Microgrids for Resilience: The EcoBlock Model

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EcoBlock: A Multi-Customer Microgrid Solution

California Energy Commission EPIC project
Phase I (2015-2018) $1.5M
Phase II (2019-2023) $5M

Unique features:
Retrofits of older housing stock on an existing block, combining deep efficiency with 100% solar PV microgrid

Innovative legal and financial structures:
Community ownership and management via nonprofit Co-op or trust; Financing via Community Facilities District (CFD)

Beneficiaries:
Project aims to prove affordability for low-to-middle income neighborhoods; Scale-up potential is key

Problems addressed by the EcoBlock Model

1. **Urban resilience**
   Create power islands for essential services during sustained outages, whether due to PSPS or other causes

2. **Access to solar power**
   Make clean energy and reliable backup power affordable for low- and medium-income households

3. **Feeder hosting capacity**
   Address variability and power quality impacts of high-penetration solar photovoltaics (PV) by aggregating them with storage and controls behind a single interconnection point

4. **Fuel switching for decarbonization**
   Accelerate adoption of electric vehicles (EVs) and other new loads (e.g. space and water heating) by fuel switching from gasoline and natural gas to electricity, and accommodate impacts on distribution grid

5. **Deep efficiency**
   Accelerate adoption of deep energy efficiency retrofits for existing buildings

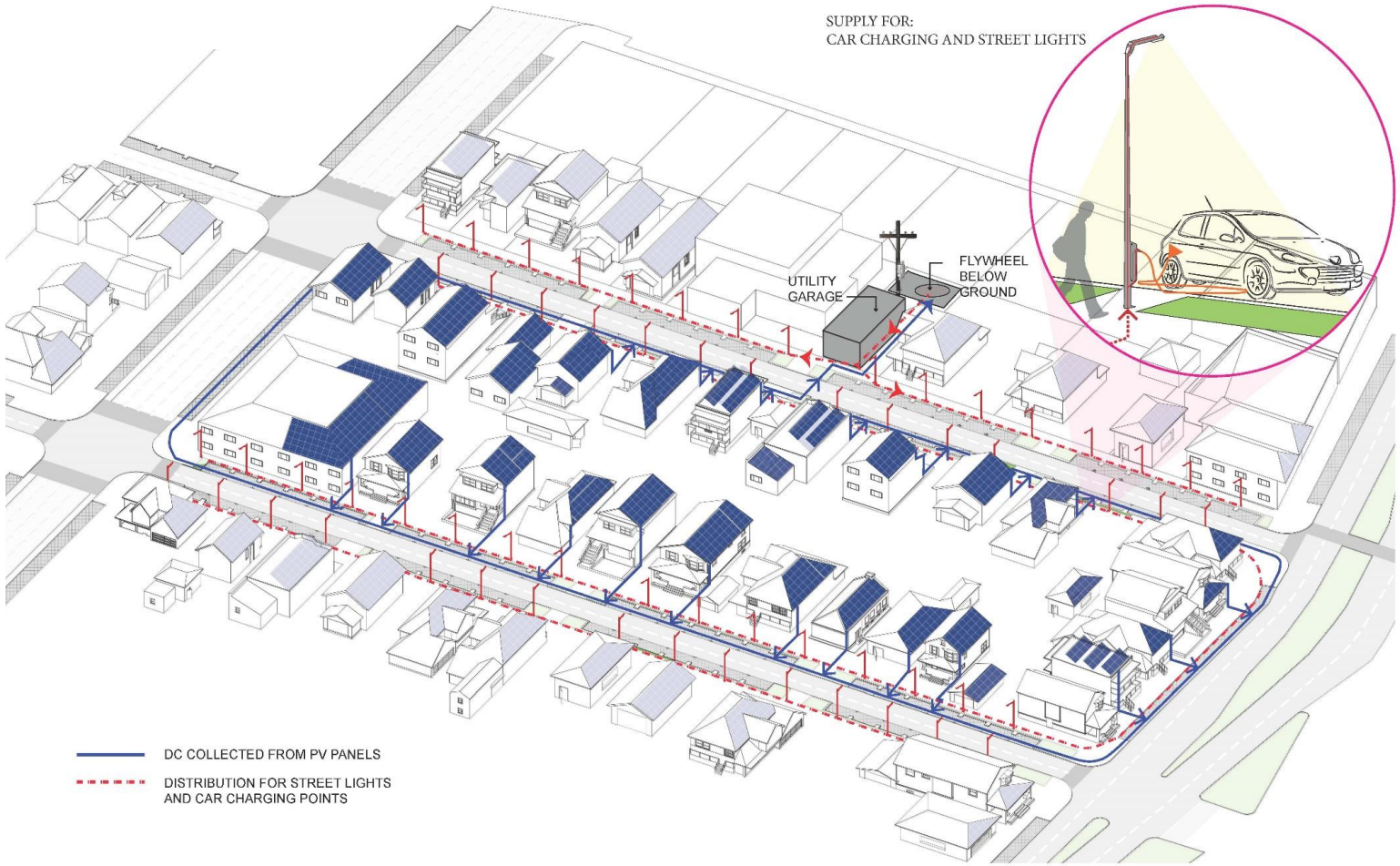
6. **Community management of Distributed Energy Resources (DERs)**
   Develop financing and governance mechanisms to support shared prosperity, sustainability and scalability

EcoBlock Vision: A Multi-Customer Microgrid Solution

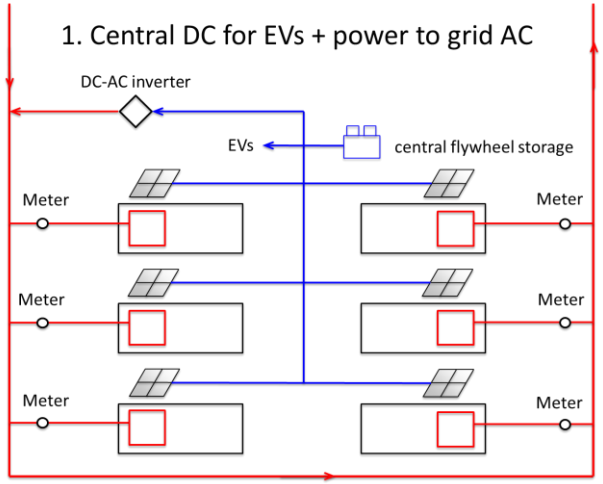
Electrical system combines DER

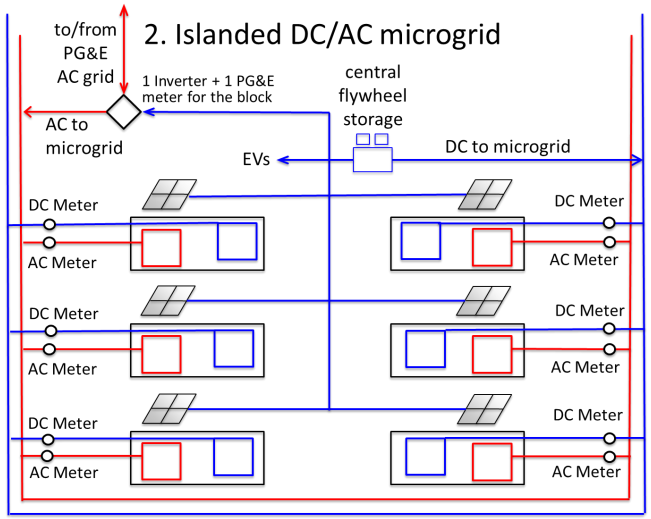
- Communal rooftop solar PV
- Communal energy storage system (flywheel and/or battery)
- Intelligent loads and electric demand response
- Shared Electric vehicle (EV) charging
- Smart controls in a direct-current (DC) microgrid infrastructure

behind a single interconnection with PG&E

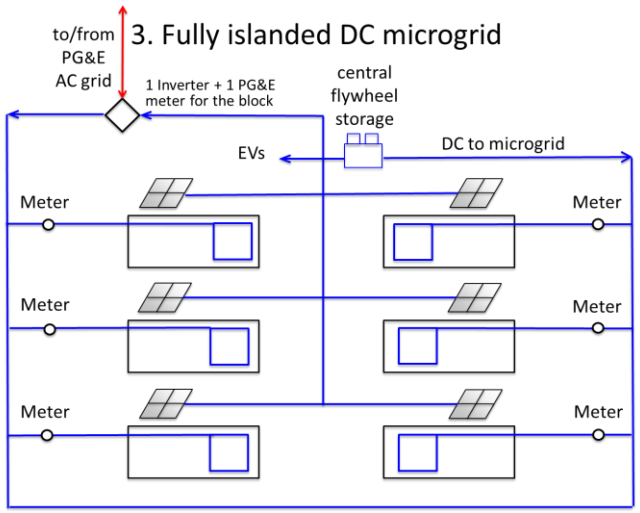


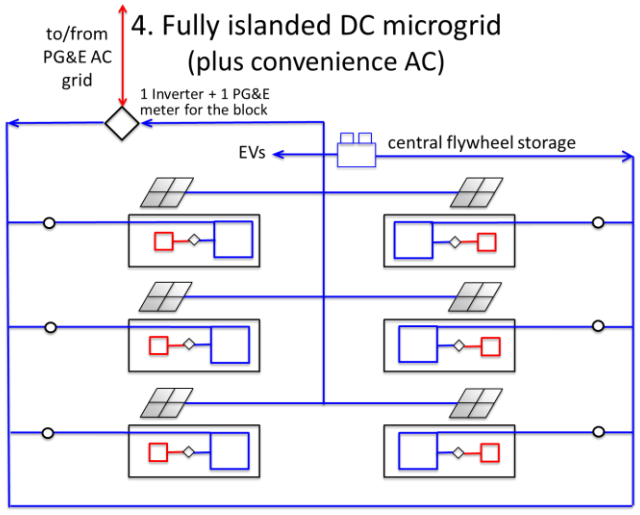
EcoBlock Vision: Different possible topologies for AC and DC power sharing



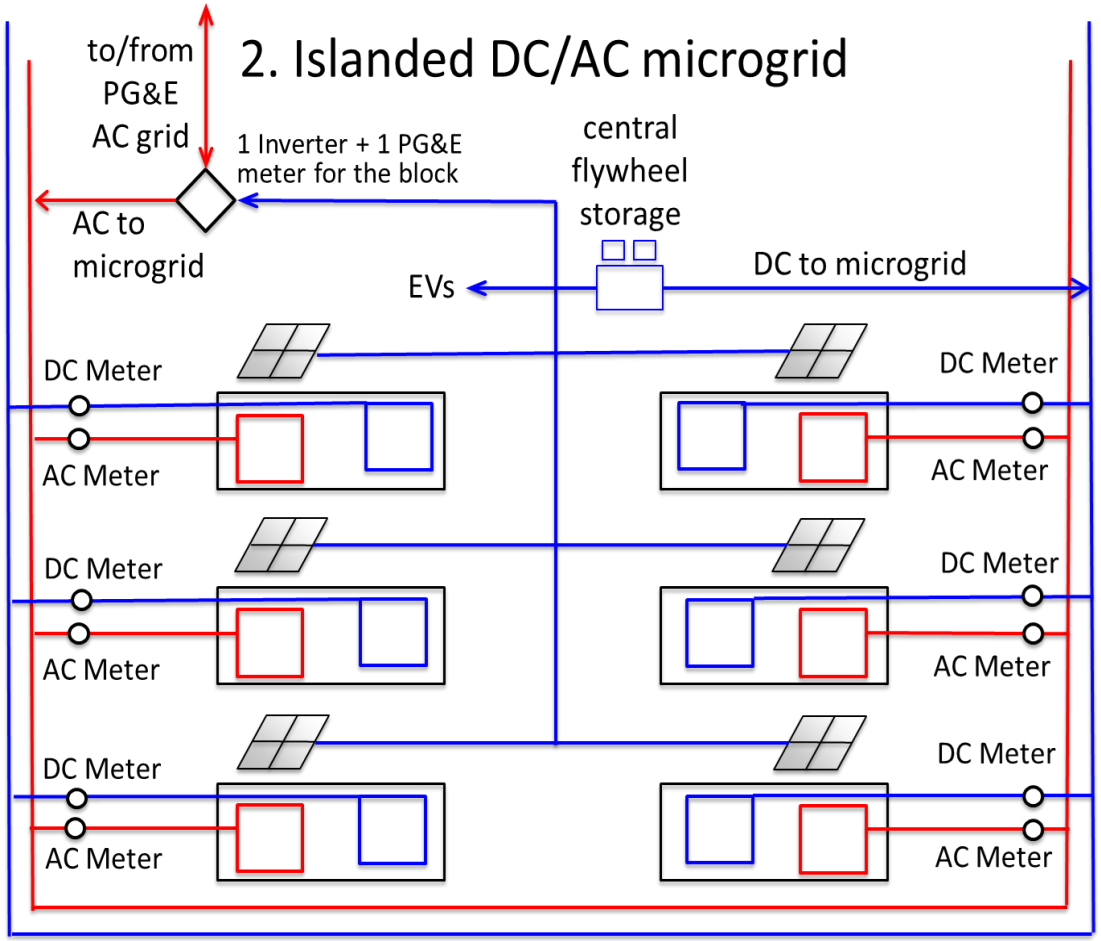


Different topologies may fit different situations





EcoBlock Vision: Candidate topology for AC and DC power sharing



Redundant AC/DC infrastructure advantages:

- Higher efficiency through DC delivery and appliances
- Easier control of DC microgrid
- Hedge risk for participants by retaining AC connection
- Design & planning autonomy from PG&E
- Advance DC technology adoption

Barriers to the EcoBlock Model

Regulatory: Resource sharing among residential neighbors;
Interpreting the term “public utility” and “electrical corporation” to exclude microgrids

Financing and permitting: Smoothing the path for affordable, sustainable resilience solutions

Recommendations for CPUC to address regulatory barriers:

1. Clarify that owners of microgrids which are research, development and demonstration pilot projects in the public interest will not be considered “electrical corporations” under Cal. Pub. Util. Code § 218, subject to: (a) compliance with technical safety standards, and
(b) transparency to allow for information sharing and learning, while protecting individual privacy.

2. Define “own use” of electric power to include sharing among residential and small commercial customers on a local scale (10s of customers, 100s of kW), none of whom profit financially from any associated transactions.
Permit electrical interconnection for purpose of access to collectively owned solar PV and energy storage resource, to mutually enhance reliability, reduce cost, and support resilience.

Benefits of addressing barriers to multi-customer microgrid solutions

Economies of Scale

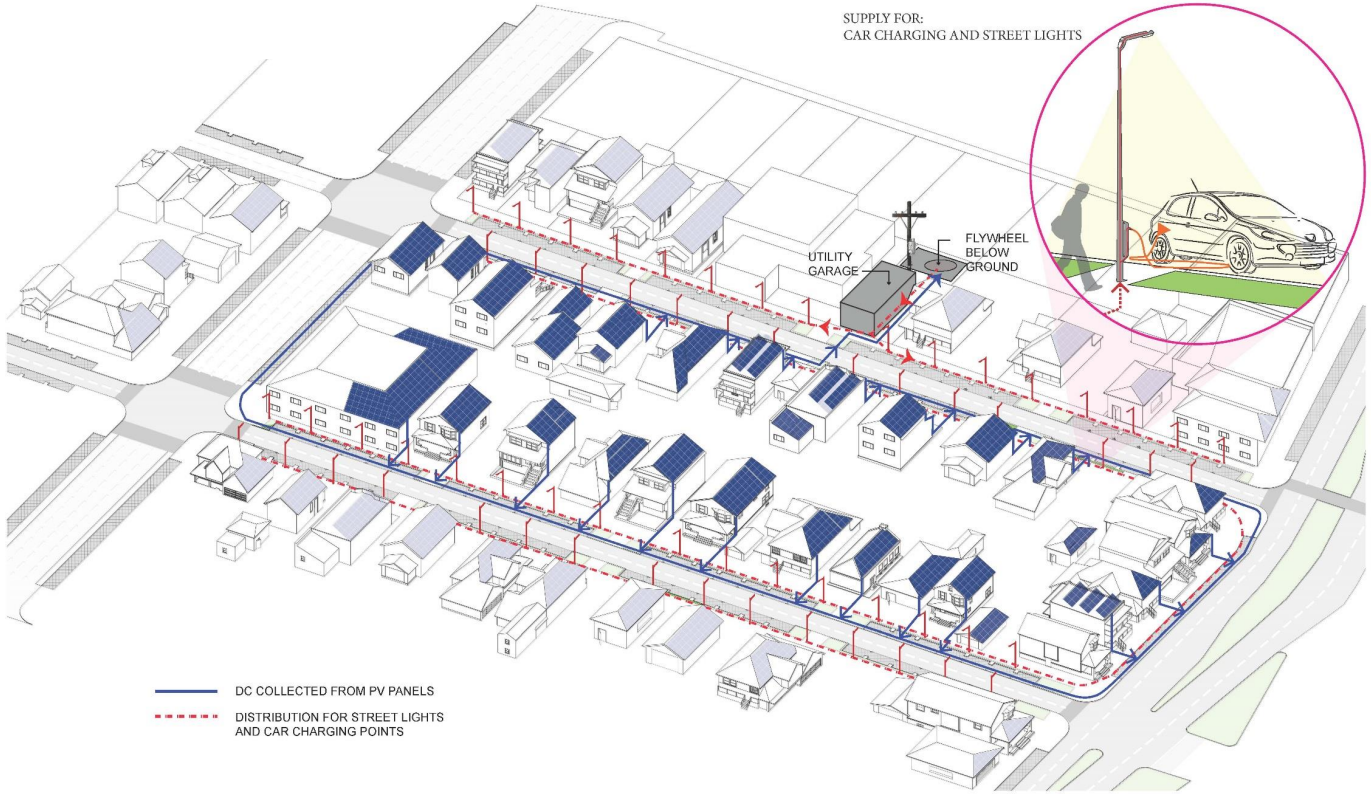
Realize improved benefit-cost ratio for aggregated PV and storage resource

Accessibility

Make clean, resilient energy solutions available to those who could not otherwise afford it

Shared prosperity

Spread benefits of energy resilience across entire neighborhoods, not just individual homeowners



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Questions?

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Microgrid Strategies for Resilience

1. **Community Microgrids for Essential Services – Near Term Priority**
   Purpose: Provide electricity for essential services during power outages to individuals in need.
   Recommendation: Fund the installation of modestly sized, off-the-shelf, islandable solar PV and battery systems at neighborhood locations, publicly accessible in emergencies. Do not rely solely on diesel generators, to avoid dependence on fuel supply in sustained outage scenarios.

2. **Controlled Islanding of Utility Distribution Circuits – Intermediate Term**
   Purpose: Restore high-priority loads and enable recruitment of existing interconnected Distributed Energy Resources (DER) in emergencies.
   Recommendation: Expand utility-supervised, islanded operation of distribution circuit sections where technically feasible. Identify infrastructure upgrades required to enable islanding on more circuits.
   Consider explicit rules for relaxed power quality and load shedding expectations under emergency island operation.

3. **Multi-Customer Microgrids – Longer Term**
   Purpose: Create urban pockets of resilience while advancing efficiency, decarbonization, and DER integration goals.
   Recommendation: Allow flexibility for novel multi-customer power sharing arrangements across property lines, behind a single Point of Common Coupling (PCC) with the utility.

Candidate Electrical Infrastructure