Building Energy Efficiency 101

Cost-Effective Home Energy Saving Strategies for the 21st Century

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Northfield Public Library
March 29, 2007

Why should I care about cost-effective home energy saving strategies for the 21st century?

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Why should I care about cost-effective home energy saving strategies for the 21st century?

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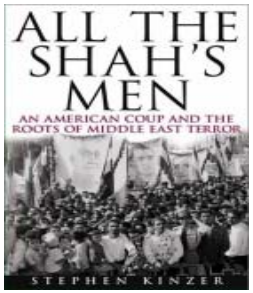
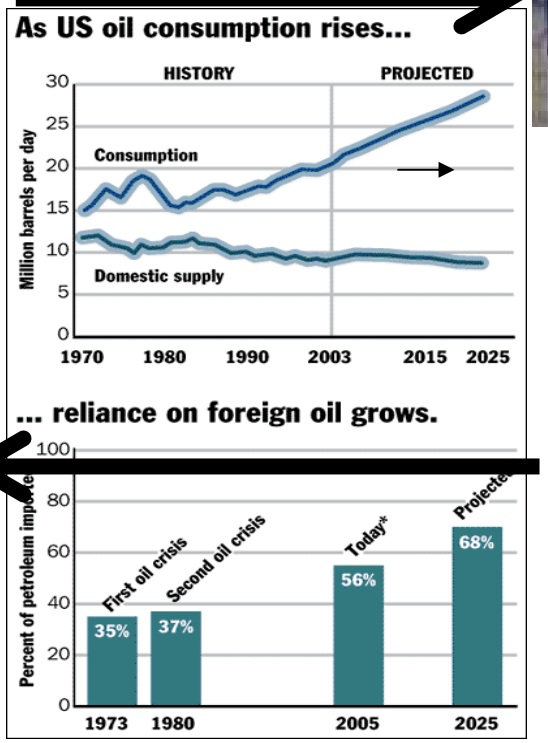
Energy Insecurity

CIA-engineered coup

1953





1977

Iran hostages

1979

Iraq hostages

2007

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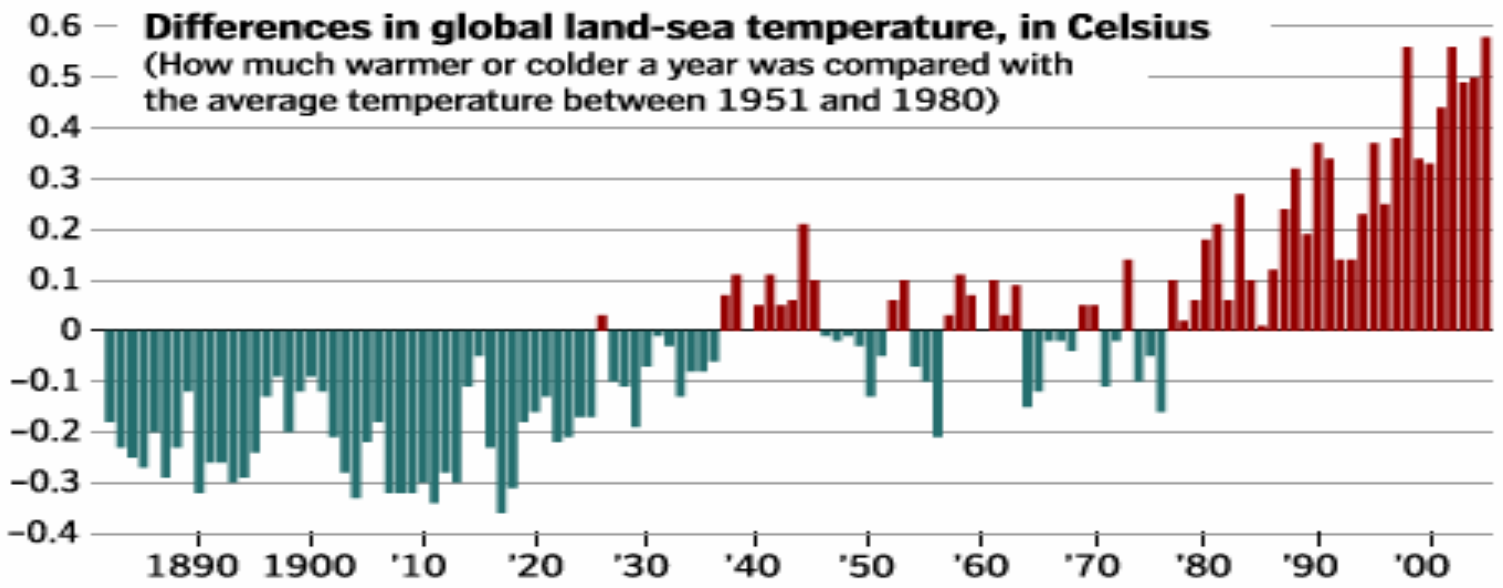
Global Climate Chaos

2005 Continues the Warming Trend

Year's Temperatures Are Among the Highest on Record, Scientists Announce
By Juliet Eilperin
Washington Post Staff Writer Friday, December 16, 2005



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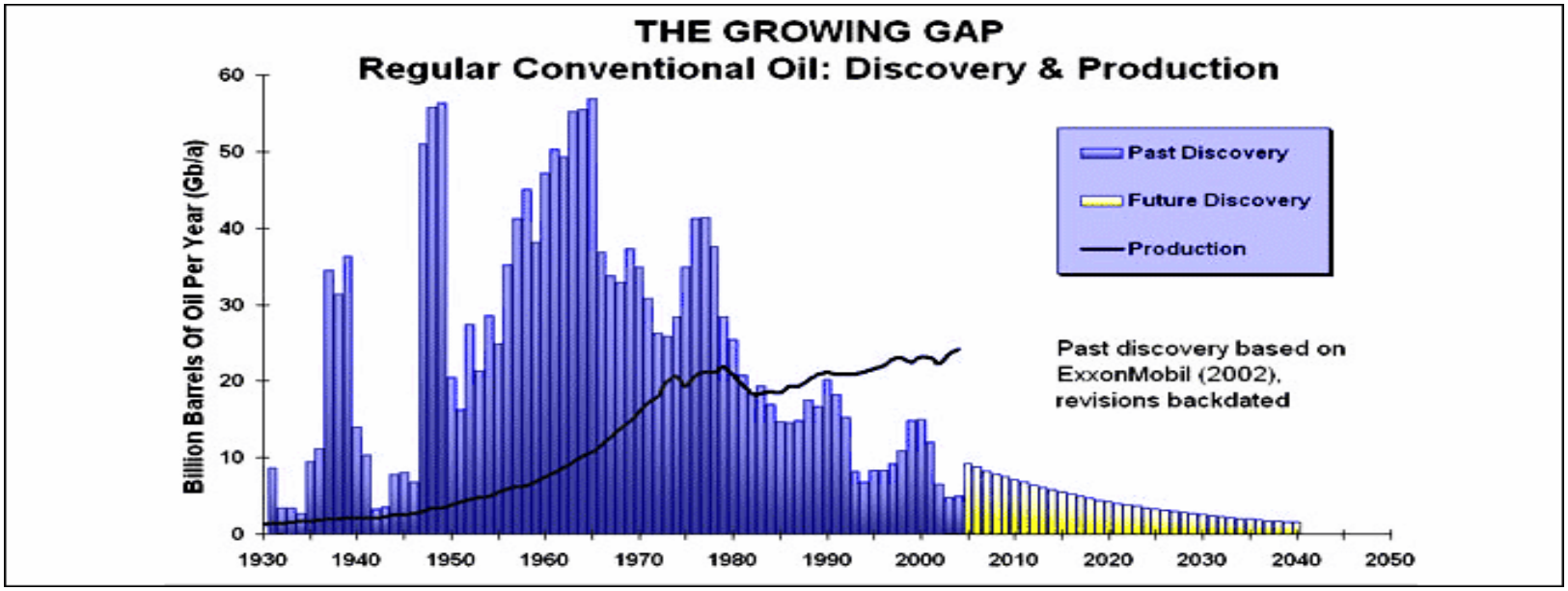
Peak Oil (and Natural Gas)

- **There were enormous early discoveries (in the Middle East) in the late 1930s and late 1940s**
- **Worldwide oil discovery peaked in 1964 and has been falling ever since**
- **Every year since 1984, we have discovered less oil than we have produced**
- **We currently find one barrel of oil for every four that we consume**

Past Discovery and Production Worldwide (ExxonMobil)

Source:
http://philhart.com/peak_oil.php



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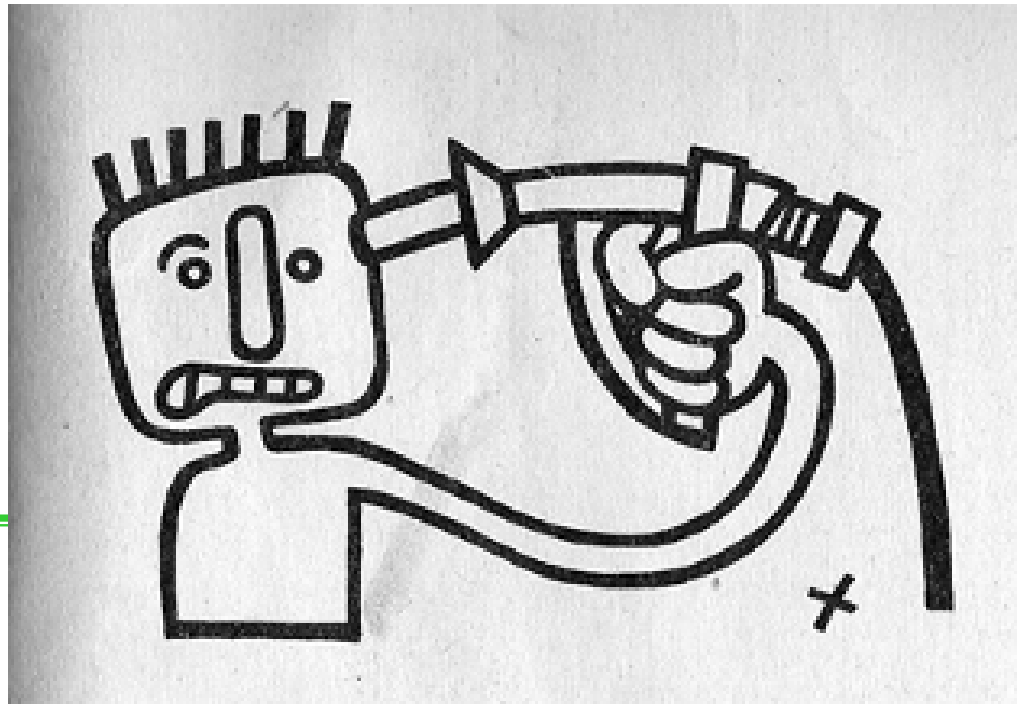
To ensure a secure, sustainable, thriving local future, we must address:

- Energy Insecurity
- Global Climate Chaos
- Peak Oil

We're playing **Russian Roulette with bullets in five chambers** on these issues



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Why should I care?

- **$$$ benefits for individuals and businesses**
- **Competitive advantage for proactive communities…**

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Why should I care?

- **Not to mention preserving a planet worth inhabiting for future generations**

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Cost-effective home energy saving strategies for the 21st century……

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So where to start?

EnergySmart Building Tips

- http://renewnorthfield.org/?page_id=335

1. Get a low-cost energy audit and implement as many of the recommendations as possible (see http://www.xcelenergy.com/XLWEB/CDA/0,3080,1-1-2_738_9855-217-5_449_778-0,00.html; call Xcel at 800 895-4999, or contact your local natural gas or electric utility if you are not an Xcel Energy customer).

So where to start?

EnergySmart Building Tips

- http://renewnorthfield.org/?page_id=335

2. Replace all of your frequently-used incandescent light bulbs with compact fluorescent light bulbs (CFLs). CFLs use only 25% to 30% as much electricity, provide as much light, last much longer than incandescents and can be found in styles that work in virtually any application, including recessed can light fixtures, outdoor floodlights, dimmable fixtures, three-way lamps, etc. (See http://www.energystar.gov/index.cfm?c=cfls.pr_cfls, or order bulbs online from Xcel Energy at http://www.xcelenergy.com/XLWEB/CDA/0,3080,1-1-2_738_9850-363-5_449_778-0,00.html.)

So where to start?

EnergySmart Building Tips

- http://renewnorthfield.org/?page_id=335

3. Choose only Energy Star lights and appliances, including heating and cooling equipment (http://www.energystar.gov), and choose from among the BEST Energy Star appliances. (For example, one can buy Energy Star clothes washers of comparable capacity – about 3.3 cubic feet — that use anywhere from about 4,900 gallons of water per year to over 9,000 gallons per year.)

So where to start?

EnergySmart Building Tips

- http://renewnorthfield.org/?page_id=335

4. Use a programmable thermostat to keep your home at 55 to 60 degrees while you sleep and your home is empty during the day (or simply adjust it manually). The lower the temperature, the more you save.

So where to start?

EnergySmart Building Tips

- http://renewnorthfield.org/?page_id=335

5. During the heating season, open the blinds or shades on the south side of your home on sunny days for passive solar gain (and on the east side during the morning and the west side in the afternoon). Close all blinds and shades at night to reduce heat loss.

So where to start?

EnergySmart Building Tips

- http://renewnorthfield.org/?page_id=335

6. Manage your home to minimize solar gain on hot summer days: close blinds and shades on the east side of your home in the morning, and the west side in the afternoon.

So where to start?

EnergySmart Building Tips

- http://renewnorthfield.org/?page_id=335

7. Use low-flow shower heads to reduce water consumption and water-heating costs. (See http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=13050.)

So where to start?

EnergySmart Building Tips

- http://renewnorthfield.org/?page_id=335

8. Install water-saving toilet(s) in your home, such as the dual flush Caroma (http://www.naturalbuilthome.com/index.php?page=shop.browse&category_id=139&option=com_virtuemart&Itemid=38) or the pressure-flush Flushmate (http://www.flushmate.com/index.asp).

So where to start?

EnergySmart Building Tips

- http://renewnorthfield.org/?page_id=335

9. Once you've made your new (or existing) home as energy-efficient as you feel is economically possible, consider installing solar water-heating equipment, solar electric (photovoltaic) and/or a small wind system to get as close as possible to zero net purchased energy (http://www.eere.energy.gov/buildings/info/documents/pdfs/35317.pdf). (For information on home-scale solar systems, start at http://www.state.mn.us/portal/mn/jsp/content.do?subchannel=-536881511&programid=536885396&id=-536881350&agency=Commerce&sp2=y , and for info on small wind systems, see http://www.windustry.org/SmallWind/default.htm.)

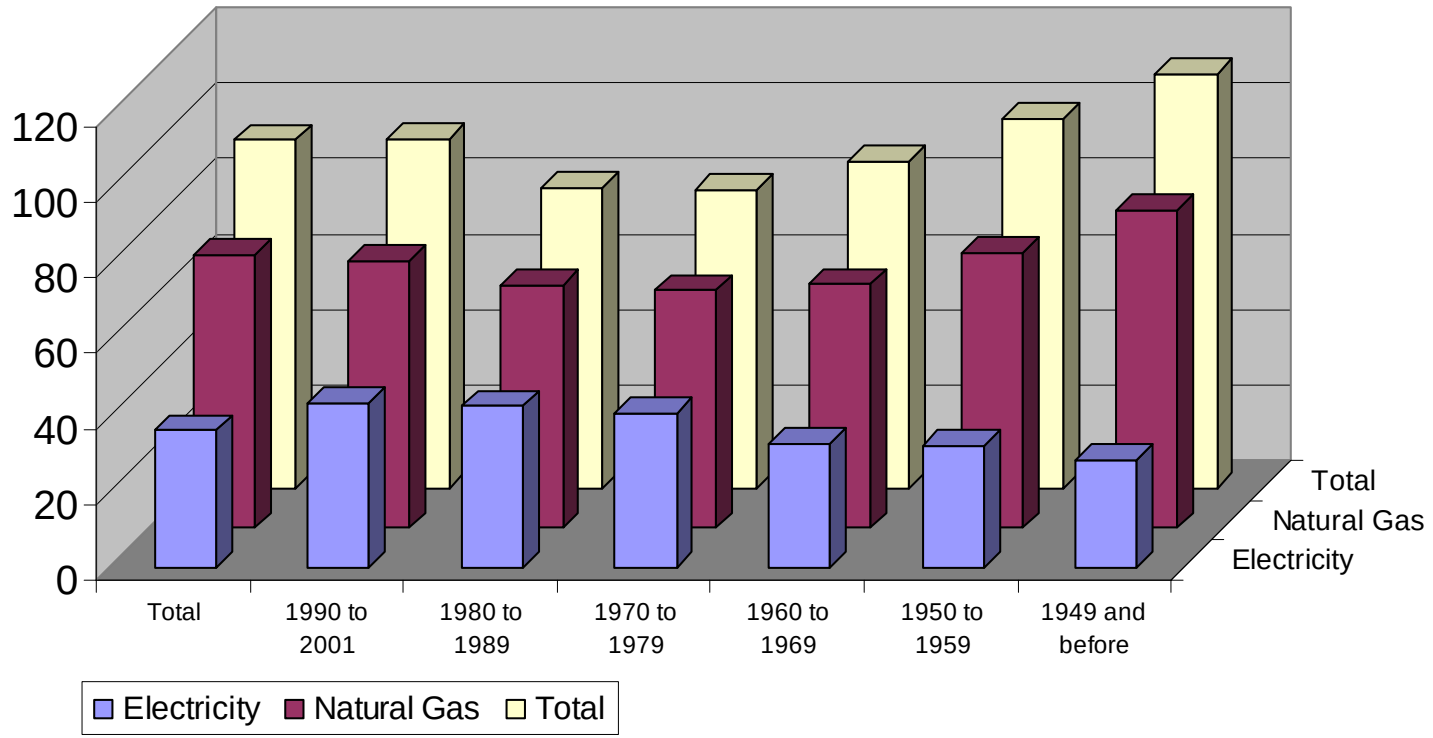
So where to start?

EnergySmart Building Tips

- http://renewnorthfield.org/?page_id=335

10. Buy green power (http://www.eere.energy.gov/greenpower/buying/buying_power.shtml?state=MN) to offset all of your electricity use. Xcel Energy's Windsource program (http://www.xcelenergy.com/XLWEB/CDA/0,3080,1-1-2_735_11612-3320-5_449_778-0,00.html) will cost you roughly an additional $0.013 per kWh.

Energy consumption in U.S. houses by year of construction (millions of Btus)



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Source: www.eia.doe.gov

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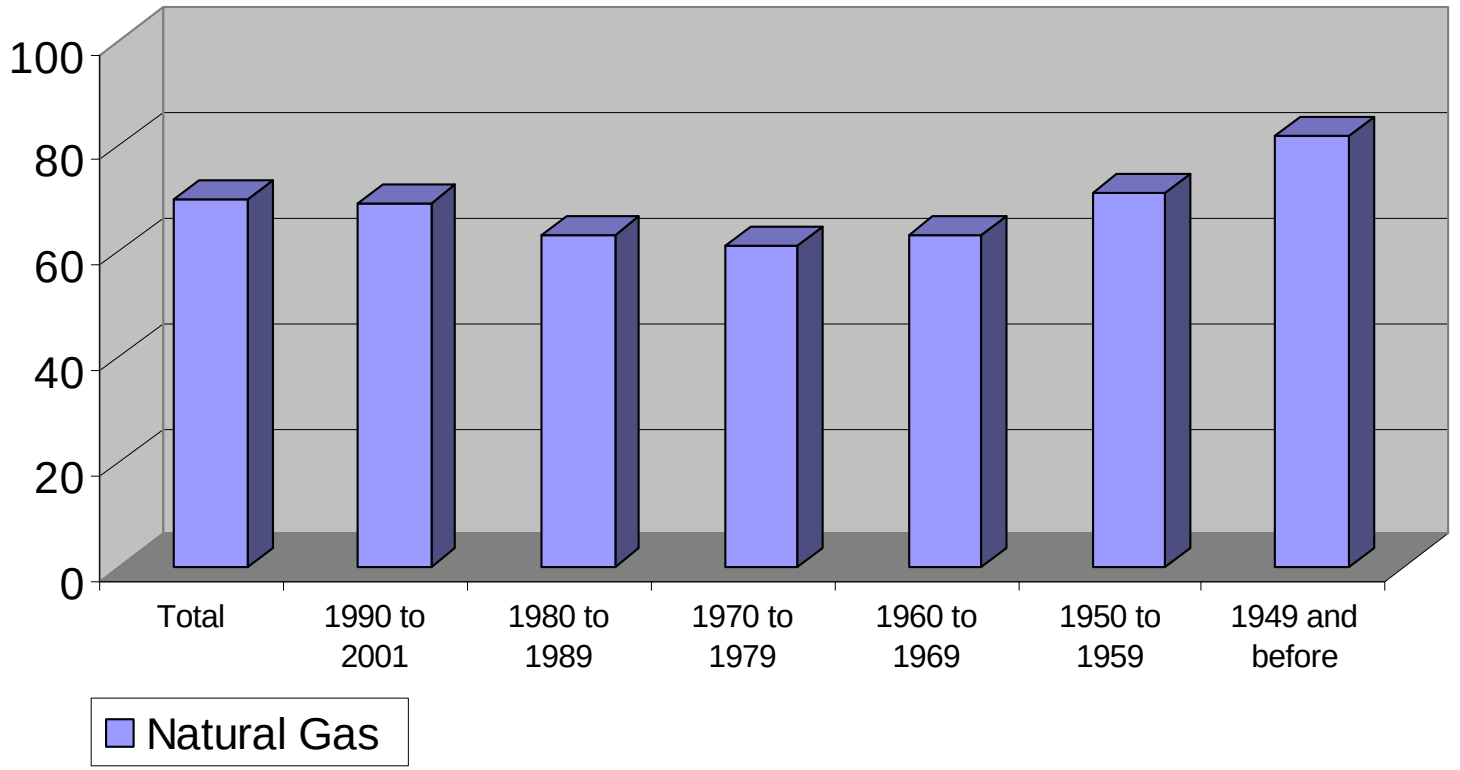
Natural gas consumption in U.S. houses by year of construction (thousands of cubic feet)



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Source: www.eia.doe.gov

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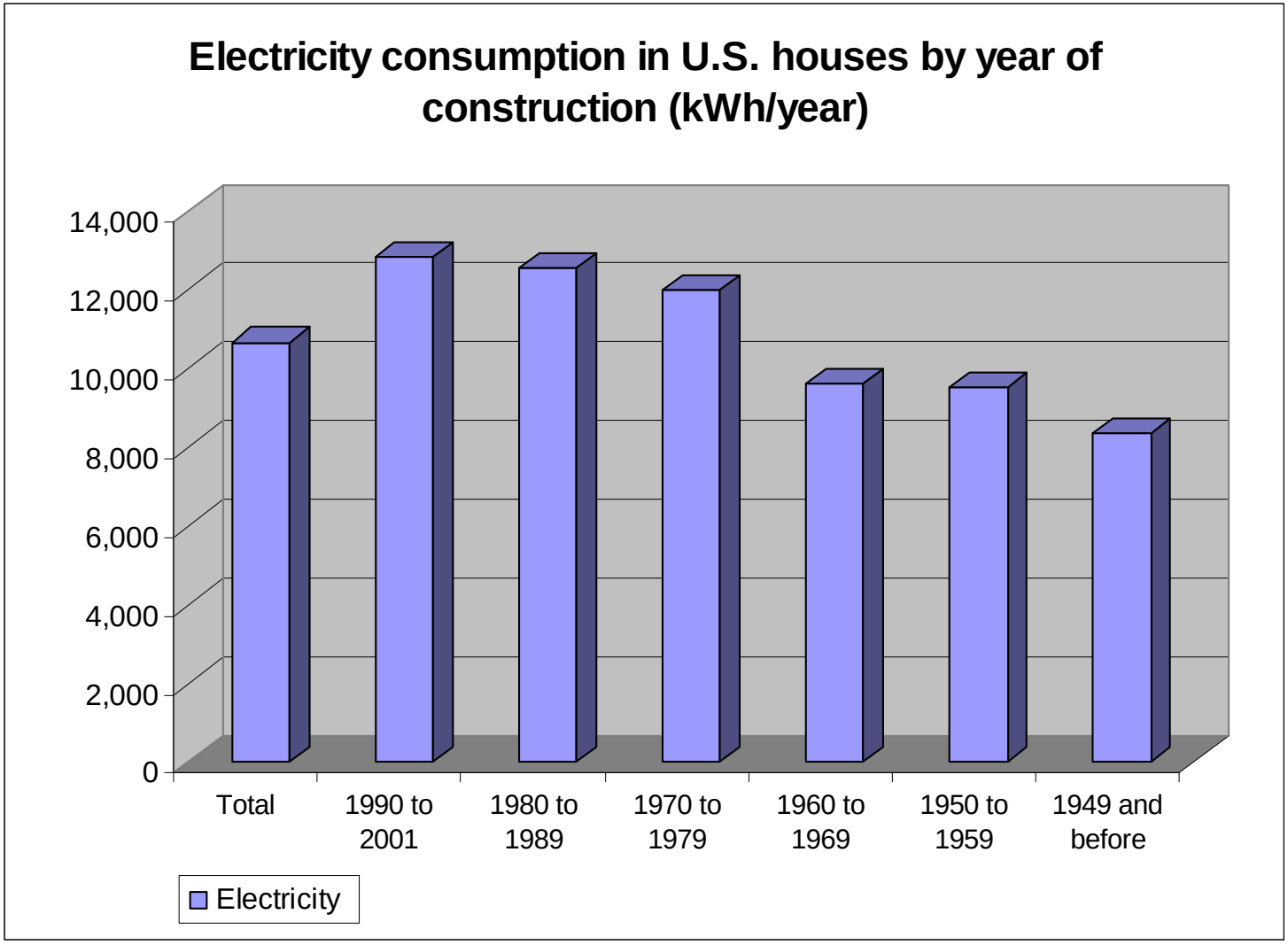

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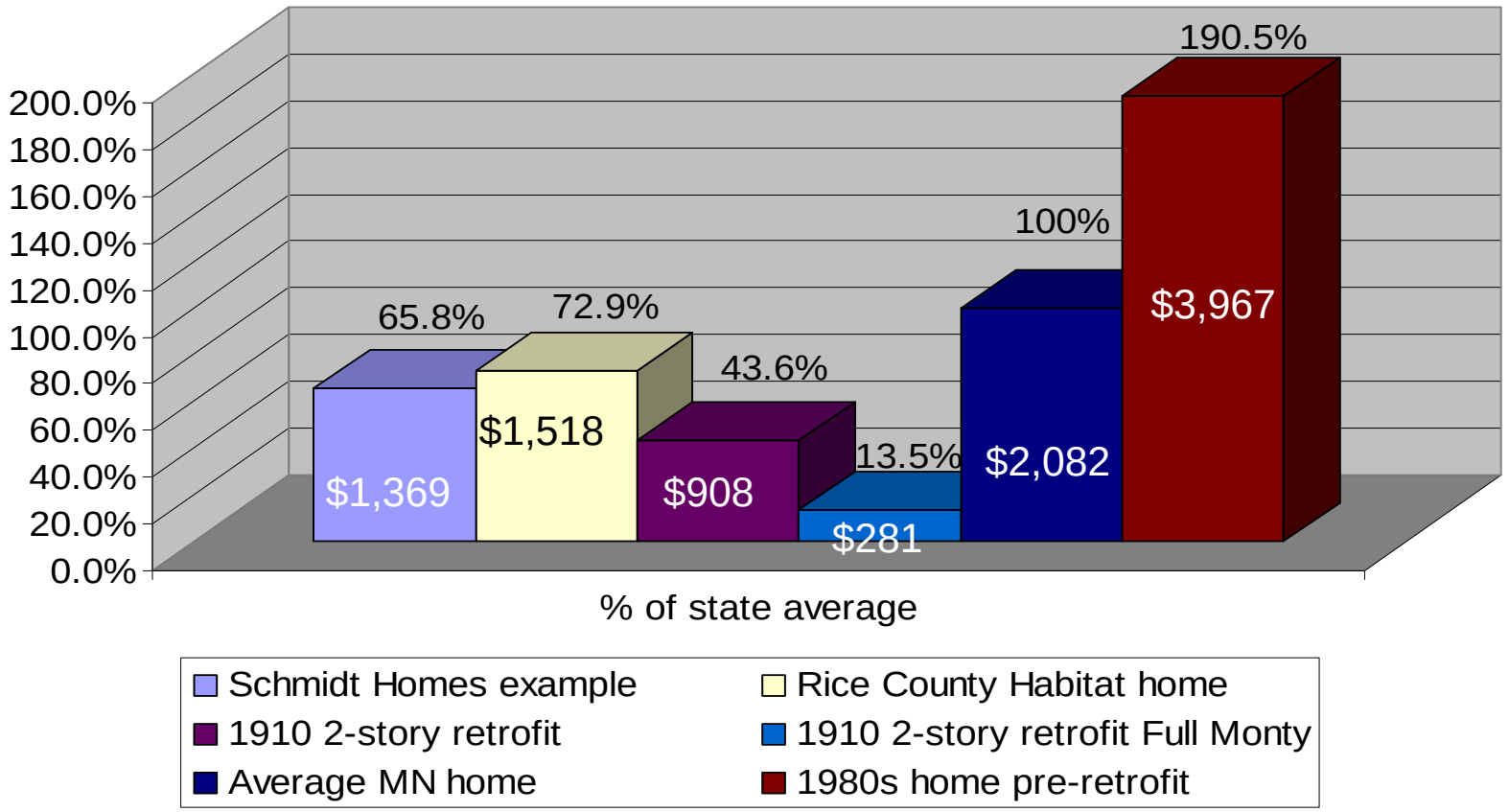
Source: www.eia.doe.gov

Comparative annual energy cost in several homes (natural gas and electricity combined)



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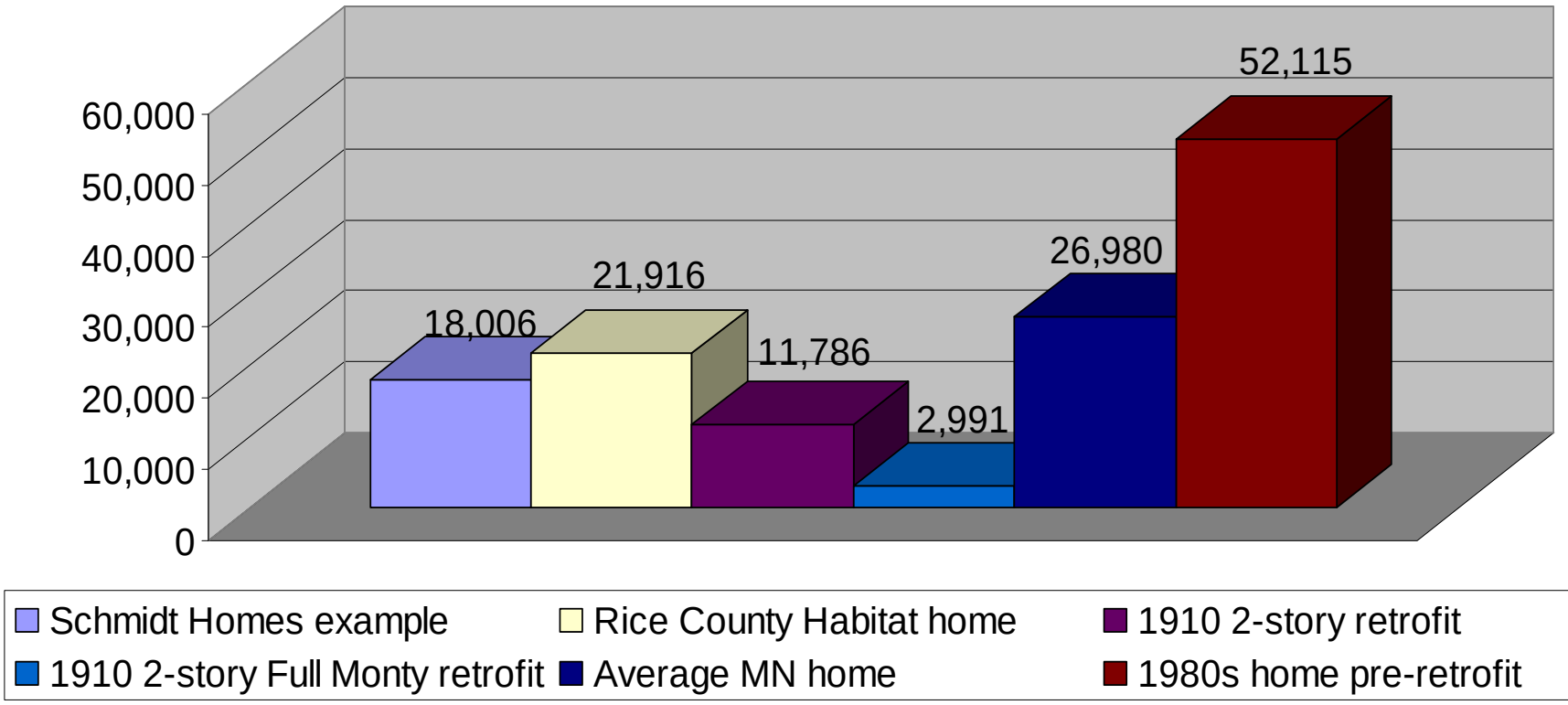
Annual carbon dioxide emissions from several sample homes (lbs)



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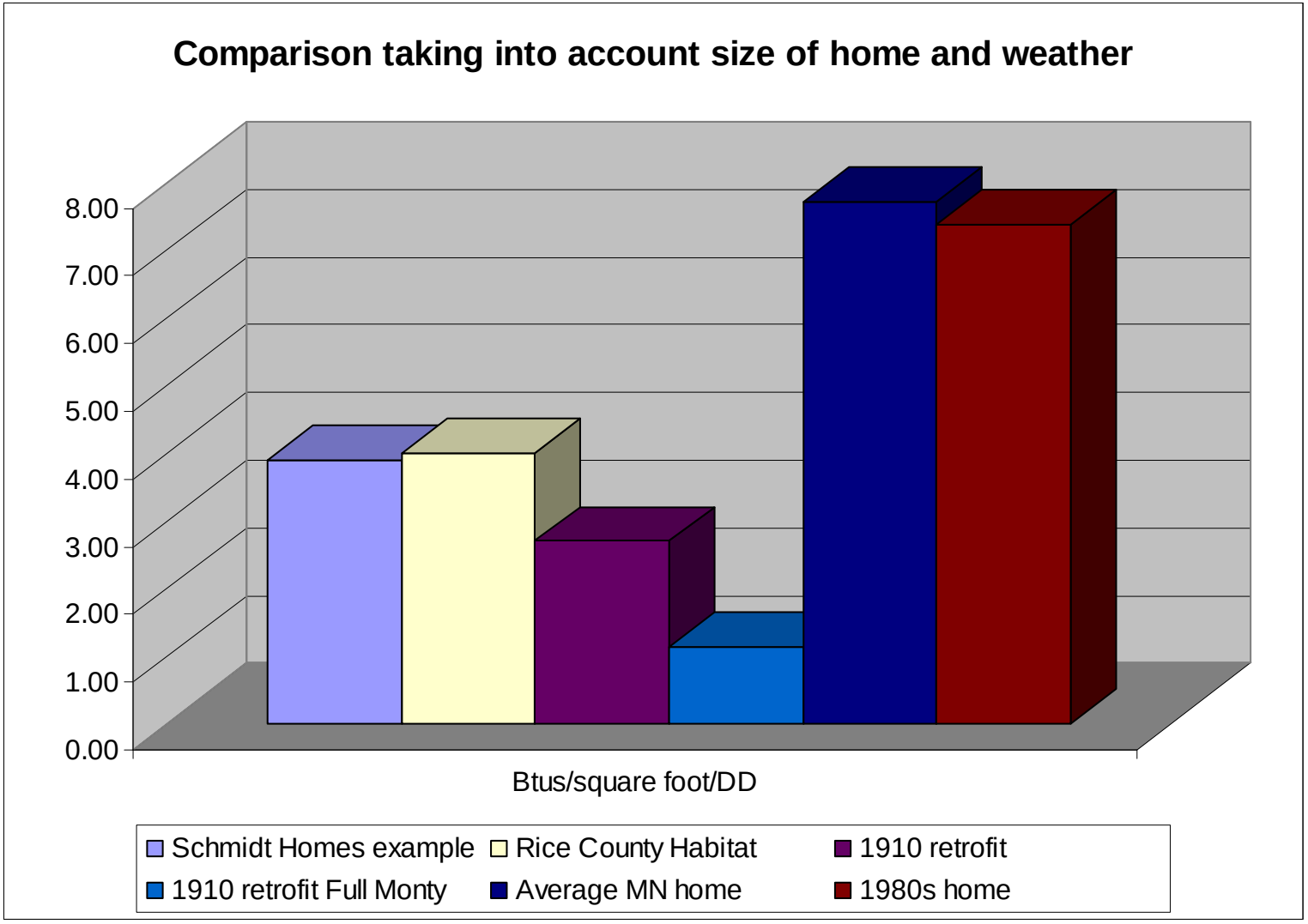
= 14,673 lbs per year



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Rice County Habitat for Humanity:
Affordability with comfort and energy efficiency

Habitat for Humanity International has built more than 225,000 houses around the world, providing more than 1 million people in more than 3,000 communities with safe, decent, affordable shelter.

Volunteers for the local chapter have built 12 homes in Rice County since 1993 in partnership with the owner-occupants of the homes.

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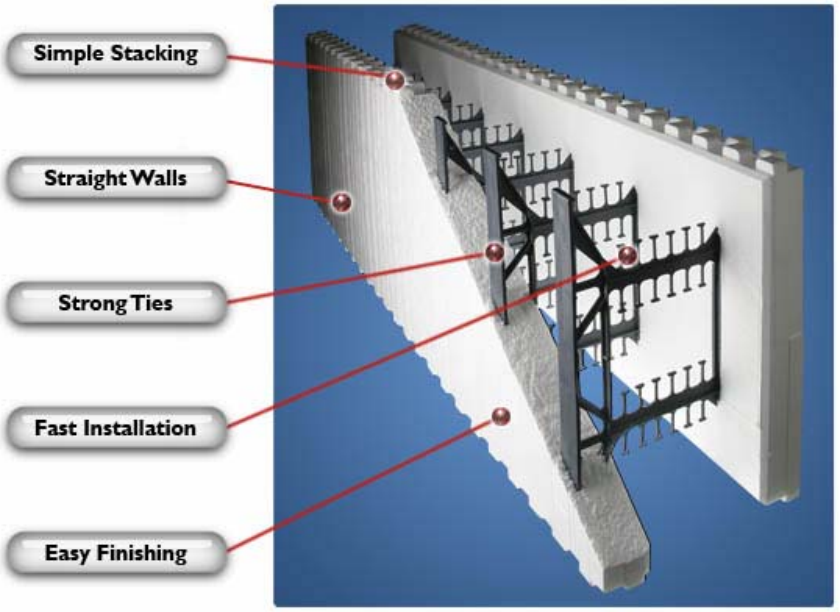
Rice County Habitat for Humanity:
Affordability with comfort and energy efficiency

- Insulated concrete form construction

Reward Wall Systems



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Rice County Habitat for Humanity:
Affordability with comfort and energy efficiency

- Careful sealing of all envelope penetrations
- Energy Star windows and doors
- Energy Star furnace
- Power vented water heater
- Energy recovery ventilation
- No air conditioning

ENERGY STAR

BUY PRODUCTS THAT MAKE A DIFFERENCE
U.S. Environmental Protection Agency • U.S. Department of Energy

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Rice County Habitat for Humanity:
Affordability with comfort and energy efficiency

Results (home in Faribault;1,120 square feet plus 1,120 square foot finished basement; built several years ago):

- Extremely tight construction (blower door test result of 650 CFM50, or 0.10 natural air exchanges)
- Natural gas use of only about $37/month

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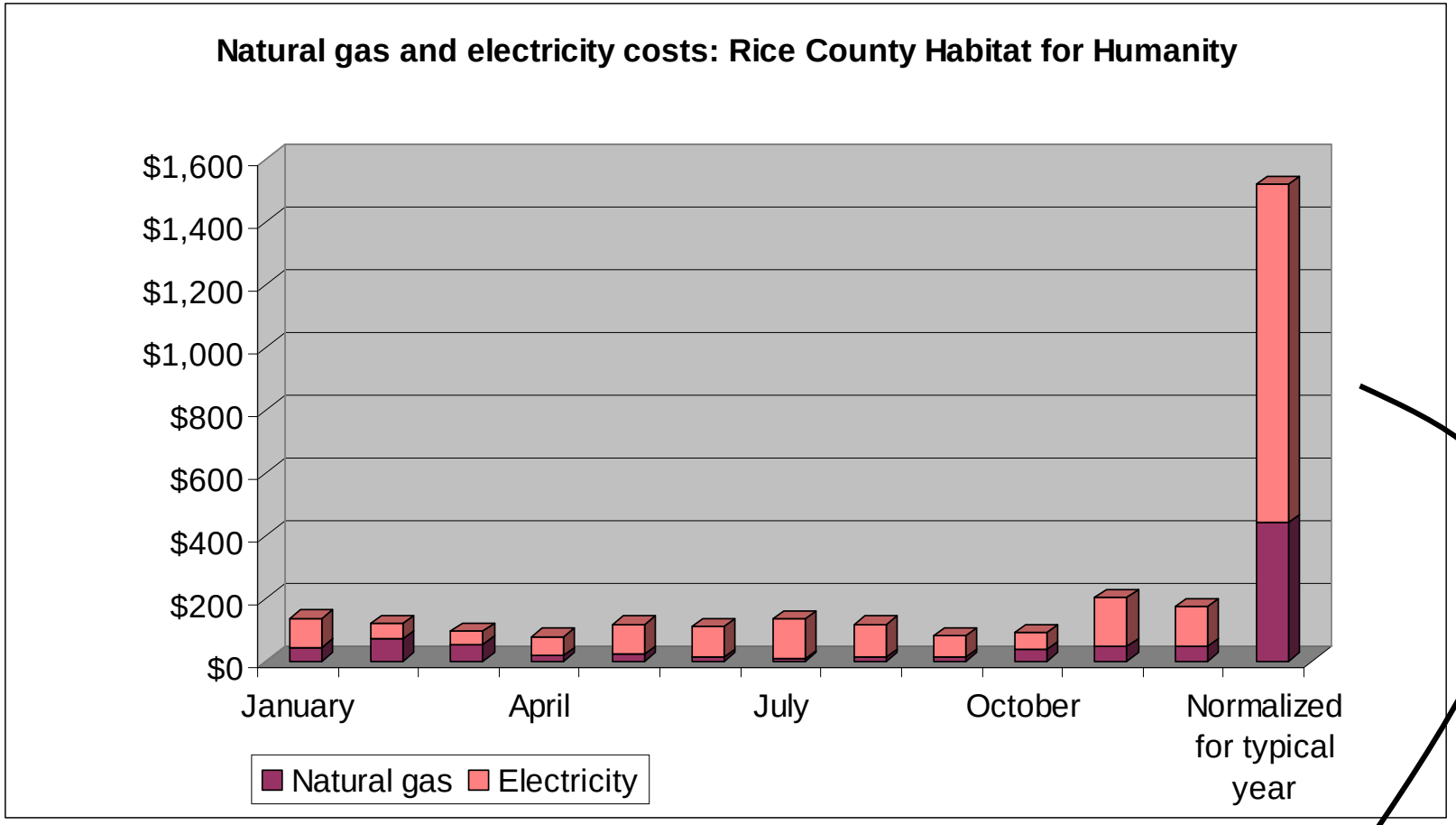
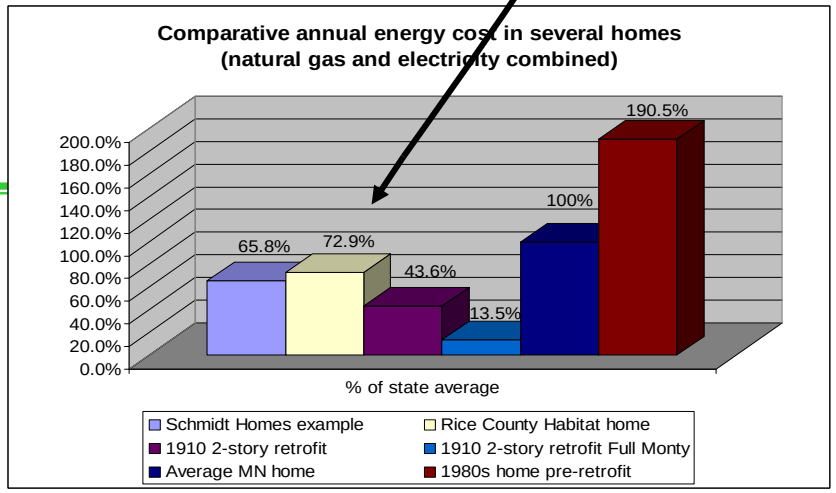
Rice County Habitat for Humanity:
Affordability with comfort and energy efficiency

Results (home in Faribault;1,120 square feet plus 1,120 square foot finished basement; built several years ago):

Electricity use is somewhat high, due primarily to:

- Use of electric space heaters(s)
- Fairly extensive use of inefficient window air conditioner(s)
- Highlights importance of occupant lifestyle/energy use decisions





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Schmidt Homes:
Energy Star Partner

100%

Since 2005, Schmidt Homes has committed to building 100% of its homes to federal Energy Star standards.

Homes that earn the Energy Star rating must meet guidelines for energy efficiency set by the U.S. Environmental Protection Agency. Energy Star qualified homes are at least 15 percent more energy-efficient than homes built to the 2004 International Residential Code (IRC).

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Schmidt Homes:
Energy Star Partner

Some of the standard features found in Schmidt Homes include:

- R-46 attic insulation
- High-efficiency furnaces and air conditioners
- Double-pane low-E inert gas-filled windows
- Attention to detail in sealing air leaks. Foam insulation, duct sealing, Tyvek wrap with taped seams and caulked wall-to-floor connections, careful caulking, weather-stripping and gaskets reduce drafts, improve comfort and energy-efficiency, and ensure building shell durability
- Heat recovery ventilation systems.

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Schmidt Homes:
Energy Star Partner

Results (representative home in Northfield built in 2006; about 1,300 square feet):

- Extremely tight construction: third-party certification of this house at 650 CFM50 (similar to the Habitat home described above)
- Annual natural gas cost of about $728 ($61/month), or 38.4% lower than the average MN home
- Combined annual natural gas and electricity cost of $1,369 ($114/month), or 34.2% lower than the average MN home

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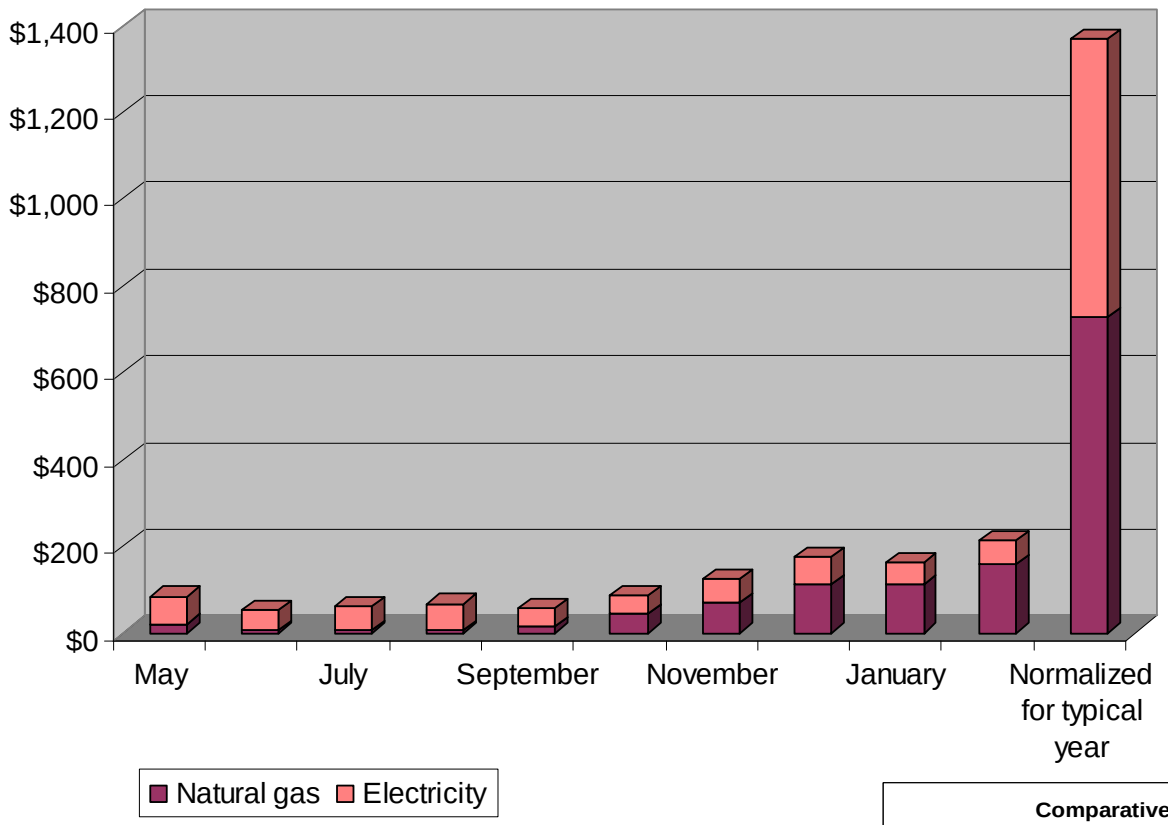
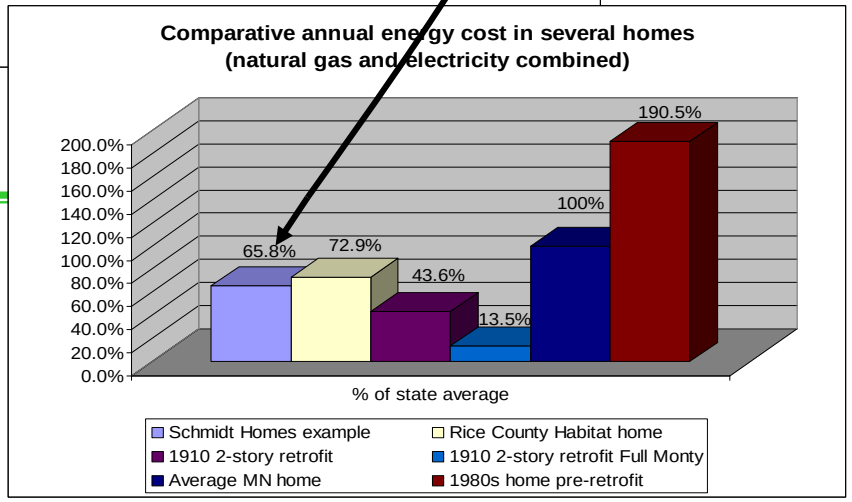
Natural gas and electricity costs: Schmidt Homes





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1910 2-story retrofit:
Bringing an old home up to modern energy performance standards

Home had no insulation in side walls, minimal attic insulation, original windows and doors when purchased in 1993. Furnace had been replaced in 1987 with an 80% AFUE model.

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1910 2-story retrofit:
Bringing an old home up to modern energy performance standards

Immediately performed “emergency” energy measures in the summer of 1993:

- Sealed attic bypasses and insulated attic to R-60 with blown cellulose
- Dense-packed cellulose in side walls
- Weatherstripping and caulking
- Insulated water heater and pipes

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1910 2-story retrofit:
Bringing an old home up to modern energy performance standards

1996:

- Installed air-tight catalytic woodstove, which provides an average of 40% to 80% of annual space heating (depending on how ambitious the homeowner is in a given winter)

2007:

- Insulated basement with 2” extruded polystyrene (R-10)

1910 2-story retrofit:
Bringing an old home up to modern energy performance standards

Electricity-saving measures over time:

- Replaced essentially all incandescent light bulbs with CFLs
- Replaced refrigerator, dishwasher, and clothes washer with Energy Star units

The best way to predict

the future is to help create it

You **choose the future you want:**

a. 

...or

b. 

➲ ***Buy two 20 watt compact fluorescent light bulbs*** and

- ➲ **Save over the lifetime of the two bulbs**
- ➲ **Prevent 1,672 pounds of carbon dioxide from being released to the atmosphere and contributing to global climate change**

Better yet:

Replace *ALL* your bulbs with compact fluorescents!

A public service announcement from

RENew Northfield

http://www.renewnorthfield.org 507.645.7133 402 Washington St., Northfield, MN 55057

The best way to predict

the future is to help create it

You **choose the future you want:**

a. 

...or

ENERGY HOG

b. 

➲ ***Buy the most energy-efficient (and water-efficient!) Energy Star*** *(http://www.energystar.gov) clothes washer you can find* and

- ➲ **Save PER YEAR in energy and water costs**
- ➲ **Prevent about 785 pounds of carbon dioxide from being released to the atmosphere annually and contributing to global climate change**
- ➲ **Save as much as *10,000* gallons of water annually**

Better yet: *When it is time to do so,*

Replace *ALL* your appliances with the most energy-efficient appliances you can find.

Money Isn't All You're Saving

ENERGY STAR

A public service announcement from

RENew Northfield

http://www.renewnorthfield.org 507.645.7133 402 Washington St., Northfield, MN 55057

1910 2-story retrofit:
Bringing an old home up to modern energy performance standards

Results (1,728 square feet of conditioned space on first and second floor; 840 square feet of unconditioned basement):

- Blower door test yielded results of about 1,600 CFM50, or about 0.22 natural air changes per hour
- Natural gas use was about 9.4% below MN average before woodstove was installed
- After installation of woodstove, natural gas declined dramatically: in 2006, natural gas consumption was about $513 ($43/month), or about 56.7% less than the average MN home
- Electricity use was $395 in 2006 ($33/month), or about 56.1% below MN average.

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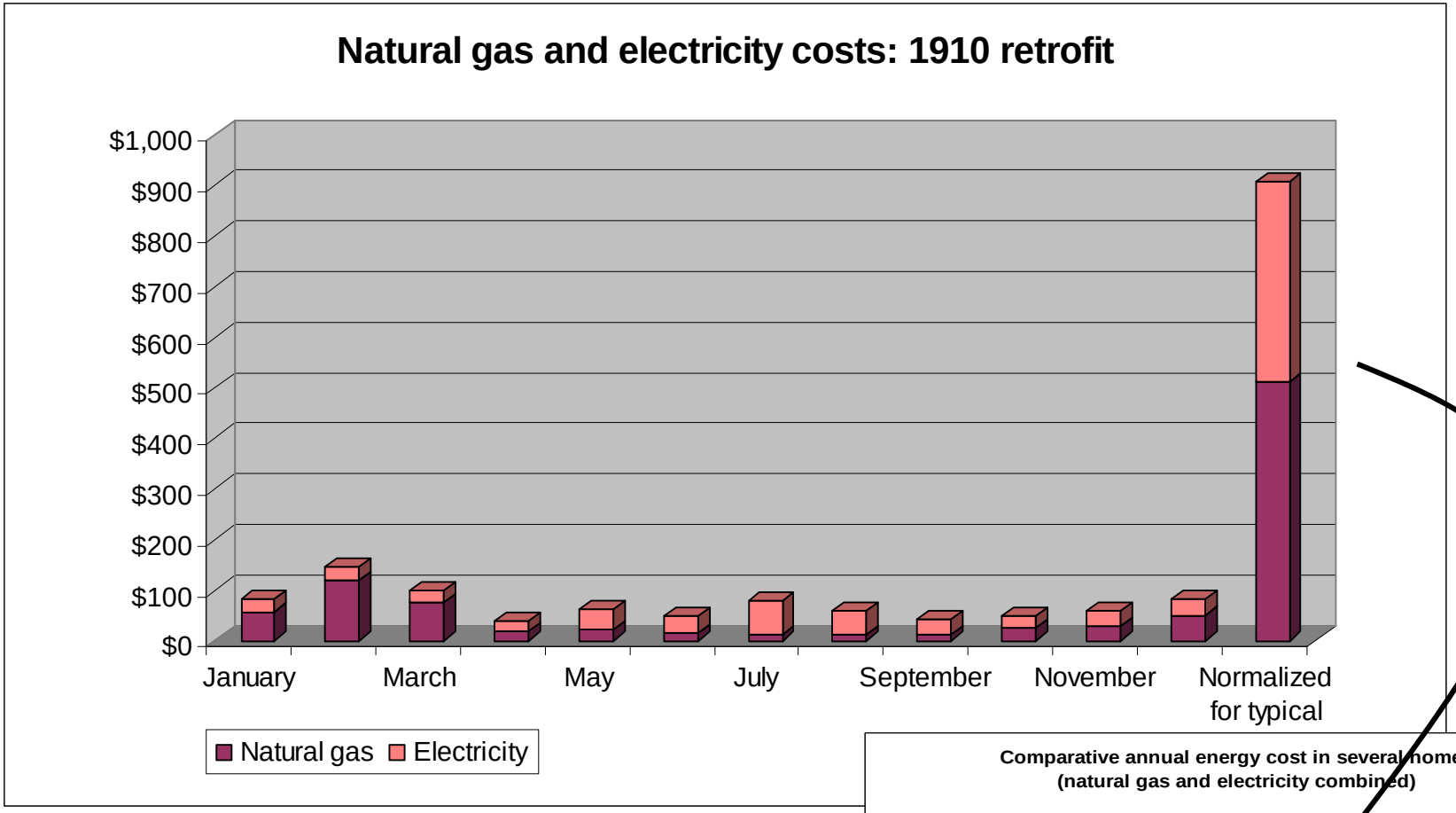

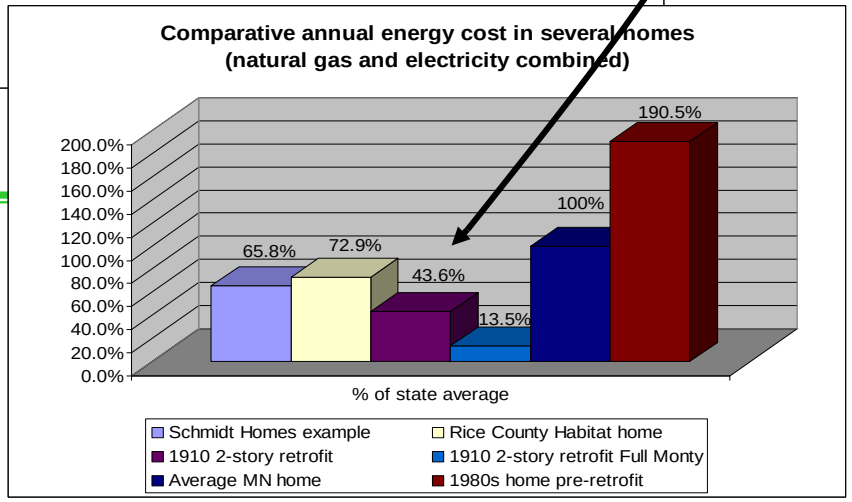

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1910 2-story retrofit:

Bringing an old home up to modern energy performance standards

Going the Full Monty:

- New high-efficiency furnace
- Solar electric (PV)
- Solar water heating with tankless natural gas backup

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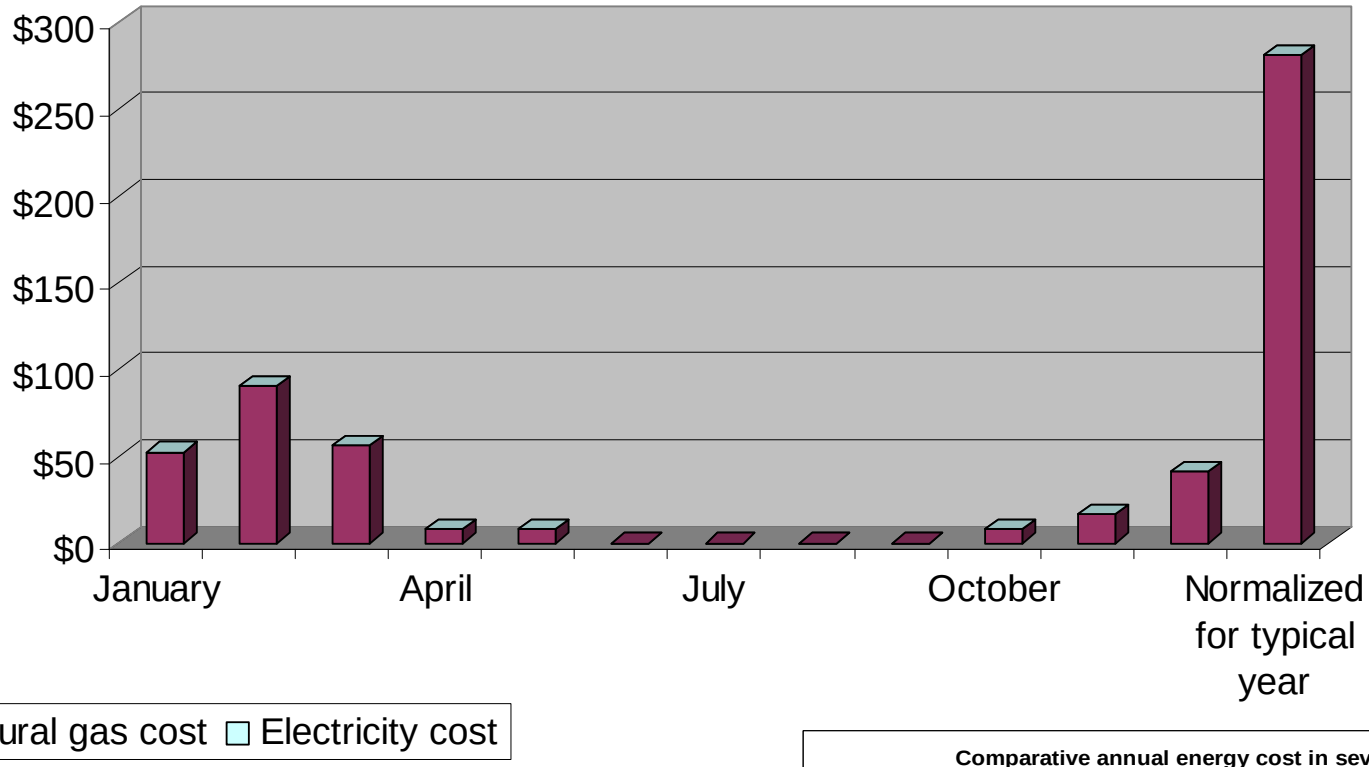
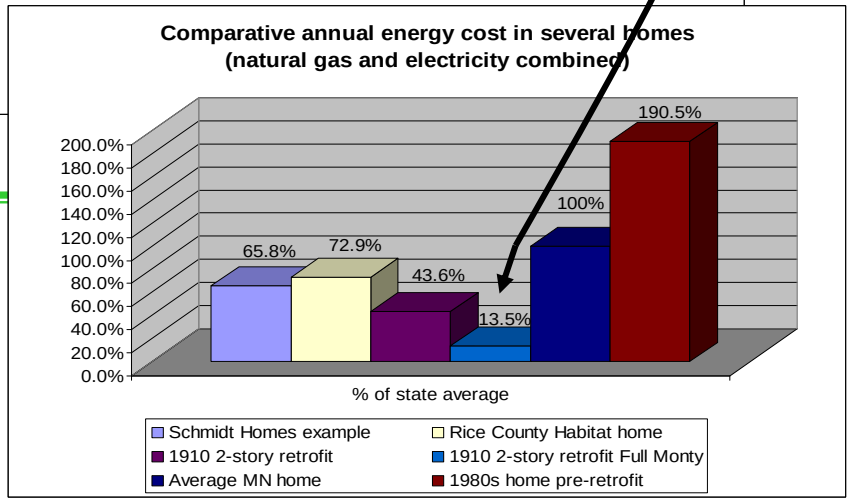
Natural gas and electricity costs: 1910 retrofit Full Monty





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Other viable options:

- Air source heat pump (heating and cooling)
- Geothermal (or ground source) heating, cooling and water heating

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Near zero energy home

Pine Island, MN

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But is it worth it?

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But is it worth it?

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Take the long view

- What's your investment horizon?

Now 2012 2022 2037

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Take the long view

- What's your investment horizon?
- Think about combined mortgage and utility costs

Take the long view

- What's your investment horizon?
- Think about combined mortgage and utility costs
- Take full advantage of utility rebates (www.xcelenergy.com)
  - Furnaces
  - Air conditioners
  - Energy Star appliances
  - Tankless water heaters
  - Insulation
  - Etc.!

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Take the long view

- What's your investment horizon?
- Think about combined mortgage and utility costs
- Take full advantage of utility rebates (www.xcelenergy.com)
- Take full advantage of any state rebates (www.commerce.mn.us)
  - $2,000 per kW solar electric (photovoltaic or PV) rebate

Take the long view

- What's your investment horizon?
- Think about combined mortgage and utility costs
- Take full advantage of utility rebates (www.xcelenergy.com)
- Take full advantage of any state rebates (www.commerce.mn.us)
- Take full advantage of federal tax credits (www.irs.gov):
  - Up to $500 for energy conservation
  - Up to $2,000 for solar water heating
  - Up to $2,000 for solar electric (PV)

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The future is in your hands….

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