

Introduction to Residential Energy Efficiency

by
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What's ahead:

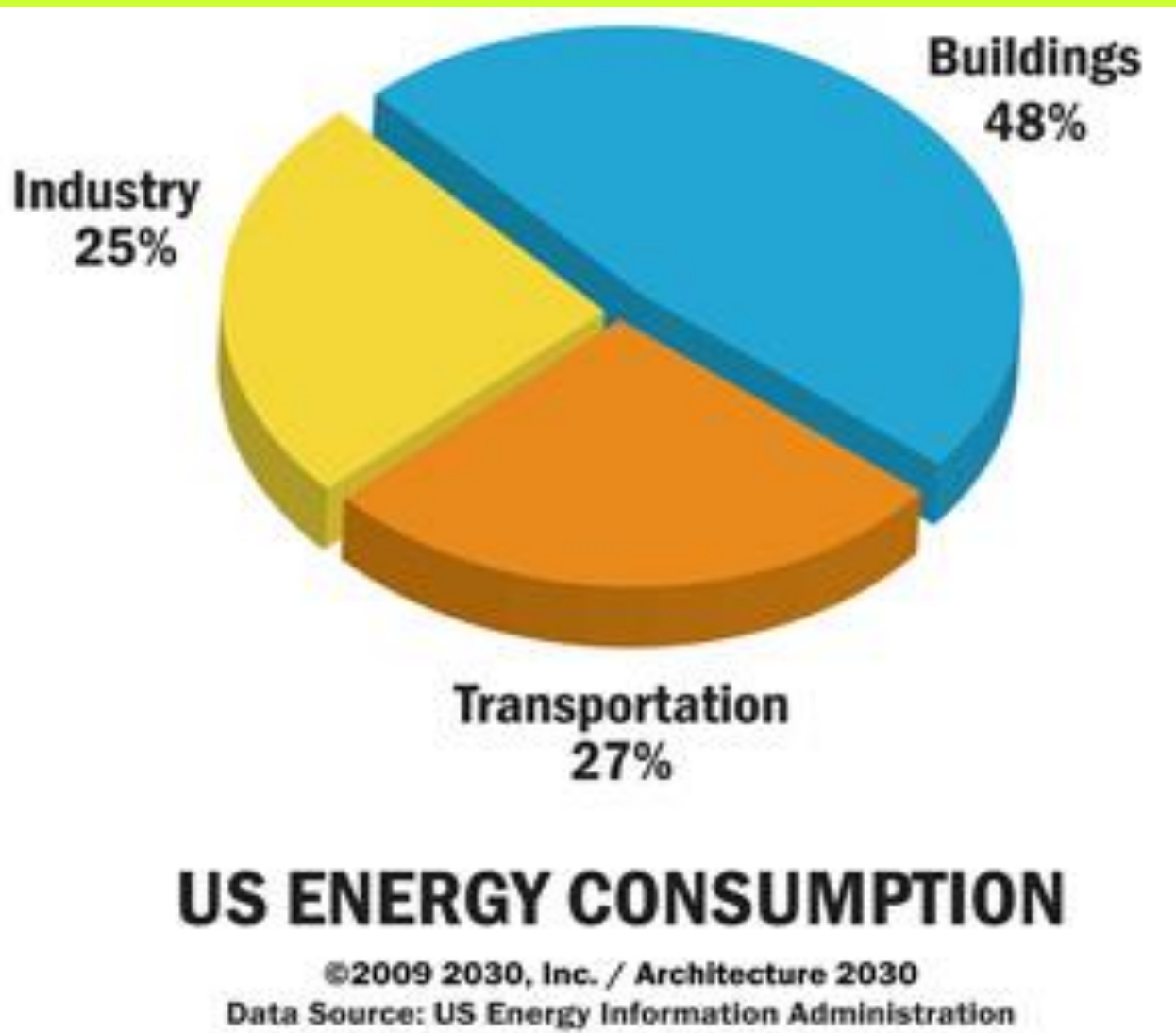
1. Why building efficiency is important
2. How much efficiency is possible?
3. Residential energy usage breakdown
4. Easiest efficiency options to consider
5. Deep efficiency remodeling
6. Q & A

Buildings Efficiency Importance

THE BIG THREE GHG CATEGORIES

- 1. FOOD & AGRICULTURE**
- 2. TRANSPORTATION**
- 3. BUILDINGS AND CITIES**

If construction energy is included, buildings consume 48%



Energy sources in buildings:

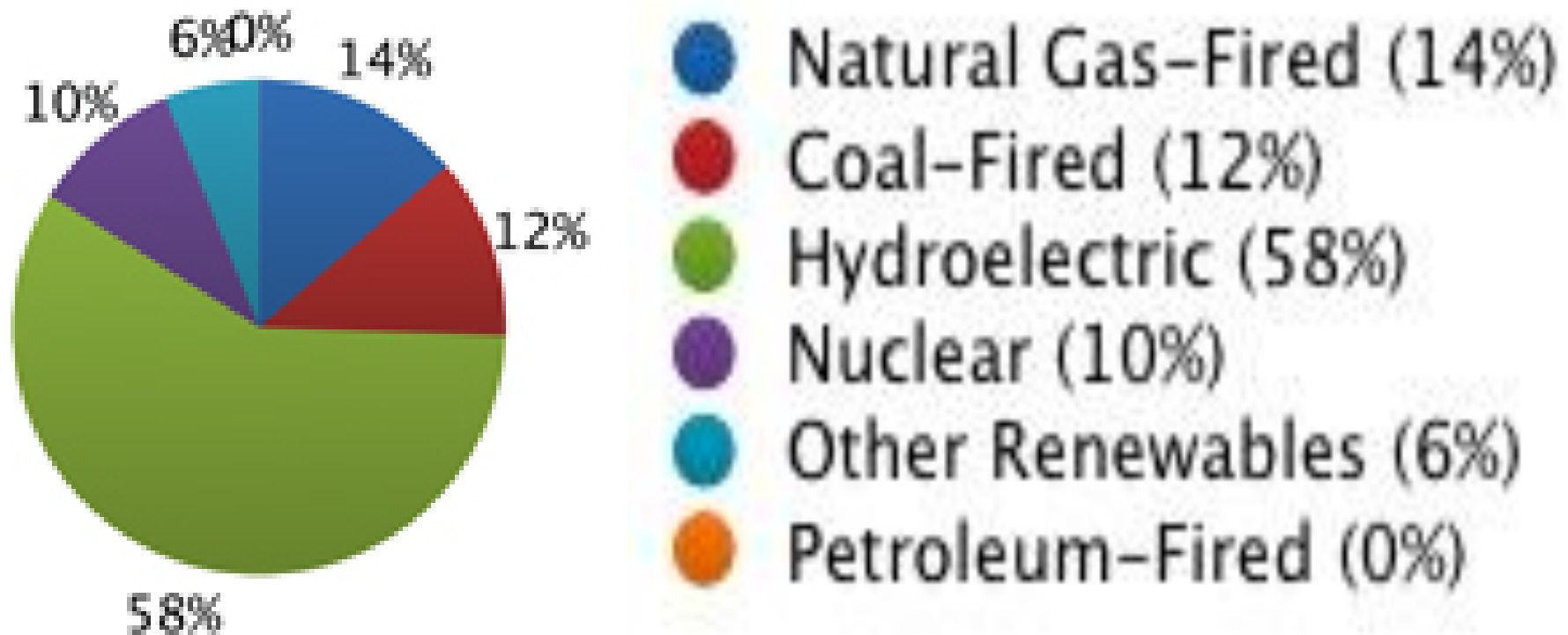
Natural Gas

--fuels air heating and hot water
(30% to 50 % of total usage)

Electricity

--powers everything else
(50% to 70% of total usage)

Washington Electricity Generation by Type



(Chart from the Institute for 21st Century Energy)

Wait a minute !

- **Washington hydropower is nearly maxed out.**
- **The transportation sector needs electricity to reduce GHG emissions.
Where can that new power come from?**
- **Answer:
Increased energy efficiency in buildings.**

The Necessary Transformation:

To fight climate change, buildings need to shed natural gas usage and reduce electrical consumption.

How much efficiency is possible?

Studies have shown

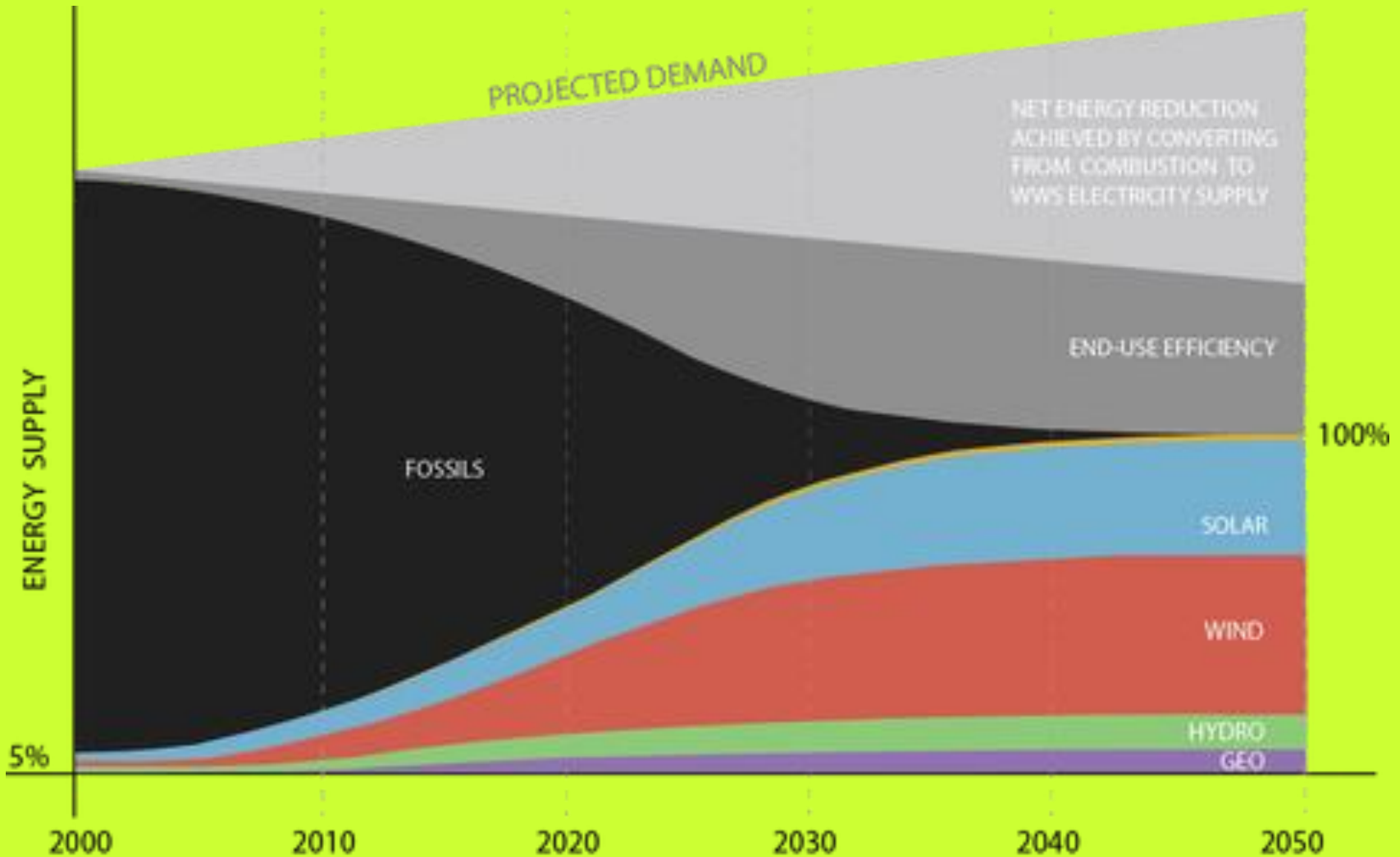
We can save 50% of a building's energy*

So,

***Energy efficiency is critical for a
sustainable future***

* Studies by the Dept. of Energy and by the New Buildings Institute

Projected Energy Transformation

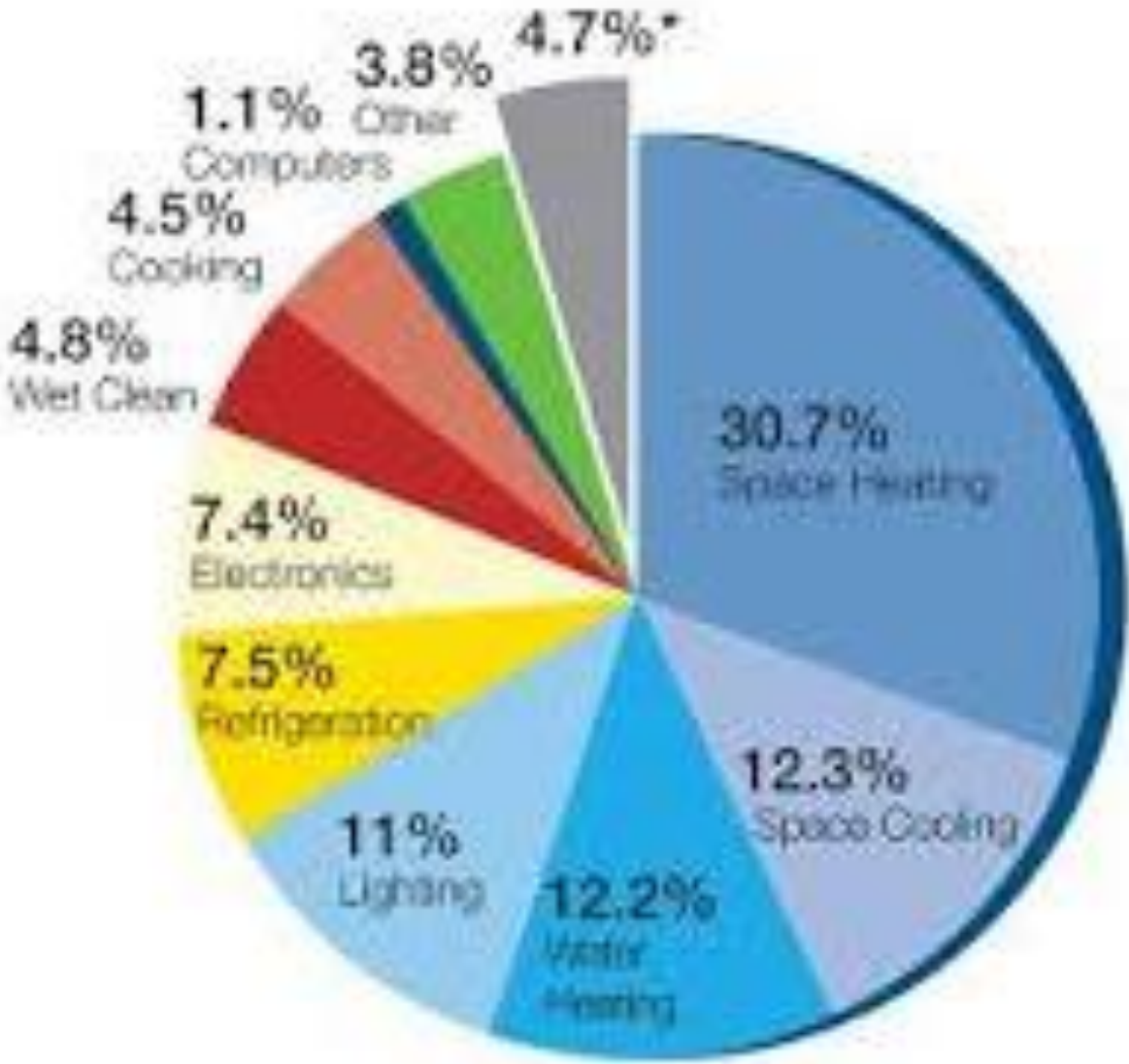


March 2013 study for NY State

(Note: Upper Gray is Wind/Water/Solar conversion efficiency)

Residential Energy Breakdown

Avg. Residential Energy Use:



Total Residential Primary energy use is 21.8 quads

- 41% --
- Heat/air/vent
- 18% - appliances
- 12% - hot water
- 11% - lighting
- 7.5% - refrig.
- 9% - other

Easiest
Residential Efficiency Options

Easy “low hanging fruit” options

REDUCE:

1. Plug/appliance loads
2. Hot water load
3. Lighting load
4. Heating, venting & cooling load
(some low hanging options)

1. Reduce Plug Loads

- Buy low energy equipment, especially refrigerator, washer, dryer, and dishwasher. Find best *Energy Star* rating.
- Buy electric induction stoves rather than conventional electric or gas.
- Buy rapid auto sleep electronics, e.g. computers
- Use occupancy sensor power strips for computers, TV, radio, lamps.

2. Reduce hot water load

- Install reduced flow fixtures.**
- Interrupt water flow when showering/washing.**
- Insulate hot water tank well.**
- Insulate hot water pipes.**
- Change to electric heat pump hot water heater. (Now cost effective & efficient.)**

3. Reduce lighting load

(A) Use more natural light

- Skylights (if well insulated)
- Light tubes

(B) Convert to all LED bulbs.

Now most cost effective. Use everywhere.

(Better than fluorescent and CFLs)

(C) Use occupancy sensor switches.

4. Reduce Heating & Cooling load

- (A) Reduce air exterior leaks**
- (B) Reduce heat distribution losses**
- (C) Better system controls**
- (D) Convert to heat pump heating**

(A) Reduce Exterior Air Leaks

- **Tight door and window seals.**
- **Tight seals at all exterior wall/roof joints and penetrations.**
- **Fireplaces are notorious draft leaks.**

(B) Reduce heat distribution losses

- **Seal air duct joints tight**
 - especially at registers**
- **Insulate air ducts or radiant heat pipes**

(C) Better system controls

- **Programed thermostat time changes**
- **Remote thermostat controls**
- **Variable area or room controls**

(D) Convert to heat pump heating

- **Uses (potentially clean) electric power**
- **Now very high energy efficient**

Deep Efficiency Remodeling

(1) Install a tight air barrier

- **Usually means sealing exterior sheathing joints**
- **May need to replace siding**

(2) Block thermal bridging

- **Insulating separations needed.**
- **Can be challenging for existing buildings.**

(3) Insulation

- **at roof level (R-49 suggested)**
- **walls (R-38 where wall thickness allows)**
- **floor ground floor joists (R-25)**
- **Insulate foundations & crawl spaces, too**

(4) High performance windows

- Should have Low U value window assembly (< .30 minimum, better if < .20)
- Low transmitting frames (metal should have “thermal break” gap; non-metal frame best)
- double pane minimum; triple pane better.
- Shade windows from summer sun (deciduous trees, overhangs and awnings.
- “e” coating on glass helps reduce solar gain.

(5) Heat recovery fresh air system

- **Circulates fresh air and recovers heat**

Questions?

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