Example 1—Calculating the payback period for a new wood stove or insert

Assume you now heat with natural gas and use 600 therms per year. You expect the cost per therm to remain $1.962. A new wood stove is 70 percent efficient, and total installed cost is $3,000. You plan to burn mostly Douglas-fir at 20 percent moisture content, and you can purchase cords (85 cubic feet of solid wood) for $200. How long will it take to recover the cost of installing a wood stove?

1. **Calculate the amount of available heat you are using.**
   therms/year x available heat/unit = BTUs/year:
   600 therms x 80,000 BTUs/therm = 48,000,000 BTUs/year

   You need 48,000,000 BTUs to heat your house.

2. **Calculate your current annual heating cost.**
   therms/year x cost/therm = annual heating cost:
   600 therms x $1.962/therm = $1,177.20

   You currently spend $1,177.20 per year to generate 48,000,000 BTUs and heat your house.

3. **Calculate the amount of wood needed to generate 1 million BTUs.**
   a. unit heat value x efficiency = available heat/cord:
   21,000,000 BTUs/cord x 0.70 = 14,700,000 available BTUs/cord

   b. 1 million ÷ available BTUs/cord = cords required for 1 million BTUs:
   1 million ÷ 14,700,000 = 0.068 cord

   It will take 0.068 cord of firewood to generate 1 million BTUs of available heat.

4. **Calculate the amount of Douglas-fir firewood needed to heat your house.**
   BTUs used x amount of wood/1 million BTUs ÷ 1 million = amount of wood:
   48,000,000 BTUs x 0.068 cord ÷ 1 million = 3.264 cords

   You will need 3.264 cords of firewood to heat your house each year.

5. **Calculate the cost of the firewood.**
   number of cords x cost/cord = cost of firewood:
   3.264 cords x $200 = $652.80

   It will cost $652.80 each year to heat your house with firewood.

6. **Calculate the annual savings of using firewood.**
   annual cost of natural gas – annual cost of firewood = annual savings:
   $1,177.20 – $652.80 = $524.40

   With the wood stove, you will save $524.40 each year in fuel costs.

7. **Calculate the payback period for purchasing a wood stove.**
   cost of stove ÷ annual savings = years to pay back stove cost:
   $3,000 ÷ $524/year = 5.7 years

   It will take 5.7 years to recover the cost of your investment in the new wood stove. There may be state or federal tax incentives for purchasing high-efficiency wood-burning appliances. Such incentives would decrease the payback period.

Example 2: Comparing the heating value of two fuels

How much heating oil or natural gas would be replaced by one cord of firewood?

available heat/cord ÷ available heat/unit of alternative fuel = amount replaced:

Natural gas: 18,000,000/cord ÷ 80,000/therm = 225 therms

Heating oil: 18,000,000/cord ÷ 116,000/gal = 155 gallons of heating oil

The heating value of a cord of well-seasoned dense hardwood is equal to the heating value of about 225 therms of natural gas or about 155 gallons of heating oil.

Example 3: Calculating the break-even cost of firewood to replace current fuel

Assume you use 35,000 KWH of electricity to heat your home, and the cost of electricity is $0.0653/KWH. How much Douglas-fir firewood would you need to heat your home? At what price of firewood would you break even on the cost of heating your home with firewood instead of electricity?

1. **Calculate the KWH value of a cord of firewood.**

   available heat/cord of firewood ÷ available heat/unit of alternative fuel:

   12,600,000 BTUs/cord ÷ 3,415 BTUs/KWH = 3,690 KWH/cord

   A cord of firewood is equal to about 3,690 KWH of electricity.

2. **Calculate the amount of firewood needed to replace the total BTUs of electricity.**

   BTUs of electricity to replace ÷ KWH/cord:

   35,000 KWH/year ÷ 3,690 KWH/cord = 9.48 cords/year

   To replace 35,000 KWH of electricity, you would need approximately 9.5 cords of Douglas-fir firewood.

3. **Calculate your current cost of electricity.**

   cost/KWH x electricity used:

   $0.0653/KWH x 35,000 KWH/year = $2,285

   You currently spend $2,285 to heat your home with electricity.

4. **Calculate the break-even cost of firewood.**

   cost of electricity ÷ 9.48 cords:

   $2,285 ÷ 9.48 = $240

   You can break even if the cost of Douglas-fir firewood is $240 per cord. If the cost per cord is less than $240, you will save money on fuel costs by burning firewood.

For more information

The U.S. Department of Energy Information Administration tracks some fuel prices: http://www.eia.doe.gov/

For Oregon fuel prices, go to the Oregon Public Utility Commission: http://www.oregon.gov/PUC/index.shtml

For information on wood and pellet stoves, see the EPA consumer wood-burning appliance website: http://www.epa.gov/burnwise/appliances.html