South Eastern Colorado Renewable Energy Society

About CRES

- 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

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HOME ENERGY EFFICIENCY: MYTHS AND MONEY

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Overview

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

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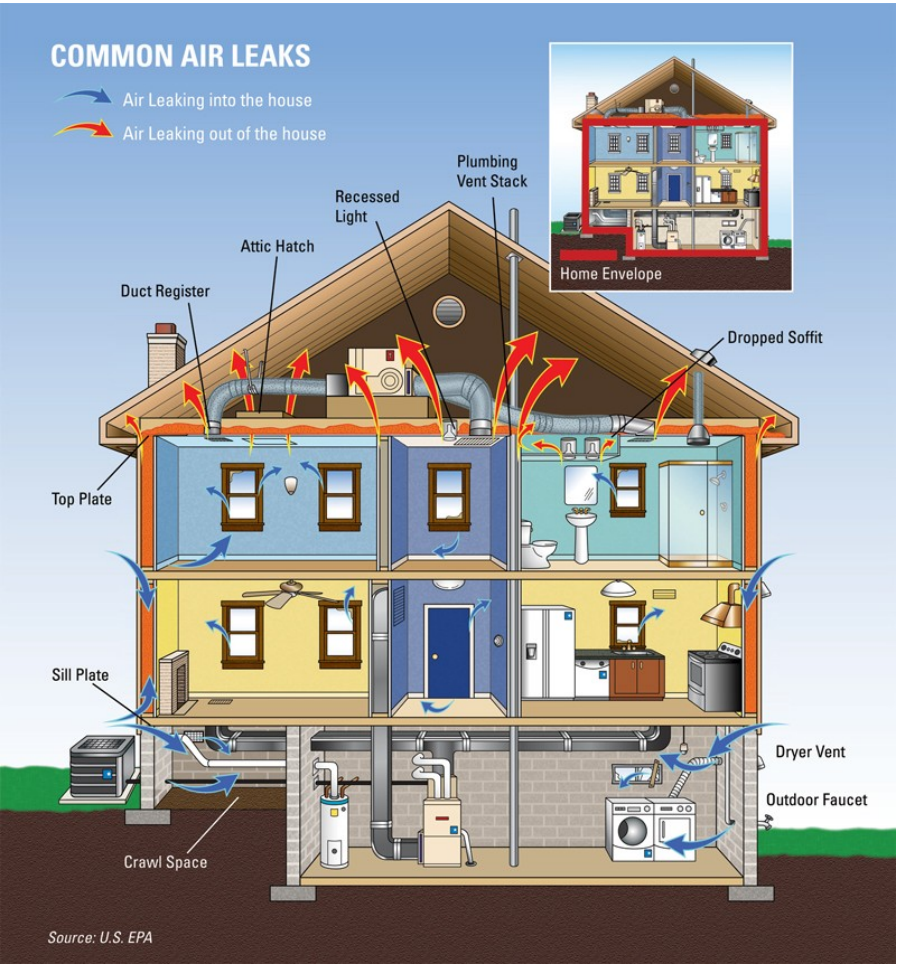
Benefits of Energy Efficiency



- 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

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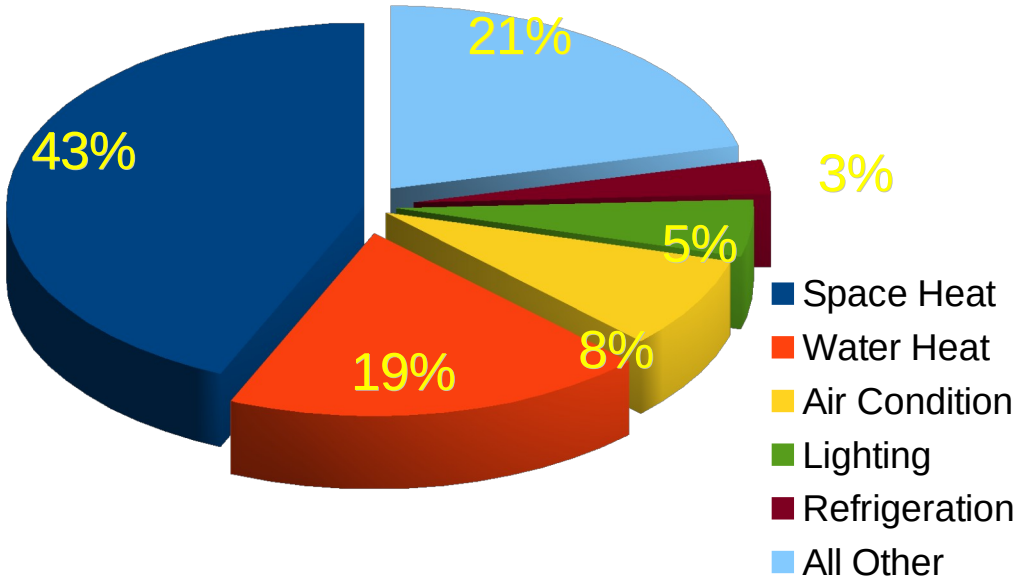
Where Does the Energy Go?

U.S. Household Energy Use (Percent)



Source: U.S. EIA

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

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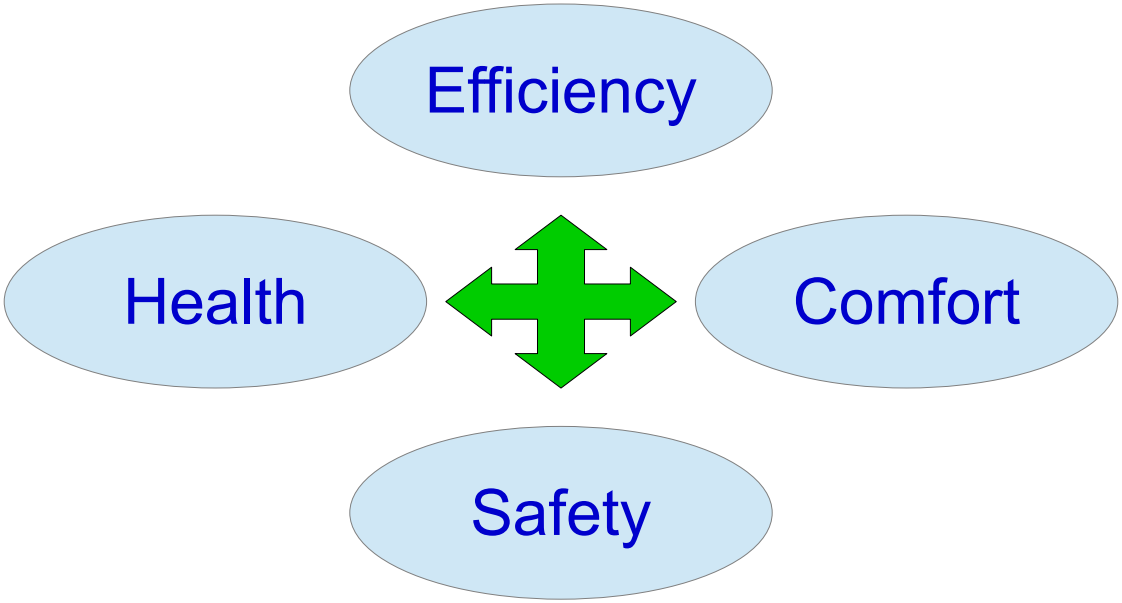
Cannot Consider Efficiency in Isolation

House is a "System of Systems"

- Heating / Cooling
- Ducts
- Water Heating
- Appliances
- Lighting
- Ventilation
- Insulation
- Air Barrier



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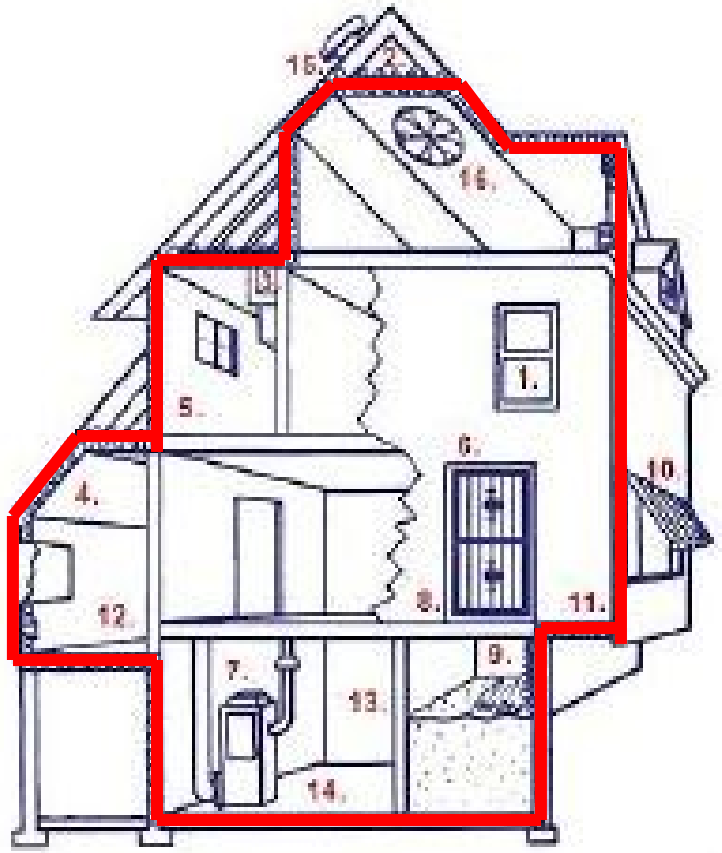
Key Point: Think "Thermal Boundary" Not Just "Insulation"

- 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



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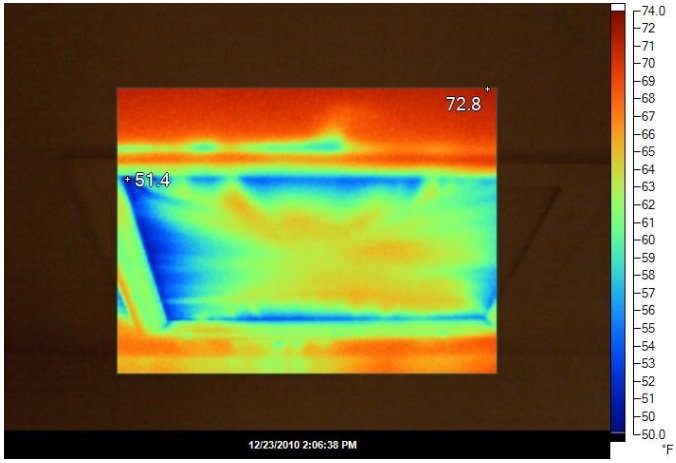
Common Problem Areas 1

- Attics:
  - Penetrations
  - Knee Walls (Vertical Walls)
  - Insulation
  - Ventilation
  - Ducts
  - Hatches



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Common Problem Areas 2

- Crawlspaces:
  - Venting
  - Moisture control
  - Air sealing and insulation
  - Ducts and plumbing

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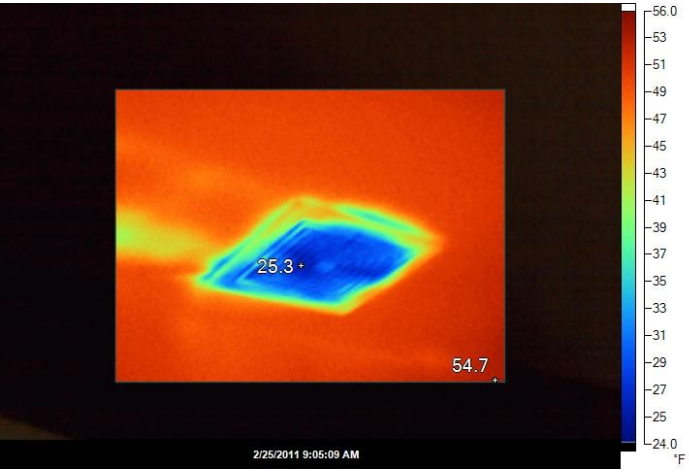
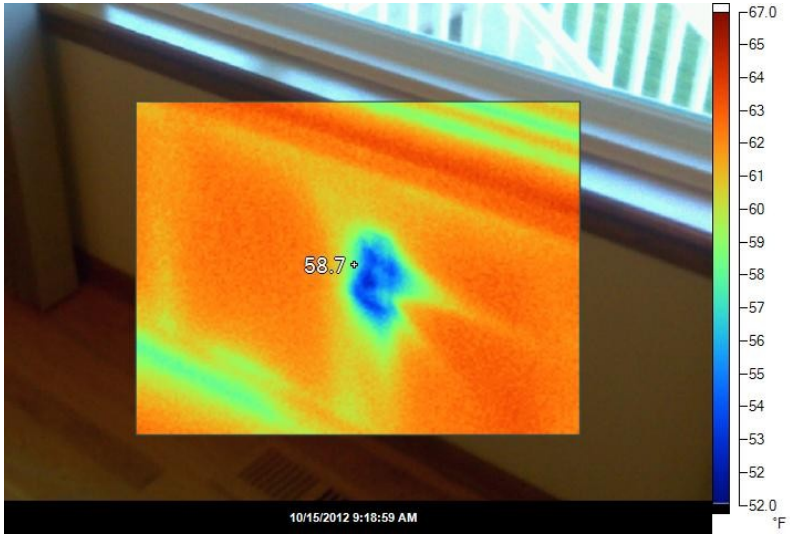
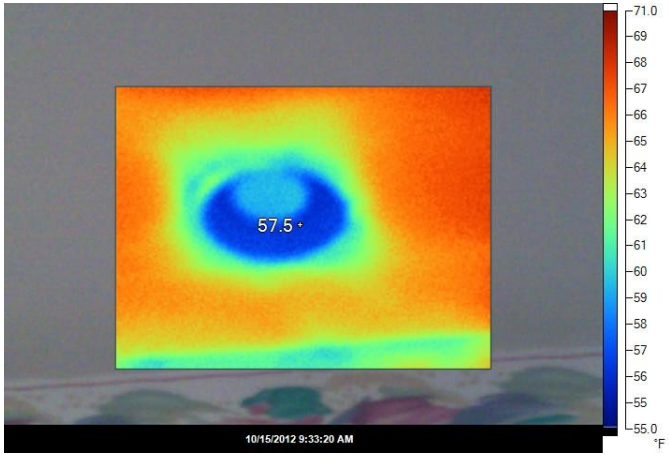
Common Problem Areas 3

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







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Hidden Problems

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

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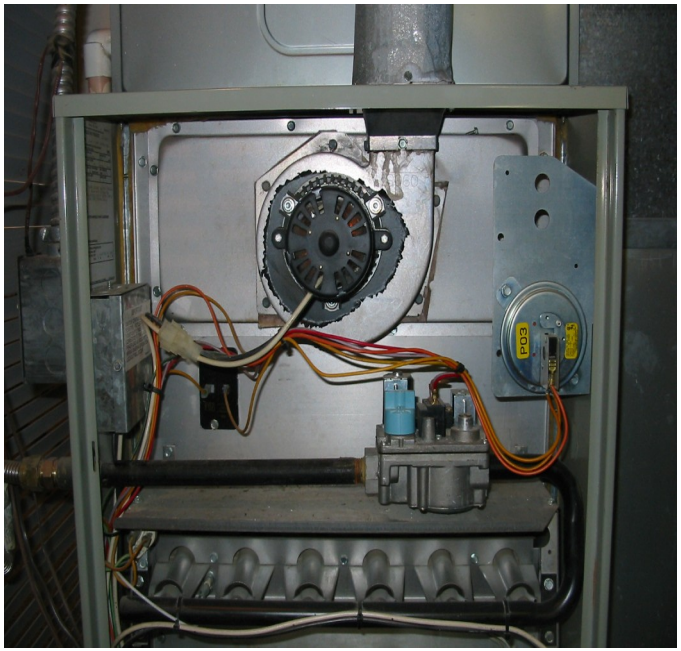
Furnaces

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

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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)

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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)

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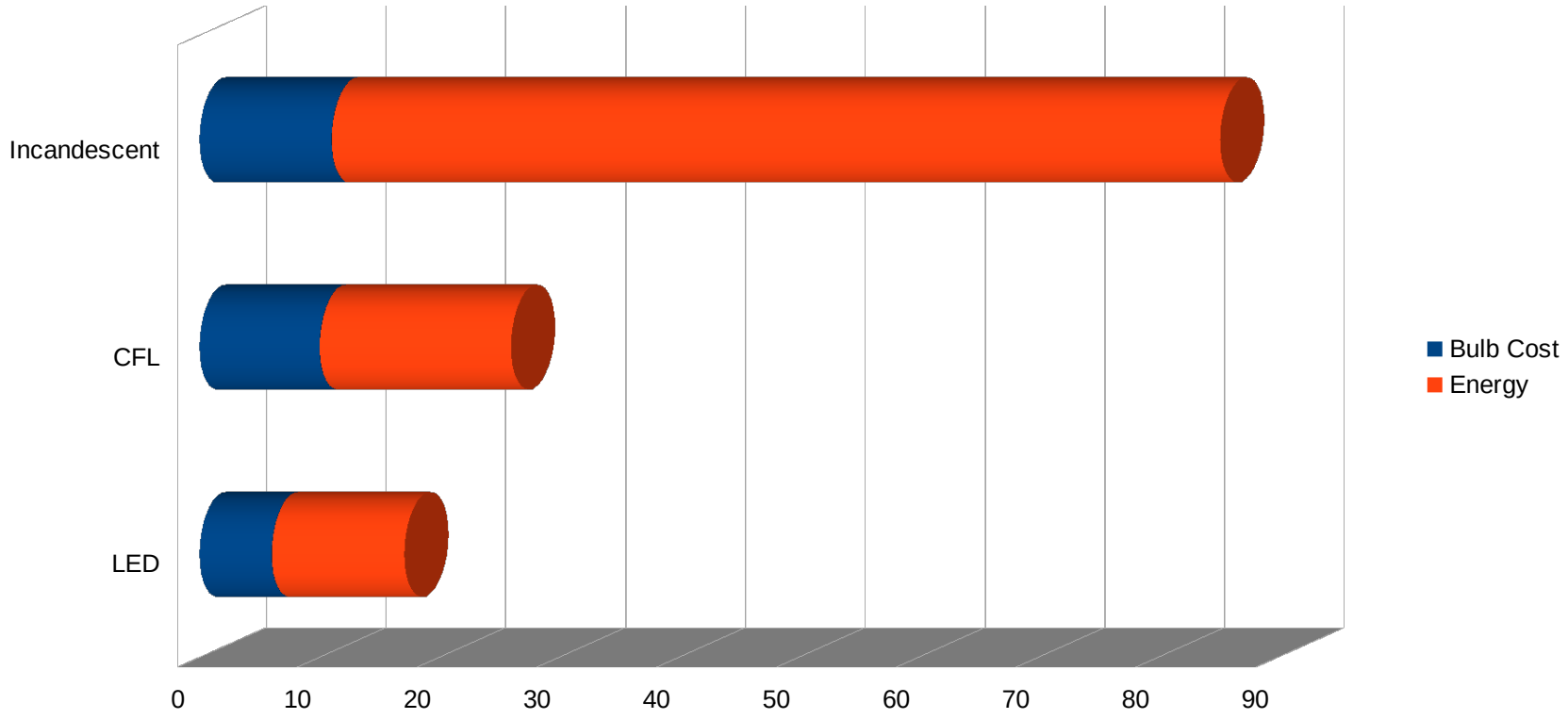
Lighting: 10 Year Costs



Incandescent Bulbs: 10% Light + 90% Heat

CFL= Compact Fluorescent Light

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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

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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**

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Energy Myths vs. Building Science

- 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

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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

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Energy Myths vs. Building Science

- 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

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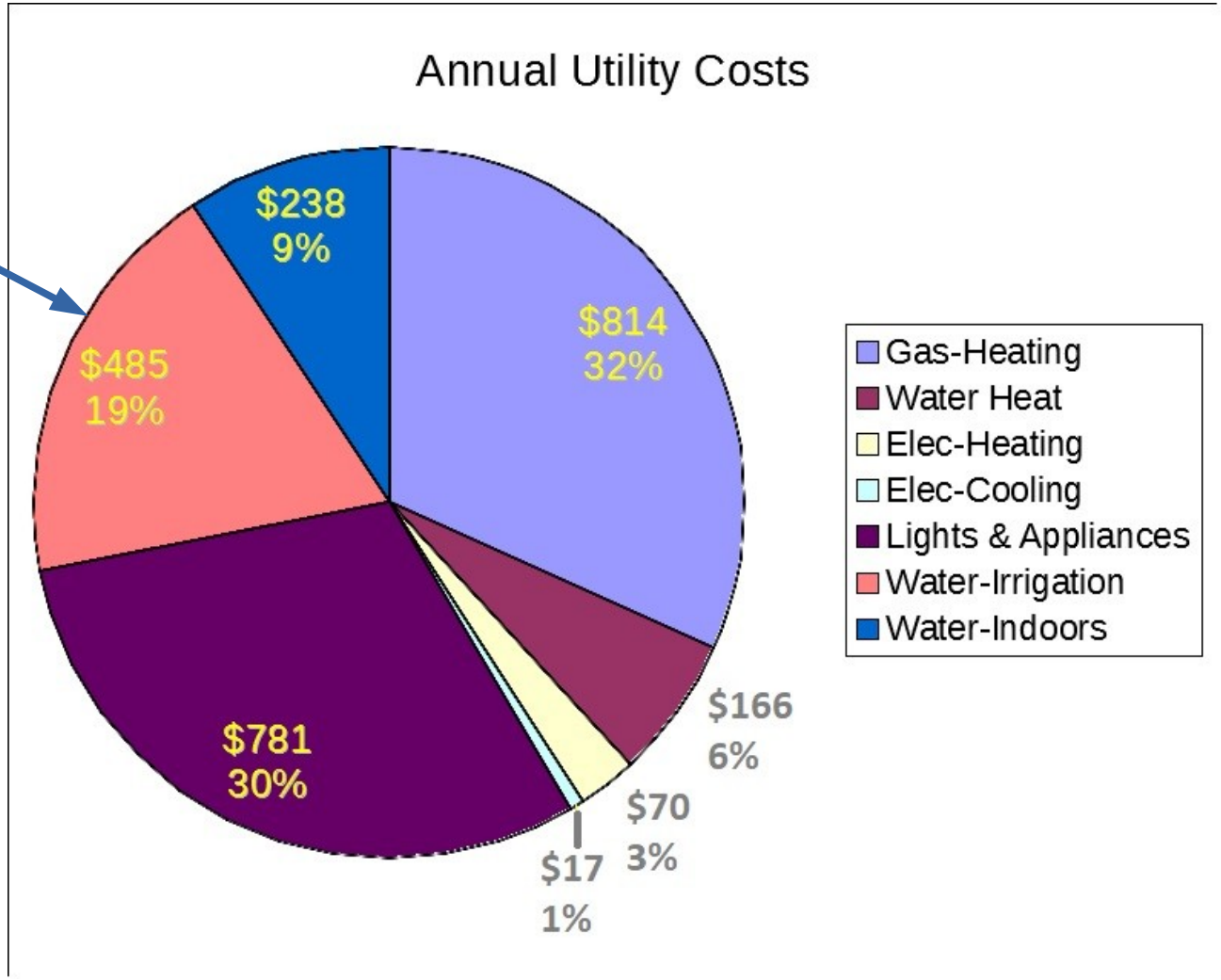
Don't Forget Water Costs

Irrigation Water: CO Springs Utilities



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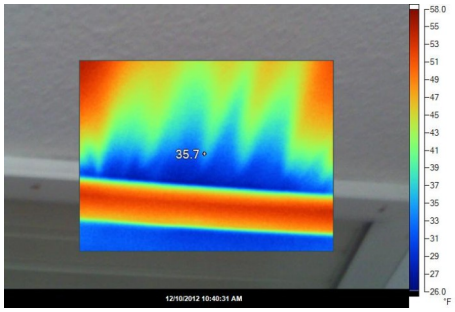
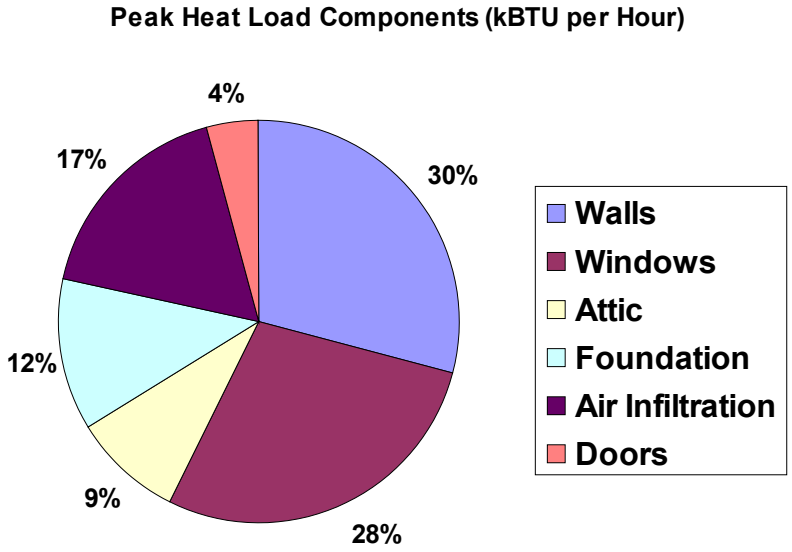
The Home Energy Audit





- 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

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Conclusion

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

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QUESTIONS?