• Founded 1996
• 501(c)3 non-profit organization staffed by volunteer board
• Mission: To educate the public and promote the benefits of renewable energy, and energy efficiency.
• Policy advocacy in the state legislature
• More information, join, or donate at cres-energy.org
HOME ENERGY EFFICIENCY: MYTHS AND MONEY

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Overview

- Home Energy Efficiency Basics
- Sample Energy Audit Results
- Common Efficiency Myths
Benefits of Energy Efficiency

- U.S. Dept of Energy Study: 33% decrease in heating bills after weatherization
- Eliminate comfort problems
- Healthier air in the home
- 10% Efficiency Improvement eliminates 1400 pounds of emitted CO2
- Allows for smaller, less expensive solar elec system
- High return on investment
Where Does the Energy Go?

- Largest Waste of Home Energy: duct and house air leaks, and insulation problems
- Consumer electronics consumption growing

U.S. Household Energy Use (Percent)

- Space Heat: 43%
- Water Heat: 19%
- Air Condition: 8%
- Lighting: 5%
- Refrigeration: 3%
- All Other: 21%

Source: U.S. EIA
Cannot Consider Efficiency in Isolation

House is a “System of Systems”

- Heating / Cooling
- Ducts
- Water Heating
- Appliances
- Lighting
- Ventilation
- Insulation
- Air Barrier
Key Point: Think “Thermal Boundary” Not Just “Insulation”

- The thermal boundary must be air sealed and insulated
- Adding fiber insulation over leaky attic floor is mostly ineffective
- Air Barrier vs Vapor Barrier: In most cases a breathable air barrier is desired
- A typical attic loses more energy through air leaks than under-insulation
Common Problem Areas 1

- Attics:
  - Penetrations
  - Knee Walls (Vertical Walls)
  - Insulation
  - Ventilation
  - Ducts
  - Hatches
Common Problem Areas 2

• Crawlspaces:
  – Venting
  – Moisture control
  – Air sealing and insulation
  – Ducts and plumbing
Common Problem Areas 3

- Air Infiltration
  - Fireplaces
  - Sockets
  - Sill and bottom plates
  - Attic fans
  - Recessed lights
  - …and many more
Hidden Problems

- Air infiltration in stud cavities
- Insufficient insulation
- Leaky cantilever overhangs and window boxes
Furnaces

65% Efficient: Standing Pilot

80% Efficient: Spark Ignition

95% Efficient: Condensing

Direct Vent, Condensing Furnaces also Offer:

• 55% more efficient motors;
• No indoor combustion air;
• Multiple fan and burner stages
Cooling

• Relatively few cooling days
• Hard to recoup investment in air conditioning replacement or upgrade
• Cool, low humidity evenings create higher efficiency options
  – Evaporative coolers
  – Whole house fans
• Ensure proper attic ventilation and insulation
• Most cost effective option: block summer solar heat gain (windows and skylights)
Appliances and Plug Loads

- Typical U.S. Household: 920 kilowatt-hours per month ($101)
  - Moderately efficient family: 800 kWh/month
  - Focused family: 400 kWh/month

- For typical appliances (excludes hot tubs!), refrigerators consume most electricity
  - Decreased from 1200 kWh/year in 1990s to 550 kWh/year today

- Phantom loads approaching 20% to 25% of consumption
  - Energy consumed when device is “Off”
  - Example: DirecTV box = 22 to 25 watts when off but plugged in ($18 per year in wasted energy)

- Electric Vehicles: 8000 miles of annual home charging
  - Approx 190 kWh ($21) per month average (at 3.5 miles/kWh)
Incandescent Bulbs: 10% Light + 90% Heat

CFL = Compact Fluorescent Light
Energy Myths vs. Building Science

Myth: “Replace your windows and save 40% on your heating bills.” (Radio ad)

Reality:
- Even with single panes, heat loss through windows is 12% to 30% of total heating bill
- Standard uncoated double pane vs. ENERGY STAR windows: R-2.2 vs. R-3.3
- Old wood single pane vs. ENERGY STAR: R-1.0 vs. R-3.3
- Typical payback time: 50 – 100 years
Energy Myths vs. Building Science

• Myth: Save energy by turning down the thermostat and turning on gas fireplace
• Reality:
  – Typical furnace: 80% efficient (Modern: 90–98%)
  – Typical gas fireplace: 15% to 35% efficient
  – Conventional wood fireplace: <5% efficient
• Fireplace pilot lights consume $12 to $20 per month. Turn them off in summer!

Pro Tips:
• Pick from EPA Certified Wood Stove list: www.epa.gov/burnwise/epa-certified-wood-stoves
• US doesn’t EnergyStar rate gas fireplaces...but Canada does: https://tinyurl.com/nrcanfire
• Myth: Always start in attic when adding new insulation

• Reality:
  – An uninsulated basement or crawl space wastes 5 times more energy than an under-insulated attic
  – Know the payback time when considering additional attic insulation
Energy Myths vs. Building Science

• Myth: Add more insulation to stop air leaks into attic.

• Reality:
  – Fiberglass and cellulose are not air barriers
  – Air leakage can be wasting more energy than insufficient insulation
• Myth: Can't seal a house too much...a house needs to breathe.

• Reality:
  – A house can never be too tight...but it can be under-ventilated
  – Best to “Make it tight and ventilate right” using efficient, controlled ventilation
Don't Forget Water Costs

Irrigation Water: CO Springs Utilities

Annual Utility Costs

- $814 (32%)
- $781 (30%)
- $485 (19%)
- $238 (9%)
- $166 (6%)
- $70 (6%)
- $17 (3%)
- $1 (1%)

Gas-Heating
Water Heat
Elec-Heating
Elec-Cooling
Lights & Appliances
Water-Irrigation
Water-Indoors
The Home Energy Audit

Diagnostic Testing:
- Blower Door (air leakage)
- Duct Blower (duct leakage)
- Thermal imaging
- Combustion gas analysis
- Natural gas leak detection
- Indoor air quality

Inspections:
- Insulation
- Heater, A/C, ventilation
- Moisture Issues
- Attic, basement, crawl space

Electrical, Gas and Water Consumption Analysis

Modeling and Analysis

Peak Heat Load Components (kBTU per Hour)
- Walls: 30%
- Windows: 17%
- Attic: 12%
- Foundation: 9%
- Air Infiltration: 4%
- Doors: 28%
Conclusion

- Energy efficiency return on investment not always obvious
- Must consider relationship between efficiency, safety and comfort when performing upgrades