The 2030 Challenge

That all new buildings, developments and major renovations be designed to meet a fossil fuel energy consumption performance standard of 50% of the regional (or country) average for that building type.

That at a minimum, an equal amount of existing building area be renovated annually to use 50% of the amount of fossil fuel energy they are currently consuming (50% of the regional average through innovative design strategies, the application of renewable technologies and/or the purchase (1/5 maximum) of renewable energy).

That the fossil fuel reduction standard for all new buildings be increased to:
60% in 2010
70% in 2015
80% in 2020
90% in 2025
Carbon-neutral by 2030 (using no fossil fuel GHG emitting energy to operate).

We know these targets are readily achievable and that most buildings can be designed to use only a small amount of energy at little or no additional cost through proper siting, building form, glass properties and location, material selection and by incorporating natural heating, cooling, ventilation, and day-lighting strategies. The additional energy a building would then need to maintain comfort and operate equipment can be supplied by renewable sources such as solar (photovoltaics, hot water heating, etc.), wind, biomass and other viable carbon-free sources.

To meet the ***2030 "Challenge"****, we must not only design high-performance and carbon-neutral buildings but advocate actions that will require all buildings and developments to meet these targets as well (through building codes, government regulations and legislation).*

—Edward Mazria AIA

Understanding Energy Units

• Imperial units use the unfortunate British Thermal Unit (Btu) for thermal energy. One Btu is about the amount of energy released by striking a single match. This is so small as to be nearly useless, so we usually talk about thousands of Btus (kBtus) or therms (100,000 Btu).

• Natural gas is delivered in units of CCF, or hundred cubic feet. One CCF is about equal to 100,000 btu, also known as a therm.

• Electrical energy is measured in the S.I. units of kilowatt-hours (kWh). One kWh is the energy used by 1000 watts (i.e. ten 100-watt light bulbs) running for one hour.

• Electrical power is measured in the S.I. units of watts or kilowatts (KW). Power is energy per unit of time—an measure of the RATE of energy use.

• Electrical energy can be converted to thermal energy at the rate of 3,412 Btu per kWh. However, electrical energy is a HIGHER and MORE USEFUL form of energy that can be used to spin motors, strike an arc, or illuminate a display device.

• Thermal energy can be converted to electrical energy, but at a cost. Only 33 to 50% conversion is currently possible. At most thermal generation stations, it takes 3 units of thermal energy to make one unit of electrical energy.

Understanding Carbon Units

• When we talk about carbon, we are really talking about carbon dioxide (CO2), the primary greenhouse gas. The carbon impact of fuels varies.

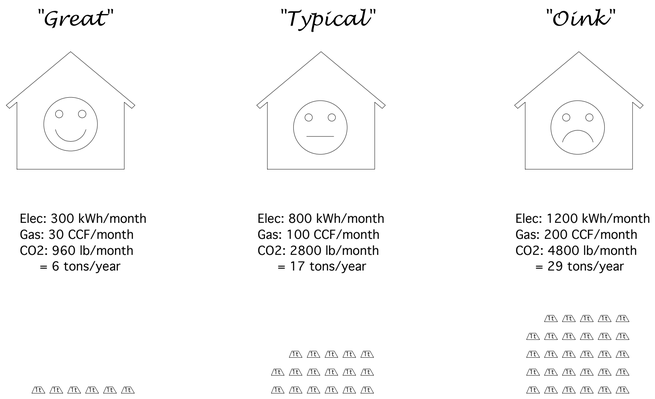
• Natural gas releases about 12 pounds of carbon dioxide per CCF.

• Electrical energy from typical fossil fuel generation emits about 2 pounds of CO2 per kWh.

• Electrical energy from solar PV, solar thermal, wind, and hydro sources has nearly zero CO2 emissions.

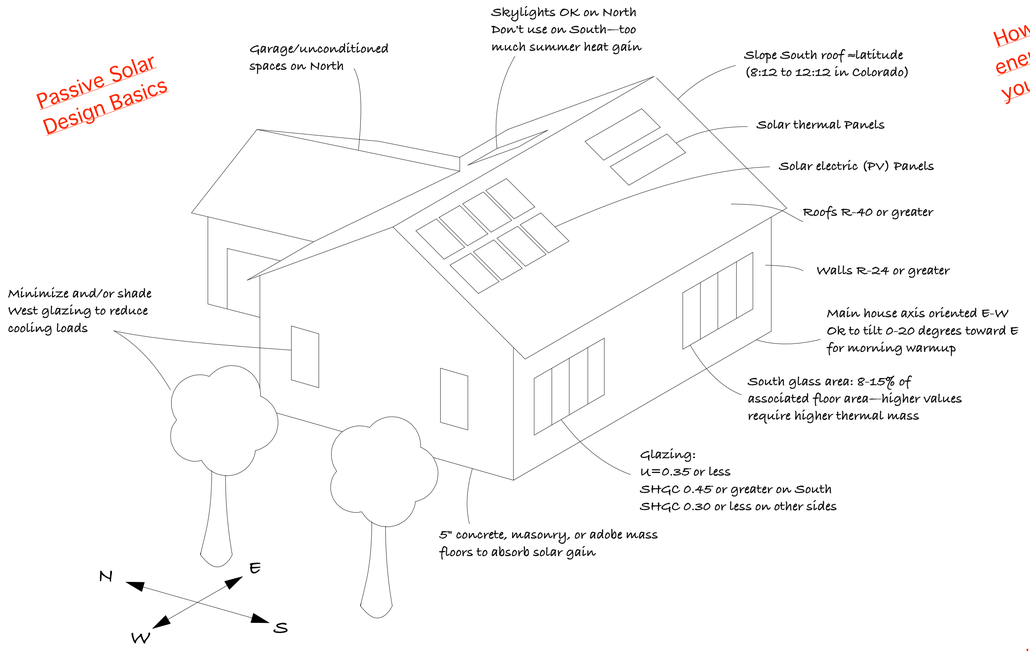
• Electrical energy from nuclear power has indirect CO2 emissions from construction and managing the fuel and waste cycles.

Comparing Houses

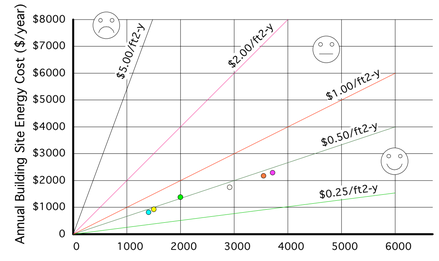


All houses: Typical 2500ft2 house in western Colorado climate

Passive Solar Design Basics



How much are your energy bills?

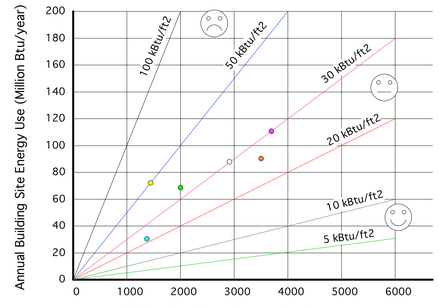


Add up all your electricity bills for one calendar year. Notice that there is a charge per unit for the energy used, and a flat fee for being connected to the grid. Some bills are "unbundled" and include fees for transmission and distribution. There are usually taxes applied as well. Use the total dollar amount for this comparison.

Add up all your natural gas bills for one calendar year. Gas bills usually include commodity and transport fees, which may or may not be broken down in the bill.

Combine these two values for your grand total. Plot on the chart versus your house size. Check your smile.

How much energy does your building use?

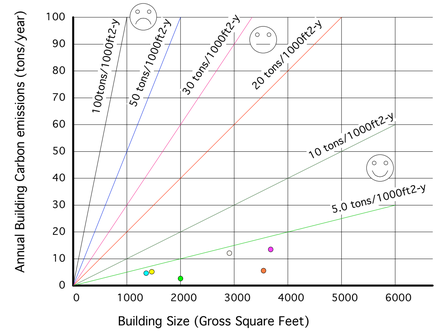


Add up all your electricity bills for one calendar year. Electric bills are measured in kWh (kilowatt-hours). Multiply the total kWh by 3.412 to convert to kBtu, then divide that by 1000 to convert to Million Btu.

Add up all your natural gas bills for one calendar year. Gas bills are measured in CCF (hundred cubic feet). Multiply by 0.8 (value may vary locally) to convert to therms. Multiply that by 10 to convert to kBtu, then divide by 1000 to convert to Million Btu. (If you use propane, one gallon of propane is about equal to one CCF of gas.)

Combine these two values for your grand total. Plot on the chart versus your house size. Check your smile.

How much carbon does your building emit?



Take your annual electricity usage (in kWh) for one calendar year as calculated above. For most Colorado utilities (primarily coal/gas-fired electricity), multiply your kWh by 2.0 to get pounds of CO2.

Take your natural gas usage (in CCF or therms) for one calendar year as calculated above. Multiply by 12 to get pounds of CO2.

Combine these two values for your grand total, then divide by 2,000 to get tons of CO2. Plot on the chart versus your house size. Check your smile.

Resource Engineering Group, Inc. provides structural and mechanical engineering for high-efficiency and alternative buildings.
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efficiency • sustainability • simplicity

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2030 Challenge

Reduce New Building Energy Use by 50%, starting NOW
Location: Earth

Issued for	Date
Education	1/01/2007
Action	1/02/2007
Follow-through	1/03/2007

Checked By	*August Hasz*
Drawn By	*Dave Houghton*
Date	August 10, 2007
Project #	999
Phase	Critical
Sheet	A.1

Start Now