



# Energy Saving Tips and Practices for the Farm and Home

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# Results of a Tight Energy Supply

- Increased energy costs
  - Electricity
  - Gasoline
  - Heating oil / propane
- Increased cost for goods and services
  - Food
  - Clothing
  - Durable goods
- Reduced disposable income



# Two Ways to Approach

- Supply
  - Alternative energy supplies
- Demand
  - Conservation



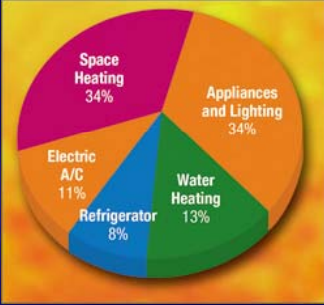

# What are we going to discuss??

Alternative energy sources?  
 Wind, solar, biomass?  
 Generalities? Case Studies?


Efficiencies/conservation?  
 reducing electricity usage,  
 heating fuels, fuel consumption



# Your Home's Energy Use

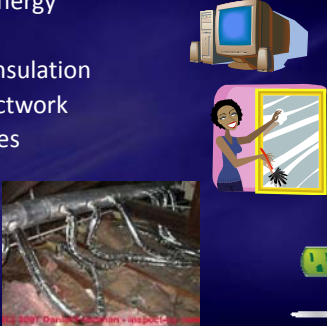



Source: US Department of Energy







# Home Energy Losses

- Phantom energy
- Air leakage
- Improper insulation
- Leaking ductwork
- Inefficiencies
- Waste

## Home Energy Losses

- Phantom or drain losses can account for up to 5% of energy expenditures
  - Anything with a clock
  - Anything with a remote
  - Anything that uses a charger
  - Anything with a converter








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## Air Leakage


- Air Leakage & improperly installed insulation can waste more than 40% of your energy expenditures.
- A 1/16" gap around a door is equal to
  - a 3.8" square
  - Or a 4.3" diameter round

Hole in the wall of your house!!!!


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## Sources of Air Leakage



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## Infrared (Thermal) Imaging



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## How to Stop the Leaks

- Weatherstripping
  - Around Doors
  - Around Windows
- Caulk
  - Where two dissimilar materials meet
  - Spray foams for larger holes





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## Selecting a Weatherstripping

- Resistance to wear by abrasion or friction.
- Exposure to weather.
- Material to be weatherstripped.
- The size of the gap.
- Evenness of the gap.
- Appearance. Some types are hidden after installation; other types may look "added on."
- Durability. A more expensive type that will last can be the most economical choice.
- Ease of installation.

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## Types of Weatherstripping

- Self stick or nail on
  - Felt
  - Open cell foam
  - Closed cell foam (sponge)
  - Vinyl tube
  - Metal
  - Wood with foam
  - Interlocking metal
  - Magnetic
  - Spring loaded
  - Thresholds
  - Sweeps

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## Caulks

- Silicone Caulk
- Latex Caulk
- Acrylic Latex Silicone Blend Caulk
- Kitchen and Bath Caulk
- Butyl Rubber Caulk
- Oil-Based Asphalt Caulk
- Caulking Cord
- Oakum
- Spray Foam

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## Spray Foams

For gaps that aren't likely to move, encounter adverse weather and for areas that would benefit from a little insulation, spray foams may be more appropriate than caulk.

are rigid and have a higher R-value than polyurethanes. They expand as they cure, so they come in low-expanding formulas, but polyurethanes grow.

urethane cures soft and flexible than polyurethanes, and they have a slightly lower R-value, typically around R-4, than polyurethanes, so use.

Source: Fine Homebuilding 162, April/May 2004

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## How to Caulk

- Remove old caulk
- Cut tip at a 45° angle
- Tip hole should be smaller than the gap
- Hold gun at an angle
- Apply even pressure
- Work at an even speed
- Tool the caulk when done to force into gap
- Use foam backer rod for cracks more than 1/4" deep

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## Insulation

- Where to insulate
  - Attics
  - Attic access doors
  - Walls
  - Floors in unheated areas
  - Foundations
  - Duct work
  - pipes
- How much do I need?
  - Ceiling/attic R-49
  - Walls R-18
  - Floors R-25
  - Over unheated, uninsulated space
  - Interior basement wall R-18
  - Duct work R-6 with vapor barrier

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## How Much Do I Need?

**Recommended R-Values**

Zone	Attic	Wall	Floor
1	R-49	R-18/R-28*	R-25
2	R-49	R-18/R-22	R-25
3	R-49	R-18	R-25
4	R-38/R-49	R-13/R-18	R-13/R-25
5	R-38/R-49	R-13/R-18	R-11/R-25
6	R-22/R-49	R-11/R-18	R-11/R-25

\*First value is for homes heated with natural gas; second is for electric furnaces.

Source: U.S. DOE, [www.energys.gov/consumers/insulation.html](http://www.energys.gov/consumers/insulation.html)


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## Types of Insulation - I

**A. Cotton Batts**  
No-itch batts of recycled denim from jeans factories are treated with borates to resist fire and insects.  
**Good for:** New construction, attics  
**R-value per inch:** 3.7  
**Vapor barrier needed:** Yes  
**Cost:** 70¢ to 75¢ per sq. ft.

**B. Loose-Fill Fiberglass**  
Fluffy bits of spun glass that are noncombustible and can't decay. Blown in dry. Tends to settle. R-value declines by as much as 50 percent at temps below 0 degrees F.  
**Good for:** Attic insulation, new construction, retrofit  
**R-value per inch:** 4  
**Vapor barrier needed:** Yes  
**Cost:** 21¢ per sq. ft.

**C. Extruded Polystyrene (XPS)**  
Closed-cell structure stops water and water vapor, resists compression, and holds its R-value over time. Must be protected from solvents and sunlight. Flammable and must be protected from fire with drywall or plaster.  
**Good for:** In-ground foundation, masonry structures  
**R-value per inch:** 5  
**Vapor barrier needed:** No  
**Cost:** 50¢ per sq. ft. for a 2-in.-thick panel




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## Types of Insulation - II

**D. Cellulose**  
Made from pulverized newspapers and treated with boron to resist fire and pests. Blown into place dry or wet. An adhesive reduces its tendency to settle.  
**Good for:** Retrofit work, attic insulation  
**R-value per inch:** 3.8  
**Vapor barrier needed:** No, if packed to a density of at least 2.6 lb./cu. ft.  
**Cost:** 17¢ per sq. ft.

**E. Fiberglass Batts**  
Lightweight batts of spun glass offer a predictable R-value if not compressed, but the fibers offer little resistance to air movement and convective heat loss.  
**Good for:** New construction, attics  
**R-value per inch:** 3-4  
**Vapor barrier needed:** Yes  
**Cost:** 38¢ per sq. ft.

**F. High-Density Polyurethane Spray Foam**  
The rigid, closed-cell structure makes it impermeable to water. Must be professionally applied. While not flammable, it must be protected with drywall or plaster to stop offgassing during a fire.  
**Good for:** Masonry basement walls  
**R-value per inch:** 7  
**Vapor barrier needed:** No  
**Cost:** 4 times the cost of fiberglass batts




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## Types of Insulation - III

**G. Mineral Wool**  
Spun from blast-furnace slag, this inorganic insulation does not burn or support the growth of mold or mildew. Highly sound-absorbent. Blown into place wet, it's trimmed flush after it dries.  
**Good for:** New construction, attics  
**R-value per inch:** 4  
**Vapor barrier needed:** Yes  
**Cost:** 19¢ per sq. ft.

**H. Low-Density Polyurethane Spray Foam**  
Blocks the movement of air, absorbs sound, flexes with the seasonal movement of the framing. Must be professionally applied. Although not flammable, must be protected from fire with drywall or plaster.  
**Good for:** New construction, retrofit in attics, crawl spaces  
**R-value per inch:** 4  
**Vapor barrier needed:** No  
**Cost:** 4 times the cost of fiberglass batts.



**I. Foil-Faced Polyisocyanurate**  
Its closed-cell structure stops water, vapor, and the foil-covered face acts as a radiant barrier. Not recommended for exterior, below-grade applications. Not flammable, but it must be protected with wallboard.  
**Good for:** Cathedral ceilings, walls for finished basements  
**R-value per inch:** 7-8  
**Vapor barrier needed:** No  
**Cost:** 40¢ per sq. ft. for a 3/4-in.-thick panel



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## How Insulation Works



- All insulation works when it is installed properly and has no gaps, voids, or compressed areas.

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## Seal Your Ducts

- In a typical house about 20% of the air that moves through the duct system is lost due to leaks, holes, and poorly connected ducts.
- You may have duct problems if:
  - You have high summer and winter utility bills
  - You have rooms that are difficult to heat and cool
  - You have stuffy rooms that never seem to feel comfortable
  - Your ducts are located in an attic, crawlspace, or the garage
  - You find tangled or kinked flexible ducts in your system

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## Tax Incentives for Energy Improvements to the Home

- Existing homes are eligible for a series of efficiency measures. For some measures, such as insulation, a taxpayer can take a credit of up to 10% of the cost. There is a \$500 cap on the credit per home, including the amount received for heating and cooling equipment, as described in the next section. Lower caps are set on credits for some individual measures.
- These credits are available for buildings or systems placed in service from January 1, 2009, through December 31, 2009.

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## What is Eligible for the Federal Tax Credits?

- Added insulation to walls, ceilings, or other part of the building envelope.
- Replacement windows and skylights: credit capped at \$200.
- Window Films
- External doors
- Sealing cracks in the building shell and ducts to reduce infiltration and heat loss.
- Pigmented metal roofs, or an asphalt roof with appropriate cooling granules.
- Only materials (insulation, windows, sealants, etc.) are eligible and not the labor to install these materials.

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## Inefficiencies


- Water Heaters
  - 13% of home energy use to heat water
  - If more than 10 years old, consider replacing
  - An R-11 Blanket can pay for itself in less than 1 year
  - Super high efficiency units have an approximate 5 year payback
  - On demand water heaters
    - Gas
    - Electric



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## Inefficiencies

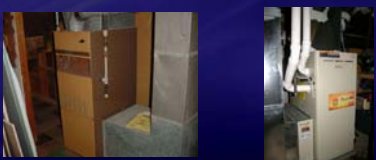
- Appliances
  - Refrigerator accounts for 8% of home energy use
  - Newer refrigerators will be up to 35% more efficient than units just 10 years old!
  - Don't save the old one!!



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## Inefficiencies

- HVAC
  - 34% of our energy bill
  - Annual Fuel Utilization Efficiency (AFUE) rating.
  - AFUE ratings range from 78% to 100% (electric)
  - AFUE does NOT include losses from ductwork
  - DOE - AFUE higher than 90% as "high efficiency"
  - Many older units have an AFUE of 50-65%



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## Annual Estimated Savings for Every \$100 of Fuel Costs by Increasing Heating Equipment Efficiency\*

Existing System AFUE	New/Upgraded System AFUE								
	55%	60%	65%	70%	75%	80%	85%	90%	95%
50%	\$9.09	\$16.76	\$23.07	\$28.57	\$33.33	\$37.50	\$41.24	\$44.24	\$47.36
55%	----	\$8.33	\$15.38	\$21.42	\$26.66	\$31.20	\$35.29	\$38.88	\$42.10
60%	----	----	\$7.69	\$14.28	\$20.00	\$25.00	\$29.41	\$33.33	\$37.80
65%	----	----	----	\$7.14	\$13.33	\$18.75	\$23.52	\$27.77	\$31.57
70%	----	----	----	----	\$6.66	\$12.50	\$17.64	\$22.22	\$26.32
75%	----	----	----	----	----	\$6.50	\$11.76	\$16.66	\$21.10
80%	----	----	----	----	----	----	\$5.88	\$11.11	\$15.80
85%	----	----	----	----	----	----	----	\$5.55	\$10.50
90%	----	----	----	----	----	----	----	----	\$5.30


\*Assuming the same heat output

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Source: US Department of Energy

## Inefficiencies

- Central Air conditioning
  - 11% of our energy bill
  - Seasonal Energy Efficiency Ratio (SEER) - indicates the relative amount of energy needed to provide a specific cooling output.
  - Many older systems have SEER ratings of 6 or less.
  - The minimum SEER allowed today is 13.
  - Calculate the improvement in efficiency
    - 1 - old SEER/new SEER
    - Example from a SEER of 10 to a SEER of 15 is  $1 - 10/15 = 0.33$  or 33% less energy used



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## Inefficiencies


- Room air conditioners
  - EER - ratio of the cooling capacity (Btu per hour) to the power input (in watts).
  - The higher the EER rating, the more efficient
  - National appliance standards require room air conditioners built after January 1, 1990, to have an EER of 8.0 or greater.
  - A 1970's-vintage room air conditioner with an EER of 5 replaced with an EER of 10 unit will result in air conditioning energy costs cut in half.
  - When buying a new room air conditioner, look for units with an EER of 10.0 or above.

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## Energy Star

- What is Energy Star?
  - ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy helping us all save money and protect the environment through energy efficient products and practices.
- Allows homeowners to save up to 30% a year on energy costs


<http://www.energystar.gov/>



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## What is Included?


- Over 50 product categories
  - Major appliances
  - HVAC
  - Office equipment
  - Lighting
  - Home electronics
  - New homes
  - Commercial and industrial buildings.



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## Cost of Energy Star




- Energy Star items are generally more expensive to purchase/install
- Will cost less to operate over the life of the item
- May increase resale value
- May qualify for a tax credit



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## Inefficiencies


- Lighting
  - Approximately 15% of home energy use
  - Incandescent bulbs turn 85-90% of input energy into heat
  - Compact fluorescent turn 85-90% of input energy into light
  - 60 watt incandescent = 13 watt CFL = 3 watt LED

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## Five Minute Energy Savers


- Programmable Thermostat
  - Set back 1° for 8 hours/day = 1% Energy savings



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### Five Minute Energy Savers

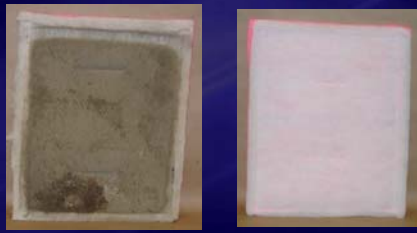
- Replace Dryer Vent
  - Shuttle design can reduce heat loss by 80%



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### Five Minute Energy Savers

- Change the furnace/ac filters
  - Can reduce efficiency by 20%




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### Five Minute Energy Savers

- Electrical flow interrupter device

**NOTE – PROPER POSITIONING**



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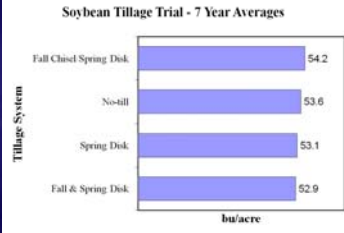
### Farm Energy Conservation Practices

- **Maintain tractors/Equipment**
  - Use the proper viscosity oils and seasonal fuels
  - Change filters as recommended
  - Clean injectors on a regular schedule
  - Gear up and throttle down
  - Avoid excessive idling
  - Keep tire pressure at the lowest recommended level and avoid over-ballasting

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### Farm Energy Conservation Practices

- **Consider no-till management strategies.**
  - Reduce diesel fuel consumption
  - Preserve topsoil structure
  - Conserve soil carbon



Tillage System	bu/acre
Fall Chisel/Spring Disk	54.2
No-till	53.6
Spring Disk	53.1
Fall & Spring Disk	52.9

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### Farm Energy Conservation Practices

- **Irrigate efficiently**
  - Studies in Western states indicate that about 25 percent of electrical energy used in irrigation is wasted due to poor pump and motor efficiency.
    - combination of mechanical and management upgrades
    - Lowering pressures on pivot irrigation systems
    - Use pressure gauges
    - monitor soil moisture to avoid over watering
    - examine sprinkler nozzles regularly for wear.

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## Farm Energy Conservation Practices

- **Manage stock tanks to reduce electrical use during winter.**
  - Earth-bermed
  - super-insulated stock tanks



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## Farm Energy Conservation Practices

- **Manage stored fuel**
  - A 300-gallon unsheltered above-ground tank can lose up to 10 gallons per month through evaporation during warm months, particularly when painted a dark color.
    - Silver-coat the tanks
    - Shelter to keep them shaded
    - Pressure relief caps also reduce evaporation loss.



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## Additional Resources

- Energy Star – [www.energystar.gov](http://www.energystar.gov)
  - 1-800-782-7937
  - Home sealing guide  
[www.energystar.gov/ia/home\\_improvement/home\\_sealing/DIY\\_COLOR\\_100\\_dpi.pdf](http://www.energystar.gov/ia/home_improvement/home_sealing/DIY_COLOR_100_dpi.pdf)
- U.S. Department of Energy – <http://www.doe.gov/>
  - Energy saving tips book - <http://www.eere.energy.gov/consumers/tips/>
- University of Missouri Extension publications  
<http://extension.missouri.edu/xplor/>
- Tax Incentives Program - <http://www.energytaxincentives.org/>
- U.S. DOE Energy Efficiency and Renewable Energy -  
<http://www.eere.energy.gov/consumer/>  
Or [http://apps1.eere.energy.gov/consumer/your\\_home/](http://apps1.eere.energy.gov/consumer/your_home/)

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