Decarbonizing is *Electrifying!*

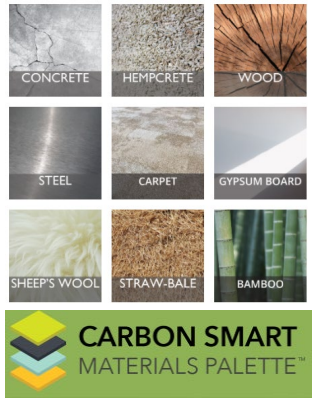
The IMPERATIVE to Decarbonize

We need to phase out "natural" gas (methane) & propane.

- Methane's 20-year global warming potential is **84 times that of CO_2**
- Leaking lines make gas **as polluting as coal**
- Leaks cause lethal explosions & keep fires burning after structures are gone
- Gas appliance risks include:
  - indoor air pollution
  - asthma and other respiratory problems
  - burn injuries

Ingredients of Zero Emissions Homes

1 Low-carbon materials

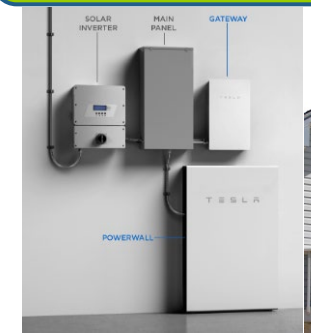


2 Efficiency improvements

3 Electric heating & water heataing

4 Electric appliances

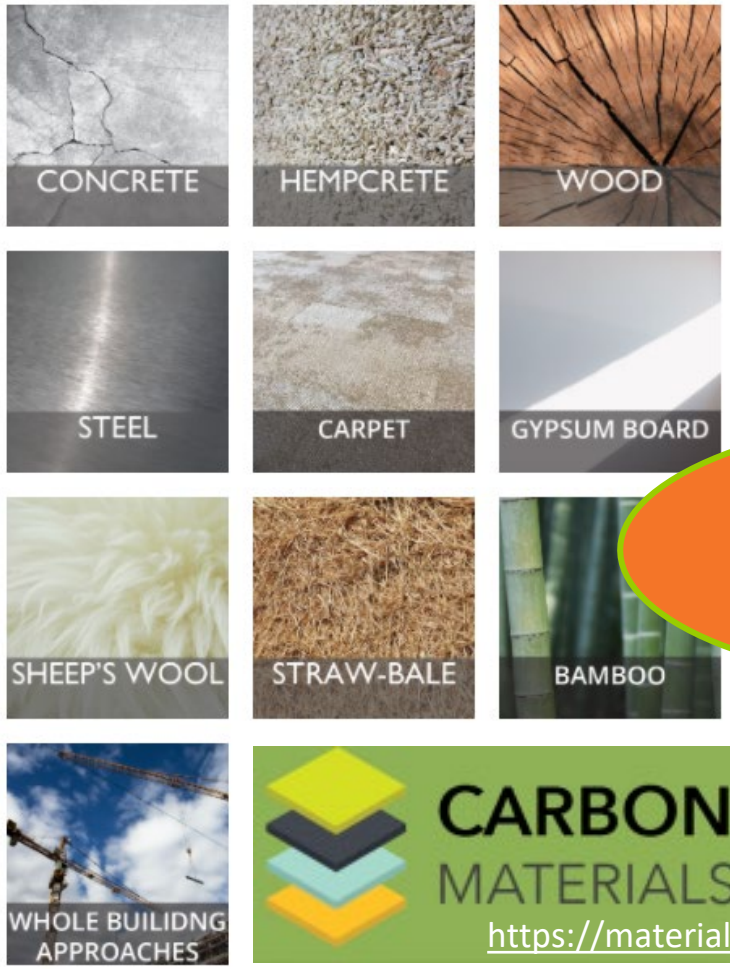
5 Resiliency features



6 Renewable energy

1

Low-carbon Materials



https://materialspalette.org/

CARBON SMART MATERIALS PALETTE™
https://materialspalette.org/

It matters what you **BUILD & REMODEL** with —

Products & materials that are:

- Low in embodied carbon
  - Structural & finish materials
  - Wood, natural fibers, clay, earth-based, etc.
- Locally produced whenever possible
- Non-toxic
  - Flame retardant-free bedding & upholstery

2

Efficiency Improvements

TOP TARGETS:

- Lighting
- Windows
- Air sealing
- Insulation

ESPECIALLY IF YOU'RE PLANNING ANY ARCHITECTURAL CHANGES!

3

Electric Heating & Water Heating

- **Replace aging gas equipment**
  - Heat pump water heaters
  - Heat pumps for space heating & cooling
- **Test & improve distribution systems**
  - Ducts
  - Piping

If you only have heating now, get COOLING, too—with one piece of equipment!

4

Electric Appliances

INDUCTION COOKING:

Magnetic technology

- Requires steel/ iron-based cookware
- There's a learning curve – heats much faster!

INDUCTION

- Cleaner
- Safer
- Healthier
- Better control
- Cooler

All electric (or gas) dryers look pretty much the same

DRYERS:

Standard electric

- Faster drying time
- $350 - $1,900

Heat pump

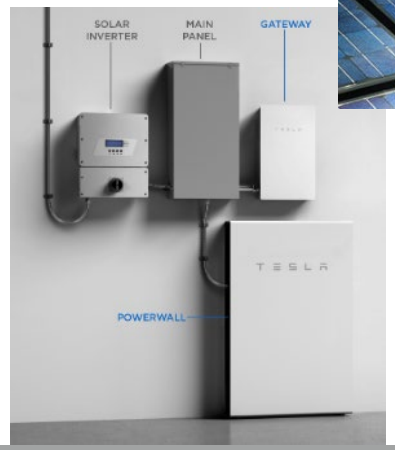
- *Much* longer drying time
- Lower heat, gentler on clothes
- No venting needed
- Use ½ the energy
- $1,100 - $1,900

5

Resiliency Features

POWER OUTAGES

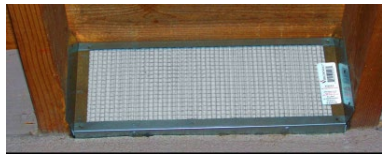
- High-quality thermal enclosure for comfort & health
- Shading devices to protect against excessive heat gain
- Photovoltaics plus batteries for critical loads



RESOURCE: https://www.greenchange.net/actions/batteries/

WILDFIRES

- "WUI" vents
- External shutters
- Tempered windows
- Non-combustible siding & decking



NUMEROUS RESOURCES at Ibhs.org

Insurance Institute for Business & Home Safety®

6

Renewable Energy

INSTALL SOLAR ONSITE:

- Have a vendor estimate the size and cost of a photovoltaic (PV) system that will meet your annual demand

OR:

- Choose MCE " Deep Green Premium" 100% renewable energy plan

Get the federal tax credit—

- 26% in 2020
- 22% in 2021
- Expiring in 2022

RESOURCES:

- ❑ Energy Sage: using the federal tax credit for solar
- ❑ Energy Sage: using the federal tax credit for batteries

MAKE A PLAN

1.
2.
3.
4.
5.
6.
7.

1

Plan Ahead:
Make a list of *ALL* electric items

What's on your wish list?

New equipment?

+

Battery storage?

+

Electric vehicles?

Aquarium? Spa? Electric fireplace?

2

Plan Ahead:
Think About Timing

REPLACE EQUIPMENT BEFORE FAILURE:

- Determine age & life expectancies of appliances
- Establish replacement dates to avoid failures

Appliance	Average Life Expectancy	Replace After Years
Gas water heater	10	8
Gas furnace	15-20	12
Air conditioner	10-15	8-10
Gas range	15	12
Clothes dryer	13	12

2

Plan Ahead:
Think About Timing

ANALYZE BENEFITS OF DOING THINGS TOGETHER:

- While you have an electrician onsite, is it cheaper to have some changes made before you need them?
- If you get an EV at the same time as PVs, will gasoline savings offset some of your upgrade expenses?
- Will adding battery storage allow you to avoid paying peak electric rates in the late afternoons and evenings?
- While doing other remodeling, are there relatively inexpensive improvements you can make?

3

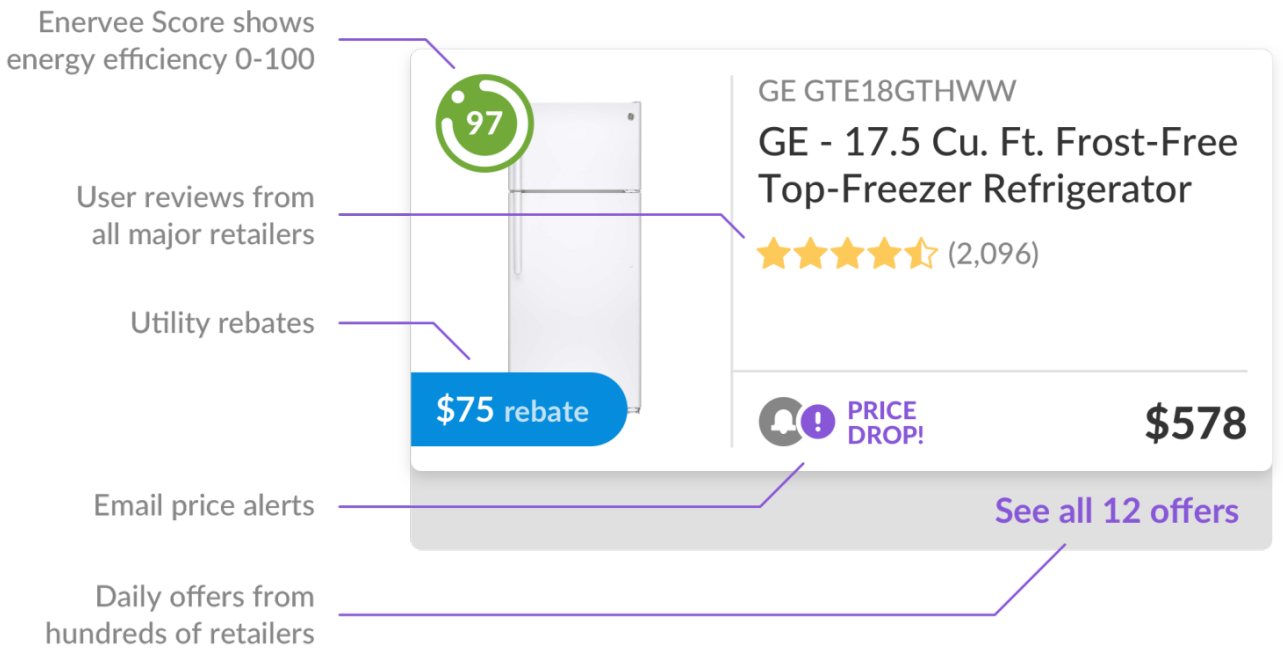
Reduce Demand:
Replace Dated Electric Devices

- **Select "best in class"**
  - Lighting
  - Appliances
  - Electronics

100% LEDs

Listings at:
- Energystar.gov/products/most_efficient
- Cee1.org
- Enervee.com

Most Efficient 2019 ENERGY STAR www.energystar.gov



RESOURCES:

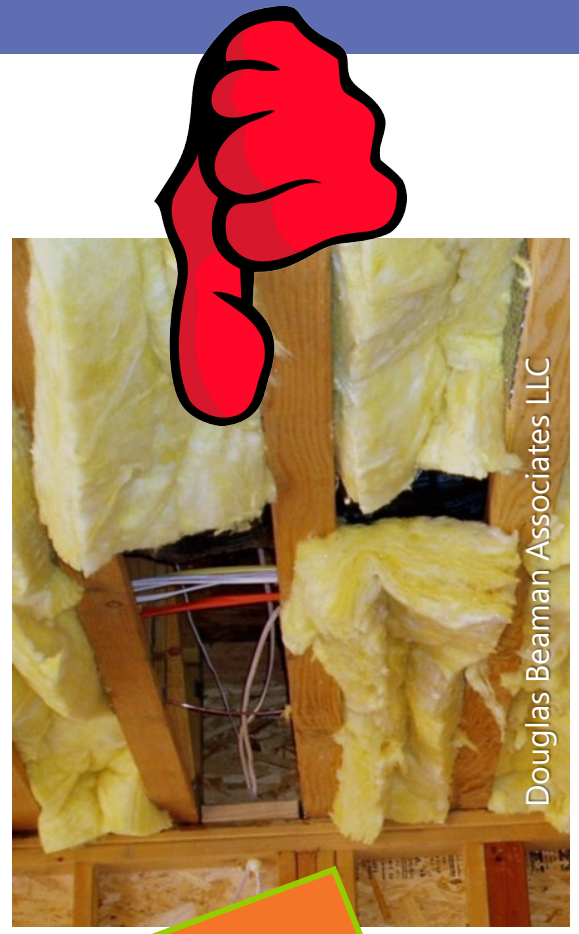
- ❑ Residential Lighting, California Lighting Technology Center, UC Davis
- ❑ Liberty Lighting Guidelines for Zero Net Energy Communities, California Lighting Technology Center, UC Davis

4

Reduce Demand:
Improve the Building Enclosure

EVALUATE & CONSIDER:

- **Air sealing attics, crawlspaces, other gaps**
- **Upgrading insulation**
  - Attics
  - Below floors
  - Walls (if feasible)



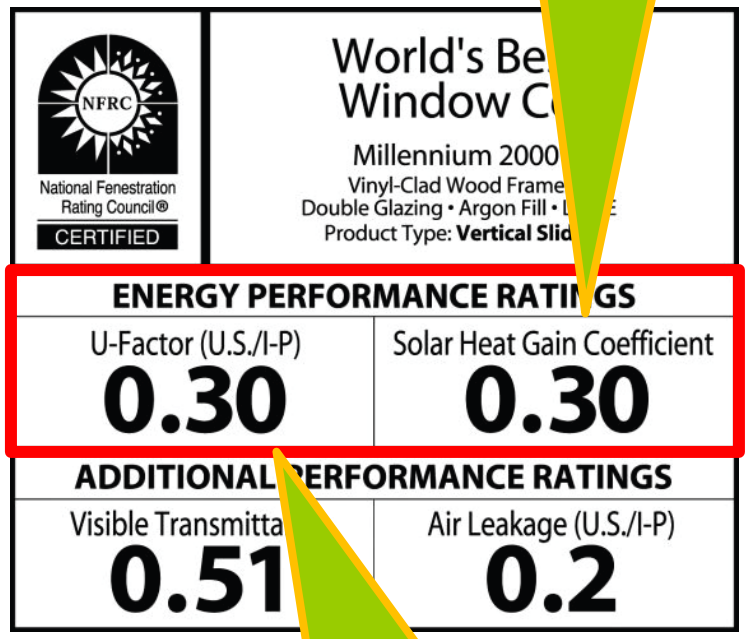
Poorly installed insulation is the NORM!

4

Reduce Demand:
Improve the Building Enclosure

EVALUATE & CONSIDER:

- **Replacing older windows to reduce heating need**
  - Single glazing, aluminum frames, leaky/drafty units
  - Select appropriate U & SHGC values
- **Adding shading devices to reduce cooling need**



SHGC ≤ 0.30 = less heat GAIN

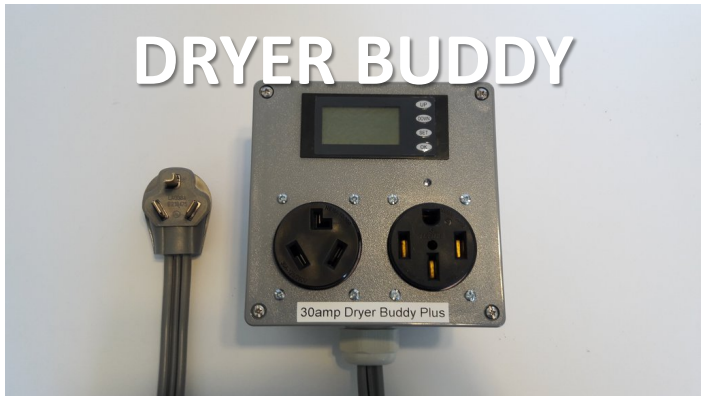
U-factor ≤ 0.30 = less heat LOSS

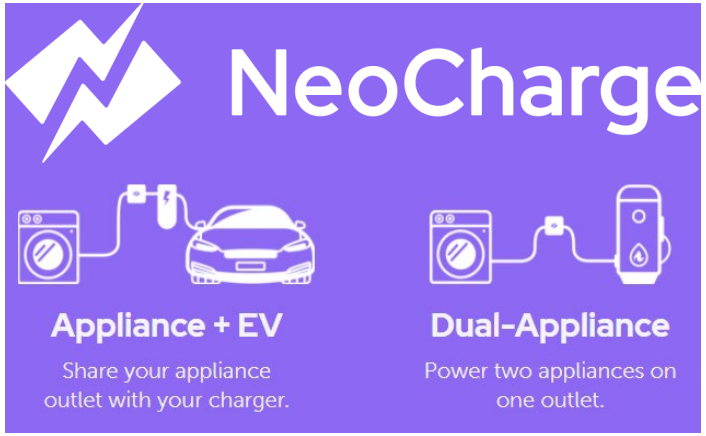
5

Check Electrical Capacity:
Upgrade Service Panel

- **Add enough capacity, circuits, and outlets for all eventual needs:**
  - Heat pump (heating/cooling)
  - Electric water heater
  - Electric dryer
  - Induction range
  - EV charger
  - Photovoltaics

- **AND/OR look for work-arounds to avoid a panel upgrade**





6

Improve & Electrify:
Upgrade Heating & Cooling Systems

Install new, high-efficiency ELECTRIC HEAT PUMP

PLUS:

- Make sure equipment is sized properly
- Test duct system and airflow and improve, if needed

Insist on getting an ACCA* calculation

*Air Conditioning Contractors of America

System-wide improvements can double performance, cut demand in half

7

Improve & Electrify:
Replace Water Heater

Install new, high-efficiency electric HEAT PUMP WATER HEATER

PLUS:

- If concerned about higher-than-normal demand, consider:
  - larger capacity
  - a resistance heat booster
- If hot water takes too long to arrive, consider an ON-DEMAND recirculation pump to speed it up and save water

HPWHs are 3x more efficient, but heat more slowly than traditional models

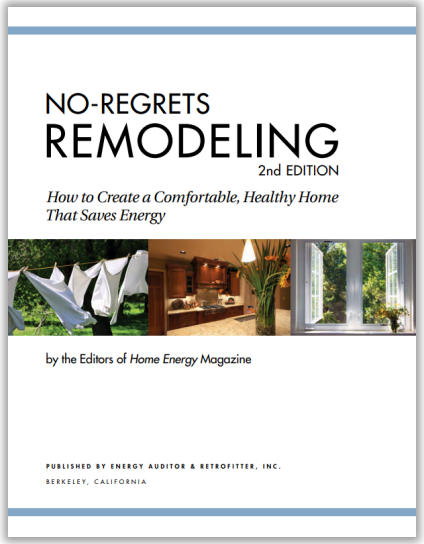
Benefits of Decarbonizing —

Going all-electric & solar-powered

- **Indoor air quality & health**
- **Fire safety & resiliency**
- **Avoided gas price increases**
  - Rates expected to nearly double by 2050
- **Resale value with solar +4%**
- **Equipment improvements**
  - Quiet
  - Efficient
  - Reliable

Cooling with heat pumps!

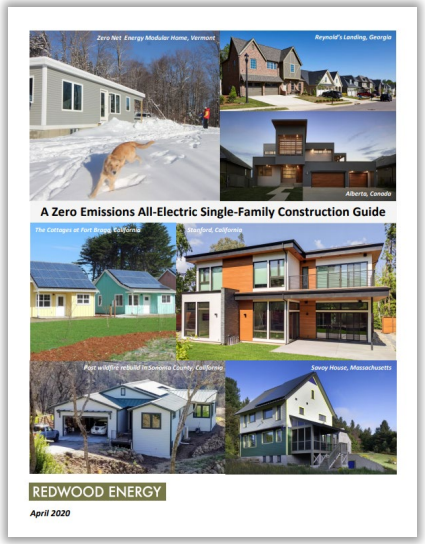
An all-electric home emits 40% less greenhouse gas than an equivalent home powered by natural gas, saving >1 ton of CO_2/year



No Regrets Remodeling

Download here

Thank you!



All-Electric New Home Guide

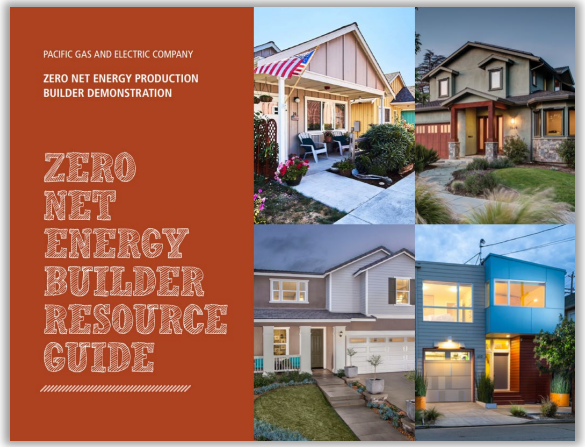
Download here

ZNE Primer for Architects

Download here

AnnEdminster.com

- Green building consulting
- Design team facilitation
- Writing, research, advocacy



ZNE Builder Resource Guide

Download here