wednesday, december 5

thedailygreen

the consumer's guide to the green revolution

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news

10.19.2007 12:00 am

California Aims for Zero Energy Homes

All New Homes Built After 2020 Would Make as Much Energy as they Use

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By Dan Shapley

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California energy regulators adopted an ambitious first-of-its kind rule yesterday, making it a goal that all new homes built after 2020 produce as much energy as they consume, according to the Los Angeles Times.

With so-called "distributed energy" technology includes

related articles

- Solar-Powered Homes Outselling Weak Market
- McCain's energy policy speech
- 2008 Candidates: The Greenest and the Leanest
- Tankless Water Heater
- Fuel Rationing, Chemtrails and Bush-Cheney Oil Men: IPCC Ex-Chair Speaks Out
- Passive Solar Heating/Cooling

Builder

Michelle Kaufm

Green solutions prepack

Source: BUILDER Online News
Publication date: September 1

By Nigel F. Maynard

Noted California architect M
set to reveal a new entry in h
prefabricated houses, only th
budget analyst at the
International Monetary Fu
Ages ago, when offices st
used mimeograph machines, he
pushed for copiers. He brought
in the first word processors. He
won some battles but lost many
more

said. "For years now, John Wesley Miller and his company

odes and Standards Committee, was honored with NAHB's

Marketplace

< Back

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2002)

gy home - a home that

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an of the US DOE. "Solar
bined with off-the-shelf
s, solar energy can make
ly priced."

to a

n energy-saving

oved

Digg This

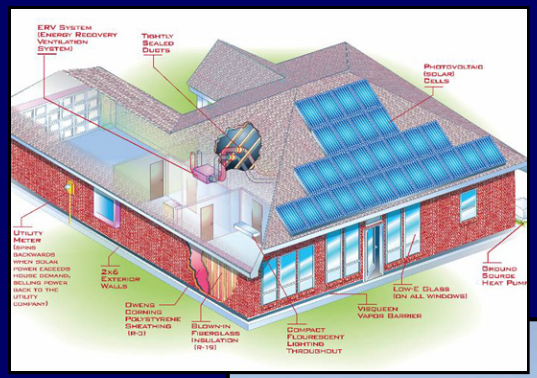
Homes initiative

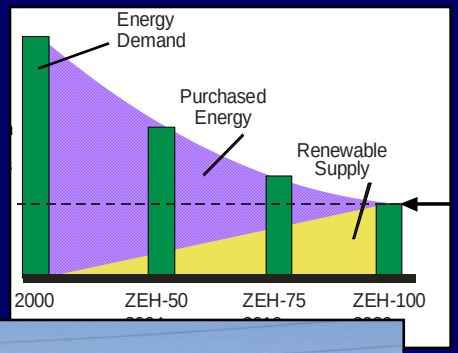
ew single-family home

omes built in Austin this year

Hanley Homebuilders is building the showcase home to help demonstrate the variety of "Green" building practices and materials that

Zero Energy Homes: What, Why, and How?





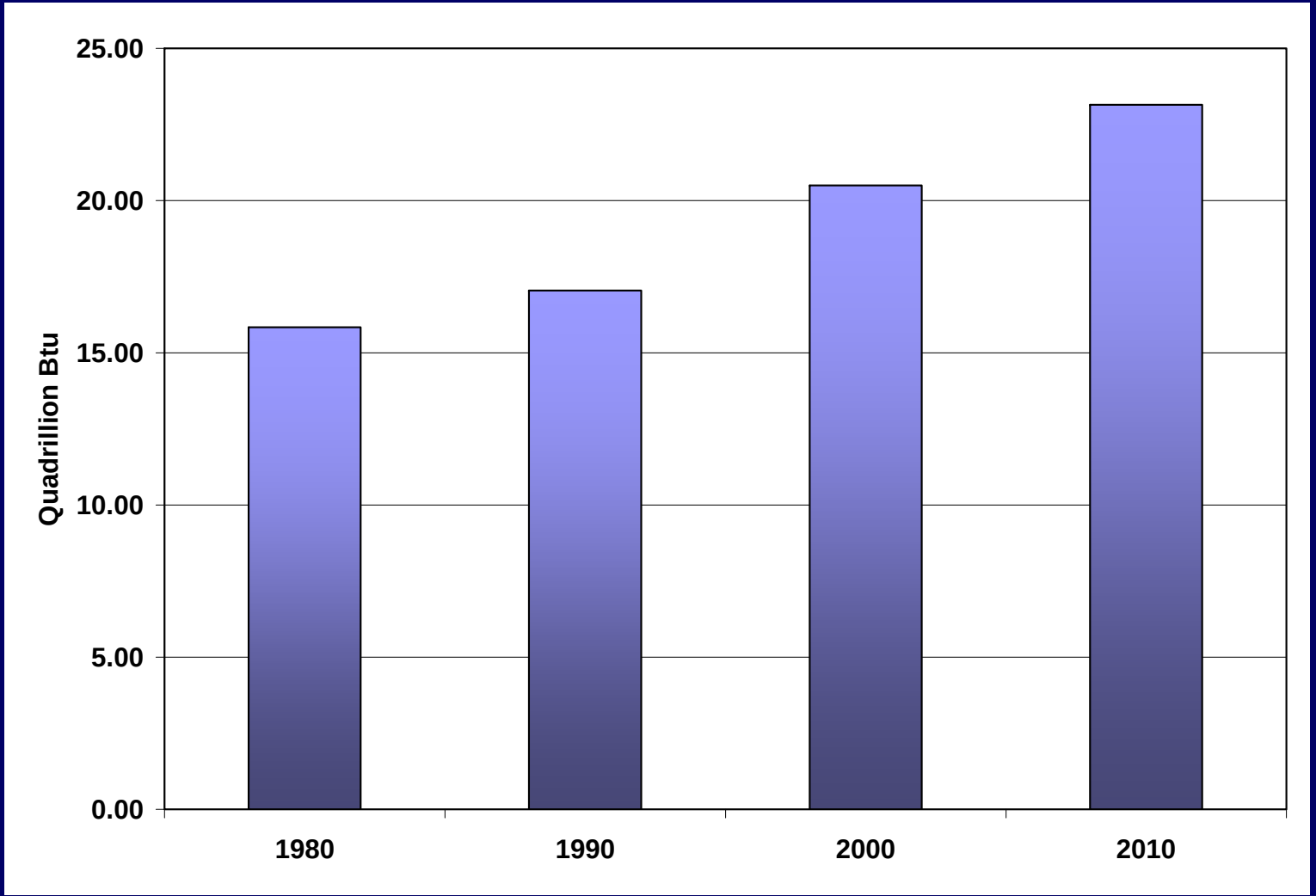
Paul Norton
Center for Buildings and Thermal System

Why?

Homes account for **20%** of **all** US primary energy use

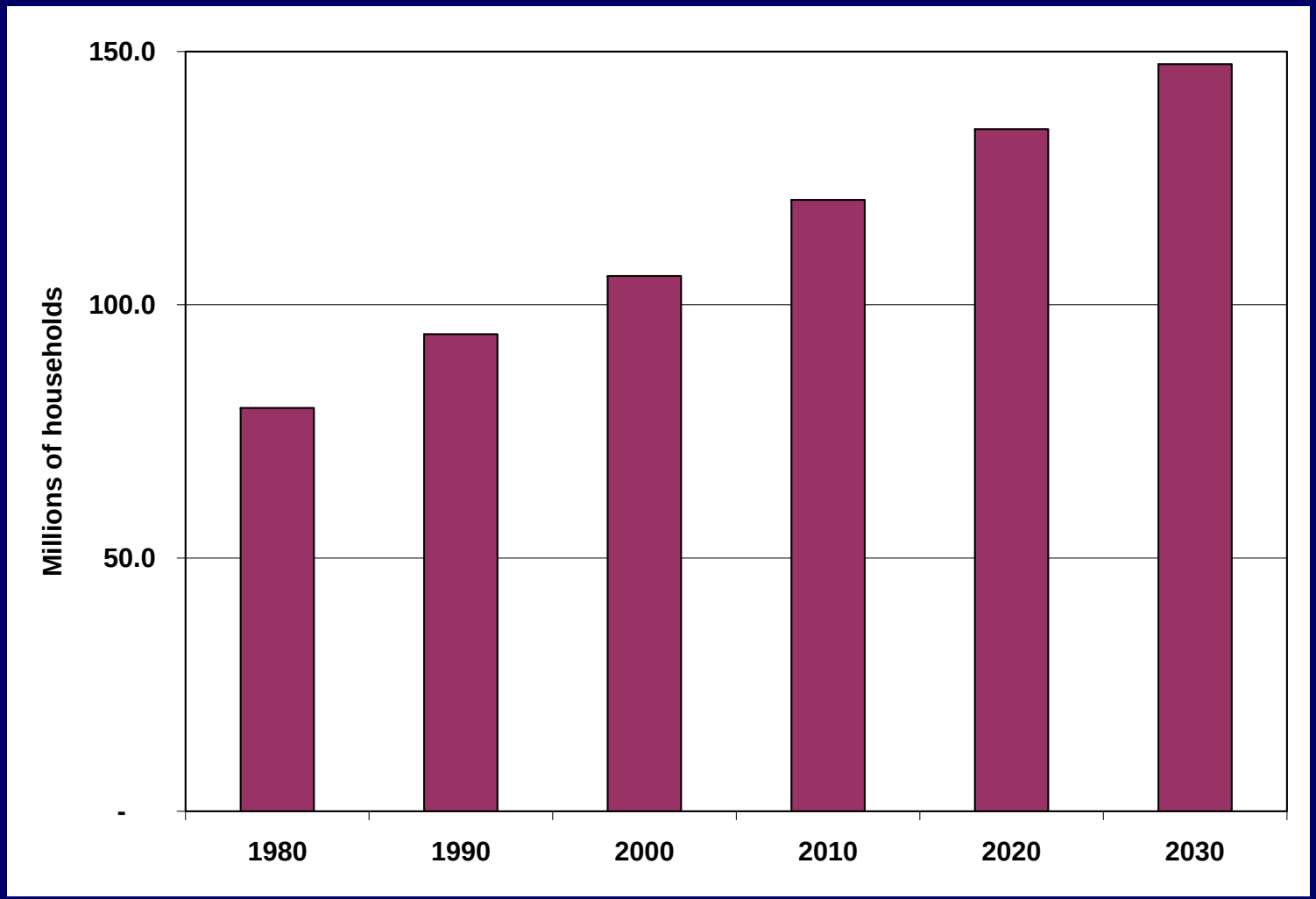
Homes account for **37%** of **all** US electricity use

Residential energy use is growing



Residential primary energy consumption
Source: DOE 2007

Number of Households is Growing



Number of Households
Source: DOE 2007

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McKinsey&Company

THE CONFERENCE BOARD

Reducing U.S. Greenhouse Gas Emissions: *How Much at What Cost?*

U.S. Greenhouse Gas Abatement Mapping Initiative
Executive Report
December 2007

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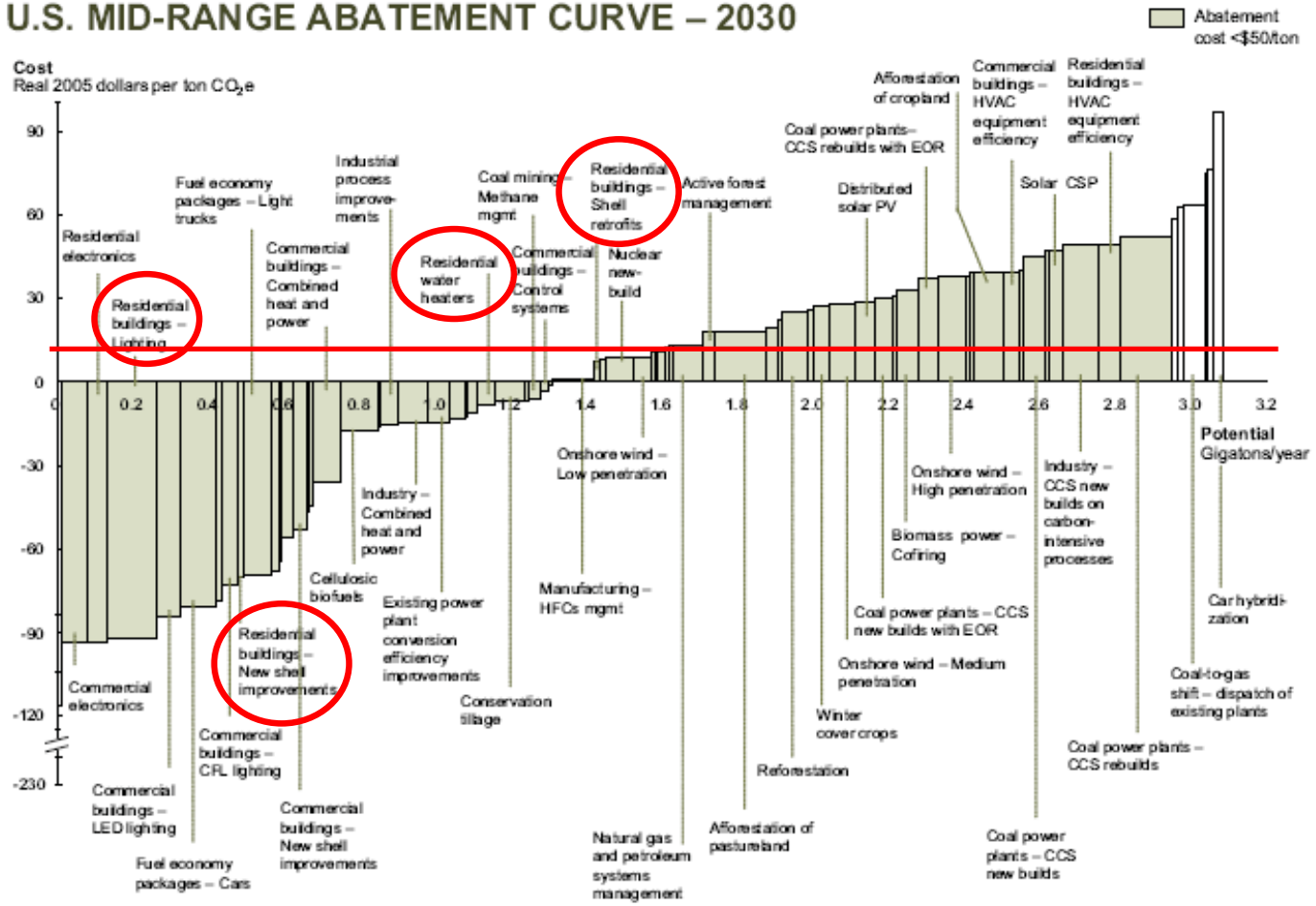
Exhibit B

U.S. MID-RANGE ABATEMENT CURVE – 2030



Source: McKinsey analysis

What is a Zero Energy Home?

Zero Energy Homes consume NO energy!

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What is a Zero Energy Home?

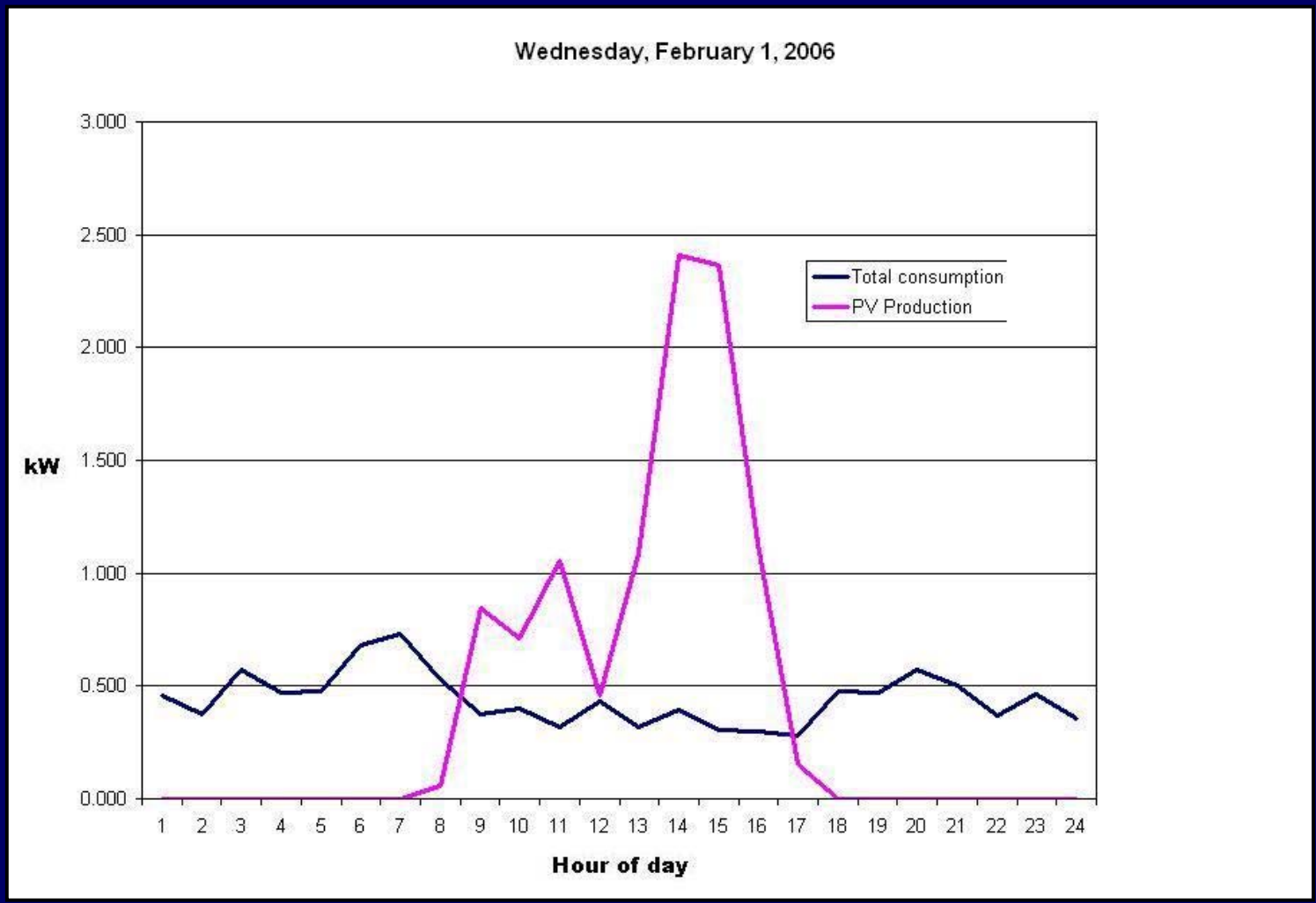
Zero Energy Homes produce as much energy as they consume on an annual basis.

What is a Zero Energy Home?

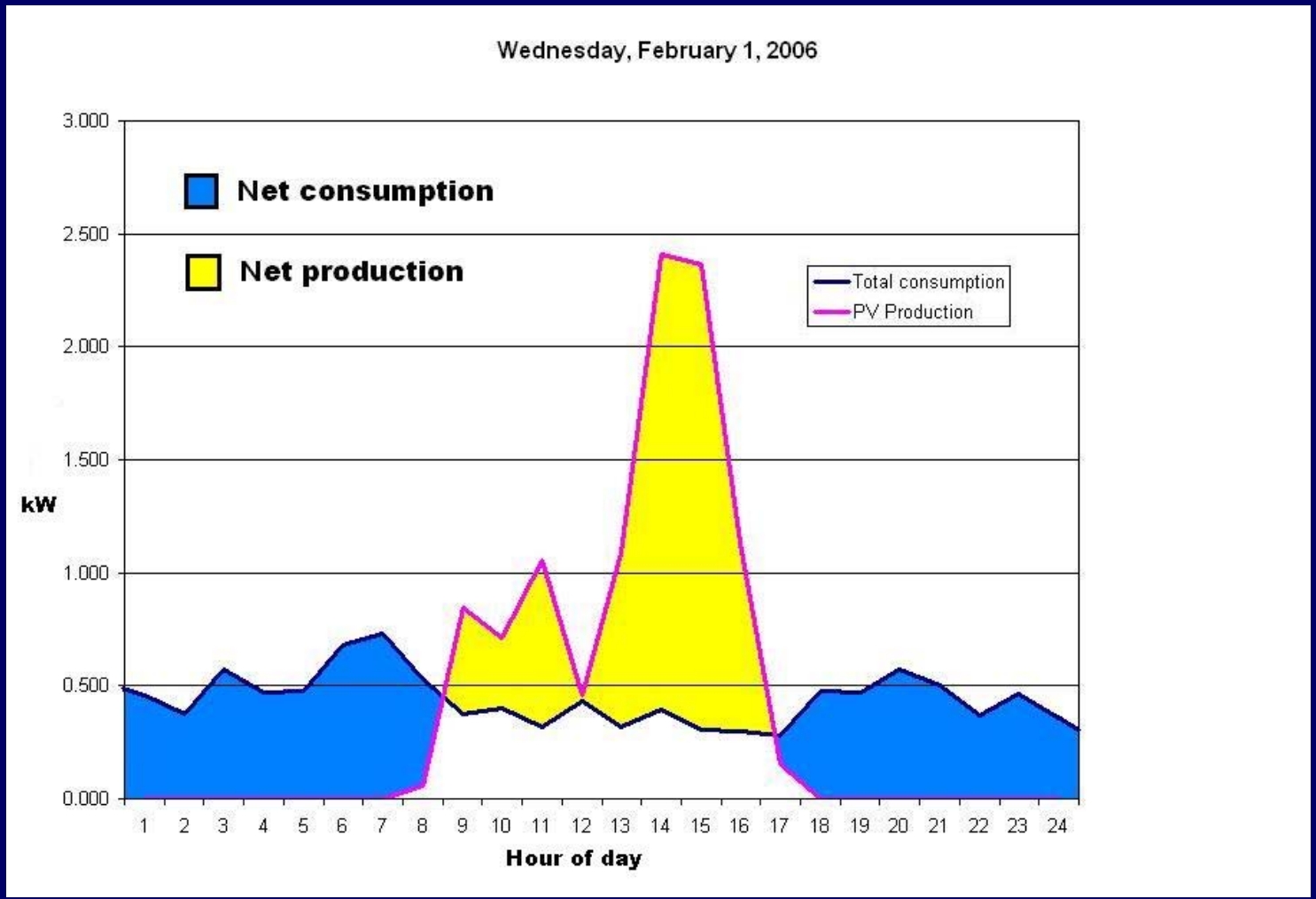
Zero Energy Homes produce as much energy as they consume on an annual basis.

- NET zero energy
- Zero energy ≠ zero utility bills
- The path to zero in new homes
- How to make a zero energy home
- Examples of zero energy homes
- What about my existing home?

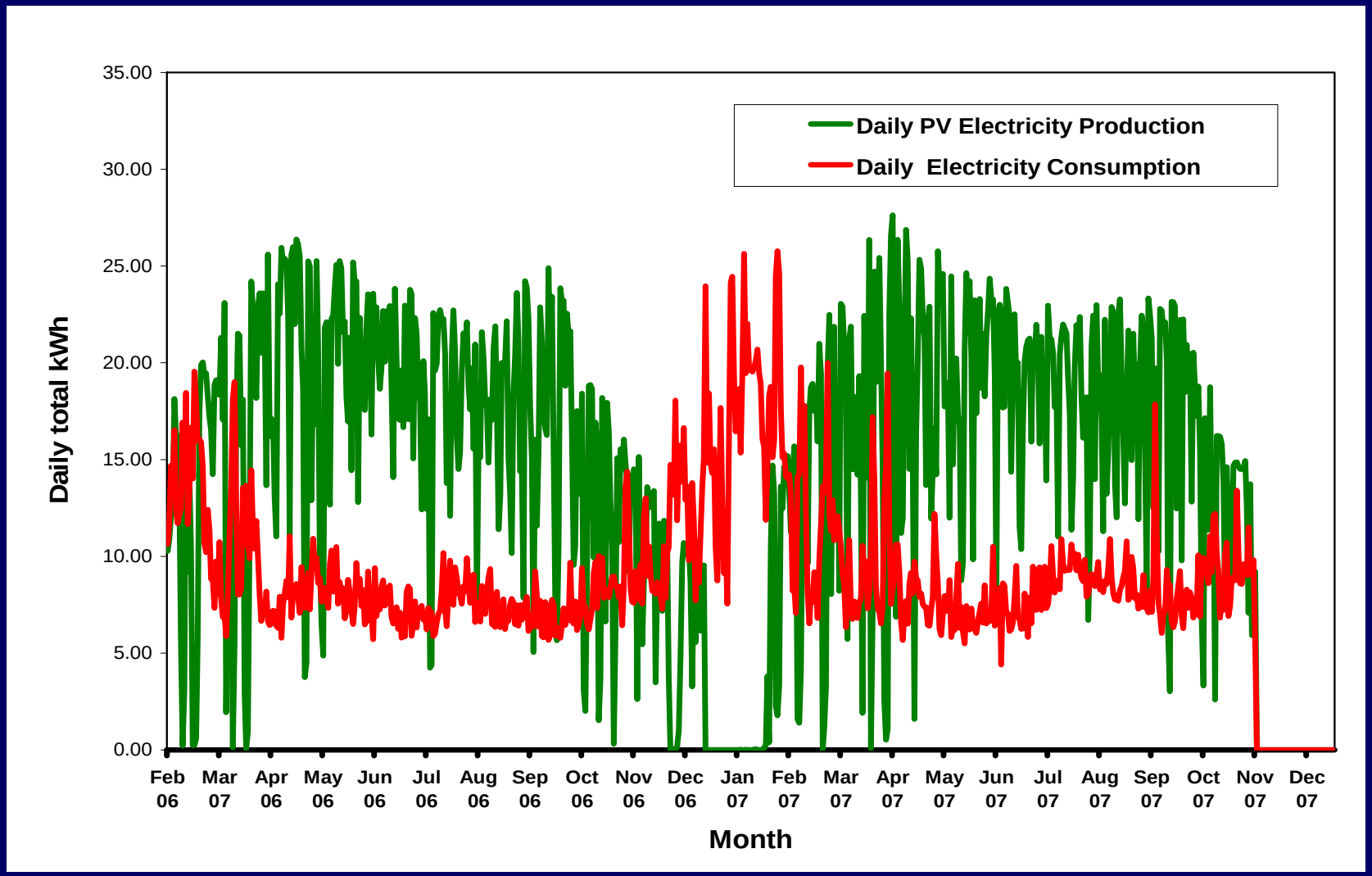
NET Zero Energy: Daily Energy Flow



NET Zero Energy: Daily Energy Flow



NET Zero Energy: Seasonal Energy Flow

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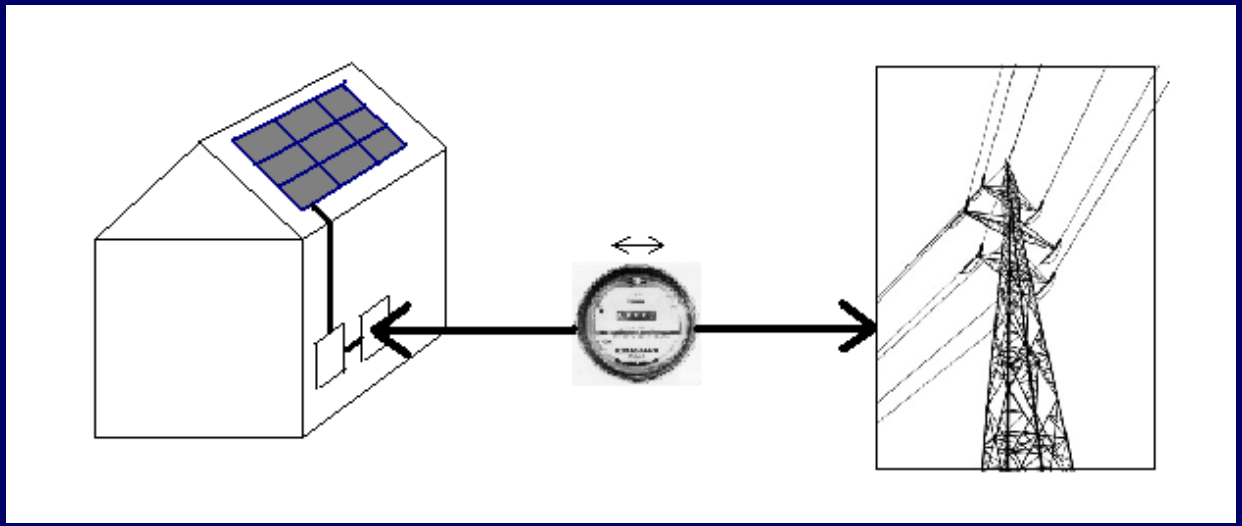
Zero energy ≠ zero utility bills

Net metering

Net billing

Feed-in tariffs

Net Metering



42 States now have net metering laws

In most states, the net metering requirement only applies to investor owned utilities

Colorado Xcel customers have net metering

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DSIRE: www.dsireusa.org

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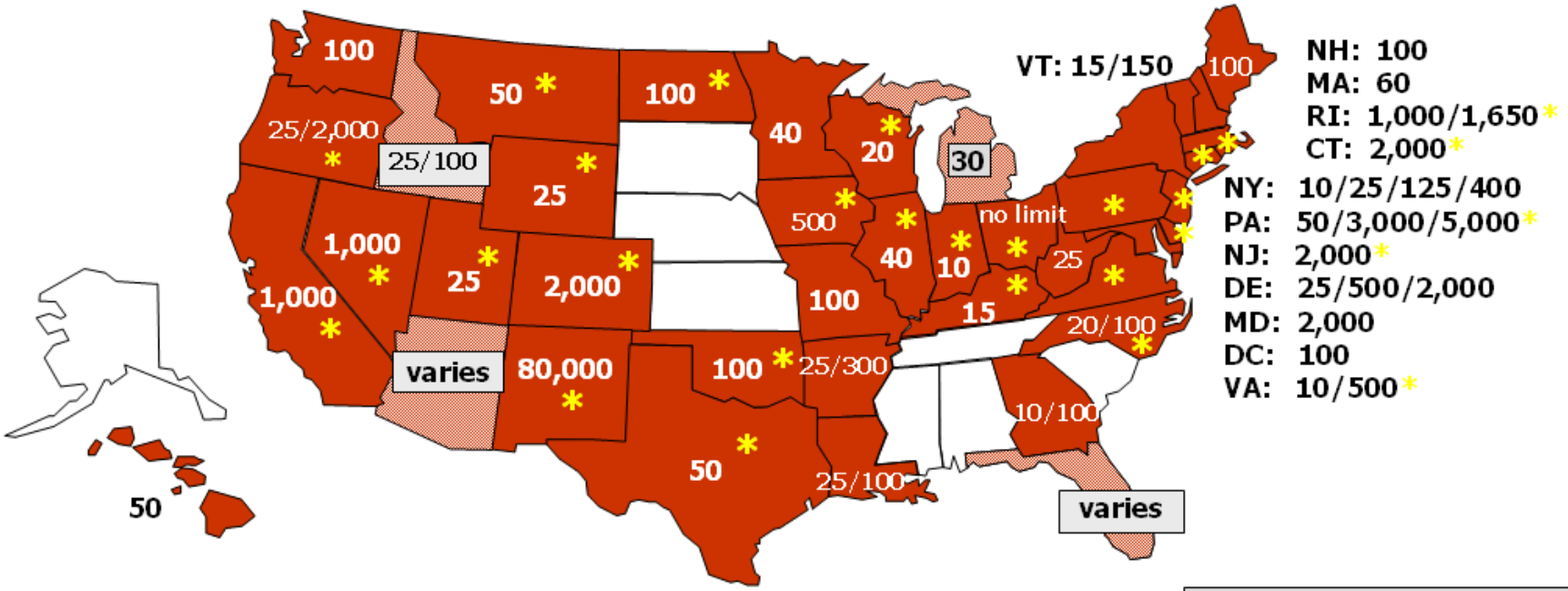
Net Metering



NH: 100
MA: 60
RI: 1,000/1,650*
CT: 2,000*
NY: 10/25/125/400
PA: 50/3,000/5,000*
NJ: 2,000*
DE: 25/500/2,000
MD: 2,000
DC: 100
VA: 10/500*

State-wide net metering for all utility types

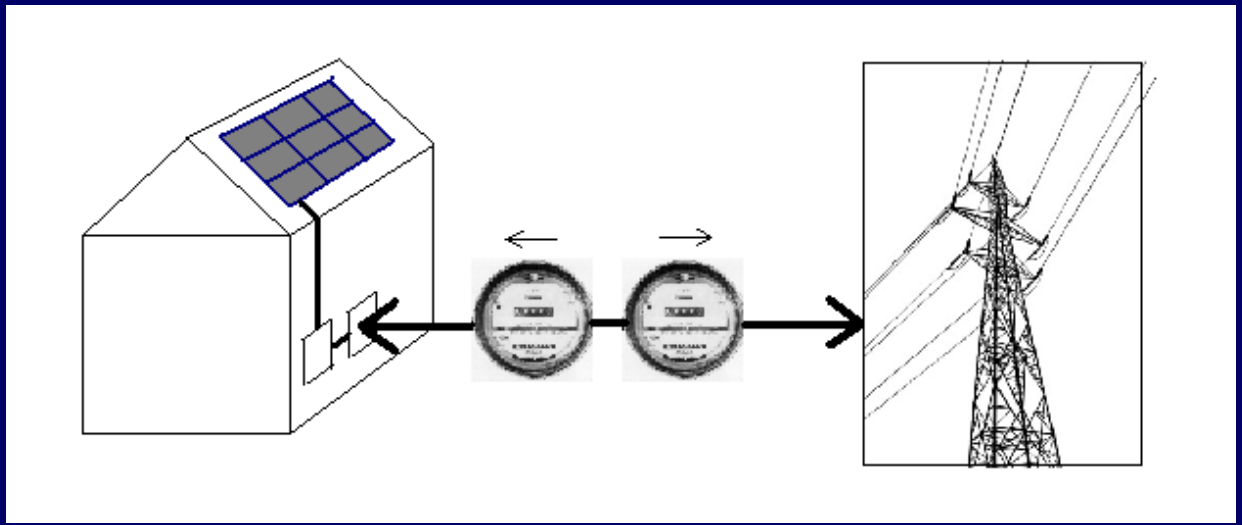
State-wide net metering for certain utility types (e.g., investor-owned utilities only)

Net metering offered by one or more individual utilities

Net metering is available in 42 states + D.C.

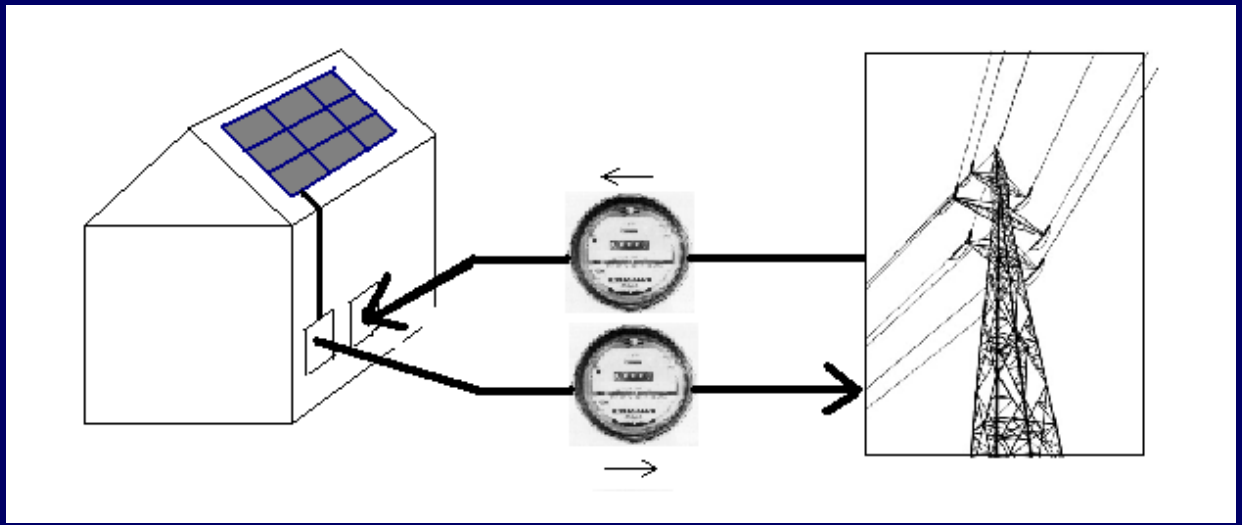
(Numbers indicate individual system size limit in kilowatts. Some states' limits vary by customer type and/or technology as shown)

Net Billing



More common in rural coops

Feed-in Tariff



Some current feed in tariffs:

Germany	~ $0.65/kWh
TVA	$0.15/kWh

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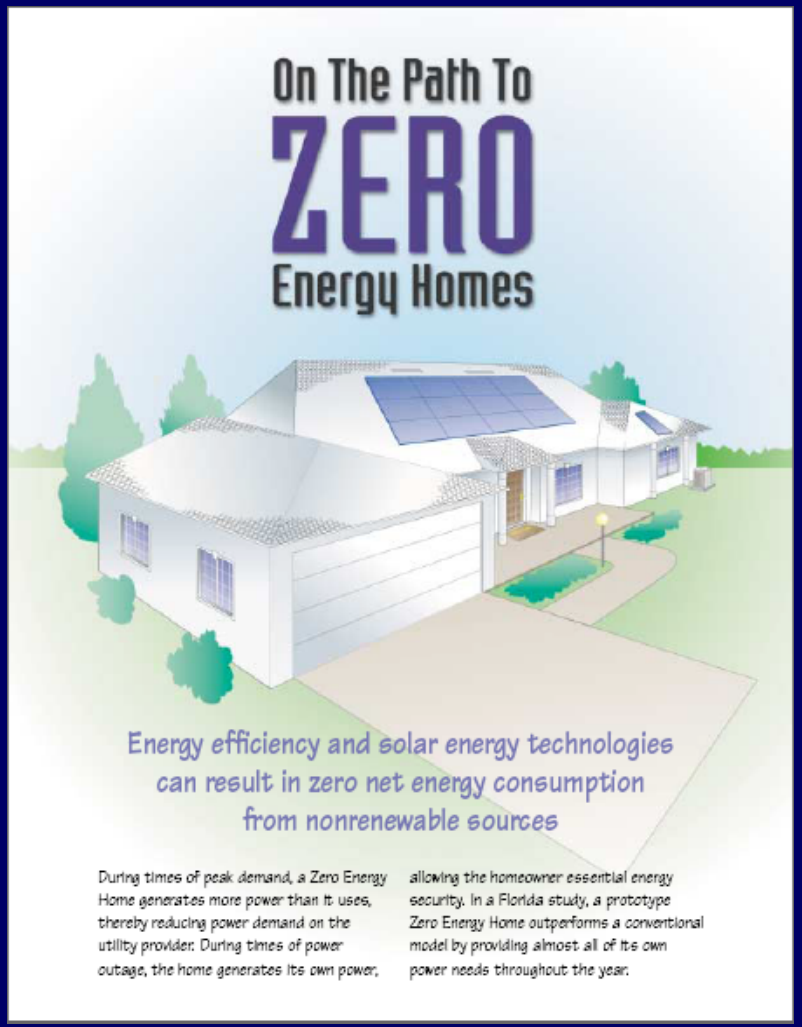
The path to Zero Energy

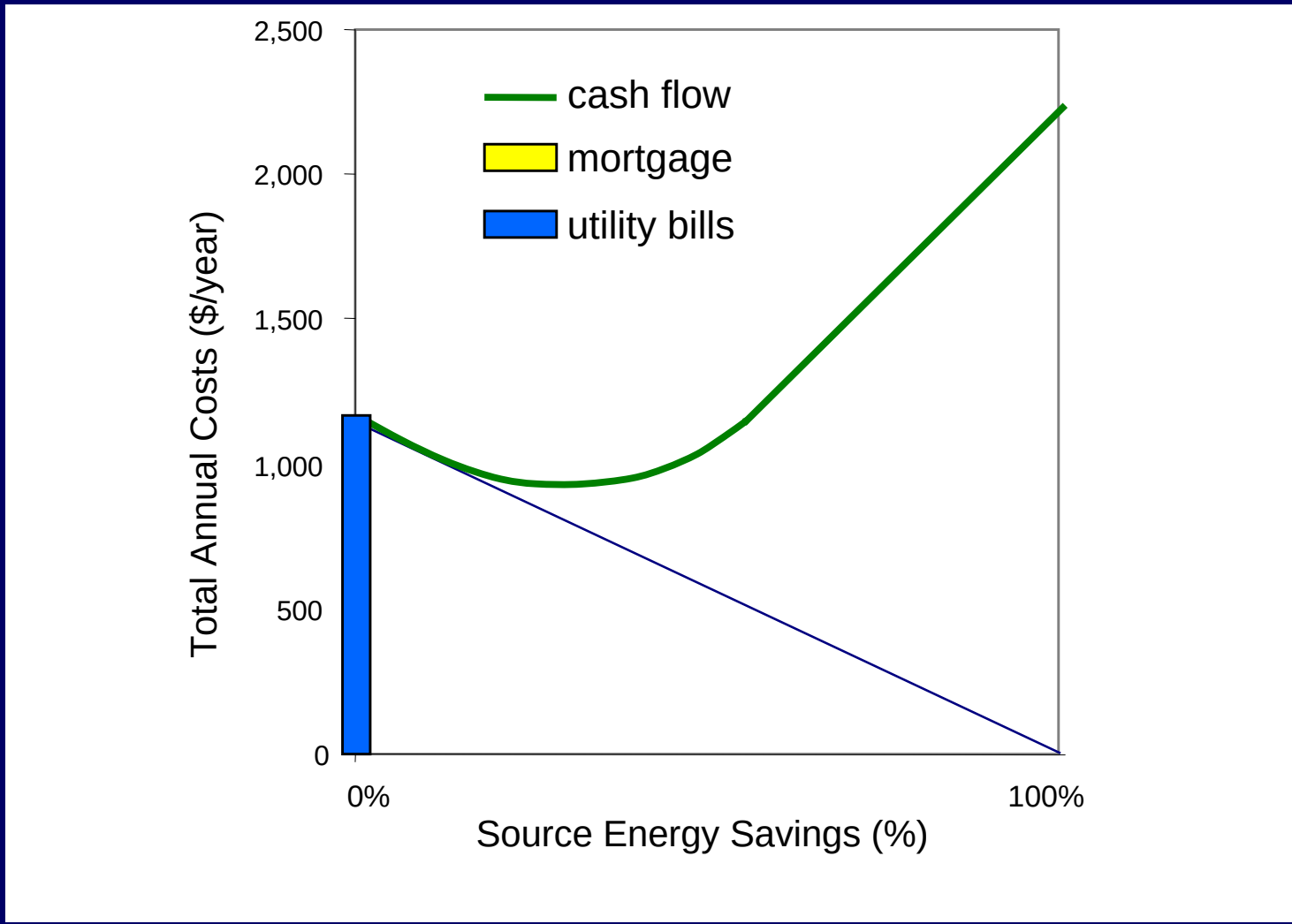


On The Path To ZERO Energy Homes

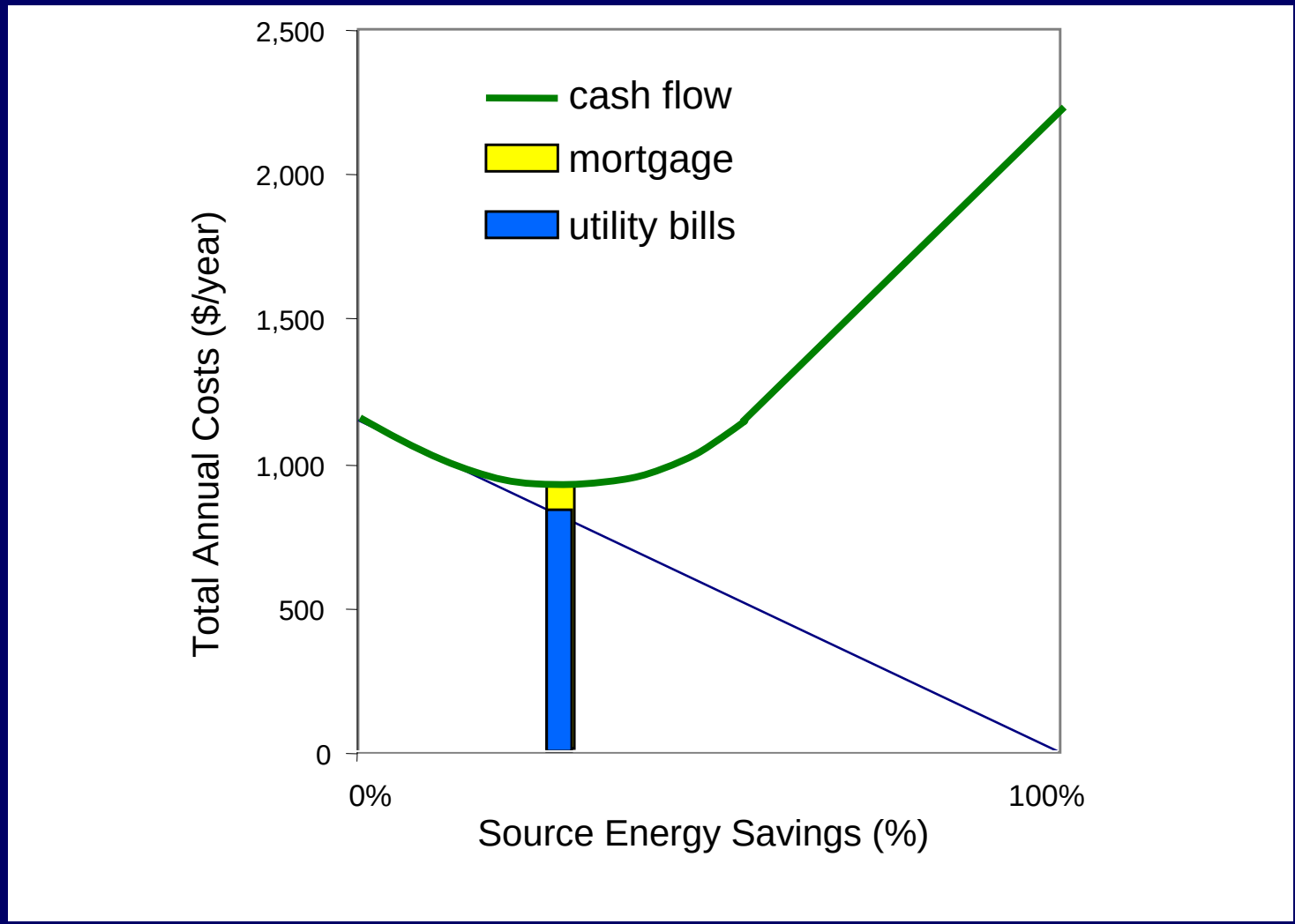
Energy efficiency and solar energy technologies can result in zero net energy consumption from nonrenewable sources

During times of peak demand, a Zero Energy Home generates more power than it uses, thereby reducing power demand on the utility provider. During times of power outage, the home generates its own power, allowing the homeowner essential energy security. In a Florida study, a prototype Zero Energy Home outperforms a conventional model by providing almost all of its own power needs throughout the year.

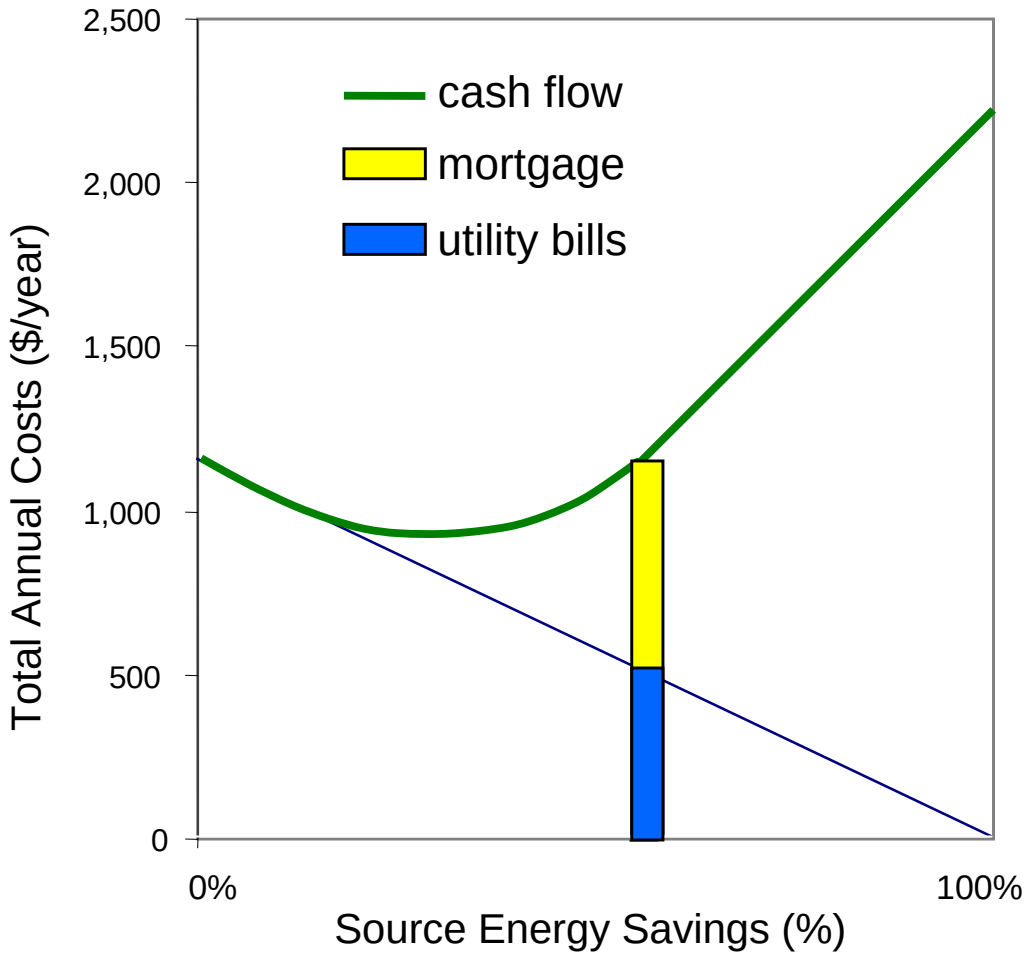
The cost effective path to Zero Energy



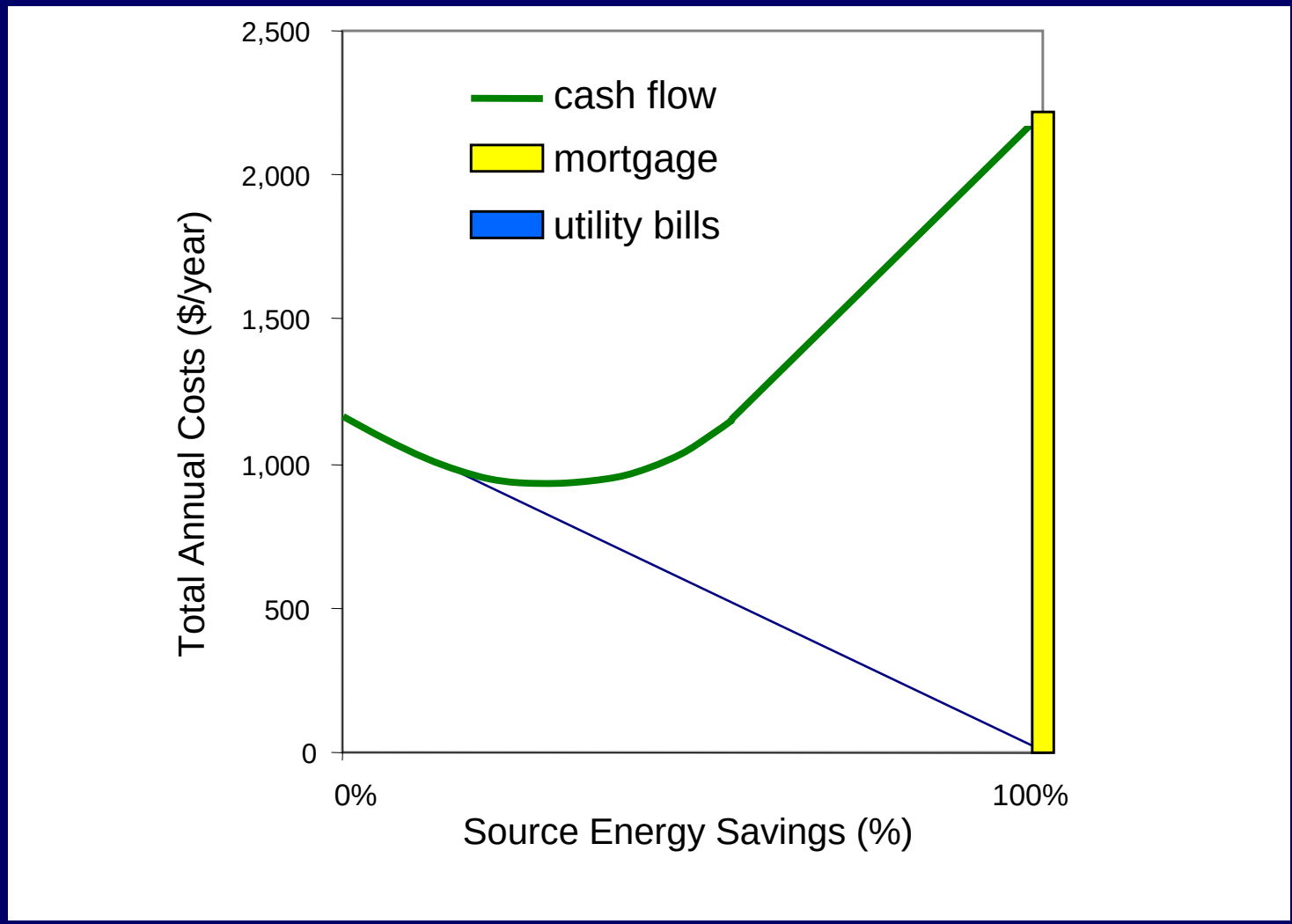
The cost effective path to Zero Energy



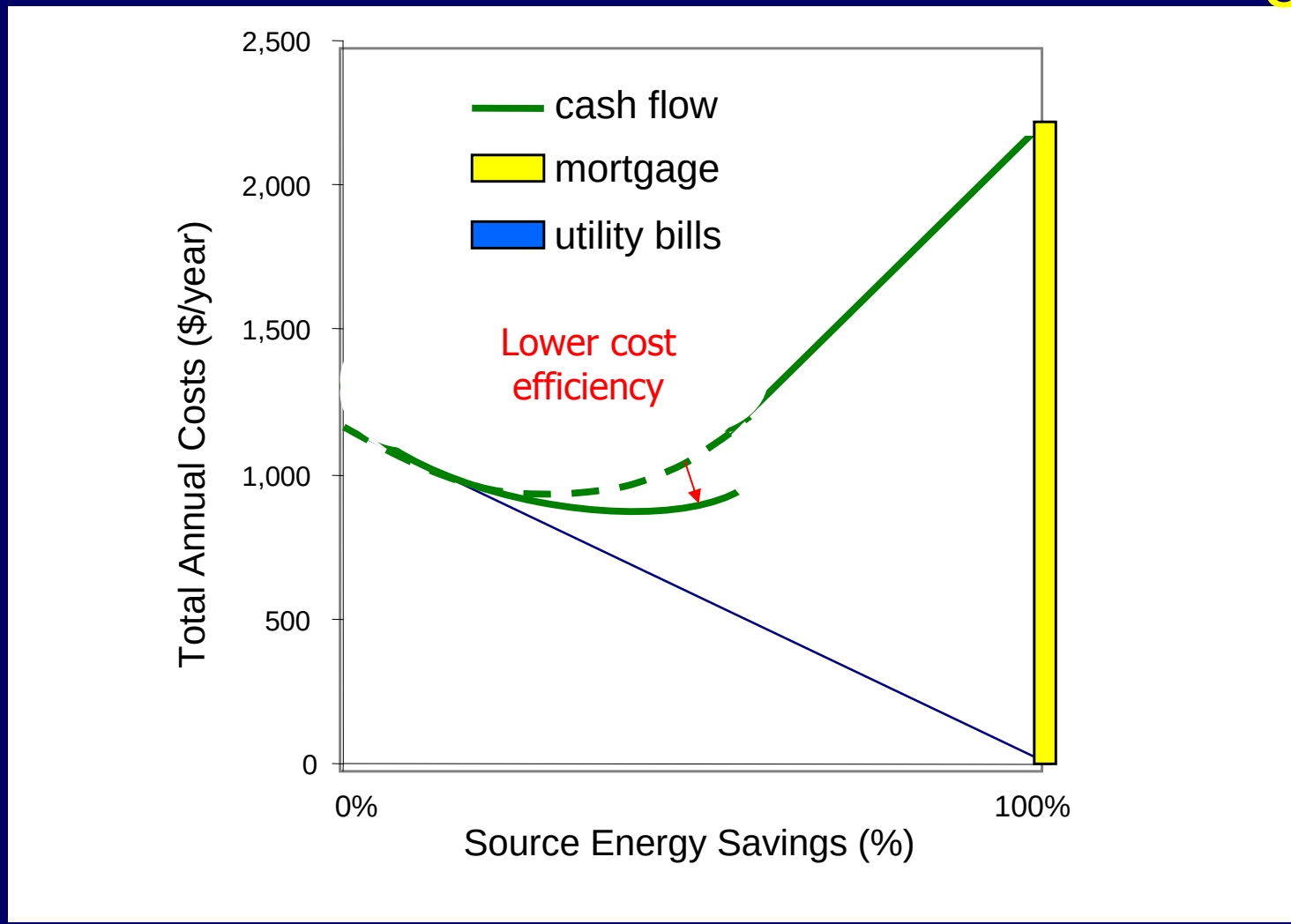
The cost effective path to Zero Energy



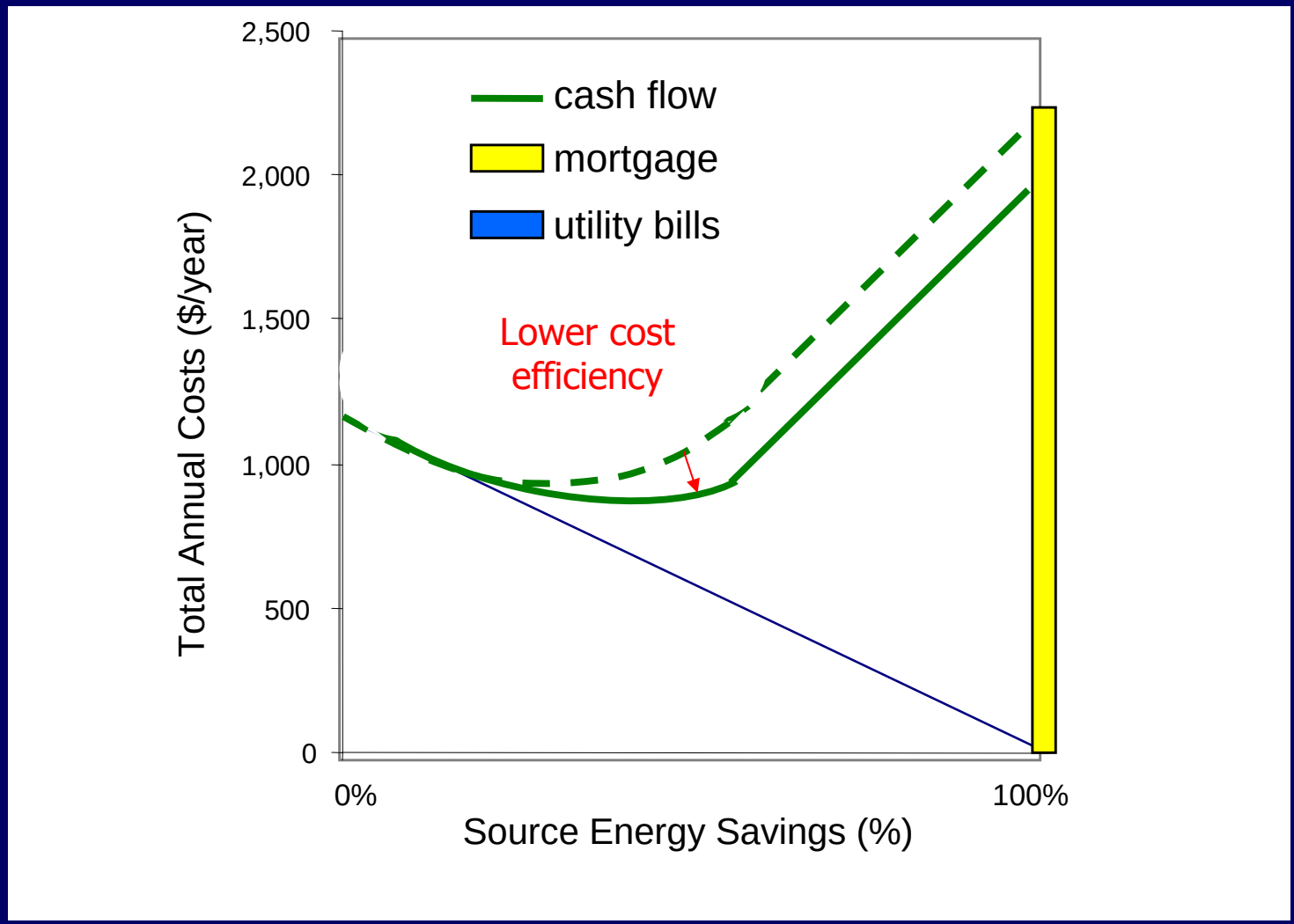
The cost effective path to Zero Energy



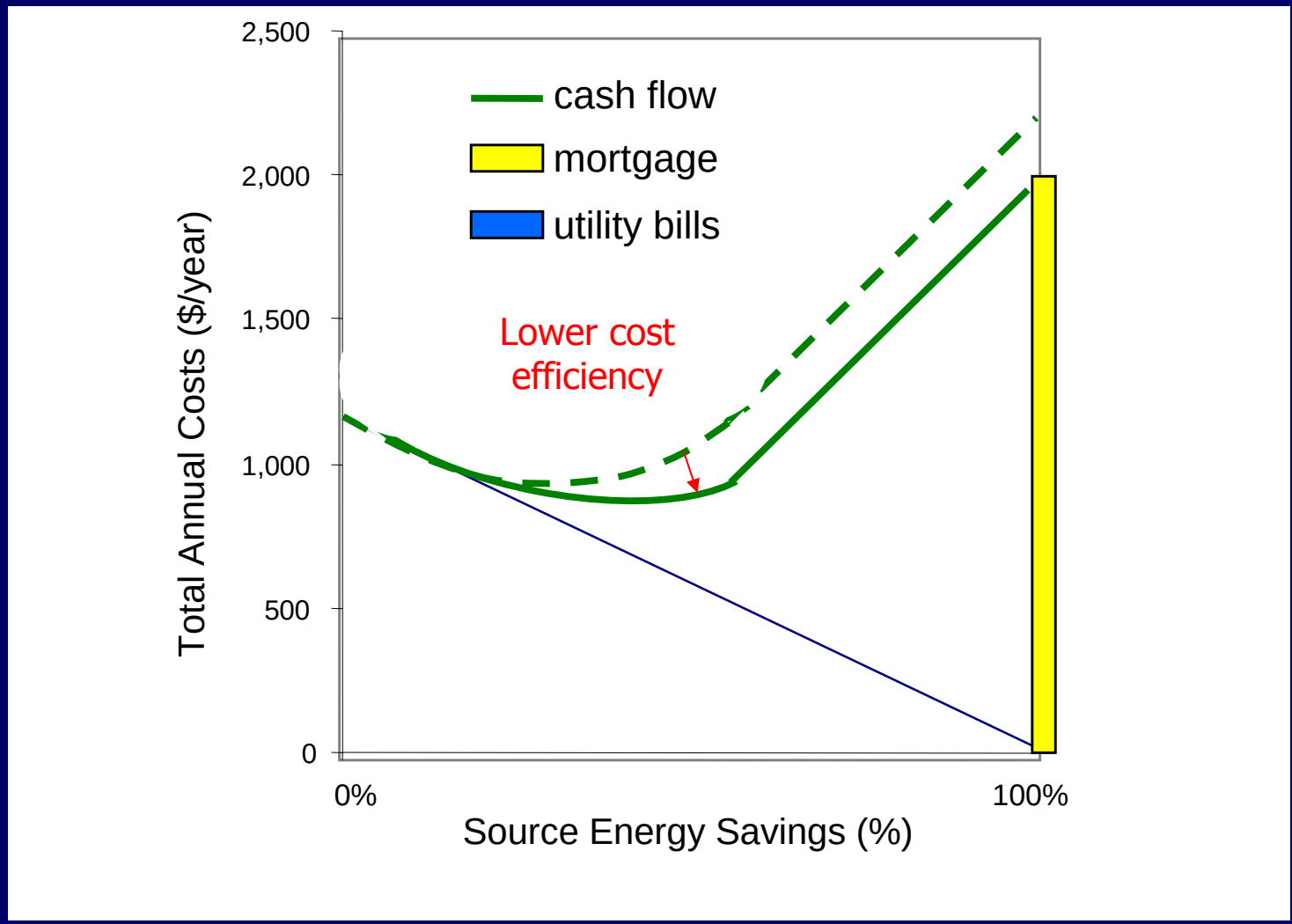
The cost effective path to Zero Energy



The cost effective path to Zero Energy



The cost effective path to Zero Energy



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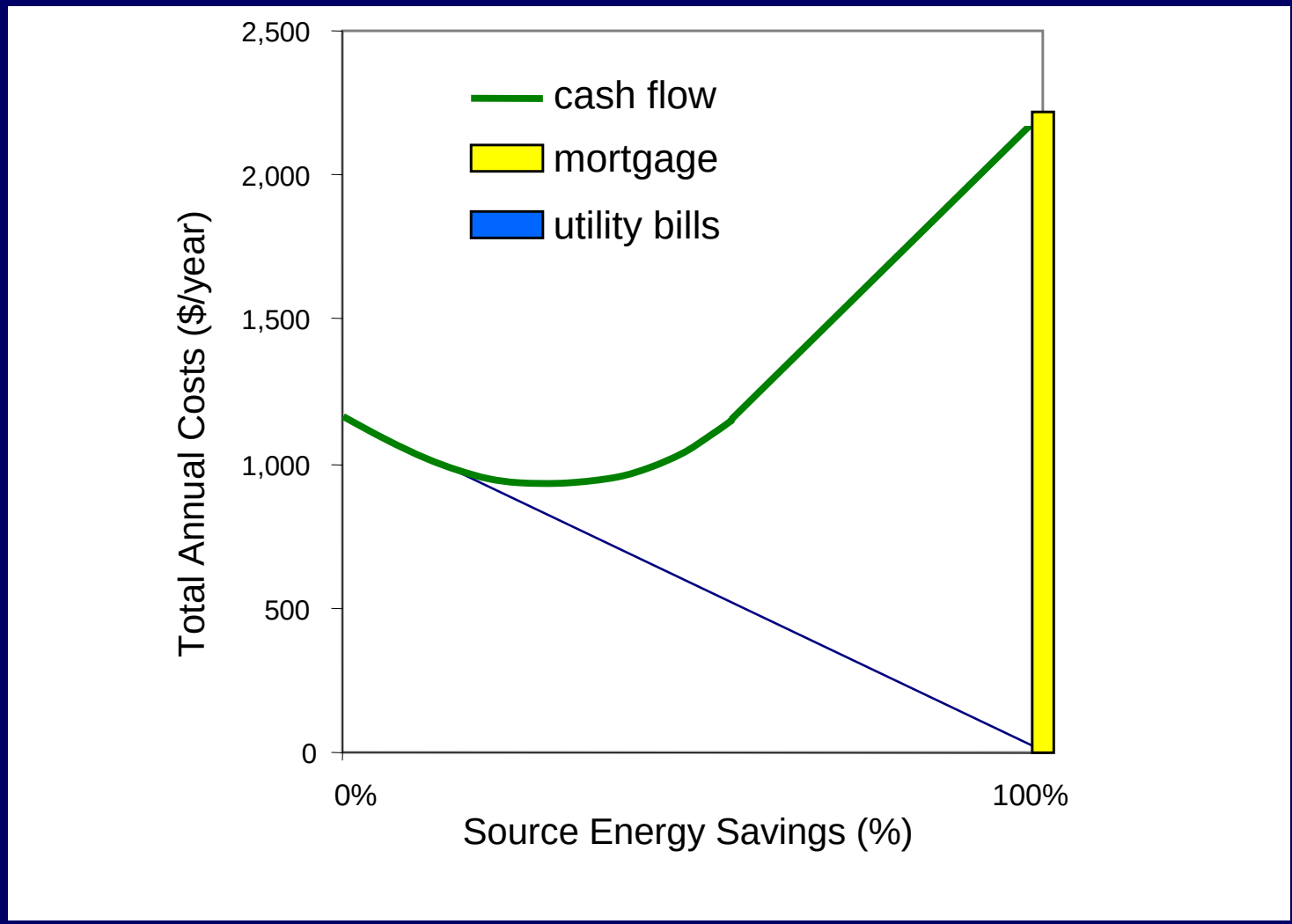

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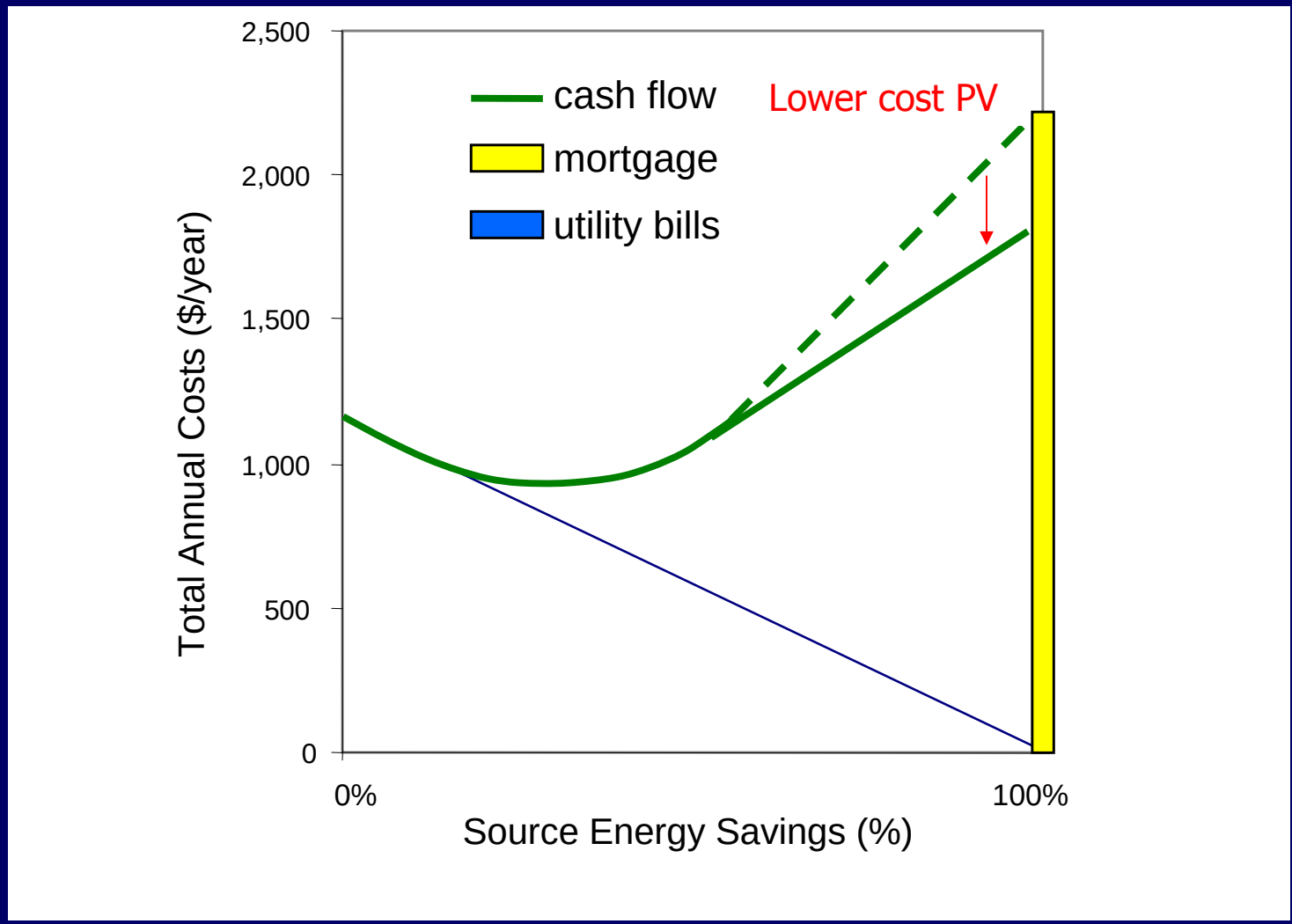
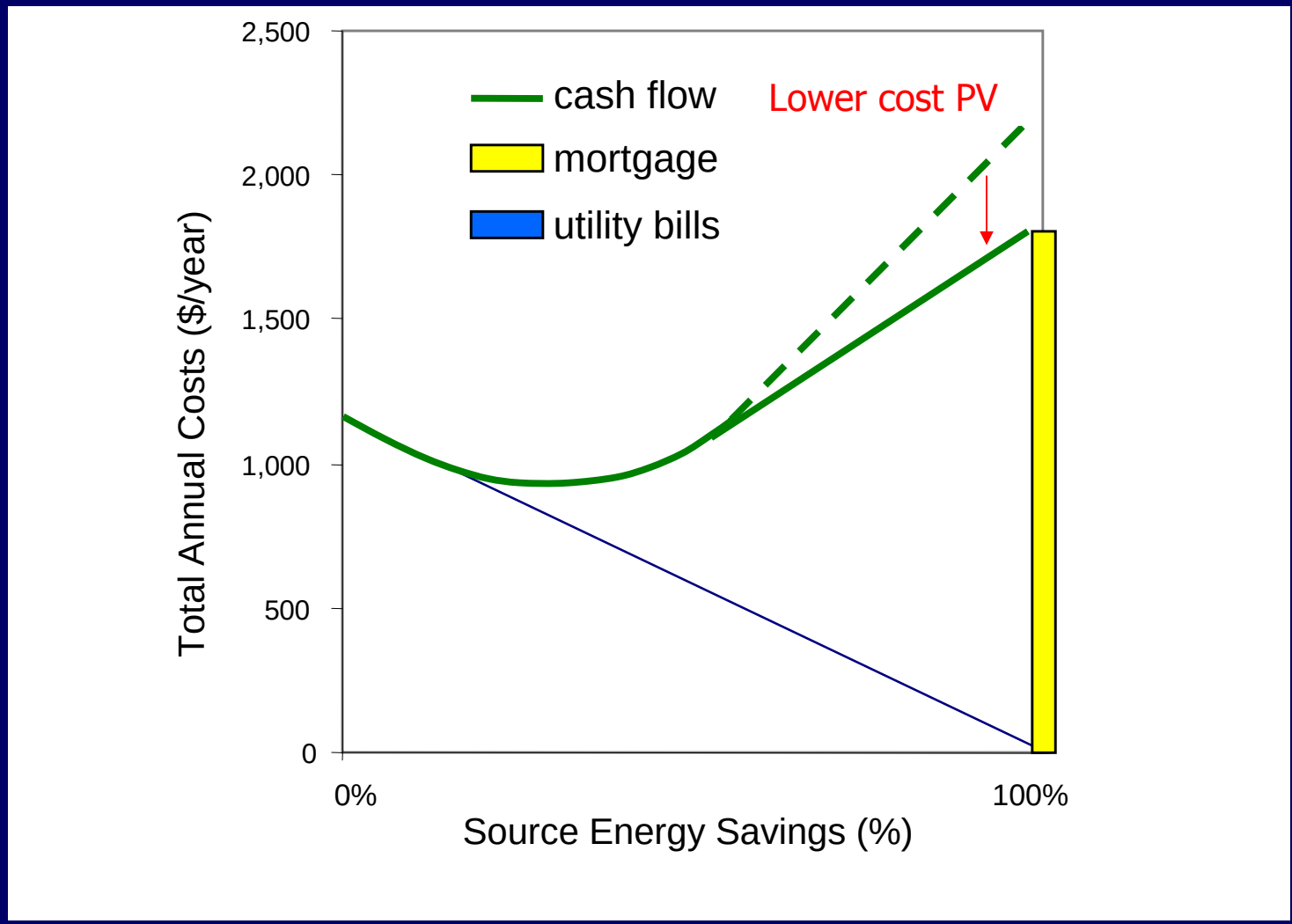
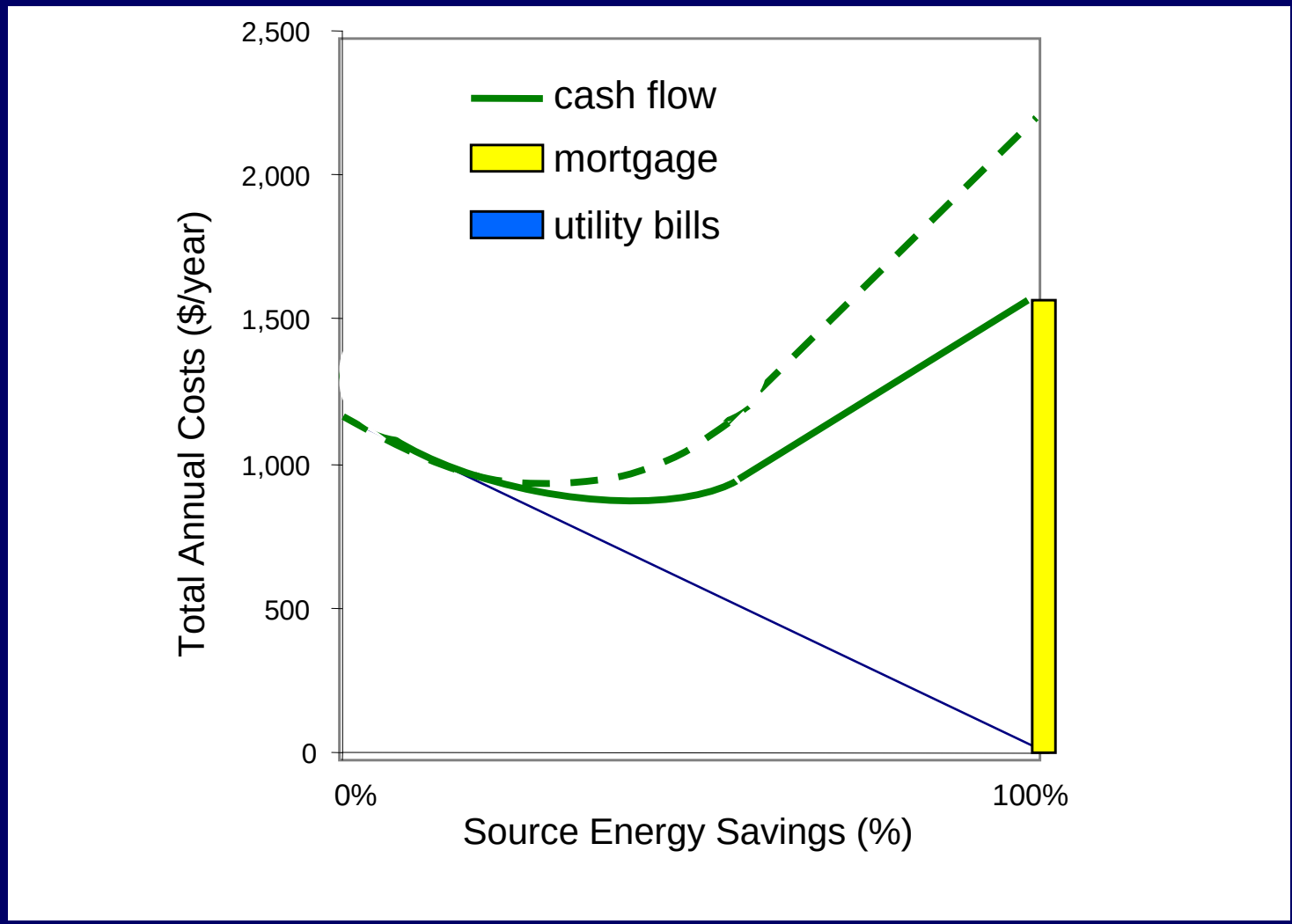


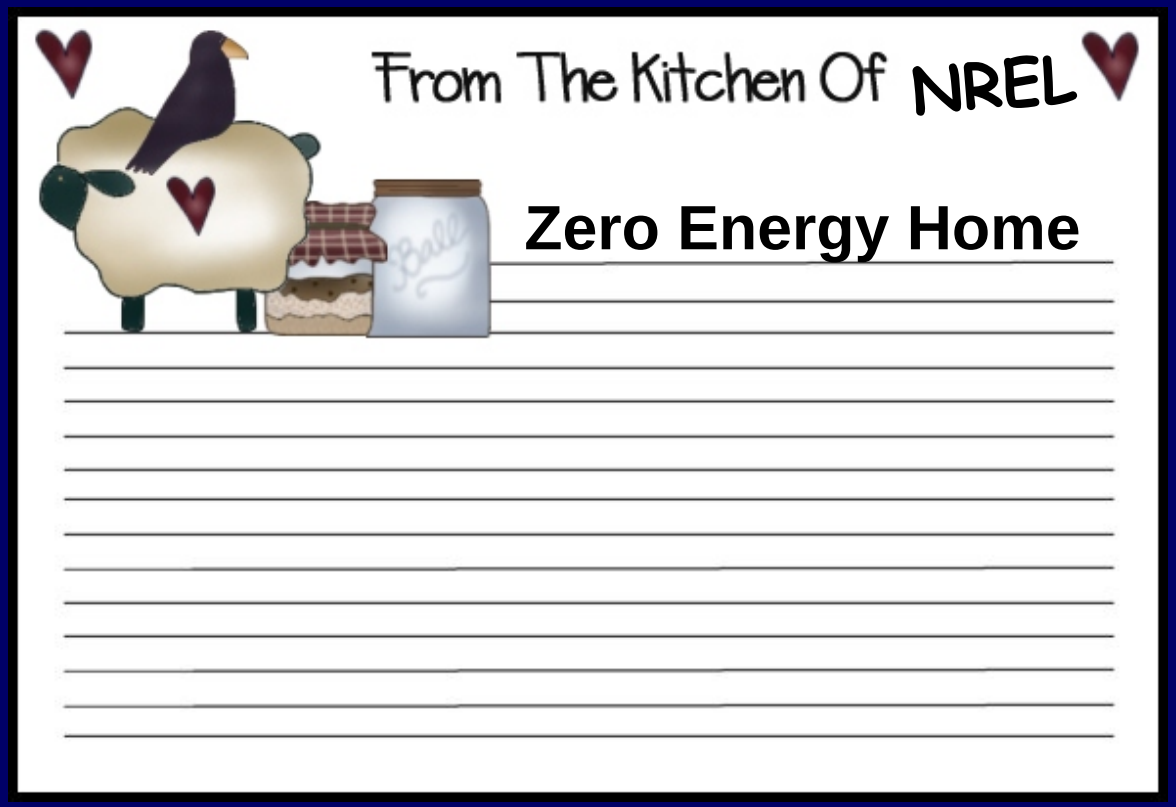
The cost effective path to Zero Energy



The cost effective path to Zero Energy



How to make a ZEH



How to make a ZEH

Successful Zero Energy Homes:

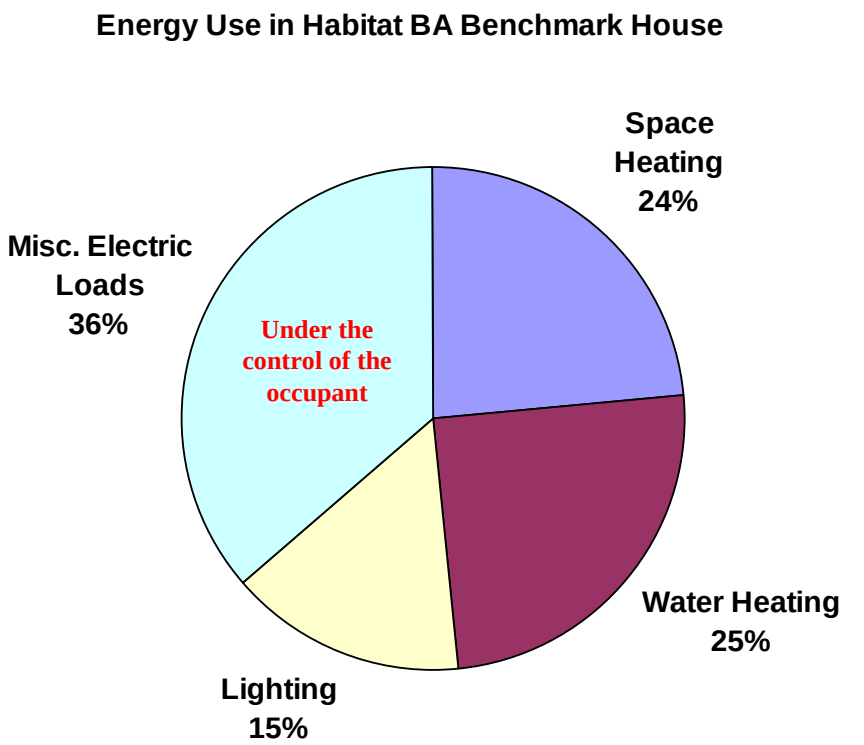
1. Efficiency
2. Efficiency
3. Efficiency
4. Solar
5. Solar
6. Solar

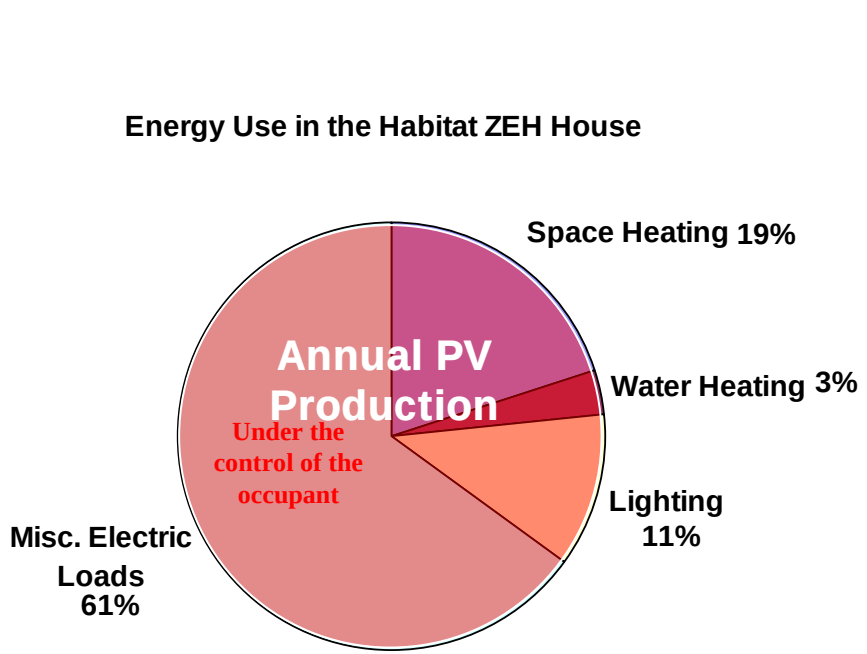
How to make a ZEH

Successful Zero Energy Homes:

1. Efficiency - envelope: walls, roof, foundation
2. Efficiency - heating and cooling systems
3. Efficiency - lights and appliances
4. Solar - passive techniques
5. Solar - active thermal systems
6. Solar - electric systems (photovoltaics)

Zero Energy Guaranteed?





Will it *really* be ZERO??

It could be!

In any given year, it depends on….

- **Plug loads**
  (TVs, DVDs, Microwave, computers, stereo, toaster, electric blanket, hair dryer, …. the list goes on!)
- **Specific weather conditions**
- **Temperature set points**
- **Hot water use**

The house AND the occupants
meet or miss the zero energy target *TOGETHER*

Ideal Homes ZEH

- Near Oklahoma City, OK
- 1584 ft2, 3-bedrooms, 1-story
- 5.3 kW

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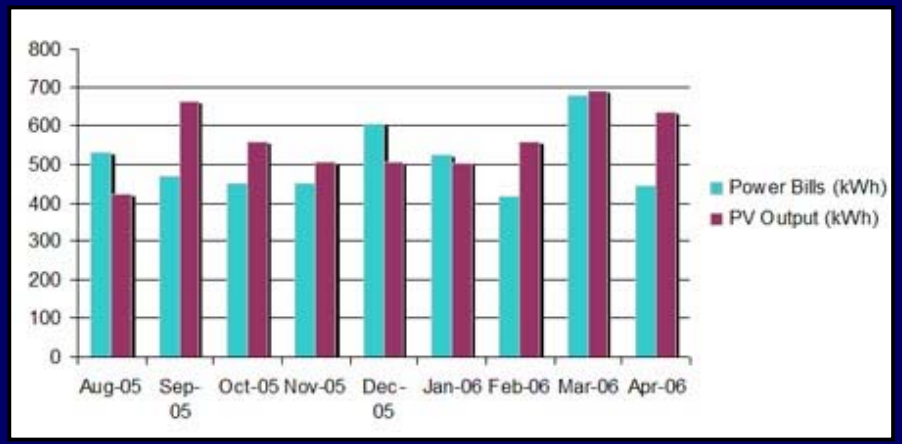
Hickory, NC



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Patterson, NJ

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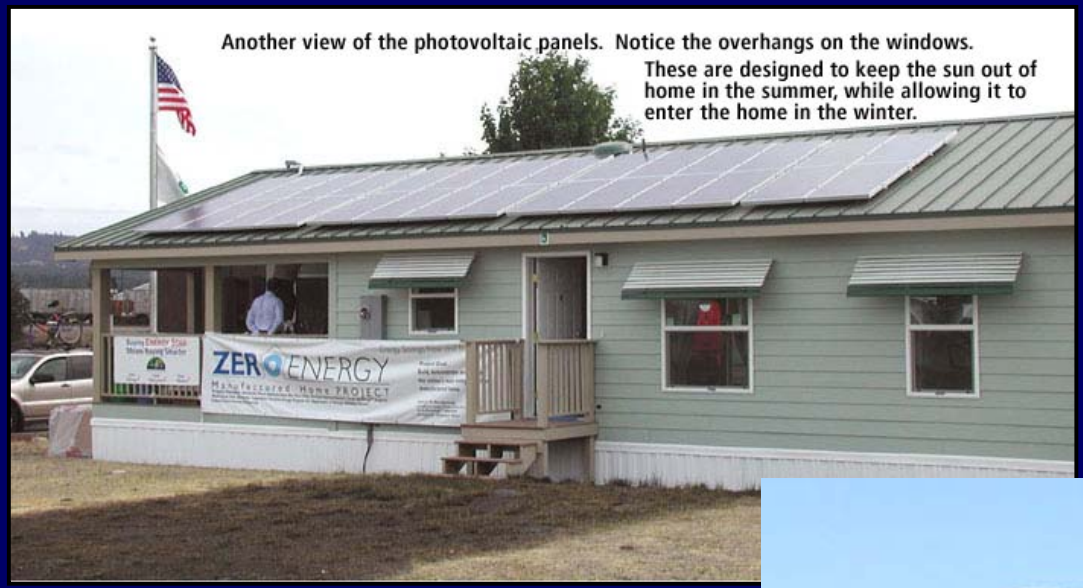
Frisco, TX
8kW PV

Washington State



Another view of the photovoltaic panels. Notice the overhangs on the windows. These are designed to keep the sun out of home in the summer, while allowing it to enter the home in the winter.

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Europe

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Tucson, AZ

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Solar Row
Boulder, CO

SOLAR ROW
SUSTAINABLE LIVING

$529,000
2,300 sq. ft.

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NREL/Habitat for Humanity
Wheatridge, CO

- 1280 sq ft
- 4 kW PV

Home Features

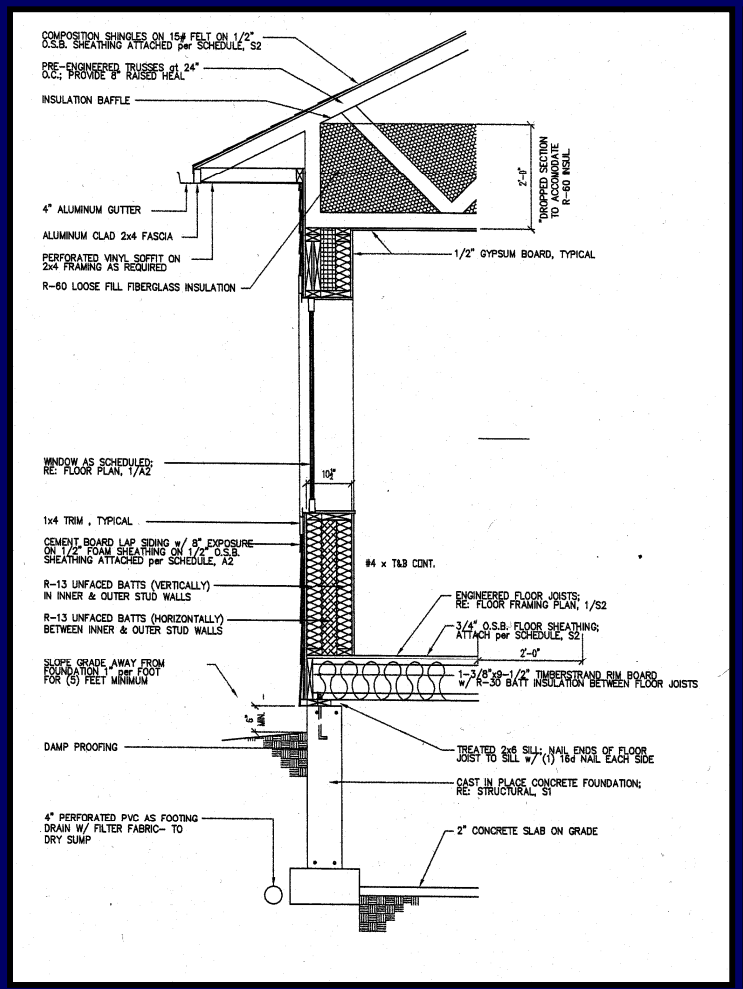
1. Make it HIGHLY Efficient!

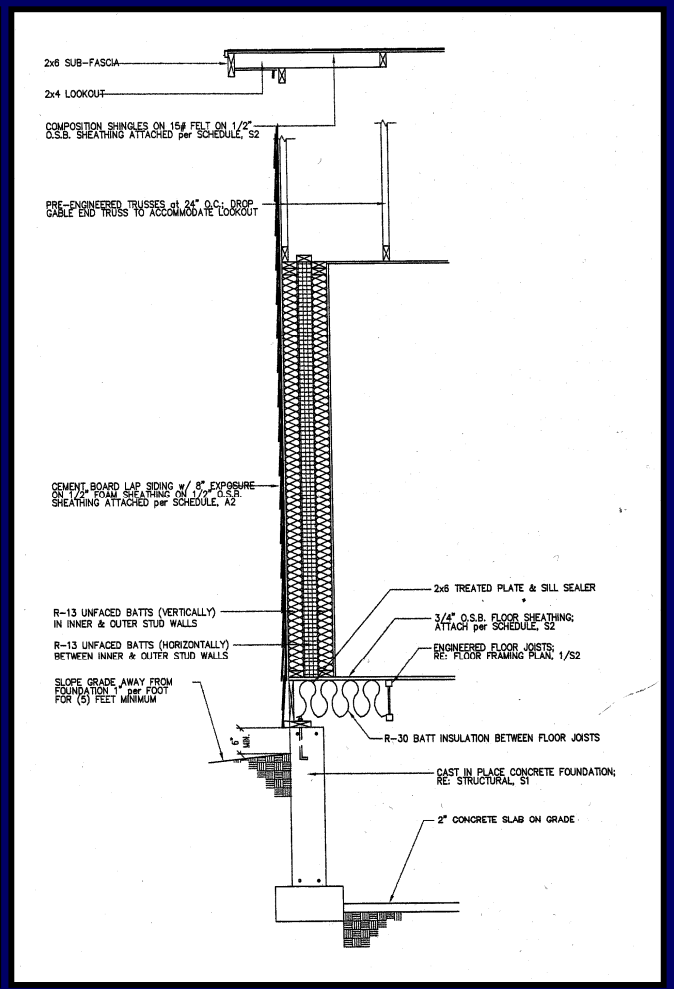
- Superinsulated, tight building envelope, Wall R-40, Ceiling R-60
- Low-e windows
- Heat recovery ventilation
- Tankless back-up water heater
- Energy Star refrigerator and clothes washer
- Compact Fluorescent Lighting

2. Meet ALL of the Remaining Energy Needs with Solar

- Solar tempering with orientation specific windows
- 96 sq. ft. drainback solar water heating system
- 4 kW PV system

Superinsulated Construction





- **Double Stud Wall**
- **Three layers of fiberglass batt insulation**
- **24” Raised heel trusses**
- **Wall R-40**
- **Ceiling R-60**
- **Floor R-30**
- **Low-e windows**


Tyvek
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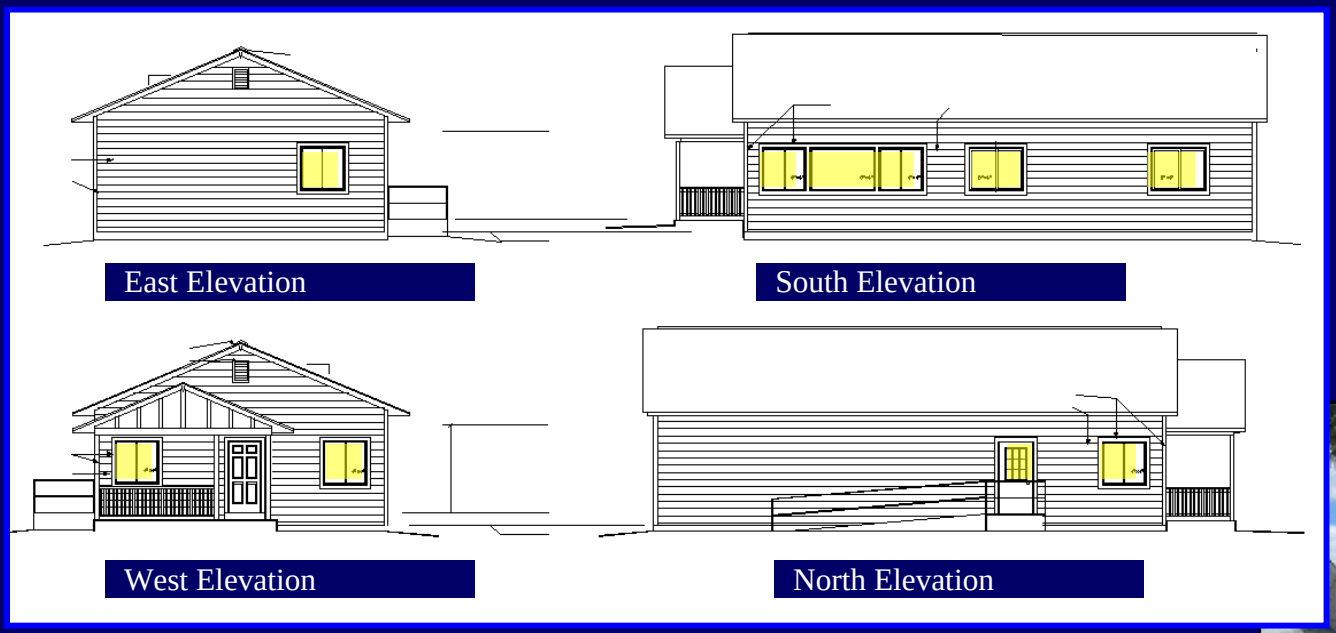
Solar Tempering



- **Window distribution**
- **Orientation specific glazing**
- **3’ overhang**

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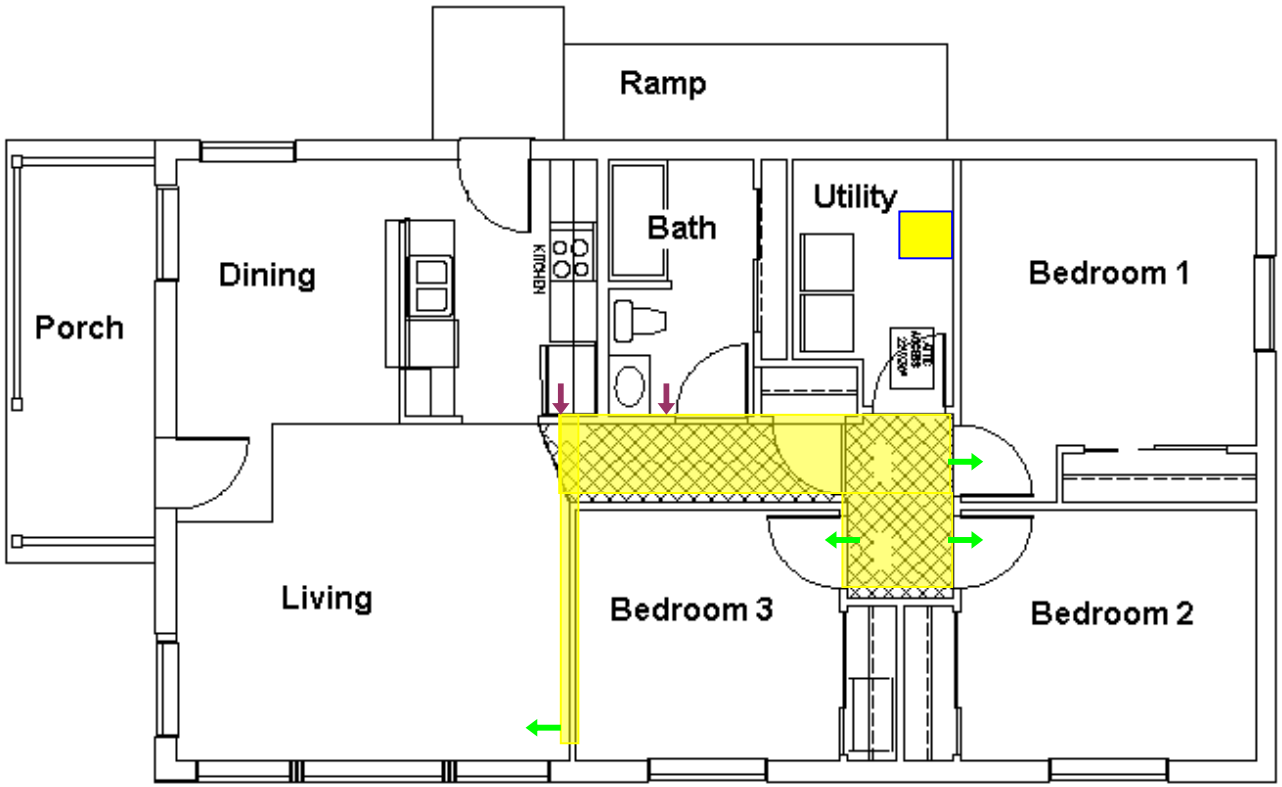
Energy Recovery Ventilation



- **Recovers heat from ventilation air**
- **6” ducts in hallway drop ceiling**


UltimateAir ™
by Stirling Technology, Inc.
CHECK FILTER
MED
LOW
HI
OFF
POWER
VENTILATION CONTROL

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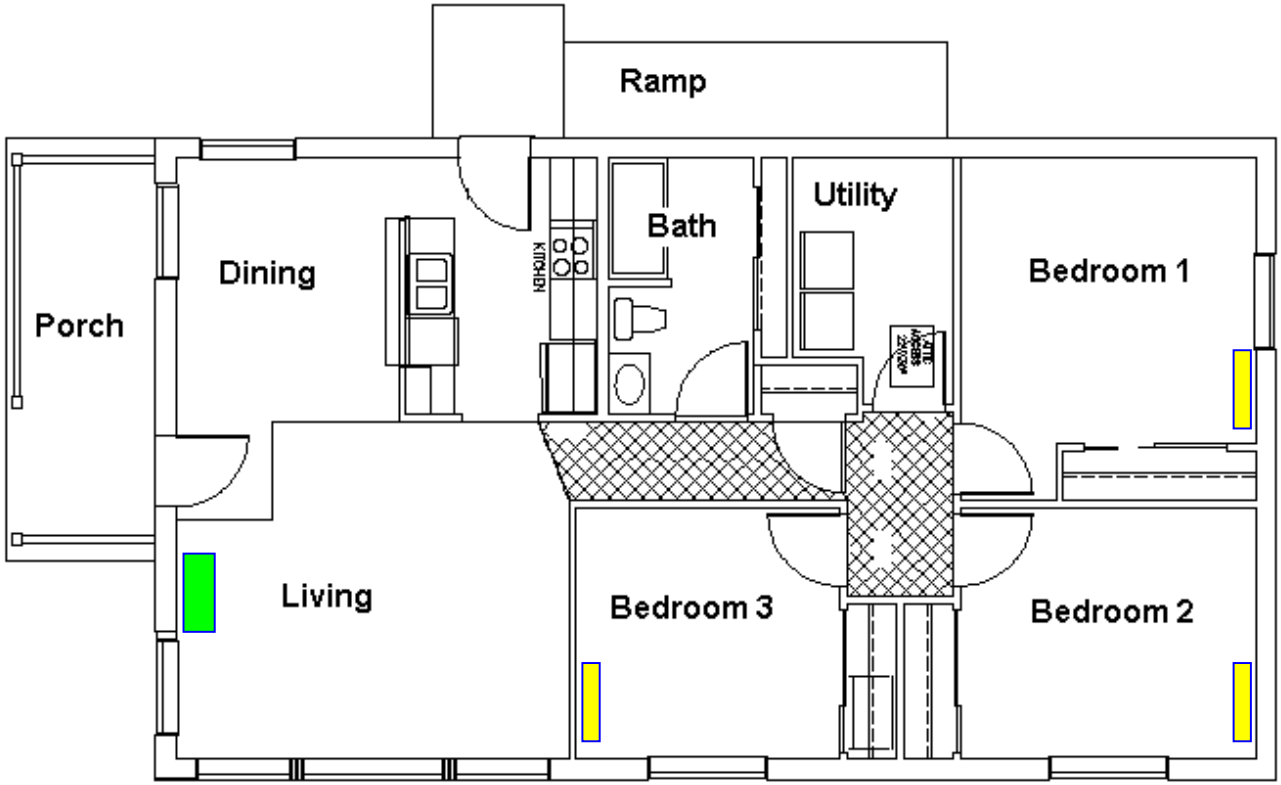
Hybrid NG/Electric Space Heating System

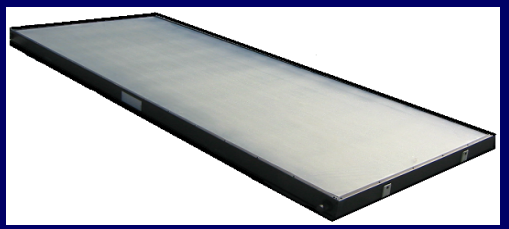


- **Direct vent, single point NG heater**
- **Small electric baseboards in bedrooms**


Rinnai ENERGYSAVER 556WT
ON/OFF


4100

Solar Water Heating System



- Drainback system
- 96 sq. ft. collector
- 200 gal storage tank
- Tankless backup heater

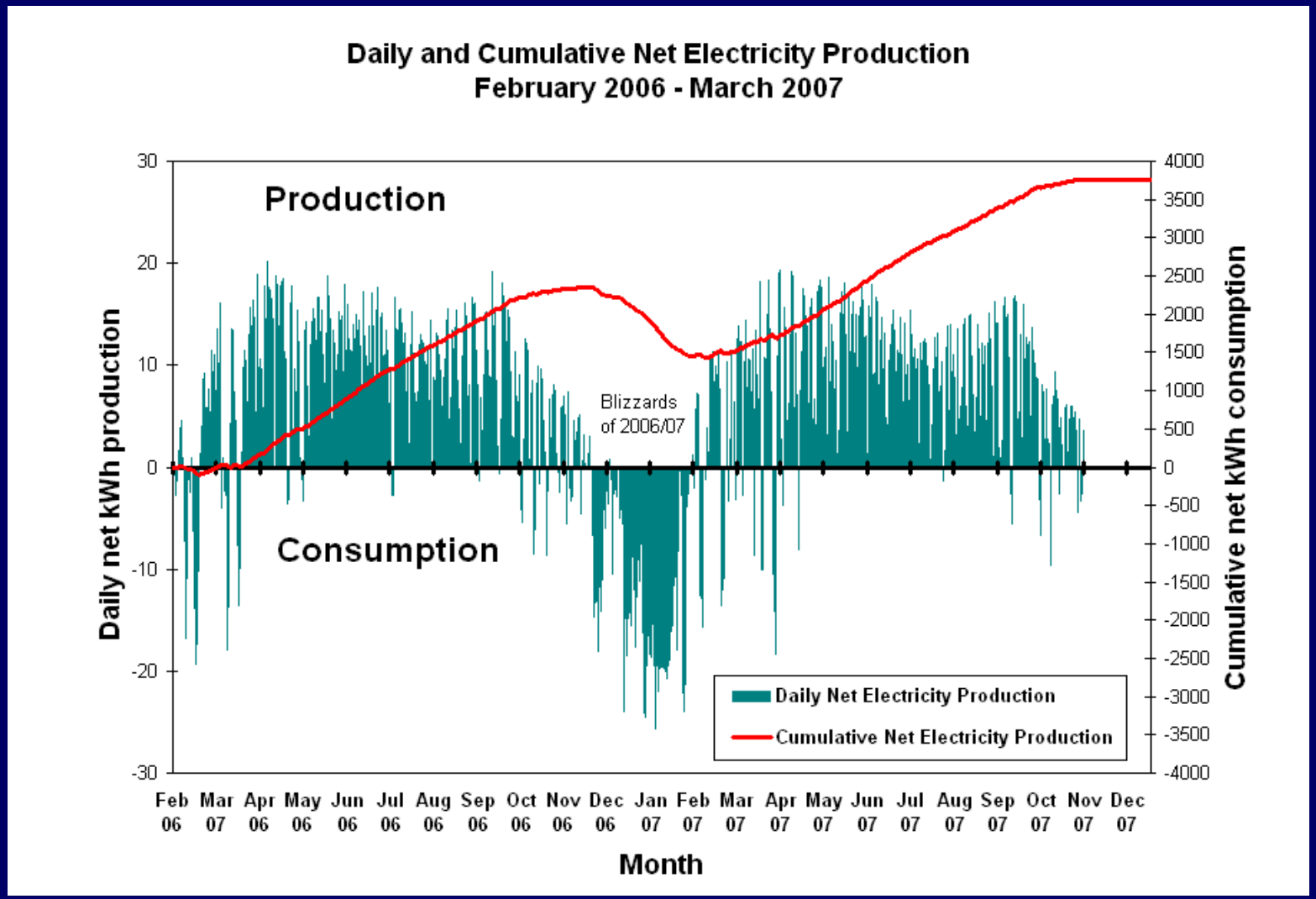

ENERGYGUIDE
Rinnai
Continuum
Model 2532

PV System

4 kW System

for net zero energy

NREL/Habitat ZEH Performance



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Zero Energy Retrofits

Can my existing home be converted to a Zero Energy Home?

Zero Energy Retrofits

Yes…. But it is expensive

Zero Energy Retrofits

Step 1: Do the most cost effective changes first.

How? …. Get some expert advice!

- Energy Audit
- Home Energy Rating (HERS)
- Home Performance with Energy Star (HPwES)

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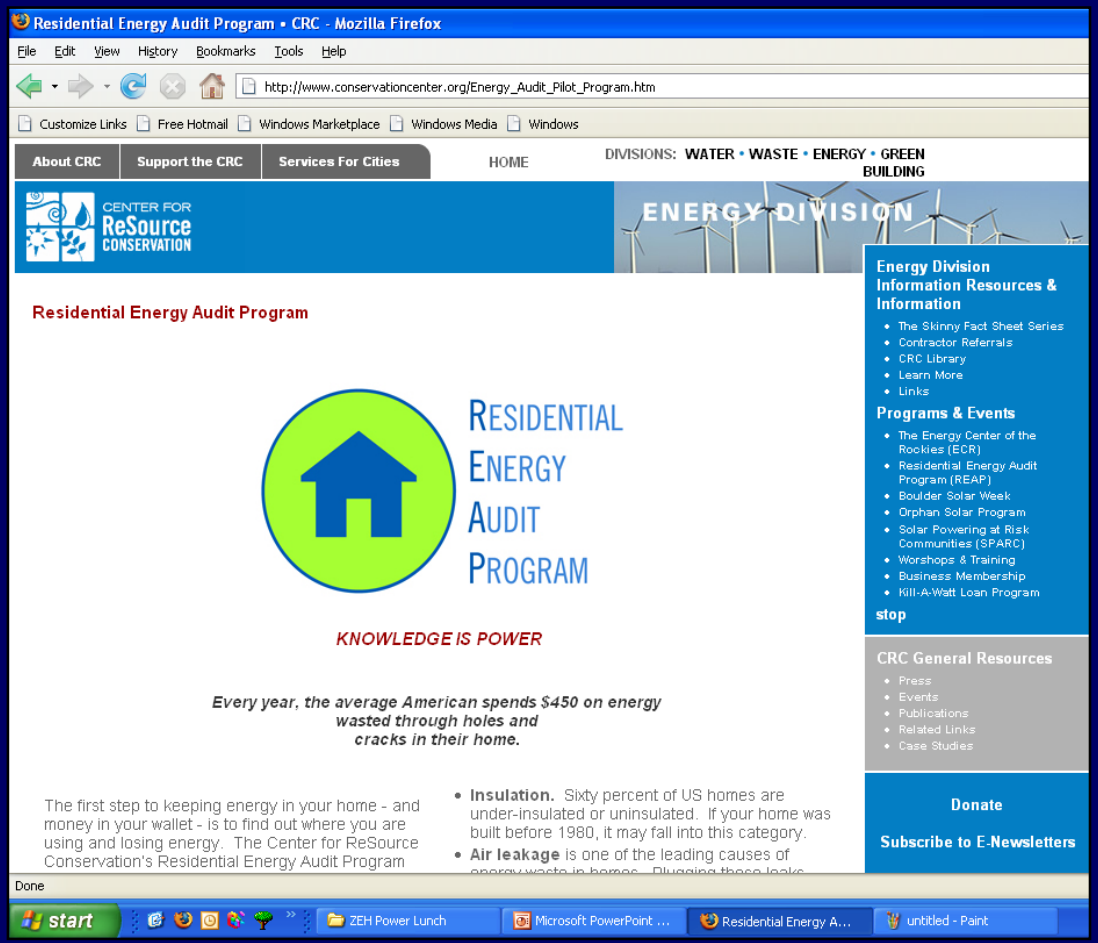
Residential Energy Audit

Example: Boulder, CO

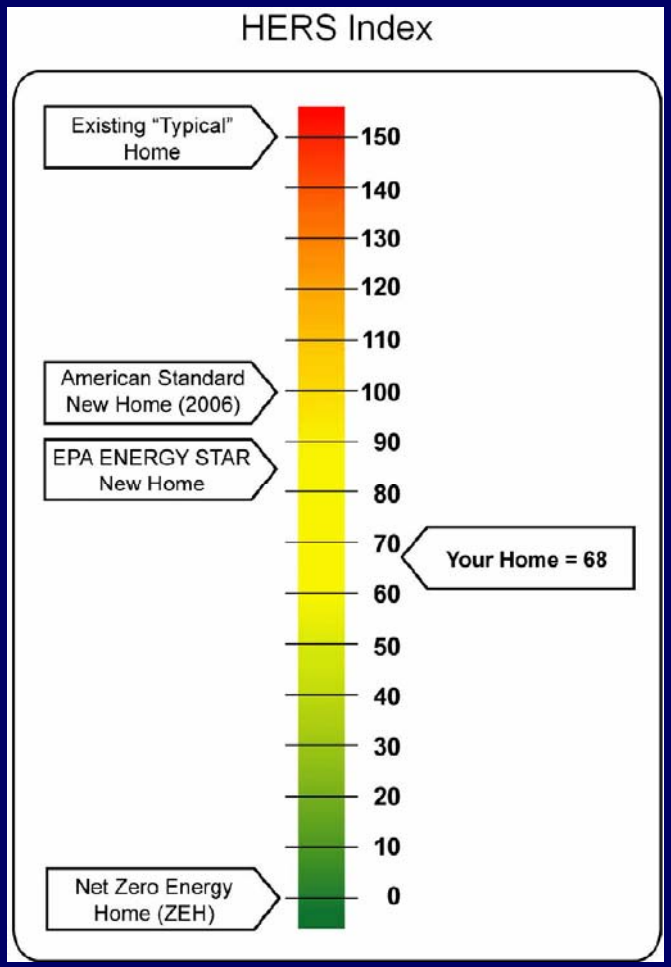
Audit cost $100

Includes blower door testing

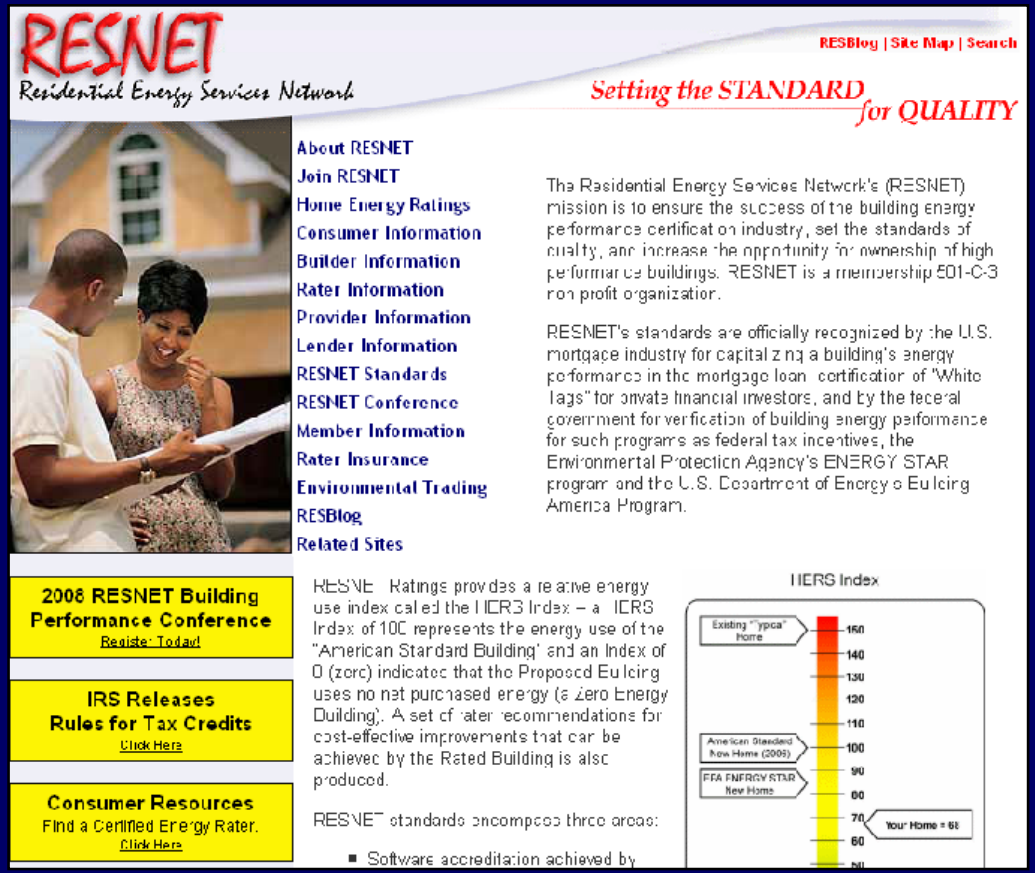
Produces report of most cost effective changes



HERS Rating and Projected HERS Rating



- Compares your home to IECC 2004.
- Can be used for Energy improvement Mortgage



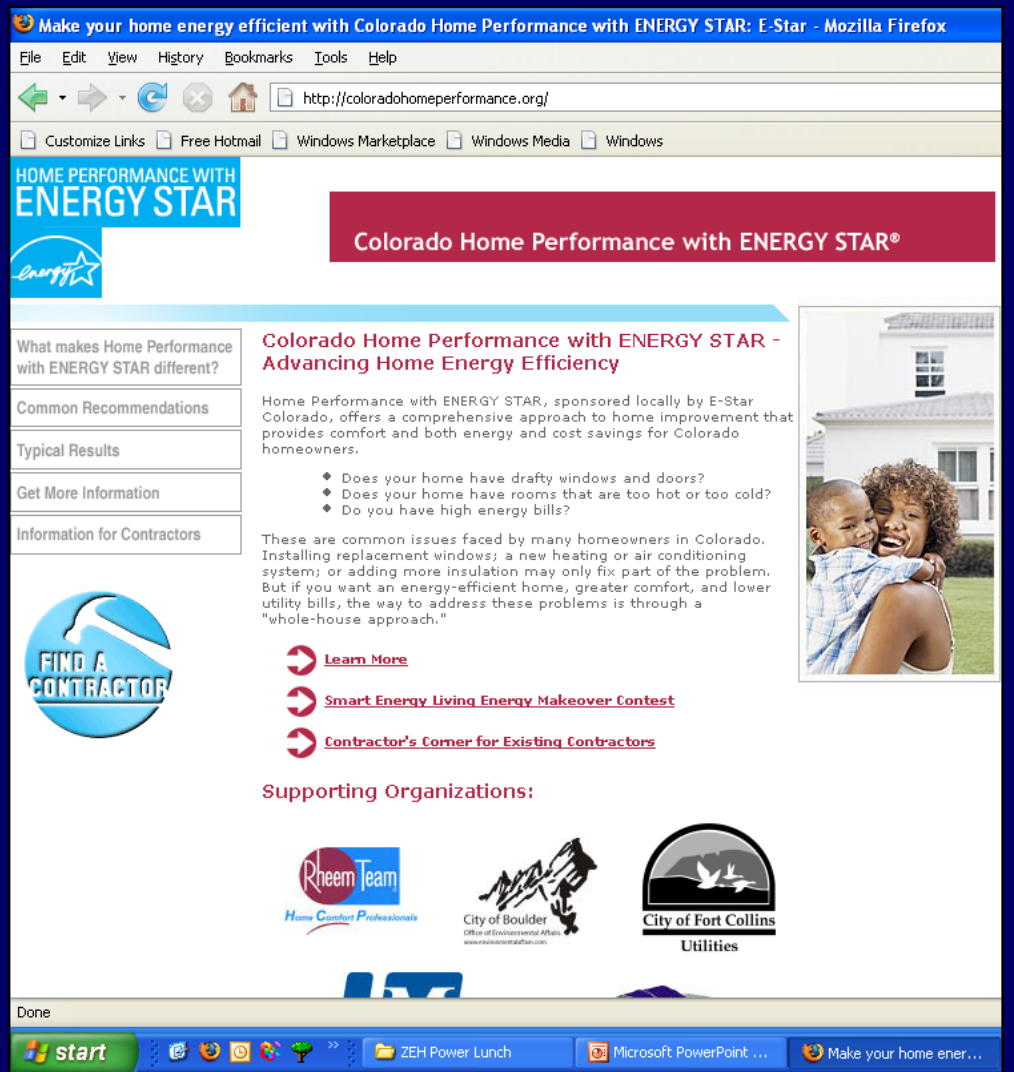
Home Performance with ENERGY STAR®

Contractor does home energy audit AND can perform the work

http://coloradohomeperformance.org

National average spent on an energy upgrade: $9,000

Average energy savings: 25%



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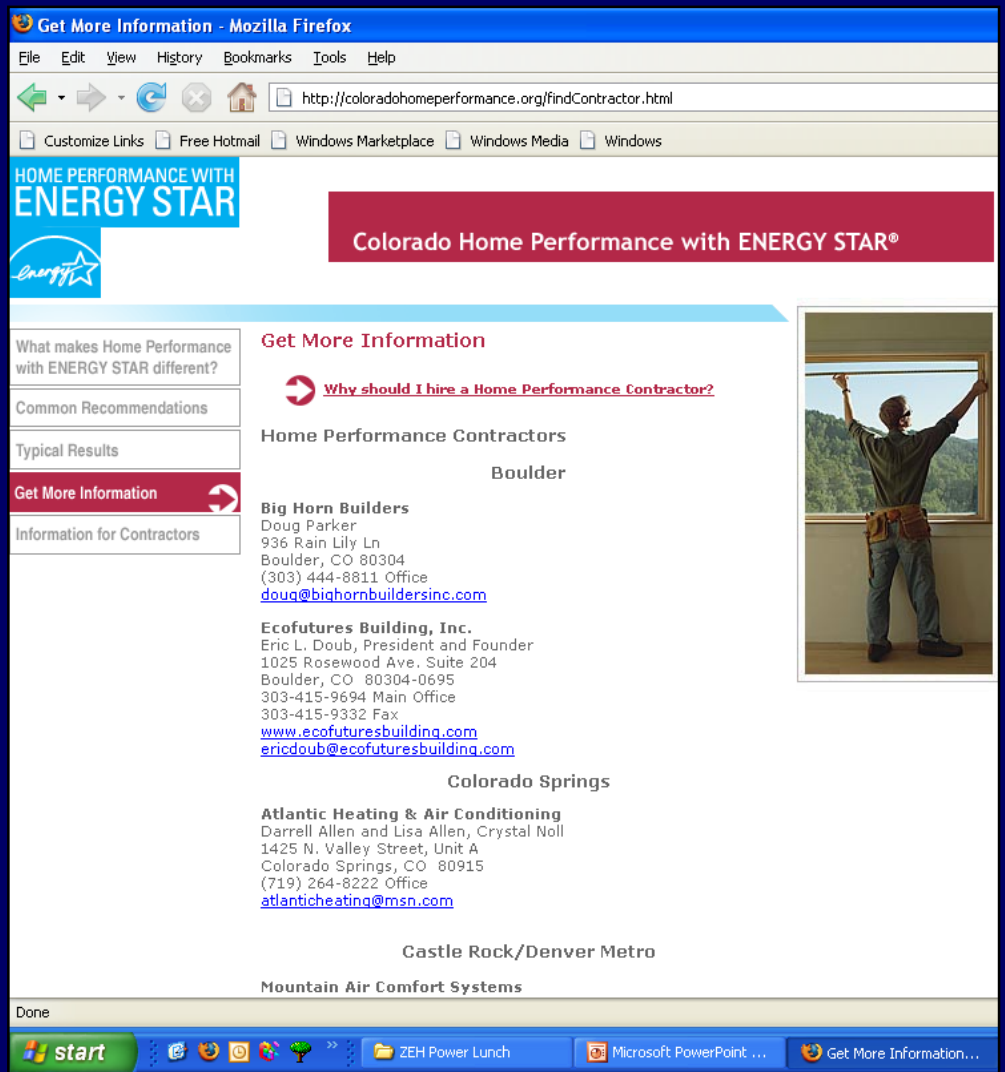
National average spent on an energy upgrade: $9,000

Average energy savings: 25%

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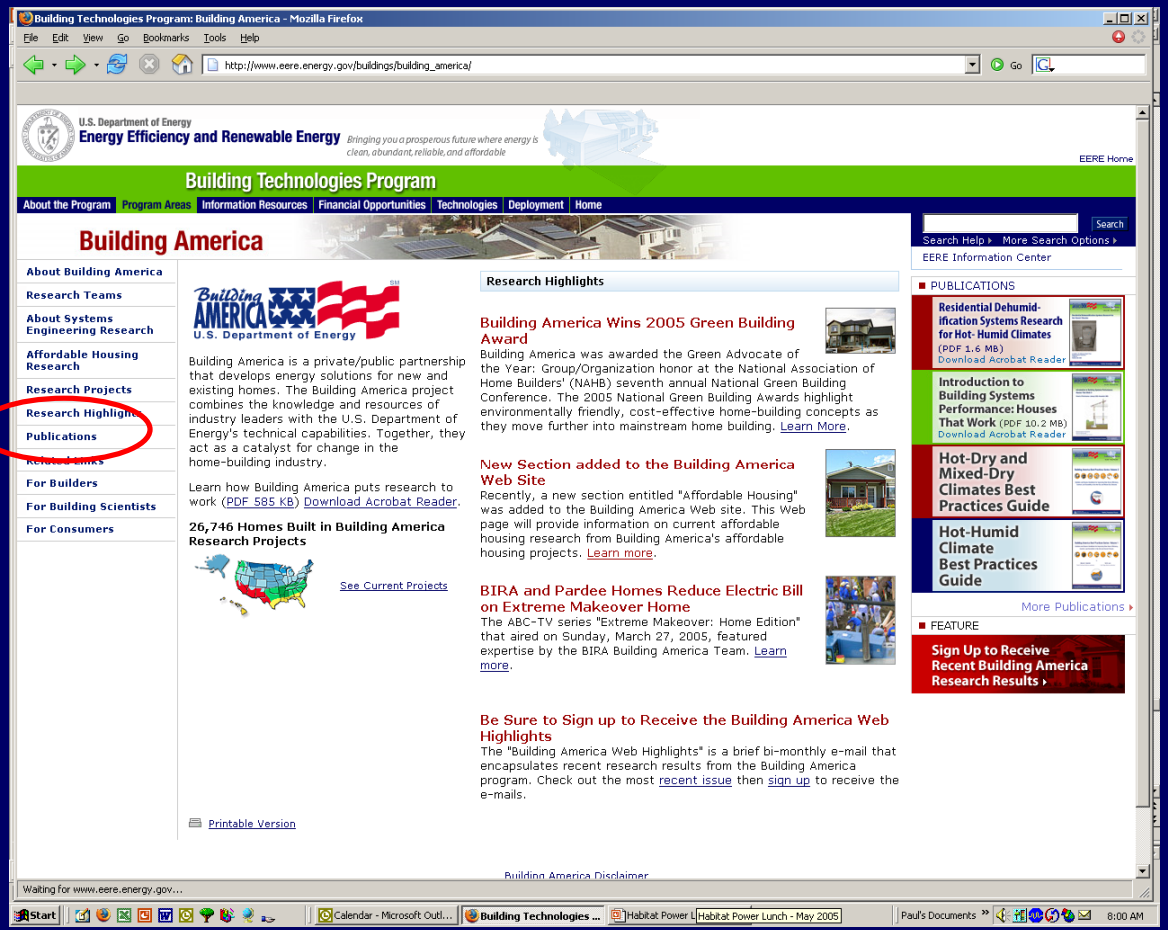
The Devil is in the details....

- What about using off-site renewable energy production?
- Site energy vs. source energy
- Use and offset natural gas?
- Utility issues
  - Intermittency of renewable energy
  - The power is supplied on an unscheduled basis
  - Peak demand is as important as energy production

Resources



Building America Website

www.BuildingAmerica.gov

Includes an extensive document database

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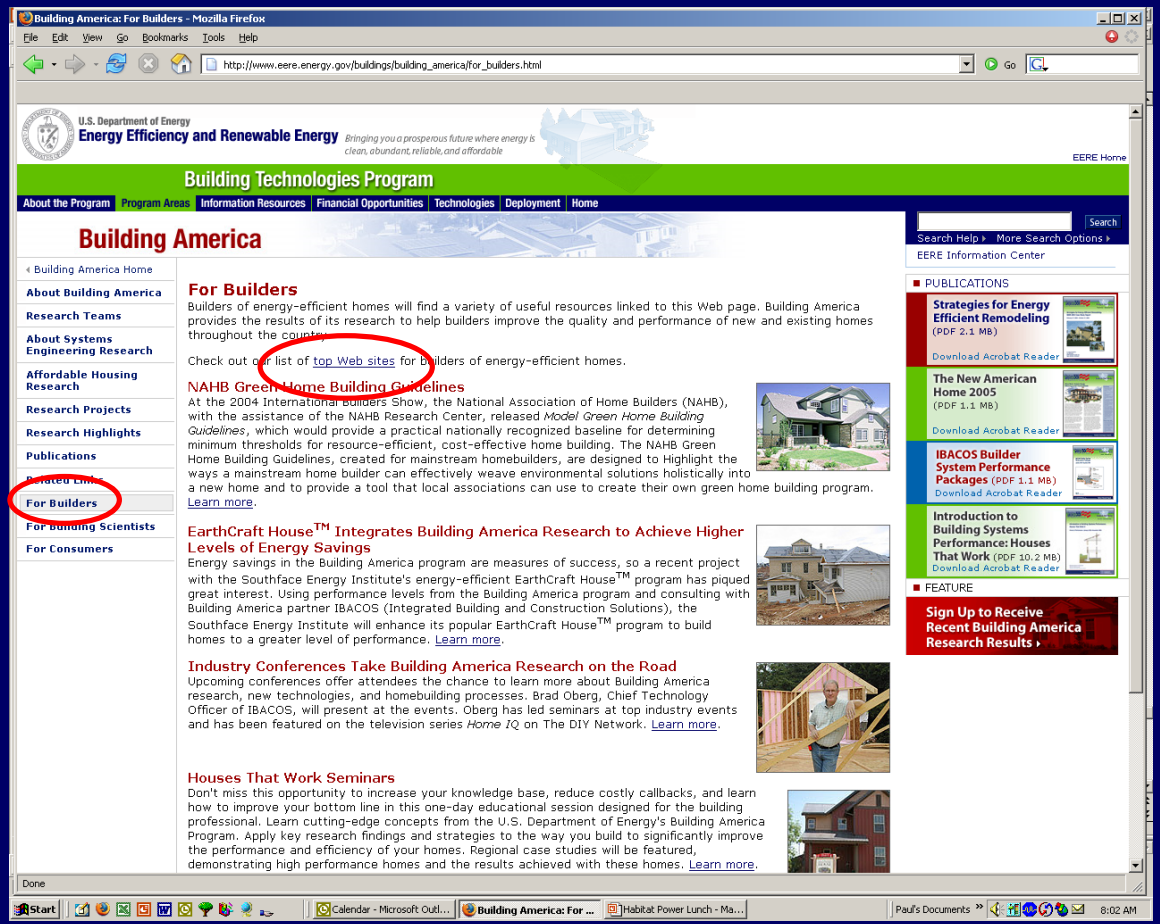
Resources



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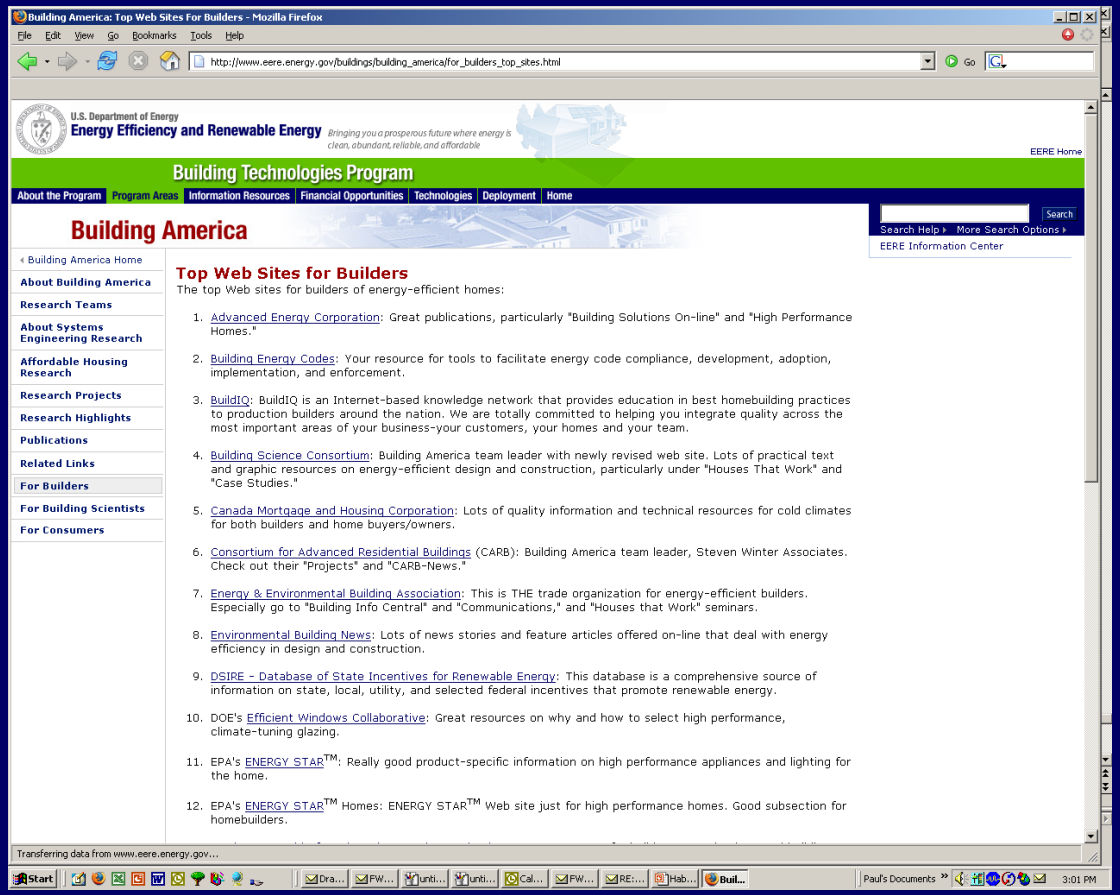
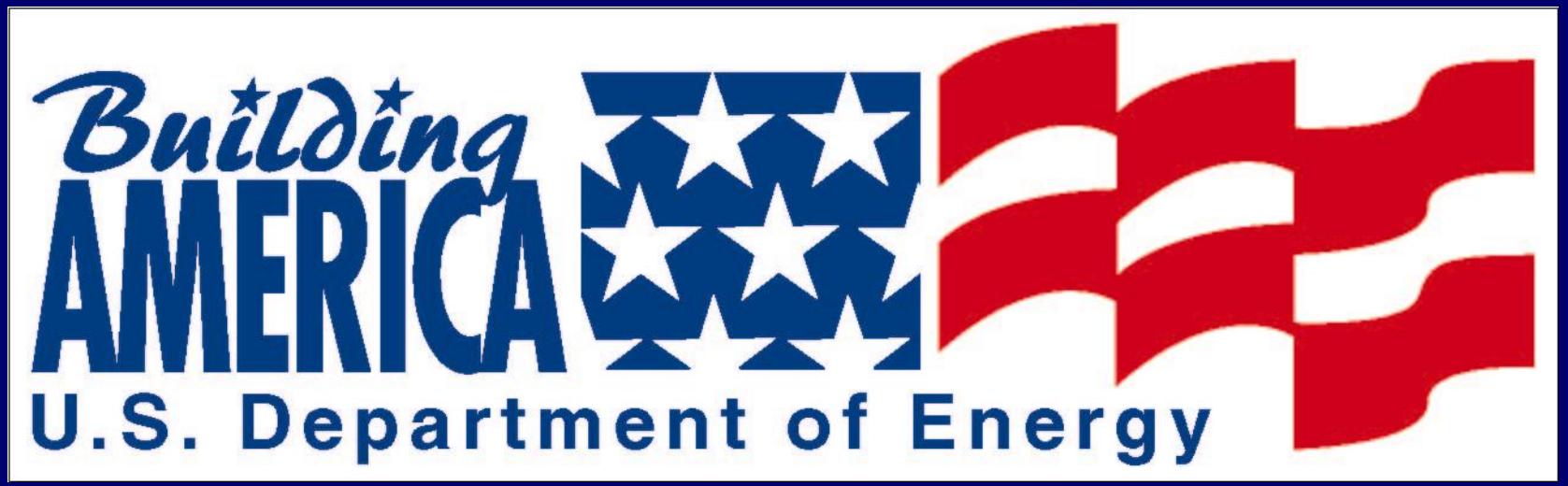


List of top 25 energy efficiency home design and construction web sites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Alphabet soup

ZEH
NZEH
NZEH
ZENH
ZEMH
ZEN

Alphabet soup

ZEH – Zero Energy Home
NZEH – Net Zero Energy Home
NZEH – Near Zero Energy Home
ZENH – Zero Energy New Homes (California)
ZEMH – Zero Energy Manufactured Homes
ZEN – Zero Energy Neighborhood

Passivhaus – Passive House (Germany)
Factor9 home – Canada
Green homes
Carbon neutral homes