Clean Coalition

Making Clean Local Energy Accessible Now

The Sonoma Community Microgrid Initiative:
The Path to Resilience and Sustainability

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Clean Coalition

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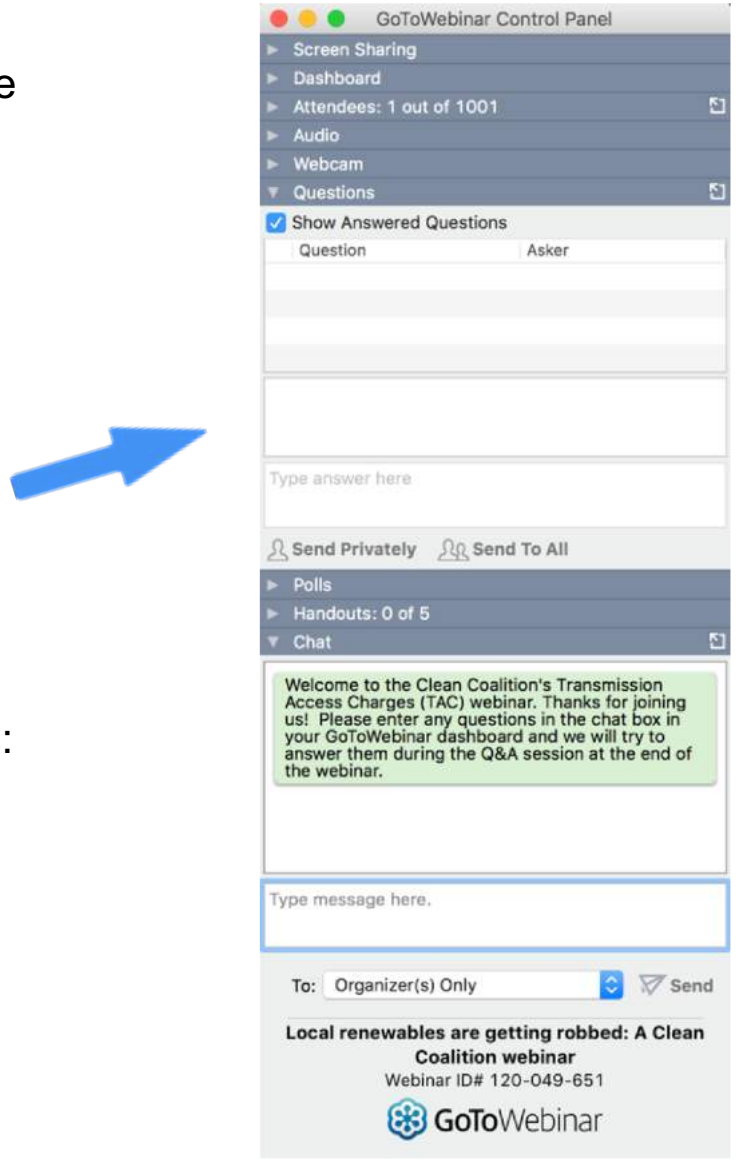
GoToWebinar FAQ

- Webinar recording and slides will be sent to registered attendees within two business days
- All webinars are archived on www.clean-coalition.org and the Clean Coalition's YouTube channel
- Submit questions in the Questions window at any time (window view varies by operating system and browser)
- Questions will be answered during the Q&A portion of the webinar
- Contact Josh for webinar questions: josh@clean-coalition.org



Today's presenter

Greg Thomson

Director, Community Microgrid Initiative

greg@clean-coalition.org

Clean Coalition (nonprofit) mission

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

Expertise areas

Analysis & Planning

Full cost and value accounting for DER; siting analysis

- PG&E
- PSEG
- SCE

Grid Modeling & Optimization

Powerflow modeling; DER optimization

- PG&E
- PSEG
- SCE

Program and Policy Design

Grid planning, procurement, and interconnection

- LADWP, Fort Collins, PSEG
- City of Palo Alto (FIT and solar canopy RFP)
- RAM, ReMAT
- Rule 21 & FERC

Community Microgrid Projects

Design and implementation

- San Francisco, CA
- Long Island, NY
- U.S. Virgin Islands

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Making Clean Local Energy Accessible Now

The Sonoma Community Microgrid Initiative

Part 1: Overview of Community Microgrids

Energy is critical infrastructure

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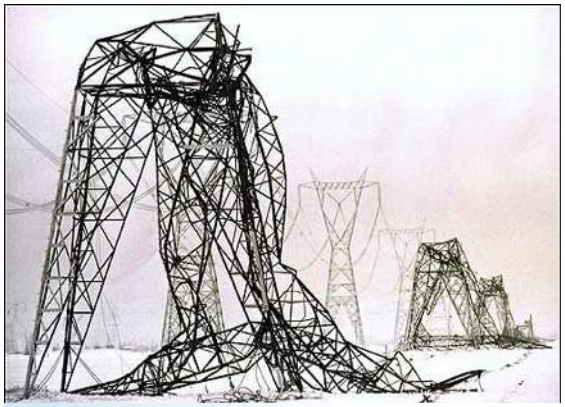
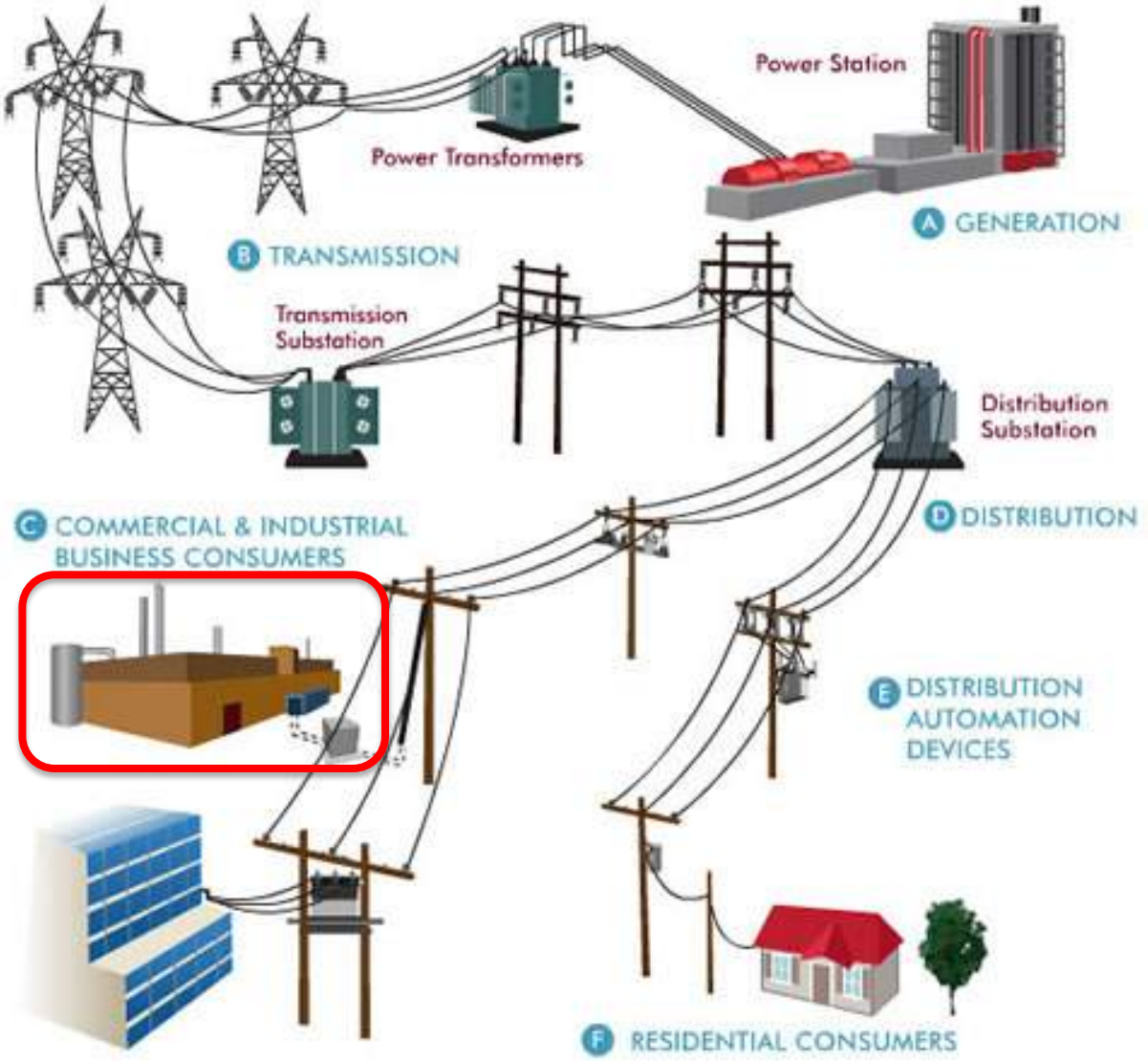
Our legacy, centralized energy architecture carries multiple critical risks.

- This architecture is **costly, aging, inefficient,** and a **highly vulnerable security risk**
- **Extreme weather events** are occurring more frequently, further demonstrating the **vulnerability** and **high cost**
- **Cyber attacks** are a **growing risk,** and an attack on a centralized system can **affect millions**
- To ensure both **local and national security,** we must move quickly to a new solution

Community Microgrids:
Cleaner, more reliable and resilient, more affordable



Traditional microgrids focus on single customers



Source: Oncor Electric Delivery Company

Community Microgrids serve thousands of customers

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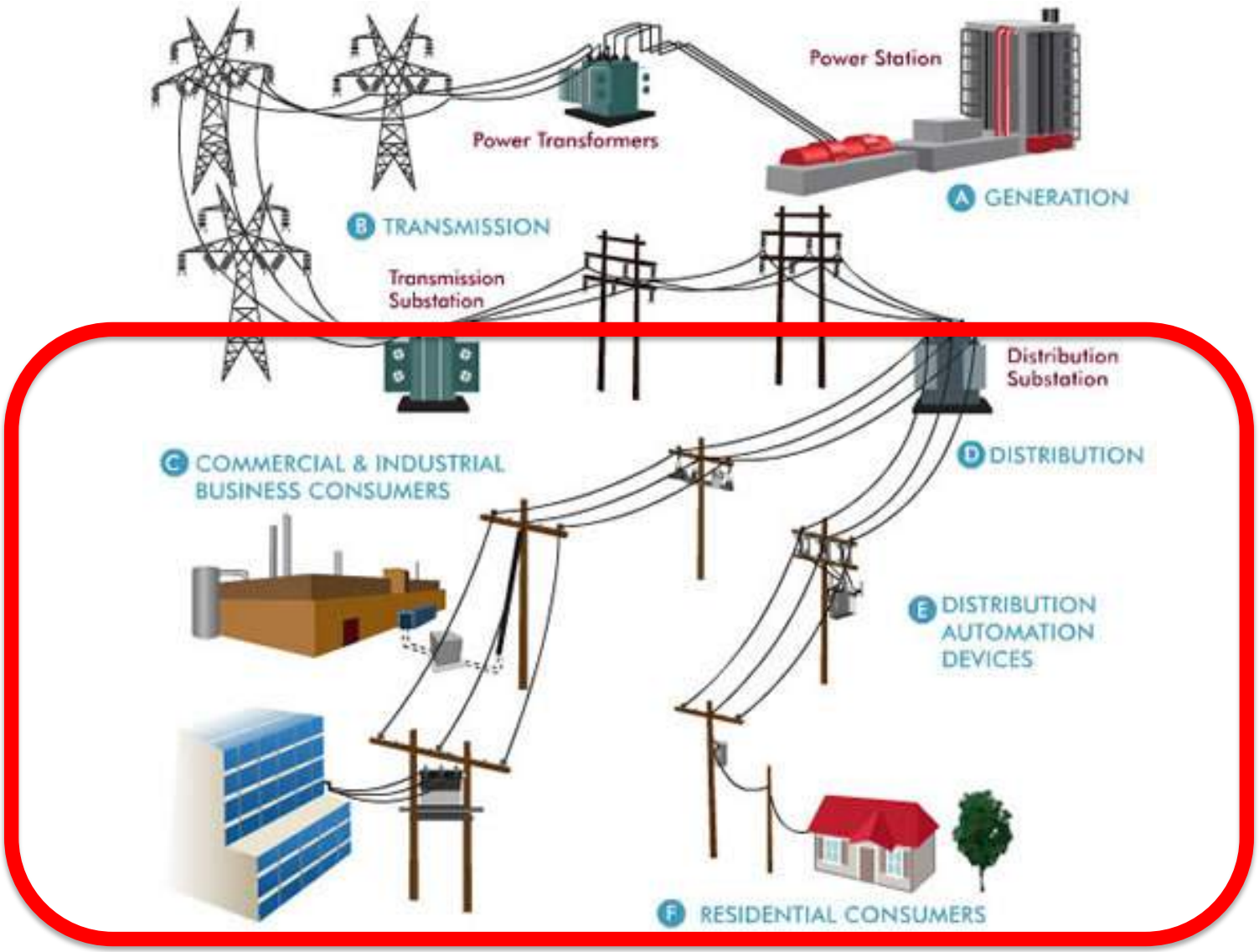

Source: Oncor Electric Delivery Company

Community Microgrids: The grid of the future

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Community Microgrids are a modern approach for designing and operating the electric grid, stacked with local renewables and staged for resilience.

Key features:

- A targeted and coordinated **local grid area** served by one or more distribution substations
- **Optimal penetrations of clean local energy** and other Distributed Energy Resources (DER) such as energy storage and demand response
- **Ongoing, renewables-driven backup power** for critical and prioritized loads across the grid area
- A solution that can be **readily extended** throughout a utility service territory – **and replicated** into any utility service territory around the world

Community Microgrids: Why?

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A Community Microgrid brings communities four benefits that are not provided by today's mostly centralized energy system.

1. **Lower costs and increased economic investment**
   - Reduces the cost of electricity by eliminating expensive peak periods and associated infrastructure costs
   - Increases local economic investment

2. **Improved overall performance**
   - Replaces fossil fuels, improves grid performance, and serves local transportation needs
   - Provides better outcomes for all stakeholders

3. **Resilience and security**
   - Provides ongoing power to critical and priority loads in communities
   - Can withstand multiple disaster and/or cybersecurity scenarios

4. **Replicable and scalable model**
   - Can cover an entire substation area
   - Can be scaled and deployed in any community

Community Microgrids feature “local balancing”

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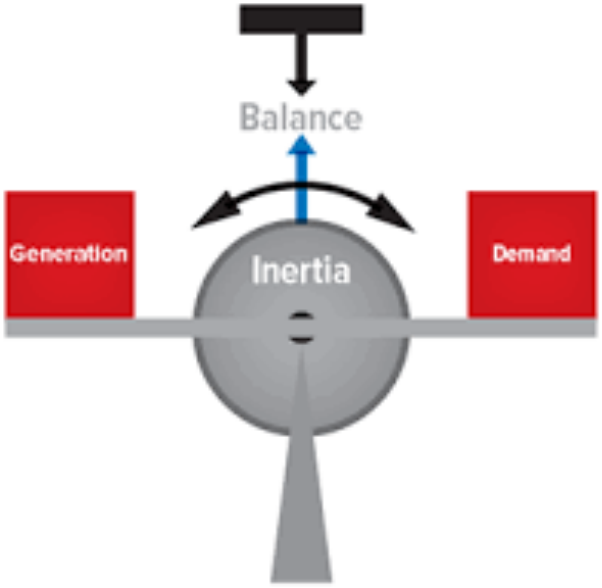
Local balancing is a more efficient way to operate the grid

1. **Flattens and lowers load shapes** across entire community areas, reducing system-wide peaks and thus the most costly energy and grid infrastructure
2. **Manages variability/volatility locally**, rather than exporting volatility as an aggregated issue up to the centralized system
3. **Provides energy resiliency and security** to cities and communities via power generated, delivered, and consumed locally



The distribution and transmission grids become equal partners in grid operations and efficiencies.

Local balancing offers multiple economic benefits

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The six economic benefits of local balancing via Community Microgrids

1. Cost reductions due to **peak management**
   - Protection against the high cost of peak energy
2. Cost reductions due to **demand charges**
   - Protection against additional fees charged by utilities for peaks
3. Cost reductions due to **rate management**:
   - Protection against future rate changes, e.g., evening ramp
4. Cost reductions due to **investment deferrals**
   - Deferral of substantial costs for centralized infrastructure
5. Cost **certainty**
   - Keeping rates and costs constant for consumers as well as grid operators.
6. Increased **economic investment** in communities

The current cost issues are a product of our mostly centralized system

Example: Local balancing optimizations

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Opportunity:
Vastly untapped commercial and industrial energy assets

The formula for low-carbon cities:

Example: Solar on 25% of commercial and industrial rooftops
= 25%+ local annual energy use

- ✓ Largest financial opportunity — largest DER systems
- ✓ Largest rooftops and parking lots — most generation
- ✓ Largest daytime loads — matching solar
- ✓ Largest utility bills, including demand charges — motivated
- ✓ Best solution for grid — system peak reduction, strong feeders
- ✓ Most carbon emissions within cities

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The Sonoma Community Microgrid Initiative

Part 2: Community Microgrid examples

Example: California

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Setting a precedent: Community Microgrids eliminate gas peakers

- Influenced by Clean Coalition cost analysis, the California regulators are rejecting new peaker plants, such as Puente in Oxnard, CA, in favor of solar+storage
- In Jan 2018, the California Public Utilities Commission also announced that PG&E will be required to use renewables and storage instead of gas-fired plants run by Calpine
- This appears to be “the first time a utility will procure energy storage to replace existing gas plants for local capacity needs.”
- Leveraging this important analysis can prevent future new gas plants across the country

Source: https://www.greentechmedia.com/articles/read/pge-must-solicit-energy-storage-ders-to-replace-three-existing-gas-plants

Example: New York

New York State uses peak power only 100 hours each year – costing ratepayers $1.7 billion to serve less than 1% of the system's needs.

- On Jan 2, 2018 Gov. Andrew Cuomo announced a state initiative to **deploy 1,500 MW of energy storage** by 2025.
- Includes utility **procurements**, changes in utility **rates** and wholesale energy **markets**, and storage for large-scale **renewable** procurements
- The Marcus Garvey affordable housing complex in Brooklyn, NY uses a new solar+storage microgrid system to **cut costs**, improve grid **reliability**, and provide **resilient** backup power
- NY Green Bank to commit **at least $200 million** for storage-related investments

New York: Long Island Community Microgrid

Clean Coalition

Long Island Community Microgrid (LICMP) design

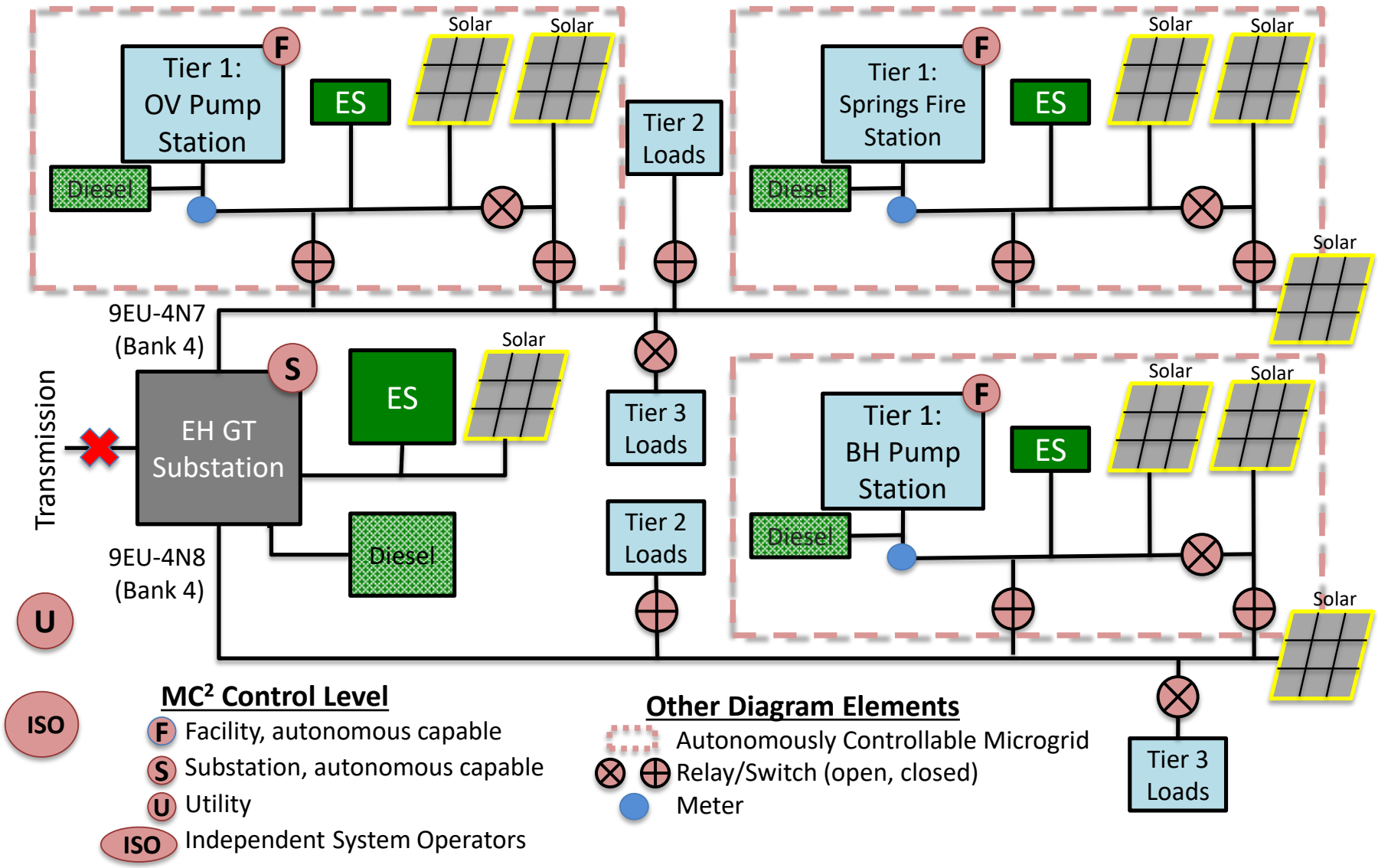
NEW YORK STATE OF OPPORTUNITY. | NYSERDA

- LICMP would **avoid $29-38 million** of new transmission capacity resulting in a net cost benefit for all ratepayers.
- The combined solar+storage system would **reduce NYISO capacity charges by $6 million** through 2022, and over $1 million annually thereafter.
- LICMP would shift wholesale power purchases from peak to off-peak periods, realizing **net energy savings of $2.5 million** by 2022 and more than $500,000 annually thereafter.
- Resilience savings from avoided outages would **exceed $330,000** per outage day.
- Savings = **lower electric rates** for all PSEG-LI utility customers.

PSEG LONG ISLAND
We make things work for you.

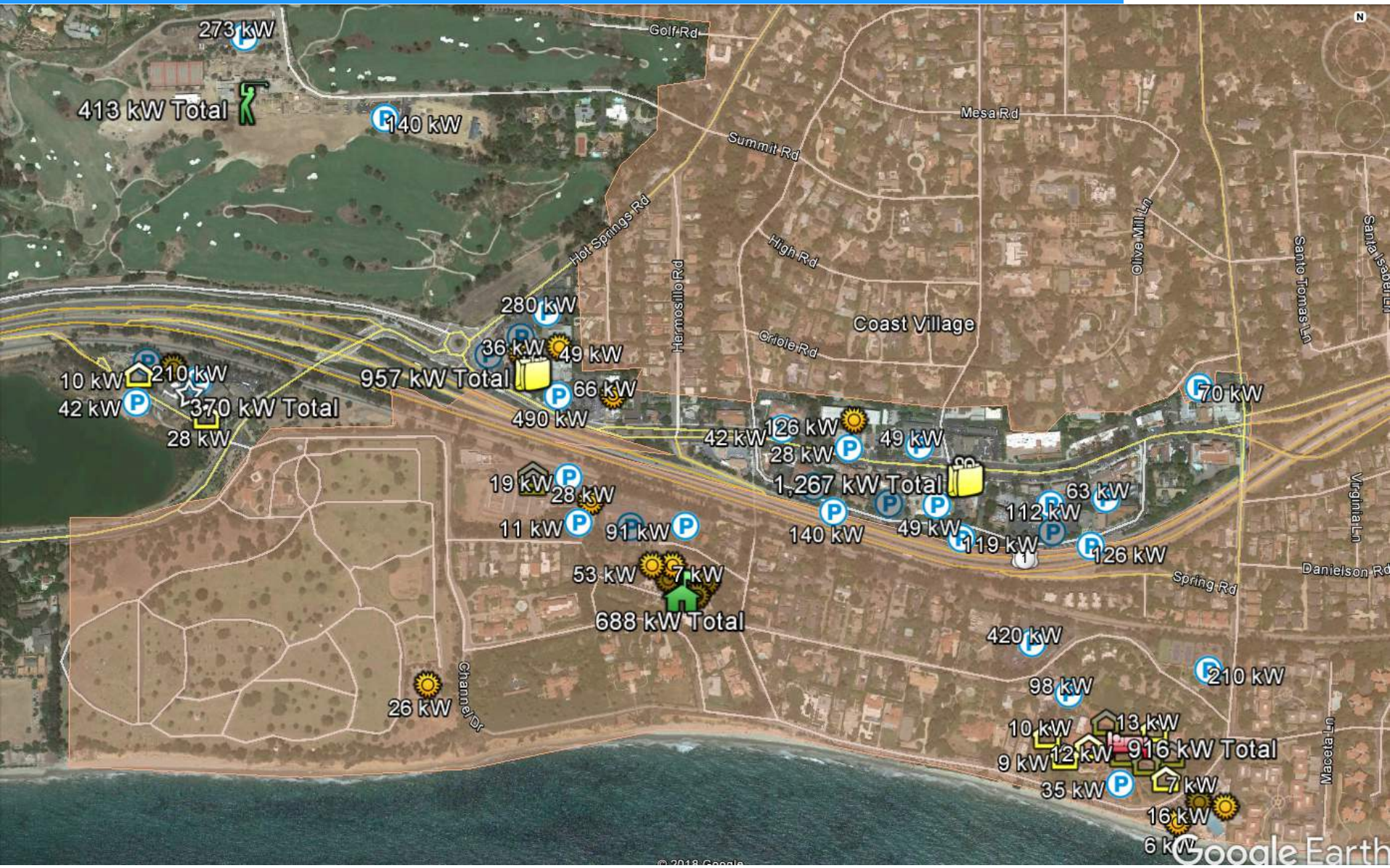
Long Island Community Microgrid design

Clean Coalition



California: Montecito Community Microgrid map view

Clean Coalition



Montecito Community Microgrid block diagram

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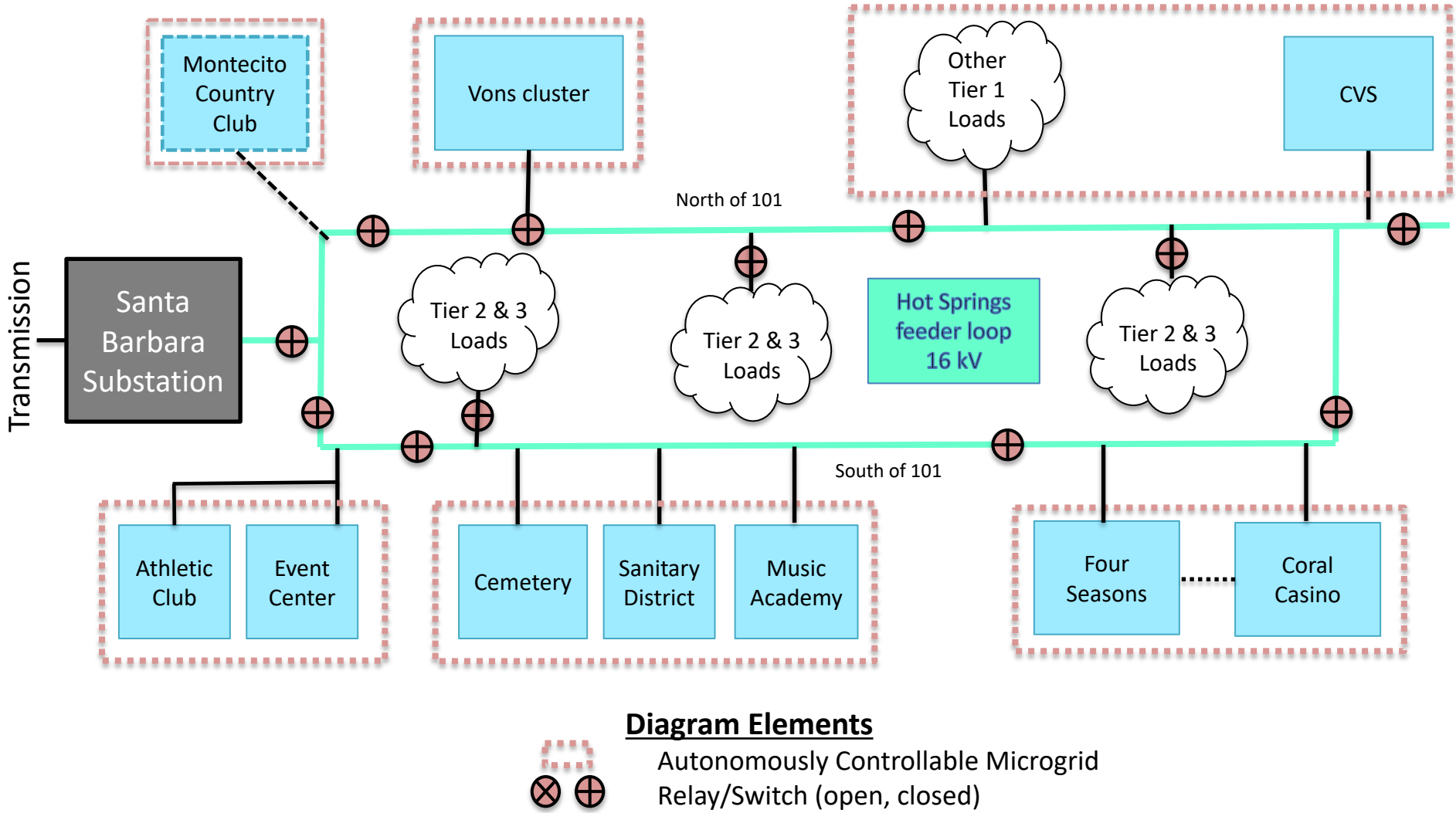
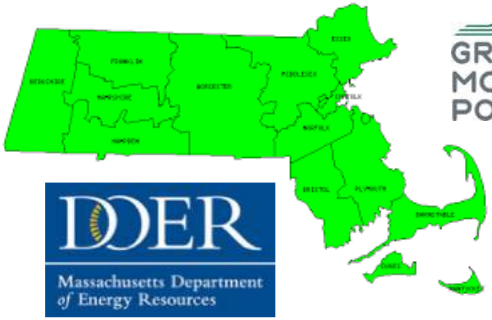


Examples: many other states

Clean Coalition

Many other states are taking big steps towards Community Microgrids – recognizing the **full value** including cost savings, resilience, and sustainability. These community programs cover distributed solar, storage, and now even "microgrid clusters." (See backup slides for more…)

- **Vermont**
- **Massachusetts**
- **Connecticut**
- **Minnesota**
- **Illinois**

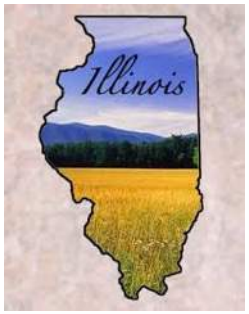


GREEN MOUNTAIN POWER

DOER
Massachusetts Department of Energy Resources

Connecticut Department of ENERGY & ENVIRONMENTAL PROTECTION

Xcel Energy®



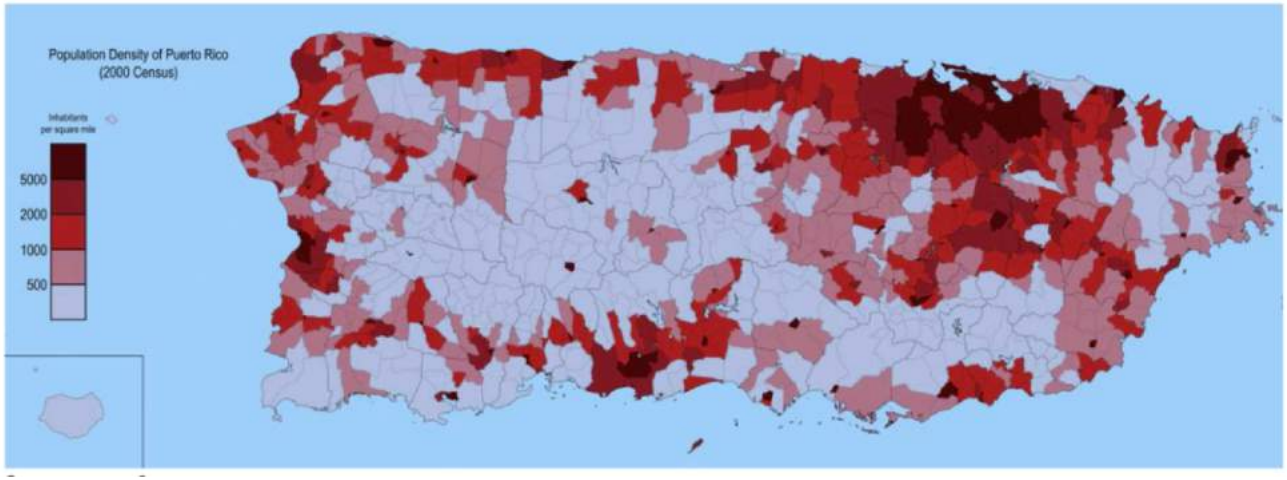
ComEd

Moving forward: Puerto Rico

Clean Coalition

Puerto Rico rebuild highlights: the “Build Back Better” plan

- A unique opportunity to rebuild and update the power system to 21st-century technologies and best practices, rethinking how power is generated and distributed.



- Hurricanes Maria and Irma decimated T&D lines across the island and caused widespread wind and flooding damage to substations, generation, and distribution facilities.
- Damage from the hurricanes resulted in the longest power outage in US history.

Moving forward: Puerto Rico

Clean Coalition

Puerto Rico rebuild highlights: the “Build Back Better” plan

- **Team**: Features many grid and energy experts including NY Power Authority, Con Ed, Edison International, EPRI, PSE&G Long Island, DOE, SEPA, Puerto Rico Electric Power Authority, Navigant Consulting, NREL, PNNL, Grid Modernization Lab Consortium
- **Goal**: Implement resilience and hardening measures designed to increase the capability of Puerto Rico’s electric power grid to withstand future storms
- **Recommendation**: Use modern grid technologies and control systems, renewable energy resources, and new technologies such as energy storage and microgrids to make energy **abundant, affordable, resilient, and sustainable**. Lowers the dependence on large central generating stations.

New York Power Authority

EDISON INTERNATIONAL

conEdison

U.S. DEPARTMENT OF ENERGY

EPRI ELECTRIC POWER RESEARCH INSTITUTE

NREL NATIONAL RENEWABLE ENERGY LABORATORY

This modern power system design will provide a model for the industry while promoting private investments in the use of clean energy for a low-carbon future.

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Making Clean Local Energy Accessible Now

The Sonoma Community Microgrid Initiative

Part 3: Rebuilding resiliently in Sonoma

Sonoma Community Microgrid Initiative

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Objective: make energy abundant, affordable, resilient, and sustainable

1. **Rebuild fire-destroyed areas with high levels of resilience and sustainability** in homes, buildings, and grid, enabling a modern, distributed, and carbon-free system that delivers substantial economic, environmental, and resilience benefits.

2. **Establish a blueprint for rebuilding disaster-destroyed areas** in a timely and cost-effective manner that also maximizes the economic and resilience value of energy as a critical resource to ratepayers, property owners, and municipalities.

3. **Provide a model for operating a modern distribution grid** that incorporates optimal distributed energy resources, cost-effective local balancing, full interaction with the transmission system, and local energy markets — with resulting benefits across both grid operations and economics.

4. **Ensure that building codes are advanced** to achieve more resilient, safer, and cleaner building stock and communities.

Sonoma Community Microgrid Initiative: Benefits Analysis

Clean Coalition

Sonoma Initiative example target: 30 MW Solar PV

Benefits over 20 years

Energy

Cost parity: Solar vs. NG, LCOE
$150M: Spent locally vs. remotely
$50M: Avoided transmission costs
$20M: Avoided power interruptions

Economic

$120M: New regional impact
$60M: Added local wages
1,000 job-years: New near-term and ongoing employment
$6M: Site leasing income

Environmental

46M pounds: Annual reductions in GHG emissions
10M gallons: Annual water savings
225: Acres of land preserved

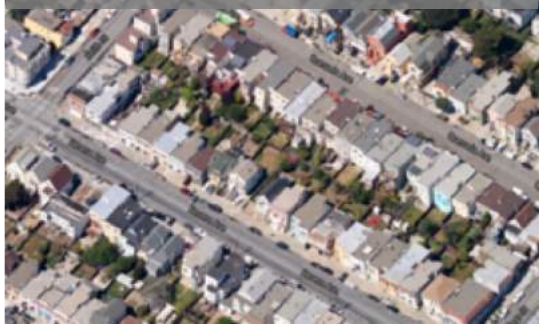
Example: Large rooftop
- PV sq. ft = 47,600
- System size = 714 kW

Commercial: 18 MW

Example: Large parking lot
- PV sq. ft = 37,800
- System size = 567 kW

Parking lots: 2 MW

Example: 50 avg. rooftops
- Avg. PV sq. ft = 343
- Avg. system size = 5 kW

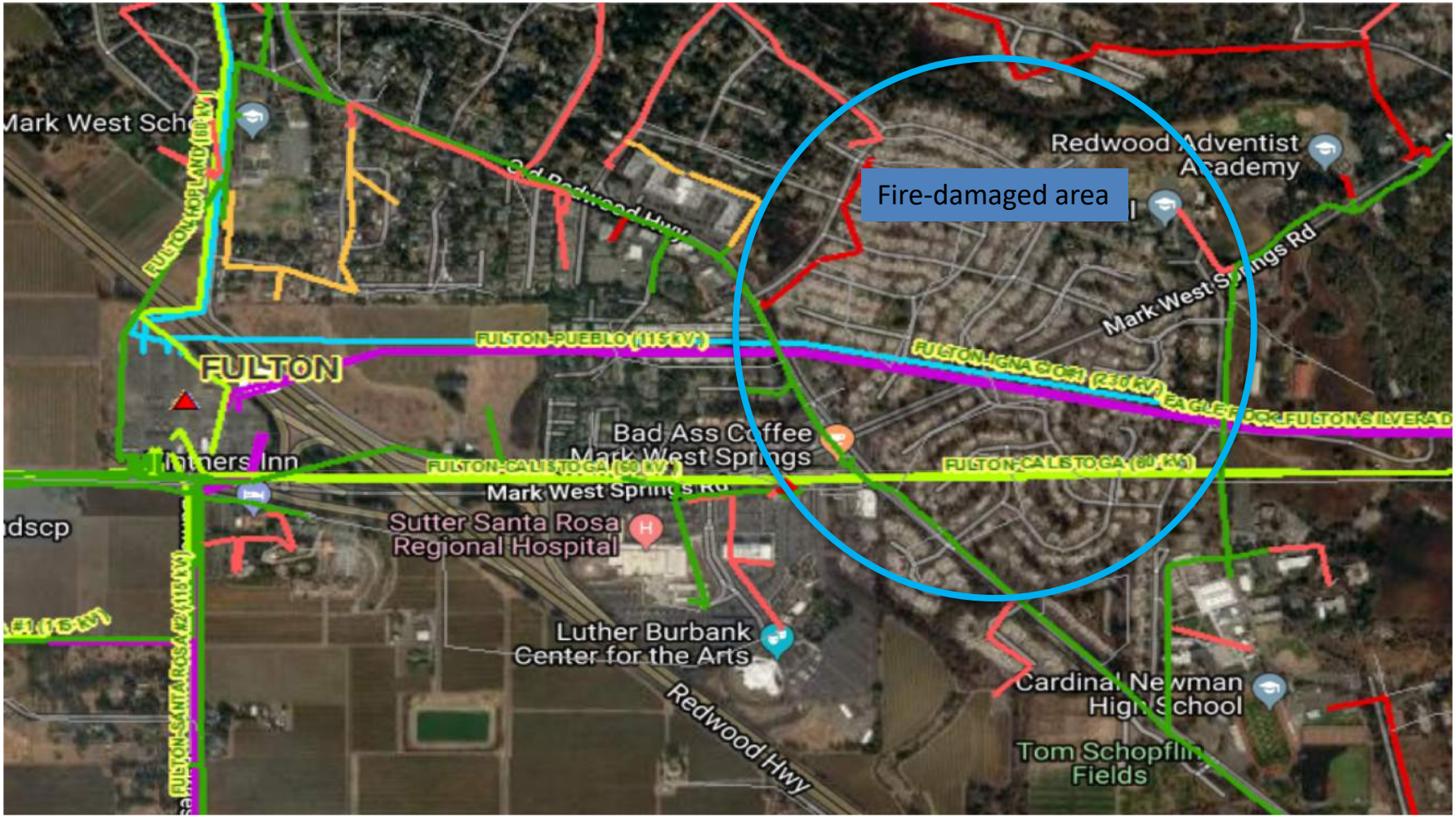


Residential & MDU: 10 MW

Sonoma Community Microgrid Initiative: Example Location 1

Clean Coalition

- Larkfield and the Old Redwood Highway Corridor – ideal for Community Microgrid
- Served by single substation, Fulton.



Sonoma Community Microgrid Initiative

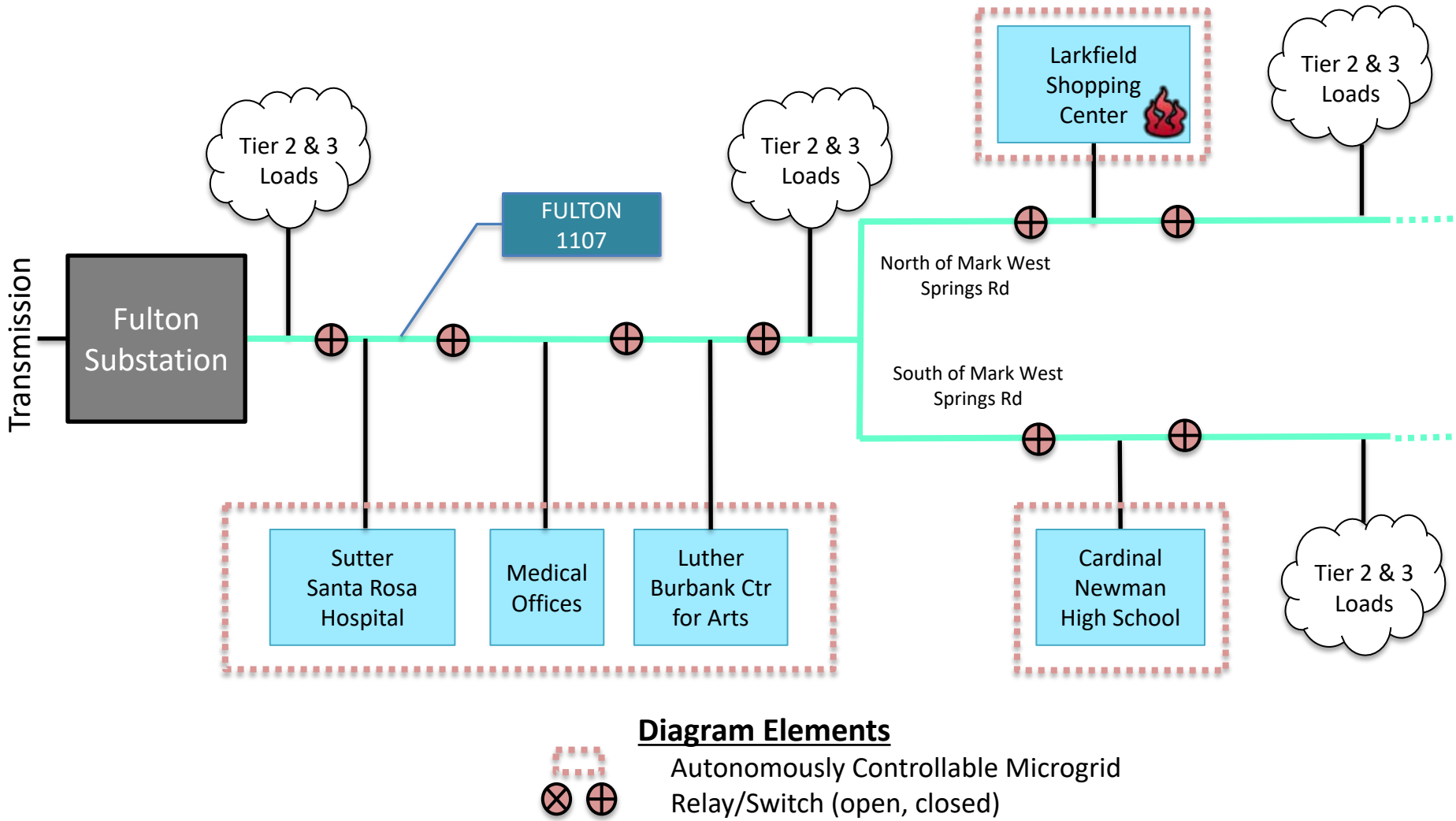
Example key sites:
critical, priority, large roofs & parking, etc.

Larkfield and the Old Redwood Highway Corridor

- Sutter Santa Rosa Regional Hospital
- Luther Burbank Center for the Arts
- Cardinal Newman High School
- Mark West School and area
- Larkfield Shopping Center
- Molsberry Markets
- John B Riebli School
- St. Rose School

Example: Larkfield and Old Redwood Highway Area Community Microgrid block diagram

Clean Coalition



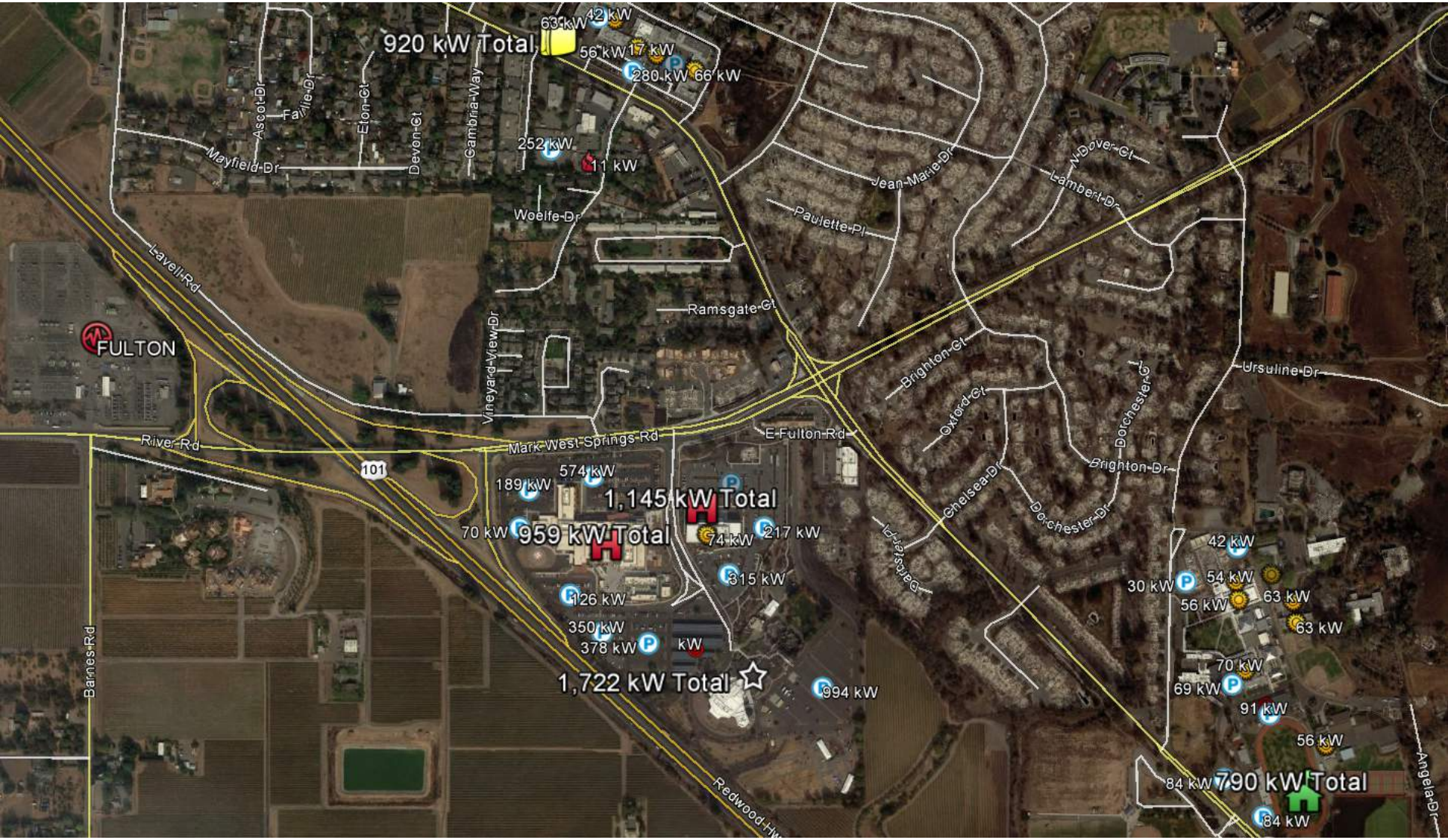
Example Community Microgrid Elements

Clean Coalition

Cluster	Elements	PV kW AC
Sutter Regional Hospital	Hospital	959
	Medical Offices	1144
	Luther Burbank Ctr	1722
Larkfield Shopping Center	Shopping Center & Fire Station	920
Cardinal Newman HS	School	789

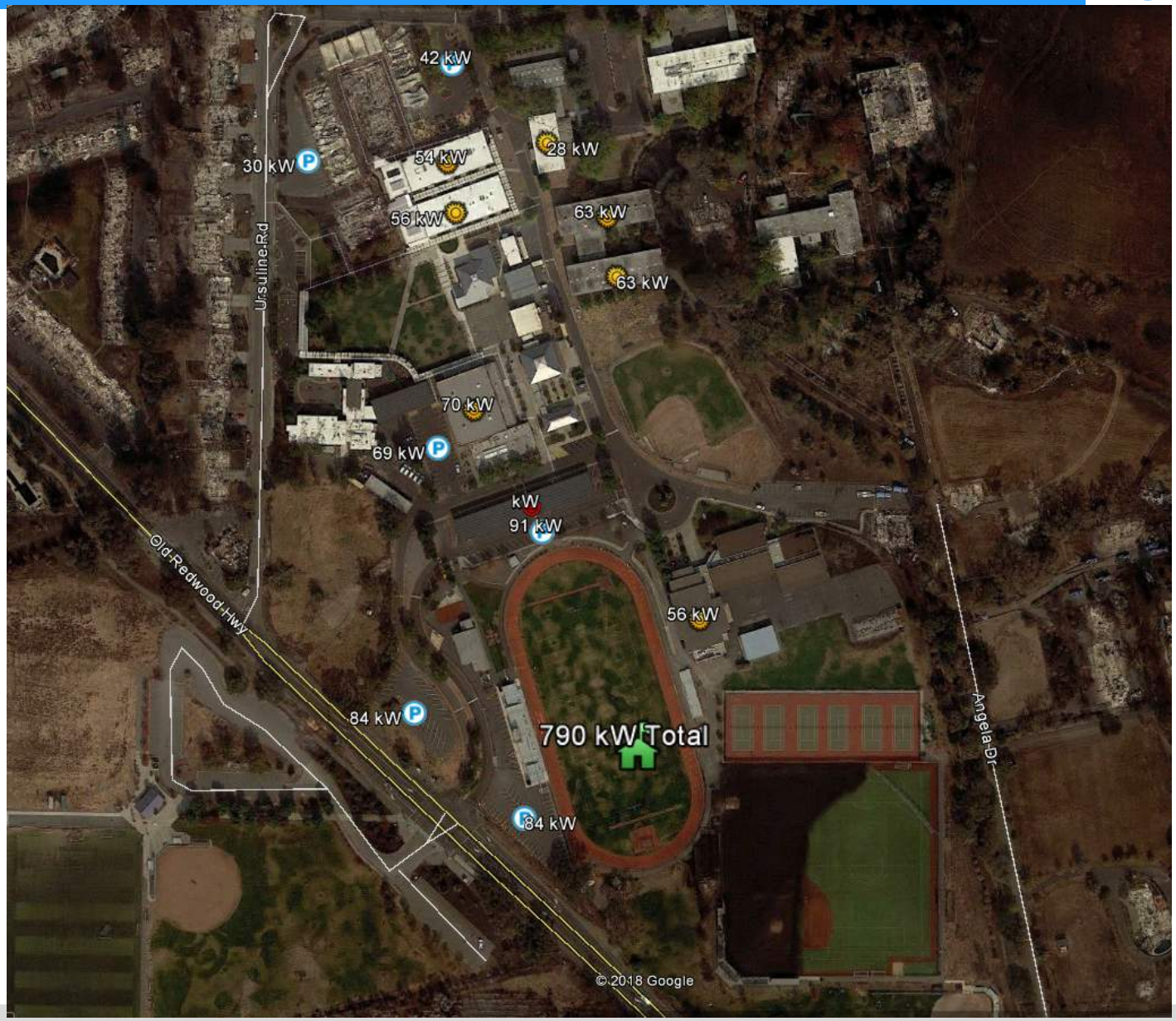
Example Sonoma Community Microgrid Elements: Fulton substation area

Clean Coalition

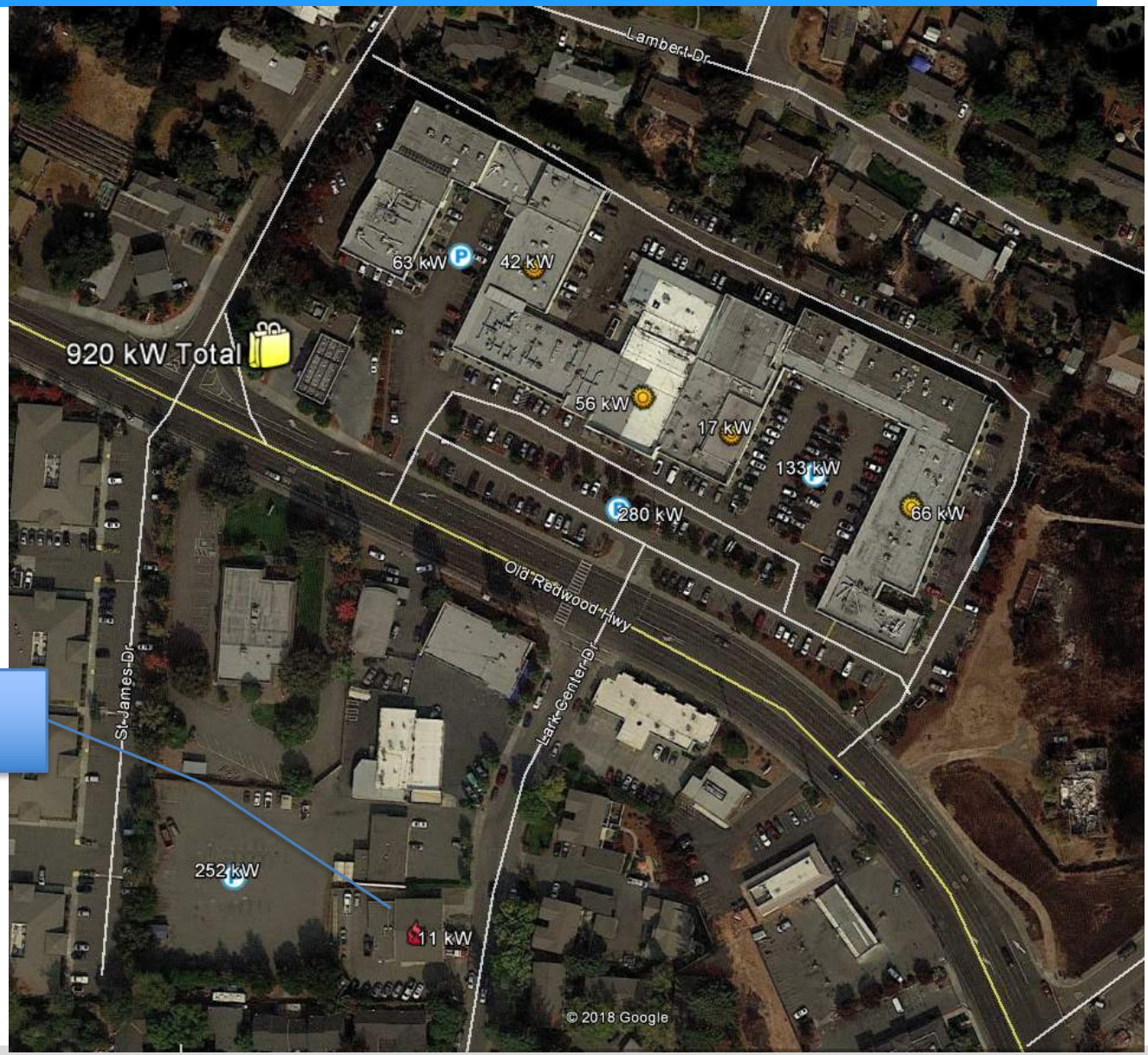


Hospital Cluster

Cardinal Newman High School Cluster

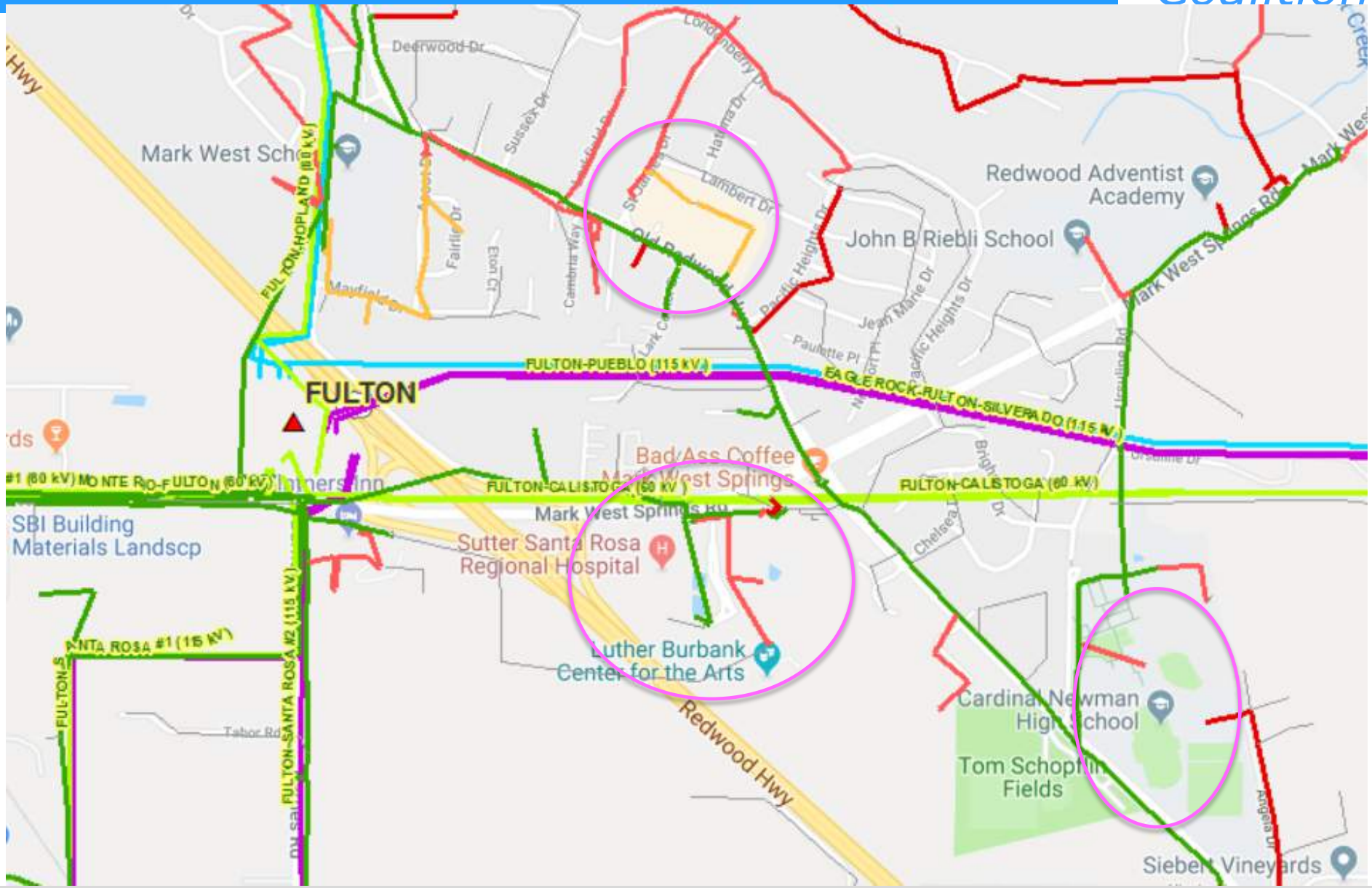


Larkfield Shopping Center Cluster



Fire Station

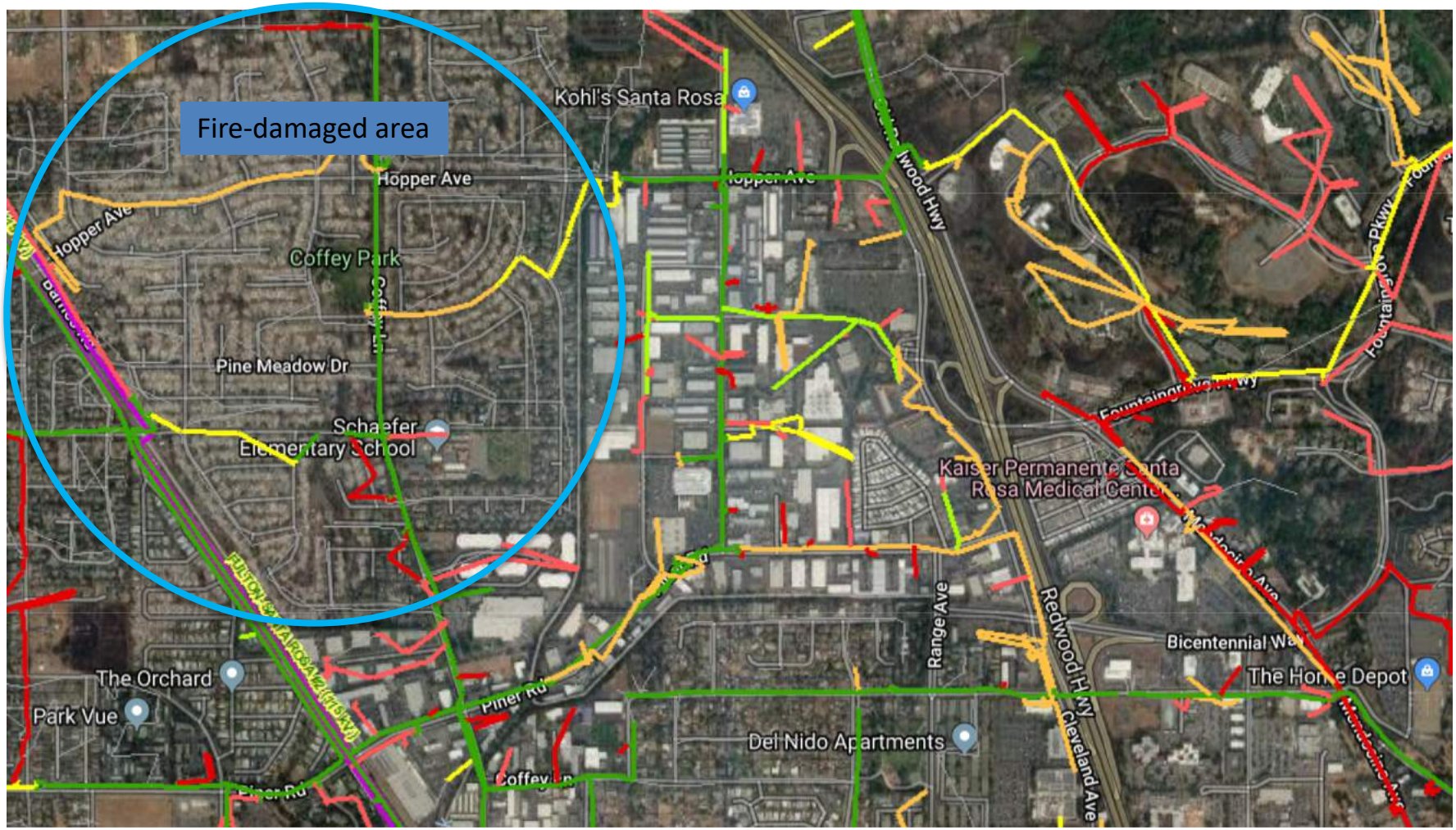
ICA Feeder Map with clusters circled



Sonoma Community Microgrid Initiative: Example Location 2

Clean Coalition

- Coffey Park and the Bicentennial Corridor — ideal for Community Microgrid.
- Served by single substation, Monroe.



Sonoma Community Microgrid Initiative: Locations

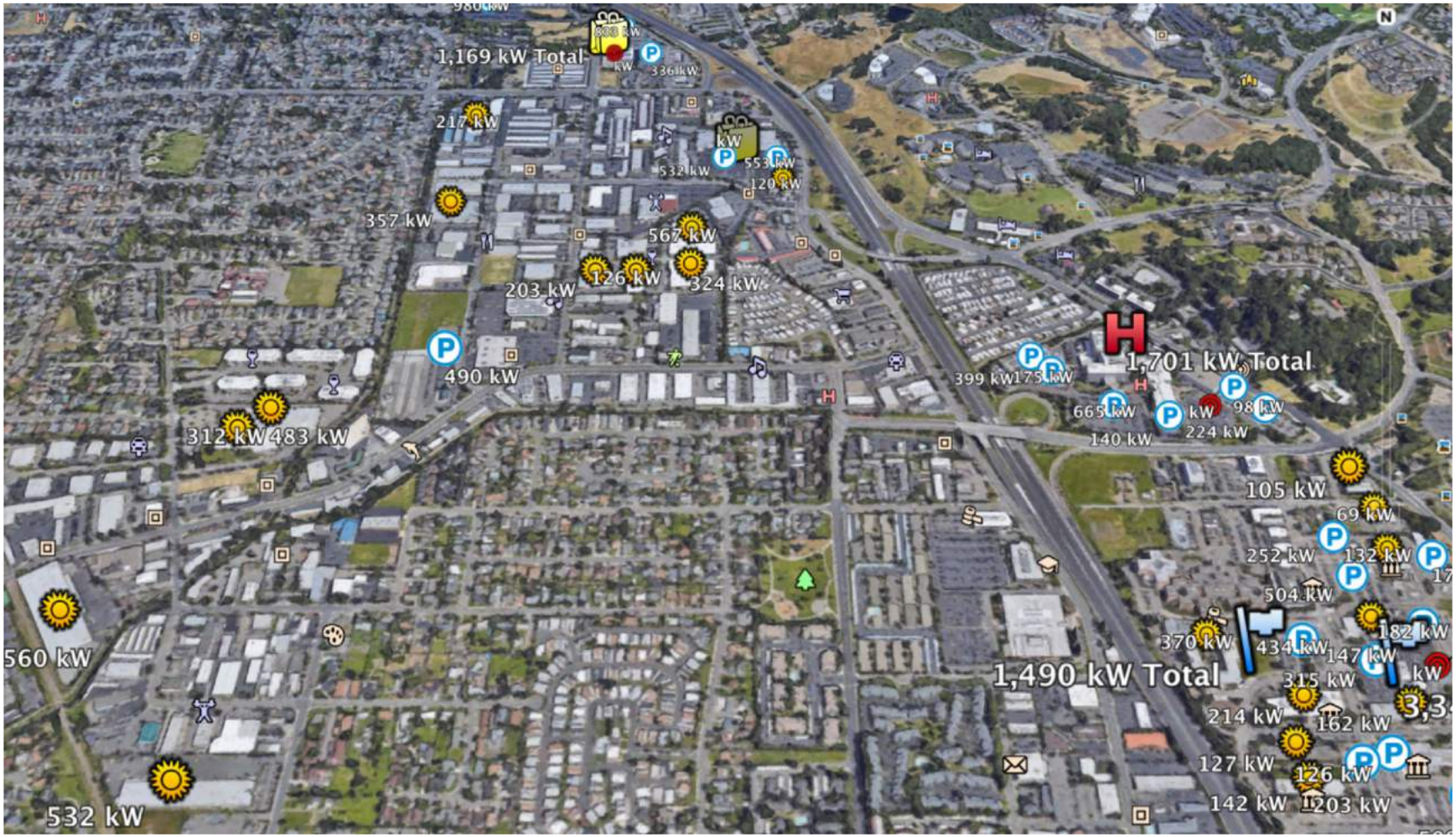
Clean Coalition

Example key sites:
critical, priority, large roofs and parking, etc.

Coffey Park and the Bicentennial Corridor

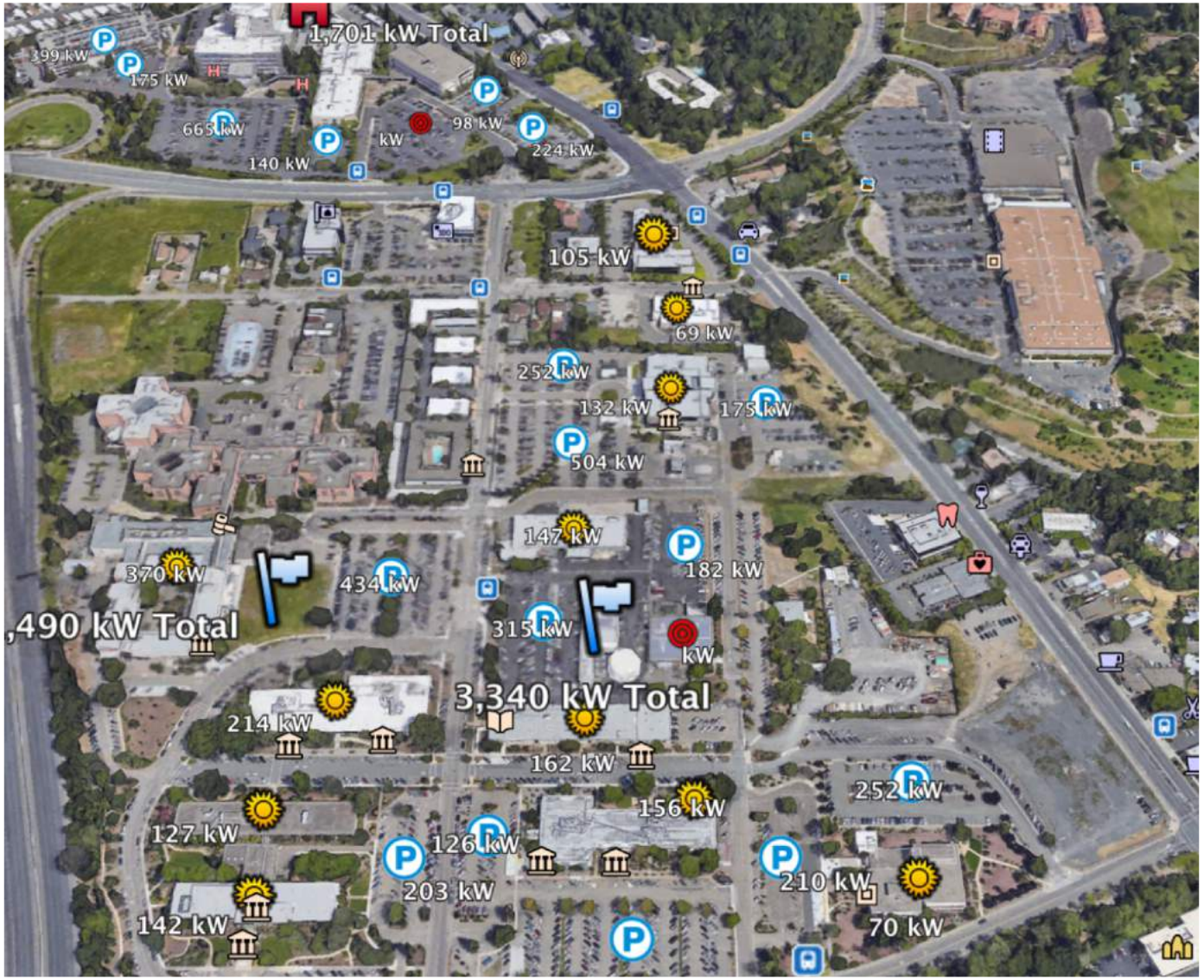
- Kaiser Permanente Santa Rosa Medical Center & Foundation Hospital
- Kaiser Permanente Santa Rosa Hearing Center
- Sonoma County Sheriff's Office
- Superior Court of California
- Sonoma County Clerk Recorder
- Sutter Urgent Care
- Security Public Storage
- Schaefer Elementary School
- Solstice Senior Living Center
- And dozens of Commercial & Industrial roof and parking lot locations including K-Mart, Vertex Climbing Center, Trader Joe's, Epicenter, Walgreens, Pepsi Bottling Group, etc.

Example Sonoma Community Microgrid elements: Monroe substation area

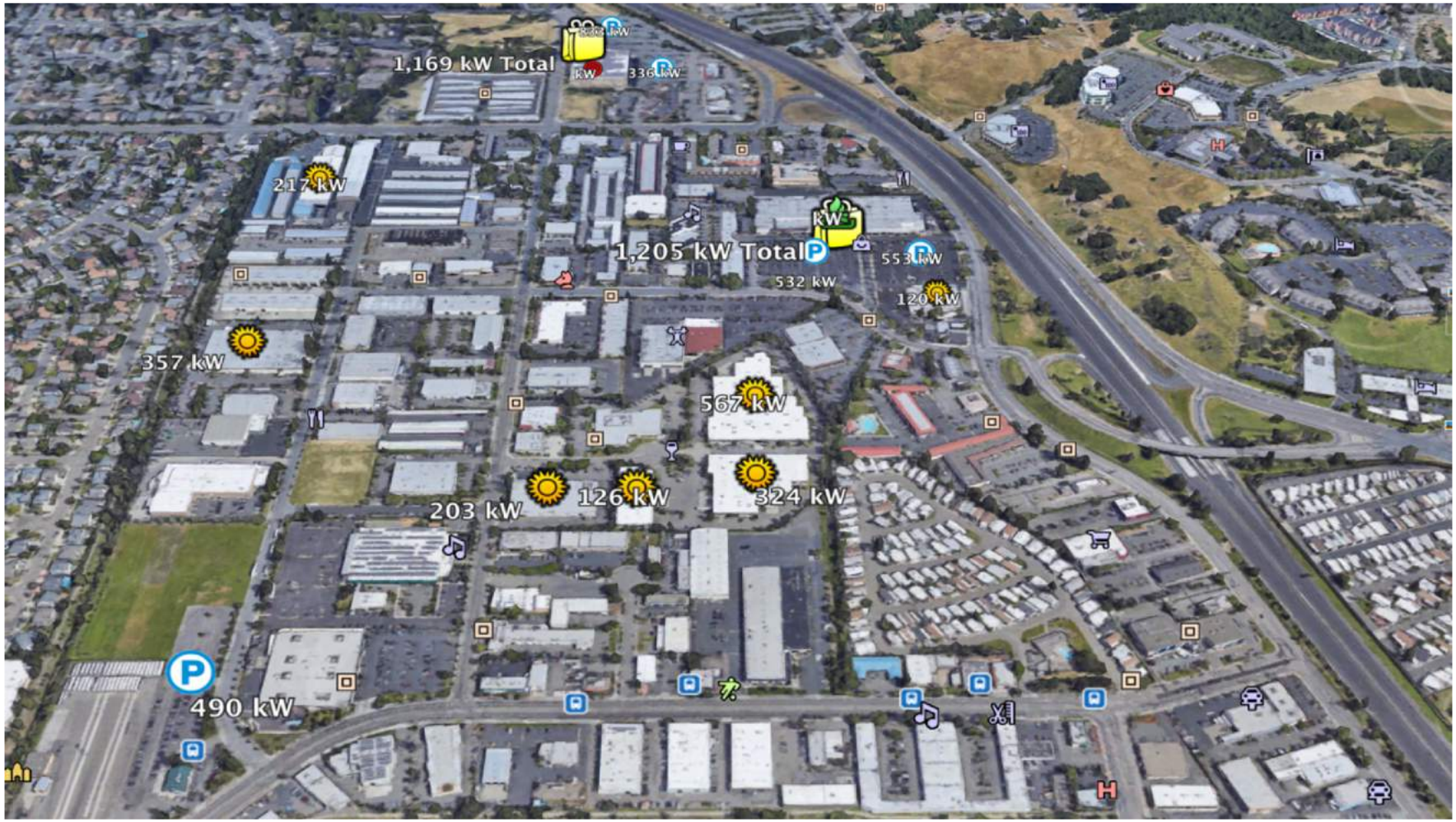


Kaiser Medical Center and Foundation Hospital

Sonoma County Government Buildings Cluster



Commercial and Industrial Cluster



Sonoma Community Microgrid Initiative: Utility Support

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Ongoing PG&E support & commitment

- PG&E is in full support of the Sonoma initiative, including the re-build program for homes (upcoming slide).
- PG&E is also committed to the Community Microgrid and grid modernization effort, in sync with the re-build.
- PG&E has made significant progress on their analysis of grid opportunities for the fire rebuild areas. This analysis includes:
  - Customer/ feeder load profiles
  - Estimated duration of power required by building type and criticality type
  - Circuit configuration, telemetry and control requirements
  - Rough costs for deploying microgrids at various target locations

Sonoma Community Microgrid Initiative: Utility Support

Clean Coalition

Ongoing PG&E support & commitment

- Key analysis criteria
  - High risk areas due to wind, fire, etc.
  - Grid topology – including the capability to sectionalize the grid to provide required isolation during emergencies
  - Community layout including opportunity for local generation, resilience for critical services, etc.
- PG&E's analysis and recommendation for target areas to be completed in approximately 2 weeks.
- The completed analysis plus input from the community will be considered to determine the best location opportunities.
- Recommendations will include developing "Microgrid-Ready" areas, including Community Resilience Zones. This will help ensure homes and buildings are prepared for Community Microgrids in terms of design, electronics, wiring, etc.

Sonoma Community Microgrid Initiative: Homes and buildings as grid partners

- Well-designed and well-situated ZNE homes
  - A valuable part of the resource mix when combined with larger PV arrays on commercial and industrial structures

Sonoma Community Microgrid Initiative: Homes and buildings as grid partners

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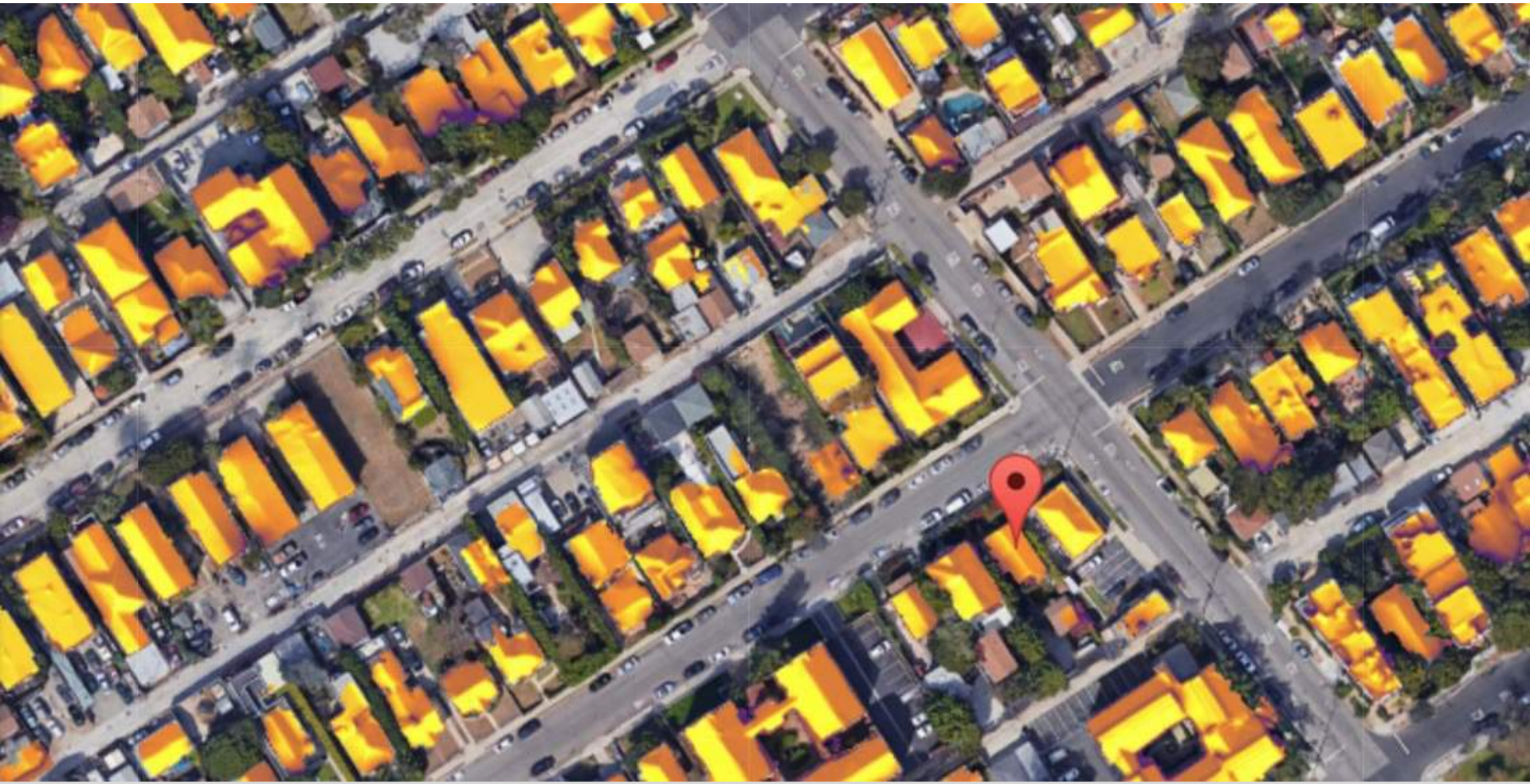
Ann V Edminster DESIGN AVEnues LLC

- Residential PV arrays as part of a community microgrid
  - Can be sized for optimum contribution and fair compensation to owners regardless of their site-specific demand via total procurement



Sonoma Advanced Energy Rebuild for Homes

Clean Coalition

Ongoing PG&E support & commitment

- Sonoma Clean Power (SCP), Pacific Gas and Electric Company (PG&E), and Bay Area Air Quality Management District have joined efforts to help homeowners affected by the October 2017 firestorms rebuild energy-efficient, sustainable homes.
- The program will be an enhancement to PG&E's long-standing California Advanced Homes Program, and offers two incentive packages tailored to Sonoma and Mendocino Counties.
- Each package has a flexible performance pathway or a simple prescriptive menu.
- If you have any questions about the program, please e-mail programs@sonomacleanpower.org.

Advanced Energy Rebuild for Homes

- Program scheduled to launch in early May
- Check back in early April for details on incentives and criteria.

https://sonomacleanpower.org/advancedenergyrebuild/

Sonoma Clean Power

PG&E

Bay Area Air Quality Management District

Sonoma Advanced Energy Rebuild for Homes

Clean Coalition

1 Advanced Energy Home

$7,500

Flexible Performance Path

- 20% above code
- 220V outlet at stove/range, water heater, and clothes dryer
- Design roof for additional structural loads associated with solar panels, and add conduit for future installation
- Electric Vehicle Charging Station - Equipment free from Sonoma Clean Power

2 All Electric Home

$12,500

Flexible Performance Path

- 20% above code, all electric end uses
- Design roof for additional structural loads associated with solar panels, and add conduit for future installation
- Electric Vehicle Charging Station - Equipment free from Sonoma Clean Power

$7,500

Simple Prescriptive Path

- 2016 Code High Performance Walls or 2016 Code High Performance Attics
- 2019 Code windows (Max U-factor 0.30, SHGC 0.23)
- High efficiency water heater: Heat Pump w/ EF of 3.0+ or gas tankless w/ EF of 0.92 with 220v outlet
- Heating/cooling ducts that are well sealed, insulated (R-8), and located primarily in conditioned space (note: buried deeply in attic insulation can qualify)
- WaterSense efficient plumbing fixtures
- Water efficient landscaping
- Energy Star Appliances
- 220V outlet at stove/range and clothes dryer
- Electric Vehicle Charging Station – Equipment free from Sonoma Clean Power

$12,500

Simple Prescriptive Path

All features of Advanced Energy Home plus...

- 2016 code High Performance Walls
- 2016 Code High Performance Attics
- Insulation inspected by a HERS Rater (QII)
- "Cool" roof
- Building Enclosure Airtightness verified by a HERS Rater (less than 3 ACH50)
- NEEA tier 3.0+ HPWH w/ controls
- High efficiency heat pumps for heating/cooling (EER of 12.5+, HSPF of 9.5+)
- Smart thermostat
- Compact plumbing design
- Induction cooking
- Electric or heat pump clothes dryer
- Electric Vehicle Charging Station – Equipment free from Sonoma Clean Power

Add solar to either option

$5,000

- Solar panel system designed to fully offset annual electric usage with battery storage sufficient to hold 30% of one summer day's production;

OR

- Pre-purchase of 20-year premium on 100% local renewable power (e.g., EverGreen or SolarChoice).

Advanced Energy Rebuild for Homes

- Program scheduled to launch in early May
- Check back in early April for details on incentives and criteria.

https://sonomacleanpower.org/advancedenergyrebuild/

Sonoma Clean Power

PG&E

Bay Area Air Quality Management District

Sonoma Community Microgrid Initiative

Clean Coalition

Sonoma Team

- Clean Coalition
- Sonoma Clean Power
- PG&E
- Rebuild North Bay
- Center for Climate Protection
- County of Sonoma, Energy & Sustainability Division
- Regional Climate Protection Authority
- Bay Area Air Quality Management District
- Design AVEnues, LLC — EE/ZNE expert Ann Edminster
- Stone Edge Farm Microgrid
- Other city and county leadership

Sonoma Clean Power

PG&E

Bay Area Air Quality Management District

REBUILD NORTHBAY FOUNDATION

COUNTY OF SONOMA ENERGY AND SUSTAINABILITY

center for climate protection

Ann V Edminster DESIGN AVEnues LLC

Stone Edge Farm Microgrid

Thank you. Any questions?

For questions and assistance, contact:

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Thank you. Any questions?

Clean Coalition

Backup

Example: Vermont

Clean Coalition

Vermont utility Green Mountain Power now pays customers over $30 per month to use their battery systems as a load-offsetting capacity resource.

GREEN MOUNTAIN POWER

- Makes investments in battery-based backup systems **more attractive** for customers.
- For Green Mountain Power, access to the batteries helps address the **steep transmission access charge** assessed by ISO New England. That charge **more than doubled** from $3 per kilowatt per month in 2016 to over $7 in 2017, and is **expected to increase** to over $9 in 2018.
- As more solar is installed on the distribution grid, **access to that local solar** at times when electricity from transmission is the most expensive is a **grid benefit** that can **save a utility money**.

Source: http://www.qatargreenleaders.com/news/sustainability-news/1668-unlocking-the-distributed-grid-with-flexibility-management-software

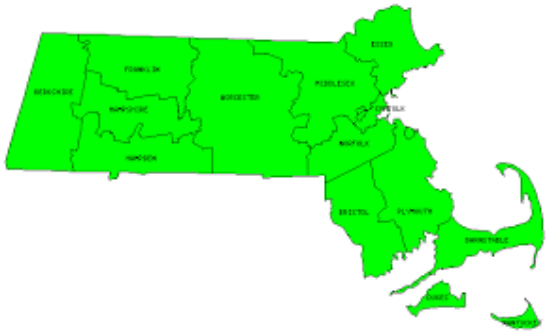
Example: Massachusetts

Clean Coalition

Massachusetts announced a new model for community-scale energy systems: SMART (Solar Massachusetts Renewable Target)

DOER
Massachusetts Department of Energy Resources

- **Fully compensates solar PV** for the total output of a system — rather than relying on net metering, which only accounts for net bill savings.
- A large warehouse roof or shopping center parking lot can be **fully compensated** for all the solar generated on that site, regardless of the amount of electricity used onsite.
- Commercial and industrial sector example: 250kW – 1,000kW solar systems would receive **incentives** of $0.16 - $0.18/kWh over a term of 20 years.
- This model is commonly referred to as a **Feed-In-Tariff** — or **CLEAN** program — and has been used successfully in other locations such as Germany to deploy more clean local energy.



Source: http://www.qatargreenleaders.com/news/sustainability-news/1668-unlocking-the-distributed-grid-with-flexibility-management-software

Example: Connecticut

A new group of microgrids has been proposed to help support Connecticut's critical facilities in the event of emergencies.

- Funding opportunities under the state's Department of Energy and Environmental Protection (DEEP) **microgrid program**
- New focus on the growing movement to provide **resilient power** to essential buildings during emergency situations
- Includes a proposal for Westbrook, CT middle school and high schools, which have recently been designated as **emergency/evacuation shelter** and support areas
- Another proposal for Coventry, CT would island a circuit loop for **nine critical facilities**, including schools, a communication tower, and a senior care center

Connecticut Department of ENERGY & ENVIRONMENTAL PROTECTION

Source: http://www.renewableenergyworld.com/articles/2018/01/this-is-what-microgrids-for-resilience-in-emergencies-look-like.html

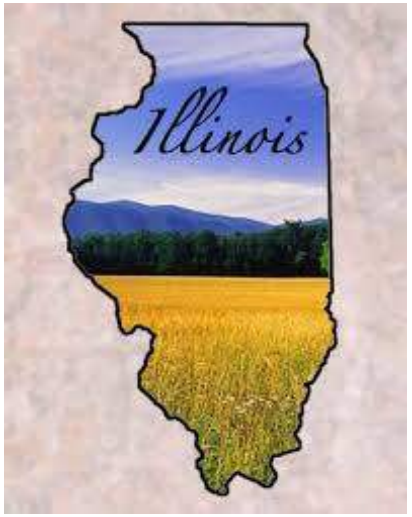
Example: Illinois

Clean Coalition

Illinois now supports shared utility + customer microgrids.

ComEd

- Extends distributed clean energy, islanding, and controls **across utility infrastructure** and to **multiple customers** — not limited to individual behind-the-meter implementations.
- Expands **competitive bids** for distributed energy resources to serve generation needs while relying on **solar, energy storage, and other alternatives** to diesel-fueled generators.
- Joe Svachula, vice president of engineering and smart grid technology at ComEd "It's an important step forward in our effort to develop a more **secure, resilient and reliable distribution system** in the future."



"Microgrid Clusters": bottoms-up Community Microgrids

source: https://www.greentechmedia.com/articles/read/xcel-energy-community-solar-program-turns-three#gs.rPWCafg

Example: Minnesota

Largest Community Solar program in the country — helping double the solar generation across the state.

- More than **doubled** the community **solar capacity** in 2017, to **211 megawatts in operation** today, demonstrating awareness and accelerating success.
- **Any customer** can participate. Provides monthly bill credits to those who subscribe.
- Beginning to offer **predictability** and **transparency** due to a mature process. The most effective program strides have been made in **access to interconnection** information.
- One pilot project will pair **energy-efficiency improvements** with **community solar**, and there is now a push for this model to be **expanded** across Xcel's service territory

Is Community Storage next? Yes — Community Microgrids

source: https://www.greentechmedia.com/articles/read/xcel-energy-community-solar-program-turns-three#gs.rPWCafg

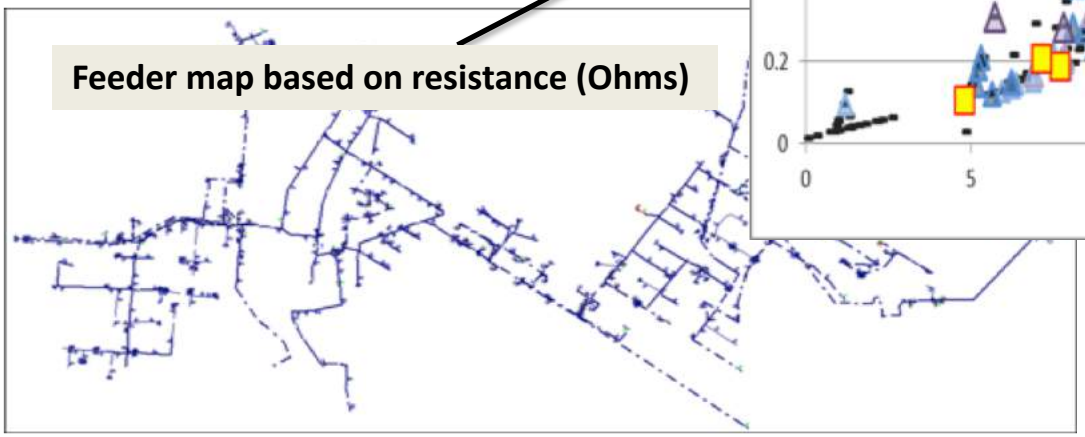
Example: Local Balancing optimizations

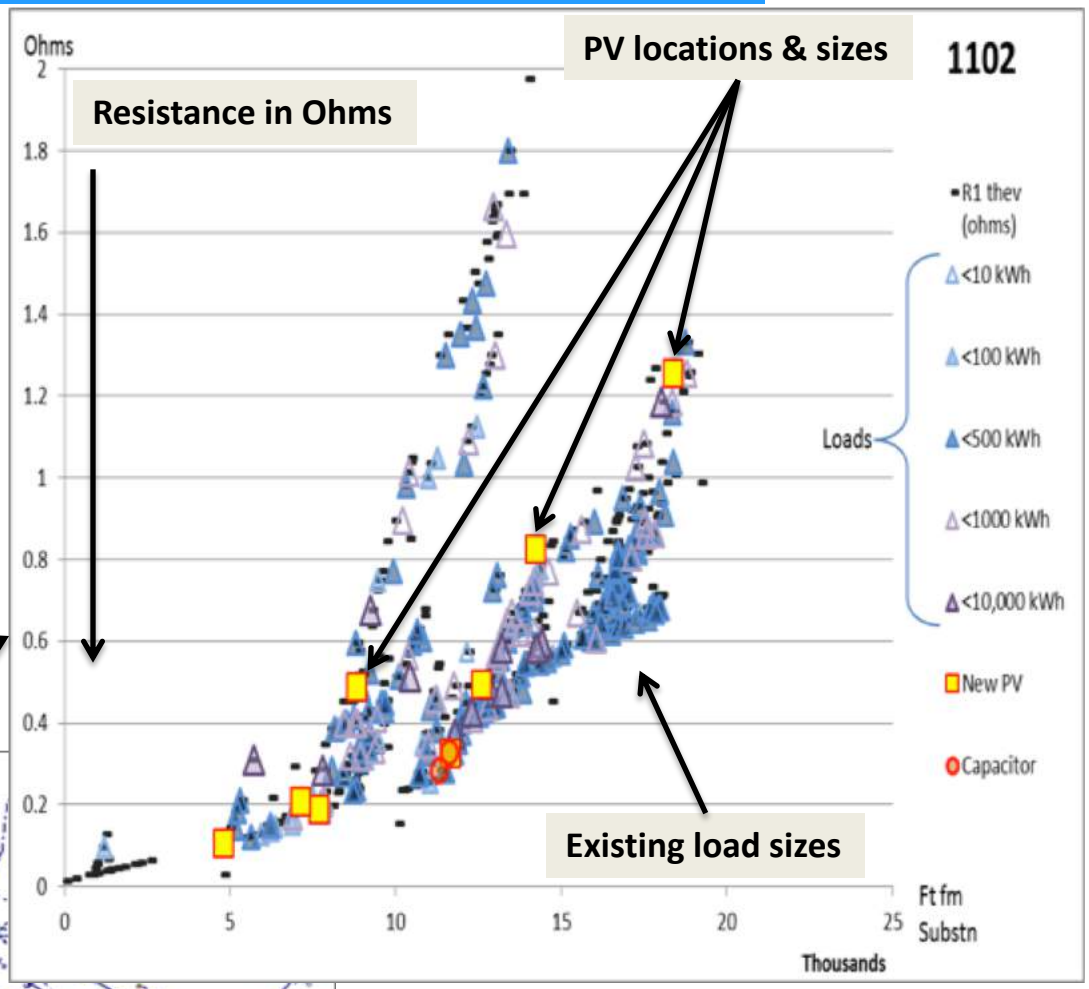
Optimal locations for PV, to help reduce daytime peaks across the system:

1. Matching load types: e.g. higher loads during daytime means better match for PV

2. Robust feeder locations: less resistance (lower Ohms) means more capacity for local generation

3. Avoided costs: service transformers, etc.



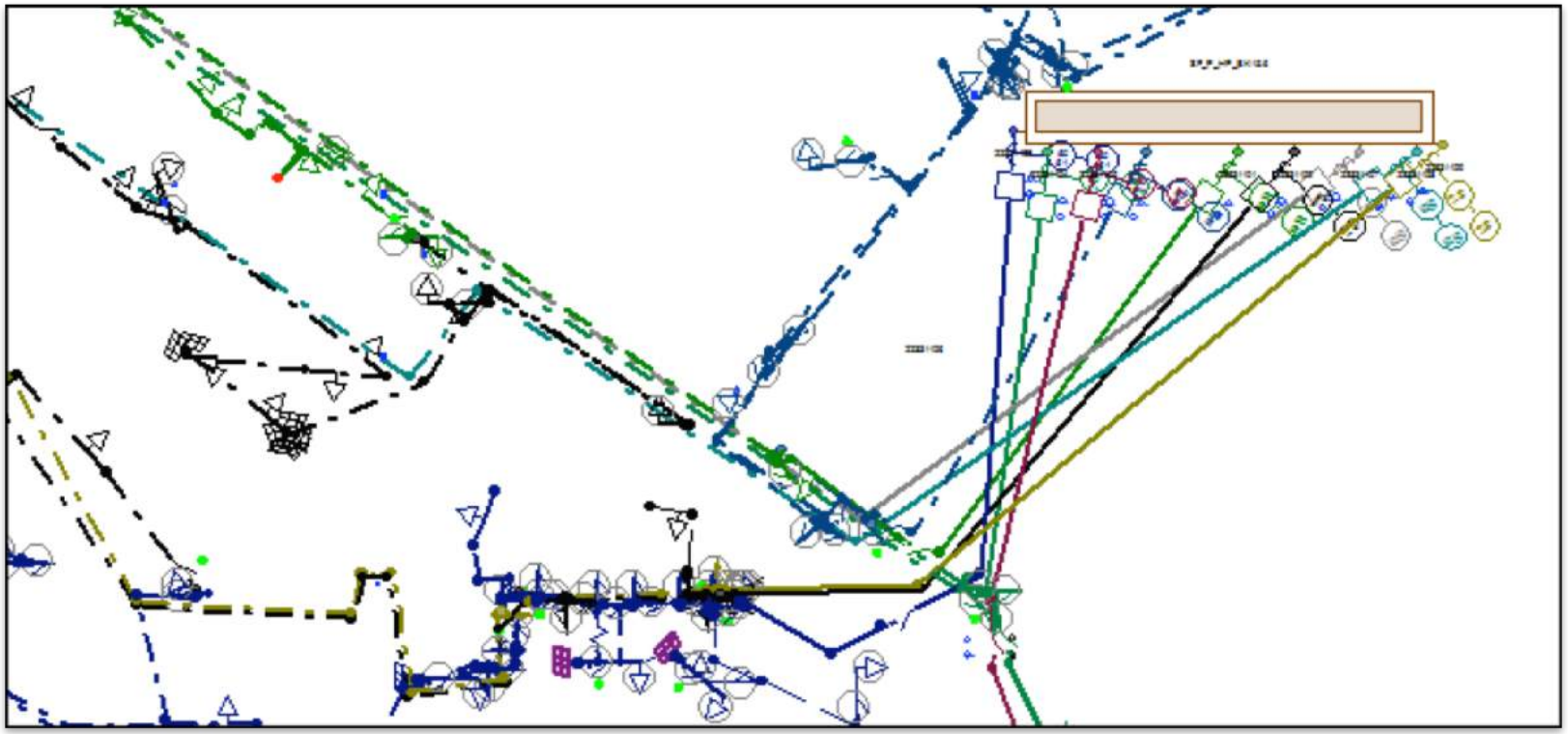


Source: The Clean Coalition's Hunters Point Community Microgrid Project

Example: Local Balancing optimizations

Connected feeders enables substation-wide optimizations and balancing across a substation, such as:

1. "Crossfeeding," e.g. over-generation on certain feeders consumed by load on other feeders within the substation area
2. Optimizing DER such as storage and demand response across the substation feeders
3. Optimizing settings, e.g. load tap changers, across the substation feeders



Example: Local Balancing optimizations

Step 4: DER Optimization

The DER Wheel of Fortune! Unlocking optimal and most cost-effective DER portfolios.

More reliable, cost-predictable, cleaner

Local Market Value – e.g. Rates

Optimal feeder locations

Derived In combination with the other optimizations

Optimal DER Portfolio

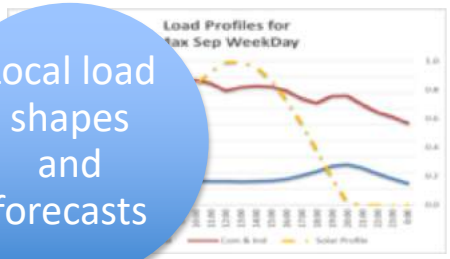
Locally connected feeders

Helps achieve local balance

Also extends to system-wide avoided costs

Local avoided grid upgrades

Local load shapes and forecasts



Unlocks optimal customers and DER