Heat Pumps

Physics and Mathematics of Sustainable Energy

College of the Atlantic.

1. Suppose that you set your thermostat at 22 degrees C and in January you used 15 MMBTU of heating oil to keep your house warm. The average outside temperature in January is -6 degrees C. The current average cost of heating oil in Maine is \$2.30 per gallon.

   (a) How many gallons of fuel is this?
   (b) How much would this fuel cost?
   (c) How much CO2e would be emitted from burning this fuel?
   (d) If you turned your thermostat from 22 to 18, how much less fuel would you use? Express your answer as percent. I.e., N% less fuel.
   (e) How much would you save on your heating bill?
   (f) How much less CO2e would be emitted?

- 1 kWh = 3.6 MJ = 3412 BTU
- 1 MMBTU = 1,000,000 BTU
- Calorific value of heating oil: 12.8 kWh/kg, 37.3 MJ/L, 139,000 BTU/gallon
- Carbon intensity of heating oil: 260 g of CO_2 per kWh of thermal energy
- 1 gallon = 3.8 liters
- Current average cost of heating oil in Maine: \$2.30/gallon.
- Cost of electricity in Maine \$0.168/kWh.