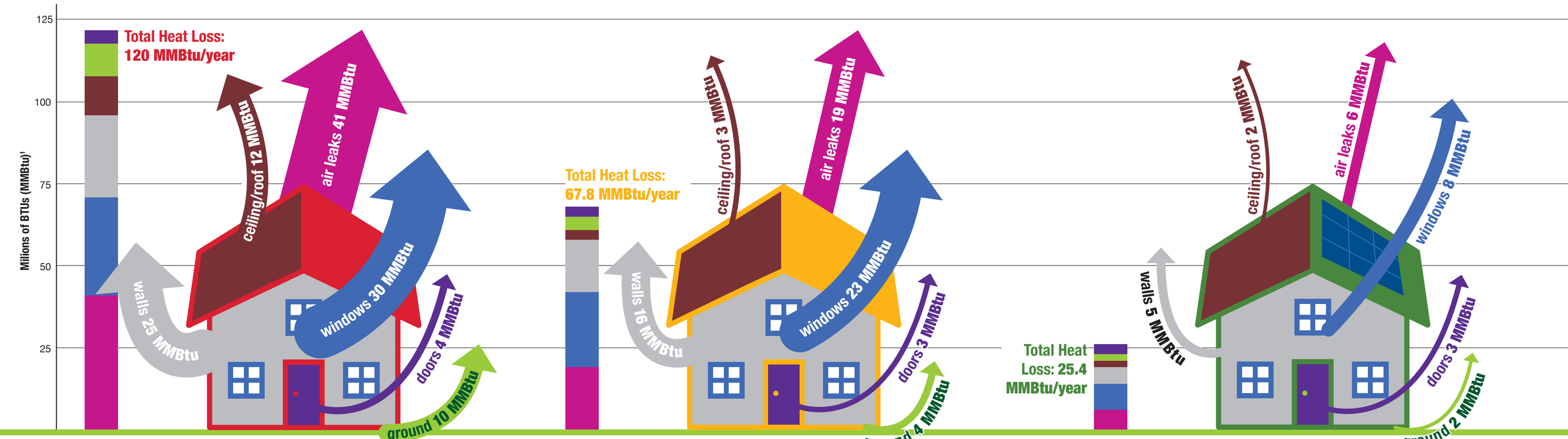
HEATING NH HOMES

Where is heat leaving our homes?[2]



OLD HOUSE

Annual heating cost, with fuel oil: $2,500 / 30,000 lbs CO_2e

WEATHERIZED OLD HOUSE

Annual heating cost, with fuel oil: $1,400 / 17,000 lbs CO_2e

NET ZERO READY HOUSE

Annual heating cost, with electric heat pump:
$500 / 4,100 lbs CO_2e from the grid, $280 / 200 lbs CO_2e from PVs

NEW HAMPSHIRE NHEEP ENERGY EDUCATION PROJECT

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of the Vermont Energy Education Program

OUR MISSION is to build a deep understanding of energy through education, encouraging choices that result in sustainability in our communities, economy and environment.

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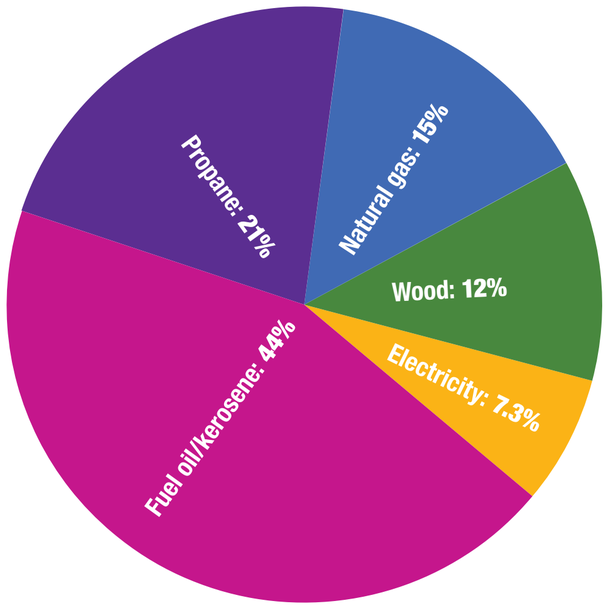
NOTES

1. A British thermal unit (Btu) is a measure of energy defined as the amount of heat required to raise one pound of water 1 degree F. Burning up a large wooden match releases about 1 Btu. One million Btus (1 MMBtu) is the amount of heat released by the combustion of 7 gallons of fuel oil.
2. Based on a two-story, 2,300 sq.ft. home, 29 feet wide by 40 feet long. The old house has some insulation, but is quite leaky to air movement; the weatherized old home has been tightened up and insulated and storm windows have been repaired. Both have typical oil boilers. The net zero ready home is very highly insulated and very airtight, with heat recovery ventilation and an air source heat pump.
3. Data from U.S. Energy Information Agency: eia.gov/state/seds/seds-data-fuel.php?sid=NH#DataFiles. These data may undercount cord-wood, because it is often cut by the user or bought on the informal market, not tracked by US EIA.
4. Cost of fuels are tracked by the State of New Hampshire: www.nh.gov/osi/energy/energy-nh/fuel-prices/index.htm. Cost per million BTUs (MMBtu) is based on typical efficiencies for new heating systems used in homes. Carbon dioxide equivalent (CO2e) is a simple way to account for all greenhouse gases in a standard unit based on the global warming potential of a unit of carbon dioxide over a specified timeframe (here set at 100 years). For example, one ton of methane would be equal to 25 tons of CO2-eq, because it has a global warming potential 25 times that of CO2. These values include GHG emissions emitted in the process of exploration, extraction, transport, refinement, distribution, and consumption of the fuel.
5. Many tallies of CO2 emissions discount wood emissions partially or totally because trees will regrow and absorb that CO2. We include a range of emissions here because 1) Burning wood releases as much or more carbon dioxide per unit of energy as burning coal, 2) We don't know whether the trees are harvested sustainably. The larger value represents total emissions from harvesting, transporting and burning the wood. The lowest figure assumes almost all the wood is harvested sustainably. However, the forests of NH are sequestering far more CO2 annually than is being released by the forest industry and biomass energy use.
6. How can efficiency be more than 100%? Even in very cold climates, a modern air source heat pump will deliver, on average over the winter, about 2.3 units of heat for every unit of electricity it uses. It does this by extracting heat from the outside air, even at very low outdoor temperatures.
7. Isn't the cost of solar-powered electricity $0? The energy from the sun is free, but it costs money to install a photovoltaic (PV) system. The cost of electricity from PVs is estimated here at $0.09/kWh, figured by dividing the installed cost of the PV system by its lifetime kWh output.

What energy sources heat our homes?[3]



What is the cost of each source?[4]

Heating Fuel	Typical delivery efficiency	CO_2e emissions per MMBtu of heat delivered	Cost per MMBtu of heat delivered to the house
Fuel oil/kerosene	85%	240 lbs	$26
Propane	90%	210 lbs	$38
Natural gas	90%	260 lbs	$12
Cord wood	65%	30–300 lbs[5]	$21
Wood pellets	85%	23–230 lbs[5]	$19
Electricity from the grid with resistance heat	100%	360 lbs	$53
Electricity from the grid with air source heat pump	230%[6]	160 lbs	$23
Electricity from solar with air source heat pump	230%	8 lbs	$12[7]