Troop 93
February 24, 2014
Sustainability merit badge

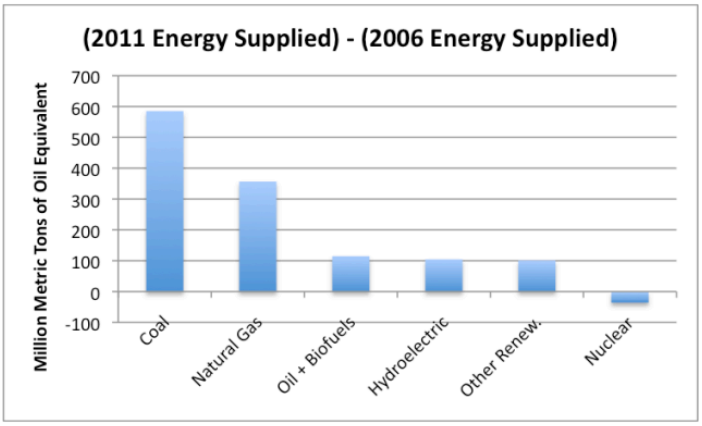
ENERGY

What is a carbon footprint? *"A measure of the total amount of carbon dioxide (CO_2) and methane (CH_4) emissions, considering all relevant sources, sinks and storage."*

Most of the carbon footprint emissions for the average U.S. household come from "indirect" sources, i.e. fuel burned to produce goods far away from the final consumer. These are distinguished from emissions which come from burning fuel directly in one's car or stove, commonly referred to as "direct" sources of the consumer's carbon footprint.

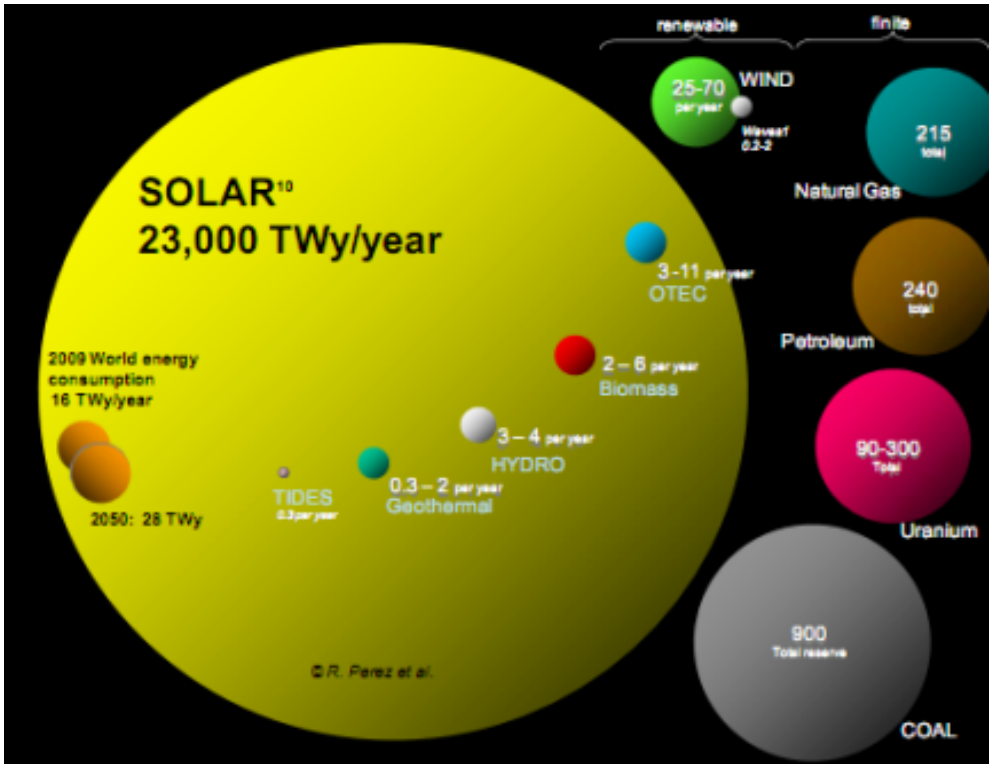
The heating and cooling of air and water are essential parts of our everyday lives. However, these services come at a substantial cost, with approximately 44% of energy consumption in the U.S. directly attributable to heating and cooling. The residential, commercial, and industrial sectors spend over $270 billion annually on heating and cooling.

Sources of energy:



Fossil Fuels – There are 3 primary forms of fossil fuels: Oil, Coal and Natural Gas. All were formed during the Carboniferous Era 285-360 million years ago when the Earth was covered in swamps full of trees, ferns and other leafy plants. The seas were full of algae. Dying plants turn into peat at the bottom of the oceans and are eventually pressed beneath rock over millions of years, turning them into one of these fuels. The Earth is not making any more of these fuels. Fossil fuels are NOT renewable energy sources – we are expected to run out of oil in around 40 years from the sources we know exist. Coal will likely be extinguished in around 100 years. Natural Gas can continue to be produced through various means, like shale fracking, but it needs a lot of up-front investment, and several years time delay to get the gas.

Solar - There are several ways to harness solar energy: photovoltaics (also called solar electric), solar heating & cooling, concentrating solar power (typically built at utility-scale), and passive solar. There are currently 9 GW_{th} of SHC capacity installed in the U.S., which ranks 36th in the world in installed capacity relative to its population.



Wind – Of all our energy sources, wind power has the lowest environmental impact of any utility-scale source of electricity. It emits no air or water pollution. It requires no mining or drilling for fuel, uses virtually no water, and creates no hazardous or radioactive waste. Currently installed wind power will offset nearly 100 metric tons per year of carbon dioxide emissions – about 1.8% of the country's total.

Nuclear - There are currently 104 operable commercial nuclear reactors at 65 nuclear power plants. Since 1990, the share of the nation's total electricity supply provided by nuclear power generation has averaged about 20%, and about 8% of all energy used. The United States has more nuclear capacity and generates more electricity from nuclear power than any other nation. The main environmental concerns for nuclear power are radioactive wastes such as uranium mill tailings, spent (used) reactor fuel, and other radioactive wastes. These materials can remain radioactive and dangerous to human health for thousands of years.

Hydropower – Hydroelectric power uses the kinetic energy of moving water to make electricity. Dams are built to stop or slow the flow of water. Water movement is then controlled to flow through a powerhouse, where a turbine spins a generator, generating energy. Hydropower is one of the oldest sources of energy. It was used thousands of years ago to turn a paddle wheel for purposes such as grinding grain. Our Nation's first industrial use of hydropower to generate electricity occurred in 1880.

Geothermal – For every 330 feet you travel beneath the surface of the Earth, the temperature of the rock rises 5.4 degrees. Hot water within the rock of the Earth can be seen travelling to the surface as hot springs or geysers. People use this naturally heated water for swimming pools, or even to heat buildings in winter.