

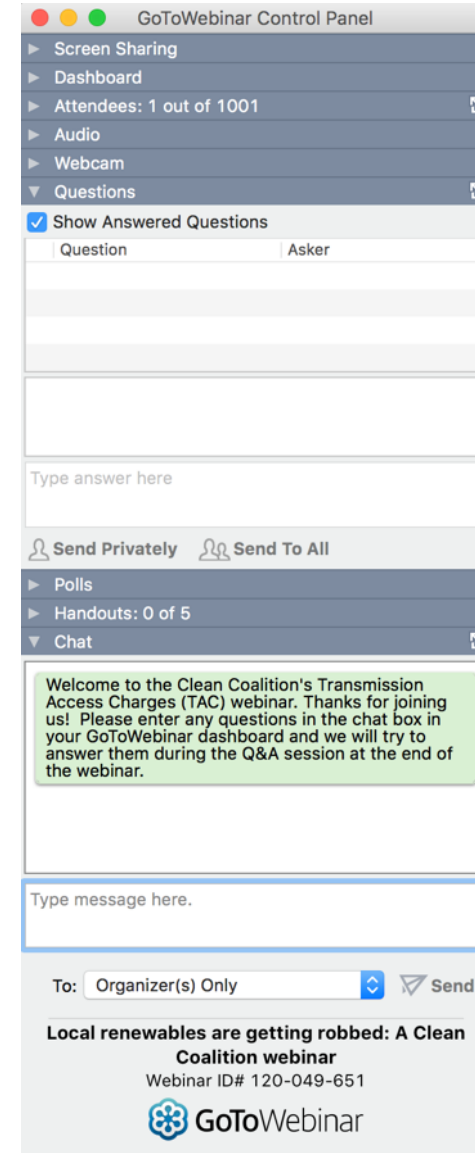
## North Bay Community Resilience Initiative: The path to energy resilience and sustainability



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- Webinar recording and slides will be sent to registered attendees within two business days
- All webinars are archived on [clean-coalition.org](http://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](mailto:josh@clean-coalition.org)





**John Sarter**, Program Manager

John is a sustainable designer/developer, innovator in systems integration, and expert in real estate, renewable energy, and transportation. He has owned and operated his firms, Sarter Construction & Design, Off The Grid Design, and Sol Lux Alpha, since 1986. A recognized leader in the solar+storage space since 2008, John founded the Microgrid Development Group in San Francisco in 2014 to unite a consortium of technology, energy, engineering, and other professionals committed to creating a resilient and sustainable, 100% renewable energy future.



**Malini Kannan**, Program Engineer

Malini leads the technical activities of Clean Coalition's Community Microgrid Initiative. She has helped communities across California, the New York metropolitan area, and Puerto Rico design and develop Community Microgrids through scoping, planning, and engineering design and analysis work. Previously, as a Research Engineer at the Schatz Energy Research Center, Malini tested and analyzed performance data from small-scale solar, battery, and LED consumer electronics as a consultant to the World Bank.

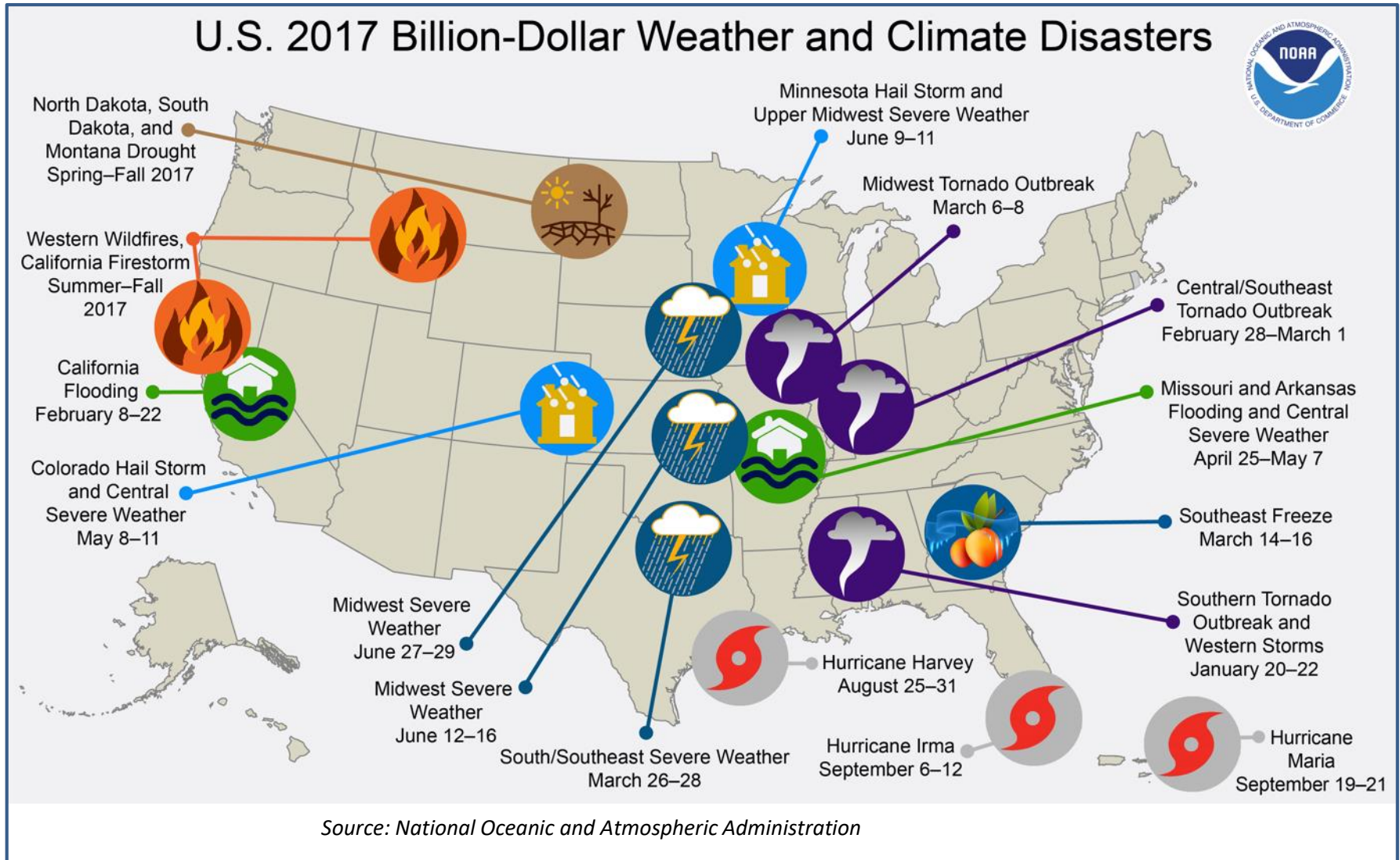
To accelerate the transition to renewable energy and a modern grid through technical, policy, and project development expertise

Coffey Park neighborhood of Santa Rosa, before and after.



NBCRI primary objectives:

- Help impacted communities rebuild with greater efficiency, decarbonize, and enhance **resilience**
- Encourage **all** new development to do the same
- Create healthy, safe communities



# Why do we need a resilient power system?

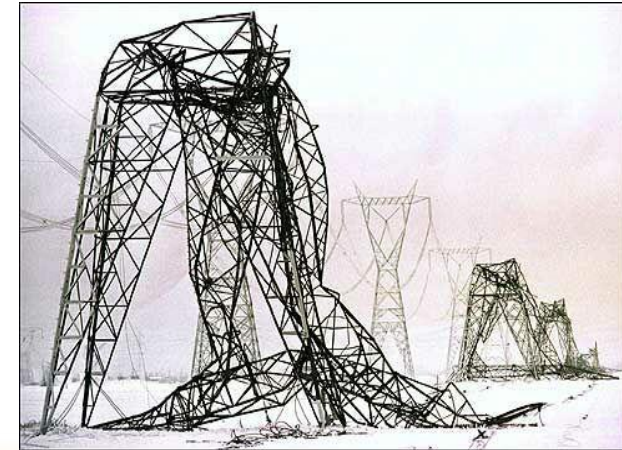
- Our centralized energy infrastructure is **costly, aging, inefficient, and a security risk** — highly vulnerable to extreme weather and cyber attacks
- **Extreme weather events are occurring more frequently:**  
From January through September 2017, the U.S. experienced **16** weather- and climate-related events that cost **\$1B or more**, for a record-breaking total of **\$300B** (National Oceanic and Atmospheric Administration)



# What is power system resilience?

**Resilience = The ability to keep critical loads online indefinitely in the face of extreme or damaging conditions**

- Goes **beyond reliability** — which is measured after only 5 minutes of grid outage
- Driven by **renewables with energy storage and demand response**
- Focused on **reducing outage duration, cost, and impact on critical services**





## WHICH CUSTOMERS ARE MOST LIKELY TO HAVE THEIR POWER TURNED OFF? ^

If we need to turn off power for safety, it will be limited to neighborhoods or communities served by electric lines that run through areas experiencing extreme fire danger conditions. We will turn the power back on as soon as it is safe to do so. The most likely electric lines to be considered for shutting off for safety will be those in areas that have been designated by the California Public Utilities Commission (CPUC) as at extreme risk for wildfire (Tier 3 areas).

- Multiple PSPS events were planned in 2018.
- PG&E has brought in mobile fossil-fuel generators to connect at the substation in the past, but PG&E will not provide this service long-term.
- Negative impact: Critical facilities, businesses, and residents lose power during planned shutdowns and cannot provide services.

- **Goal 1:** Track, promote, and publicize cutting-edge resilience-related energy efficiency and electrification incentives and policy advancements by government agencies.
- **Goal 2:** Procure and develop a database of model structures with “Community Microgrid–ready” designs: new and retrofit residential, commercial, and municipal.
- **Goal 3:** Develop Community Microgrid roadmap and stage pilot projects beginning with critical-facility microgrids such as fire stations, hospitals, and emergency shelters.
- Position these pilots in areas that are conducive to expansion into Community Microgrids, ideally at preinstalled interconnection hub (PIH) locations identified by PG&E.

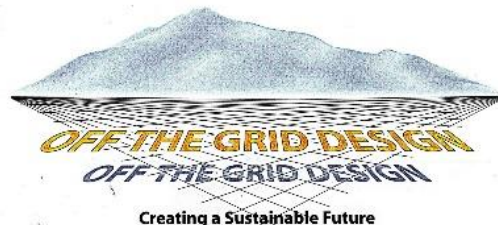




COUNTY OF SONOMA  
ENERGY AND SUSTAINABILITY



Stone  
Edge Farm  
Microgrid




## Support for rebuilding with resilience, efficiency, and electrification

- 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 firestorms to rebuild energy-efficient, sustainable homes.
- The program is 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.
- MCE has a similar program for the Napa rebuilding efforts.
- The Clean Coalition is helping to reduce barriers to adoption of these programs



# SCP Advanced Energy Rebuild for Homes

1 Advanced Energy Home	2 All Electric Home
<p style="text-align: center;"><b>\$7,500</b></p> <p style="text-align: center;"><b>Flexible Performance Path</b></p> <ul style="list-style-type: none"> <li>• 20% above code</li> <li>• 220V outlet at stove/range, water heater, and clothes dryer</li> <li>• Design roof for additional structural loads associated with solar panels, and add conduit for future installation</li> <li>• Electric Vehicle Charging Station - Equipment free from Sonoma Clean Power</li> </ul>	<p style="text-align: center;"><b>\$12,500</b></p> <p style="text-align: center;"><b>Flexible Performance Path</b></p> <ul style="list-style-type: none"> <li>• 20% above code, all electric end uses</li> <li>• Design roof for additional structural loads associated with solar panels, and add conduit for future installation</li> <li>• Electric Vehicle Charging Station - Equipment free from Sonoma Clean Power</li> </ul>
<p style="text-align: center;"><b>\$7,500</b></p> <p style="text-align: center;"><b>Simple Prescriptive Path</b></p> <ul style="list-style-type: none"> <li>• 2016 Code High Performance Walls or 2016 Code High Performance Attics</li> <li>• 2019 Code windows (Max U-factor 0.30, SHGC 0.23)</li> <li>• High efficiency water heater: Heat Pump w/ EF of 3.0+ or gas tankless w/ EF of 0.92 with 220v outlet</li> <li>• Heating/cooling ducts that are well sealed, insulated (R-8), and located primarily in conditioned space (note: buried deeply in attic insulation can qualify)</li> <li>• WaterSense efficient plumbing fixtures</li> <li>• Water efficient landscaping</li> <li>• Energy Star Appliances</li> <li>• 220V outlet at stove/range and clothes dryer</li> <li>• Electric Vehicle Charging Station – Equipment free from Sonoma Clean Power</li> </ul>	<p style="text-align: center;"><b>\$12,500</b></p> <p style="text-align: center;"><b>Simple Prescriptive Path</b></p> <p>All features of Advanced Energy Home plus...</p> <ul style="list-style-type: none"> <li>• 2016 code High Performance Walls</li> <li>• 2016 Code High Performance Attics</li> <li>• Insulation inspected by a HERS Rater (QII)</li> <li>• "Cool" roof</li> <li>• Building Enclosure Airtightness verified by a HERS Rater (less than 3 ACH50)</li> <li>• NEEA tier 3.0+ HPWH w/ controls</li> <li>• High efficiency heat pumps for heating/cooling (EER of 12.5+, HSPF of 9.5+)</li> <li>• Smart thermostat</li> <li>• Compact plumbing design</li> <li>• Induction cooking</li> <li>• Electric or heat pump clothes dryer</li> <li>• Electric Vehicle Charging Station – Equipment free from Sonoma Clean Power</li> </ul>
<p style="text-align: center;"> <b>Add solar to either option</b></p>	
<p style="text-align: center;"><b>\$5,000</b></p> <ul style="list-style-type: none"> <li>• Solar panel system designed to fully offset annual electric usage with battery storage sufficient to hold 30% of one summer day's production;</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>• Pre-purchase of 20-year premium on 100% local renewable power (e.g., EverGreen or SolarChoice).</li> </ul>	

# MCE Advanced Energy Rebuild Napa (AERN)



## Choose your level of energy efficiency above current energy code requirements.

Receive up to **\$4,900**. In order to participate in the program, 20% above energy code must be reached.

Average Percentage Above Energy Code	20%	30%	40%
Average incentive for new rebuilt homes	\$2,800	\$3,700	\$4,900

As an example, a 20% above energy code home would require:

- High performance walls or attics
- Advanced windows
- Insulation inspection
- High efficiency water heater: Heat Water Pump with EF of 3.0+ or gas tankless with EF of .92
- Ducts in conditioned space
- ENERGY STAR Appliances



## Choose your add on upgrades for additional incentives.

Receive up to **\$7,640**

- +\$40** for a smart thermostat
- +\$500** for an electric vehicle charging station
- +\$800** for induction cooking
- +\$800** for a heat pump clothes dryer
- +\$1,000** for an electric heat pump hot water heater
- +\$1,500** for an electric heat pump HVAC system
- +\$3,000** for a solar panel system with battery storage

Contact MCE at [energysavings@mcecleanenergy.org](mailto:energysavings@mcecleanenergy.org) or (415) 464-6033 for additional program details and funding availability prior to submitting applications.

The funding for this program will expire December 31, 2019 or once funding is depleted. Application is valid for 36 months from date of utility acceptance.

- Grid-optimal: Light on the grid by virtue of very high energy efficiency and solar+storage
- Islandable building and campus microgrids, adding layers of resilience
- Grid-integrated electric infrastructure; appliances, electric vehicle chargers, and soon bi-directional chargers
- Designed to interconnect into Community Microgrids as “prosumers,” a customer who both produces and consumes energy
- Model structure will incorporate elements in the Electrification & Community Microgrid–ready guideline document that the Clean Coalition developed

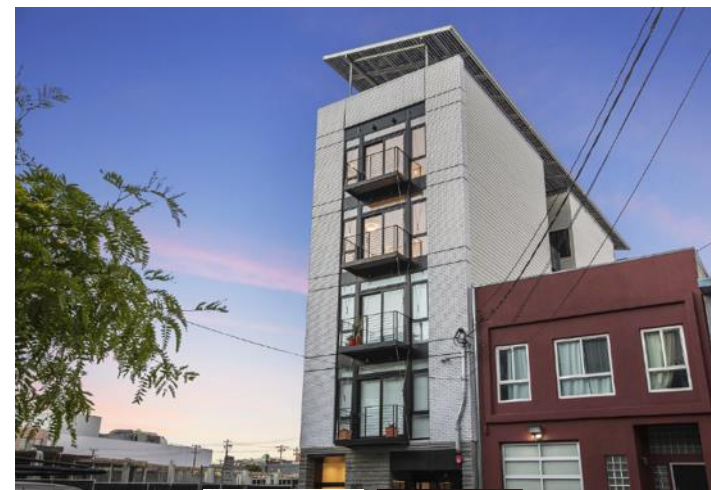
- Design Challenge for model structures for new and retrofit residential, commercial, and municipal buildings
- Collaborate with highest building performance organizations:
  - US DOE Zero Energy Ready Home Program
  - US DOE Solar Decathlon Program
  - Rocky Mountain Institute
  - USGBC / New Buildings Institute “Grid-Optimal”
  - Passive House Institute US - “Source Zero”
  - Modular Building Institute





## SOL LUX ALPHA

- First Passive House certified multi-unit “Nanogrid” in U.S. market
- Passive House = 80% savings on heating/cooling
- Carbon-neutral living + transportation system
- 4-unit, 6-story using only PV within the building site
- All-electric: Fossil-fuel-free
- 2018 US DOE Housing Innovation Award winner
- 2018 PHIUS “Best Overall Project” - North America



**PHIUS+**  
The Passive House Institute US (Phius), maintains and certifies the highest standards for site energy efficiency in the world today.



**Energy Star**  
The US Energy Star program guides builders and homeowners to the highest efficiency home appliance and other home energy products available in the USA today.



**US EPA WaterSense**  
The US EPA WaterSense program helps save water and protects the environment by promoting WaterSense labeled products for homes, yards, and businesses, while taking various other simple steps to save water each day.



**Department of Energy**  
The United States Department of Energy has developed a partner program dedicated to the building of, the science behind and the energy generation for Zero Net Energy and Net Positive Energy homes in the US. Sol Lux Alpha was built to exceed even the DOE program's highest standards, which is measured and recognized a year after occupancy.

# Model structures: Sol-Lux Alpha nanogrid system

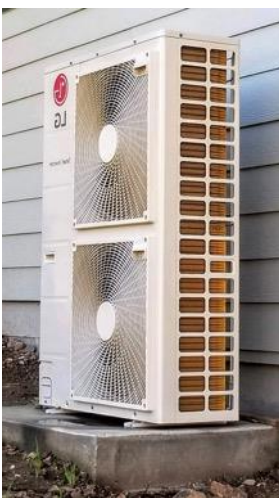
- **Sunprime GxB 380w Bifacial** panels (up to 25% boost) = 475w ea. (21 panels per unit = 8 kW array per unit)
- **Tesla Energy Powerwall x3** (triple redundancy, 2-3 days energy) and **Tesla Backup Gateways** (battery management system (BMS) and automatic transfer switching)
- **Blue Planet Energy Blue Ion** (for 3 phase - common area loads)
- **3 Schneider Conext** inverters (building management system and automatic transfer switch)
- **V2B architecture**—enabled (allows mobile energy for community resilience)



# Model structures: Advanced Energy Rebuild case studies



Hirsch residence: First SCP Advanced Energy Rebuild



Heat pump HVAC



Hirsch residence all-electric kitchen with induction range



LG Chem energy storage



Rheem HPWH

## Financial impact @ building scale

- Lower operation costs (near-zero energy bills)
  - Revenue from excess energy export (HOA **dividends?**)
  - Electric vehicles powered by renewables
  - Better occupant health (reduced medical costs)
  - Home becomes a community asset
- = **Higher appraised property values**



# Goal 3: Critical-facility microgrids

## Stage pilot projects beginning with critical-facility microgrids

- City / County Centers
  - Offices of Emergency Services
- Fire Departments
  - Rincon Valley Fire Protection District
  - Sonoma County Fire and Emergency Services
- Hospitals
  - Kaiser Permanente Santa Rosa
  - Sutter Hospital Larkfield Campus
- Emergency shelters
  - County Veterans Buildings
  - Luther Burbank Center
  - Community Centers



[Fremont Fire Station microgrid](#)



[Kaiser Permanente Richmond microgrid](#)



[Seattle Community Center microgrid](#)



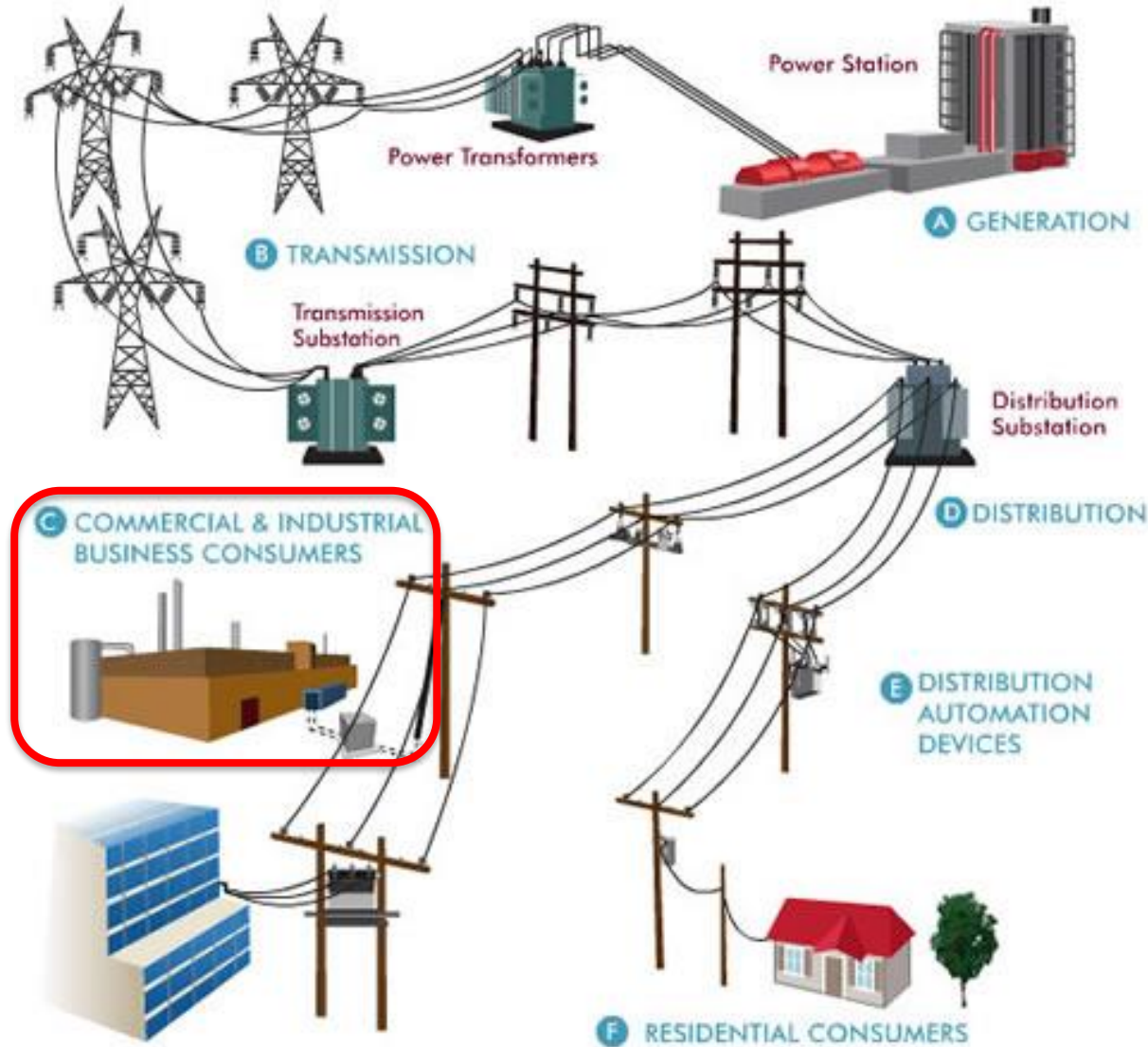
# microgrid (n)



- A microgrid is a group of interconnected loads and distributed energy resources (DER) within clearly defined electrical boundaries that acts as a single controllable load with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island mode.
- *Microgrid* is an umbrella term that incorporates a variety of scopes, scales, and use-cases.
- A microgrid can provide cost savings, but it can also be more expensive than energy from PG&E. The economics are project-specific.

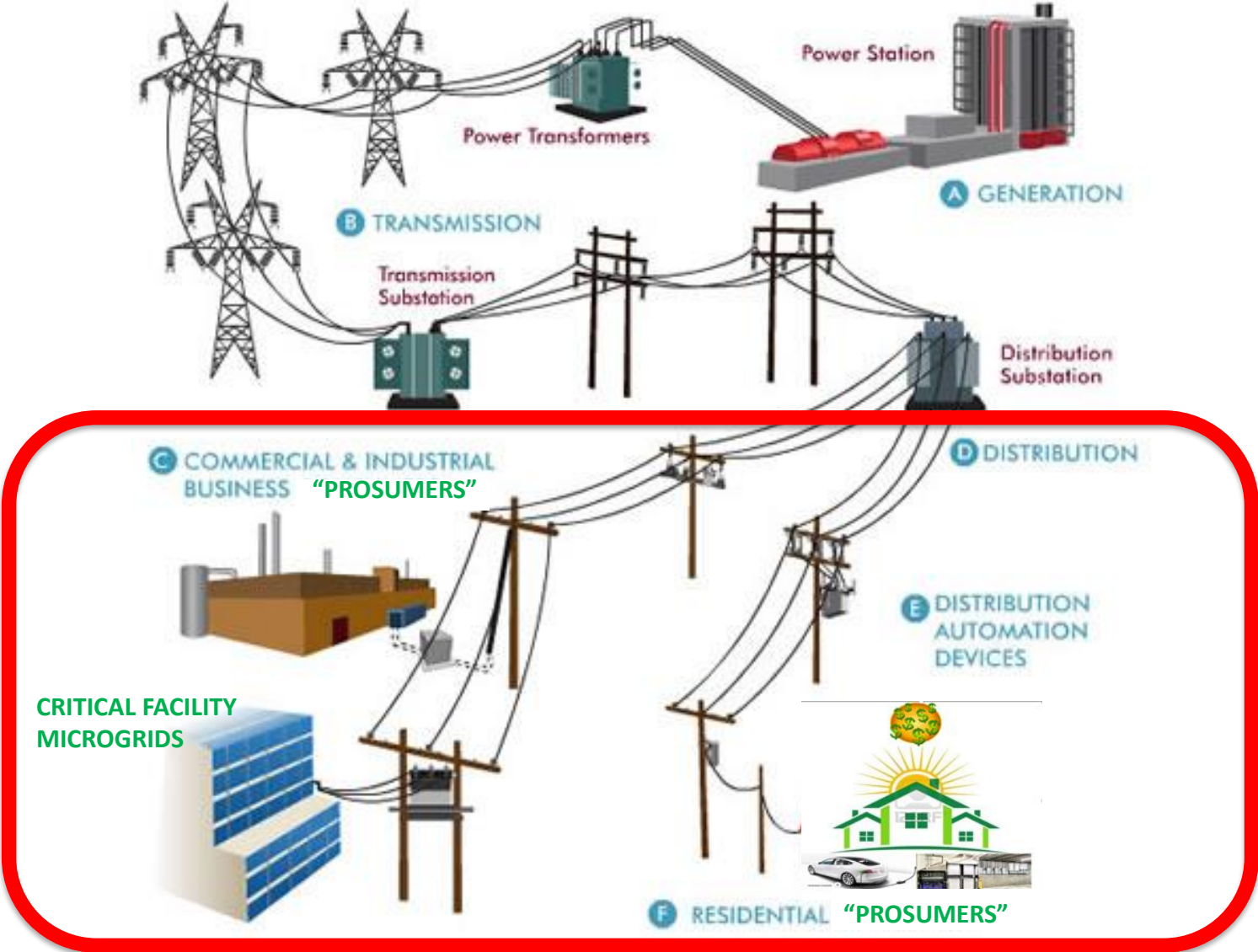


# Facility microgrids focus on single customers



Source: Oncor Electric Delivery Company

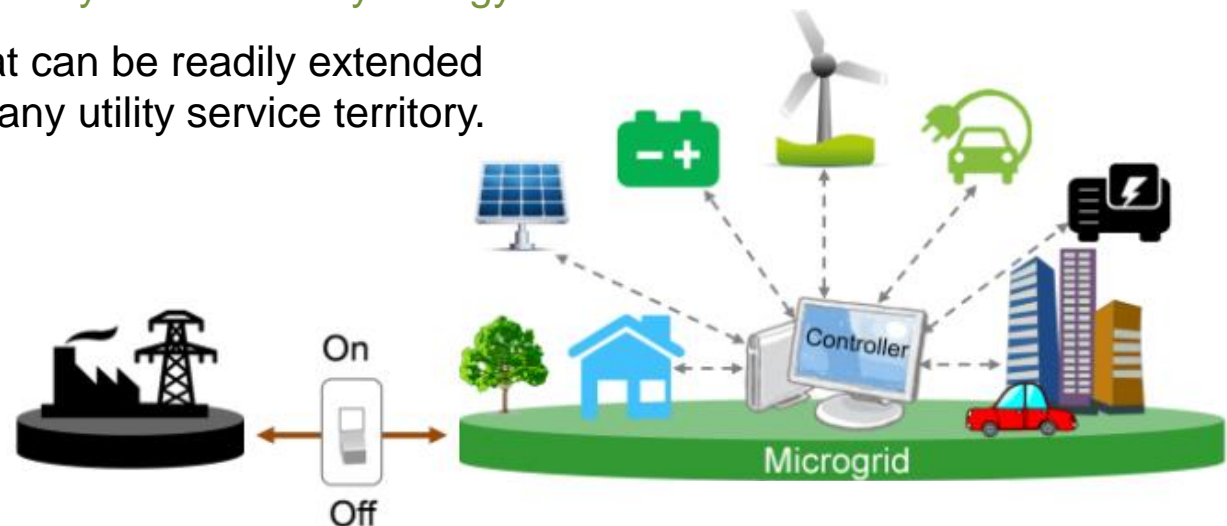
# Community Microgrids can serve up to thousands of customers



Source: Oncor Electric Delivery Company

*A modern approach for designing and operating the electric grid, stacked with local renewables and staged for resilience.*

- **“Islanding” from the grid:** A coordinated local grid area that can separate from the main grid and operate independently.
- **Components:** Solar PV and other renewable energy, energy storage, demand response, and monitoring, communications, & control.
- **Clean local energy:** Community Microgrids facilitate optimal deployment of distributed energy resources (DER).
- **Resilient:** Ongoing, renewables-driven backup power for critical and prioritized loads, **and eventually all community energy needs.**
- **Replicable:** A solution that can be readily extended and replicated throughout any utility service territory.



Community Microgrids bring communities four benefits not provided by today's centralized energy system

- 1. Lower costs and increased economic investment**
- 2. Improved overall performance**
- 3. Resilience and security**
- 4. Replicable, scalable model**

Indefinite renewables-driven backup power provides an unparalleled trifecta of economic, environmental, and resilience benefits



- Reliability and power continuity
- Resilience and safety
- Local, renewable energy
  - Greenhouse gas reductions
  - Local control of energy
  - For electric vehicles and charging infrastructure
  - Reduced transmission losses
- Local jobs in engineering, construction, and maintenance
- More participation enabled by a network of “prosumers” who share the use, generation, and revenue of and from energy
- Energy security and national security



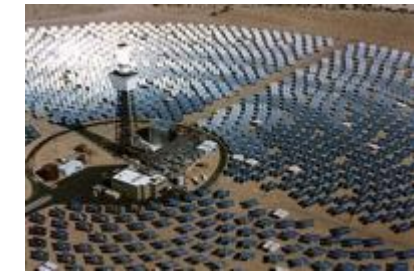
# WDG unleashes renewables for California's 100% renewable energy future

*Project Size*

50+ MW  
500 kW  
5 kW

Central Generation

Serves Remote Loads



**Wholesale DG**  
Serves Local Loads



**Retail DG**

Serves Onsite Loads



*Behind the Meter*



*Distribution Grid*



*Transmission Grid*



# Commercial and industrial (C&I) parking lots and rooftops have untapped solar potential

- Large rooftops, parking lots, and parking garages provide local solar generation potential.
- Electric load profiles of C&I facilities often match peak solar production hours.
- Large utility bills with demand charges motivate customers to install solar and energy storage.
- Local solar can reduce system peaks, and often industrial areas have excess feeder capacity to install large amounts of solar and energy storage without grid upgrades.
- Reduce carbon emissions from the heaviest polluters.



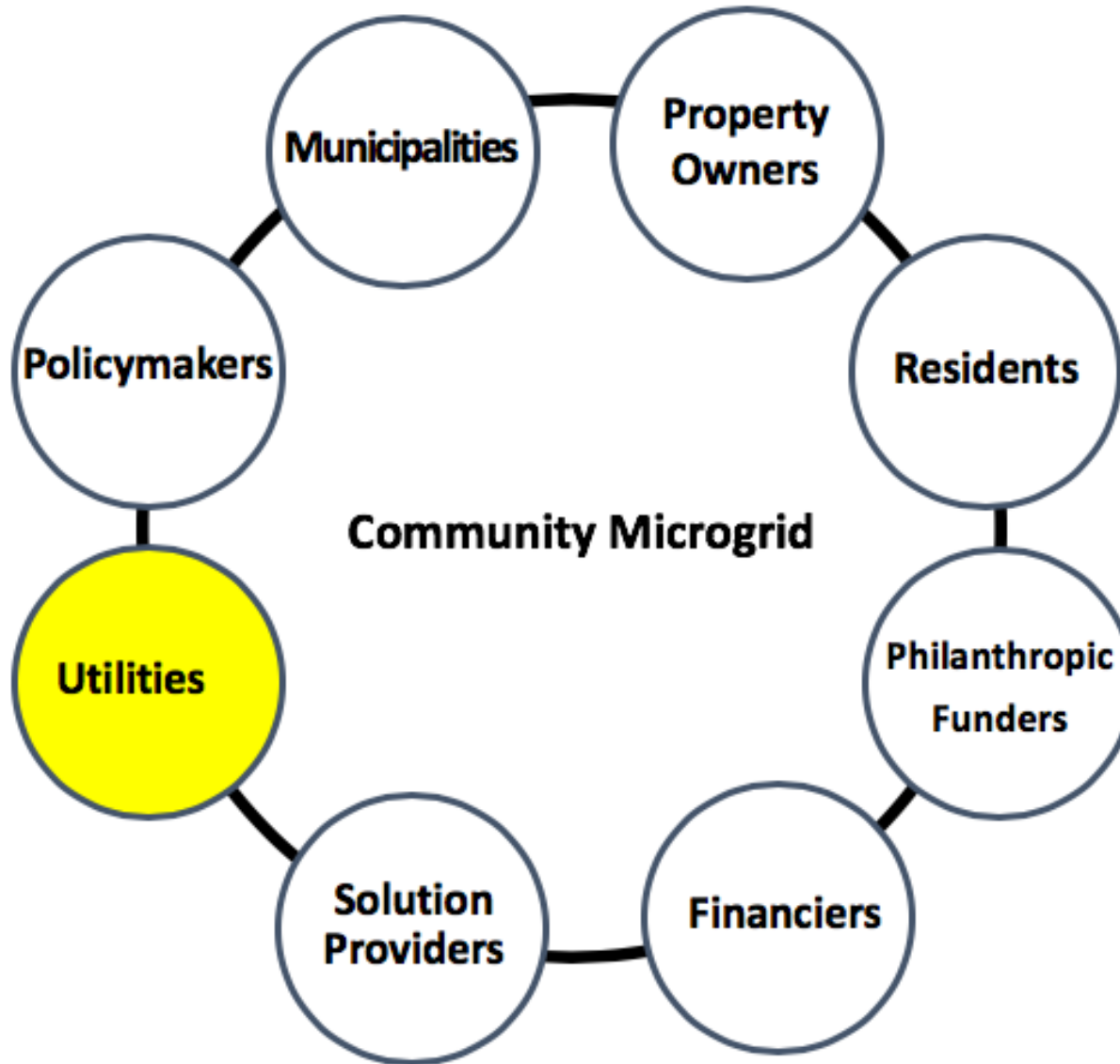
Well-designed and well-situated zero-net energy and net positive energy buildings become a valuable grid participant when combined with larger PV arrays on commercial and industrial structures.



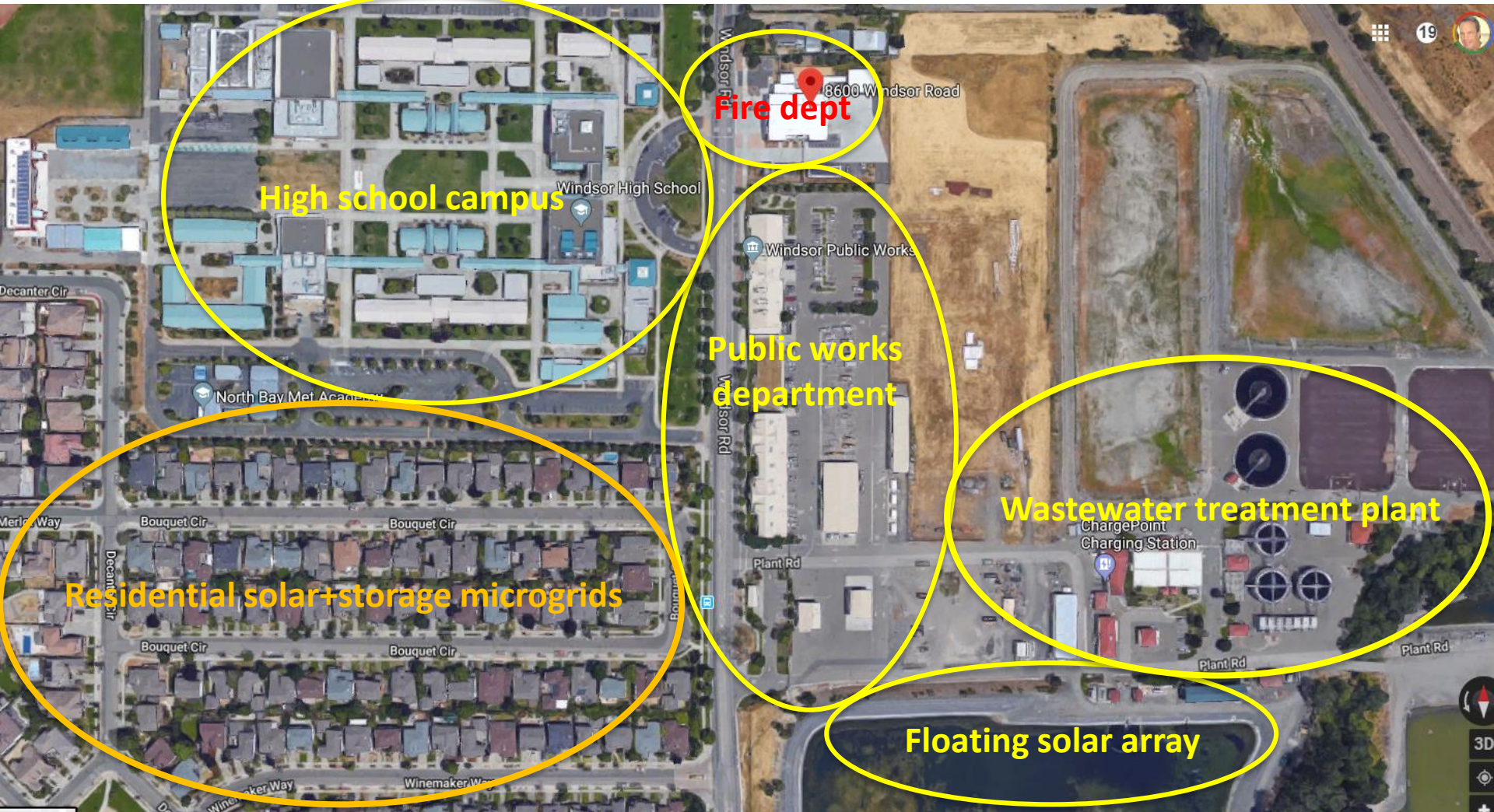
Individual building microgrids can be incorporated into a larger Community Microgrid with the appropriate hardware and software. It's critical to design behind-the-meter systems now to be compatible with future advances in energy infrastructure.



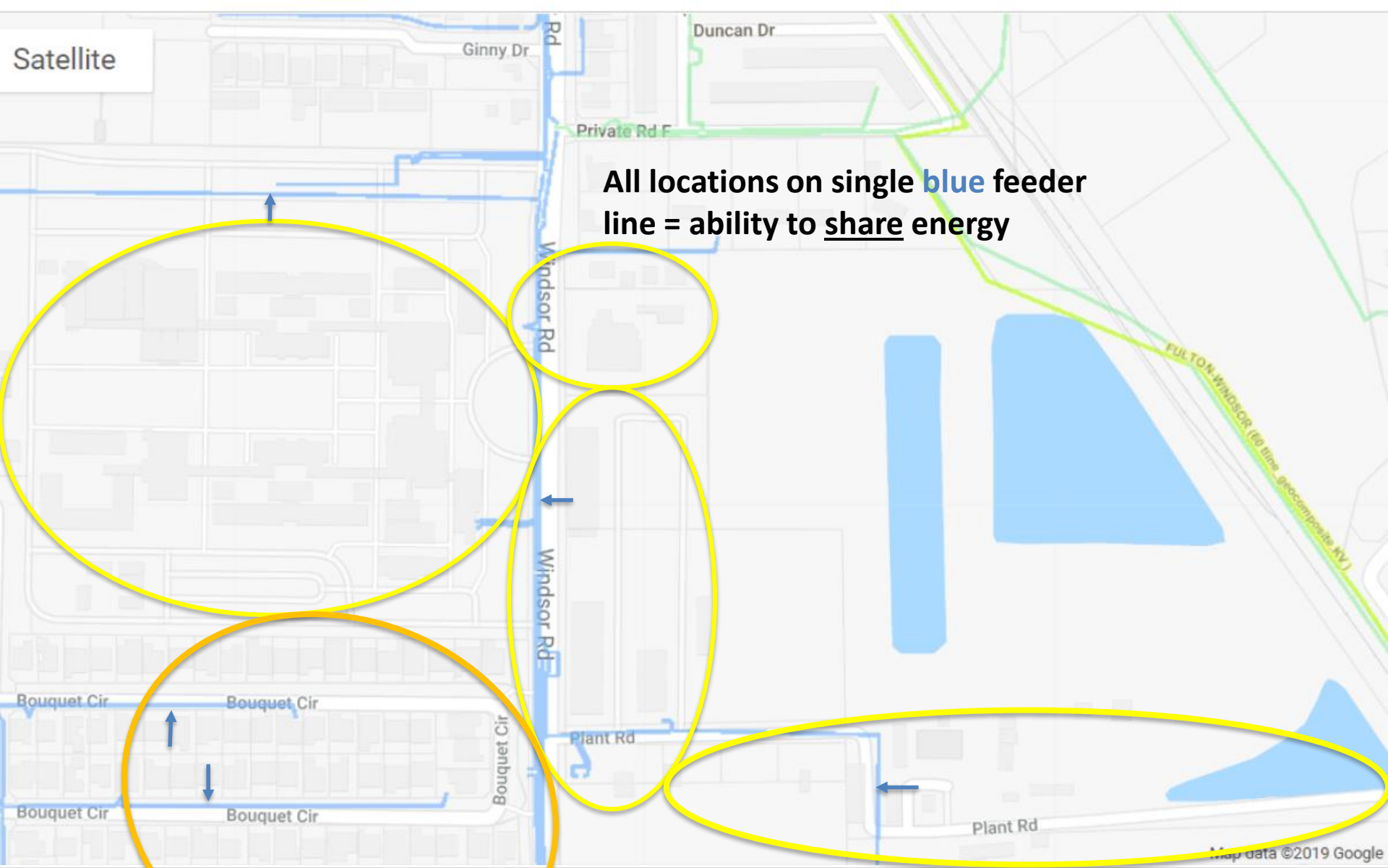
- PG&E is developing a new technology called a pre-installed interconnection hub. The PIH enables a mobile generation source to be interconnected during a grid outage event. This technology is still in the pilot phase.
- This would provide power to an islandable section of the grid, and develop a Resilience Zone.
  - This is essentially a basic microgrid, with variable but limited scope.
- We are collaborating with PG&E to identify locations on the distribution grid where a PIH could be installed.
- We are working with municipalities and PG&E to enable Community Microgrids in Resilience Zones.



# Example: Community Microgrid site



# Example: Community Microgrid site grid feeders: Substation level



# Example: Community Microgrid site Solar Siting Survey





- **Critical infrastructure: Essential for life and safety**
  - Fire departments
  - Public works departments
  - Water treatment and pumping
  - High schools (emergency shelters)
- Target sites have solar siting potential on large rooftops, parking lots, areas that can accommodate floating solar
- **Secondary sites: homes and non-critical businesses**
  - ZNE microgrid-ready homes
  - EV charging infrastructure

- Developed “Electrification & Community Microgrid–ready” document (ECMR)
- Developed draft document “Resolution for resilient communities”
- Developing a Community Microgrid plan for the City of Calistoga
- In discussion with West and North County communities for resilient microgrid plans





- Designed for adoption by cities and municipalities, to state intentions toward developing resilient communities.
- No binding measures; the document states intentions for staff to keep in mind while designing programs, codes, standards, etc.
- Please suggest connections to decision makers within your communities, or recommendations.
- Link to the document: [Resolution for Resilient Communities](#)

- Subscribe to [Clean Coalition newsletter](#)
- Subscribe to team partners' newsletters
- Share information on potential model structure case studies
- Suggest city or municipal staff to connect with
- Suggest publications to reach out to
- Suggest individuals/organizations to connect with
- Suggest experts in related fields to connect with and invite to join our team to fulfill the goals of the NBCRI



**Thank you for attending!**

**Questions?**

Contact information:

- John Sarter, Program Manager, NBCRI, [johns@clean-coalition.org](mailto:johns@clean-coalition.org)
- Malini Kannan, Program Engineer, Clean Coalition, [malini@clean-coalition.org](mailto:malini@clean-coalition.org)
- Webinar series with deep dives into the 3 main NBCRI goals coming in early May. Check the Clean Coalition website for details:  
<https://clean-coalition.org/news/category/events/upcoming-events/>