

Our Ocean Backyard
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Moving to Renewable Energy

Burning fossil fuels has been the dominant energy source on the planet for centuries, beginning with wood, migrating to peat in northern Europe, then moving to coal in the 1800s, and by 1900 to petroleum. Today on a global basis, 80% of our energy comes from burning fossil fuels. Not much has been done to alter this picture until recently, but this is now changing, more rapidly than most people would have thought possible.

The burning of fossil fuels, which are all essentially organic compounds formed by plants storing solar energy through photosynthesis, has allowed civilization to emerge, develop and prosper. But combustion in the engines of 1.4 billion motor vehicles, in thousands of power plants, ships, planes and factories around the planet, is producing smoke and smog, which lead directly to about nine million people dying every year, more deaths than from war and terrorism combined. In 2020, fossil-fuel pollution led to the deaths of three times as many people as COVID-19. Then there is the invisible carbon dioxide that has altered the Earth's climate in ways that are becoming increasingly apparent (ocean and atmospheric warming, ocean acidification, heat waves and droughts, forest fires, floods, and sea-level rise), threatening humans, as well as other animals and plants.

But the energy from that burning sun 93 million miles away, which allows for photosynthesis on Earth and its preservation as fossil fuels, also can be collected in photovoltaic panels. Because the solar radiation heats the Earth differentially, we have global wind patterns, energy that can be collected by highly efficient wind turbines. This collected energy can provide for almost all of the needs that fossil fuels are now used for.

The big difference is that these energy sources are sustainable, have virtually no negative side effects, do not alter the Earth's climate and are distributed more evenly around the planet than coal and oil deposits so aren't dependent on geopolitics. Several nations, including Norway, Iceland, Albania, Uruguay, Paraguay, Costa Rica and Namibia are producing more than 95% of their electricity from clean renewable sources now. Many others, including Austria, Brazil, Canada, Denmark, Ecuador, New Zealand and Venezuela produce over 60% of their electricity from renewables.

In the USA we generate just 14.7% of our electricity from renewable sources; 45.9% of that is from hydroelectric dams, 36% comes from wind, 10.8% is from biomass, 7.9% is from solar and 2.9% from geothermal.

Technology is advancing quickly for both wind and solar and along with these advancements, prices are dropping. A recent study from Stanford University reported that we have ninety-five percent of the technology needed to produce a hundred percent of American power needs from renewable energy by 2035, just thirteen years from now. As the number of solar panels manufactured doubles, the price falls by another thirty percent, or about ten percent every year.

Other energy sources don't follow this same pattern, however, and the price of gasoline is a good example. I recall filling my first car up with gas, a 1949 Chevy, at 27.9 cents/gallon in 1961. I would ask each of my friends in the back seat for 25 or 50 cents and fill up the tank. Today, you all know that a full tank can run you seventy-five to a hundred dollars. The easy-to-extract coal and oil were mined or pumped out years ago and we are now digging deeper and drilling offshore in five to ten thousand feet of water to find oil from drilling platforms that may cost \$500 million to one billion dollars each.

While statements and articles regularly appear regarding the high cost of renewable energy compared to fossil fuels, the price trajectories of fossil fuels and renewables are now crossing with much of our renewable energy now cheaper than fossil fuel. A recent compilation of what is referred to as global levelized costs of electricity generation has recently been compiled from five different sources: the U.S. National Energy Administration, the Intergovernmental Panel on Climate Change (part of the United Nations), Bloomberg New Energy Finance, Lizard Investment Bank, and the International Renewable Energy Agency. These costs are given as US\$ per MWh, or \$ per megawatt hour. One megawatt hour is enough to power 400-900 U.S. homes for a year.

While there is understandably some modest variation in the cost calculated by each of these five sources, to even these out the costs they have been averaged. These are listed here in order of increasing costs: Hydropower \$47/MWh; Onshore wind \$50; Solar utility-scale \$68; Natural gas \$75; Coal \$88; Offshore wind \$104; Solar rooftop \$145. There are some very significant additional factors which are not included in these costs, however, often called externalities. These include health damage from coal plant emissions, greenhouse gas emissions and their multiple impacts on climate change, ocean warming and acidification, acid rain and rising sea level to name a few. Renewable energy is now cheaper than fossil fuels, it will never run out.