
  - Spans the Mad River
- Tribal Utility Authority (2013)
- Top 10 employers in rural Humboldt County
  - ~400 employees

Resilience Rationale – Global / National

- 2020: highest number of billion-dollar disasters in U.S. ever
- 2019: highest ocean temperatures ever recorded (NOAA)
- 2010-2019: warmest decade ever recorded (NOAA)
- Antarctic & Greenland ice sheets: contain ~220 feet of sea level rise; melt is earlier than predicted, and accelerating (NASA)
- CO2 concentrations are at highest levels in human history, >415 ppm, and increase is accelerating (NOAA)
- Larger storms/wildfires; persistent drought; extreme heat; air pollution
- Increasing GHG emissions; need more data
  - Unknown large methane emissions
    - https://www.nytimes.com/interactive/2019/12/12/climate/texas-methane-super-emitters.html
- Species die-offs (e.g., pollinators, Australia wildfires)
- Feedback loops are accelerating – e.g., Arctic permafrost melt; methane hydrates

Photo Credit: H. Patton, Flickr Creative Commons

U.S. 2020 Billion-Dollar Weather and Climate Disasters



This map denotes the approximate location for each of the ***22 separate billion-dollar weather and climate disasters that impacted the United States during 2020****.*

Resilience Rationale - Local

- Global climate change *amplifies* local conditions
- Extended “severe” drought
- Unpredictable, volatile weather, extreme storms
  - Arcata, CA ‘rain bomb’ 9/2019: ~2” in 30 minutes
- Nuisance power outages are common, but worsening
  - One in November 2019, One in January 2020 (entire county)
  - Rolling blackouts in Aug/Sept 2020
    - Due to grid stress and historic heat waves across the western US.
- “Public Safety Power Shutoffs” (PSPS)
  - Planned outages to prevent wildfires from electrical grid; projected to last 2-10 days; two PSPS events in Oct. 2019, one in September 2020
- Increased wildfires and air pollution

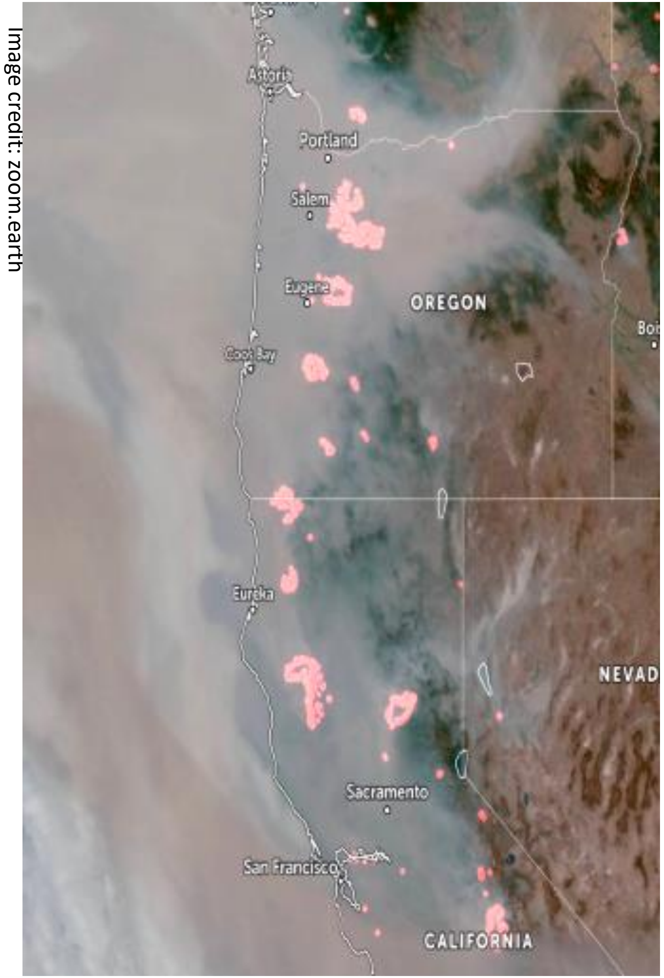


Image credit: zoom.earth 9/11/2020

Resilience Rationale - Local

- Cascadia Subduction Zone, Mendocino Fault, Gorda Plate, Pacific Plate, North American Plate converge at ‘triple junction,’ directly offshore from Humboldt County.
- Serious earthquake / tsunami risk
  - Can achieve >9.0 earthquake
- Entire Pacific Coast can be simultaneously impacted
  - Due to relatively low population, our region may be lower priority for response

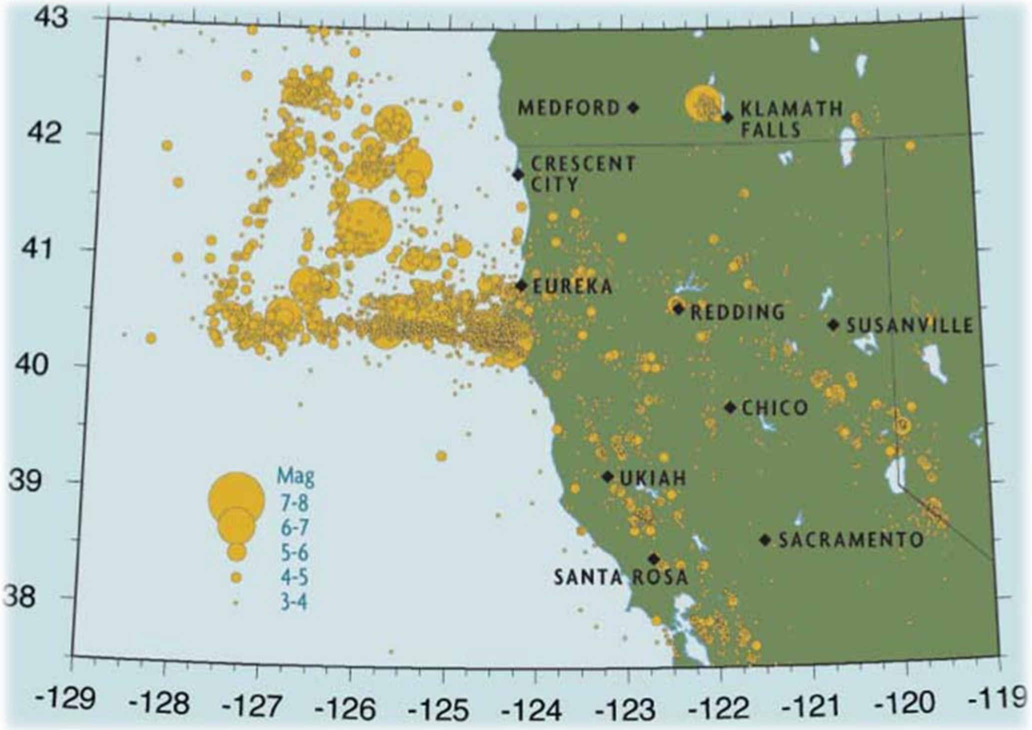


Image credit: Humboldt State University

Resilience Rationale - Local

- "Behind the Redwood Curtain"
- Tenuous connection to natural gas, electrical, and digital communications grids
  - Increasing risk of damage / disruption
- Landslides | Floods
- Disruption of local supply chains
  - Food
  - Diesel / gas / propane
    - Can't rely on liquid fuels for transport or energy
- Sea Level Rise (SLR)
  - Humboldt County has fastest SLR on the Pacific Coast
  - Impacts to local anchor power plant and other infrastructure
  - Threatens local nuclear waste repository

Simultaneous landslides across two (of three) main highways to the region. Photo credit: CalTrans

Climate-smart Resilience Strategy

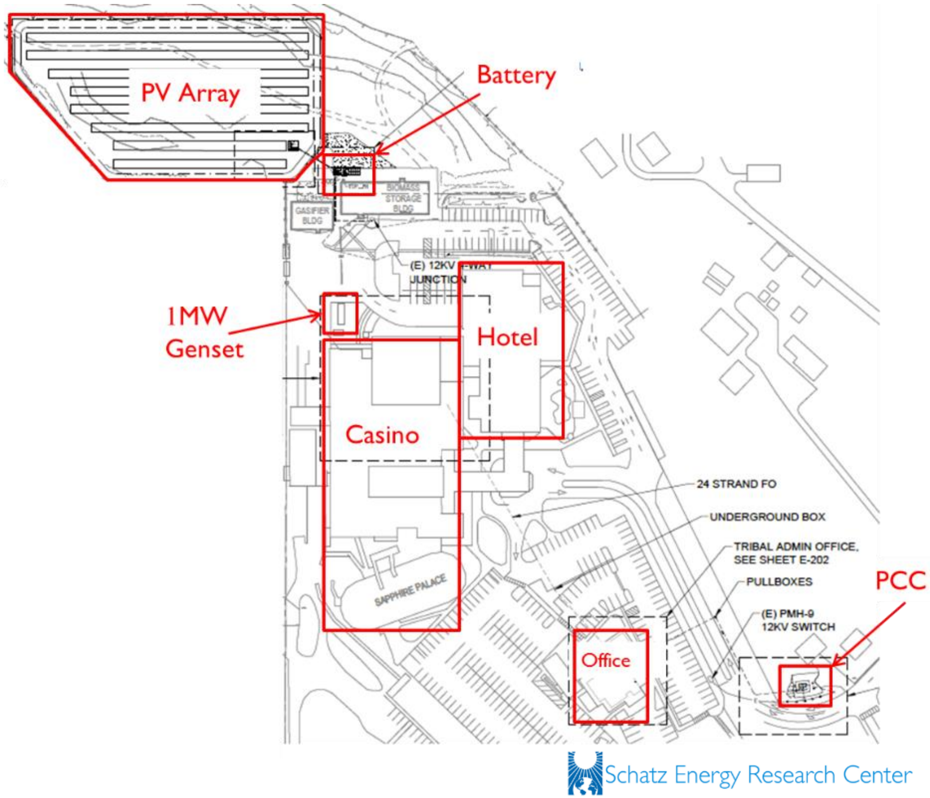
- Transition to 'climate-smart' infrastructure ASAP
  - Improve continuity of operations (COOP), community health, resilience
  - Economy-enabling investments
    - more jobs; lower, predictable costs
    - increased local capacity (key in rural regions)
- "Lifeline Sector" Priorities
  - Energy, Water, Food, Transportation, Communications
  - If these are done well, social, economic, and environmental benefits result
- Zero-carbon Solutions
  - Pairing climate mitigation + adaptation
    - Solving current climate impacts with lowest carbon solutions
    - Avoid making underlying causes worse
  - Achieve zero net greenhouse gas emissions by 2030

Low-carbon Microgrids at Blue Lake Rancheria

- Community scale – in operation since 2017
- Facility scale – in operation since early 2020
- Campus scale – in design, full operation by 2022
- Three clustered microgrids allow for ongoing research in reliability, load management / demand response and grid benefits

Community Scale Microgrid

- Public/private partnership - Tribe, Schatz Energy Research Center, Humboldt State, PG&E, Siemens, Tesla, CEC, CPUC, Idaho Nat'l Lab, others
- Funded by the Tribe, and a CEC R&D grant
- Powers tribal government offices, economic enterprises, critical lifeline sectors
  - American Red Cross Shelter; Covid-19 Testing
- Can seamlessly island and reconnect to grid
- 420kW solar PV; 2MWh battery storage; diesel generators
- Annual energy cost savings ~$200,000
- Annual greenhouse gas reductions ~200 tons



Facility Microgrid “Solar+”

Photo: Theindychannel.com

- Public/private partnership
  - Blue Lake Rancheria, Schatz Energy Research Center, Humboldt State, PG&E, SunPower, Tesla, CEC, Lawrence Berkeley National Lab, others
  - Funded by the Tribe and a CEC EPIC R&D grant
- Powers fuel station / convenience store complex and EV charging
- Creates a replicable, low-carbon ‘resilience package’
- Solar PV (60kW) + battery storage (106kw/169kwh) – clean energy
- Can island from, and reconnect to, the larger grid
- Advanced building controls – efficiency, demand response, balance
- In emergencies:
  - Supply lifeline sectors to public; emergency responders
  - Important where these types of facilities are the only community resource (e.g., in rural areas)

Microgrids at work in emergencies

- Public Safety Power Shutoff (PSPS) - 10/9/19
- Served over 10,000 people (~10% of the county)
- Supplied general public & response agencies
  - Power
    - Provided critical medical housing in hotel
    - Communication device charging
    - Electric Vehicle (EV) charging
  - Fuels (electricity, gas, diesel, propane)
  - Supplies (ice, water, food)
  - Internet access, cellular connection, ATMs
    - Fuel for local clinic to keep medicines cold
  - Community Support Center | Business Center
    - *Times-Standard* regional paper of record published onsite
- The PSPS apparently did its job – no wildfires
- The microgrids did their job – regional support

Wildfire Outage Reflections

- Outages were relatively short
  - Utilities/agencies worked to limit scope, appreciated given severe, fast-changing weather
  - If outages would have lasted longer, there would have been other issues
    - Cellular / internet communications outages (started to fail at the 24 hour mark)
      - Impacts emergency communication, and electrical grid controls that require internet connectivity
    - Water/wastewater systems
    - Further economic and social disruption
- Tribe’s resilience worked; was well-received
  - Increased interest in microgrids and grid segmentation
    - Focus on overlap of telecom/energy
    - Focus on overlap of transportation/energy
- PSPSs predicted for the next decade or longer

Microgrids as Solutions

- Low- or zero-emission microgrids' stacked benefits
  - Resilience, jobs, capacity, GHG and pollution reduction
- How are microgrids valued; how do we fund them?
  - In business as usual and emergencies; local and regional benefit
  - Value of lower emission energy and transportation
  - Value of resilience and resource adequacy
- Microgrid knowledge transfer
  - Avoid inappropriate technology, increase standardization, lower capital and O&M costs (slower if overly proprietary)
- How to best manage microgrids?
  - Increase regional expertise/capacity | ensure safety and broad grid ecosystem benefits
  - 24/7 emergency response and O&M (electricians, IT)
  - Inter-jurisdictional issues, interconnection policy lag
  - Regional utility owned and operated?
- Microgrids - vs. - segmenting the grid to enable larger, more cost-effective generation/storage projects and ensure all systems are coordinated for grid-easing benefit

Final Thoughts

- Tribes are increasing jurisdictional and operational control of utilities that serve their nations and communities.
- Tribes will be increasingly assuming a utility commission role and portfolio – rate setting, policies, programs
- Tribes will be building more community-scale and utility-scale clean DERs.
- Recommend creating forums to collaborate at the regulatory level


The Washington Post

Amid shut-off woes, a beacon of energy

A Native American tribe has insulated itself from California's blackouts by creating a microgrid utility

Select Resilience Recognition

2019 "Green Power Leadership Award (Direct Project Engagement)" U.S. EPA

2019 "Microgrids for Greater Good Award (Grid-Connected)" Microgrid Knowledge

2018 "Project of the Year (DER Integration)" POWERGRID International, DistribuTECH

2017 "Whole Community Preparedness Award" FEMA

2015-2016 "Climate Action Champion" White House and U.S. Department of Energy

Further Reading

- *Washington Post* article on microgrid and resilience: https://www.washingtonpost.com/climate-solutions/2020/01/01/amid-shut-off-woes-beacon-energy/?arc404=true
- Technical reports on microgrids: https://ww2.energy.ca.gov/2019publications/CEC-500-2019-011/CEC-500-2019-011.pdf and https://ww2.energy.ca.gov/2018publications/CEC-500-2018-022/CEC-500-2018-022.pdf
- *T&D World* article on microgrid: https://www.tdworld.com/grid-innovations/smart-grid/article/20971186/microgrid-serves-multiple-purposes
- *Reasons to be Cheerful* article on Blue Lake Rancheria resilience: https://reasonstobecheerful.world/power-struggle/
- NOAA Climate Website: https://www.noaa.gov/climate
- National Security Implications of a Changing Climate: https://obamawhitehouse.archives.gov/sites/default/files/docs/National_Security_Implications_of_Changing_Climate_Final_051915.pdf
- Intergovernmental Panel on Climate Change Special Report: https://www.ipcc.ch/sr15/
- United Nations Environment Programme *Emissions Gap Report (2019)*: https://wedocs.unep.org/bitstream/handle/20.500.11822/30798/EGR19ESEN.pdf?sequence=13
- Rhodium Group Climate Risk Data: https://rhg.com/impact/climate-risk/

Clean Coalition

Value-of-resilience from Solar Microgrids

VOR123 Methodology

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13 January 2021

Clean Coalition (nonprofit)

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.

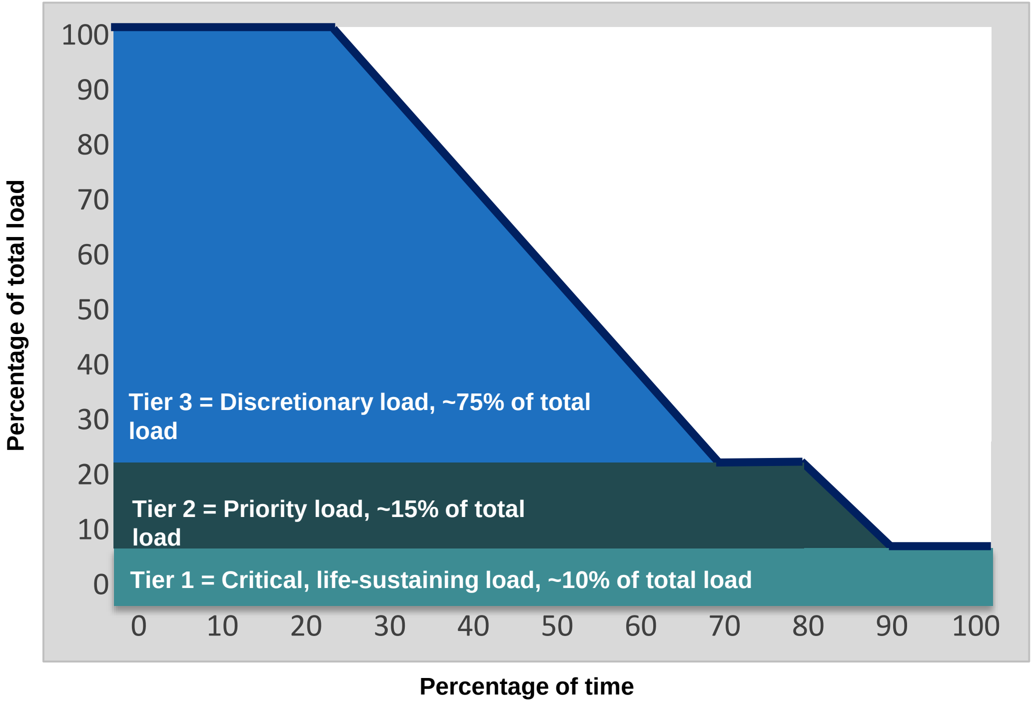
VOR123 methodology yields a 25% typical adder

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.

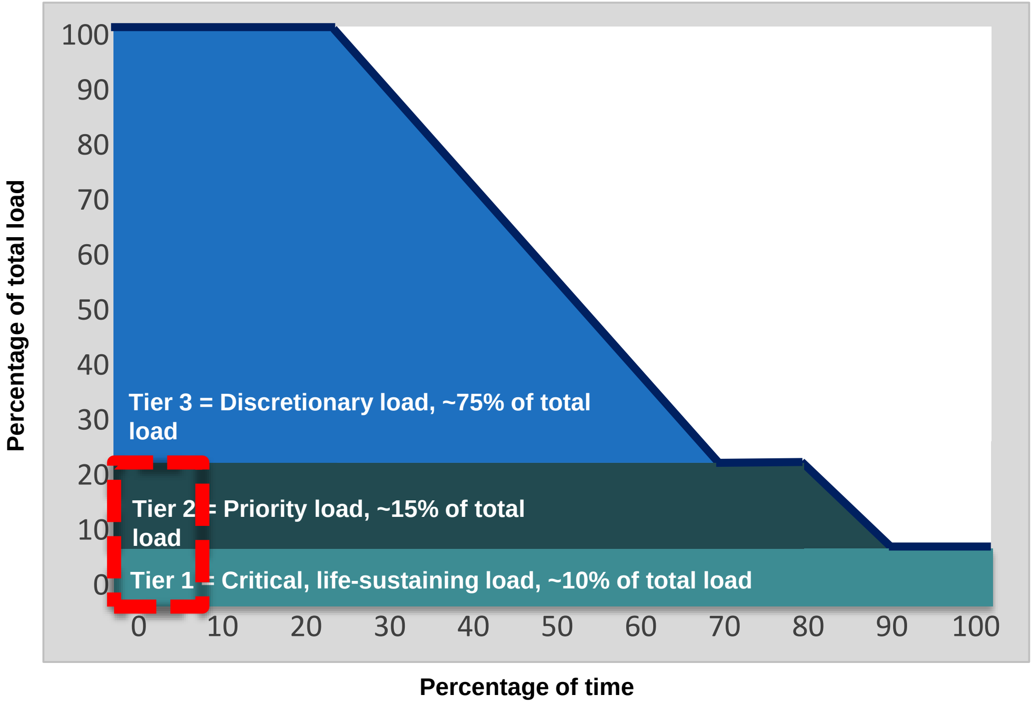
Typical load tier resilience from a Solar Microgrid



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

Clean Coalition

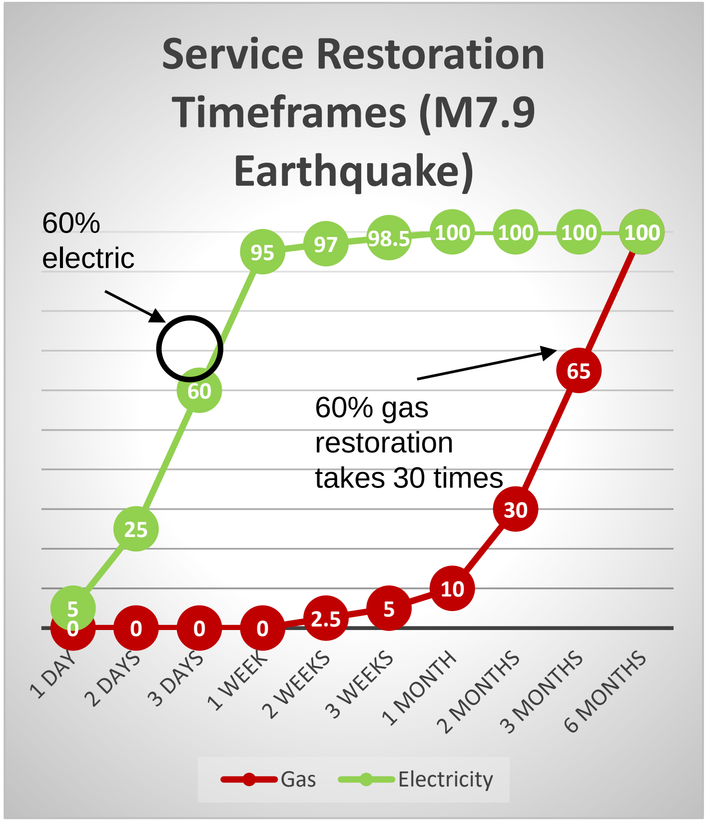


A typical diesel generator is configured to maintain 25% of the normal load for two days. If diesel fuel cannot be resupplied within two days, goodbye. This is hardly a solution for increasingly necessary long-term resilience. In California, Solar Microgrids provide a vastly superior trifecta of economic,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

Validating VOR123 – four confirming approaches

Clean Coalition

Importantly, the Clean Coalition has resolved on the general 25% premium figure after conducting numerous analytical approaches, including the following three primary methodologies:

1. **Cost-of-service (COS):** This is the cost that suppliers will charge in order to offer the Solar Microgrid VOR across the Tier 1, 2, and 3 loads (VOR123). As evidenced by a case study of the Santa Barbara Unified School District (SBUSD), a COS that reflects a 25% resilience adder is sufficient to attract economically viable Solar Microgrids at the larger school sites.

2. **Department of Energy (DOE) Multiplier**: The DOE researched VOR and determined that the overall value of critical load that is missed due to grid outages over an annual period is $117/kWh. While the Clean Coalition stages Solar Microgrids to provide indefinite solar-driven backup power to critical loads, and considers 30 consecutive days to be a proxy for indefinite, the Clean Coalition assumed a conservative annual cumulative outage time of 3 days for the DOE Multiplier VOR analysis. The SBUSD case study yielded an overall 30% VOR adder to the 2019 electricity spend, as indicated in the table below.

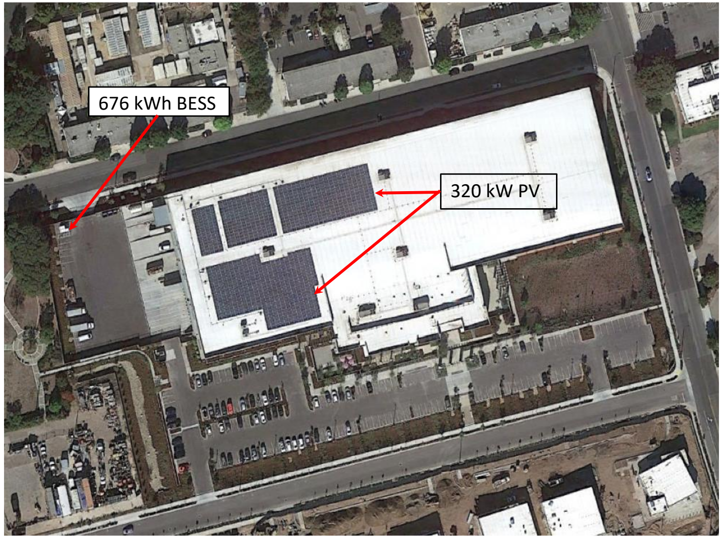
DOE Multiplier results for SBUSD prototype schools

Prototypical School	Average Tier 1 Load (kW)	Tier 1 kWh/year missed (72 hours/year)	VOR ($117/kWh)	Total 2019 electricity spend	DOE-derived VOR % of 2019 spend
Franklin ES	4.7	336	$39,256	$70,000	56%
La Cumbre JHS	2.8	202	$23,587	$78,000	30%
San Marcos HS	4.4	314	$36,729	$188,000	20%
Totals	11.8	851	$99,572	$336,000	30%

Validating VOR123 – four confirming approaches

3. **Market-Based:** This is essentially the market price, where supply meets demand, and the Direct Relief Solar Microgrid provides a local case study. Direct Relief has deployed a 320 kW PV and 676 kWh BESS Solar Microgrid, and while the PV is purchased via a roughly breakeven PPA, the BESS is leased at an annual cost of $37,500. While the size of the Direct Relief BESS (676 kWh) is a bit smaller than the size of the San Marcos Solar Microgrid BESS (710 kWh), Direct Relief is paying a bit more ($37,500/year) than the DOE Multiplier would value the San Marcos BESS ($36,729/year, as shown in Table 2-2).

Direct Relief Solar Microgrid



Validating VOR123 – four confirming approaches

Clean Coalition

4. **Avoided Diesel Generator Cost:** This approach is analogous to the previous cost-of-service (COS) approach, except it calculates the adder needed for a diesel generator to fulfill the VOR123 level of resilience. For this calculation, we equate "indefinite backup" to 30 days, and assume such a grid outage occurs once per year, during which the loads need to be maintained according to the standard VOR123 profile. The result, for a diesel backup system sized for a 1 million kWh/year site in Santa Barbara, is a **21 % adder** to the electricity bill.

Site Load Inputs

Total Site Annual Load (kWh)	1,000,000
Outage Duration (days)	30
Number of outages/year	1
Average cost of utility-purchased electricity ($/kWh)	$0.18
Average Site Power (kW)	114
Yearly cost of utility-purchased electricity	$180,000

VOR123 Parameters

Tier 1 % of time	100%
Tier 2 % of time	80%
Tier 3 % of time	30%
Tier 1 % of load	10%
Tier 2 % of load	15%
Tier 3 % of load	75%

TCLR (kWh)	36,575

Diesel Genset Size Check

Diesel genset size (kW)	200
Peak load (kW)	171

Diesel Tank Capacity Check

Diesel genset tank capacity (gallons)	3,000
Diesel used for TCLR (gallons)	3,040

Financials

Diesel Genset Depreciation Life (years)	15
Diesel Genset Capex	$350,000
Diesel Genset Opex ($/year)	$14,694
Diesel Genset Depreciated Capex ($/year)	$23,333
Diesel Genset Total Yearly Cost	$38,027

Cost of Diesel Genset backup energy ($/kWh)	**$1.04**
% adder of Diesel backup cost on top of utility-purchased electricity	**21%**

Goleta Load Pocket (GLP)
Community Microgrid
case study

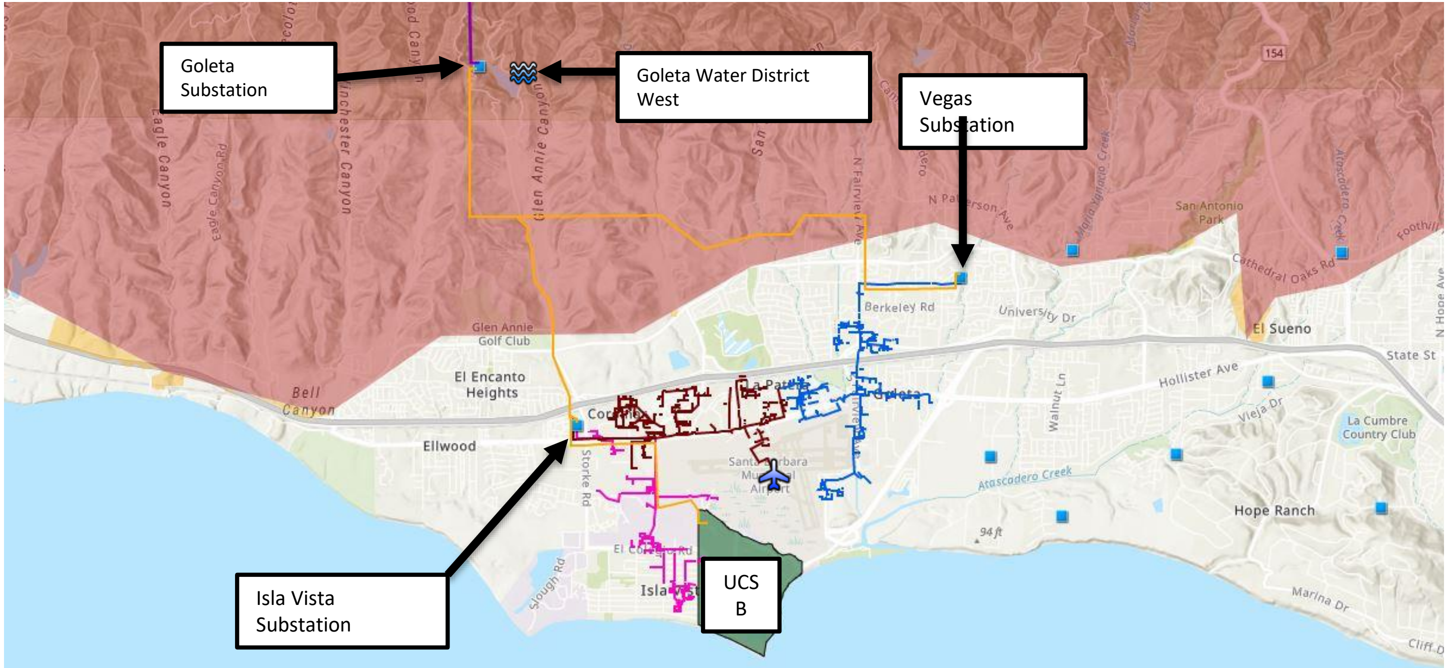
Goleta Load Pocket (GLP) and attaining resilience

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.

Target 66kV feeder at the core of the GLP

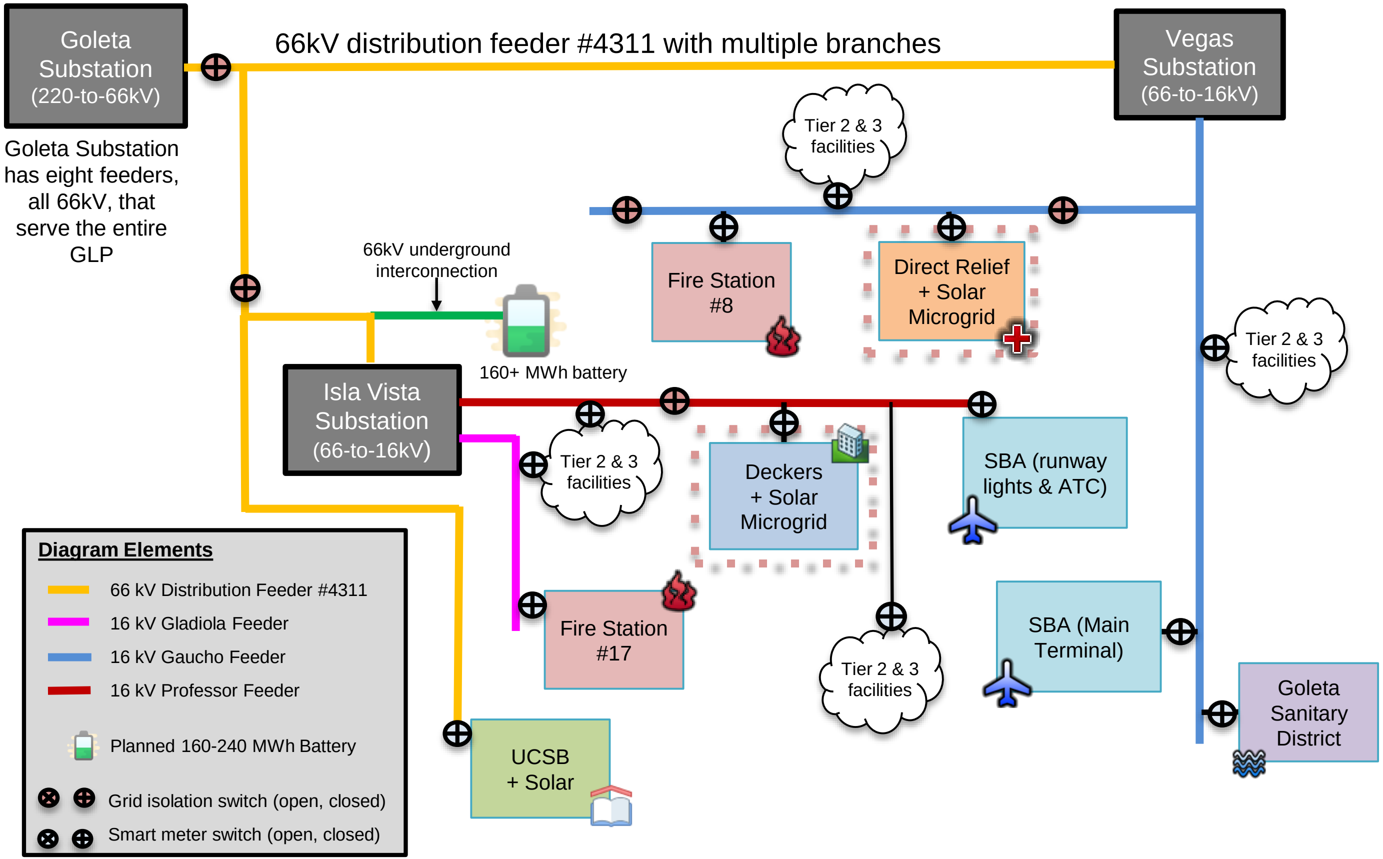
Clean Coalition



Legend

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

Target 66kV feeder grid area block diagram



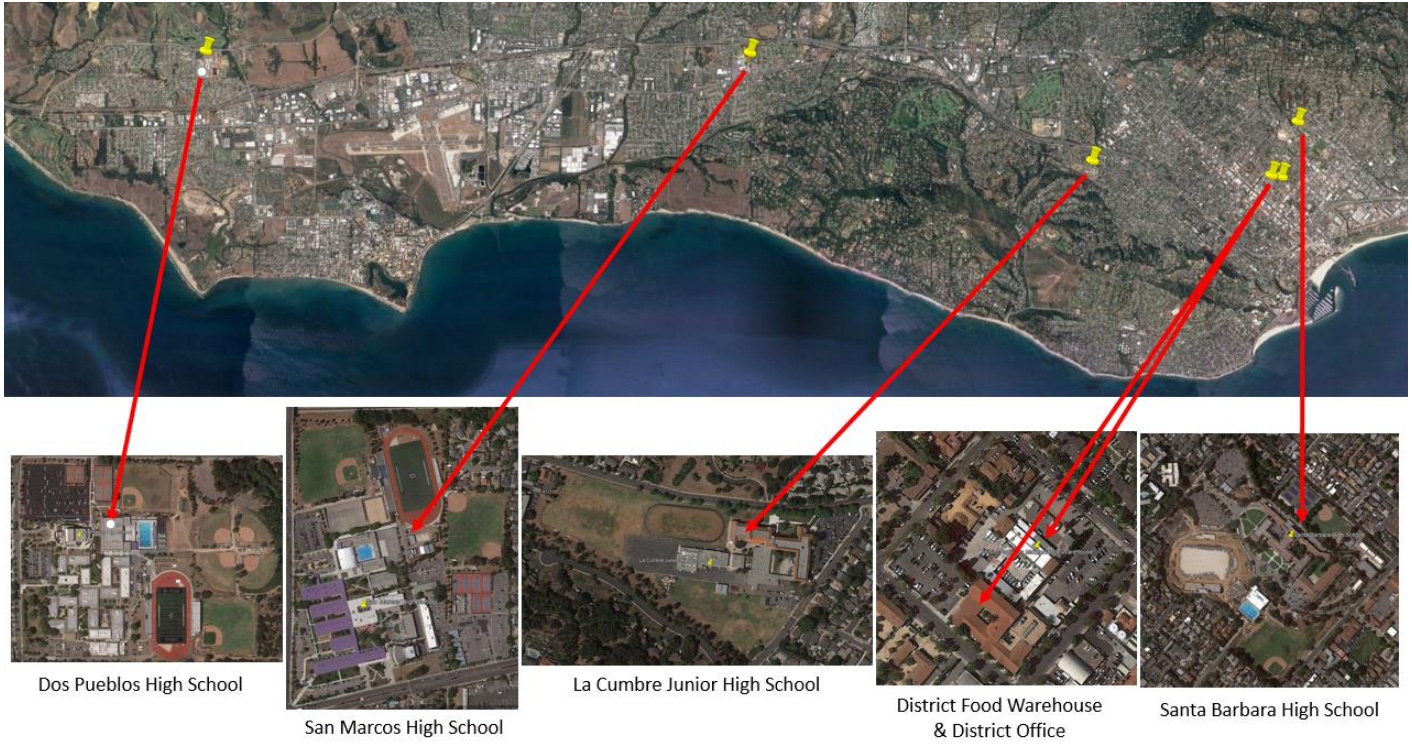
Clean Coalition

Santa Barbara Unified School District (SBUSD) case study

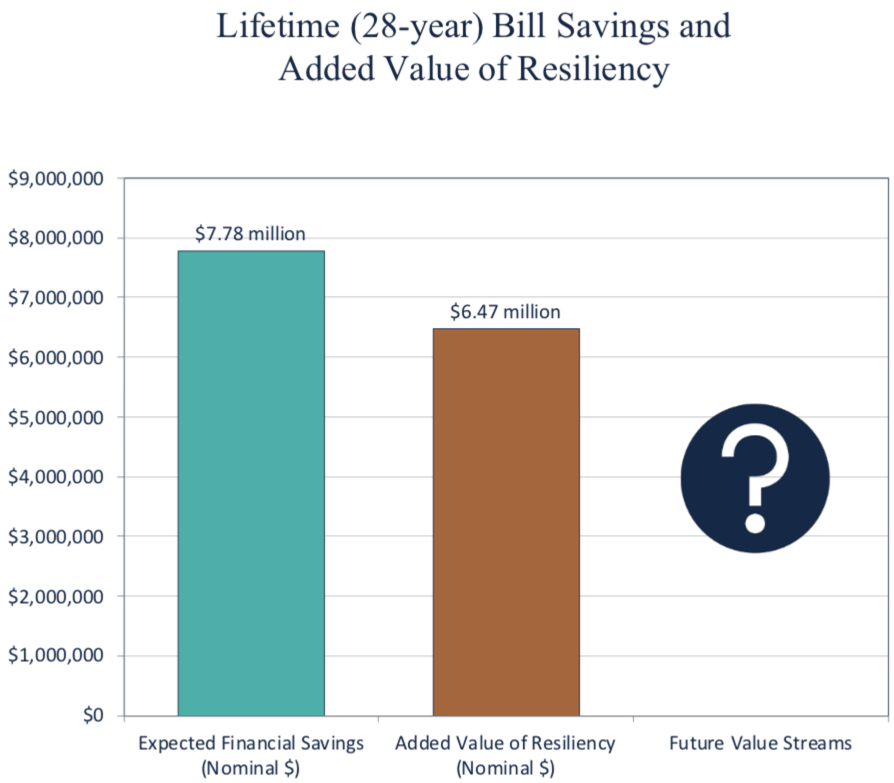
Santa Barbara Unified School District (SBUSD)

- 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.

Six SBUSD Solar Microgrid sites



Guaranteed SBUSD bill savings and free VOR



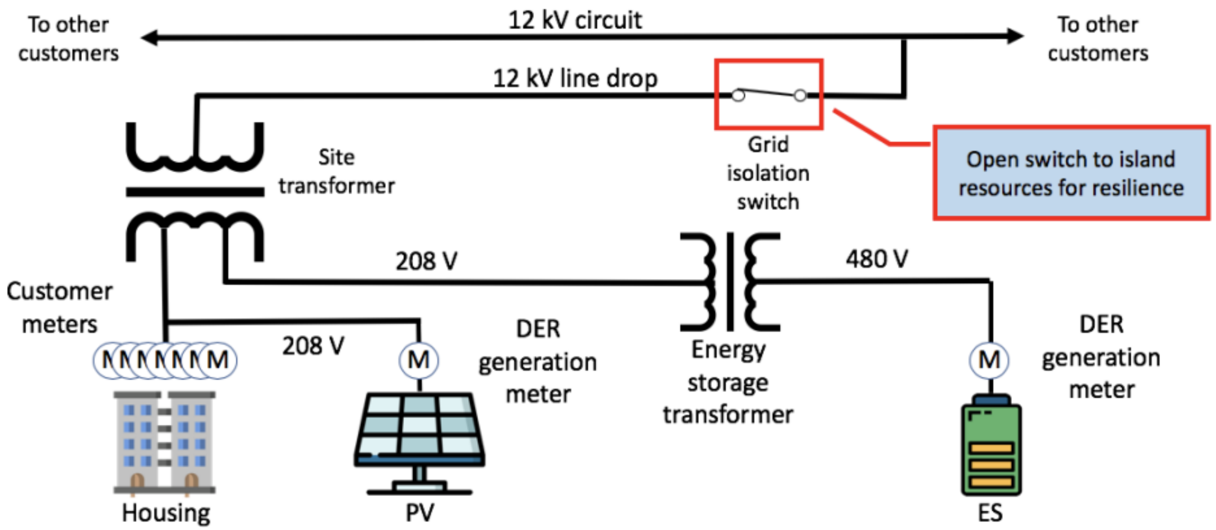
Valencia Gardens Energy Storage (VGES)
Community Microgrid opportunity

Peek at the Community Microgrid future

Ecoplexus project at the Valencia Gardens Apartments in SF. ~800 kW meeting ~80% of the total annual load.

VGES pathway to Community Microgrid

Clean Coalition



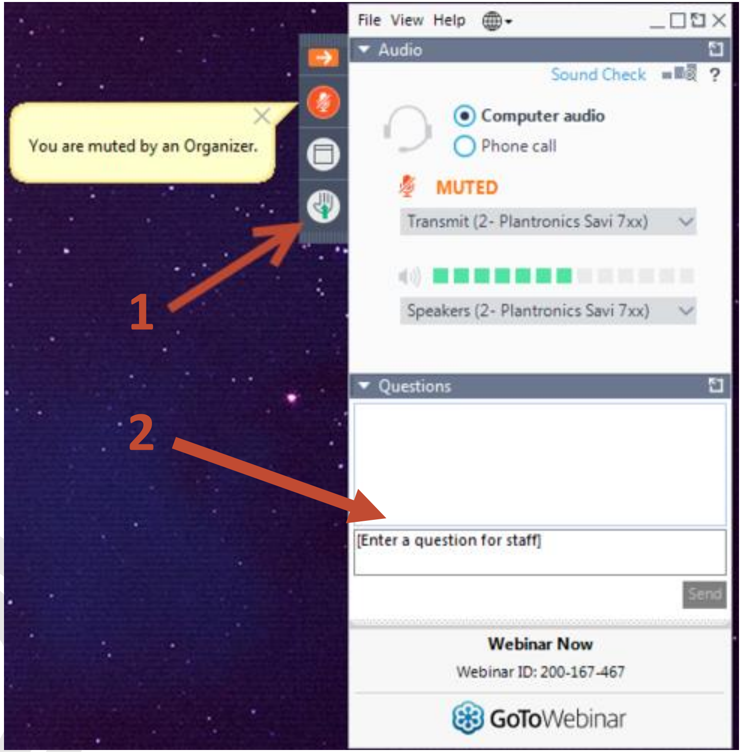
VGES can be upgraded to a full Community Microgrid via a single Grid Isolation Switch

QUESTIONS

Submit questions two ways:

1. Raise your hand and the moderator will call on you to unmute your line
   Enter your PIN – click Audio to see it

2. Type a question into the question box



National Association of State Energy Officials

THANK YOU

This concludes the webinar.

NARUC-NASEO Microgrids State Working Group members are invited to remain for a brief members-only discussion.