

# Oakland EcoBlock



## A Neighborhood Energy Retrofit

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# The Problem

Urgency of climate change: energy upgrades one house at a time is too slow

The majority of homes in California were built before energy codes. These homes are more often owned by low-middle income households.

72% of housing in California is in single family and 2-4 unit multifamily buildings, but community solar often focuses on new suburban construction or energy upgrades on existing 5+unit multifamily.



# Oakland EcoBlock: A Zero Net Energy Neighborhood Retrofit

**Goals:** provide **affordable** access to solar and energy upgrades, reduce greenhouse gases, improve electrical grid **reliability**, and **scale**.

## Unique features:

- Energy retrofits of older 1-4 unit housing stock
- Shared rooftop solar
- EV car share and shared curbside EV charger
- (if funded) a microgrid or other storage
- Stormwater mitigation
- Community ownership via nonprofit Association

## California Energy Commission Advanced Energy Community

Phase I (2016-2018), 1.5M + donors: Feasibility study

Phase II (2019-2025), \$5M + \$3M donors + cost share: Build





# Oakland EcoBlock: Affordable, Clean, Resilient Energy

**Energy efficiency**  
(insulation/air sealing) in  
older urban housing stock

**Electrification** of space  
conditioning and water  
heating

Shared rooftop **solar**

Microgrid design  
Curbside **EV charger** and **EV  
car share**

**Stormwater bioretention**  
and sidewalk planting

Innovative legal & financial  
structures for **community  
ownership & governance**

Provide templates and best  
practices for a **path to scale**

0 100' 200' 400'

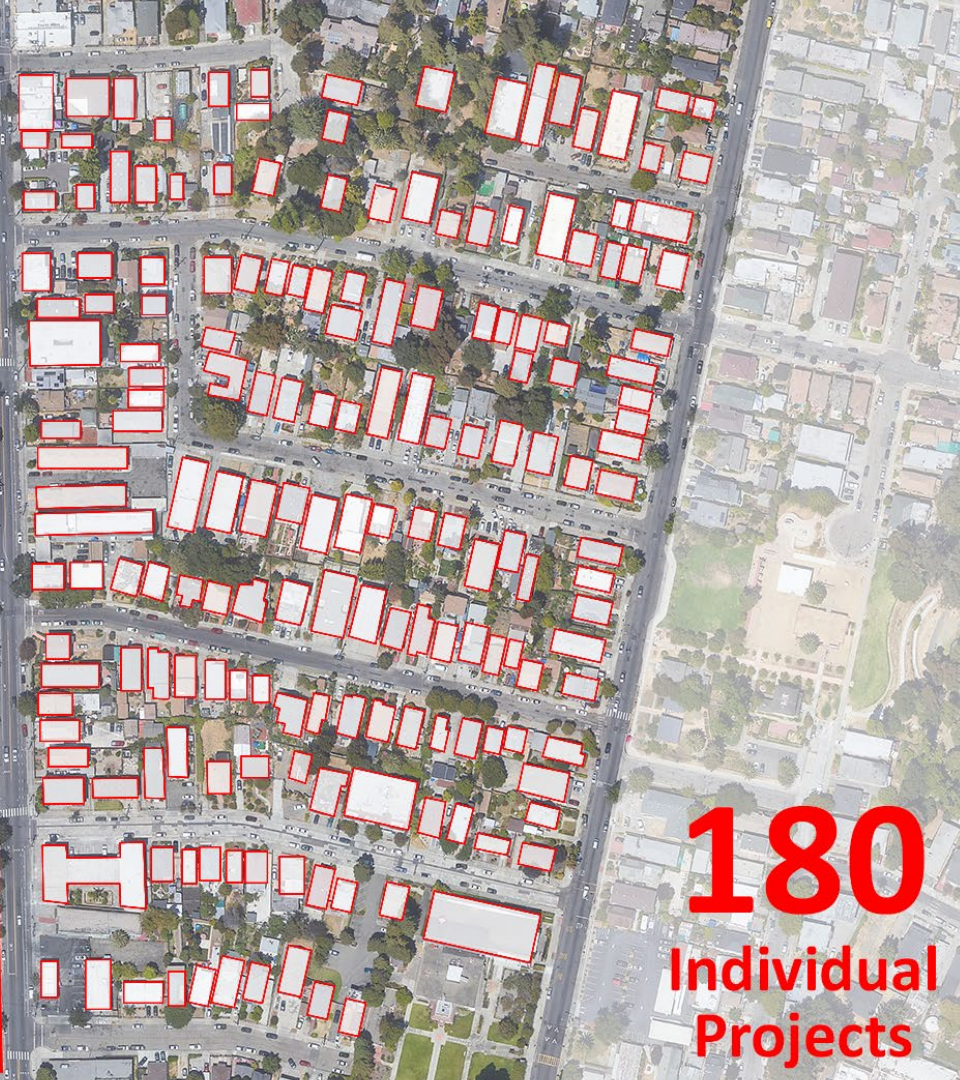






9

EcoBlock  
Projects



**180**  
Individual  
Projects





9

## EcoBlock Projects

We are exploring how EcoBlock leverages Economies of Scale to:

- Reduce capacity for solar/storage by sharing
- Reduce energy transmission losses
- Save construction time
- Fewer vehicles/equipment through car/EVCS share
- Decommission natural gas lines
- Rapidly increase adopters through neighbor/peer effect

180  
Individual  
Projects



## Economies of scale: in construction

- Fewer truck rolls (delivering appliances, trips to the dump)
- Potential for bulk purchase of appliances and heat pumps
- Alleviate “half-day” labor issue when a project finishes midday





# Economies of scale: neighbor or peer effect

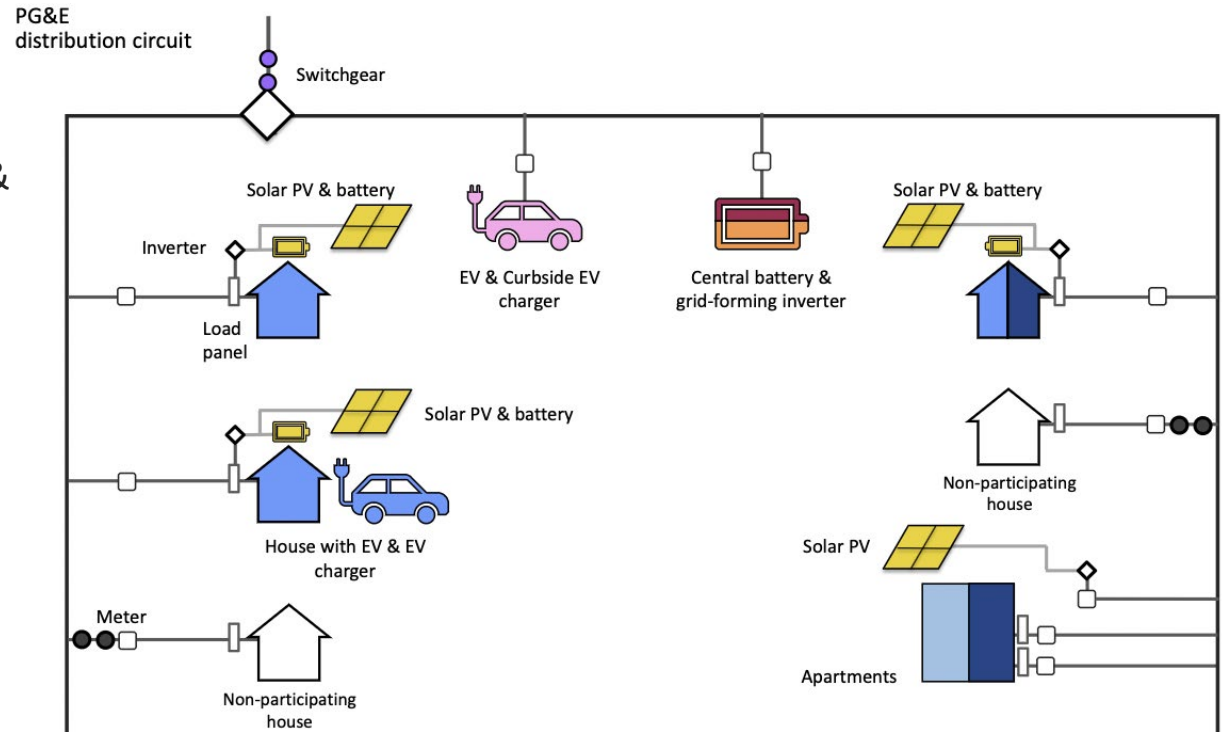
- Solar adoption is contagious in neighborhoods regardless of income.
- These new technologies—heat pumps, induction stoves—are hard to understand
- Trusted source of information: Neighbors talk to each other about new technologies and can reduce the burden
- Potentially reduces soft costs of acquiring customers (home performance, electrification, solar)





# Community Microgrid

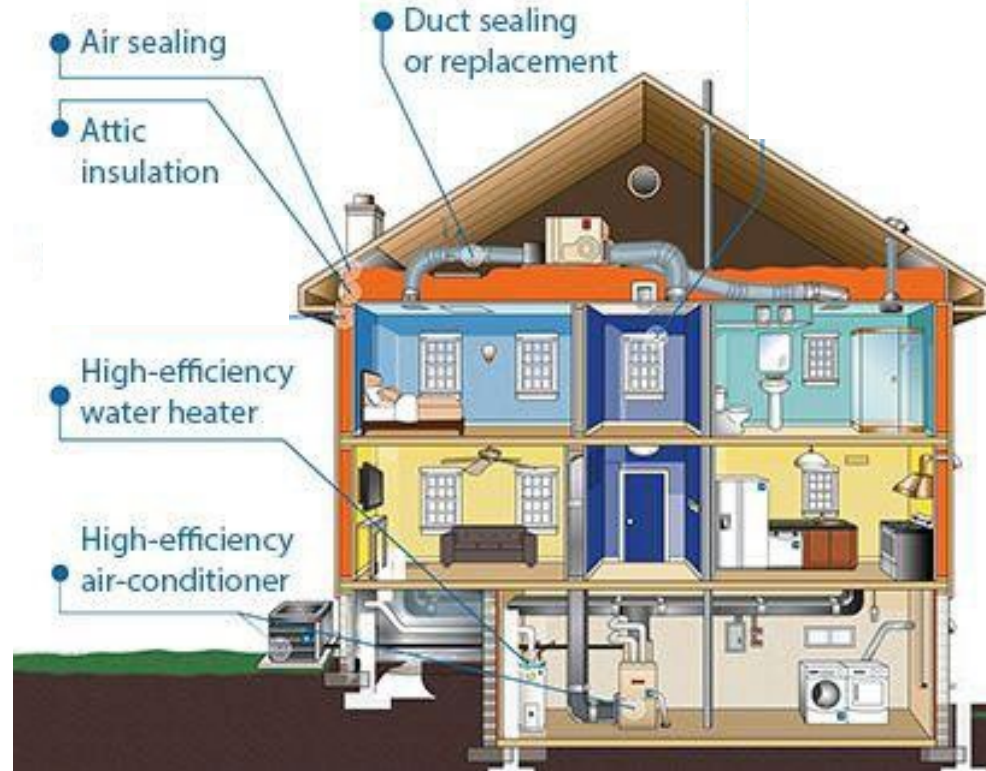
- **PG&E** owns & operates all overhead wires, transformers & protective devices
- ~100 kW solar on 15 roofs
- 125 kW/250 kWh LiFePO<sub>4</sub> battery
- Shared curbside EV charger charges **shared EV**
- Not all houses need to join



# Design & Construction

Reduce loads to **make equipment smaller & cheaper** and provide **improved comfort and indoor air quality**

- High performance envelope
- Ventilation systems (kitchen hood, bathroom fans)
- Heat pumps for space heating/cooling
- Heat pump water heaters

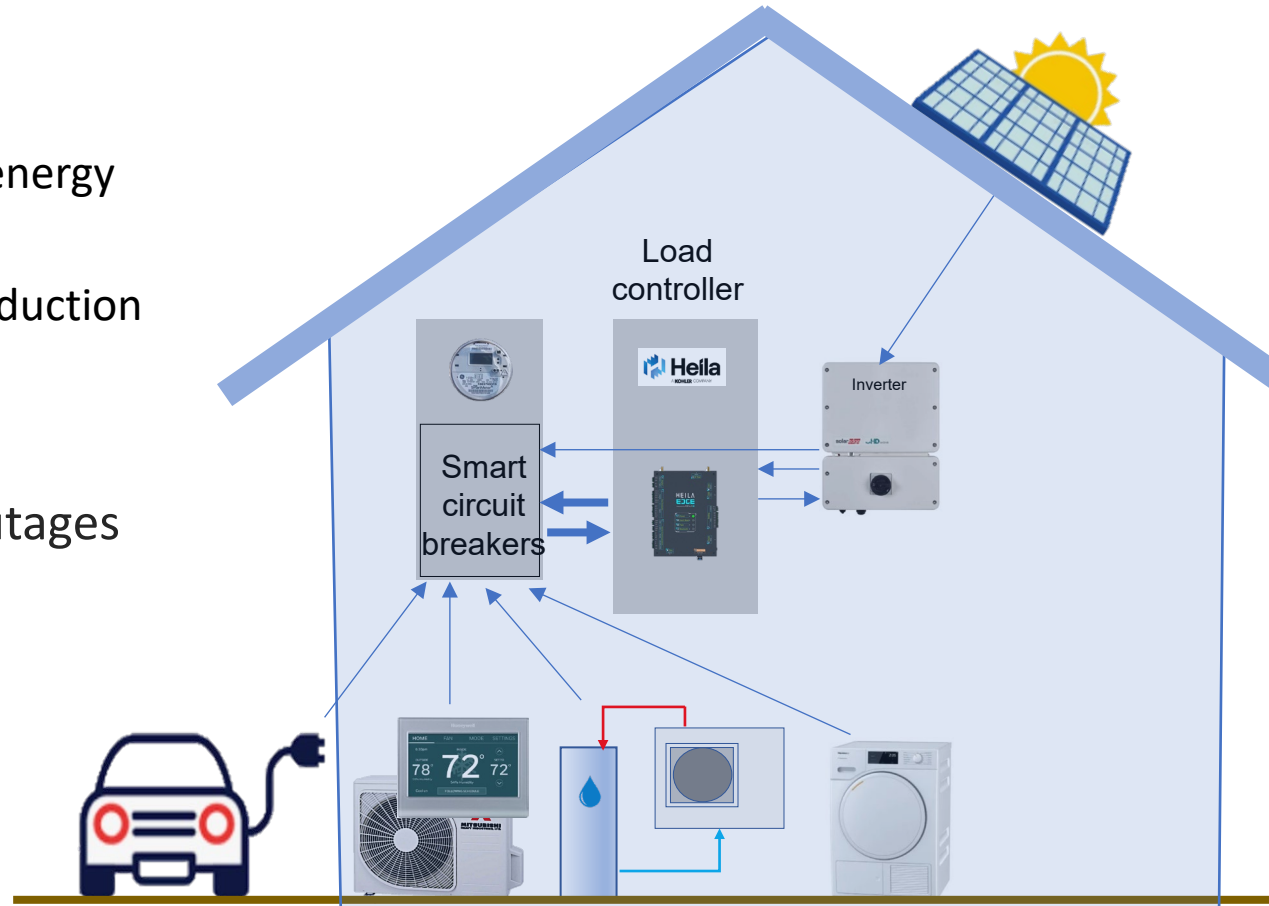




# Home Energy Management System

## Control & Connectivity

- Monitor
  - Whole building energy consumption
  - Solar energy production
- Manage loads
- Local control
- Resilient to Internet outages



# Water Efficiency

## Laundry to landscape irrigation workshop

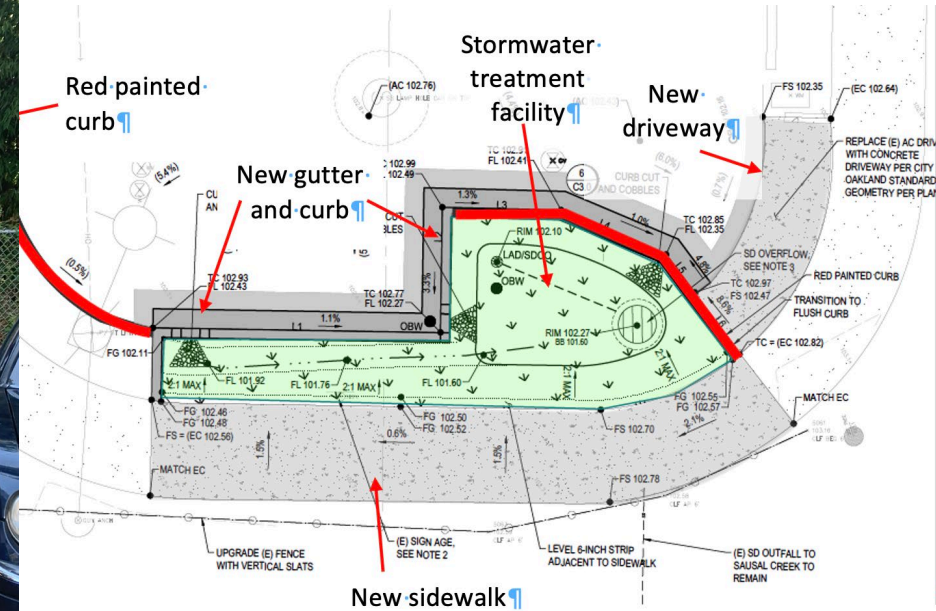




# Stormwater mitigation

## EPA grant

- Biodetention swale at end of block before creek. Will monitor water flow and quality.

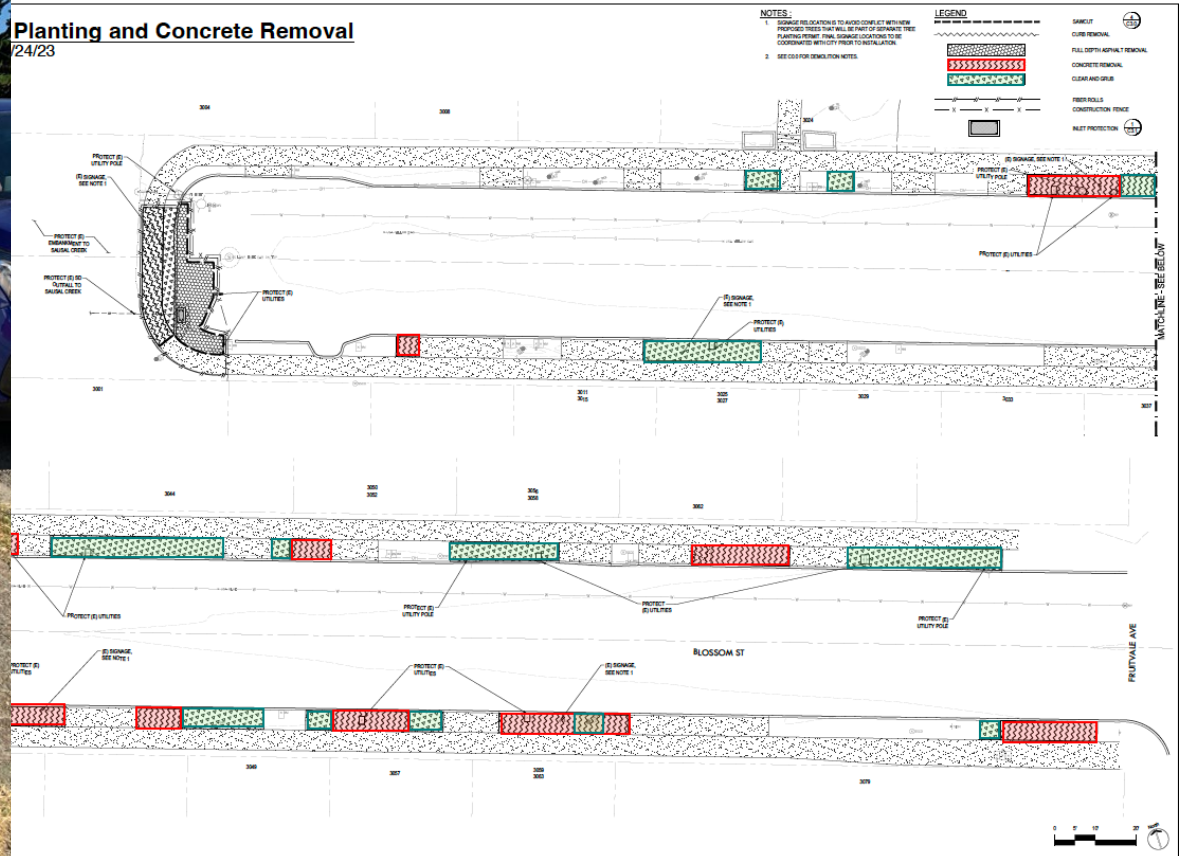


# Street plantings—aesthetic and reduce runoff



## Planting and Concrete Removal

2/4/23





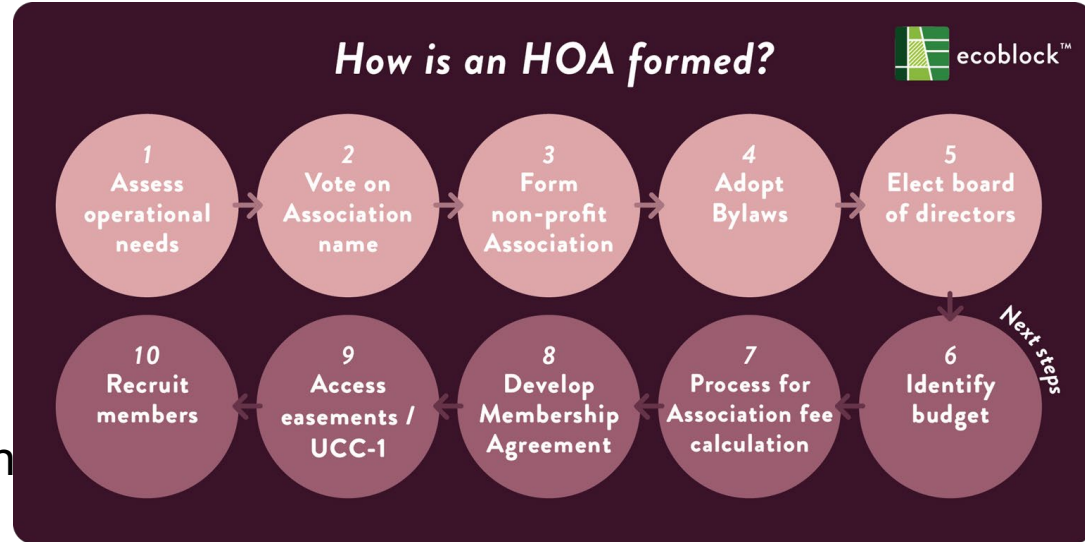
# Mobility

- **Curbside Electric Vehicle (EV) charger**
  - It's Electric
    - Work with homeowner
    - Submeter from house for charger
    - Cord stays with the car
  - City: major encroachment permit
  - Not open to public
- **EV car share** for block participants
  - Majority responded they would get rid of a second car if they had access to car share!
  - Difficult to find car share company that works with private group



# Policy and Law











- City codes and permits
- Utility tariffs and regulations
- Land use issues
- Tenant/property owner issues
- Tax issues
- Choice of Governance vehicle
- Formed Homeowners Association with block leaders
- Neighbors recruited neighbors to form Membership





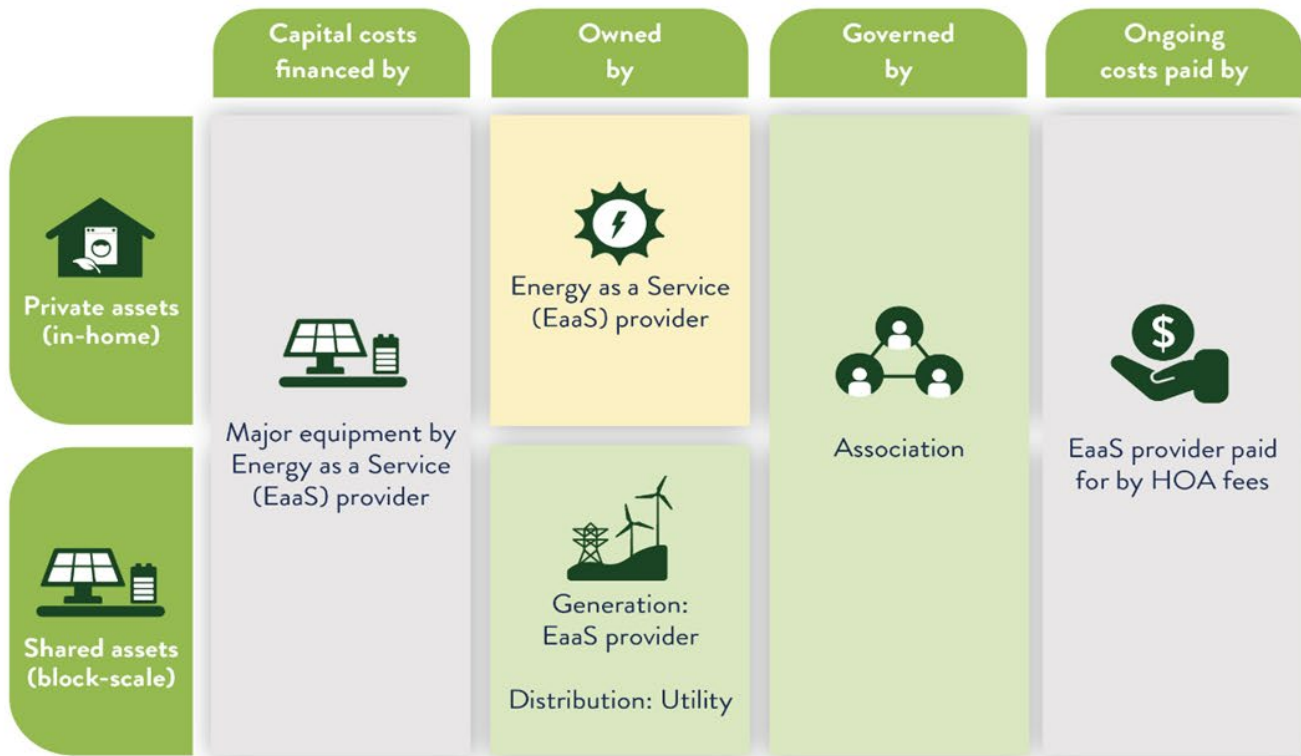
# Business & Finance

- On-bill financing for in-home upgrades
- Public financing or nonprofit lender for shared assets

	Capital costs financed by	Owned by	Governed by	Ongoing costs paid by
 Private assets (in-home)	 Personal financing (On-bill financing)	 Property owner	 Property owner	 Property owner
 Shared assets (block-scale)	 Public financing (Communities Facility District (CFD))	 Generation: Association Distribution: utility	 Association	 Association fees

# Business & Finance

- Third Party finances & owns major in-home upgrades, energy generation, storage & controls
- Utility owns & maintains distribution infrastructure





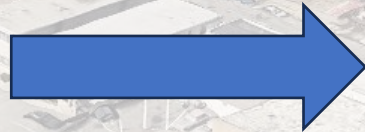


# Community



# How can we improve Oakland neighborhoods?

- Old inefficient, leaky homes, poor air quality
- Old natural gas lines—susceptible to fires
- Old electrical capacity
- High energy bills
- Susceptible to power outages
- Low income/priority populations



- More comfortable homes
- Improved air quality
- Keep the lights on and lower energy bills!
- Local clean neighborhood transportation
- Neighbors working together



# Education



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## AROUND THE BLOCK

ECOBLOCK'S COMMUNITY NEWSLETTER

### From the team

Dear Neighbors,

Happy summer! We apologize for the long silence, and hope you are well. Things have been busy with EcoBlock behind the scenes, and we're excited to share the latest project updates with you:

- **Construction** is starting this month, **PG&E service upgrades** are delayed, and **permitting for the block-level upgrades** is underway. (pg. 2-3)
- Blossom Street residents: Interested in being part of the EcoBlock recycling group? **Nick Corlett** shares his experience using **Ridwell**, an innovative community recycling service, with fellow neighbors on the block. (pg. 4)
- The **San Francisco-Oakland Bay Bridge** is a remarkable feat of engineering with a secret guardian: the Bay Bridge troll. Learn about this mysterious figure who has added intrigue and bit of magic to the Bay Bridge for decades. (pg. 5)

With appreciation,

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CREDIT: HAXIN GUO

**A greener future:** The Oakland EcoBlock is paving the way for more sustainable and climate-resilient communities.

### General announcements



**All participants:**  
Homeowners & Renters



**All Homeowners**

- Recently, PG&E notified the team that given the current electrical load issues on the block, the service upgrades will require them to **replace the existing overhead distribution lines**. This will reduce the cost of the microgrid but will delay the project by about **six months**. The first step in the process is to submit the **service upgrade contracts**—the team is working with all participating PG&E customers to sign the contracts, which the project will pay for.
- Given PG&E's new policy, Eco Performance Builders is planning to **conduct construction in phases**, and is **starting work on the block this month**. They will be in touch with this new schedule.

### Upcoming events

**Try induction cooking—for free!**

East Bay Community Energy (EBCE) and Acterra are offering all East Bay residents—both EBCE and non-EBCE customers—the chance to "test drive" induction cooking in their home for free! Apply to reserve your Induction Lending Kit today: [ebce.org/induction-cooking](http://ebce.org/induction-cooking).

### APPLIANCES 101:

## KNOW YOUR HEAT PUMP WATER HEATERS

### 01 WHAT ARE HEAT PUMP WATER HEATERS?

Heat pump water heaters (HPWHs) work like refrigerators in reverse: they use electricity to capture heat from the surrounding air and transfer it into an **internal water tank**. Water heating accounts for roughly **20 percent** of home energy use and makes up the **largest residential natural gas load**. However, recent technological advances have made HPWHs more effective for efficient electrification.

### 02 TYPES OF HEAT PUMP WATER HEATERS

• **Integrated:** Integrated HPWHs have an **internal compressor** on top of the **hot water tank**. They typically include **1-2 electric resistance elements** that provide backup hot water during periods of high demand (e.g., during the colder winter months).

• **Split:** Split systems have an **external compressor** that is connected to a hot water tank inside the house. They typically do not include an electric resistance heater.

### 03 INSTALLATION CONSIDERATIONS

• **Size & first hour rating:** To properly size a HPWH, consider how many gallons of hot water it can supply per hour.

• **Sound & filtration:** HPWHs produce **ambient noise** during operation and require regular **air filter cleaning**.

• **Condensate:** HPWHs produce **distilled water** that should be drained outside or to a sewer.

• **Location:** HPWHs should be placed **indoors**, where temperatures stay between **40°-90°F** year-round.

• **Air space:** About **750-1,000 cu. ft.** of air space is needed. The HPWH can be vented to bring in air for intake.

### 04 WHY HEAT PUMP WATER HEATERS?

**Pros**

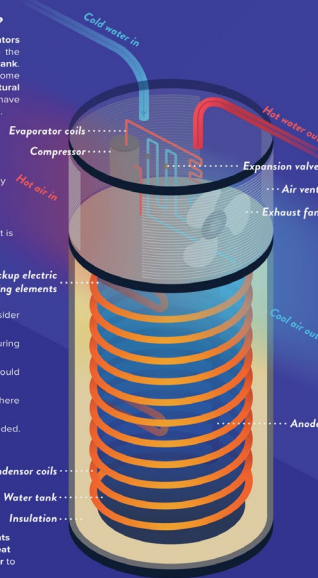
- Can program mode and set point controls to optimize operation
- Premium costs can be offset with long-term energy savings, federal tax credits & local rebates

**Cons**

- Higher initial costs
- Have unique space & installation requirements
- May take longer to heat large volumes of water to the present temperature when demand is high

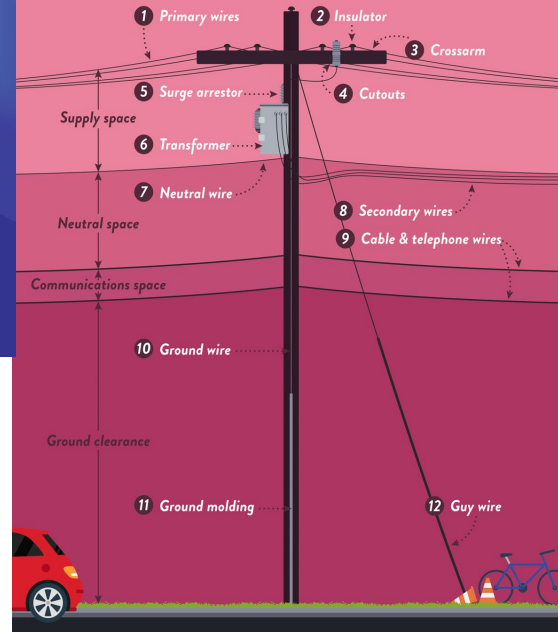
Image by Burke Cheng

Sources: Amy Dryden & Theresa Peffer, EcoBlock • Bob Vito • Build with Blue • ENERGY STAR • This Old House • U.S. Department of Energy • U.S. Energy Information Administration



### UTILITIES 101:

## KNOW YOUR UTILITY POLES



# Oakland EcoBlock Stakeholders

## Partners



Technical  
Advisory  
Committee



ZNE/Alliance

## EcoBlock Community Association



ecoblock™

## Research



## Implementation



Morgan Lewis



## Sponsors



Anonymous Donor

## Utilities



## Next steps

- Finish construction
  - insulation, reroofing, rooftop solar, electric water heating and space conditioning
- Look for funding
  - Complete electrification, interactive website, energy storage or microgrid
- Test revenue streams and aggregation
- Interview residents
- Document lessons learned in a Guidebook (or interactive website!)
- Brainstorming how to scale, how to transfer this knowledge effectively





# Lessons learned: Oakland EcoBlock Guidebook

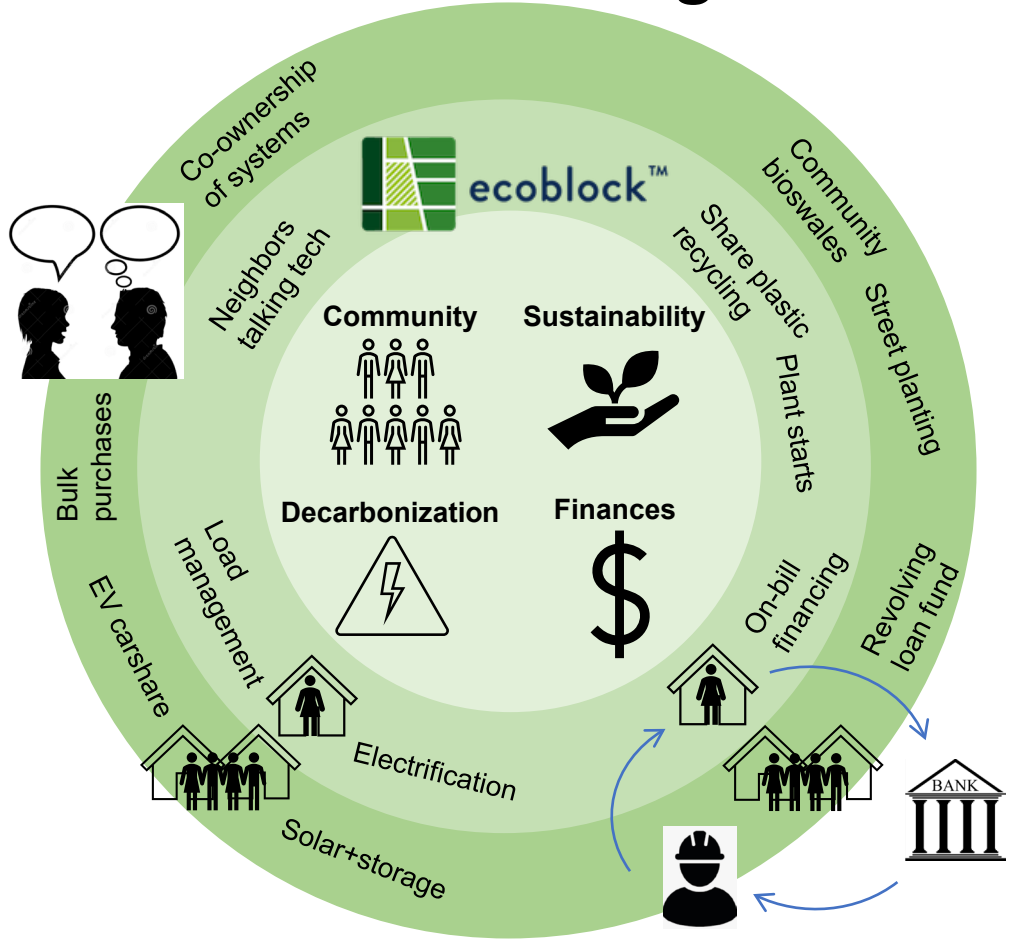
- Technical
  - Worked with PG&E for 1.5 years to design the microgrid possible!
  - Expensive battery shed.
  - Community tariffs not ready yet.
  - EV car share desired by community, but difficult at the block scale.
  - Stormwater swale at community level, streetwide planting—community building!
  - Was upgrading the electric panels necessary?
  - Home energy management + what to do with tenants, cloud control
- Financial and business models
  - Developed detailed model of Insurance/operation and maintenance costs.
  - Different ownership models.
  - Still considering aggregated load benefit bill financing of energy retrofits, low interest/revolving loans,



# Lessons learned: Oakland EcoBlock Guidebook

- Regulatory
  - Nonprofit association can get tax credit for microgrid!
  - Process of sharing energy with multiple meters: similar to master meter multifamily solar Working with tenants.
  - Creating an association lots of paperwork (templates for the next EcoBlock)
- Social
  - Community volunteers and leads!
  - Hired a community liaison
  - Foster twoway discussion
  - Educate
  - Provide translation and interpretation
  - Used consensus method to understand objections
  - “Barn raising” type laundry to landscape workshop.
  - Neighbors teach and encourage each other especially new technologies!

# The EcoBlock Portfolio of Strategies





# Questions?



[www.ecoblock.berkeley.edu](http://www.ecoblock.berkeley.edu)

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