



TRI-COUNTY  
REGIONAL ENERGY NETWORK

SAN LUIS OBISPO • SANTA BARBARA • VENTURA

# Appliances and Energy Storage – Part 5: All-Electric Design & Construction Series

*Jennifer Rennick, AIA, CEA  
In Balance Green Consulting*

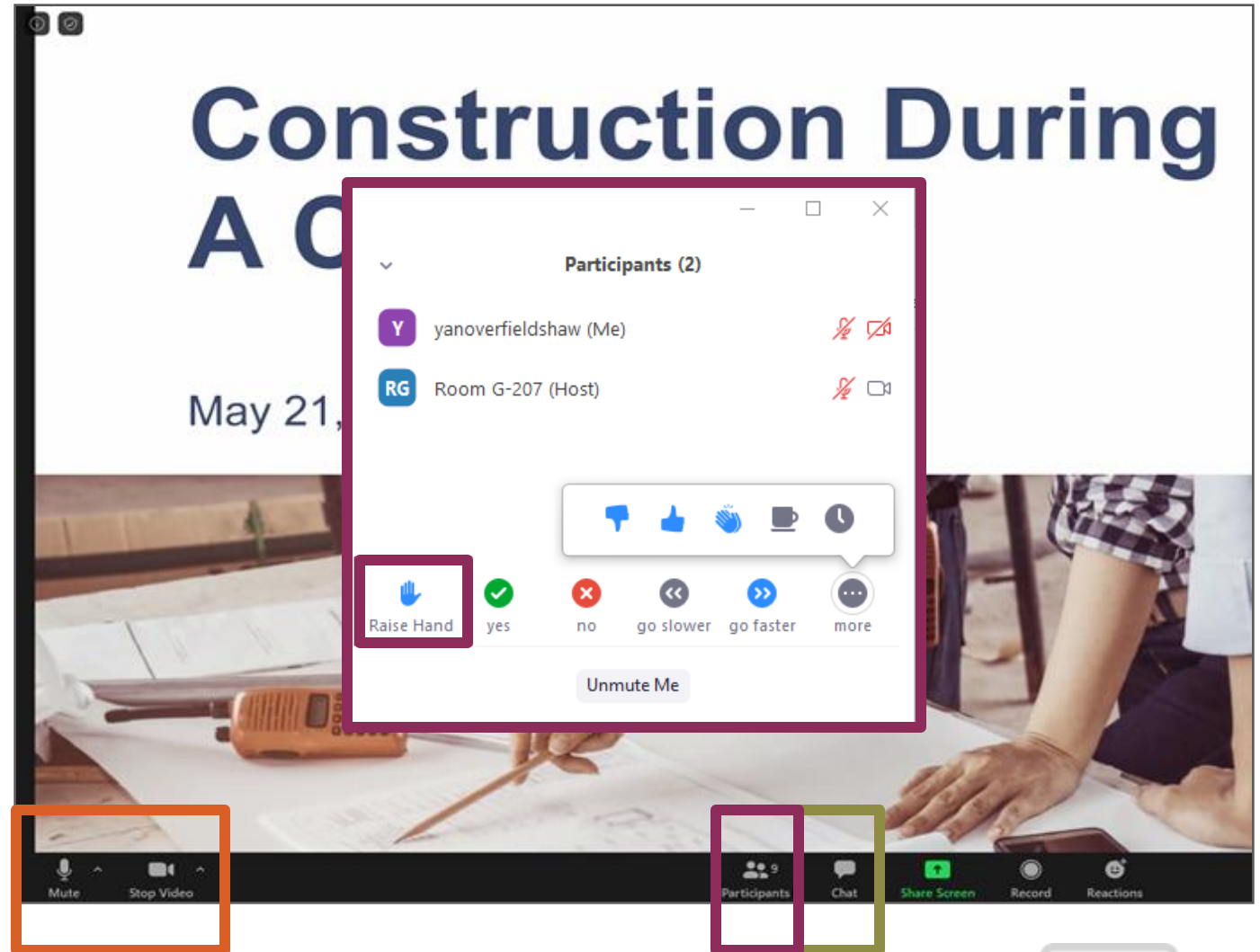
*Tatiana Soglin, LEED AP BD+C  
In Balance Green Consulting*

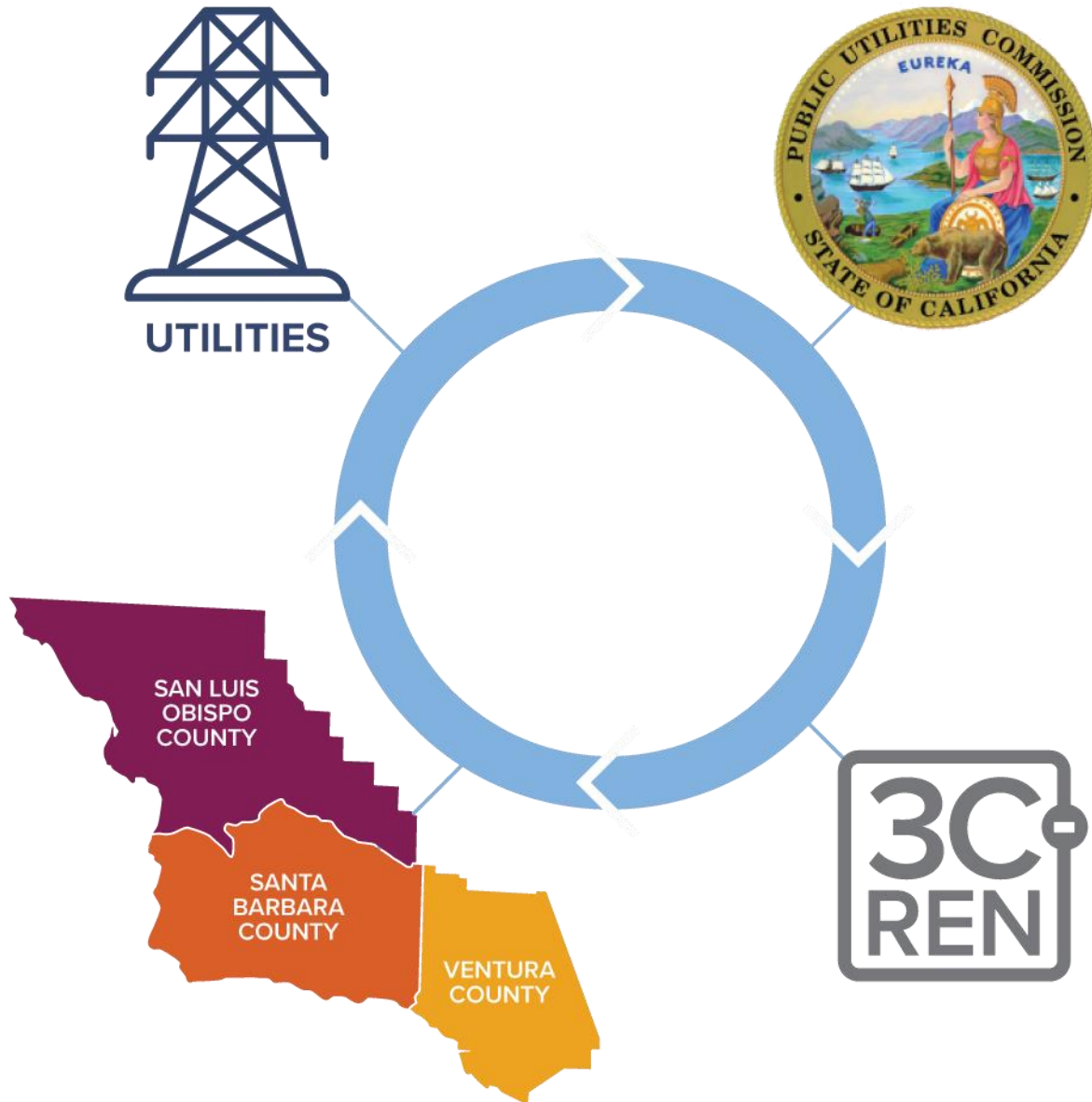
January 30, 2025



# Zoom Orientation

- Add an **introduction** in the chat. Be sure **full name** is displayed.
- Did you call in? Please **share** first and last name with us.
- Please **mute** upon joining
- Use the "**Chat**" to share questions or comments
- Under "**Participant**" select "**Raise Hand**" to share a question or comment verbally
- Session may be **recorded** and posted to 3C-REN's on-demand page
- Slides/recording are **shared** after most events





# Tri-County Regional Energy Network

3C-REN is a collaboration between the tri-counties

Our programs reduce energy use for a more sustainable, equitable and economically vibrant Central Coast

Our free services are funded via the CPUC, bringing ratepayer dollars back to the region



# Our Services

## Incentives



### HOME ENERGY SAVINGS

[3c-ren.org/for-residents](https://3c-ren.org/for-residents)  
[3c-ren.org/multifamily](https://3c-ren.org/multifamily)



### COMMERCIAL ENERGY SAVINGS

[3c-ren.org/commercial](https://3c-ren.org/commercial)

Contractors can enroll at  
[3c-ren.org/contractors](https://3c-ren.org/contractors)

## Training



### BUILDING PERFORMANCE TRAINING

[3c-ren.org/events](https://3c-ren.org/events)  
[3c-ren.org/building](https://3c-ren.org/building)



### ENERGY CODE CONNECT

[3c-ren.org/code](https://3c-ren.org/code)

View past trainings at  
[3c-ren.org/on-demand](https://3c-ren.org/on-demand)

## Technical Assistance



### AGRICULTURE ENERGY SOLUTIONS

[3c-ren.org/agriculture](https://3c-ren.org/agriculture)



### ENERGY ASSURANCE SERVICES

[3c-ren.org/assurance](https://3c-ren.org/assurance)



# 3C-REN Achievements



**4,000+**

Individuals Attended  
Training



**1,374**

Energy-Saving  
Projects Completed



**334**

Title 24/CalGreen  
Questions Answered



**\$155M**

Secured for investment  
in the tri-county region  
through 2028

*Data from 2019-2023 for three programs*



# California Licensure & AIA Learning Units

- Beginning in 2023 Licensed Architects are required by the State of California to take five (5) hours of Continuing Education (CE) coursework in Zero Net Carbon Design (ZNCD).
- This course is designed to count towards CA's ZNCD requirement as well as AIA's Health, Safety, Welfare (HSW) Learning Units.
- The whole series provides **5 AIA HSW / CA ZNCD** Learning Units
- For more information see [https://www.cab.ca.gov/docs/misc/ab1010\\_zncdce\\_faq.pdf](https://www.cab.ca.gov/docs/misc/ab1010_zncdce_faq.pdf)



# Series Outline



1. Overview: Carbon Reduction through Building Electrification
2. ZNCD for Heat Pumps for Heating and Cooling
3. ZNCD for Domestic Hot Water
4. ZNCD for Ventilation and HRV
5. ZNCD for Appliances & Energy Storage

# Today's Learning Objectives

- Learn the 'why' behind California's shift to building electrification and the link to Zero Net Carbon Design
- Learn the pros and cons of various products to help in selecting appropriate systems that meet electrification and carbon-reduction goals
- Learn critical installation details such as dimensions and venting to call out in plans and/or identify early in construction
- Understand the local market for specific all-electric/ZNCD equipment, including cost, availability and lead times.

## Learning Units:

- 1.0 AIA HSW LU approved for this course

*We'll send you the slides later!*



# Agenda

1. Context: CA Clean Energy Goals
2. Stove Tops and Ranges
3. Electric Clothes Dryers
4. Electric Car Charging
5. Battery Energy Storage (and Solar PV)





# ZNCD and California's Clean Energy Goals

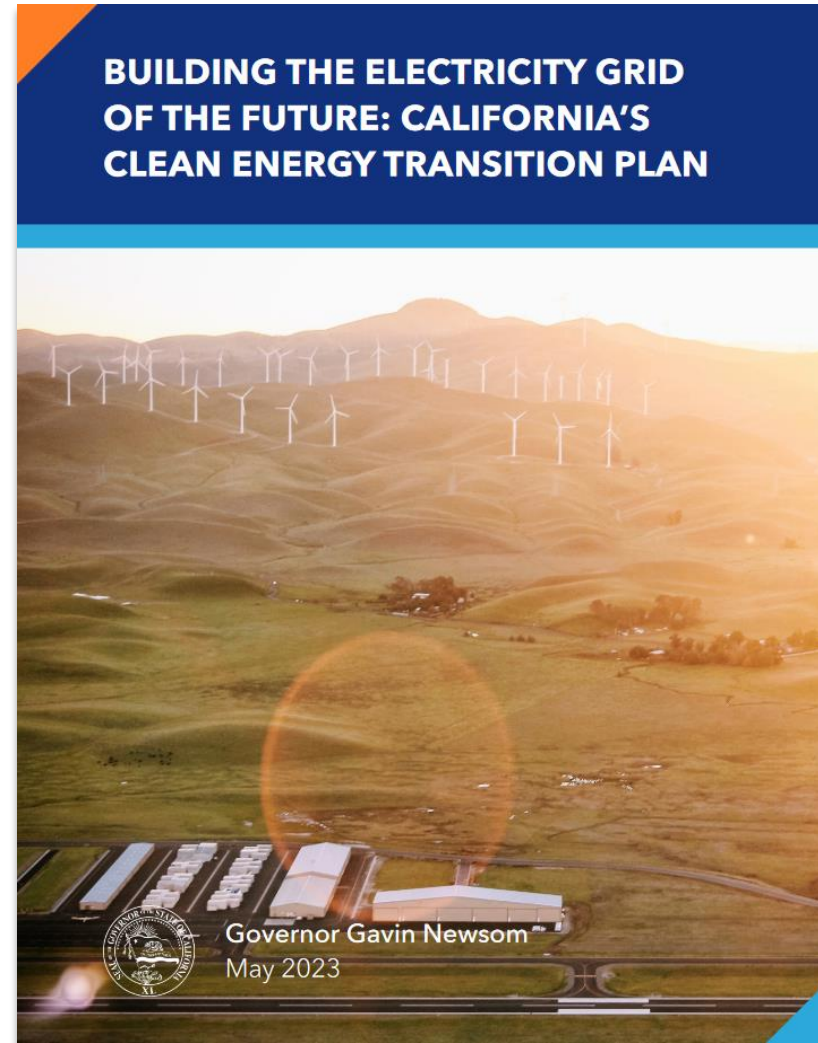


California Air Resources Board (CARB) - Mary D. Nichols Campus

# California's Plan for Grid Stability and Expansion

## A carbon-free electric grid where:

- **Buildings** are increasingly decarbonized.
- **The Industrial Sector** is powered by clean electricity, and by clean fuels, such as green hydrogen.
- **Transportation** choices are zero-emission and able to plug into the electric grid at places of convenience for all customers



<https://www.gov.ca.gov/wp-content/uploads/2023/05/CAEnergyTransitionPlan.pdf>

# Big Picture Goals for the 2022 Code and 2025 Updates

HOMES AND BUSINESSES USE  
NEARLY **70 PERCENT**  
OF CALIFORNIA'S ELECTRICITY AND  
ARE RESPONSIBLE FOR A QUARTER  
OF CALIFORNIA'S GREENHOUSE  
GAS (GHG) EMISSIONS.



- Encourage heat pump technology for space and water heating
- Establish electric-ready requirements for single family homes
- Expand PV systems and battery storage standards
- Strengthen IAQ ventilation standards



# Appliances are part of the *all-electric* dwelling/building



## Stove Tops and Ranges

- Electric Resistance
- Induction Cooktops and Convection Ovens



## Dryers

- Electric Resistance
- Condensing
- Heat Pump



## Car Charging

- Home Charging
- Level 2
- NEMA or Hardwired



## Solar and Battery Energy Storage

- Energy Production
- Home Energy Storage

# Stove Tops and Ranges



# Induction Cooktops

## Before:

- Gas and electric resistance were most common
- Old ideas of “electric cooking” is the old coil/electric resistance kind
- Clients seeking a specific “look” for their kitchen range:



*Rangemaster*



*At San Luis Ranch*

## Now:

- There's a *range* of induction options – high end to affordable
- Reminder that induction needs stainless steel or cast iron cookware
- Induction is faster than electric resistance and gas – AND is more energy efficient!

# Portable Induction Options...



NuWave PIC Double Portable, Powerful Independently Adjustable Dual Induction Cooktop with 52 Temperature Settings Between 100°F and 575°F & Advanced Stage Cooking & Program Functions

Brand: NuWave



205 ratings

\$199<sup>99</sup>

& FREE Returns

Pay \$19.50/month or less for 12 months with Affirm. [Learn more](#)

Brand	NuWave
Material	Ceramic
Color	Black/Gold
Item Dimensions LxWxH	12.25 x 12.5 x 2.75 inches
Item Weight	17 Pounds



- Add one burner or two burner cooktop
- Portable, affordable, popular
- Check one out from the library
  - San Luis Obispo
  - Santa Barbara
  - Ventura

# Central Coast California Retailers Offer a Few Common Brands

## Home Depot

Bosch  
Empava  
Frigidaire  
GE  
LG  
Samsung  
Trifecta

## Lowe's

Bosch\*  
Empava  
Equator Advanced Appliances  
GE  
LG  
SPT  
Summit Appliance

## Ferguson Supply House

GE Café\*  
JennAir\*  
KitchenAid\*  
Miele\*  
Monogram\*  
Thermador\*  
Whirlpool  
Wolf\*

## Costco

Bosch  
GE  
Nuwave  
Samsung

## Idler's

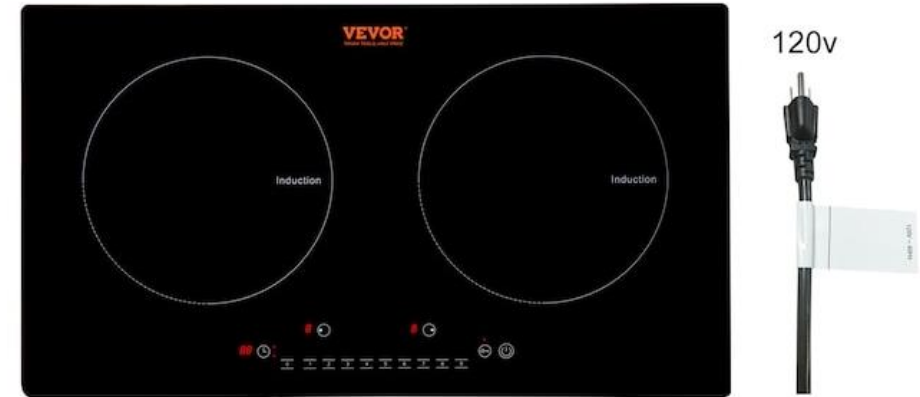
Bosch  
Frigidaire  
GE  
KitchenAid\*  
Miele  
Monogram  
Samsung\*

Note: These appliances run the full range of costs ("standard" to "ultra-high end") and features

\* Brand has products on display in store

# 2 Burner Induction Cooktop Example – VEVOR \$

- **Cost Range:** \$95-\$140
- **Availability:** Home Depot, Lowe's, direct manufacture's website, other on-line shops
- **EnergyStar:** No
- **Special Features:** 2 burners, plugs in to 120v outlet and doesn't require professional installation
- **Warranty:** 1 yr Standard

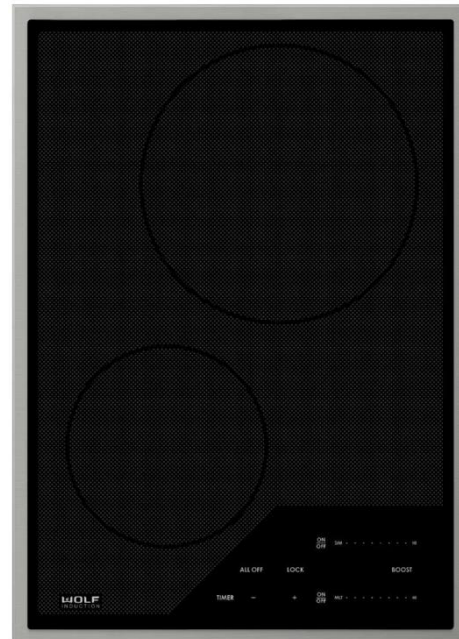


Note: This unit sit on counter top and can be plugged into a standard 120V outlet



# 2 Burner Induction Cooktop Example – Wolf \$\$\$

- **Cost Range:** \$1312-\$1620
- **Availability:** Ferguson, Idler's, direct manufacture's website, other on-line shops
- **EnergyStar:** No
- **Special Features:** 15" 2-burner cooktop, illuminated touch controls
- **Warranty:** 2 yr Standard



*Touch controls >*

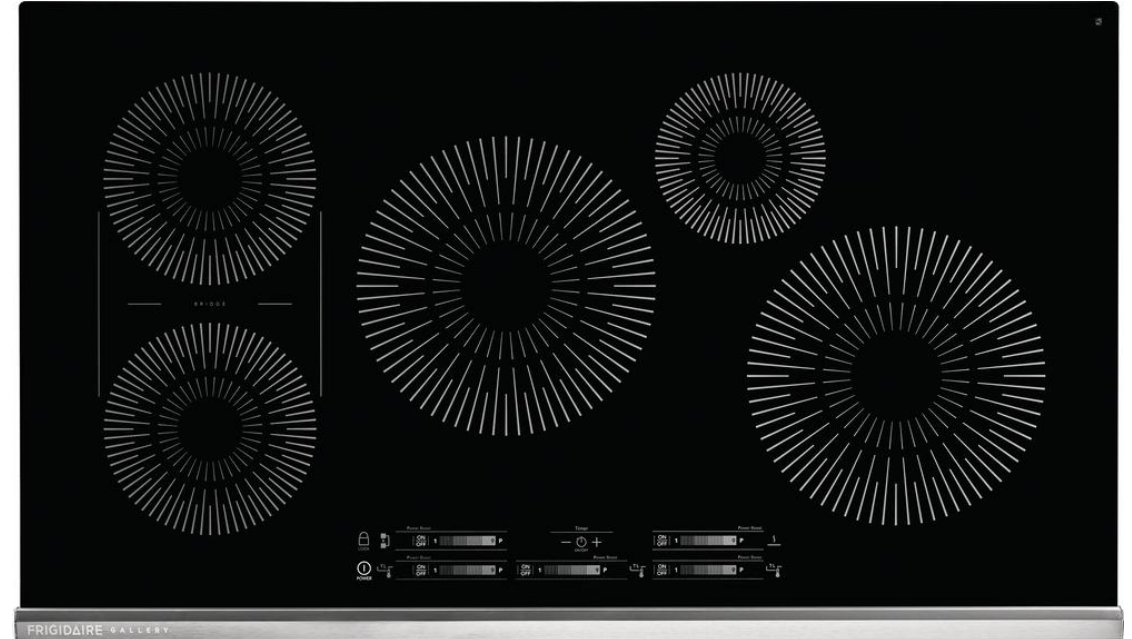


Note: This unit is hardwired



# 5 Burner Induction Cooktop Example – Frigidaire \$

- **Cost Range:** \$900-\$1100
- **Availability:** Idler's, Home Depot, Lowe's, direct manufacture's website, other on-line shops
- **EnergyStar:** Yes
- **Special Features:** 36" 5-burner cooktop, touch controls
- **Warranty:** 1 yr Standard



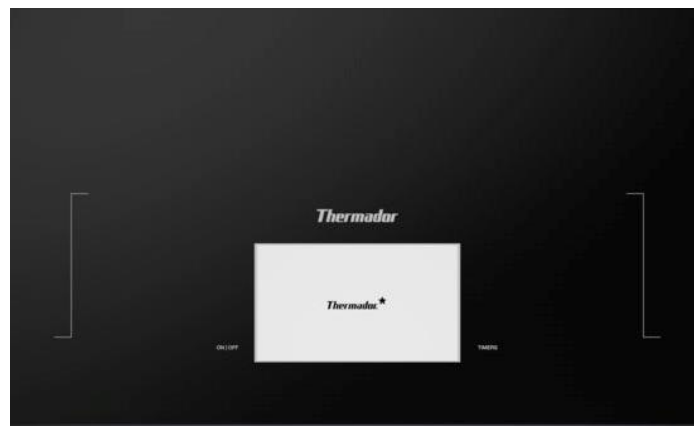
*Touch controls ^*



# Full Surface Induction Cooktop Example – Thermador \$\$\$

- **Cost Range:** \$6099
- **Availability:** Ferguson, Idler's, direct manufacture's website, other on-line shops
- **EnergyStar:** No
- **Special Features:** 36" of fully usable cooking surface with room for up to 7 pots and pans, WiFi enabled for remote monitoring
- **Warranty:** 2 yr Standard

*Full color touch screen display >*



Note: Cooktop shown here in combination with 36" downdraft ventilation



# Induction Range Example – Frigidaire \$

- **Cost Range:** \$680-\$1000
- **Availability:** Home Depot, Ferguson, Best Buy, direct manufacture's website, other on-line shops
- **EnergyStar:** No
- **Special Features:** 30" induction cooking surface, rear panel control
- **Warranty:** 1 yr Standard



*Rear panel control*



*Induction dial control*



Note: Look for sale prices, often priced to be competitive with gas models



# Induction Range Example – Samsung \$\$

- **Cost Range:** \$1300-\$1600
- **Availability:** Home Depot, Lowe's, Idler's, direct manufacture's website, other on-line shops
- **EnergyStar:** Yes
- **Special Features:** 30" induction cooking surface, touch controls, WiFi connectivity
- **Warranty:** 1 yr Standard



*Touch controls*



# Induction Range Example – GE Café \$\$\$

- **Cost Range:** \$4050-\$4500
- **Availability:** Ferguson, Home Depot, Lowe's, direct manufacture's website, other on-line shops
- **EnergyStar:** No
- **Special Features:** 30" wide front-control convection range with dial control induction cooktop
- **Warranty:** 1 yr Standard



# Electric Clothes Dryers



# Electric clothes dryers

*Ventless Dryers can use significantly less energy than a traditional electric vented dryer... important for ZNE and battery storage capacity*

## Electric Dryers

### Vented

Vents moisture laden air to the outdoors

### Standard Electric

### Ventless

Uses condenser to remove moisture from the air

### Condensing

### Heat Pump

Price range \$800-\$1600

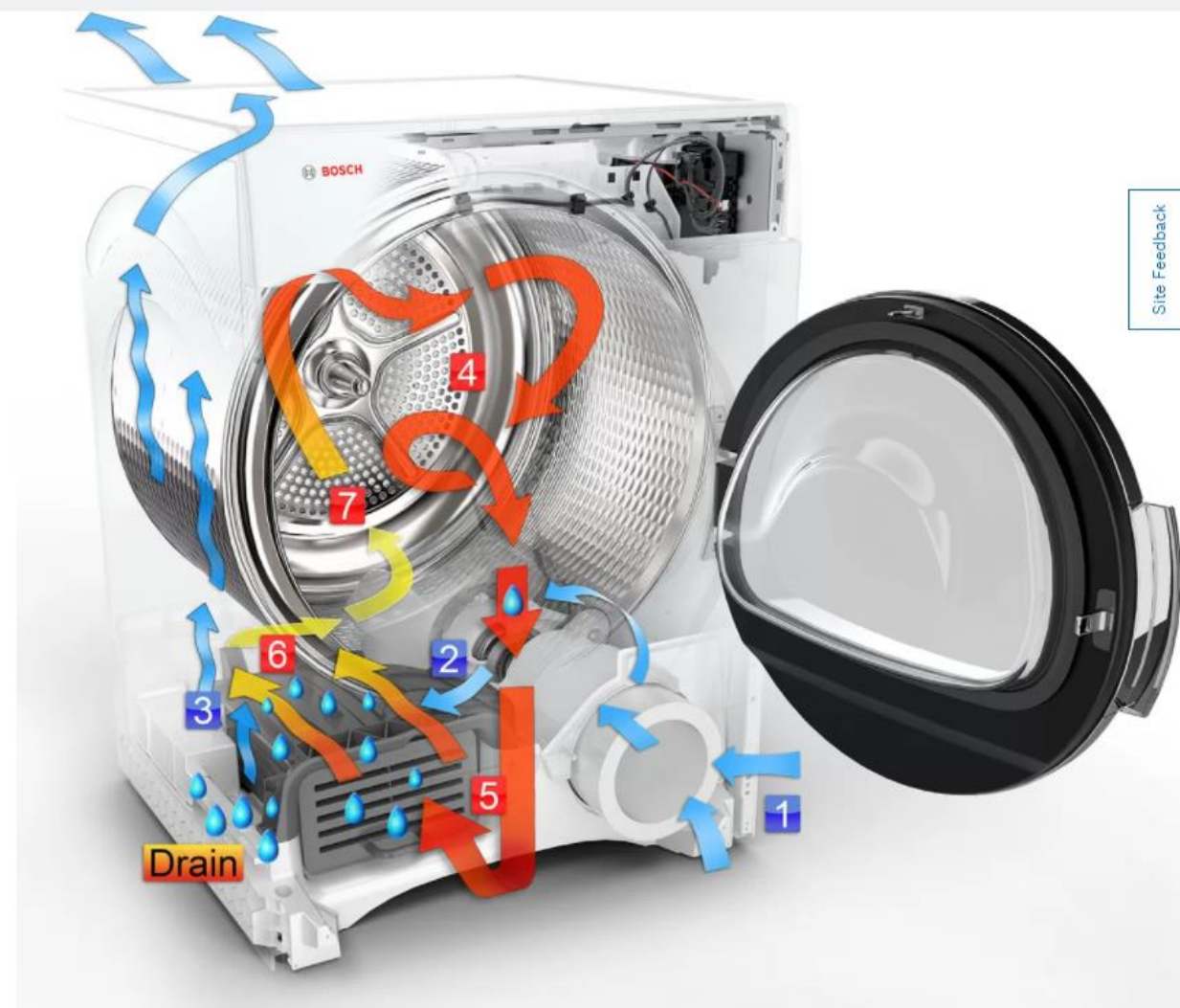
Search dryers and filter for ventless

Resources: <https://guide.pge.com/> and  
[https://www.energystar.gov/products/products\\_list](https://www.energystar.gov/products/products_list)

### Condensation, the new way to dry.

The Bosch Condensation Dryer uses an eco-friendly solution to gently dry clothes at an optimal temperature without the need of external ducting.

1. Cool ambient air goes inside the dryer from the living area.
2. Cool ambient air is heated by the heating element at the back of the dryer.
3. Hot air circulates in the drum, evaporating moisture from the load.
4. The combination of the hot air and moisture circulates through the condenser unit.
5. The hot air and moisture condenses into water as it passed through the cool condenser unit.
6. The water is collected under the condenser unit and is pumped out by the drain pump.
7. Warm dry air is reheated and circulated back into the dryer drum.



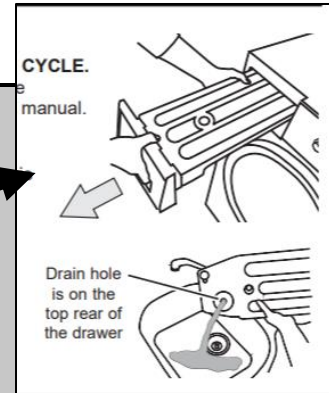
# Dryers with Condensers

Ask:

- Manual or 'self-draining' condenser reservoir?
- Manual or self cleaning condenser coil?
- Net free ventilation area needed?

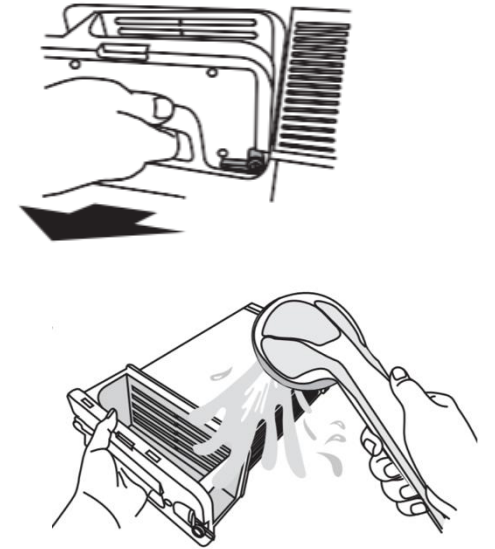
## Condensed Water

- manually empty
- drain hose option



## Condenser Coil

- self cleaning option
- manual clean monthly



# Venting and Clearances

**Issue:** Laundry not dry with doors closed

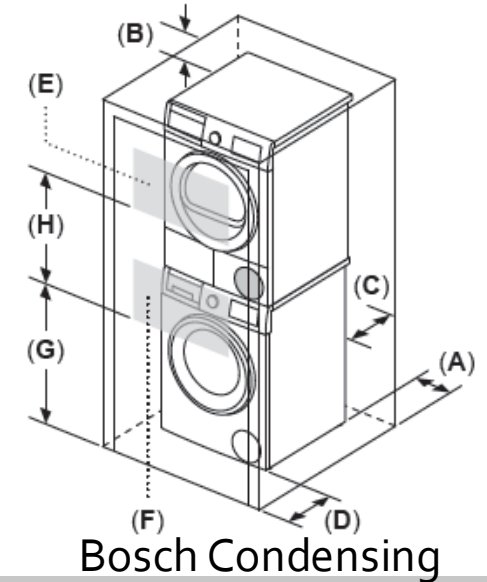
**Response:** Keep doors open or replace w/ louvered doors and/or vent the space



Bosch condensing dryer  
Installed. Dwelling designed  
for Bosch heat pump dryer

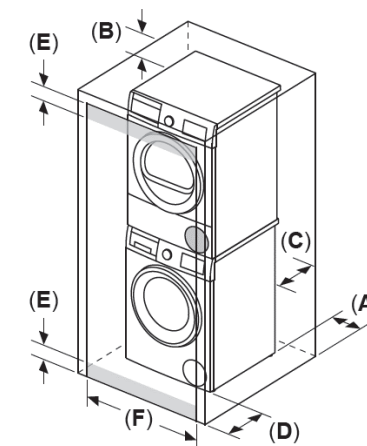
Bonus: Bosch heat pump dryer  
only \$300 more and comes with  
self cleaning condenser coil.

Closet: Stacked Washer  
and Condensation Dryer



Bosch Condensing

Closet: Stacked Washer  
with Heat Pump Dryer



Minimum clearance requirements  
(Stacked, Stand Alone or Side by Side):

- A: Both sides (left and right) – 1/2"
- B: Top – 6 1/4"
- C: Rear – 3"
- D: Front – 1/2"

Minimum door undercut (louvered area):

- E: Undercut height (Top and Bottom) – 1 1/4"  
Louvered areas of equal total sizes and split between  
upper and lower portions of door are permitted.
- F: Undercut width (Top and Bottom):  
– 24" minimum for Stacked and Stand Alone  
– 48" minimum for Side by Side

For shortest drying times keep closet door open while  
dryer is operating. When closet doors are closed, open  
areas only allow minimal drying results (expect long  
drying times).

Bosch Heat Pump

# Central Coast California Retailers Offer a Few Common Brands

## Home Depot

Black+Decker  
GE\*  
Koolmore  
LG\*  
Midea  
Samsung\*  
Summit Appliance  
Whirlpool

## Costco

LG\*  
Samsung

## Lowe's

Bosch  
Electrolux  
GE\*  
LG  
Midea  
Miele  
Samsung  
Whirlpool

## Idler's

Bosch  
LG  
Maytag\*  
Samsung  
Speed Queen\*  
Whirlpool

## Ferguson Supply House

LG  
Samsung  
Summit Appliance

Note: These appliances run the full range of costs ("standard" to "ultra-high end") and features

\* Brand has products on display in store

# Two-In-One Washer/Dryers

- One machine – no load transfer
- 120V standard outlet
- No dryer vent exhaust system needed

- Samsung
- 5.3 cu. ft.
- \$2000 (on sale for \$1300 on Home Depot)
- Energy Star
- Warranty: 1 year Parts and Labor; 3 year stainless steel tub; 20 year motor part
- Special Features
  - Wifi Connectivity with SmartThings (cycle alerts, remote start/stop/delay, etc.)
  - 7" LCD Display



- GE
- 4.8 cu. ft.
- \$2900
- Energy Star
- Warranty: 1 year entire appliance; 5 year sealed drying system; 10 year motor part
- Special Features
  - Pet hair removal
  - Antimicrobial technology
  - Smart features powered by SmartHQ (specialty cycles, status notifications, etc.)
  - Dewrinkle



# Standard Capacity Ventless Options

Look for heat pumps with  
rebates for best pricing



**SPECIAL BUY** **\$898<sup>00</sup>** Was \$1299.00  
Save \$401.00 (31%)

Get up to \$185 in Rebates for 93405

★★★★★ (282)

Model# DLHC1455W

**LG**

24 in. W 4.2 Cu. Ft. Ventless Stackable  
Compact SMART Electric Dryer in White  
with Dual Inverter HeatPump Technology

Capacity (cu. ft.) — **4.2**

Vent Type — **Ventless**

Matching Washer... — **Front Load Mat...**



**SPECIAL BUY** **\$898<sup>00</sup>** Was \$1299.00  
Save \$401.00 (31%)

★★★★★ (31)

Model# DV25B6900HW

**Samsung**

4.0 cu. ft. Smart Dial Heat Pump Dryer with  
Sensor Dry in White color

Capacity (cu. ft.) — **4.0**

Vent Type — **Ventless**

Matching Washer... — **Front Load Mat...**

Appliance Type — **Electric Dryer**



**SPECIAL BUY** **\$798<sup>00</sup>** Was \$1099.00  
Save \$301.00 (27%)

★★★★★ (46)

Model# DV25B6900EW

**Samsung**

4.0 cu. ft. Smart Dial Electric Dryer with  
Sensor Dry

Capacity (cu. ft.) — **4.0**

Vent Type — **Vented**

Matching Washer... — **Front Load Mat...**

Appliance Type — **Electric Dryer**

# Large Capacity Ventless Options

Look for heat pumps with rebates for best pricing



**\$1098<sup>00</sup>** Was \$1699.00  
Save \$601.00 (35%)

Get up to \$285 in Rebates for 93405

★★★★★ (77)  
Model# DLHC5502W

LG

7.8 cu. ft. Dual Inverter Heat Pump ventless Electric Dryer with DirectDrive Motor, 6 Motion and AI Sensor Dry in White

Capacity (cu. ft.) — **7.8**

Vent Type — **Ventless**



**\$1898<sup>00</sup>** Was \$2899.00  
Save \$1001.00 (35%)

Get up to \$185 in Rebates for 93405

★★★★★ (37)  
Model# WKHC252HWA

LG

5.0 cu. ft. Washer 7.8 cu. ft. Dual Inverter Heat Pump Ventless Dryer Electric Washtower in White

Dryer Fuel Type — **Electric**

Capacity (cu. ft.) — **5.0**



**\$898<sup>00</sup>** Was \$1299.00  
Save \$401.00 (31%)

★★★★★ (31)  
Model# DV25B6900HW

Samsung

4.0 cu. ft. Smart Dial Heat Pump Dryer with Sensor Dry in White color

Capacity (cu. ft.) — **4.0**

Vent Type — **Ventless**

Matching Washer... — **Front Load Mat...**

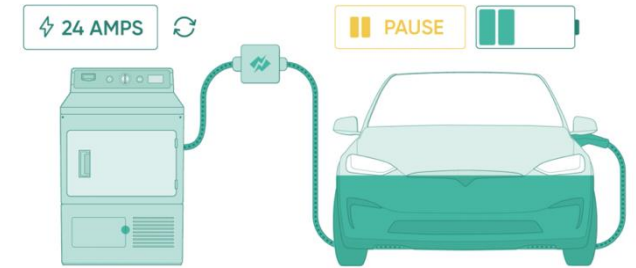
# Electric Car Charging



# Charging Our Cars



*^ Bank of Tesla Super Chargers (AG, Calif)  
NACS Plugs on 2025 EVs will allow for  
multi-brand charging*



<https://getneocharge.com>

Bonus: SLO, Calif based company



*^ Plug-in (240V) Smart Circuit Splitter*



*< Level 2 Home  
Charger (240V)*



*Plug-in  
110/120V >*

## Level 2 Chargers

Some Brands  
are Specific to  
Car Brands

ABB	InCharge	Tesla
AMPROAD	Injet	TurnOnGreen
Atess	LITEON	Vestel
Blink	Leviton	Vevor
ChargePoint	Loop	Wallbox
Cyber Switching	MUSTART	Webasto
Delta	Mid-Cour	YEAHCO
EV Gear	Morec	ZEF Energy
Eaton	Philhong	Zencar
Emporia	Piwin	Zerova
Emporia Energy	PowerPump	
Enphase	Rivian	
EvoCharge	SARIN Energy	
FLO	Siemens	
Ford	Smartenit	
Gateway International 36	Sunrun/Ford	

# Relative Costs

If Installing a permanent charger or need a new NEMA 14-50 (240V) outlet add \$750-\$2000 for Lic Electrician's work.

- Level 2 **240V Hardwired and NEMA 14-50 Plug-in**
- Typical Cost Range \$500-\$700

- Least expensive: Some **Plug-in 240V** but most are only **110V/120V** and 15-20 amp
- Costs start under \$100
- Available on-line and at Home Depot and Lowe's

- NeoCharge Smart Splitter
  - Plug into your home's existing **240V** outlet
  - All outlet configurations available
  - Typical Cost Range \$350-400



Enphase IQ 40  
Level 2 32A ...

**\$644.00**  
Enphase Store



GM Genuine  
Parts Power...

**\$599.00**  
GM Genuine ...



ChargePoint  
Level 2 EV...

**\$549.00**  
Amazon.com



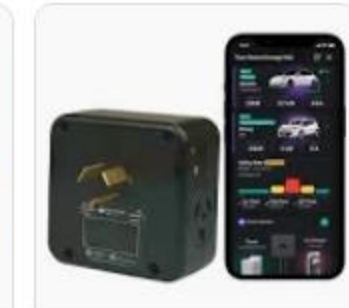
EVDANCE  
Level 1&2...

**\$186.99**  
EVDance



EV Charger  
Level 2...


**\$180.49**  
Home Depot



NEMA 10-30  
Smart Splitte...


**\$299.00**  
NeoCharge

# Rebates and Incentives



[REBATES & INCENTIVES](#)[RATES](#)[ABOUT 3CE](#)[BOARD MEETINGS](#)[NEWS & EVENTS](#)

www.3cenergy.org




### Electrify Your Ride

Electrify Your Ride

Electrify Your Ride provides 3CE customers with a "one-stop..."


## Level 2 Charger Rebates

Base	Tier 1 400-201% Federal Poverty Level for the 48 Contiguous States, 2021 (gross annual income)	Tier 2 <200% Federal Poverty Level for the 48 Contiguous States, 2021 (gross annual income)
\$400	Up to \$700	Up to \$700



[Explore](#)[Take Action](#)[Resources](#)[Programs & Projects](#)[Utilities](#)[About Us](#)[Volunteer](#)

[SB Clean Energy](#) Residential EV Program




### Santa Barbara CLEAN ENERGY

CHOOSING RENEWABLE ELECTRICITY

### EV Charger Rebate

Measure	Base Rebate	Income Qualified Rebate (All Tiers)	Income Qualified Rebate (All Tiers)
Level 2 Charger - Hard Wired	Up to \$400 or 75% of total project cost*	Up to \$600 or 100% of total project cost*	Up to \$600 or 100% of total project cost*
Level 2 Charger - Plug In	Up to \$300 or 75% of total project cost*	Up to \$400 or 100% of total project cost*	Up to \$400 or 100% of total project cost*

<https://homecharging.electricforall.org/home-chargers-incentives-catalog/>



[Explore EVs](#)[Ince](#)

powered by VELOZ

## Select a Home Charger

Browse home chargers with costs after incentives or learn more with our [FAQs](#).

ZIP CODE

ESTIMATED INSTALLATION COSTS

\$0

\$500

\$1000

\$2000

NoneLowAvg.High

VIEW YOUR AVAILABLE INCENTIVES

Filter

CHARGER PRICE

< \$1,000

BRAND

All

CORD LENGTH

< 25 ft

TYPE

WALL MOUNTED

PORTABLE

SOCKET

6-20

10-30

6-50

14-60

6-30

14-30

14-50

HARDWIRED

Piwin

PEVC2107

Wall Mounted

16 ft. Cable

Hardwired

7.68 kW

\$308

\$1000

-\$1092

\$216

Charger Price

Estimated Installation

Total Incentives

Total Cost

SELECT

Piwin

PEVC2107

Wall Mounted

16 ft. Cable

Hardwired

3.84 kW

\$311

\$1000

-\$1093

\$218

Charger Price

Estimated Installation

Total Incentives

Total Cost

SELECT

MUSTART

MUSTART - Level 2 Smart EV Charger

Wall Mounted

25 ft. Cable

14-50 Socket

7.68 kW

\$349

\$1000

-\$1105

\$244

Charger Price

Estimated Installation

Total Incentives

Total Cost

SELECT

Piwin

PEVC2107

Wall Mounted

16 ft. Cable

Hardwired

7.68 kW

\$353

\$1000

-\$1106

\$247

Charger Price

Estimated Installation

Total Incentives

Total Cost

SELECT

MUSTART

MUSTART - Level 2 Smart EV Charger

Wall Mounted

25 ft. Cable

14-50 Socket

9.6 kW

\$379

\$1000

-\$1114

\$265

Charger Price

Estimated Installation

Total Incentives

Total Cost

SELECT

Emporia

Smart Home EV Charger

Wall Mounted

24 ft. Cable

14-50, Hardwired Socket

11.52 kW

\$399

\$1000

-\$2519

\$-1120

Charger Price

Estimated Installation

Total Incentives

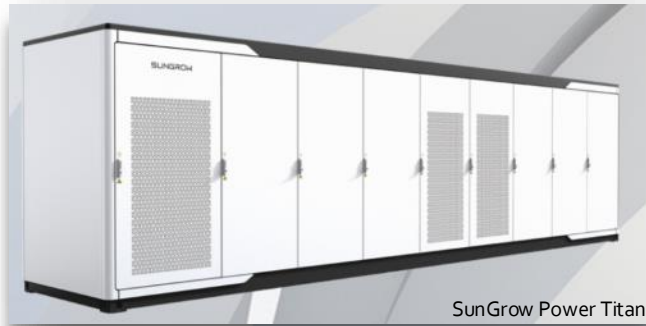
Total Cost

SELECT

# Battery Energy Storage (and Solar PV)



# Battery – Energy Storage Systems (BESS) (ESS)



SunGrow Power Titan



<https://primuspower.com/en/energy-storage/>

Batteries for Grid Scale Applications Must Last Decades and Deliver Long Duration Energy Discharge On-Demand

Utility Scale –Grid Stabilization and  
In Front of the Meter Micro-grids



Commercial and Industrial



Multifamily and Non-Res and  
Behind the Meter Micro-grids



Private Homes



# Peak Loads –Daily Load Shifting and Grid Relief

## Resiliency and Load Shifting (Single Fam and all Occupancies)

- **Load Shifting** –Use battery when electric rates are highest cost
- **Resiliency** –Use battery when electric power goes out
- **Grid Stability** –Distributed Resources and Virtual Power Plant (VPP) Battery Programs through the Electric Utility or Battery Provider/Brand Partner
- **Self Utilization** –Store excess on-site Solar Energy for later use

## Code Requirement (High-Rise Multifamily and Non-Res)

- Multifamily 4 Stories or Greater
- Commercial Occupancies
- Only Required if a PV System is Triggered
  - Grid Tied
  - Minimum Size Threshold – Exemptions

# Energy Code – Highrise and Non-Res

## 2022 Code Applicable Occupancy Types:

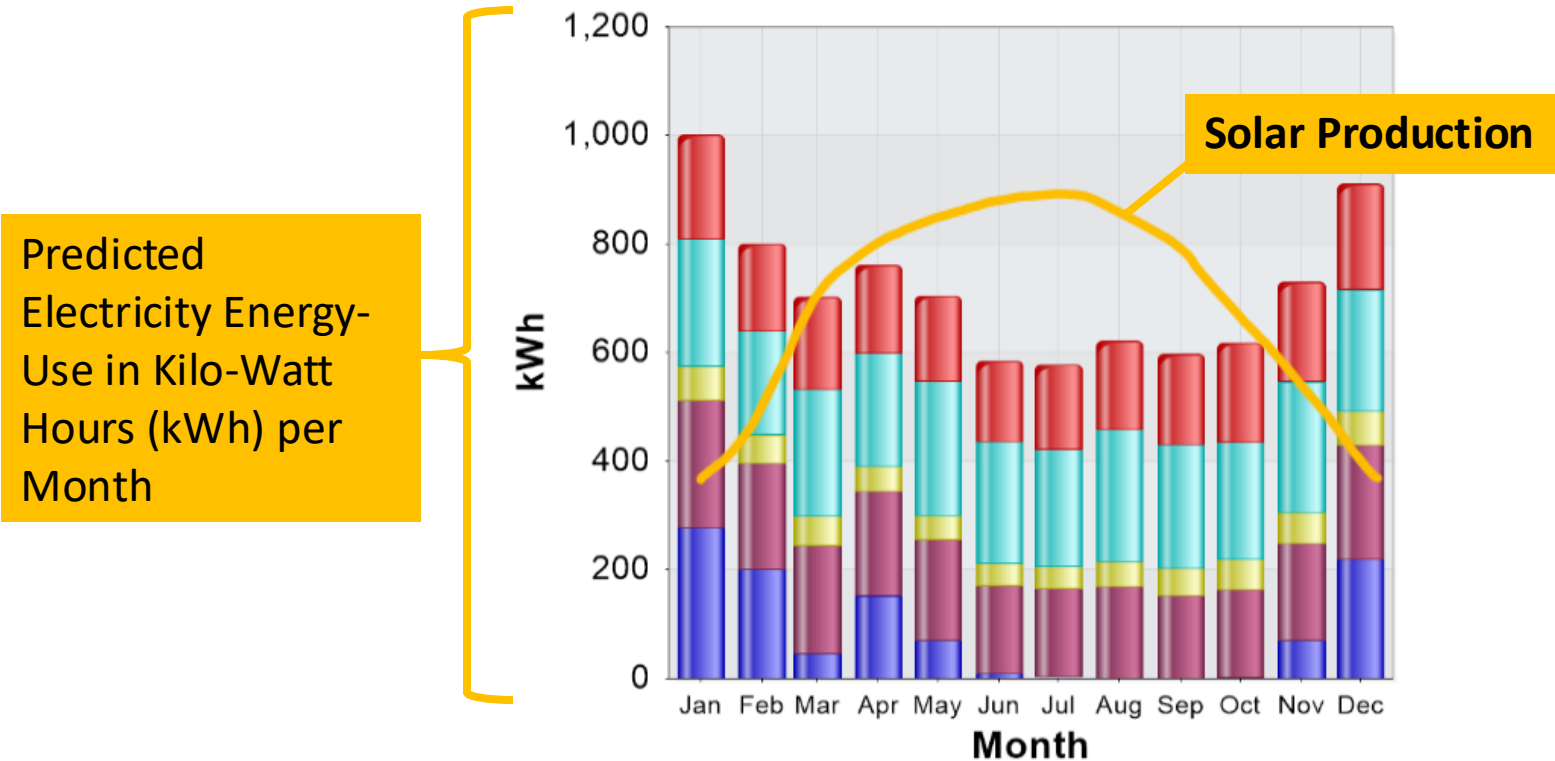
- High-Rise Residential
- Grocery
- Retail
- Restaurant
- School
- Warehouse
- Auditorium, Convention Center, Theater
- Hotel-Motel
- Office, Financial, or Unleased
- Clinic/Medical Office Building

Under the 2025 Code occupancies are expanded and some will have increased PV and Battery requirements. Restaurants for example have a dramatic increase. Libraries have been added, as they are part of emergency/disaster relief centers.



**Solar System size will depend on Occupancy Type, Conditioned Floor Area, etc. The Battery System size will depend on PV System Size.**

# The Electric Grid was the Seasonal 'Battery' for Solar PV...

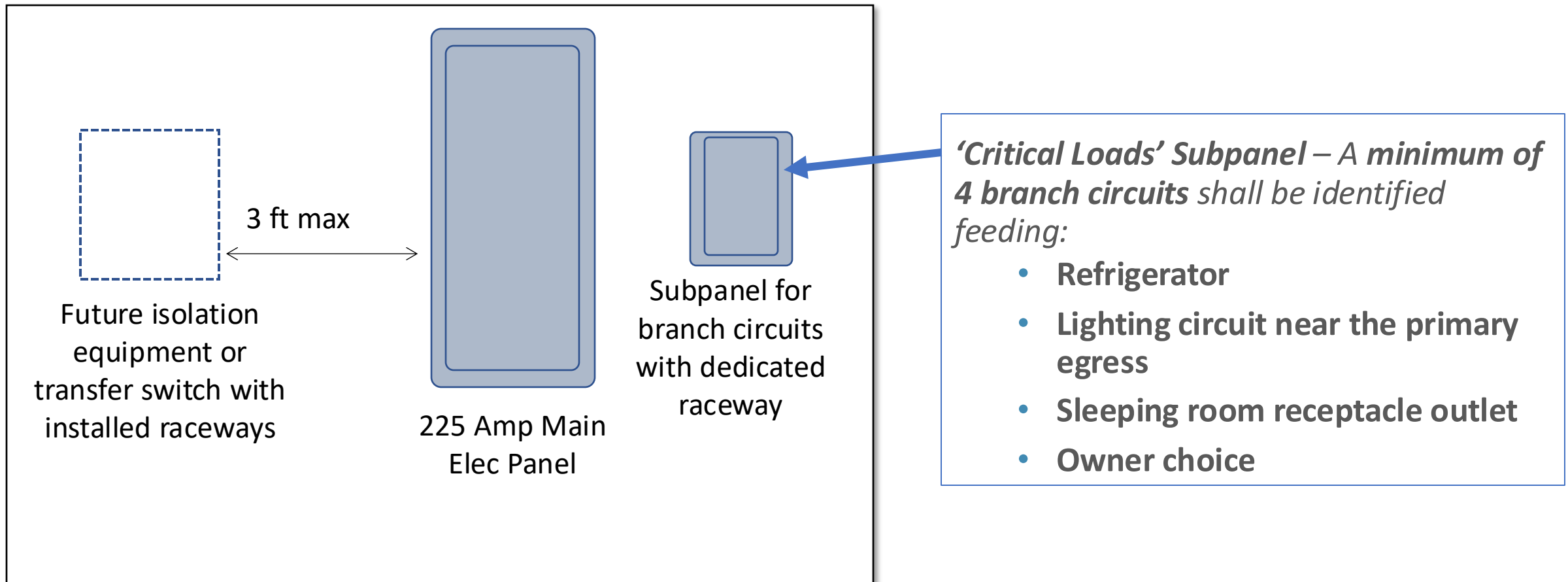


Grid-Tied solar systems were designed to use the 'Grid' as a seasonal battery.

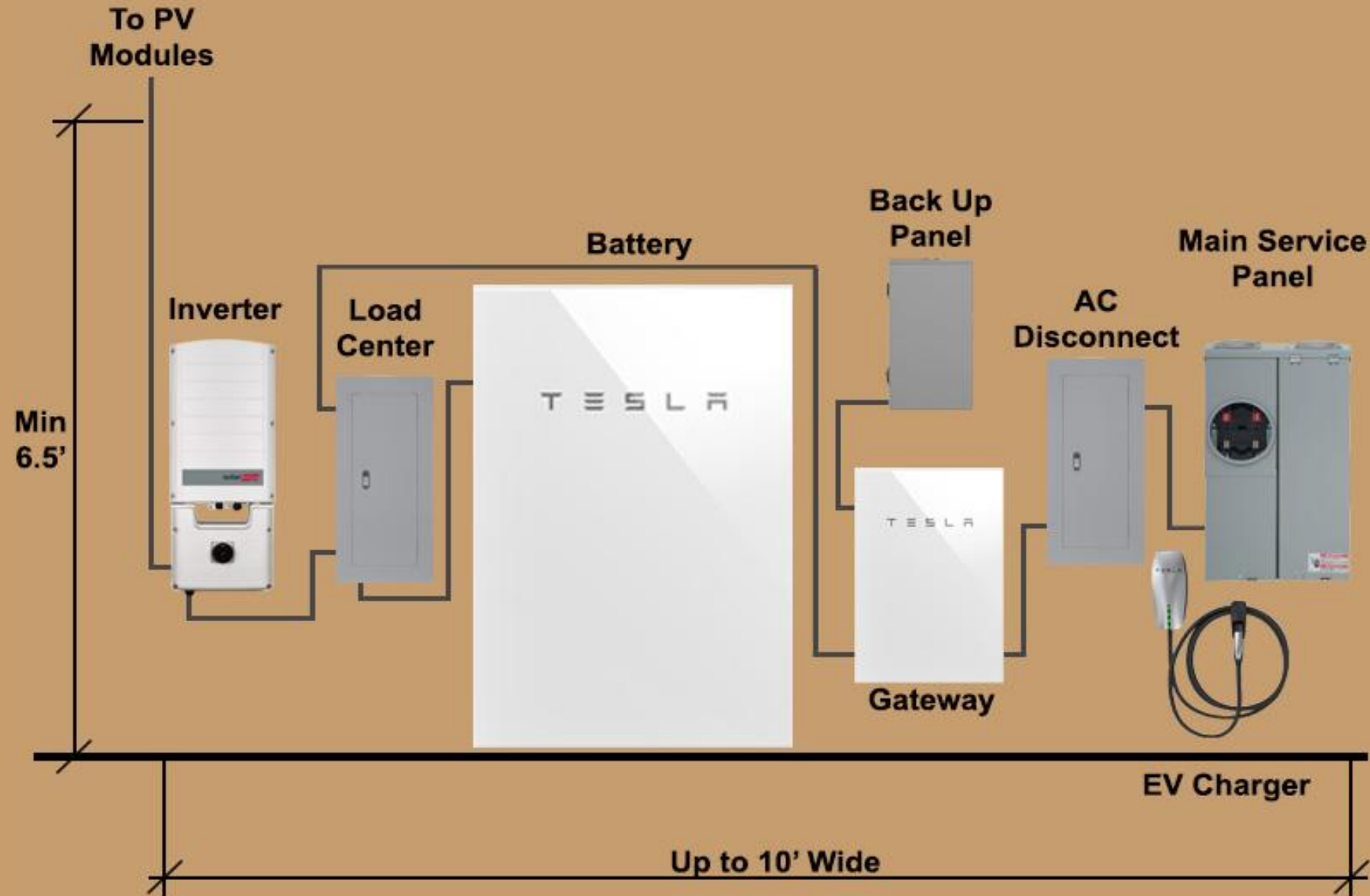
During a given year the building's solar production would deliver as many kWh as the household used.

# 2022 Energy Code – Single Family

- Battery is Optional
- **Mandatory Measure:** “Battery Ready” for New Construction



# Common Equipment for a Solar + Battery System



# General Design Considerations

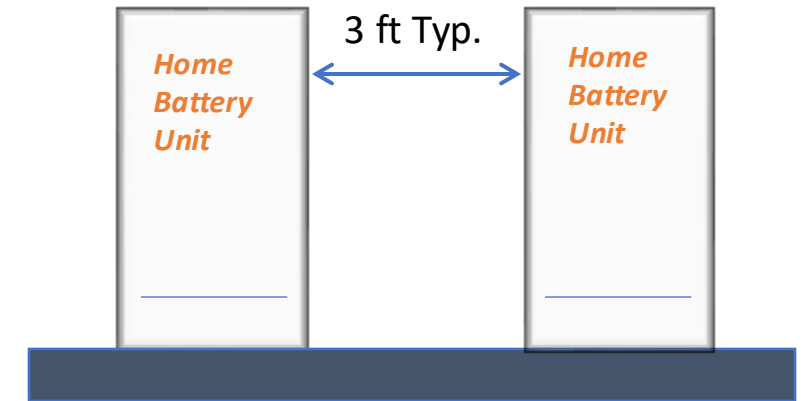
- Outdoor and indoor installations are possible
- Protect from impact damage
- Protect from temperature extremes
- Protect from adverse weather
- Maintain 3 ft distance from paths of travel, doors and windows
- Follow manufacture's installation requirements



# Fire Safety – NFPA 855

## Highlights from Chapter 15 – One and Two Family Units and Townhouses:

- Individual ESS units max 20 kWh stored energy
- Separate individual units by 3 ft
- Aggregate capacity shall not exceed:
  - 40 kWh within utility closets or storage spaces
  - 80 kWh in garages and/or detached accessory structures
  - 80 kWh on exterior walls or in outdoor installations
- Utility closets/spaces and/or garage shall have 5/8" Type X gypsum board ceilings and walls
- Interconnected smoke alarms shall be installed through out the dwelling and attached garage (or when appropriate an interconnected heat alarm)
- Maintain 3 ft clearance from all windows and doors



Batteries maybe installed closer if it can be shown to the AHJ that the battery manufacture has complied with proper fire testing and has specified the minimum distance.



# Home Battery Systems – Large Market

Some popular examples, but there are many others coming to market every day:



**gm** energy



**LG Energy Solution**  
ESS Battery Division



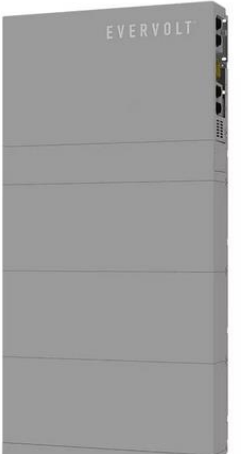
**FRANKLINWH**



**solar**edge



**ENPHASE**



**Panasonic** EVERVOLT®



**electriq**  
power



**sonnen**



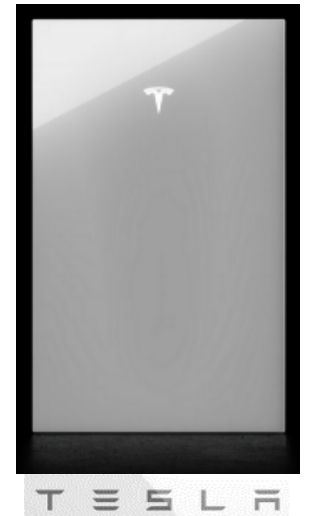
**GOALZERO**



**GENERAC**



**LITHION**

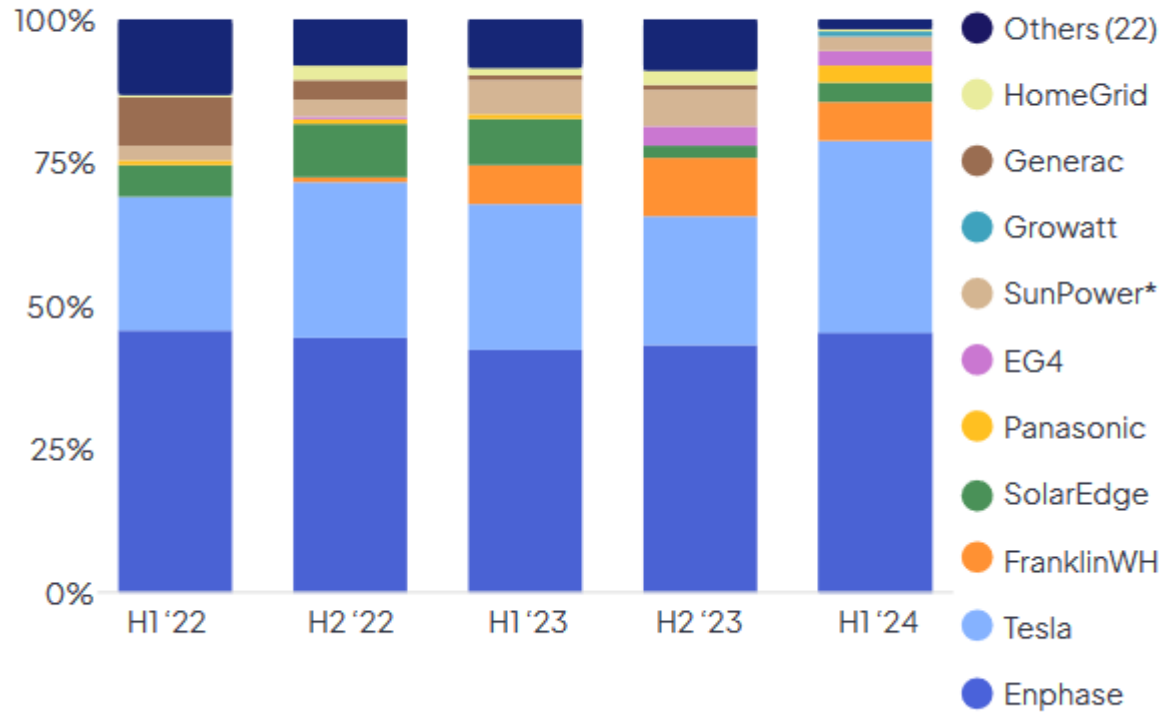


**TESLA**

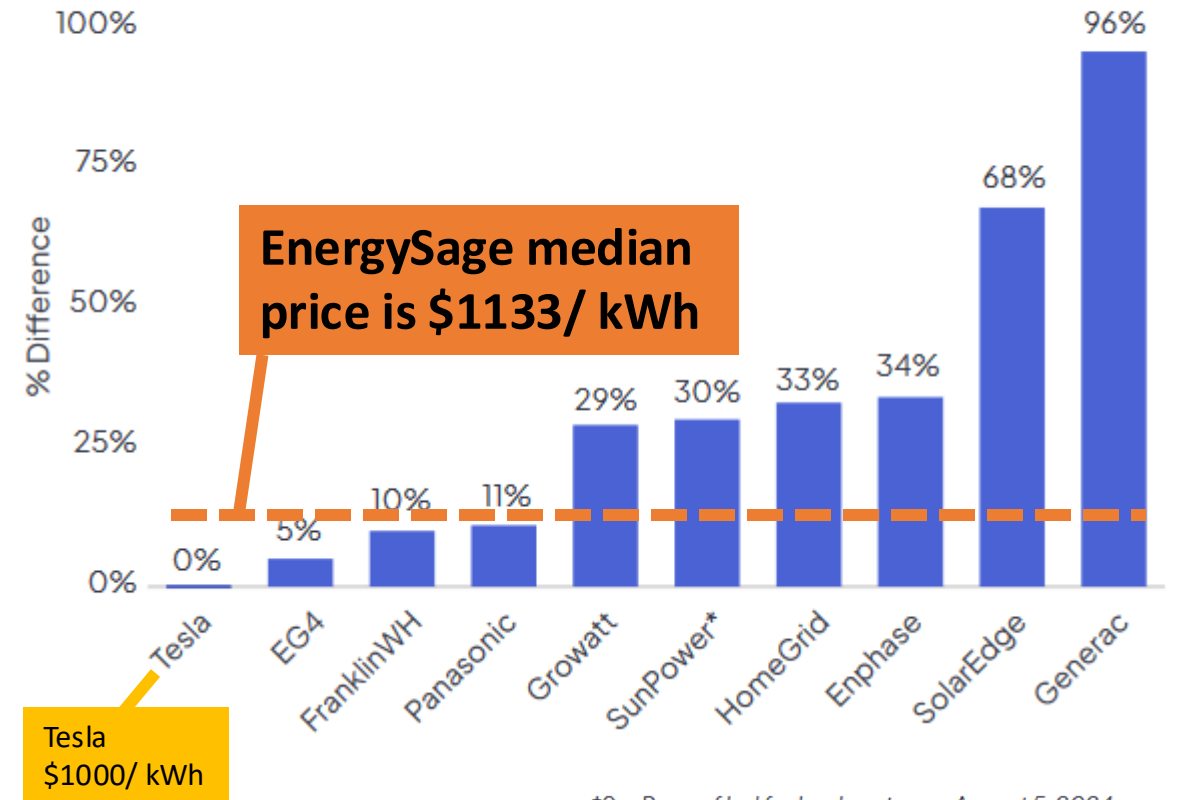
# Market Share – Excerpt from EnergySage Data Set

www.energysage.com

## STORAGE MARKETPLACE SHARE BY HALF YEAR



## PERCENT DIFFERENCE FROM LEAST EXPENSIVE OPTION



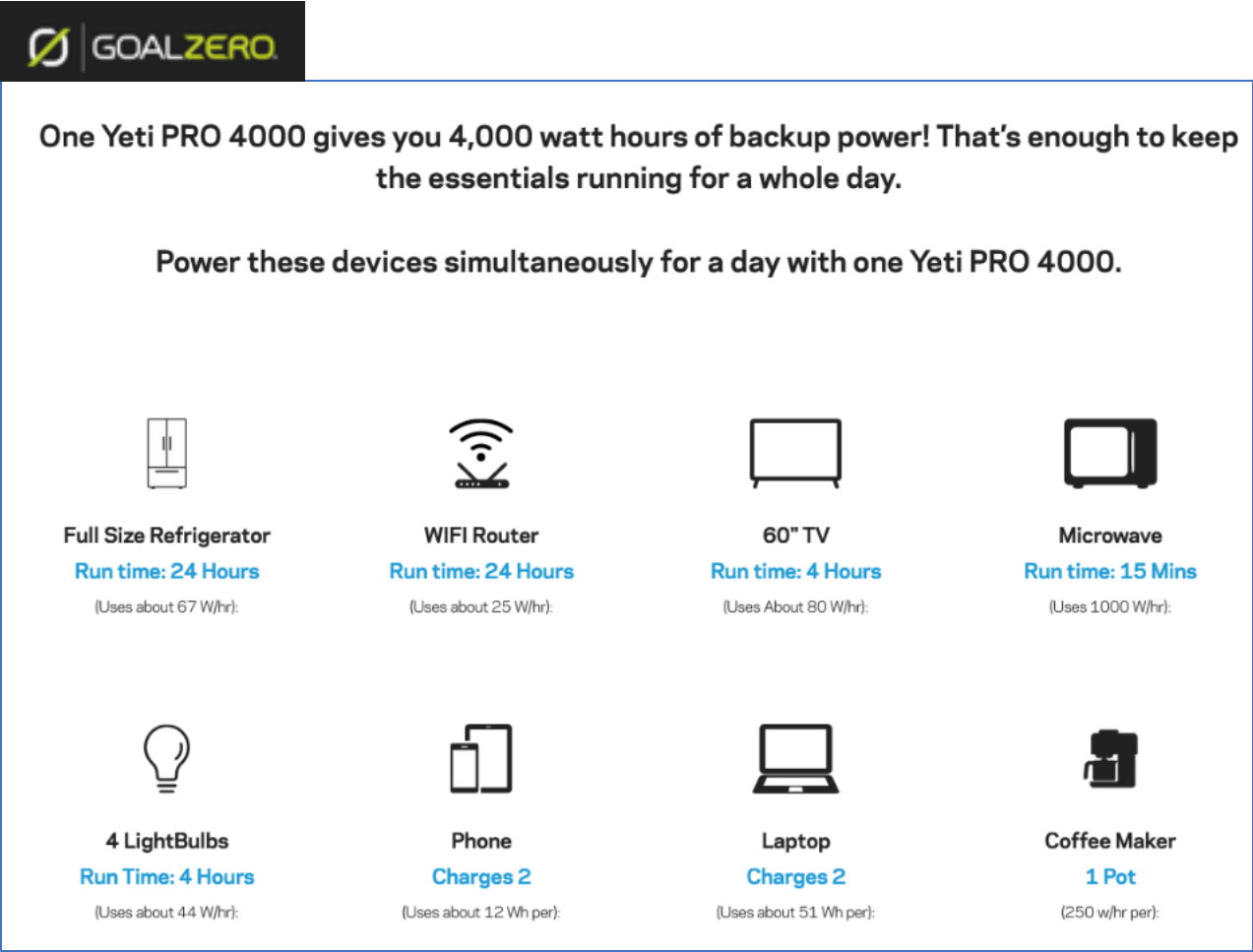
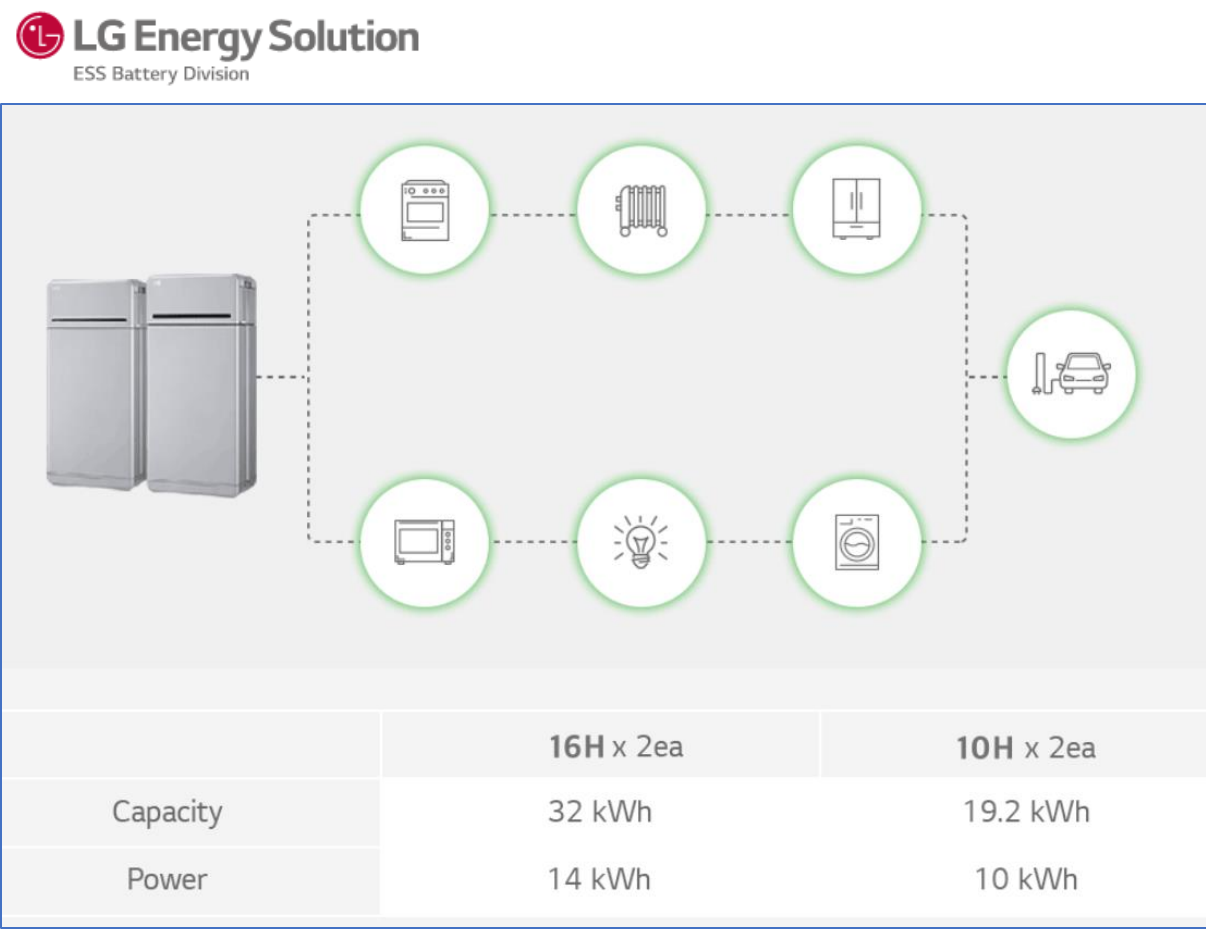
Solar & Storage Marketplace Report

intel@energysage.com

\*SunPower filed for bankruptcy on August 5, 2024, so we expect this to be the last report including its products.

# Manufactures often show estimates for their products' use:

This is useful information for a basic understanding of the capacity and duration of use for a battery system.



# Sizing and Cost Savings – Solar Calculator ‘WattPlan’

<https://guide.pge.com>

## PG&E RESOURCES

### Explore resources for PG&E Customers

Everything you need to reduce costs and maximize savings

[RESET ALL](#)



#### Solar Calculator

Make an informed decision about rooftop solar for your home. Calculate your solar savings potential with a personalized assessment with PG&E's Solar Calculator.

GENERATE SOLAR POWER | TOOLS AND CALCULATORS

[Start Estimate >](#)



#### Disadvantaged Communities – Single-Family Solar Homes (DAC-SASH) program

Learn more about available programs for income qualified customers in disadvantage communities

GENERATE SOLAR POWER | PROGRAMS, REBATES

[Get Started >](#)

User can fine tune the battery parameters and costs

## Storage

Storage can increase the amount of usage you can cover with generation from your solar system.

☒ Include storage?

Energy capacity: 13.5 kWh <sup>?</sup>

0.5  27

Power, Max Continuous: 5.0 kW <sup>?</sup>

1  10

Unit Price: \$1,000 per kWh <sup>?</sup>

100  2000

System Price: \$13,500 <sup>?</sup>

# Benefit of Battery Storage

If you can afford the upfront costs of the battery (assumed \$13,500 installed):

- Save additional \$9,307 over 20 yrs
- Additional year to 'Breakeven'
- Very low utility bill (est. \$82/mo)
- Power some critical loads during a power outage

## Solar only

<b>No</b>	<b>41%</b>
Backup power	Solar energy used on site, not exported

### Key financials

System cost	<b>\$15,960</b>
Total incentives	<b>\$4,788</b>
Net savings or (costs) over the next 20 years	<b>\$33,184</b>
Breakeven	<b>Year 6</b>
Current average monthly bill	<b>\$349</b>
Average monthly bill after solar	<b>\$178</b>

### Key features

- Solar system will export excess power to receive bill credits
- Solar generation shuts down during power outages unless special inverter is used

## Solar and storage

<b>Yes</b>	<b>78%</b>
Backup power	Solar energy used on site, not exported

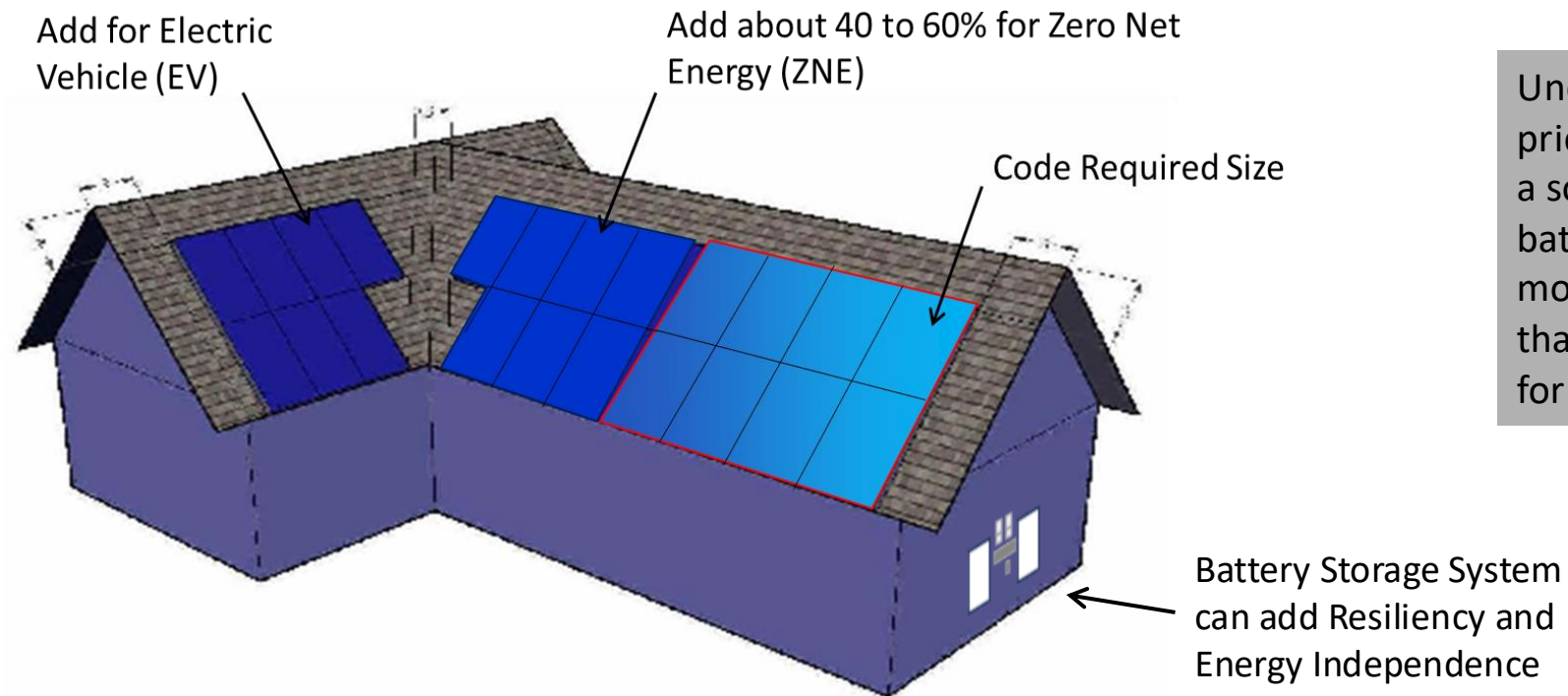
### Key financials

System cost	<b>\$29,460</b>
Total incentives	<b>\$8,838</b>
Net savings or (costs) over the next 20 years	<b>\$42,491</b>
Breakeven	<b>Year 7</b>
Current average monthly bill	<b>\$349</b>
Average monthly bill after solar + storage	<b>\$82</b>

### Key features

- Power critical appliances - or even your whole home - for a limited duration during power outages
- Use solar energy when the sun is shining, store excess solar power for use during evening peak hours, when electricity is most expensive

# Zero Net Energy (ZNE) –the energy a home uses in one year is equal to the energy produced on-site for that year

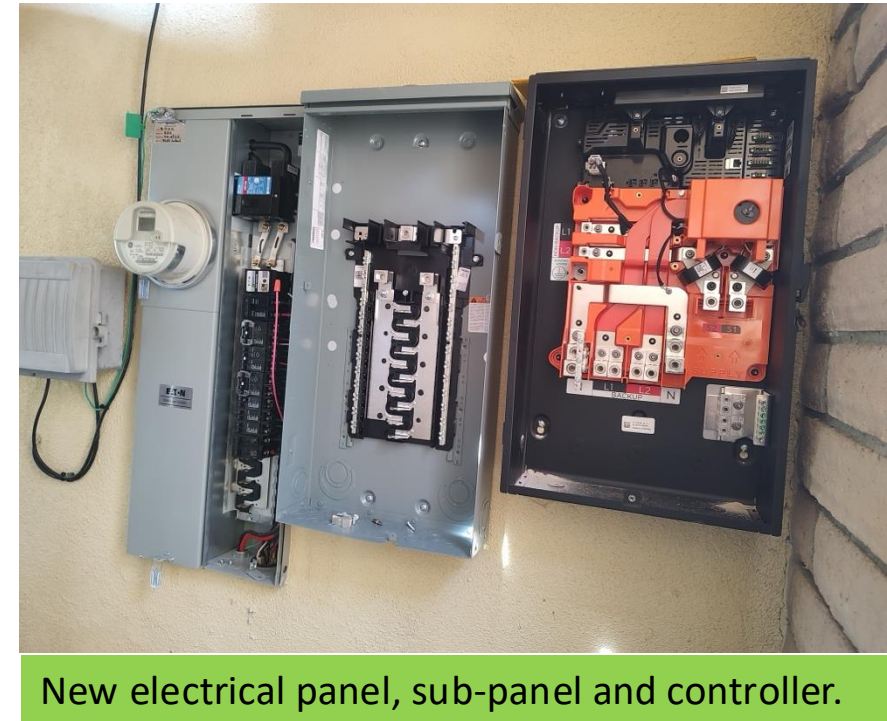
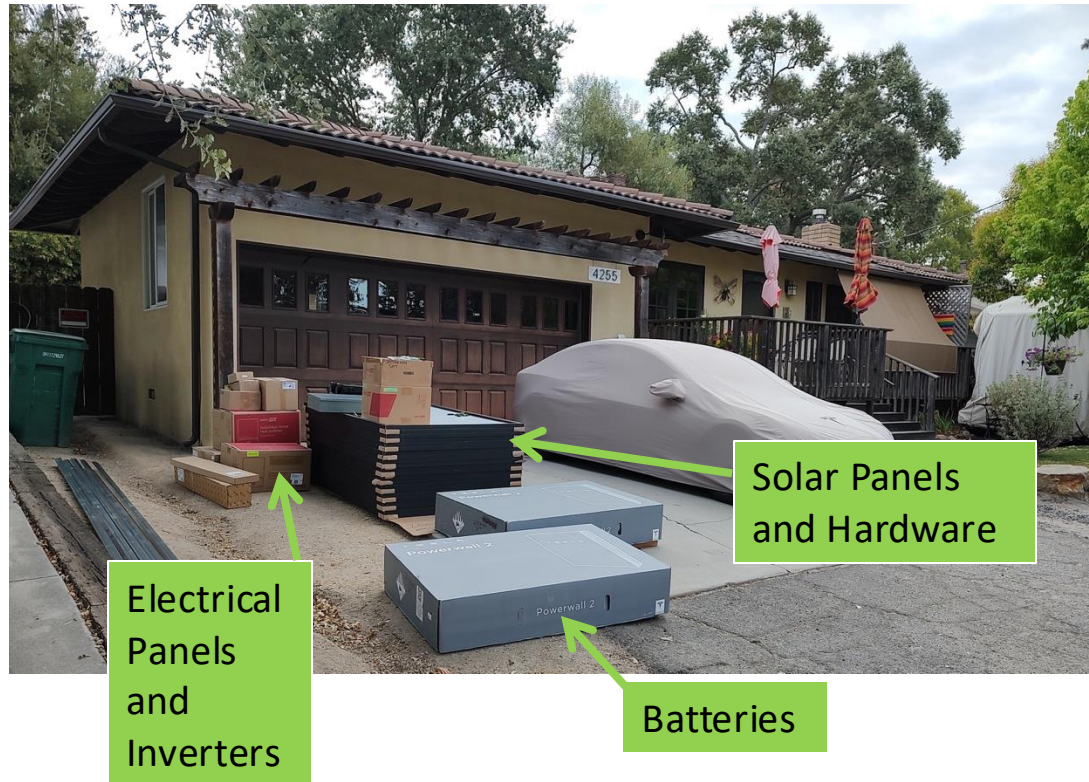


Under the new electric pricing system (NEM 3), a solar PV system with battery storage can be more cost effective than a PV System alone for a ZNE home.

*For Example: New Construction 2000 SF home in Atascadero (climate zone 4) a 2.38 kW system would be required.  
Santa Barbara and Ventura coastal areas would be slightly less.*



# Existing Homes: Solar PV and Battery Systems



Considerations:

New roof or re-roofing / repairs needed?

Panel upgrade needed –additional costs?

Solar access / shading on roof?



# Occupant Habits: Energy Usage, Solar PV and Battery Systems

Installed Roof Top Solar



Depending on one's driving mileage, electric cars can add significant loads.

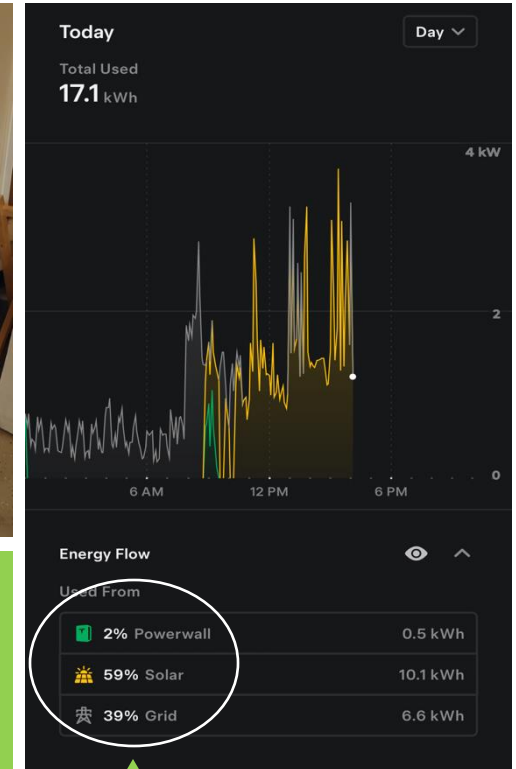


Battery Storage: Two batteries are providing whole home back-up – for the most part...



Electric dryer – Multiple consecutive use can add significant electric load, pulling energy from the grid.

“Laundry Day” – Solar only met 59% of the need that day – battery recharge has “priority” on solar energy.



# Questions about Title 24?

3C-REN offers a *free* Code Coach Service

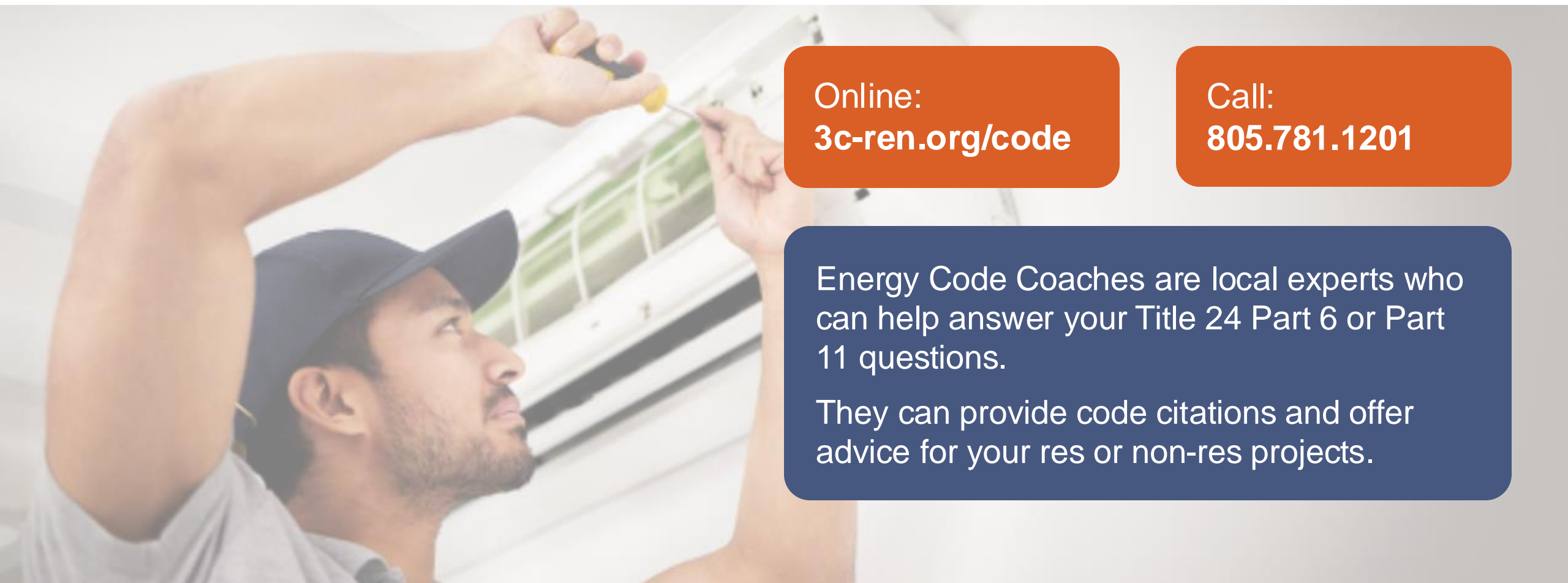


Online:  
[3c-ren.org/code](https://3c-ren.org/code)

Call:  
805.781.1201

Energy Code Coaches are local experts who can help answer your Title 24 Part 6 or Part 11 questions.

They can provide code citations and offer advice for your res or non-res projects.



# Closing



## Continuing Education Units Available

- Contact [chloe.swick@ventura.org](mailto:chloe.swick@ventura.org) for AIA LUs

## Coming to Your Inbox Soon!

- Slides, Recording, & Survey – Please Take It and Help Us Out!

## Upcoming Courses:

- Green Building Construction Tour: San Luis Obispo (2/11)
- 2025 Energy Code Update for the Building Industry (2/12)
- High Performance Buildings: Designing for Utility Costs and Carbon Emissions (2/20)
- Crafting High Performance Enclosures: Roofs, Walls, and Floors (3/4)

**Any phone numbers who joined? Please share your name!**



# Thank you!

More info: [3c-ren.org](https://3c-ren.org)

Questions: [info@3c-ren.org](mailto:info@3c-ren.org)

Email updates: [3c-ren.org/newsletter](https://3c-ren.org/newsletter)



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