SOLAR DECATHLON
2009

How Can We Make the Most of Our Energy?

U.S. DEPARTMENT OF
ENERGY

NREL
National Renewable
Energy Laboratory

APPLIED
MATERIALS.

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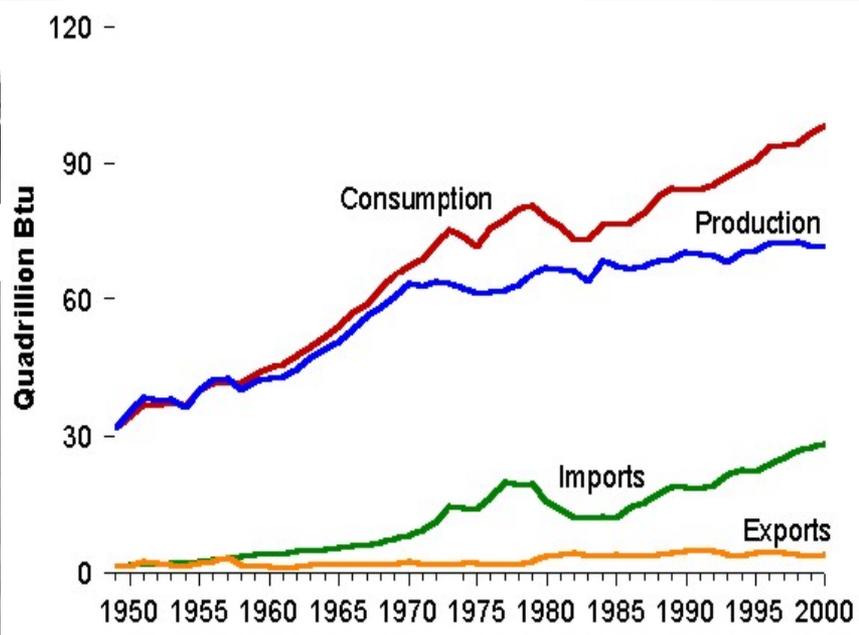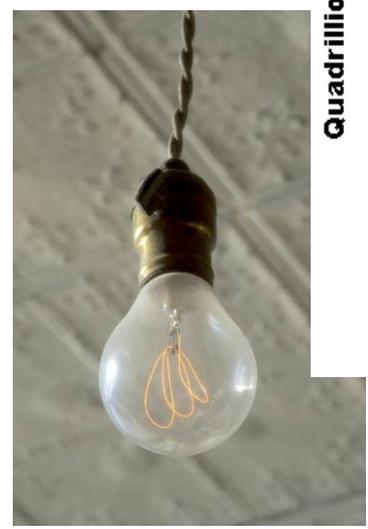
Schneider
Electric

Gary Kuzkin
Technology Innovation Group
Schneider Electric

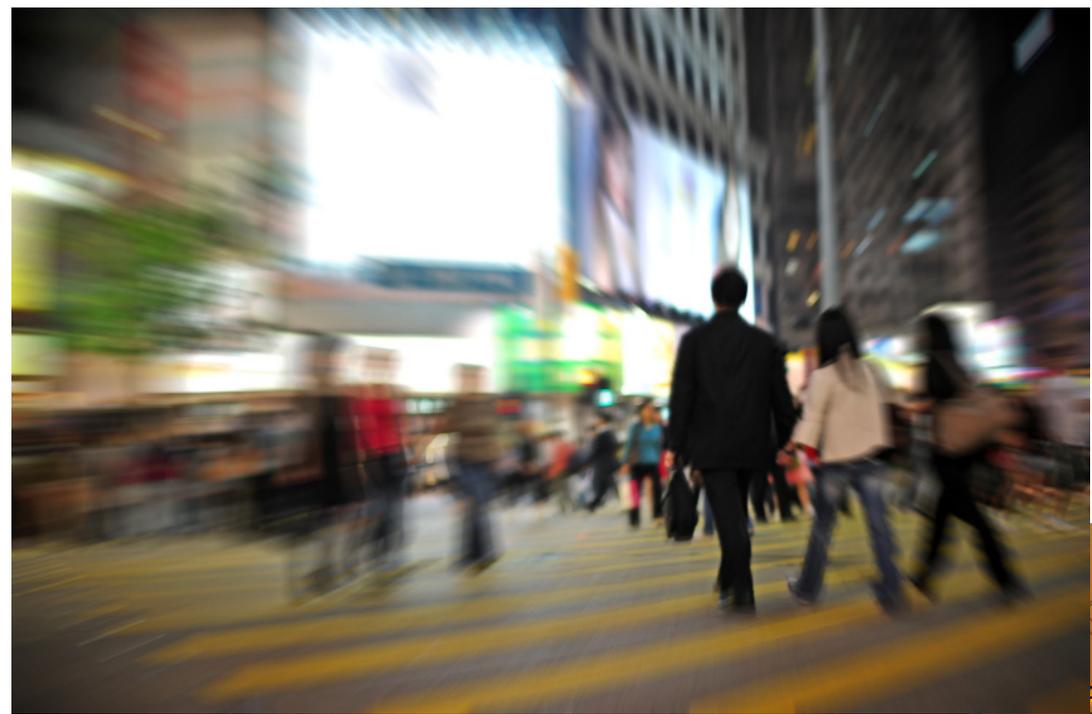# *Understanding the Energy Problem*

Source: Annual Energy Review 2008, Report No. DOE/EIA-0384(2008), United States Energy Information Administration

Energy Demand has grown three times in 50 years

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Why is this a REALLY BIG Problem Now?

An increasing world-wide economy

- *Urbanization*
- *Global economic change*
- *Increasing consumer demand*

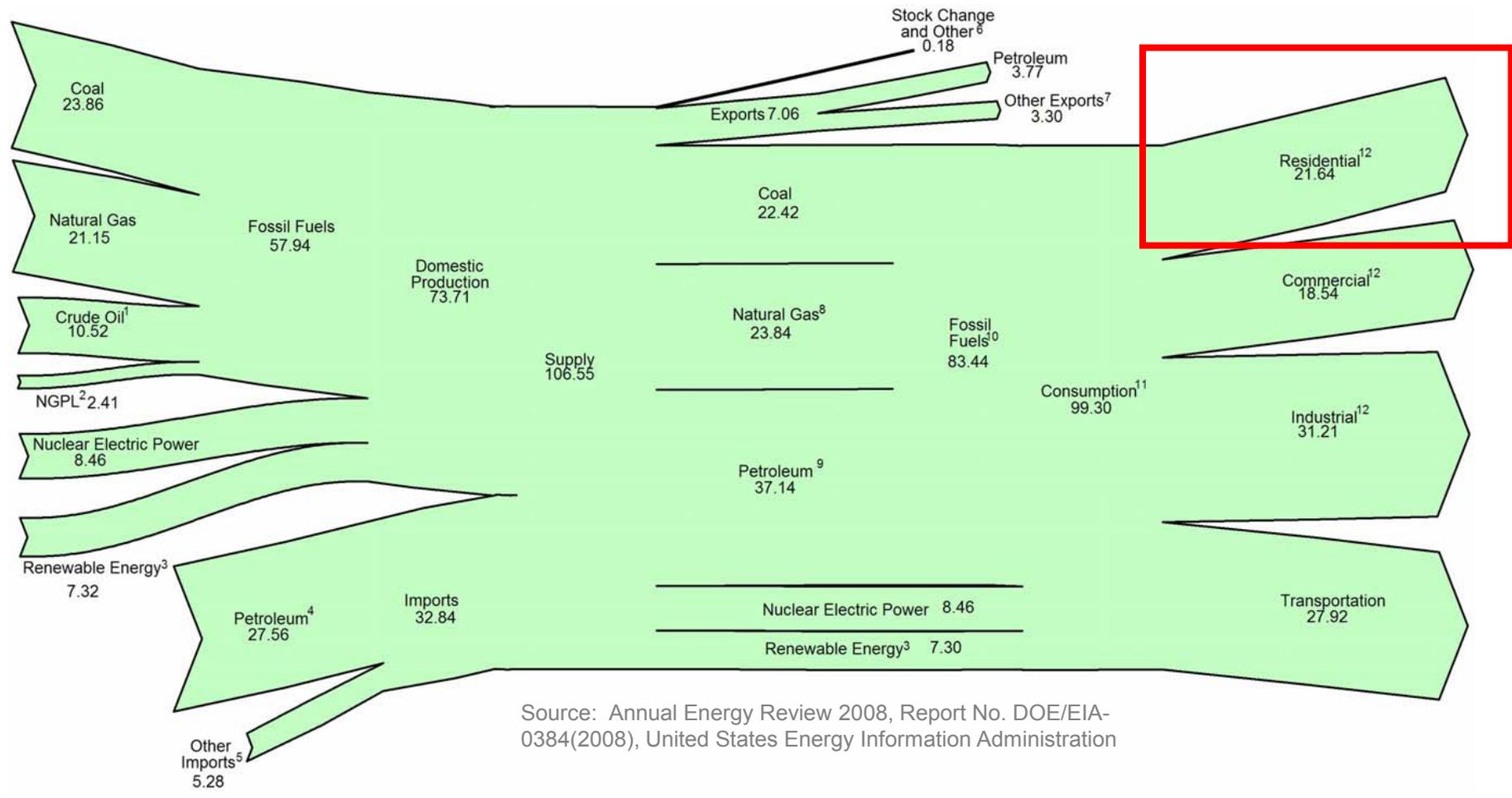*Climate change and other environmental concerns*

- *Global warming*
- *Environment impacts from mining / energy production / distribution*

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United States Energy Flow: 2008
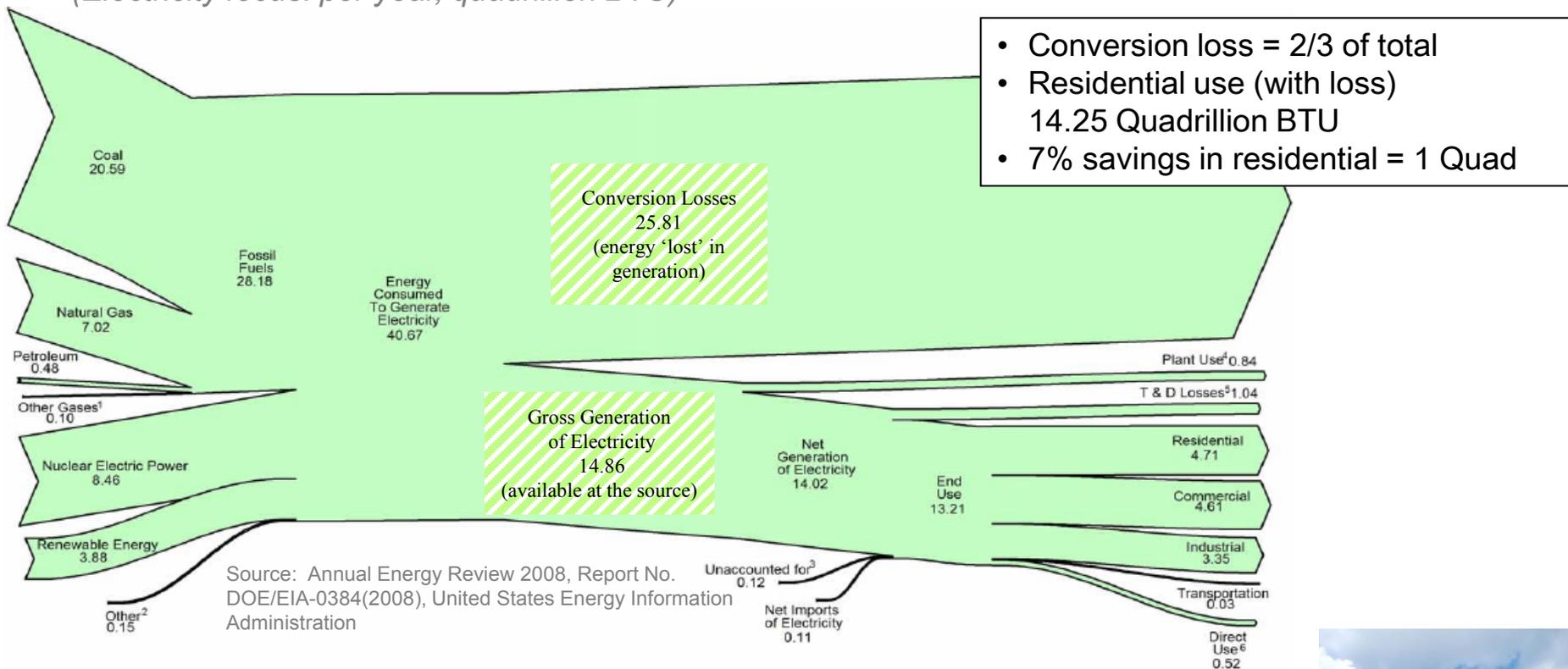*(total energy, all energy types, Quadrillion BTU*

Source: Annual Energy Review 2008, Report No. DOE/EIA-0384(2008), United States Energy Information Administration

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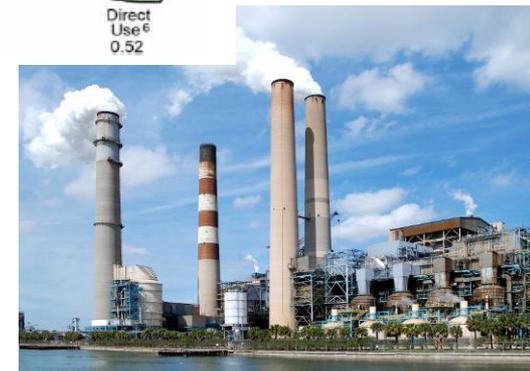
Energy Consumed to Produce Energy:
(Electricity focus: per year, quadrillion BTU)

- Conversion loss = 2/3 of total
- Residential use (with loss) 14.25 Quadrillion BTU
- 7% savings in residential = 1 Quad

Coal 20.59

Fossil Fuels 28.18

Natural Gas 7.02

Petroleum 0.48

Other Gases[1] 0.10

Nuclear Electric Power 8.46

Renewable Energy 3.88

Other[2] 0.15

Energy Consumed To Generate Electricity 40.67

Conversion Losses 25.81 (energy 'lost' in generation)

Gross Generation of Electricity 14.86 (available at the source)

Plant Use[4] 0.84

T & D Losses[5] 1.04

Net Generation of Electricity 14.02

End Use 13.21

Unaccounted for[3] 0.12

Net Imports of Electricity 0.11

Residential 4.71

Commercial 4.61

Industrial 3.35

Transportation 0.03

Direct Use[6] 0.52

Source: Annual Energy Review 2008, Report No. DOE/EIA-0384(2008), United States Energy Information Administration
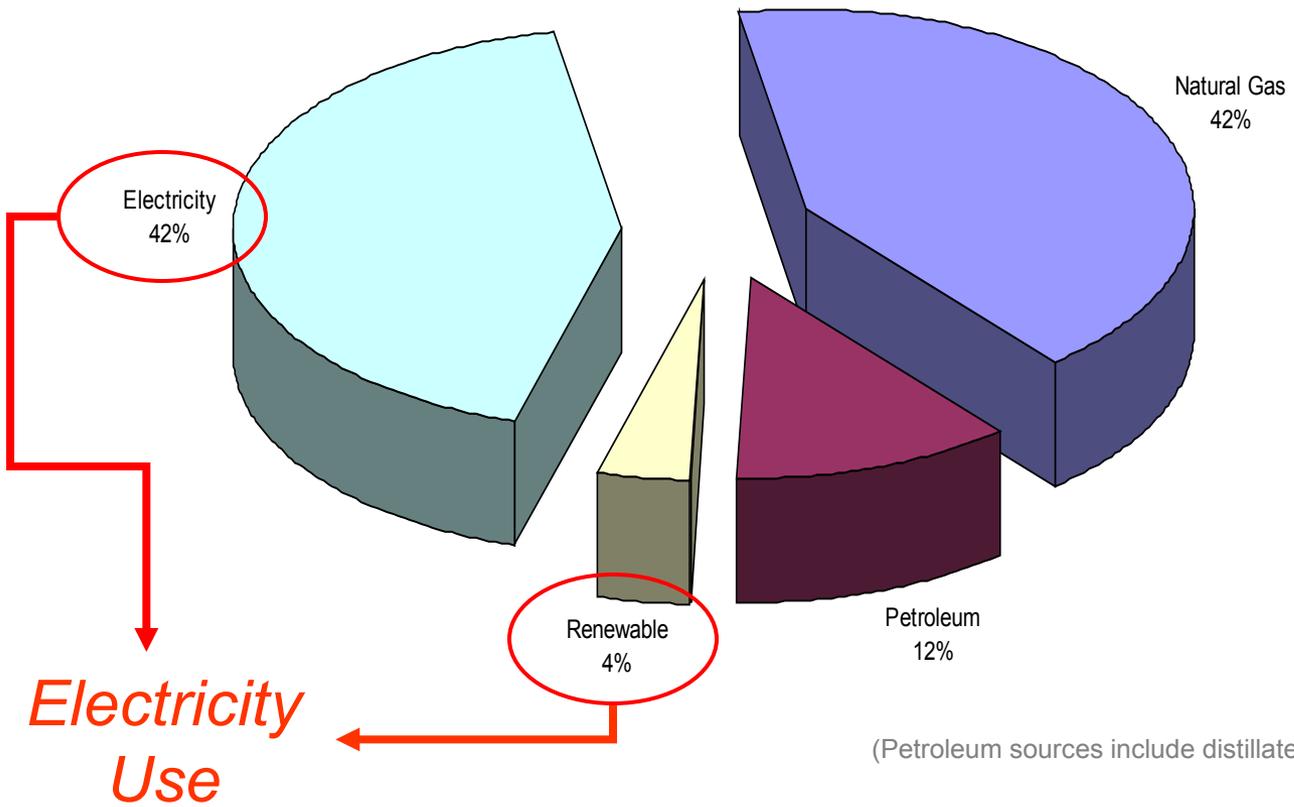
New generations of electricity generation will emerge, but … we can also SAVE,
A 7% consumer savings would equal 45 million tons of coal (10 feet thick, 1 mile long, 3.3 miles wide)

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Where we get our energy
2006 Residential On-Site Consumption by Source

Electricity
42%

Natural Gas
42%

Renewable
4%

Petroleum
12%

Electricity Use

(Petroleum sources include distillate oil, LPG, and kerosene)

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How our electricity is Used
2006 Residential On-Site Electricity Usage

Pie chart:
- Adjust to SEDS 8%
- Other 4%
- Computers 1%
- Cooking 5%
- Electronics 12%
- Lighting 17%
- Other 57%

Breakdown of "Other" 57%:
- Space Heating 7%
- Space Cooling 19%
- Water Heating 9%
- Refrigeration 10%
- Wet Clean 8%
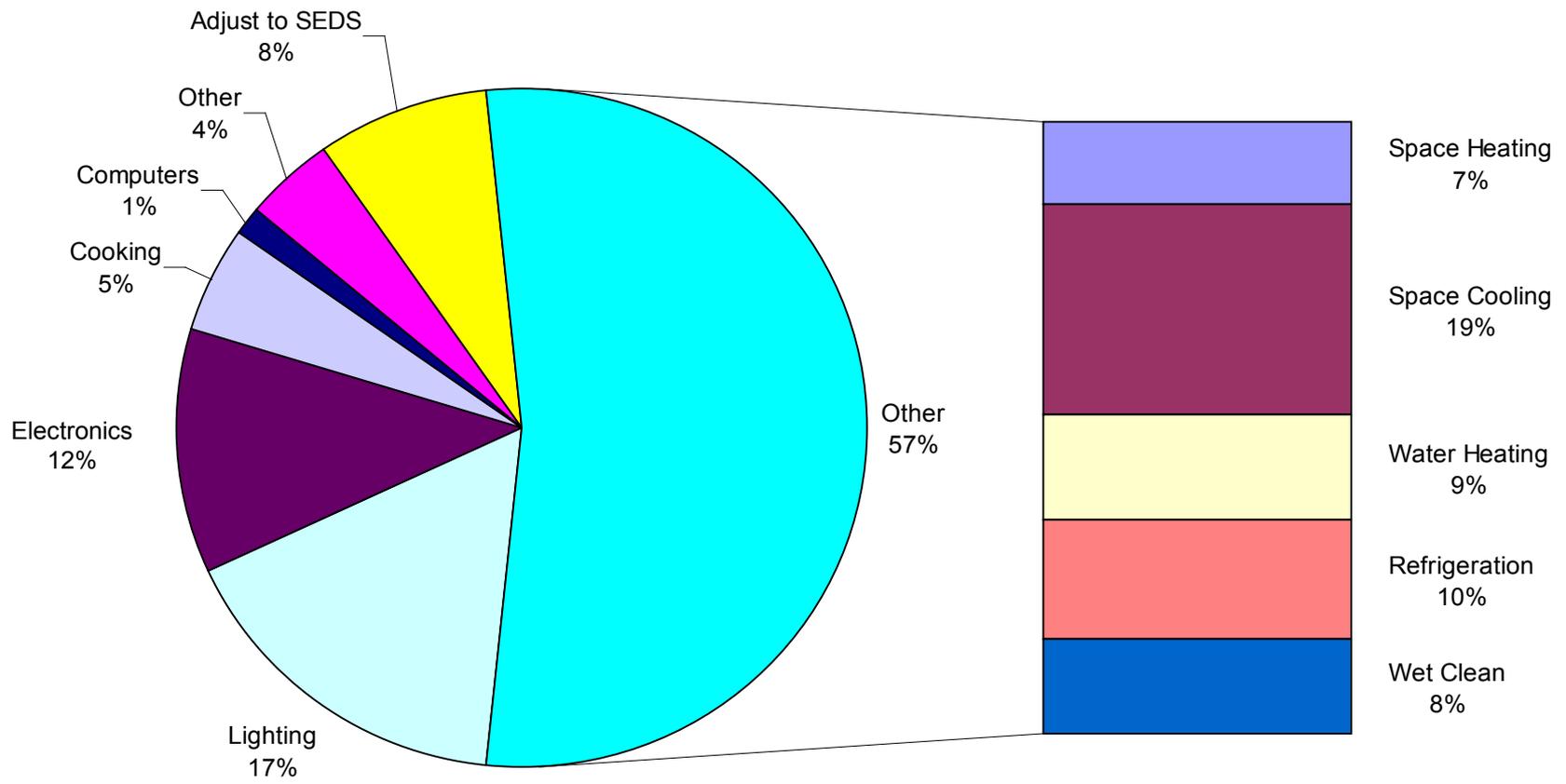
But don't take my stuff!!

We agree to save energy, but

- *Don't take my air conditioning*

- *Don't take my lighting*

- *Don't take my appliances*

- *Don't take my heated pool*

- *Don't take ….*

Can we save energy …
Do we really want to save energy …
Will we pay for the equipment to do it?

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An Energy House Cleaning

- *Energy … but no people*
  - *Lights*
  - *Heating and cooling*

- *'Vampire' loads*

- *Low efficiency appliances*

An Energy House Cleaning …
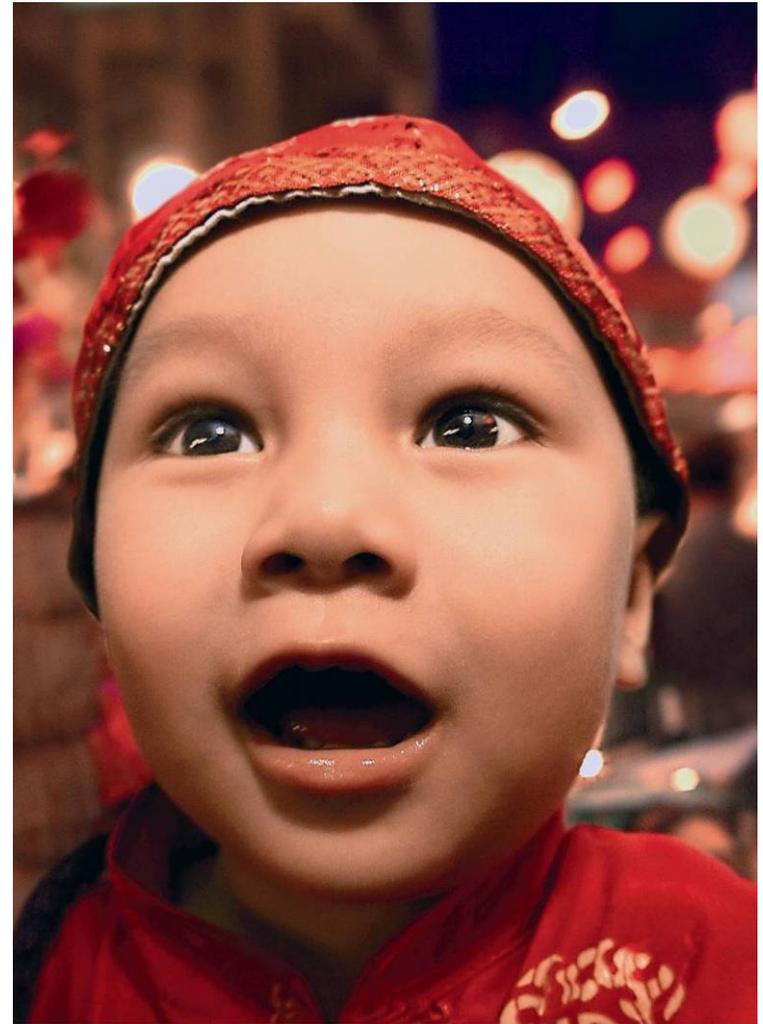   *and we're <u>SO</u> happy to do it!*

A Living Experiment

How can

WE

change the future?

Connecting Ideals to Real Change

Products that support awareness and aid control:

- *Monitor – give people information*
- *Thermostats that support setbacks, demand response features, and energy displays*
- *Monitoring and control of big energy consumers: pool pumps, water heaters, electrical heating strips*
- *Appliances that report energy use, and add-on reporting for older equipment*
- *Electrical panels that monitor, and draw attention, to continuous loads*
- *Enabling time-of-day related functions*

Connecting Ideals to Real Change

Examples: commercial and industrial

Utilities, and Legislative Change

- *Alternative sources of generation*
- *Changes that support demand response*
- *Changes to support time-of-day pricing and rate benefits*
- *Subsidized programs that support installation of energy efficient equipment*
- *Public campaigns to raise awareness of energy consuming devices: computers, wall power supplies …*
- *Pilot programs that examine the best ways to conserve energy*

Things we can do today

- *Install set back thermostats*
- *Use compact florescent lamps*
- *Turn off unnecessary appliances – or engage energy saving modes whenever possible*
- *When appliances are replaced, buy energy efficient designs – even though they may cost more*
- *Support change*

Residential Sector by Major Sources[2]
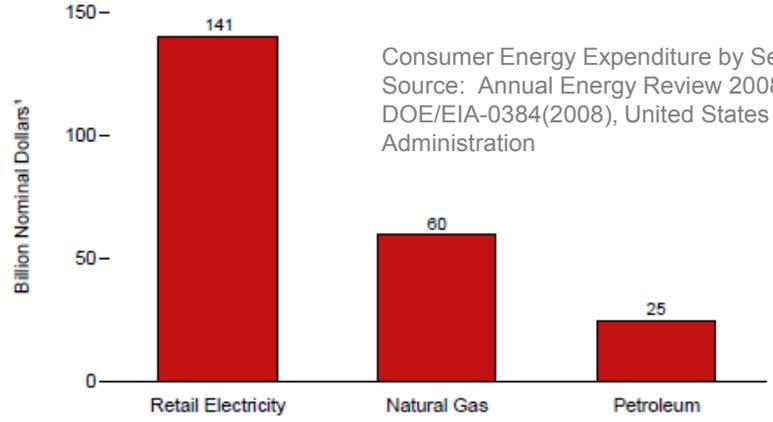
Consumer Energy Expenditure by Sector (figure 3.6)
Source: Annual Energy Review 2008, Report No.
DOE/EIA-0384(2008), United States Energy Information
Administration

Bar chart — Billion Nominal Dollars[1]:
- Retail Electricity: 141
- Natural Gas: 60
- Petroleum: 25

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