CO_2 EMISSIONS FROM RESIDENTIAL BUILDINGS

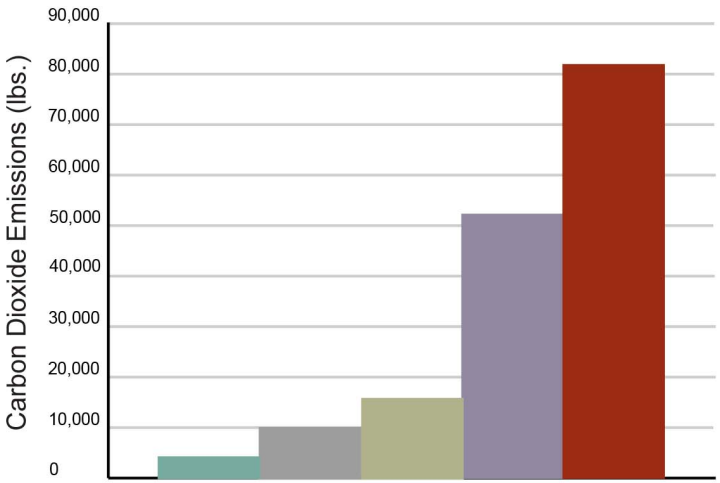
This research seeks to identify the most cost-effective order of steps to take in reducing the CO_2 emissions of new houses in Boulder, Colorado. We converted all forms of energy to kilowatt-hours in order to compare different sources (electricity, gas, and solar energy). We calculated building energy loads on a monthly basis to see the seasonal peaks in heating, electrical, cooling and hot water demand. We measured these loads against various energy sources in order to understand the economics of reducing loads versus providing renewable (photovoltaic or solar thermal) supply. We provide the results in a series of step charts that rank reductions in CO_2 emissions in order of cost-effectiveness. Due to the fact that Colorado's coal-dense electricity emits four times as much CO_2 as natural gas, we have analyzed all-electric systems as well as those with natural gas heat and hot water. This becomes important as natural gas prices rise, increasing the likelihood of a shift to all-electric systems and the resulting increase in carbon dioxide emissions. Our results indicate that emissions reductions of 50% are attainable with an increase in building cost of 3%-5% and a reduction in utility costs that would render the improvements cost-neutral. Our results track the potential improvements further to zero emissions (carbon neutral), with and without current regional photovoltaic rebates.

CARBON SOURCE KEY

- Hot Water
- Cooling
- Heating
- Electricity
- Total

Typical Code-Minimum House:
2400 sq. ft. above ground, 1500 sq. ft. basement

Electric Heating and Hot Water



Natual Gas Heating and Hot Water