

Energy Efficiency at PG&E

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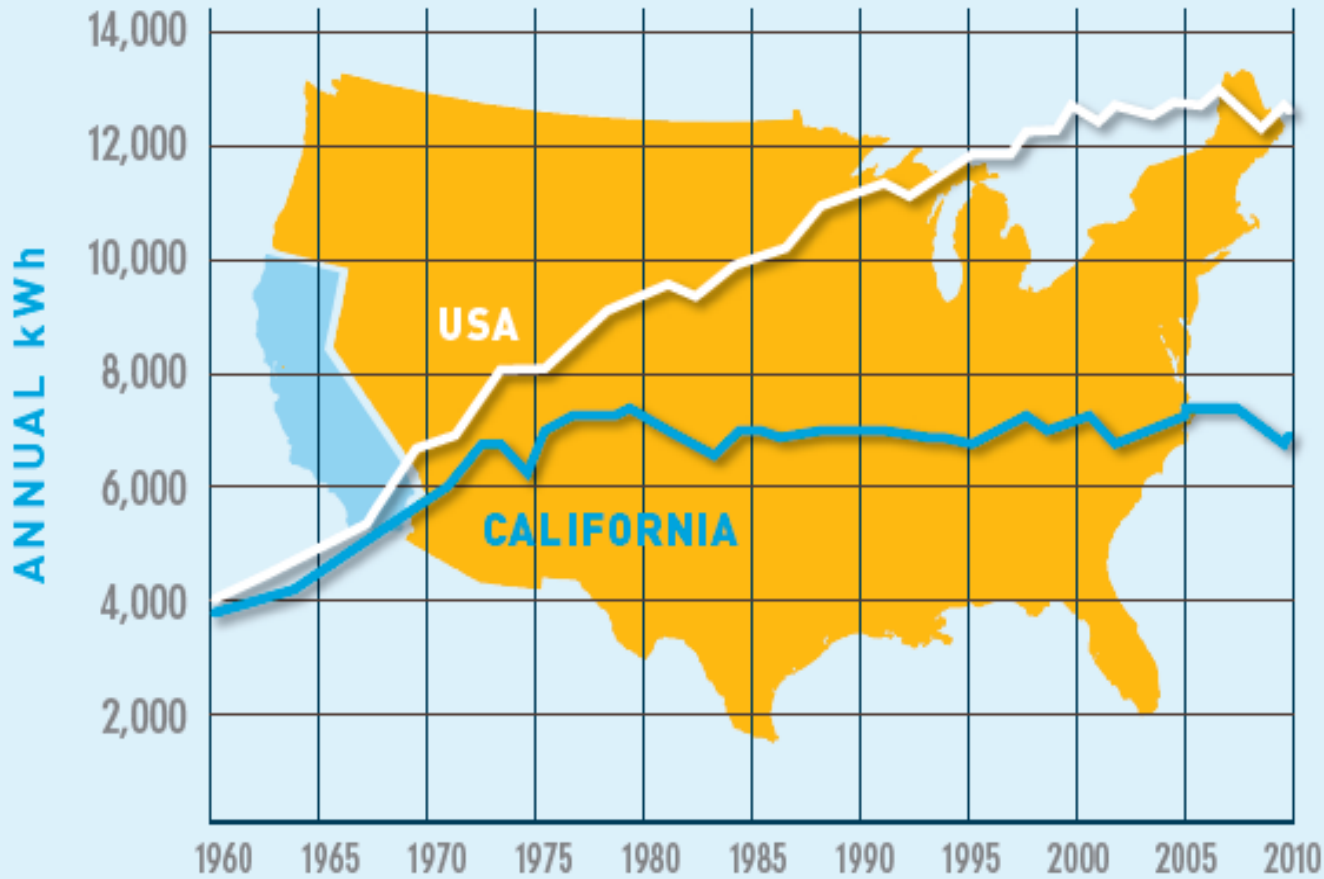
Program Manager



April 19, 2016



35+ Years of Energy Efficiency Success

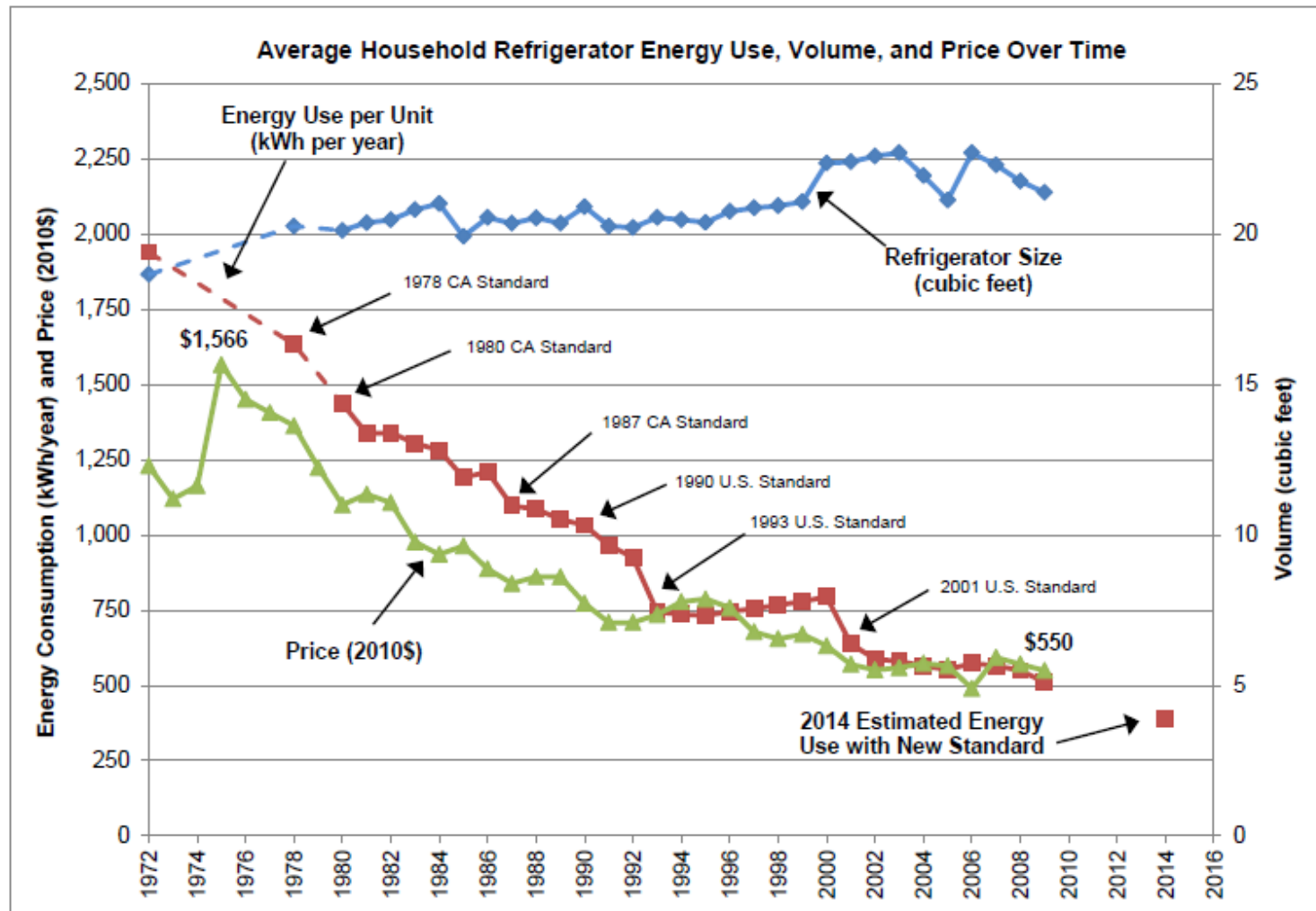


PER CAPITA
ELECTRICITY
CONSUMPTION:
UNITED STATES
vs. **CALIFORNIA**

(source: U.S.
Energy Information
Administration)



Refrigerator Market Transformation



Sources: Association of Home Appliance Manufacturers (AHAM) for energy consumption and volume; U.S. Census Bureau for price

- Notes:
- a. Data includes standard-size and compact refrigerators.
 - b. Energy consumption and volume reflect the DOE test procedure published in 2010.
 - c. Volume is adjusted volume, which is equal to the fresh food volume + 1.76 * freezer volume.
 - d. Prices represent the manufacturer selling price (e.g. excluding retailer markups) and reflect products manufactured in the U.S.



EE Policy

- 35+ years of energy efficiency
- Energy efficiency is first in the loading order
- Decoupling and shareholder incentive mechanism





EE Programs

- **Delivered to all customer segments via multiple channels and broad technology families**
 - **Residential**
 - **Commercial**
 - **Public**
 - **Industrial**
 - **Agricultural**
- **Points of Intervention:**
 - **Codes and Standards**
 - **Workforce Education and Training**
 - **Wholesale**
 - **Retail**
 - **Trade Pros**
 - **Customer**



Enabling the Future of EE

- Goal to double EE (SB350)
- Focus on opportunity in existing buildings (AB758 and AB802)
- Flexibility to support grid reliability (DRP/IDER)
- Incorporate newest technologies (AB793)





Changing Grid

Residential Rooftop PV



Electric Vehicles



Small Commercial PV



Distribution Level Energy Storage



Home Energy Storage



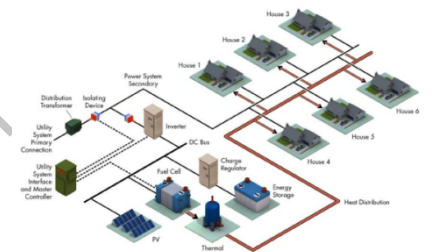
Community Energy Storage



Fuel Cells



Demand Response & Energy Efficiency



Microgrids

Zero is Here and Now!

PG&E's Production Builder Pilot

Peter Turnbull
Principal Product Manager





Today's Talk

Overview of PG&E's ZNE efforts

AB 32 from 2006—the starting point

- Air Resources Board—lead agency for AB 32
- CPUC and the Strategic Plan (2008, 2011, “all new residential construction by 2020”)
- CEC
 - Alignment of the Title 24 building code with ZNE
 - The IEPR (ZNE definition)

ZNE activities

- Large and significant C&S effort (state and federal)
- Assessment work: “Technical Feasibility” and marketplace analysis
- Prop 39 Pilot (retrofit schools to ZNE)
- Consultations with State of CA buildings
- Case studies (Vol 2 nearly ready)
- Architectural design competition (“Architecture at Zero”)
- Educational activities (classes, symposia)
- Alignment of “production programs” with ZNE



PG&E's Production Builder Program

Program Concept

- Support CA's 2020 goals: “All residential new construction to be ZNE by 2020”
- Anticipate and support code changes
- Assist builders with a prototype house

Our ZNE Mantra

- **Target** to a specific footprint (*before* the PV)
- **Design** to that footprint
- **Build** to the design (no “de” value engineering)
- **Monitor, Diagnose, Correct**



Program Model

Work with a single representative home in a new housing development

- Design development—modeling and analysis to help the builder select the best options to reduce the footprint
- Construction inspection
- Equipment and system “buy down”—coverage of incremental cost
- Performance monitoring at the system level – one year of occupancy



Pulte Home Corporation

Brentwood, CA (CZ 12)

2,344 sf

4 bedrooms



March 9, 2016

Photo: Can Anbarlilar, PG&E



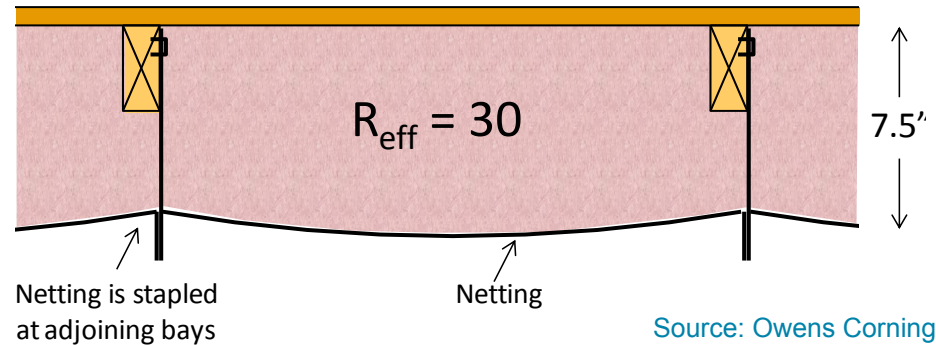
Pulte – Measure Packages

	Standard Package	ZNE Package
Walls	R-15 fiberglass 2x4, 16" oc R-5 XPS	R-15 fiberglass 2x4, 16" oc R-5 XPS
Roof	R-30 fiberglass on ceiling vented attic radiant barrier	R-38 fiberglass under roof deck unvented attic no radiant barrier
Floors	slab	slab
Glazing	0.32 U 0.25 SHGC 15% WWR	0.32 U 0.25 SHGC 15% WWR
Air leakage	5 ACH50	4 ACH50 (3.5 ACH50 goal)
Ventilation	Exhaust	Supply, 80W
Heating & cooling	SEER 16 AC - 4T 80% AFUE gas furnace	19 SEER ASHP - 3T 9.2 HSPF ASHP
Ducts	R-8, 7.5% leakage	in conditioned space
Water heating	gas tank 0.62 EF	tankless gas condensing 0.96 EF
DHW distribution	uninsulated copper	R-2 PEX
Lighting	100% CFL	100% LED
Appliances	standard appliances gas cooking gas dryer	EnergyStar electric induction cooking gas dryer
PV		4.62 kW



Pulte – Ducts in Conditioned Space

Boxed netting holding blown fiberglass under the roof deck (Owens Corning)



Source: Owens Corning





Blu Homes

Loomis, CA (CZ 12)

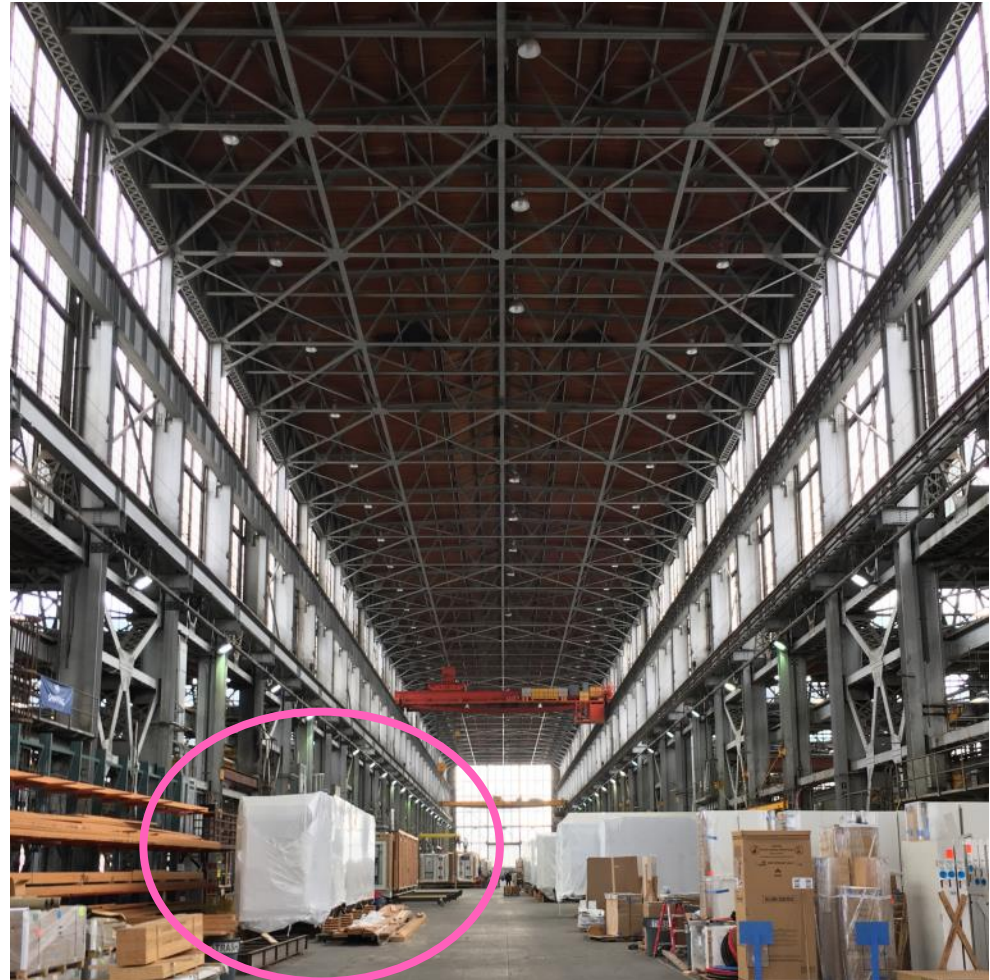
1,869 sf

3 bedrooms



Same model

Photo: bluhomes.com



November 23, 2015

Photo: Can Anbarilar, PG&E



Blu Homes – Measure Packages

	Title 24 2013 – CZ 12	ZNE Package
Walls	R-15 fiberglass 2x4, 16" oc R-5 XPS	R-19 fiberglass 2x6, 24" oc R-5 polyiso
Roof	R-38 vented radiant barrier	R-38 SIPs unvented no radiant barrier
Floors	R-19 fiberglass	R-25 fiberglass 2x8, 16" oc R-5 polyiso around hinges vented
Glazing	0.32 U, 0.25 SHGC 23% WWR	0.31 U, 0.22 SHGC 23% WWR
Air leakage	4.9 ACH50	3.6 ACH50
Ventilation	Exhaust	Exhaust
Heating & cooling	14 SEER 80% AFUE furnace	50 gal, 2.9 COP HPWH for radiant floor heating 16 SEER, 8.5 HSPF 2-speed heat pump for cooling, backup heating
Ducts	R-6, 5% leakage	in semi-conditioned crawlspace
Water heating	50 gal, 0.62 EF gas	50 gal, 2.9 COP HPWH
DHW distribution	R-2 copper	R-2 PEX
Lighting	100% CFL	100% LED
Appliances	all electric	EnergyStar, all electric
Other		Home Energy Management System
PV		4.75 kW



Blu Homes – Floor R-value

Floors have hinges and fold up to transport the house to the site.



November 23, 2015

Photo: Anna LaRue, Resource Refocus LLC

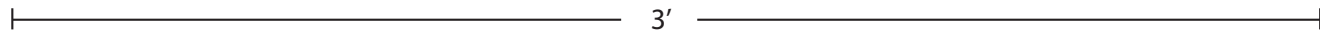
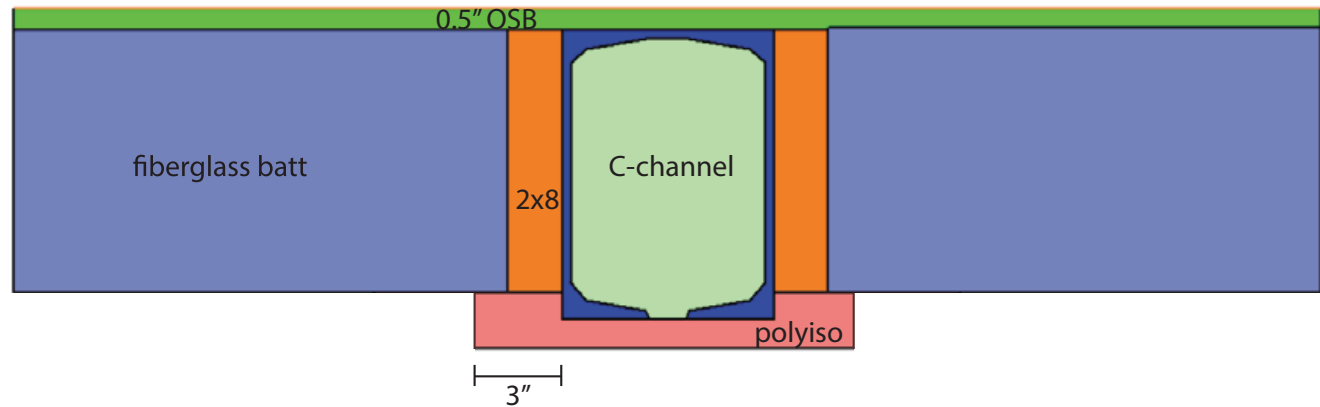
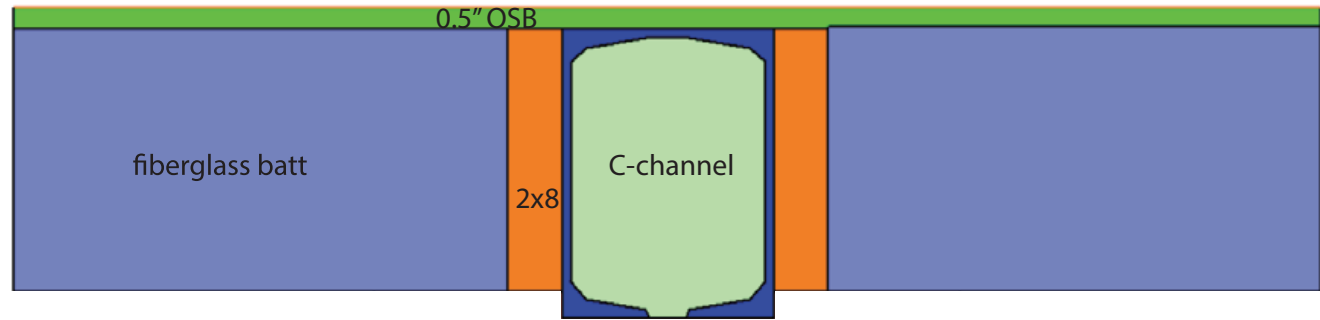


Blu Homes – Floor R-value

No hinge:
R-25

Uninsulated hinge:
R-16

Insulated hinge:
R-23





Habitat for Humanity, San Joaquin County

Stockton, CA (CZ 12)

1,229 sf

3 bedrooms



February 2, 2016

Photo: Anna LaRue, Resource Refocus LLC



Photo: Can Anbarilar, PG&E

February 27, 2016
“Welcome Home”
Ceremony



SJC Habitat – Measure Packages

	Standard Package	ZNE Package
Walls	R-21 denim 2x6, 24" oc, 0.13 framing factor R-5 XPS	R-21 denim 2x6, 24" oc, 0.13 framing factor R-5 XPS
Roof	R-42 cellulose vented radiant barrier	R-42 cellulose vented radiant barrier
Floor	R-21 fiberglass	R-21 fiberglass, reduced ventilation (under floor)
Glazing	0.27 U, 0.24 SHGC 10% WWR	0.27 U, 0.24 SHGC 10% WWR
Air leakage	1.8 ACH50	1 ACH50
Ventilation	Balanced, ERV	Balanced, ERV
Heating & cooling	minisplit heat pump 15.3 SEER, 14.3 HSPF	minisplit heat pump with offswitch 15.3 SEER, 14.3 HSPF
Ducts	in conditioned space	in conditioned space
Water heating	tankless gas 0.82 EF	tankless gas 0.82 EF located inside
DHW distribution	R-2 copper low flow fixtures, short pipe runs	R-2 copper low flow fixtures
Lighting	100% LED	100% LED
Appliances	EnergyStar fridge, electric stove; dishwasher, laundry not provided - modeled as inefficient electric	EnergyStar fridge, electric stove dishwasher, laundry not provided - modeled as inefficient electric
PV		4.3 kW



SJC Habitat – Saving Money and Improving Efficiency

- **Group hot water draws together—material and labor savings**
 - Save on piping
 - Shorter wait times for hot water
 - Save water and energy for heating water (2 cups and it's hot)
- **Lumber savings— *half the lumber!***
 - 24" oc
 - Fit windows in framing module
 - 0.13 framing factor, compared to 0.25 standard
- **HVAC capital cost savings**
 - Downsized heat pump from 3T to 3/4T
 - Positioning of equipment and grills reduced ducts from 250' to 200'

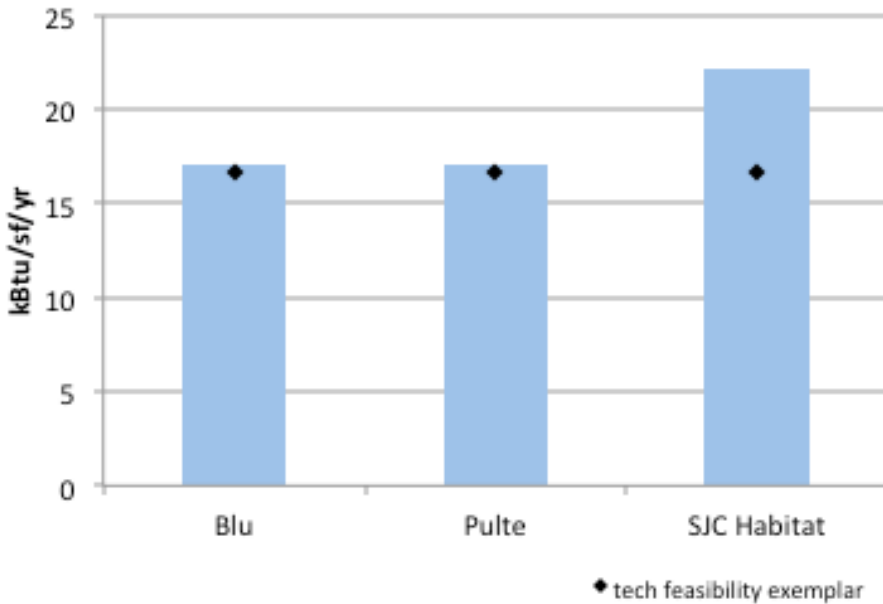


Photo: Rick Chitwood, Chitwood Energy

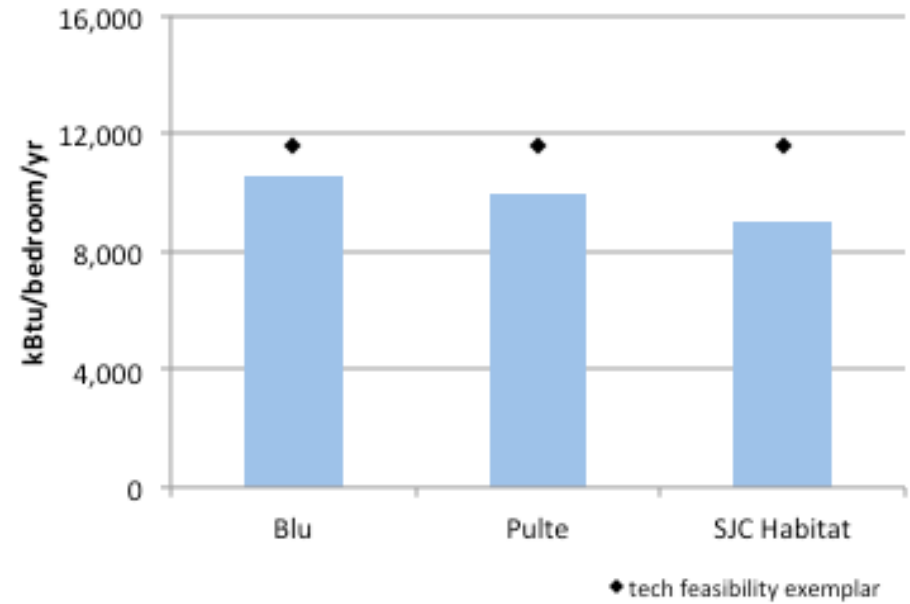


Modeled Performance

Modeled Energy per Floor Area



Modeled Energy per Bedroom



	Floor Area (sf)	Bedrooms	City	CA Climate Zone
Blu	1,869	3	Loomis	12
Pulte	2,344	4	Brentwood	12
SJC Habitat	1,229	3	Stockton	12



Project Team

PG&E

- Peter Turnbull
- Conrad Asper
- Can Anbarlilar

Resource Refocus, LLC - Demonstration Development, Oversight, Coordination, and Energy Modeling

BIRAenergy - Design & Technical Assistance, Energy Modeling

Design AVEnues - Design & Technical Assistance

Davis Energy Group - Performance Monitoring

PG&E Programs for Residential Customers

Sabrina Lawrence-Gomez
Program Manager, Residential Energy Efficiency





Home Energy Check-Up

Answer basic questions about your home and habits- the results will show you how much of your household's energy goes to heating, hot water, appliances, lighting and other uses.

The image shows the login page for PG&E My Energy. It features a blue header with the PG&E logo and the text "My Energy". Below this is a white login box with the heading "Login". Inside the box, there is a prompt: "Please enter your user name and password to sign in." followed by two input fields: "User Name:" and "Password:". Below the fields are links for "Forgot user name or password?" and "New user? Register here.". A yellow "Login" button is positioned at the bottom right of the login box.

The image shows the "Home Energy Checkup" page on the PG&E My Energy website. The page has an orange header with the PG&E logo, the text "My Energy", and a user login status "Logged in as jpanchana | Contact Us | Logout". Below the header is a navigation menu with tabs: "Overview", "Pay & Manage", "My Usage", "Ways to Save", and "Community". Underneath, there are sub-tabs: "My Plan to Save", "Ideas & Advice", and "Home Energy Checkup". The main content area is titled "Home Energy Checkup" and includes a pie chart with the instruction "Click a section for more information." To the right of the pie chart is a section titled "Top 5 tips for your home" with a list of energy-saving tips, each with a small image, a title, a number of people who have done it, and three buttons: "I'll do it", "Already do it", and "No thanks".

Tip	Number of people who do this
Install efficient showerheads	37,062
Use and switch off power strips	28,369
Improve your home's insulation	22,236
Program your thermostat	38,961



Program Eligibility

PG&E customer of commodity

Work with a participating contractor

Product and its installation meet specifications

Energy Upgrade California

1. Furnace

A heating system should be replaced once every 10 to 20 years, depending on the model and how well it has been maintained.

5. Duct Sealing, Insulation and Replacement

Ducts carry air from cooling and heating systems to each room of the home. Twenty percent of heated or cooled air can be lost in poorly sealed ducts before reaching the vents.

2. Attic Insulation and Air Sealing

Reduce cold drafts in the winter and keep hot air out in the summer.

3. Windows

Reduce summer heat gain and winter heat loss with energy-efficient windows.

4. Hot-Water Heater

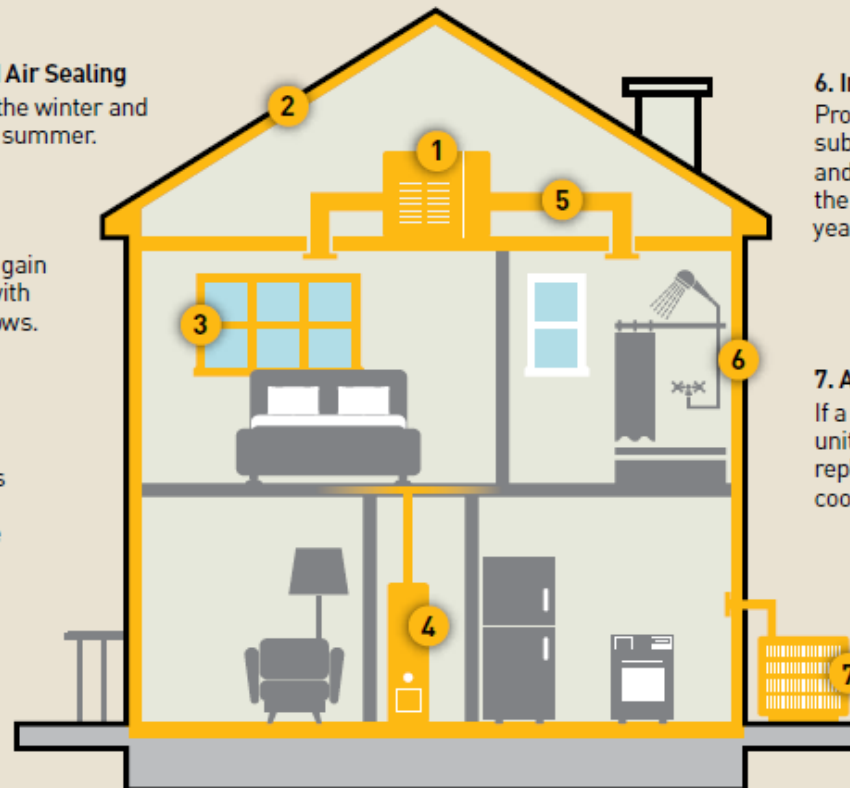
Replace water heaters older than 11 years for more cost effective water heating.

6. Insulation

Proper insulation can substantially reduce heating and cooling bills and keep the home comfortable all year around.

7. Air Conditioning

If a central air-conditioning unit is more than 12 years old, replacing it can help to reduce cooling costs.





Energy Upgrade California

Home Upgrade	Advanced Home Upgrade
Up to \$3,000 rebates	Up to \$6,500* in incentives
Single family detached home	+ 2-4 unit residence Additional custom measures: lighting, cool roof, pool pump, radiant barrier and more!
Average project cost \$10,000	Average project cost \$17,000
Average site savings 10%	Average site savings 20%
Property Owner or Renter	Property Owner or Renter

*customers may also be eligible for rebates exceeding \$6,500 based on their calculated energy savings.



Financing Options

Home Improvement Loan or Equity Line of Credit through your bank

PACE Financing

- Secured financing via property taxes

Golden State Financing

- Unsecured financing
- Up to \$50,000 for 15 years at 6.5% fixed *based on credit score

PowerSaver Loan

- Up to \$25,000 for 20 years



AC Quality Care

Rebates of up to \$625 for the following services and qualifying product purchases:

- Full ACCA Standard 4 HVAC System Assessment,
- Refrigerant Charge Adjustment
- Efficient Fan Delay Rebate
- Replacement Blower Motor Rebate
- One-Year Quality Maintenance Agreement Rebate



Smart AC

We'll install a free SmartAC device on your air conditioner and give you \$50 for participating.

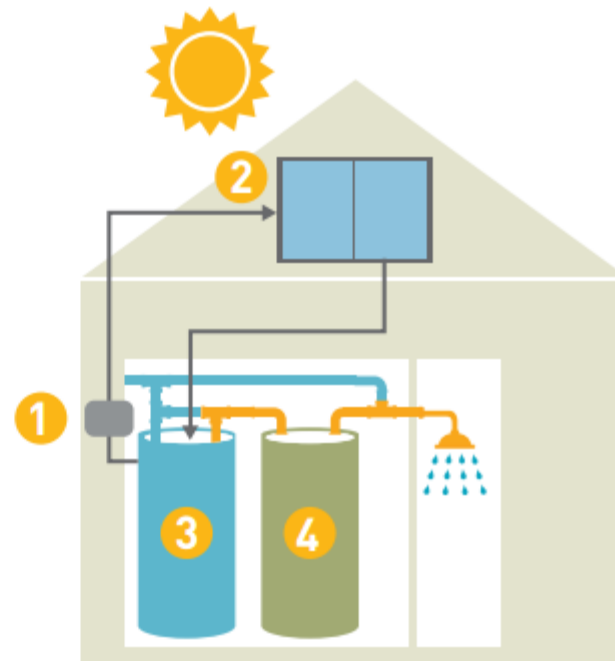
- If there is an energy shortage between May 1 and October 31, PG&E will signal your SmartAC device to run your AC at a lower capacity.

Solar Water Heating

Cut your water heating bill by as much as 80 percent
Rebates of up to \$4,366

How does it work?

1. A pump circulates a heat transfer liquid from the tank to the roof.
2. Solar collectors absorb the sun's thermal energy and heat the transfer liquid.
3. The transfer liquid enters a heat exchanger, warming the water in the storage tank.
4. Hot water flows to your existing water heater, which provides backup heating when needed.





E-Rebates

Energy Star Most Efficient 2016 Clothes Washer - \$50

**Energy Star High-Efficiency Gas Storage Water Heater
- \$200**

Energy Star Electric Heat Pump Water Heater- \$500


Variable Speed Pool Pump- \$100

Pool Pump Motor- \$100



Solar Choice Rate

Purchase up to 100 percent of your electricity from solar power, without needing to install solar panels.

TYPE OF SERVICE	MONTHLY USAGE	COSTS
<p>Choose type of service:</p> <p><input checked="" type="radio"/> Residential</p> <p><input type="radio"/> Commercial</p> <p>Usage Level:</p> <p><input type="radio"/> 50% <input checked="" type="radio"/> 100%</p>	<p><input type="text" value="500"/> kWh </p> <p><i>Estimated Residential Usage:</i> 500 kWh average, 300 kWh low, 700 kWh high</p> <p>Get Results</p>	<p>Estimated additional monthly cost:</p> <p>\$17.91</p> <p>Estimated premium:</p> <p>3.58 Cents/kWh</p>

Equivalencies that are presented are based on annual values. They are estimates and are not actual values.



PG&E Energy Advisor

Your source for information to help you manage your energy usage and bills. Each month, we will cover a range of topics, from money-saving rebates to safety tips – and more



MONEY SAVING TIPS

Wash full loads in your clothes washer.
You'll save energy and water.

Check your HVAC system filter.
A dirty filter makes the system work harder and use more energy.

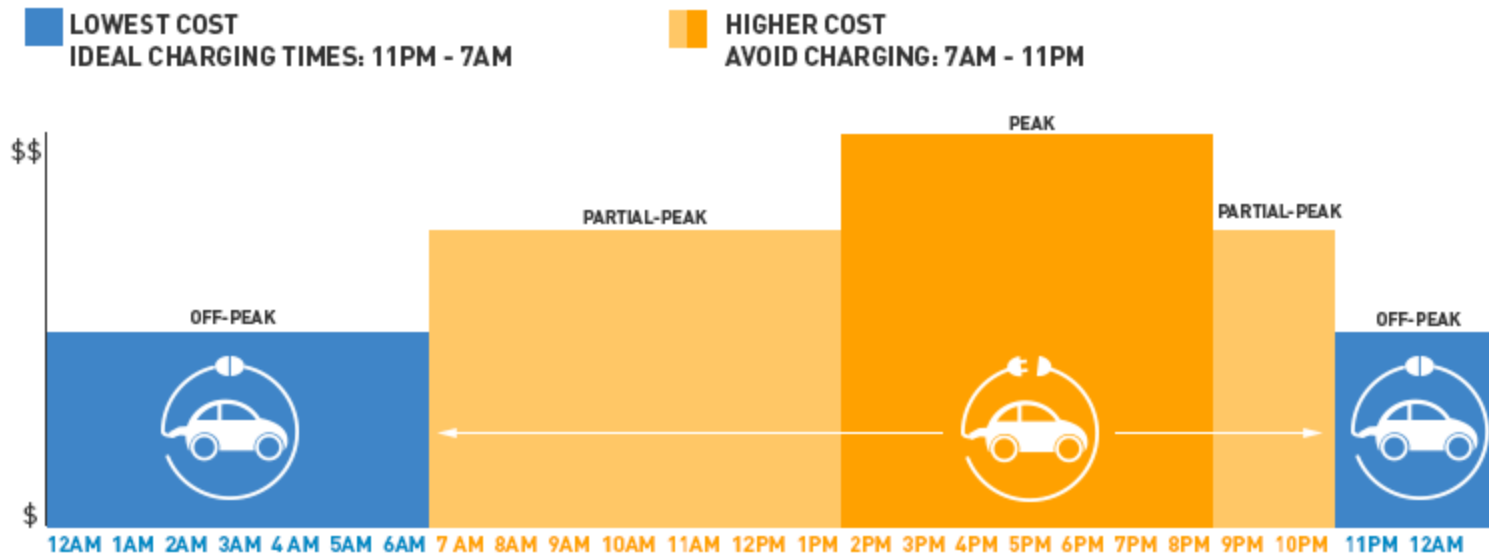
Close the blinds and drapes during the day.
That blocks the sun's heat from your home.

Want more tips? Get them [here](#).



Plug-in Electric Vehicles

Whether you already drive an EV or are thinking about buying one, you'll find information and resources here that will help you make decisions, save money and simplify your life.





Assistance Programs

California Alternate Rates for Energy (CARE) and Family Electric Rate Assistance (FERA) > offer income-qualified customers a discount on their monthly bill.

Energy Saving Assistance > Provides income-qualified renters and homeowners with free home improvements to save energy and reduce monthly bills.

Medical Baseline Allowance > Provides additional energy at the lowest (baseline) price for customers requiring life-support equipment or special heating or cooling needs due to a medical condition.

Relief for Energy Assistance through Community Help (REACH) provides one-time bill assistance to customers who have experienced unforeseen hardship.



Want to learn more?

- [Energy Upgrade California](#)
- [AC Quality Care](#)
- [Smart AC](#)
- [Solar Water Heating](#)
- [E-Rebates](#)
- [Solar Choice Rate](#)
- [PG&E Energy Advisor](#)
- [Assistance Programs](#)



Contact Us

Call:
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Thank You

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