



Green energy sustainable solutions

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Wind turbines and solar panels are an increasingly common sight. But why? What are the benefits of renewable energies--and how do they improve our health, environment, and economy?

This page explores the many positive impacts of clean energy, including the benefits of wind, solar, geothermal, hydroelectric, and biomass. For more information on their negative impacts--including effective solutions to avoid, minimize, or mitigate--see our page on [The Environmental Impacts of Renewable Energy Technologies](#).

Human activity is overloading our atmosphere with carbon dioxide and other global warming emissions. These gases act like a blanket, trapping heat. The result is a web of significant and harmful impacts, from stronger, more frequent storms, to drought, sea level rise, and extinction.

In the United States, about 29 percent of global warming emissions come from our electricity sector. Most of those emissions come from fossil fuels like coal and natural gas [1,2].

Carbon dioxide (CO₂) is the most prevalent greenhouse gas, but other air pollutants--such as methane--also cause global warming. Different energy sources produce different amounts of these pollutants. To make comparisons easier, we use a carbon dioxide equivalent, or CO₂e--the amount of carbon dioxide required to produce an equivalent amount of warming.

In contrast, most renewable energy sources produce little to no global warming emissions. Even when including "life cycle" emissions of clean energy (ie, the emissions from each stage of a technology's life--manufacturing, installation, operation, decommissioning), the global warming emissions associated with renewable energy are minimal [3].

The comparison becomes clear when you look at the numbers. Burning natural gas for electricity releases between 0.6 and 2 pounds of carbon dioxide equivalent per kilowatt-hour (CO₂e/kWh); coal emits between 1.4 and 3.6 pounds of CO₂e/kWh. Wind, on the other hand, is responsible for only 0.02 to 0.04 pounds of CO₂e/kWh on a life-cycle basis; solar 0.07 to 0.2; geothermal 0.1 to 0.2; and hydroelectric between 0.1 and 0.5.

Renewable electricity generation from biomass can have a wide range of global warming emissions depending on the resource and whether or not it is sustainably sourced and harvested.

For example, a 2009 UCS analysis found that a 25 percent by 2025 national renewable electricity standard would lower power plant CO₂ emissions 277 million metric tons annually by 2025--the equivalent of the annual output from 70 typical (600 MW) new coal plants [4].

In addition, a ground-breaking study by the US Department of Energy's National Renewable Energy Laboratory (NREL) explored the feasibility of generating 80 percent of the country's electricity from renewable sources by 2050. They found that renewable energy could help reduce the electricity sector's emissions by approximately 81 percent [5].

The air and water pollution emitted by coal and natural gas plants is linked with breathing problems, neurological damage, heart attacks, cancer, premature death, and a host of other serious problems. The pollution affects everyone: one Harvard University study estimated the life cycle costs and public health effects of coal to be an estimated \$74.6 billion every year. That's equivalent to 4.36 cents per kilowatt-hour of electricity produced--about one-third of the average electricity rate for a typical US home [6].

Most of these negative health impacts come from air and water pollution that clean energy technologies simply don't produce. Wind, solar, and hydroelectric systems generate electricity with no associated air pollution emissions. Geothermal and biomass systems emit some air pollutants, though total air emissions are generally much lower than those of coal- and natural gas-fired power plants.

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