

Breakout Session: Cutting Home Energy Use

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Issues that need to be addressed:

- How to make a big impact on existing homes; not just new homes?
- Residential consumption represents about 40% of the nation's energy load, but
- Houses are getting bigger
- Energy use/square foot is increasing (from 1980s – more devices to power, etc.)
- Occupancy loads are smaller (fewer people per house)
- Residential energy/person is on a steep rise

Keep it Simple 1-3

1. FIRST reduce electrical and fossil fuel demand; measure and monitor that reduction
2. THEN buy green power
3. FINALLY, consider more complex supply systems such as photovoltaics and direct-exchange geothermal

Actions that will worsen situation:

- Add on to house in any way (especially already big houses)
- Add central air without adding insulation – equipment not appropriate size for the house (more money spent if too big, short cycling)
- Not worrying about fiberglass vs. spray foam insulation (important difference between the two)
- Energy performance payback given high priority, but not payback for “luxury” choices (granite countertops, etc.)
- Get a new efficient refrigerator but keep old refrigerator too
- Install bamboo flooring, thinking this will make an impact (possibly made in China with “dirty” power, shipped long distances); “green” analysis needs to be more sophisticated than trendy

To have a minimally positive impact:

- Change some lightbulbs to energy-efficient ones
- Have insulation work done, but don't necessarily test it (many insulation jobs not really effective)
- Get a set-back thermostat (studies have found large-scale installations do not save much energy because people do not make proper use of it)
- Have house re-sided without adding exterior insulation (a house is re-sided only every 30-50 years or so, so adding exterior insulation is an important upgrade)

- Replace boiler with whatever the boiler company says to use: often won't make effort to research/find more efficient ones
- Don't measure whether improvements have made any impact

To reduce residential energy load by 10%-20%:

Replace windows or tune up what you have

- Energy efficient windows (EnergyStar) have R-value (resistance to heat loss) R3.5 vs R2 for most others – higher values = better resistance (www.energystar.gov)
 - Solar heat gain coefficient should be high for south facing windows – ask manufacturers
- Replace boiler with one that is 5-10% higher efficiency
- Insulate any walls that have none, but don't test
- Change over a few more lightbulbs
- Replace oldest appliance
- Turn heat down a little
- Still don't test improvements

To reduce residential energy load by 30%-50%:

- A plan with a logical sequence of improvements is necessary
- Insulate basement walls with close-cell spray foam (email for more info) minimizes air leaks. Insulating **outmost layer** (perimeter of building) of house is most efficient: approximately 20% better performance – most important around attic exterior and basement exterior! (40% heat loss in old home from air leaks). Can seal right over roof vents (roof venting is usually not necessary – “pseudo-science”; see William Rose's book “Water in Buildings”)
- Cover foam with dry wall or spray mortar for flame spread rating.
- Test insulation at each step with a blower door
 - Measures leakage in house by pressurizing house and using appropriate gages
 - Infrared camera diagnoses leaks: reads heat concentrations: with a blower door running, intensifies these “problem spots”
 - Smoke sticks to diagnose leaks: Glycol (theatrical smoke) is good
 - Blower door and Infrared camera: “these diagnostic tools are the quickest and most reliable way to judge the quality of an insulation and air-sealing job”
 - “An insulation company without a blower door and an infrared camera is like a carpenter without a tape measure and a level”
 - Isn't ventilation important? Very difficult to seal a house “too much” – hard to cause a moisture problem by insulating it BUT make sure you maintain indoor relative humidity levels at less than 60%
 - Call utility company to set up home-audit with blower door and infrared camera (\$200-300) – do basic insulation work before this test if you know you have an old leaky house
- Use an electricity consumption monitor to change your behavior; change all lights to CFLS
 - TED: Energy Detective – measures electricity consumption of whole-house usage – some have an alarm for peak cost/hour: makes you become more aware – key to reducing energy consumption!
- Insulation and air-sealing:
 - Demand for quality insulation job necessary
 - Intersecting planes are problem places for leaks (whereas doors and windows are not)

- Knee walls: one plane change much better than 3 plane change
- Basement problems: seal up into band joists; can do rigid foam on floor (much cheaper)
- Reducing Electrical loads
 - Bath fans on timer switches
 - Motion sensors for outdoor lights
 - Occupancy sensors for indoor lights
 - Plug load reduction: www.wattstopper.com, www.campingworld.com (motion detector /timer for devices not used all the time)
 - Compact fluorescent lights: quality of light is preferred by most people: 10000-30000 hours of life
- Appliances
 - www.energystar.gov
 - gas vs. electric range (gas is least efficient, even including loss of electricity while getting to your house)
 - replace an old refrigerator
- Right-size your equipment:
 - Manual J and Manual D calculations (some surveys have determined well over half of contractors do not size heating properly)
- Boiler/heating systems should be inside thermal boundary (of insulation) for maximum efficiency)

Resources:

North East Sustainable Energy Association: lists of contractors dedicated to reducing energy consumption. www.nesea.org.

See attached handout from Paul Eldrenkamp