Clean Coalition
Making Clean Local Energy Accessible Now

# North Bay Community Resilience Initiative:
## The Path to Resilience and Sustainability

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## Clean Coalition (nonprofit) mission

Clean Coalition

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

## Expertise areas

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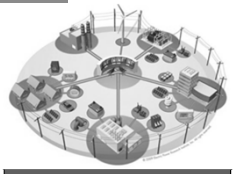

| Analysis & Planning | Grid Modeling & Optimization | Program and Policy Design | Community Microgrid Projects |
|---|---|---|---|
| Full cost and value accounting for DER; siting analysis<br>• PG&E<br>• PSEG<br>• SCE | Powerflow modeling; DER optimization<br>• PG&E<br>• PSEG<br>• SCE | Grid planning, procurement, and interconnection<br>• LADWP, Fort Collins, PSEG<br>• City of Palo Alto (FIT and solar canopy RFP)<br>• RAM, ReMAT<br>• Rule 21 & FERC | Design and implementation<br>• San Francisco, CA<br>• Long Island, NY<br>• U.S. Virgin Islands |

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## Energy is critical infrastructure

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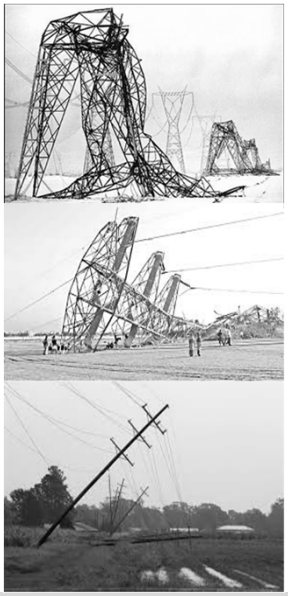
Our legacy, centralized energy architecture carries multiple critical risks.

- 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**



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## Traditional microgrids focus on single customers

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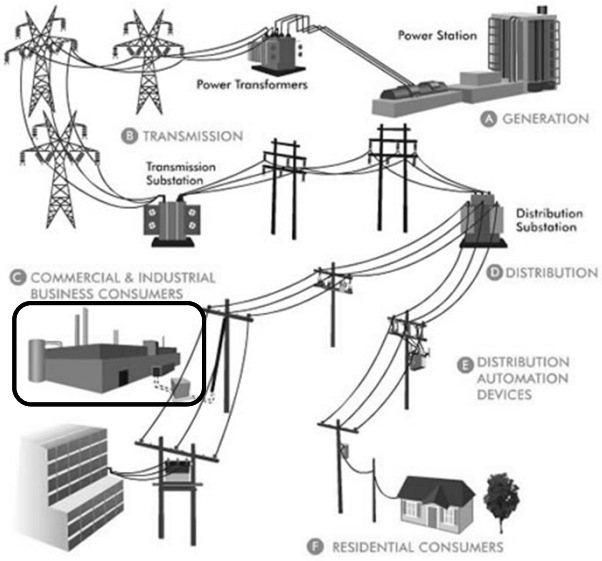


*Source: Oncor Electric Delivery Company*

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## Community Microgrids serve thousands of customers

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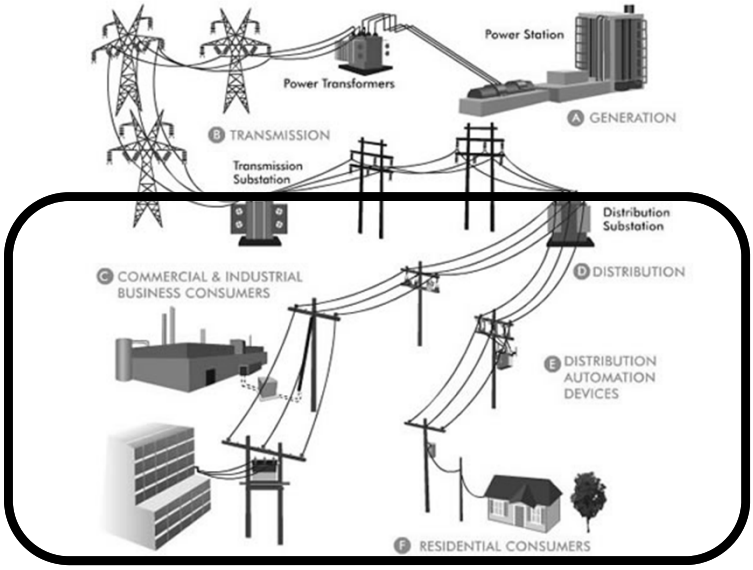


*Source: Oncor Electric Delivery Company*

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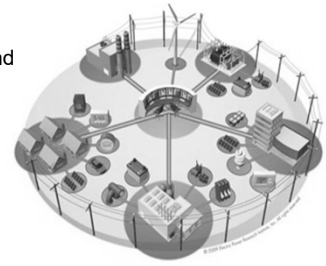
A Community Microgrid brings communities four benefits that are not provided by today's mostly centralized energy system.

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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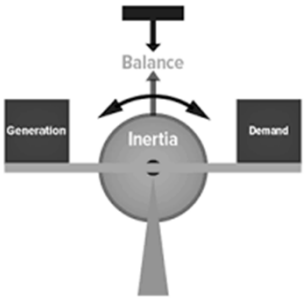
Local balancing is a more efficient way to operate the grid

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.**



## 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

## Moving forward: Puerto Rico

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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.**

## North Bay Community Resilience Initiative

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

1. **Rebuild fire-destroyed areas with high levels of sustainability** in homes, buildings, and the electric 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.
5. **Lower ratepayer costs**: DER will be utilized to defer or avoid substantial costs in centralized energy delivery, including peak energy procurement and transmission & distribution (T&D) infrastructure investments.


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## North Bay Community Resilience Initiative: Benefits Analysis

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**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**

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## North Bay Community Resilience Initiative: Example Location Only

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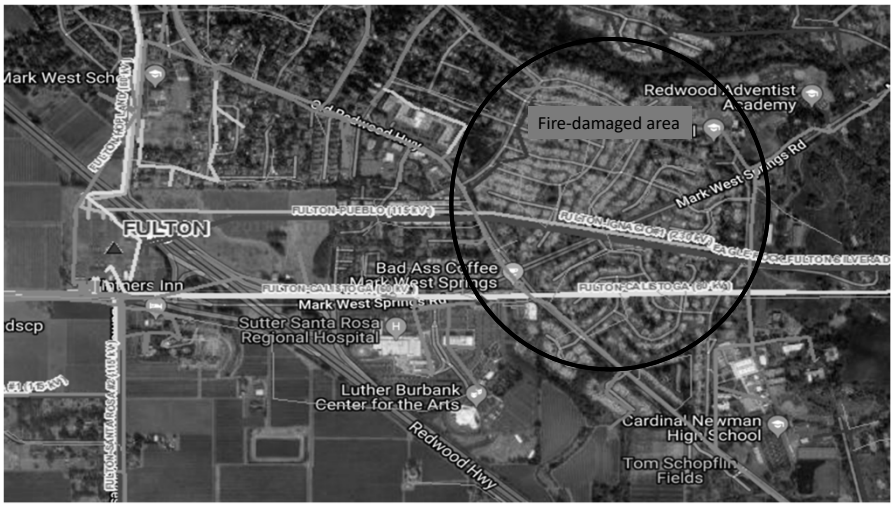
- Larkfield and the Old Redwood Highway Corridor – ideal for Community Microgrid
- Served by single substation, Fulton.






## North Bay Community Resilience Initiative

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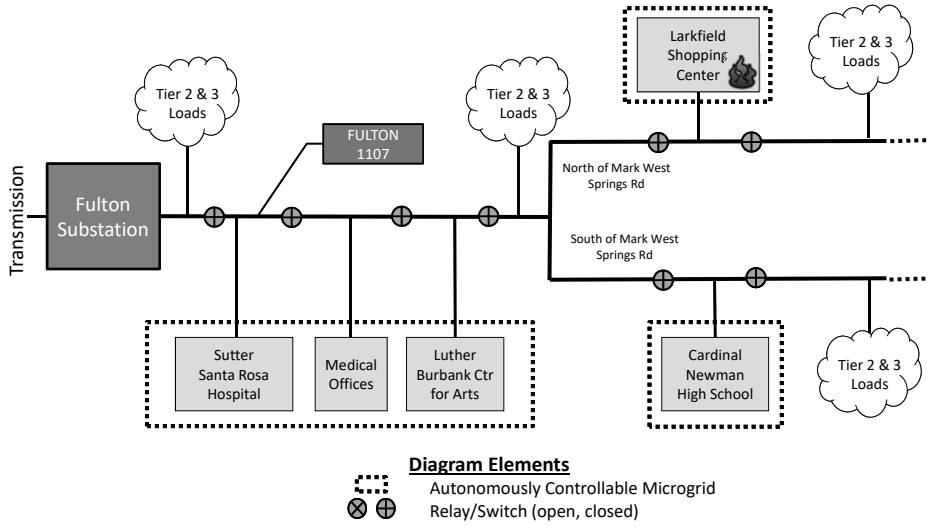
Example key sites:
critical, priority, large roofs & parking, etc.

**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 Resilience block diagram






## North Bay Community Resilience Initiative: Utility Support

Ongoing PG&E support & commitment

- PG&E is in full support of the North Bay initiative, including the re-build program for homes (upcoming slide).
- PG&E is also committed to Community Microgrid aspects and grid modernization, 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

## North Bay Community Resilience Initiative: Utility Support

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.
- This analysis is currently underway. 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.



## North Bay Community Resilience 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

## North Bay Community Resilience Initiative: Homes and buildings as grid partners

- 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



## Advanced Energy Rebuild for Homes

Support for Rebuild

- 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.
- For 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/

## Advanced Energy Rebuild for Homes

**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

**$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

**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

**$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).

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## North Bay Community Resilience Initiative

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
- Wave 1

Stone Edge Farm Microgrid

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