NUCLEAR ENERGY INSTITUTE

Nuclear Energy's Essential Role in Carbon Prevention

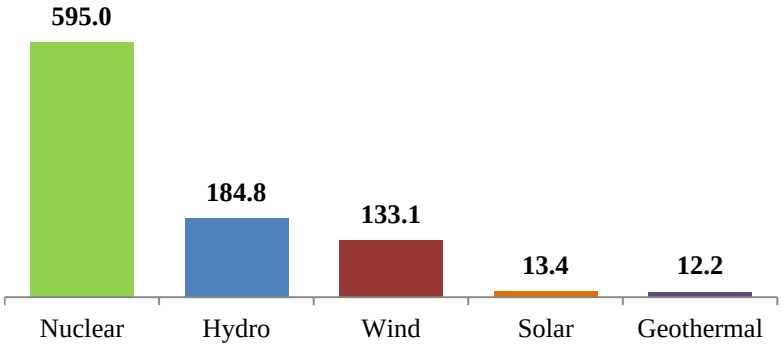
Nuclear energy is America's largest source of low-carbon electricity. In 2014, nuclear energy produced 19 percent of U.S. electricity supply (797 billion kilowatt-hours) and prevented the emission of 595 million metric tons of CO_2.

In the 111(d) rule proposed last year, the Environmental Protection Agency recognized that maintaining existing nuclear power plants is a cost-effective carbon abatement strategy. In its proposed rule, EPA estimates that the cost of keeping "at risk" nuclear plants operating is $12-$17 per metric ton of CO_2 abated. This is lower than EPA's estimate that:

- Adding renewable capacity costs $10-$40 per metric ton of CO_2 abated.
- Increasing natural gas combined-cycle power plant utilization rates to 70 percent costs $30 per metric ton of CO_2 abated.
- Implementing demand-side management programs costs $16-$24 per metric of CO_2 abated.

U.S. Electric Power Industry CO_2 Avoided

Million Metric Tons, 2014



Sources: Emissions avoided are calculated using regional and national fossil fuel emissions rates from the Environmental Protection Agency and plant generation data from the Energy Information Administration.

Nuclear energy accounted for 63 percent of America's carbon-free electricity in 2014 – three times more carbon-free electricity than hydropower and nearly five times more than wind energy. For perspective, one typical nuclear plant with two reactors avoids the emission of more carbon than all U.S. solar energy capacity in 2014 (7 GW at 28 percent capacity factor). The amount of CO_2 emissions avoided by nuclear energy facilities is equal to the CO_2 emissions from 134 million passenger cars – more than all the passenger cars in the United States. Without nuclear power plants operating in 31 states, carbon emissions from the U.S. electric sector would be approximately 27 percent higher.

Closing down a large nuclear power plant has major environmental impacts. Consider, for example, the shutdown in 2013 of San Onofre 2 and 3 in Southern California.

According to a 2014 study by IHS Energy[1], closing San Onofre also made California power production more carbon-intensive. "The two nuclear units were a major reason that the CO_2 intensity of California power production was around 0.5 pounds (lb.) per kilowatt-hour (kWh). Replacement power coming from in-state natural gas-fired power plants has associated emissions of about 0.9 lb. per kWh. Replacement power coming from the rest of the Western Interconnection has associated emissions of 1.5 lb. per kWh. Even additional wind and solar power sources in California with natural gas-fired power plants filling in and backing them up have a 0.7 lb. per kWh emissions profile."

Independent assessments of ways to reduce greenhouse gas emissions worldwide concludes that no single technology can, by itself, slow and reverse increases of greenhouse gases in the atmosphere. A portfolio of technologies and approaches will be required to reduce carbon emissions. All these independent studies and analyses suggest that aggressive pursuit of energy efficiency and conservation, renewable resources such as wind and solar, clean coal, electric vehicles, and distributed resources must be accompanied by a substantial expansion of nuclear-powered electricity generation:

I**ntergovernmental Panel on Climate Change**. Formed in 1988 by the UN's World Meteorological Organization and United Nations Environment Program, the Intergovernmental Panel on Climate Change (IPCC) surveys and summarizes contemporary scholarly research in several disciplines relating to climate change. IPCC's Fifth Assessment consists of a Synthesis Report and three Working Group Reports (on science, impacts and adaptation, and mitigation). The Working Group III report, "Mitigation of Climate Change," published in April 2014, confirms that nuclear energy is one of the lowest carbon-emitting technologies.

- When the IPPC report accounted for direct emissions and life-cycle emissions, nuclear ranked with wind energy at 12 gCO_2/kWh.
- The report's "Summary for Policymakers" states that low-carbon technologies must expand dramatically to curb the effects of climate change: "At the global level, scenarios reaching 450 ppm CO_2eq [consistent with a likely chance to keep temperature change below 2 degrees C relative to pre-industrial levels] are also characterized by more rapid improvements to energy efficiency, a tripling to nearly a quadrupling of the share of zero- and low-carbon energy supply from renewables, nuclear energy and fossil energy with carbon dioxide capture and storage (CCS) or bioenergy with CCS by the year 2050."

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[1] *The Value of U.S. Power Supply Diversity*, IHS Energy, July 2014.