We will be starting soon!

Thanks for joining us

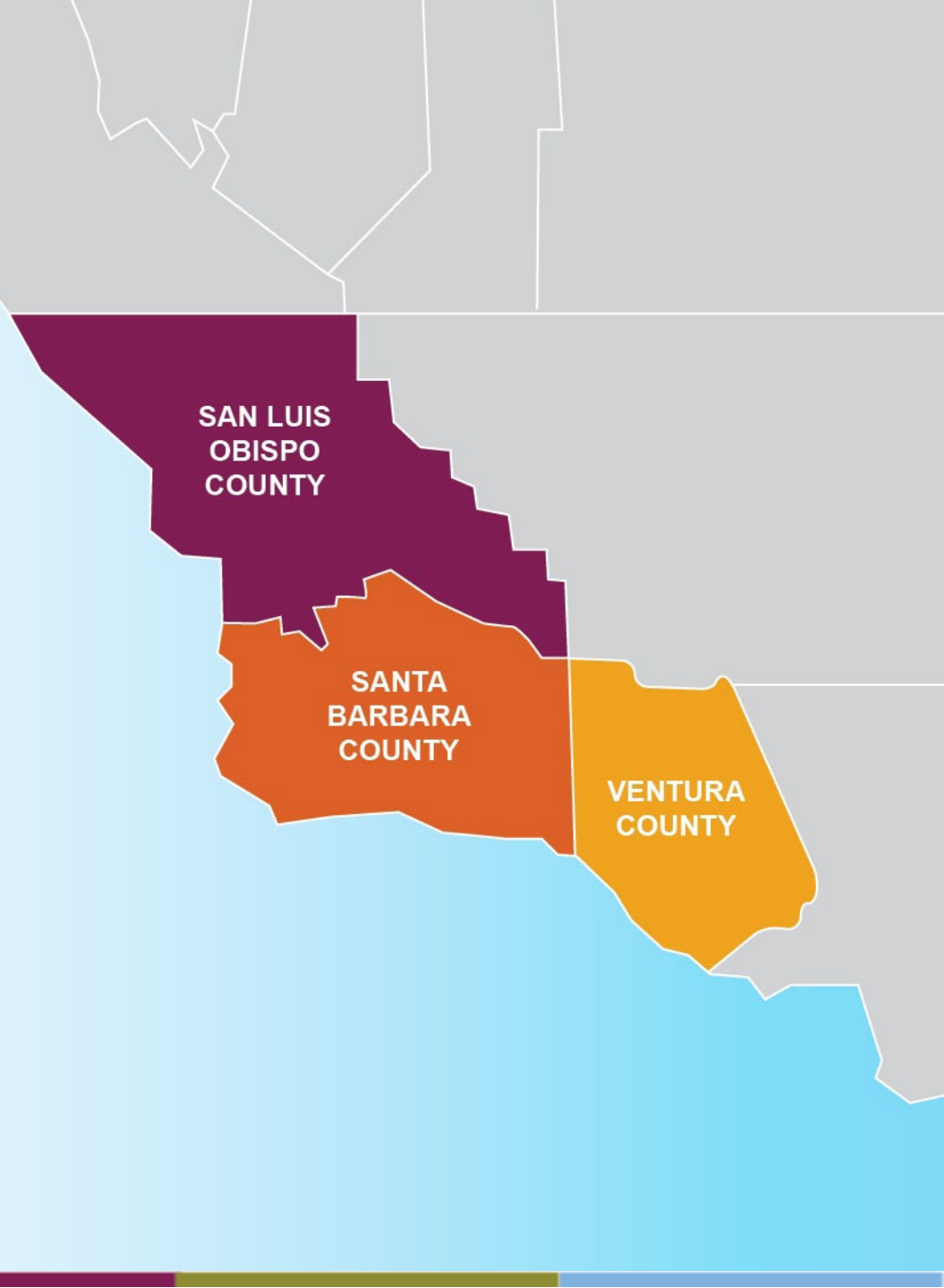
Remodeling—A Great Time to Improve Efficiency and Electrify

Ann Edminster—DESIGN AVEnues LLC

October 17, 2023

3C-REN: Tri-County Regional Energy Network

- Three counties working together to improve energy efficiency in the region
- Services for –
  - **Building Professionals:** industry events, training, and energy code compliance support
  - **Households:** free and discounted home upgrades
- Funded by ratepayer dollars that 3C-REN returns to the region



3C-REN Programs

- **Energy Code Connect (ECC)**
  - Energy Code Coach: Title 24 Compliance Support Hotline (805) 220-9991
- **Building Performance Training (BPT)**
  - Industry Trainings & Certification for current and prospective building professionals
- **Home Energy Savings (HES)**
  - Flexible Home Energy Upgrades for Multifamily and Single Family homes

3C REN HOME ENERGY SAVINGS

Single Family Program

- Discounted pricing available through enrolled contractors–up to 75% off project costs.
- Any project that saves energy (gas or electricity)* is eligible for savings when you work with an enrolled contractor.
- Actual discount depends on how much energy the project saves.

*not solar

3c-ren.org/for-residents

How much can I really save?

Example Project:
Replace Gas Furnace with Electric Heat Pump

- 3C-REN Single Family Program Incentive: ~$2,000
- State TECH Program:~$1,000
- Tax Credit: ~$2,000
- TOTAL SAVINGS: ~$5,000

Nearly half off of a $12,000 project.

How much can I really save?

Make sure that you're accessing all relevant incentives.

- Use 3C-REN's Incentive Finder
- Call or email our 3C-REN associate for support:
  - energy@cecmail.org
  - (805) 881-3877

REMODELING

A Great Time to Improve Efficiency and Electrify

ANN V EDMINSTER
DESIGN AVEnues LLC
annedminster.com | electrification consulting

REMODELING

A Great Time to Improve Efficiency and Electrify

AGENDA:

- The Remodeling Situation
- High-Performance Definitions & Benefits
- The High-Performance Toolkit
- The Planning Process
- Assembling & Working With Your Team
- Electric Equipment Options
- Incentives & Other Resources

REMODELING

THE SITUATION

California's future is *ELECTRIFYING!*

By 2045 CA has committed to:

- **100% zero-carbon electricity** (SB100)
- **Economy-wide carbon neutrality** (Exec Order B-55-18)

"Natural" gas is on its way OUT of homes

- With line leaks, gas is **as polluting as coal**
- CA energy code incentivizes energy efficient approaches **to encourage building decarbonization**
- 70+ CA jurisdictions have embraced all-electric *new* homes; **retrofits are under discussion**

https://www.sierraclub.org/articles/2021/07/californias-cities-lead-way-pollution-free-homes-and-buildings

Any home improvement project is challenging,

but when you add further

COMPLEXITY such as

- ELECTRIFICATION
- ENERGY EFFICIENCY
- HEALTH
- COMFORT
- RESILIENCY

HIGH PERFORMANCE GOALS

On top of architectural or spatial improvements ...

You may encounter some hiccups!

And it's not just YOU—
Assembling a qualified team can be challenging

- High-performance experience is still relatively uncommon
- Specialists can be hard to find
- Good ones are always busy!

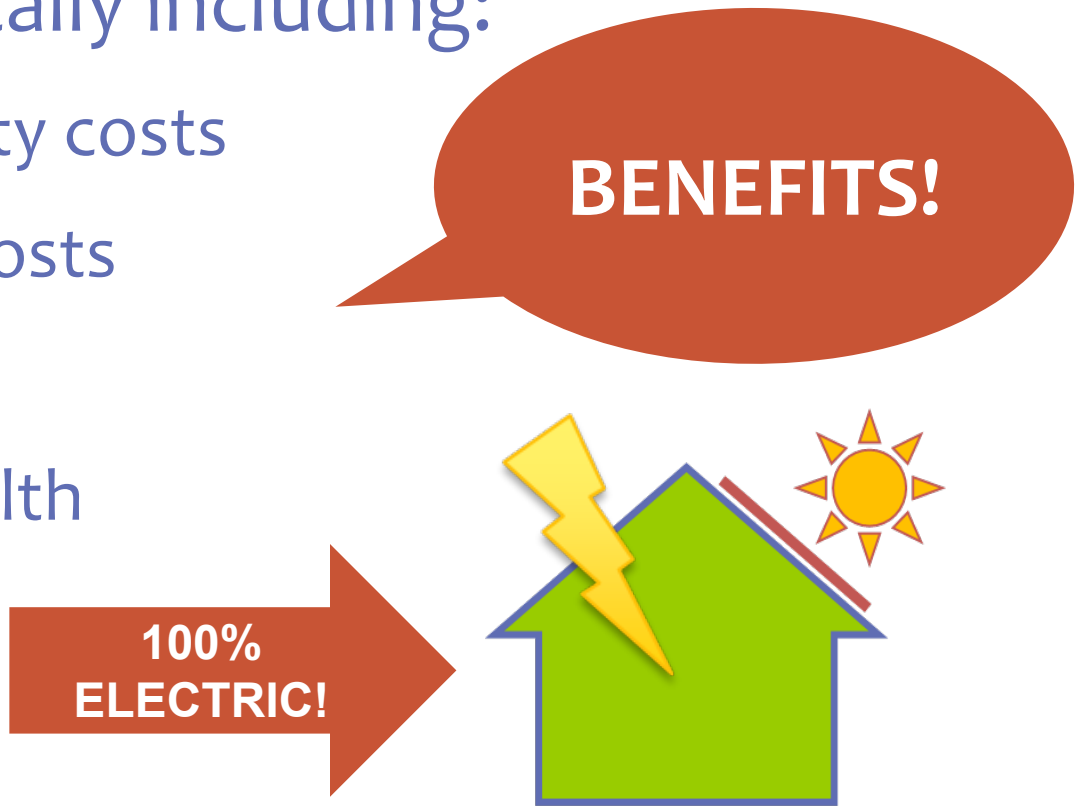
HIGH-PERFORMANCE

DEFINITIONS & BENEFITS

High performance: WHAT and WHY

A building that exceeds the performance of conventional buildings in important areas, typically including:

- **Energy conservation** – lower utility costs
- **Durability** – lower maintenance costs
- **Comfort** – improved satisfaction
- **Indoor air quality** – improved health
- **Climate responsiveness** – lower greenhouse gas emissions



100% ELECTRIC means …

Swapping out "natural" gas or propane-fired equipment

- **"The Big Four"**
- **Plus:**
  - Pools
  - Spas
  - Barbecues
  - etc.

100% ELECTRIC:

- Heating+cooling
- Water heating
- Cooking
- Clothes drying

Electrification has MANY benefits!

SWITCHING from GAS to ELECTRICITY means:

- Eliminating onsite explosion risks
- Improved equipment
- Avoided gas price increases
- Fewer kitchen safety risks
- **Reduced indoor air pollution**

An all-electric home emits 40% less greenhouse gas than an equivalent home powered by natural gas, saving >1 ton of CO_2 per year*

Rates in CA expected to nearly double by 2050

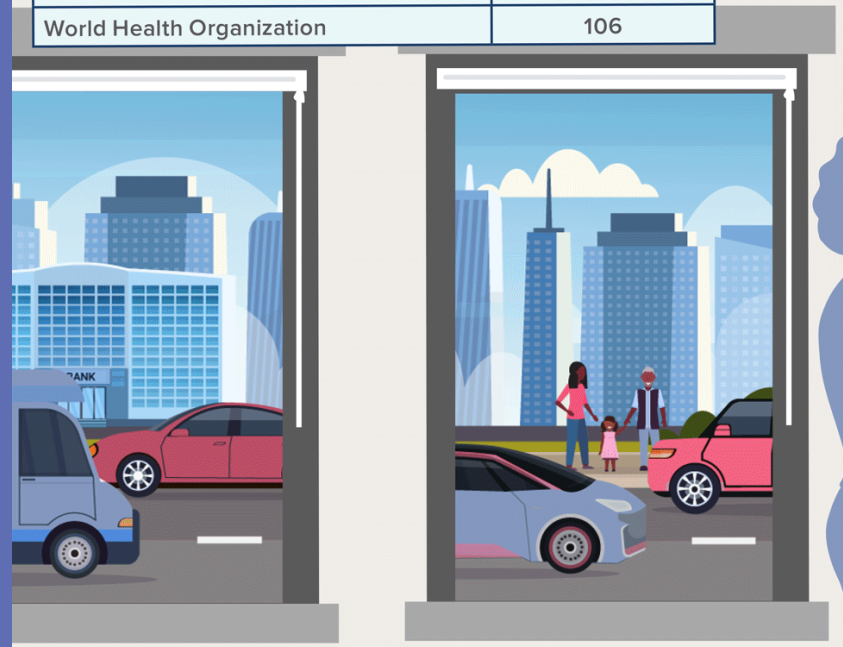
* smud.org/en/Going-Green/Smart-Homes

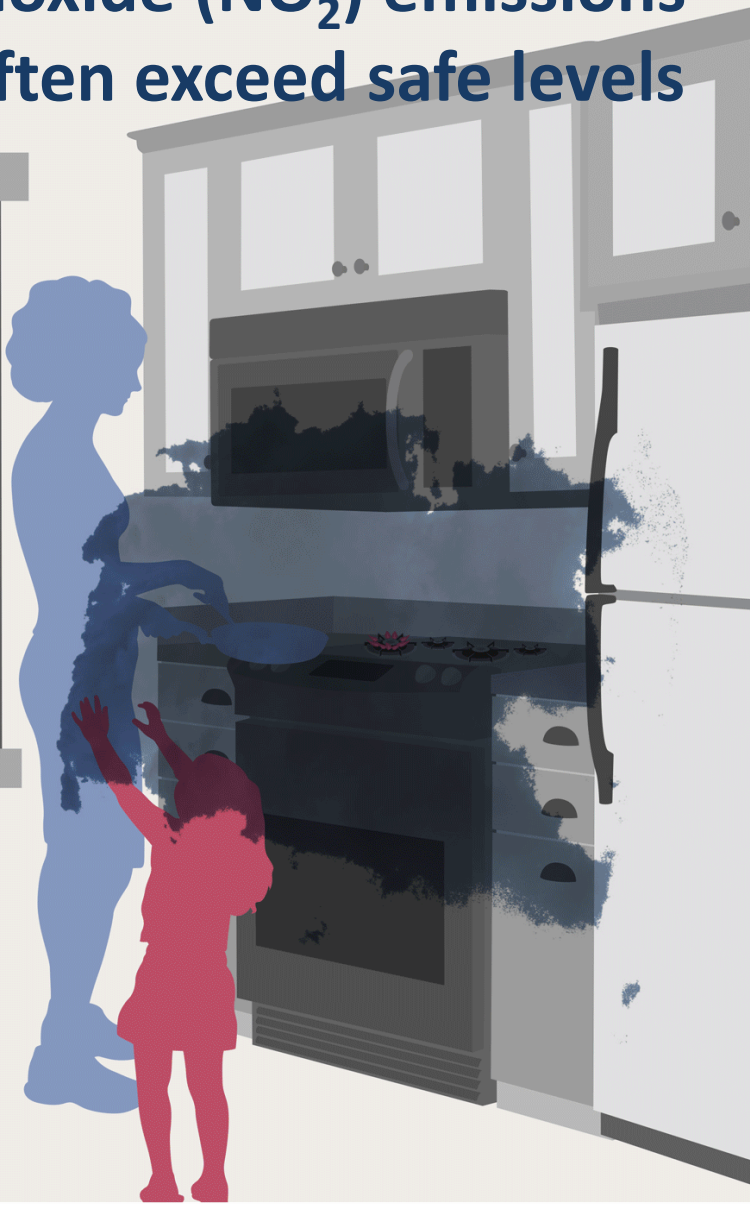
Gas cooking HAZARDS → = Compelling reasons to switch to ELECTRIC COOKING

Gas stove nitrogen dioxide (NO_2) emissions often exceed safe levels

Outdoor Standards for NO_2	1-hr average (ppb)
US National Standard (EPA)	100
Canadian National Standard	60
California State Standard	180

Indoor Guidelines for NO_2	1-hr average (ppb)
Canada	90
World Health Organization	106



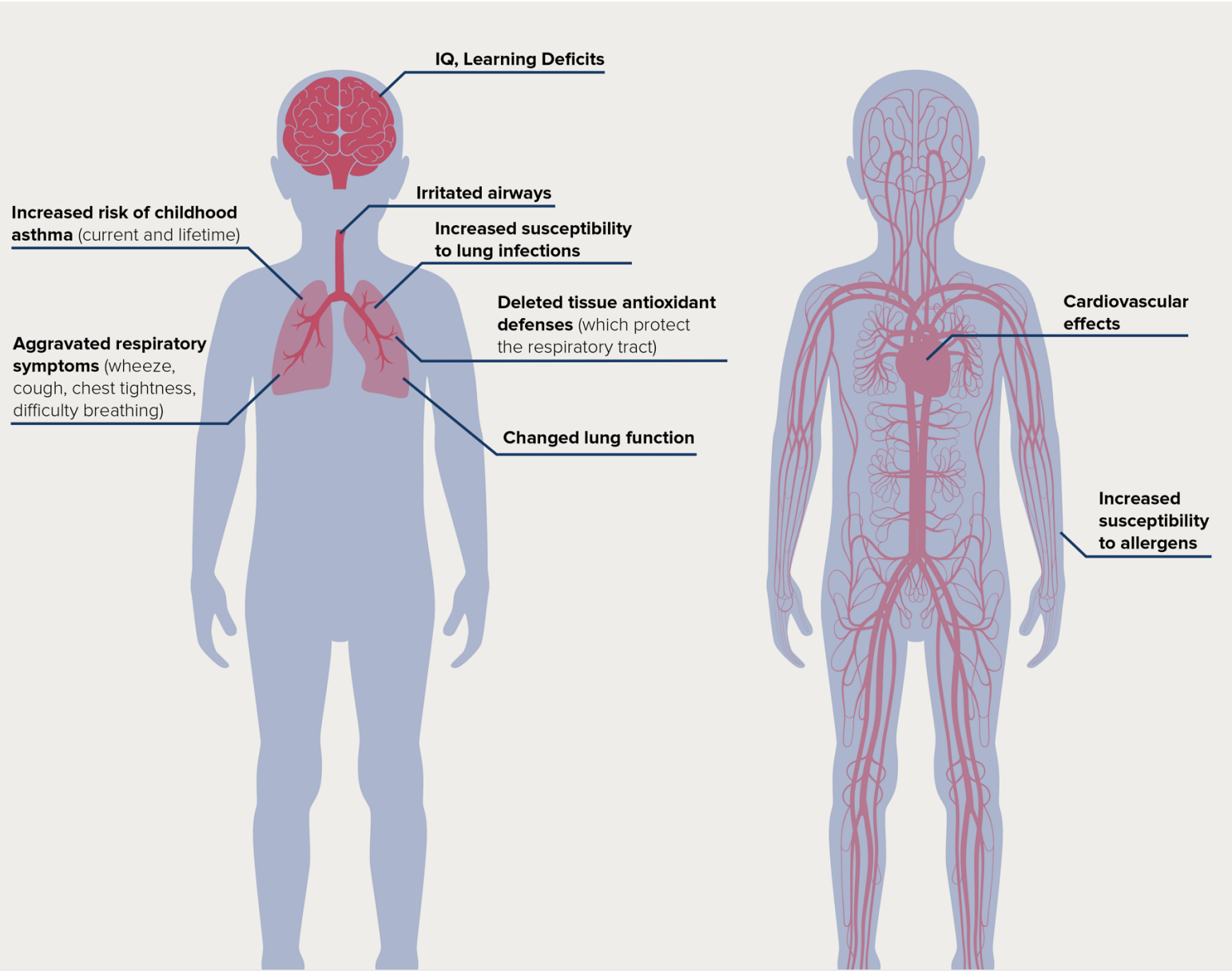


Measured NO_2 Emissions from Gas Stoves	Peak (ppb)
Baking cake in oven	230
Roasting meat in oven	296
Frying bacon	104
Boiling water	184
Gas cooktop - no food	82–300
Gas oven - no food	130–546

Source: https://rmi.org/insight/gas-stoves-pollution-health

Gas cooking HAZARDS → = Compelling reasons to switch to ELECTRIC COOKING

High levels of NO_2 in children may cause:



Source: https://rmi.org/insight/gas-stoves-pollution-health

Why is electrification part of high performance?

You *can* just electrify ***but*** ...

SWITCHING from GAS to ELECTRICITY *without addressing performance* can mean:

Larger heating, ventilation, & cooling (HVAC) equipment than you otherwise would need

→

More money spent on the HVAC equipment

→

Higher utility bills

Unresolved:
- **Comfort issues**
- **Indoor air quality**
- **Condensation risks**

and MISSED OPPORTUNITIES!

Reducing demand & upgrading performance

- Insulation quantity
- Quality of insulation installation (QII)
- How well the house is air-sealed
- Efficiency of lighting and appliances
- Distribution systems

INFLUENCE

Key aspects of performance

- Comfort
- Utility bills
- Indoor air quality
- Condensation risks
- HVAC equipment size & $$$

Renewables & storage → *MORE* benefits

+ RENEWABLE ENERGY → economic & climate resiliency

- Savings over time
- ~4% increased resale value for solar*
- Clean, carbon-free energy

+ BATTERIES → grid resiliency

- Power during outages
- Improved economics with solar
- Lower cost electricity during peak periods

Image Xana_UKR via iStock

= A RESILIENT and CLIMATE-FRIENDLY HOME!

* money.com/home-value-solar-panels/

HIGH-PERFORMANCE
THE TOOLKIT

Performance Tools | **Enclosure Elements**

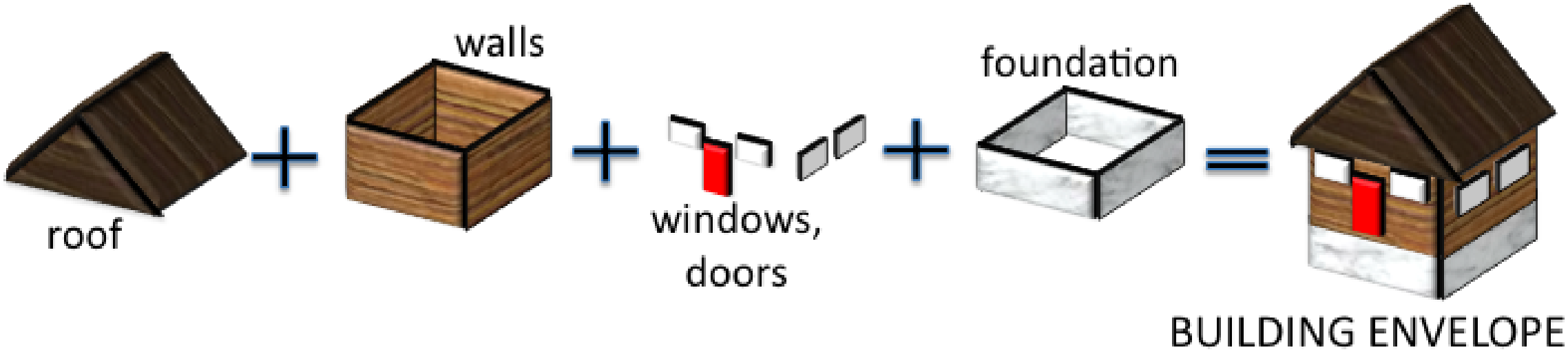


Image: EnergyEducation.ca

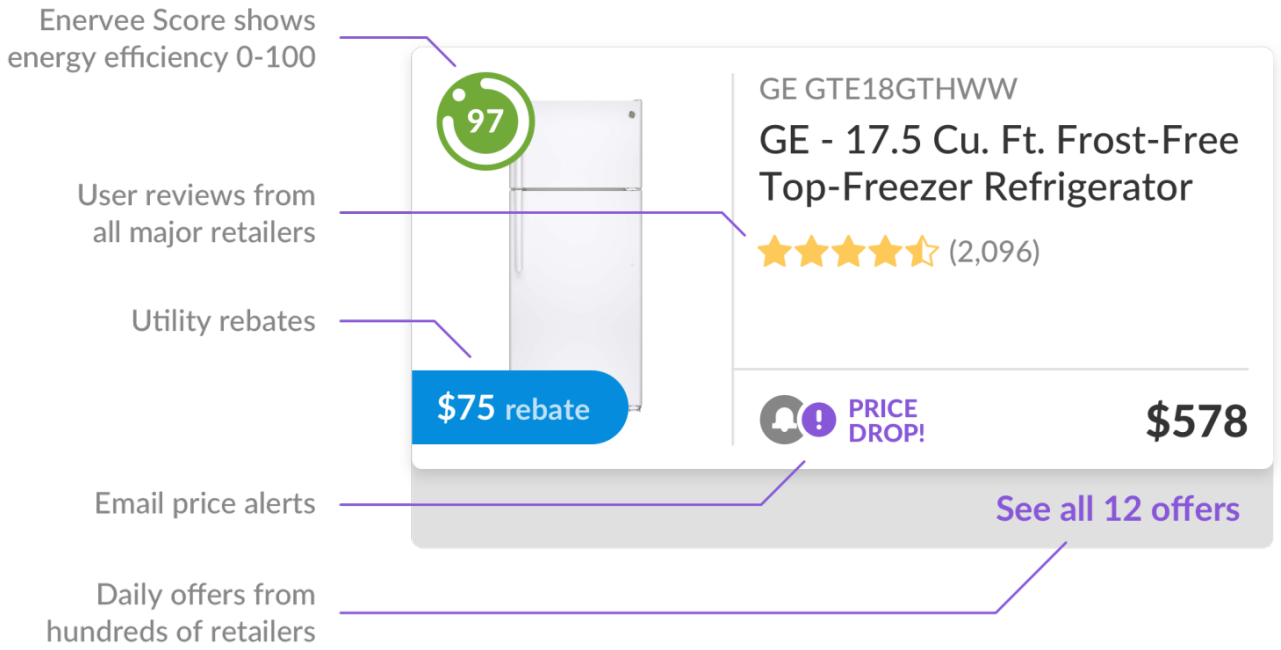
Performance Tools | **Electrical Items**

- **"Best in class"**
  - Lighting
  - Appliances
  - Electronics

100% LEDs

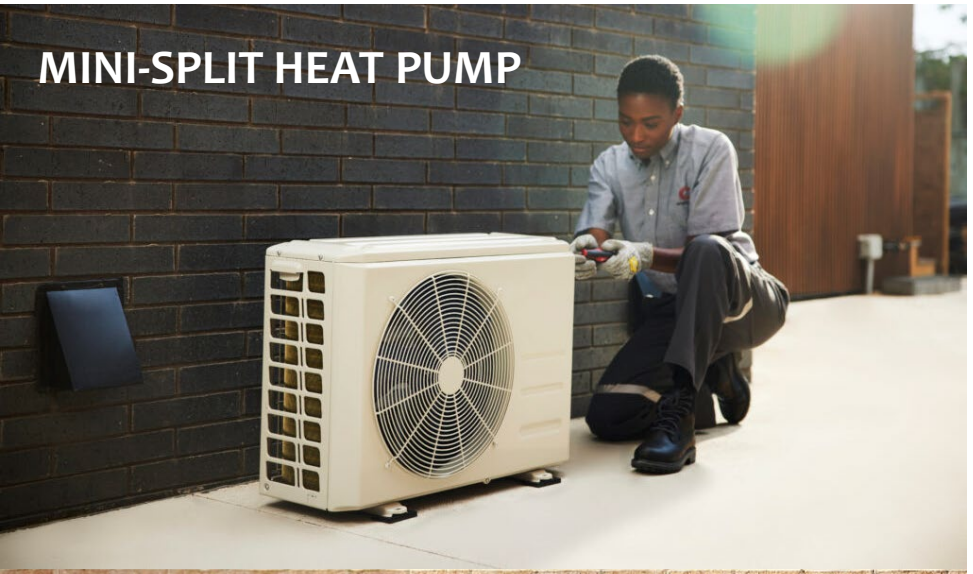
Listings at:

- energystar.gov/products/most_efficient
- cee1.org
- marketplace.pge.com

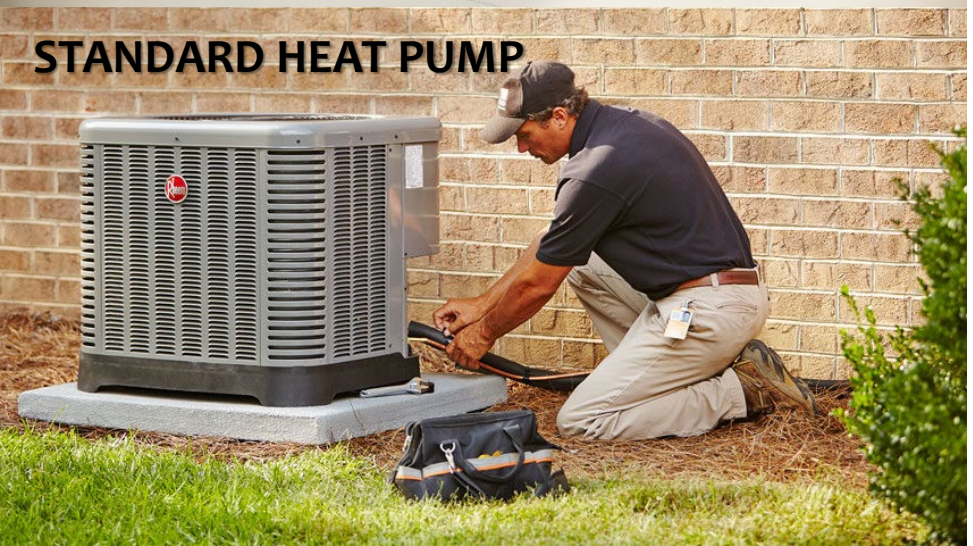


Performance Tools | HVAC* & Water Heating

*heating, ventilating, and air conditioning



MINI-SPLIT HEAT PUMP



STANDARD HEAT PUMP

HEAT RECOVERY VENTILATOR

DUCTWORK

HEAT PUMP WATER HEATER

Performance Tools | **Quality Installation**

TEST, MEASURE, & VERIFY PERFORMANCE!

- **Air sealing**
- **Insulation**
- **Window & door flashings**
- **Mechanical system components**
- **Hot water piping**

RESOURCE for quality installation specifications:

❑ ZNE Builder Resource Guide

Performance Tools | **Efficiency is the Key!**

A life safety feature!

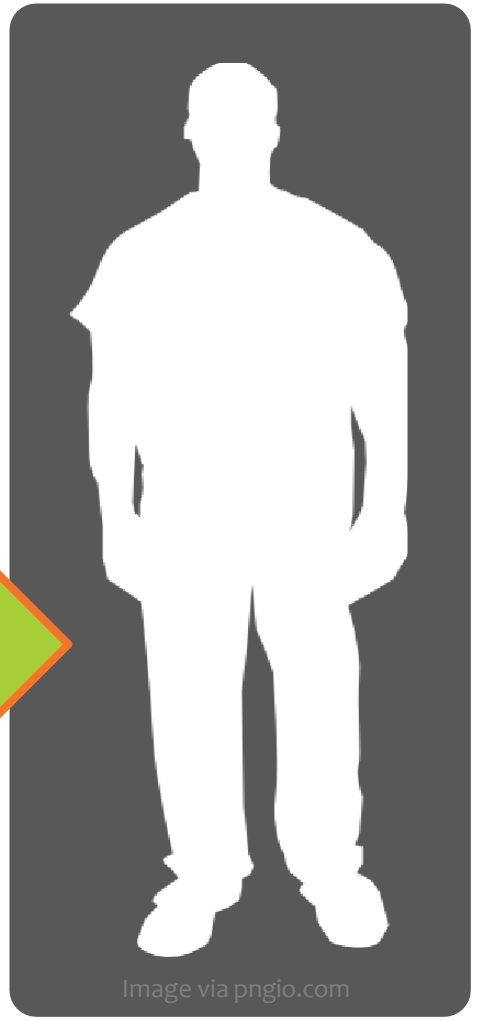
Efficiency benefits include:

- Improved comfort indoors
  - Stable temperatures – even in power outages!
  - Improved wildfire resiliency (with the right features)
- Lower overall energy use
- Reduced intrusion of outdoor pollutants
  - Wildfire smoke
  - Vehicle exhaust
  - Noise

How is a high-performance project DIFFERENT?

- Team needs familiarity with advanced standards & techniques
- Design and specifications are more demanding
- There's a job that's not in anyone's scope
- Successful execution takes *exceptional* attention to detail

The air sealing specialist



PLANNING

THE PROCESS

1 Find out all you can about your house

POTENTIAL INFORMATION SOURCES:

- City or County building department
- Architect
- Developer or general contractor

WHAT TO LOOK FOR?

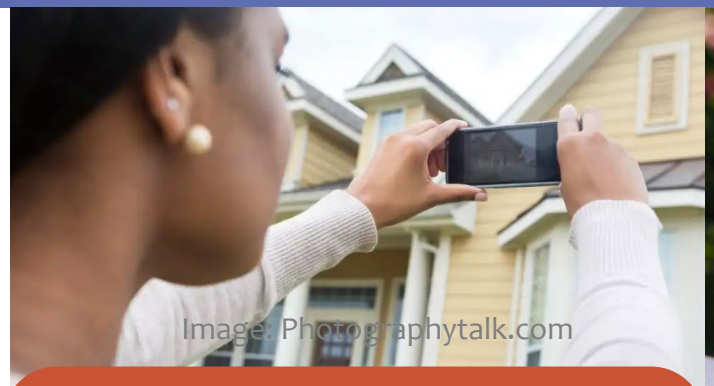
- Blueprints
- Building permits
- Title 24 energy reports
- Diagnostic testing results

Image: Hunker.com

2 Examine it—top to bottom, inside & out

DEFERRED MAINTENANCE? COMFORT ISSUES? LEAKS?

- Attic(s)
- Closets
- Every room
- Doors, windows, & frames
- Crawlspaces/basements/foundation
- Systems: HVAC, plumbing, electrical
- Architectural/functional deficits



Record your observations & questions

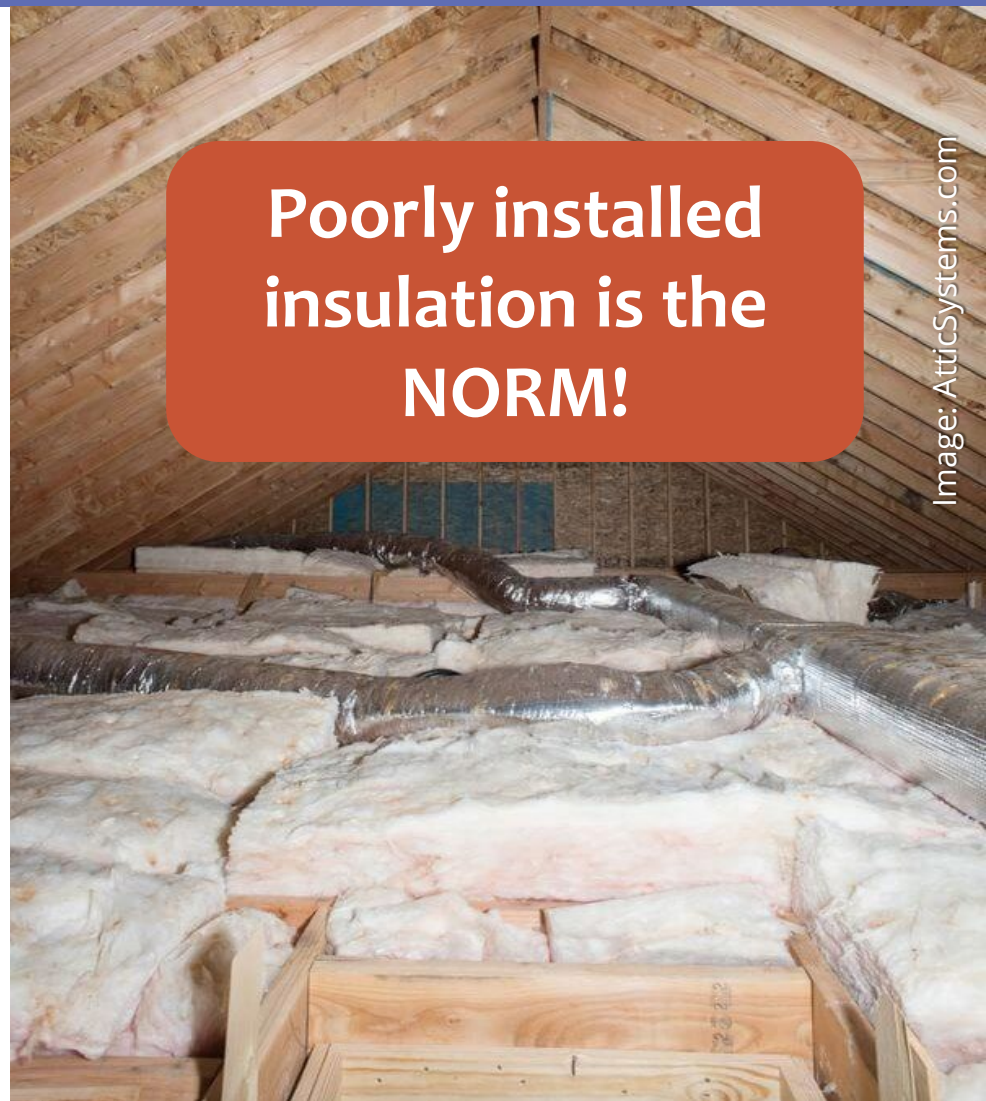
3

Consider opportunities:

Enclosure & system improvements

EVALUATE:

- Comfort issues
- Insulation defects
- Air leakage
- Window age, type, condition
- Shading opportunities to reduce cooling needs
- Mechanical system shortcomings
- Hot water lag times



4 Identify ALL planned electric items

present or future!

Photovoltaics

Energy storage

Electric vehicles

Fireplaces

Pools & spas

+ BBQs, fish tanks, etc.

5

Prioritize your *WHOLE* wish list

NEED TO HAVE	NICE TO HA
1.	8.
	9.
3.	10.
4.	11.
5.	12.
6.	13.
7.	14.

WATER CONSERVATION
CLEAN INDOOR AIR
"GREEN" MATERIALS
ENERGY STORAGE
VISUAL COMFORT
ACOUSTIC PRIVACY
ZERO-CARBON OPERATION
WILDFIRE RESISTANCE

to share with your team—

& WORKING WITH

ASSEMBLING YOUR TEAM

Build a GREAT team!

Some people you might need to involve:

- **Architect**
  - Design, drawings, permit advice, referrals
- **Engineer / HVAC designer**
  - Size & specify HVAC, pool/spa heating, etc.
- **Home performance or general contractor**
  - Enclosure & HVAC improvements
  - Electrification
- **Electricians, plumbers, HVAC installers**
- **Specialty vendors: solar, battery, EV, etc.**

Your needs will depend on the project complexity and scope, and the age & condition of your home

HIRE FOR EXPERIENCE* and *ALWAYS* CHECK REFERENCES!

** With electrification and high performance, if possible!*

Traits of GREAT high-performance teams

- Commitment
- Creativity
- Experience
- Engagement

plays well with others

With your team, set specific objectives & metrics

- **Climate / fuel choices**
  - ✓ All-electric?
  - ✓ Mixed fuel?
- **Health / air quality**
  - ✓ Eliminate indoor air pollution
  - ✓ Fresh-air ventilation
  - ✓ Healthy materials
- **Energy**
  - ✓ Efficiency
  - ✓ Affordability

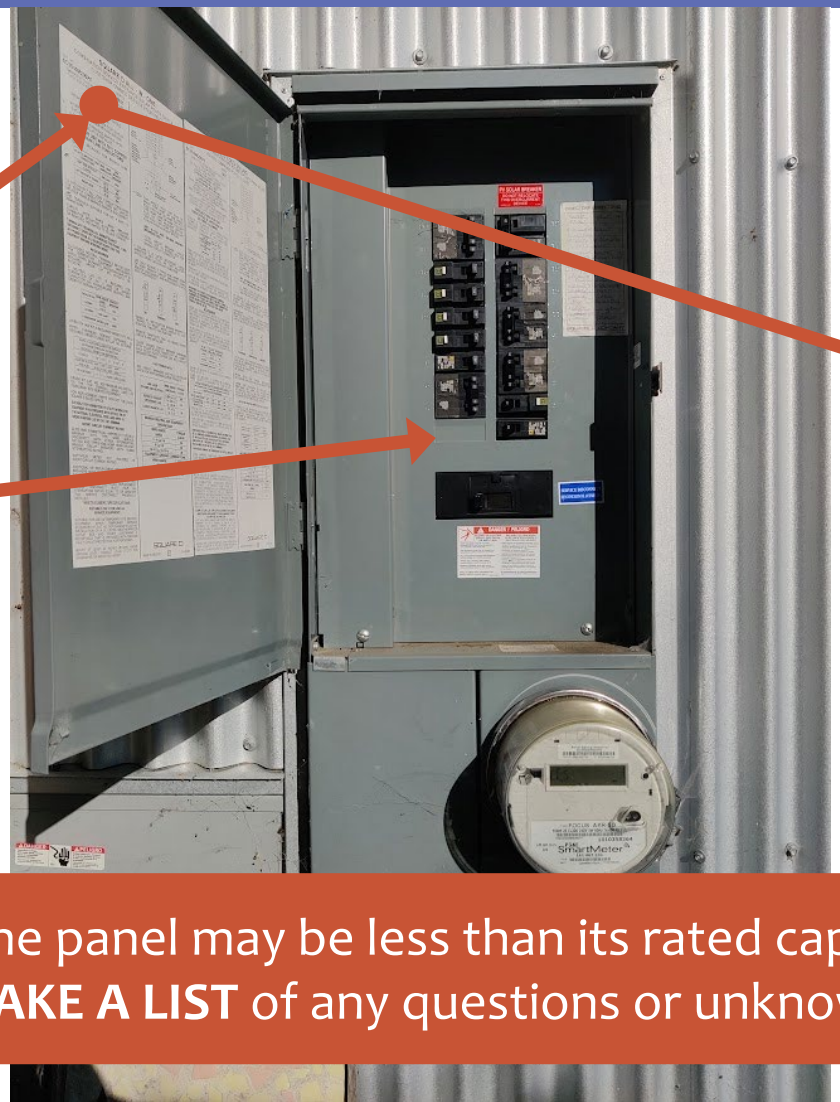
Going all-electric has important HEALTH benefits!

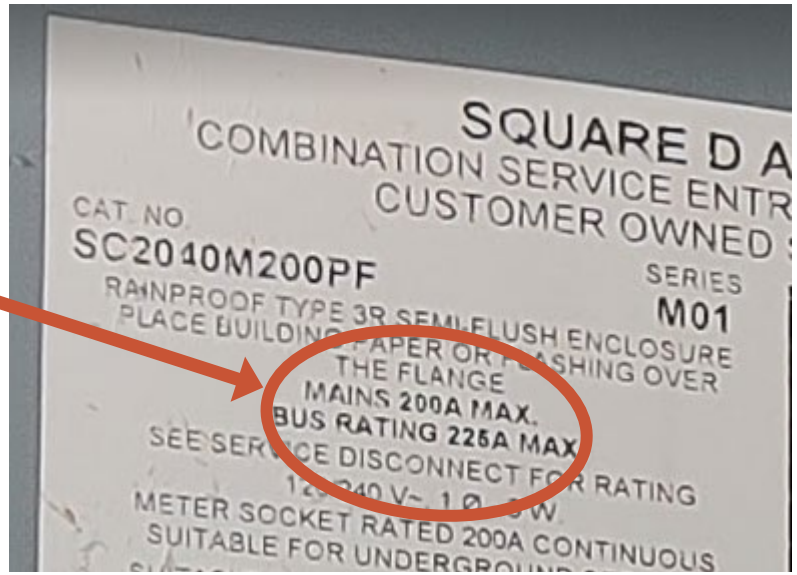
- **Comfort**
  - ✓ Thermal
  - ✓ Visual
  - ✓ Acoustic
- **Resilience**
  - ✓ Wildfire resistance
  - ✓ Onsite energy production
  - ✓ Batteries
- **Architecture / function**
  - ✓ (of course!)

THINGS YOUR TEAM SHOULD HELP WITH to devise a good plan

Check electrical capacity

- **Find out what you have—**
  - Panel capacity (Amperage)
  - Available circuits
  - Amperage delivered to panel
- **Determine new needs**





The amperage delivered to the panel may be less than its rated capacity. An electrician may be needed to determine this. **MAKE A LIST** of any questions or unknowns.

Do the math

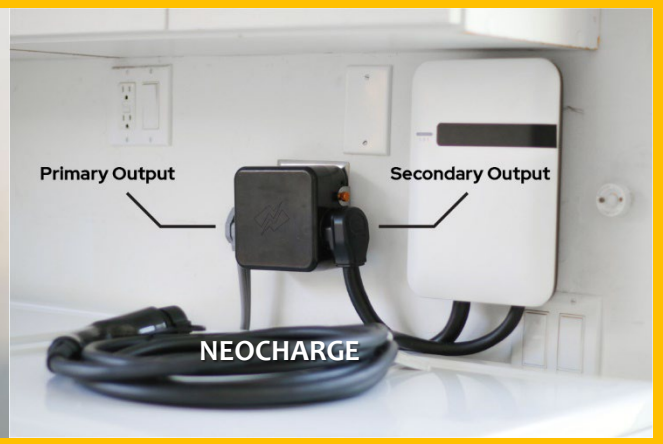
Estimate the NEW capacity needed for planned items ➔

TYPICAL ELECTRIC LOADS (Amps)	
Heat pump (space conditioning)	20+
Heat pump water heater	15-30
Induction range	40-50
Electric dryer	15-30
EV charger	40+

Evaluate a “diet” or “smart” approach

if a panel upgrade is problematic

- **Power-efficient equipment**
  - Combined condensing washer-dryer
  - 15A, 120V heat pump water heater
- **Smart technologies**
  - Smart panel (load management system)
  - Circuit sharing: dryer + EV or 2 EVs



Consider *ALL* your priorities & opportunities

EVERYTHING you examined during your top-to-bottom, inside-out evaluation—

- Lighting & appliance updates
- Enclosure & system improvements
- Window & shading improvements
- Architectural & functional changes

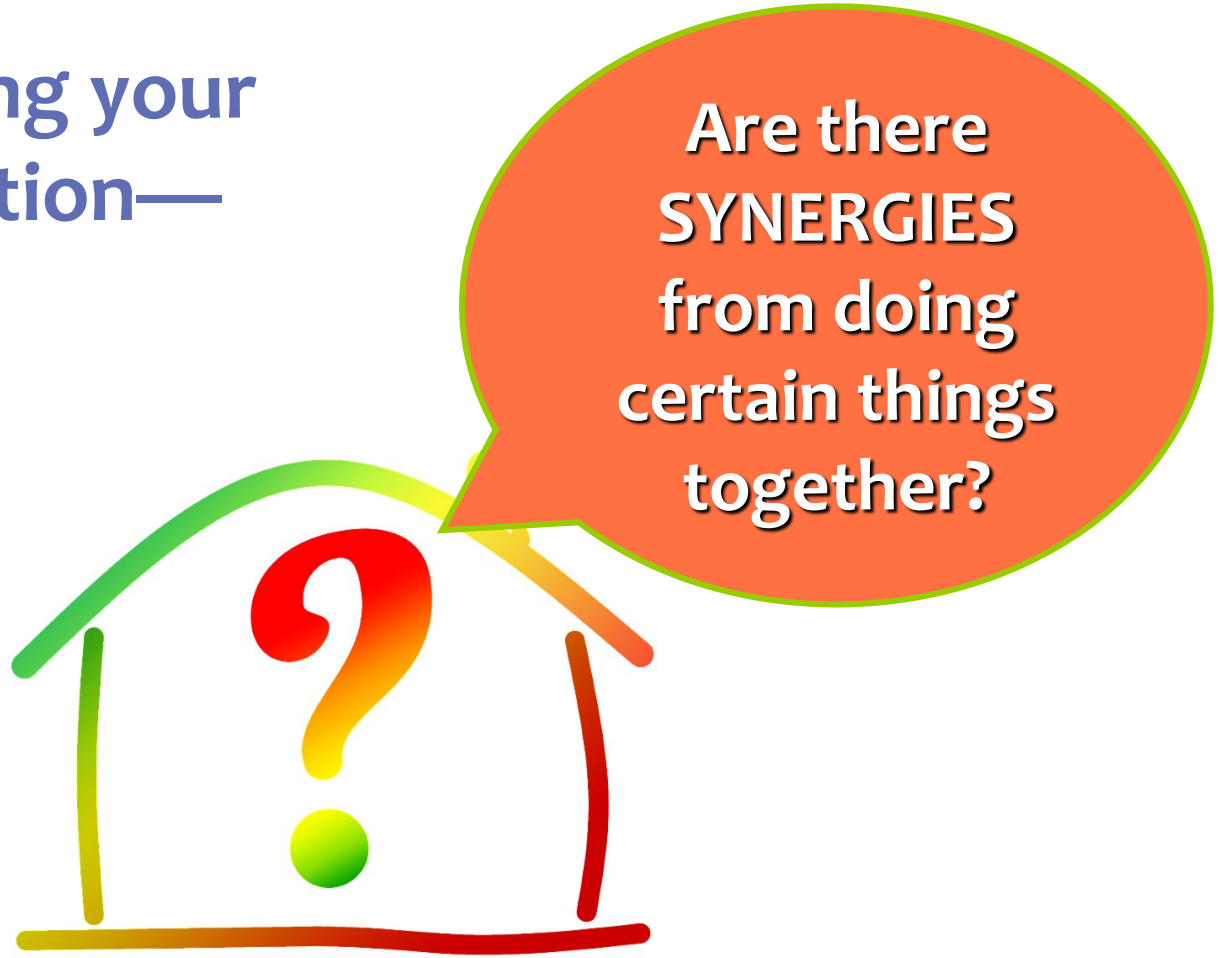


Image: Cowley's Pest Service

ELECTRIC

EQUIPMENT OPTIONS

Electric Space Heating (& *Cooling!*)

Standard heat pump

- Larger loads
  - For larger and/or less efficient homes

Mini-split heat pump

- Smaller loads
  - For efficient homes & small spaces
  - In existing homes, likely to require efficiency improvements

For example, accessory dwelling units (ADUs)

Mini-splits: Ductless or Ducted

Electric Water Heating

Heat pump water heater

- Most efficient
- Depending on location, noise may be an issue
- Needs AIR FLOW
  - Installation needs highly dependent on specific model
  - Typically, at least 700-800 cubic feet

RESOURCE:

City of Berkeley heat pump water heater page

Tankless water heater

- Less efficient
- Compact

  - Largest is roughly 18” wide x 22” high x 4” deep
- Requires lots of JUICE: ~40 amps for each gallon per minute of flow

Electric Ranges & Cooktops

Induction

- Heats by ***magnetism***
- Most former gas cooks enthusiastic after converting
  - Ignition of nearby objects unlikely—heat limited to area under cookware
  - Highly responsive—can increase or decrease heat very quickly

Conventional

- Heats by ***conduction***
- Most cooks dislike after cooking with gas
  - Increased ignition hazard—area around burner heats up, stays hot longer
  - Less responsive—slow to correct if temperature is too high or too low

Generalized...

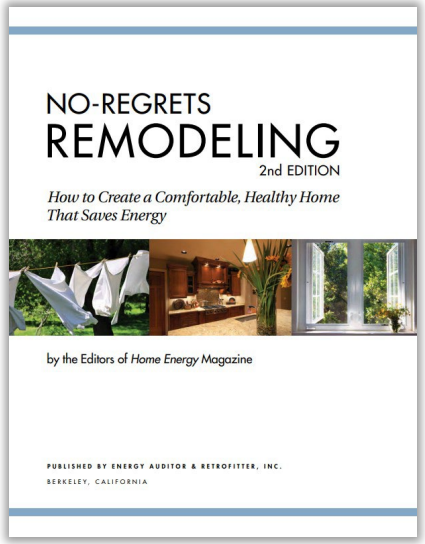
Electric Clothes Dryers

Characteristics	CONVENTIONAL	CONDENSING	HEAT PUMP
Cost	Least	Mid	Most
Efficiency	Least	Mid	Most
Heat (fabric wear)	Hottest	Less hot	Least hot
Venting/ humidity	Needs vent + most humidity	No vent; requires drain or emptying	No vent; no humidity
Sound		Quietest	
Dry time	Least	Mid	Most
Capacity	Most	Least	Mid
Washer combo?	No	Available	No

OTHER INCENTIVES & RESOURCES

Free Resources for a Deeper Dive

Each of these has links to many others!



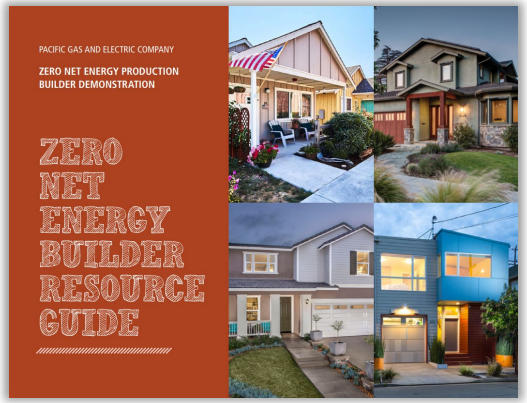
No-Regrets Remodeling
Download here

The 3C-REN Home Energy Savings
Incentives & contractors here

All-Electric Home Retrofit Guide
Download here

ZNE Primer for Architects
Download here

The Switch Is On
Incentives & contractors here



ZNE Builder Resource Guide
Download here

Thank you!

AnnEdminster.com

- Zero energy consulting
- Design team facilitation
- Writing, research, advocacy

ann@annedminster.com

Closing

Sign up to connect to a 3C-REN participating contractor for incentives:

www.3c-ren.org/for-residents

Coming to your inbox soon:

Slides & Recording

Thank you!

For more info:
3c-ren.org

For questions:
info@3c-ren.org

3C REN

TRI-COUNTY REGIONAL ENERGY NETWORK

SAN LUIS OBISPO • SANTA BARBARA • VENTURA