ET Summit 2024

Presented by

The POWER Group's Overview and Key Projects

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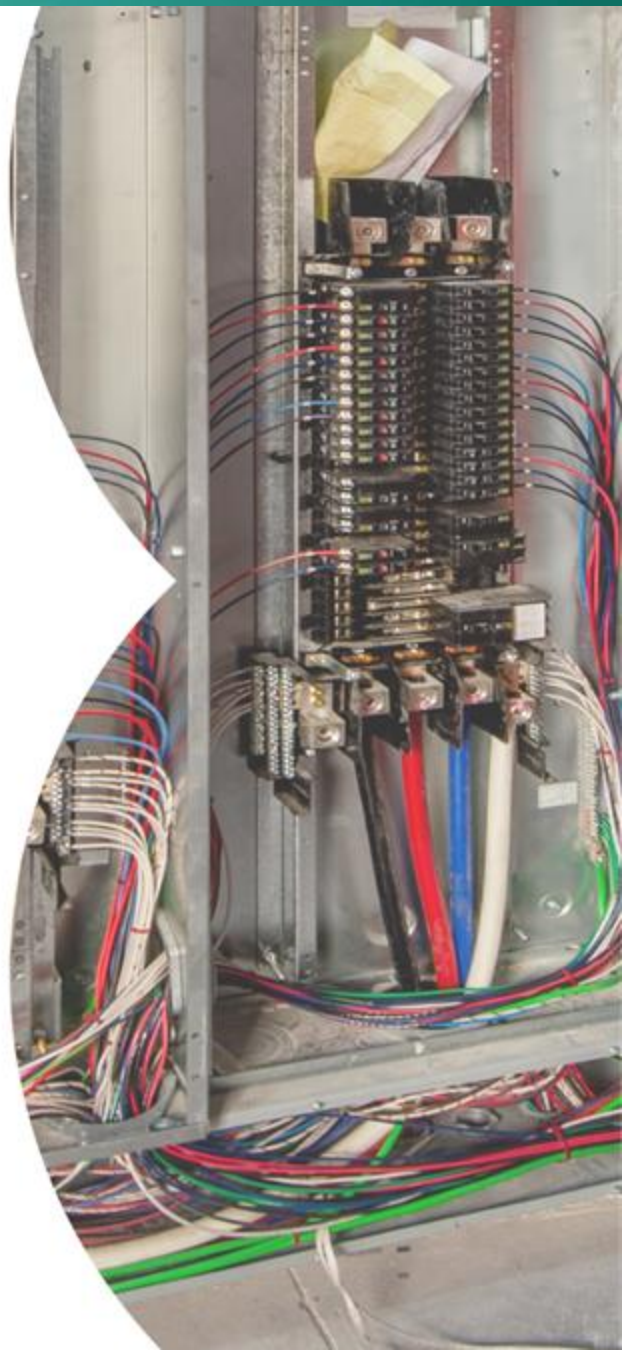
Build It Green

POWER GROUP

PANEL OPTIMIZATION WORK AND ELECTRICAL REASSESSMENTS

The POWER group learns, shares, discusses, and works on the complexities of the home electrical panel and associated electrical systems as a key lever to reach our building decarbonization goals as quickly, practically, cost-effectively, and equitably as possible



Build It Green brings together stakeholders from diverse sectors to catalyze systemic change to transform CA communities into affordable, equitable, and healthy spaces. Their work is guided by the pillars of regeneration, collaboration, and equity.

Electrifying Homes

Transitioning fossil-fuel appliances

- Water heater
- HVAC
- Cook stove

Adding new load

- Solar
- Battery
- EV charger (L2 and above)

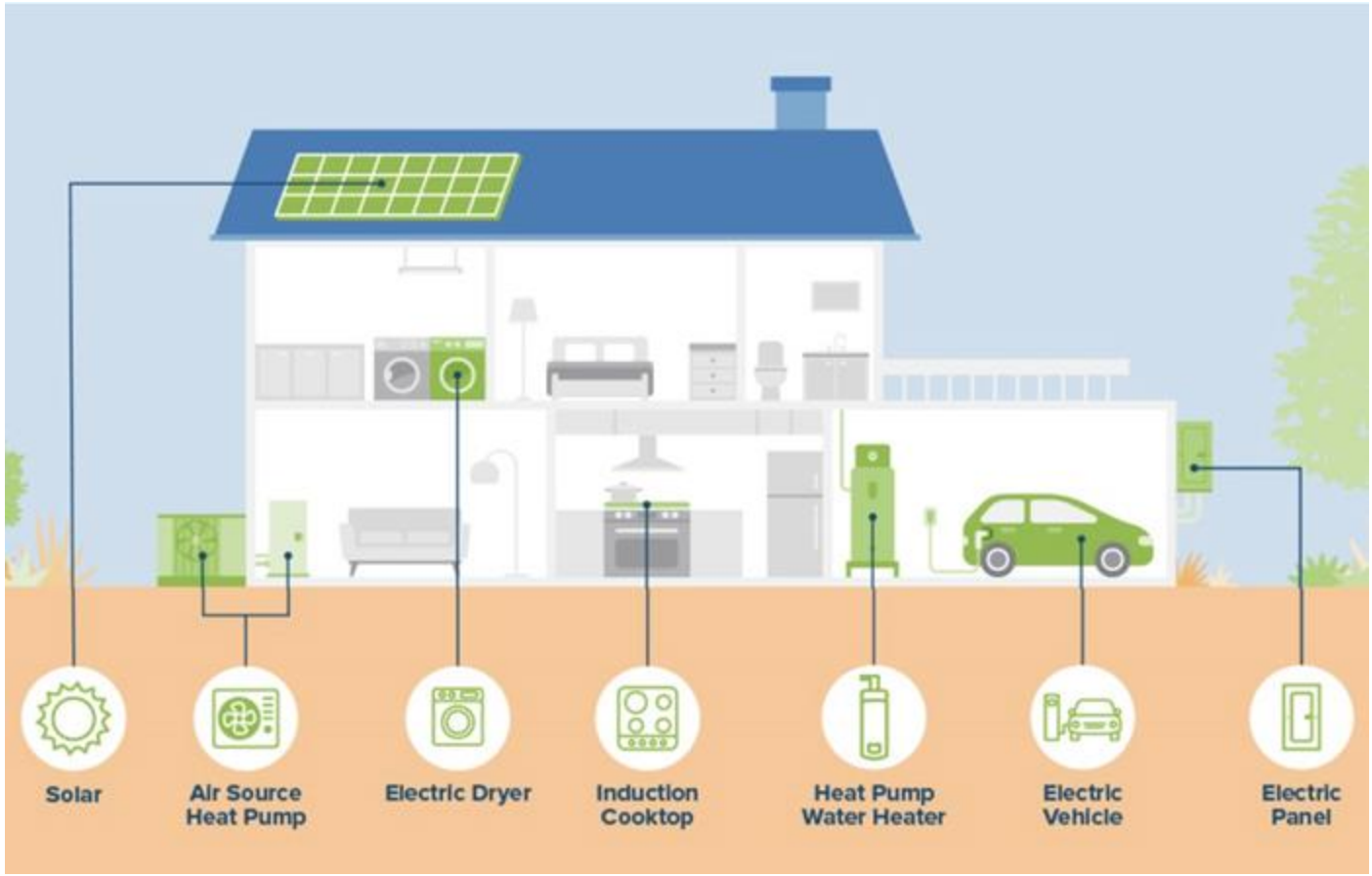


Photo credit: City of Palo Alto Utilities

Electrical Panel's Power Capacity

- Power is the flow rate of the electrical current
  - Measured in volt-amps (VA) - i.e. watts
  - Water analogy: diameter of hose
    - Wider hose

      → more current flows through

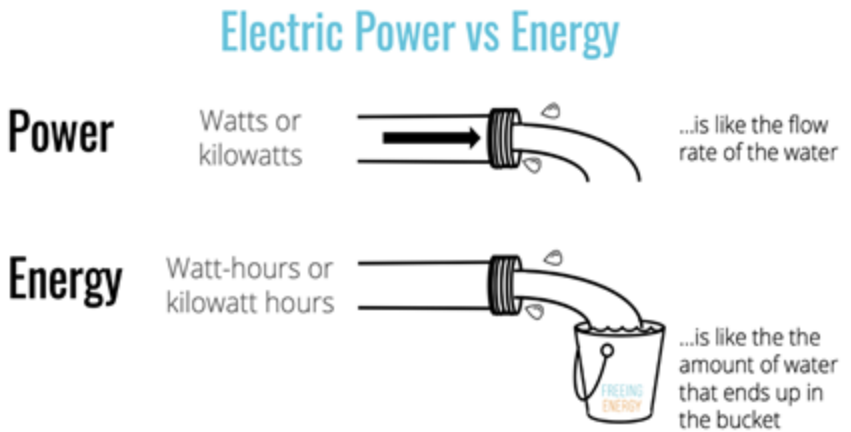


Photo credit: freeingenergy.com

- The panel size reflects its power capacity
- Since the voltage of electricity is constant (120V) to a home, the amperage (A) drives panel capacity

POLL

Panel Sizes

For single family homes, what panel sizes would usually be good enough for electrification?

a. 60 A
b. 100 A
c. 200 A
d. 400 A

Electrical Panel Upsizing or Upgrading

- Replacing a panel with a higher-capacity version, and/or a better quality panel.
- **“Upgrade”** is the conventional term
- POWER group prefers the term **“upsizing”** because a larger panel doesn’t always deliver an improvement in service for the customer.

POLL

Panel Costs

How much would you estimate it to cost to "upsize" a panel (i.e. replace a panel with a higher capacity one)?

a. $500
b. $3000
c. $10,000
d. $30,000

Will electrifying all homes require upsizing electrical panels?

Short answer: NO

Most homes can fully electrify on a 100 A panel

- **Longer answer: Depends on feasibility and technical assessments**
- Limited panel capacity (e.g. 40 A panel)
- Constraints on panel space (e.g. all circuit breaker spaces used)
- Older and/or unsafe panels will need replacement

POWER Group Activities

169 people
~90 organizations

Timeline

Dec 2021
First Meeting

March 2022
Monthly Meetings

November 2022
NEC subgroup formed

May 2024
SPUR's Policy Brief - Solving the Panel Puzzle

July 2024
Awarded CEC EPIC Grant GFO-23-303 Panel Tool

Impacts of Unnecessary Panel/Service Upsizing

COSTS

- Panel upsizing: top ~$2,000-$4,500
  - borne by: homeowners
  - *increased costs:* extensive rewiring, recircuiting or relocating panels (not included)
- Service upsizing: top ~$30,000
  - borne by: homeowners + utilities

TIME

- Panel upsizing: days ~ weeks
  - permits, utilities sign-off
- Service upsizing: weeks ~ several months
  - *increased costs:* underground service line, transformer replacement

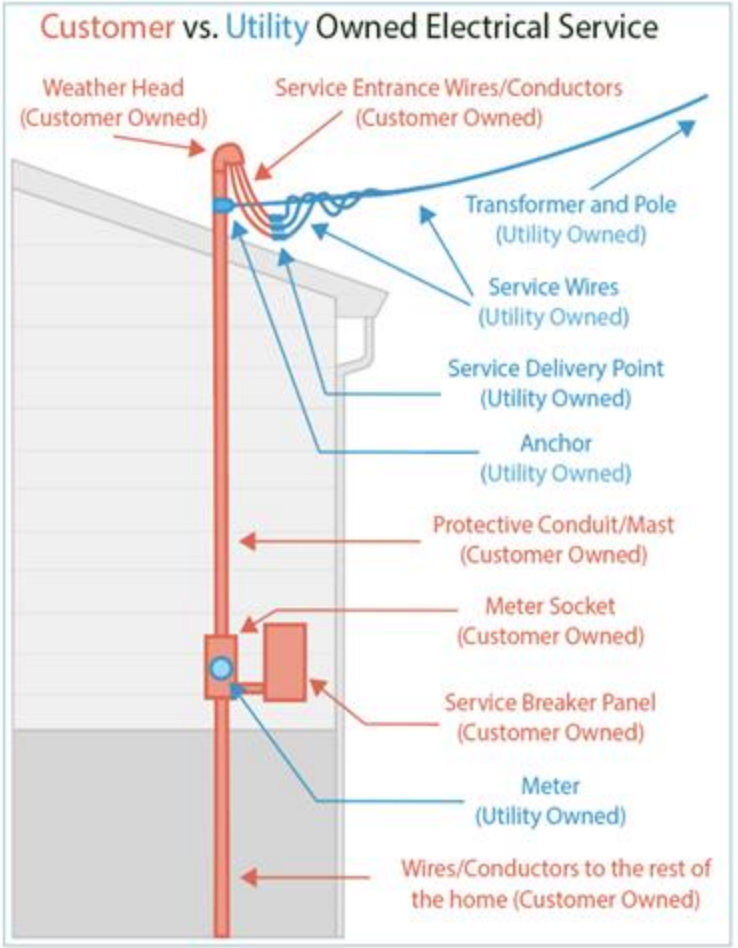


Photo credit: Emily Higbee, Redwood Energy Research Director
Sourced from: PG&E Service Upgrades for Electrification Retrofits Study Final Report by NV5: May 27, 2022

Impacts of Unnecessary Panel/Service Upsizing

RESOURCES

- Stretched resources to assist in electrifying homes (e.g. rebates for induction ranges) + weatherization + energy efficiency measures
  - Potential to waste billions of dollars + goodwill
  - Ex: IRA home energy rebates for CA ~$600M
- Other home safety, health & structural issues
  - Ex: lead removal, pests, earthquake proofing

WORKFORCE

- Limited trained contractors

RENTERS

- Potential for increased rents/evictions

Strategy: Panel Optimization & Planning

Power efficient appliances

- 120V appliances (e.g. heat pump water heater, ductless mini-splits, through-wall heat pumps)
- Sizing up water tanks for heat pump water heaters (e.g. 40 gal → 65 gal)

Combination Devices

- washer + dryer; water + space heating; stovetop + oven;

Low Power EV charging

- Level 1 (i.e. 120V charging) for electric vehicles
- Adjustable Level 2 chargers

Strategy: Panel Optimization & Planning

Thoughtful whole home electrification planning

- proper circuiting (e.g. grouping similar appliances under same circuit)
- appliance & technology selection

Weatherization

- Reduce heat and cooling loss by insulating and air sealing

Strategy: Load Management Devices

- Smart circuit breakers
- Load switches
- Circuit sharing & pausing
- Smart panels + subpanels
- Meter collars

NEC Subgroup

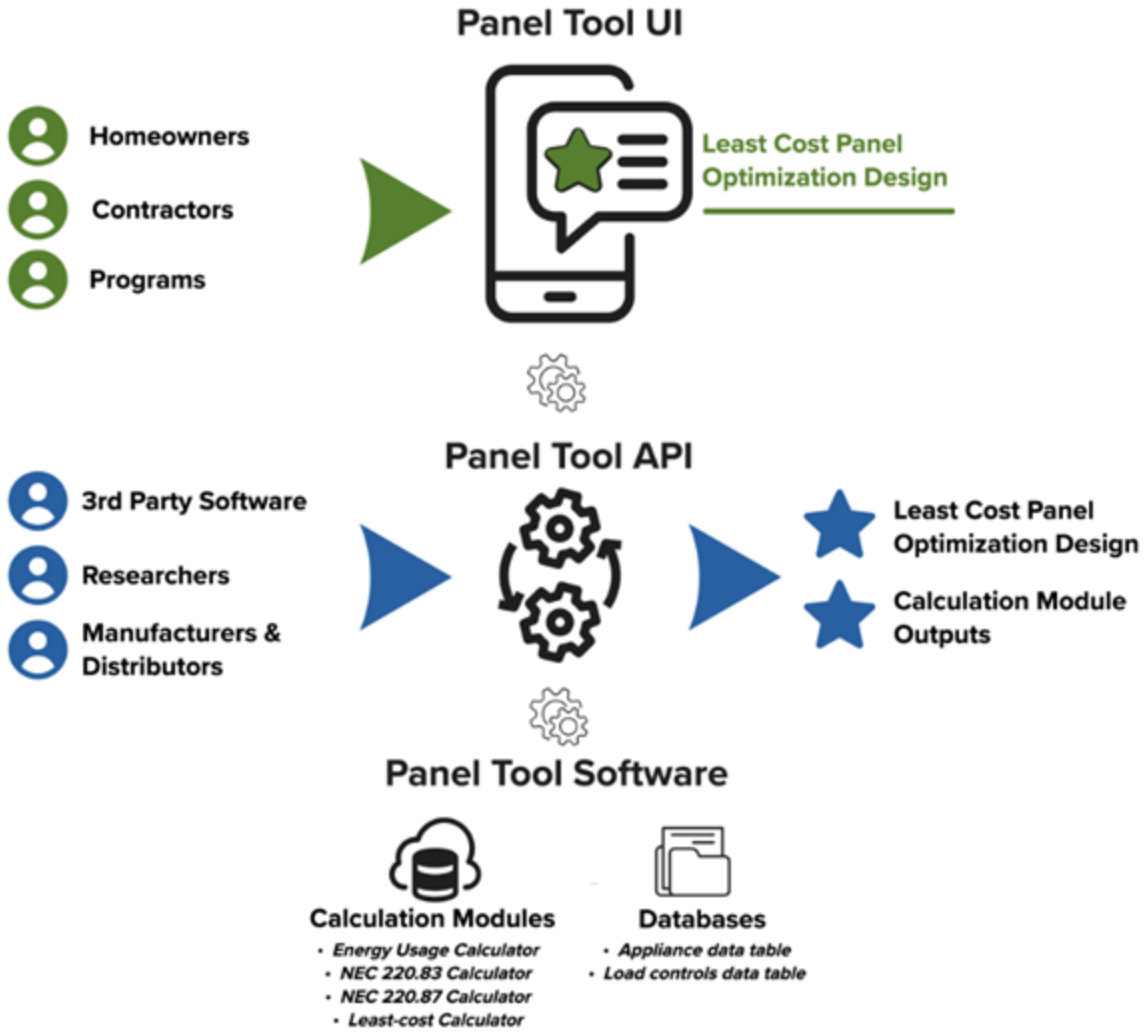
- **220.5(E) 125 Multiplier.** *Continuous loads not to be treated at 125% in load calculations and 125% does not imply continuous.*
- **220.6 Noncoincident Loads.** *Applies generally and includes by listed equipment. Moved from 220.60.*
- **220.7 Power Control Systems.** *Applies generally and includes various PCS configs. Moved from 220.70 Energy Management System.*
- **220.41 Minimum Unit Loads.** *Reduce from 3 to 2 VA/ft^2.*
- **220.54 Clothes Dryers.** *Reduce demand factor from 100 to 80%.*
- **220.57 EVSE.** *Pointing to 625.42 for EMS.*
- **220.82(B) General Loads (in dwelling unit).** *Reduce from 3 to 2 VA/ft^2. Reduce 10 to 8 kVA at 100%.*
- **220.83 Existing Dwelling Unit.** *Reduce from 3 to 2 VA/ft^2, eliminate different treatment for new HVAC, and new loads at 50%.*
- **220.84(C) Calculated Load (in multi-family).** *Reduce from 3 to 2 VA/ft^2.*

NEC 2026 on 2nd Draft

processing public inputs in task groups & code-making panel

CEC EPIC Grant GFO-23-303 Panel Tool

1. Developing a friendly tool for homeowners and contractors to use for electrifying homes that optimizes equipment and system selection to remain on a home's existing electrical panel size while taking into consideration affordability and safety
2. Making this Tool versatile to be used as a standalone or integrated into other tools to increase the widespread adoption and practice of power efficient design in home electrification



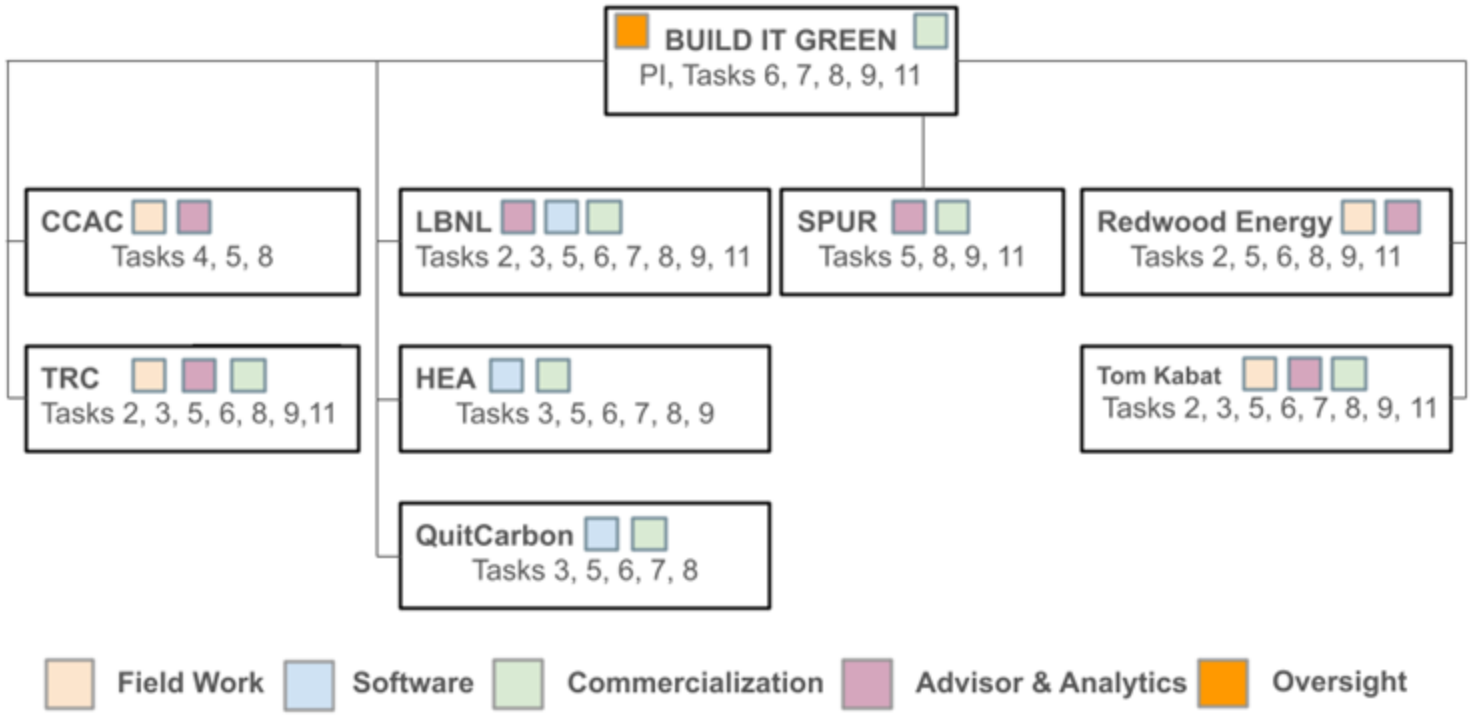
CEC EPIC Grant GFO-23-303 Panel Tool

3. Doing research and gathering robust field data of what exists in people's homes and how the Tool performs.
    - Recruit and analyze 25+ single family homes that previously upsized their electrical service panel and assess whether the upsized panels were necessary for electrification.
    - Recruit and analyze 100+ single family homes with electrical panels ≤100A to inform the development of the Tool.
    - Implement the Tool's power-efficient design recommendations in 50 of the 100+ homes recruited to validate and refine the Tool's usability, capabilities, and impacts.
3. Develop a commercialization plan for the Tool and conduct dissemination activities, training, and outreach to lay the groundwork to enable the tool to be free and accessible to all CA ratepayers.

CEC EPIC Grant GFO-23-303 Panel Tool

Team Members:

- Build It Green (Prime)
- Central California Asthma Collaborative (CCAC)
- Home Energy Analytics (HEA)
- Lawrence Berkeley National Lab (LBNL)
- QuitCarbon
- Redwood Energy
- SPUR
- Tom Kabat
- TRC



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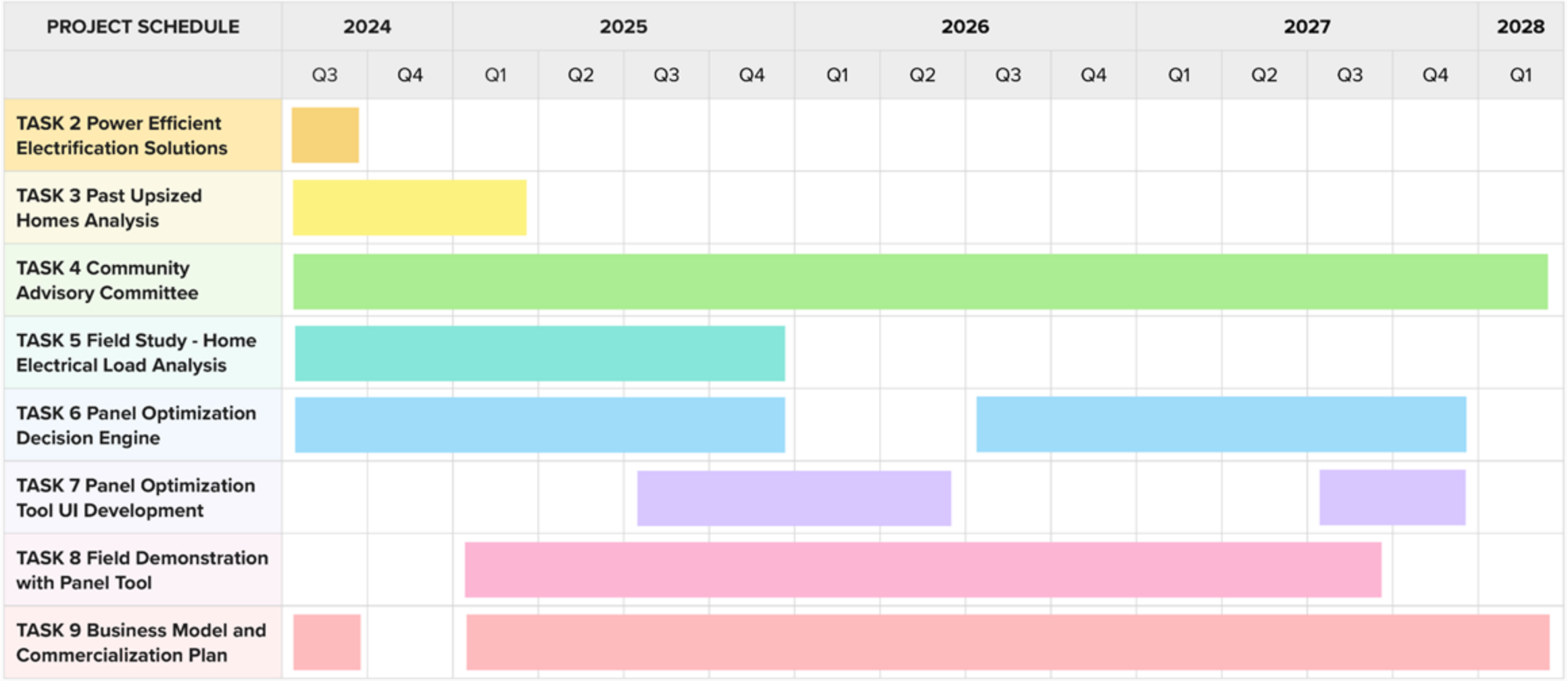
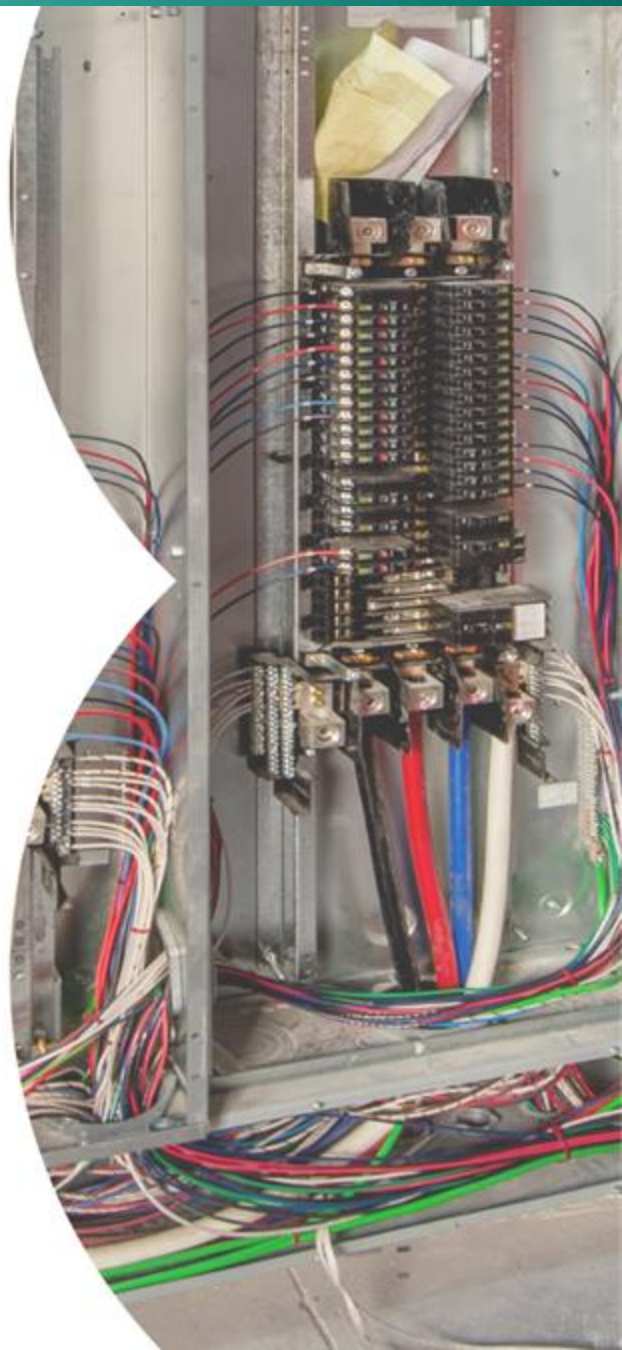


Note: Original project timeline (will be adjusted once grant is executed)

POWER Group Members

- 2050 Partners
- All-Electric California
- Ascent Environmental
- Bay Area Air Quality Management District
- BayREN
- BC Hydro
- Beyond Efficiency
- BlocPower
- Blue Rock Homes, Inc.
- Building Decarbonization Coalition
- Caliber Strategies
- Canary Media
- California Air Resources Board
- California Energy Commission
- Central California Asthma Collaborative
- City of Oakland
- City of Palo Alto Utilities
- City of San Luis Obispo
- CivicWell
- ConnectDER
- Consortium for Energy Efficiency
- Contra Costa County
- Copper
- California Public Utilities Commission
- Dunsky
- E Source
- Eco Performance Builders, Inc.
- Energy Conservation Options
- Energy Solutions
- Energy Transition Coordinating Council
- Enphase Energy
- Environmental & Energy Consulting
- EPRI
- EV Load
- Franklin Energy
- Heat Pump Summit
- Home Energy Academy
- Home Energy Analytics
- ICF
- IDeAs Consulting
- LADWP
- Lawrence Berkeley National Laboratory
- Lumin
- Lumina Decision Systems
- Misti Bruceri & Associates LLC (MBA LLC for Local Energy Codes)
- NeoCharge
- New York City Housing Authority
- npc Solar
- NRDC

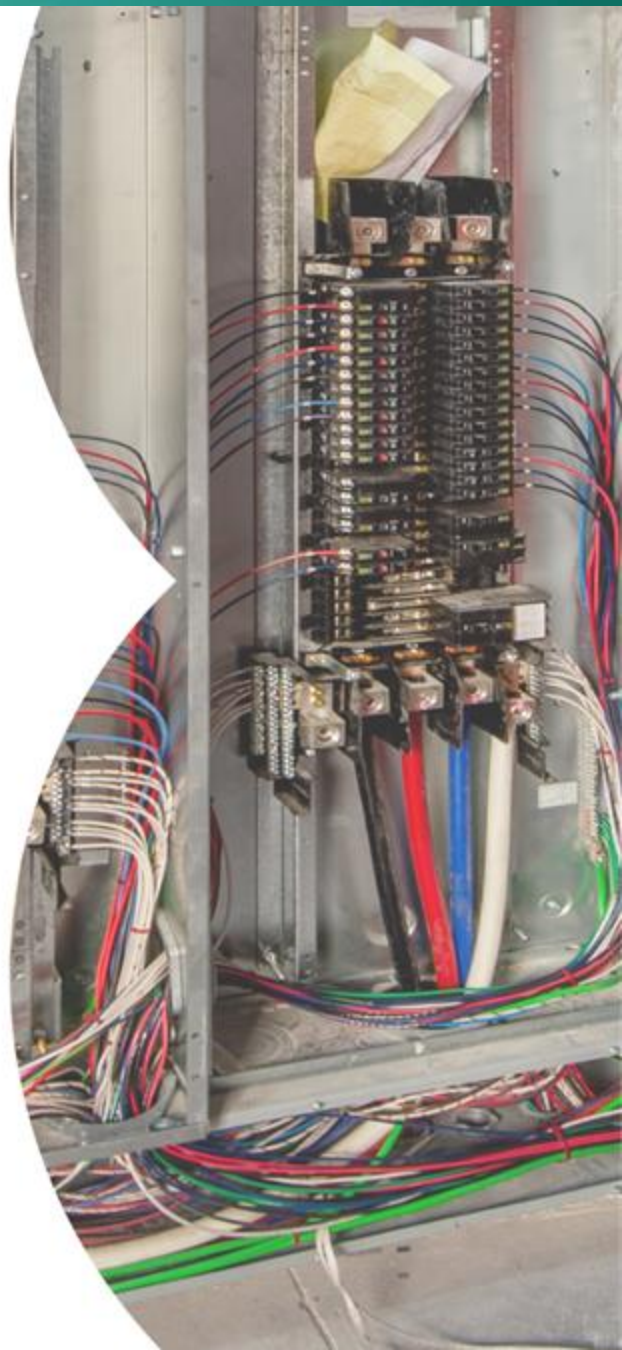


POWER Group Members

- Onsemble
- Opinion Dynamics
- Peninsula Clean Energy
- PG&E
- Plumas-Sierra Rural Electric Cooperative
- Portland General Electric
- QuitCarbon
- Redwood Energy
- Rewiring America
- Rock Rabbit
- San Diego Building Electrification Coalition
- San Diego Green Home Rating
- San Francisco Environment Department
- Sattler Electric Service
- SCE
- Shovels
- Sierra Business Council
- Silicon Valley Clean Energy
- simpleSwitch
- Slipstream
- SMUD
- Sonoma County Transportation Authority
- SPAN
- SPUR
- Stepwise
- StopWaste
- SunWork Renewable Energy Projects
- SVCE
- The Energy Coalition
- thirdACT
- TRC
- University of California, Berkeley
- University of California, Los Angeles
- USGBC
- VEIC
- Western Riverside Council of Governments
- XeroHome
- Zero Homes

Individuals:

- Aimee Bailey
- Allison Frelinger
- Angela Evans
- Bryce Nesbitt
- Cristina Crespo
- Dave Clark
- Greg Pfotenhauer
- Gypsy Achong
- Jill Grey
- John McKenna
- Josie Gaillard
- Julia Yrani
- Meghan Wood
- Tom Kabat



THANK YOU!

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