

Nuclear Energy Plays Essential Role In Reducing Greenhouse Gas Emissions

July 2008

Key Points

■ Nuclear power plants generate electricity for one in five homes and businesses in the United States without emitting any greenhouse gases, including carbon dioxide. Nuclear energy generates more than 70 percent of all carbon-free electricity in America and is an essential part of a technology-based solution for reducing greenhouse gases.

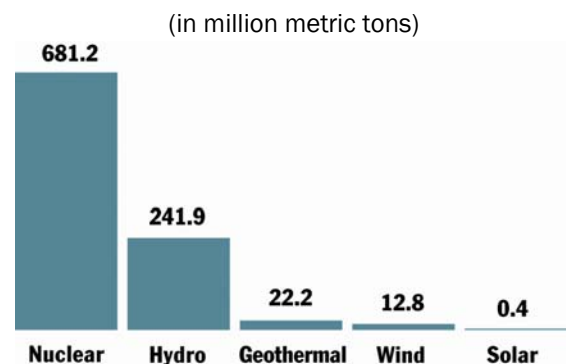
■ Nuclear energy is the only option available today that can provide large-scale electricity production 24/7 economically and without emitting greenhouse gases. Even if carbon dioxide emissions are evaluated on a total life-cycle basis, those from nuclear energy are comparable to most other non-emitting sources, such as solar, wind and hydropower. (See chart on page 2.)

■ Nuclear energy accounted for 36 percent of voluntary greenhouse gas reductions (138 million metric tons of carbon dioxide) reported by the electric power sector in 2005, according to the U.S. Energy Information Administration.

■ The United Nations' Intergovernmental Panel on Climate Change (IPCC) and other international and U.S. policy groups recognize that nuclear energy should play a significant role in global greenhouse gas emission-reduction policies.

■ The nuclear energy industry supports federal legislation or other action that reduces greenhouse gases. A credible program to reduce greenhouse gas emissions will require a portfolio of technologies and approaches. Nuclear energy is an indispensable part of that portfolio.

Carbon Dioxide Prevented by Nuclear Energy in the Electric Sector



Source: Emissions avoided in 2006 calculated using regional and national fossil-fuel emission rates from the U.S. Environmental Protection Agency and plant generation data from the U.S. Energy Information Administration.

Nuclear Energy's Vital Role in Reducing Greenhouse Gas Emissions

Carbon dioxide—the greenhouse gas mainly emitted by human activity—is the major focus of policy discussions to reduce emissions. At a time when the United States faces a projected 25 percent increase in electricity demand by 2030, failure to develop a holistic policy that meets the nation's energy demand, energy security needs and greenhouse gas reduction goals could threaten success on both objectives.

Nuclear power plants produce large amounts of electricity without emitting carbon dioxide or other greenhouse gases. America's 104 commercial power reactors provide about one-fifth of U.S. electricity—and 70 percent of the nation's carbon-free electricity generation.

In a 2007 policy paper, the Nuclear Energy Institute detailed the principles underlying its position on climate change. These include:



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- The industry supports federal legislation to reduce greenhouse gas emissions.
- Nuclear energy is a vital source of electricity that can meet the nation's growing energy needs with a secure, domestic energy supply that also protects air quality.
- A credible program to reduce greenhouse gas emissions will require a portfolio of technologies and approaches. Nuclear energy is an indispensable part of that portfolio.
- Achieving a significant expansion of nuclear energy in the United States requires sustained federal and state government policies that pave the way for advanced design nuclear plant construction, research and development on new reactor and used fuel recycling technologies, development of the next-generation work force, and long-term stewardship of used nuclear fuel.

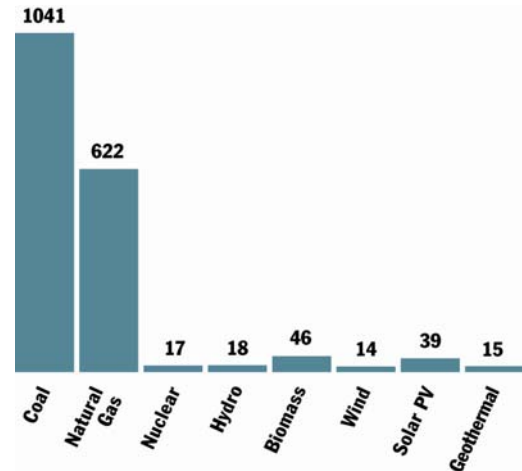
In the United States, electric utilities are expanding the use of nuclear energy along with energy efficiency and conservation programs and an expanded portfolio of low-emission sources of electricity, including wind and solar energy.

Nuclear power plants already play a powerful role in preventing greenhouse gases in the electricity sector. By using nuclear energy rather than fossil fuel-based plants, electric utilities prevented 681 million metric tons of carbon dioxide emissions in 2006. For perspective, the volume of greenhouse gas emissions prevented at nuclear power plants is equivalent to taking 96 percent of all passenger cars off America's roadways.

A credible program to reduce greenhouse gas emissions will require a portfolio of technologies and approaches, including the widespread use of nuclear energy, renewable energy sources, energy efficiency and the development of tech-

Carbon Impact of Nuclear Energy Comparable to Renewables

(tons of carbon dioxide equivalent per gigawatt-hour)



Source: University of Wisconsin

nology to capture carbon from coal and natural gas power plants.

In the European Union, a recent study of the region's carbon avoidance shows that an additional 704 million metric tons of carbon dioxide would be emitted if all nuclear power plants in these countries were removed from the electricity grid. Worldwide, nuclear energy prevents the emission of more than 2.6 billion metric tons of carbon dioxide each year.

Analyses Demonstrate Low Life-Cycle Emissions of Nuclear Energy

Although nuclear power plants do not emit greenhouse gases when generating electricity, certain processes used to build and fuel the plants do. This is true for all energy facilities.

However, even when greenhouse gas emissions are analyzed for the entire life-cycle of a nuclear power plant—from uranium mining to electricity production to used fuel management—nuclear energy has a low carbon footprint that is comparable to geothermal, hydropower and wind energy.

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Independent studies by the University of Wisconsin, Japan's Ministry of Economy, Trade and Industry, and the International Energy Agency found that nuclear power's life-cycle greenhouse gas emissions are comparable to renewable energy sources and far lower than fossil fuels used for electricity generation.

Diverse Groups Recognize Nuclear Energy's Climate-Friendly Benefits

Given the dual challenges of meeting growing electricity supply and preventing and mitigating greenhouse gases, policymakers and energy industry leaders are evaluating an expanded role for nuclear energy.

U.S. policymakers are weighing different legislative and other approaches for reducing greenhouse gas emissions. While many predict that meaningful climate change policy may take several years to finalize, the role that nuclear energy can play in carbon reduction programs is clear.

Cambridge Energy Research Associates (CERA) in a February report, "Crossing the Divide: The Future of Clean Energy," said that carbon policies could fundamentally change the competitive landscape of the global energy business. Conventional emission-free technologies—nuclear energy and hydropower—will account for most of the clean energy impact globally and almost half of the gross clean power additions by 2030, CERA reported in its analysis.

Carbon mitigation strategies from the United Nations' Intergovernmental Panel on Climate Change, Princeton University, Columbia University's Earth Institute, Harvard University and the Pew Center on Global Climate Change identify a clear role for nuclear energy in a portfolio of options to reduce greenhouse gases.

The U.N. Intergovernmental Panel on Climate Change, in its Fourth Assessment Report

issued in 2007, concluded that lowering emissions would require greater emphasis on renewables and nuclear energy. The IPCC report said that a broad mix of energy sources, including nuclear energy, "will almost certainly be required to meet the growing demand for energy services, particularly in many developing countries."

A U.N. Framework Convention on Climate Change study called for an additional investment of \$25 billion in nuclear energy by 2030. The U.N.'s findings are consistent with the World Economic Forum's 2008 analysis on energy, which stated that nuclear energy is "probably the best option for carbon-neutral energy from the perspective of currently available and easily scalable technologies." However, the forum noted ongoing concerns about safety, used fuel management and non-proliferation.

Furthermore, Dr. Jeffrey Sachs, the director of the Earth Institute at Columbia University, said "low-emission electricity generation will be achieved in part through niche sources such as wind and bio-fuels. Larger-scale solutions will come from nuclear and solar power."

Nuclear energy also is part of the strategy for combating climate change in an energy security plan released by the Center for American Progress, a progressive think tank. The center recommends that the United States establish a "renewable portfolio standard" mandating that 10 to 25 percent of electricity be produced from renewable resources and nuclear energy by 2025.

Nuclear Energy Benefits Recognized In Regional Greenhouse Gas Initiative

Ten northeastern and mid-Atlantic states have formed the first regional cap-and-trade program for carbon dioxide, known as the Regional Greenhouse Gas Initiative. The program treats all clean-air sources of electricity, such as nuclear power and renewables, equally in the greenhouse gas reduction framework.

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Nuclear plants generate about one-third of the region's electricity.

Six western states formed a similar initiative, and California passed legislation in 2006 to reduce carbon dioxide emissions by about 25 percent by 2020. California Gov. Arnold Schwarzenegger said in March that nuclear energy must be part of the state's path toward reducing carbon emissions while maintaining economic strength. Nuclear energy "has a great future," Schwarzenegger said, and it could be "very beneficial, like in France where they get [75] percent of their energy through nuclear power."

In the absence of federal legislation or regulation, state and regional action presents a valuable opportunity for climate change and energy policy development. However, these early innovations must be forged into unified federal policy that provides the predictability needed by the industry to transform our energy systems in a manner that protects our environment.

Globally, more than 400 reactors generate 17 percent of all electricity. Construction is under way on 29 reactors, and many countries have announced plans to build more than 200 reactors in the next 30 years.

This policy brief also is available at www.nei.org, where it is updated periodically.

On Nuclear Energy's Environmental Benefits

"[The United States should] provide opportunities for nuclear power to play a continuing role in a future low-carbon electricity sector. ...Because nuclear power is one of the few options for no-carbon electricity production, efforts should be made to preserve this option."

*—Pew Center on Global Climate Change
Recommendation in "Agenda for Climate
Action"*

"A more diverse mix of voices are taking a positive second look at nuclear energy—environmentalists, scientists, the media, prominent Republicans and Democrats, and progressive think tanks. They are all coming to a similar conclusion: If we are to meet the growing electricity needs in this country and also address global climate change, nuclear energy has a crucial role to play."

*—Patrick Moore
Co-founder, Greenpeace
Co-chair, Clean and Safe Energy Coalition*

"Even some environmental groups have come to realize that a new generation of safer nuclear plants is the best option for addressing the nation's mounting energy needs. ...Nuclear units emit no greenhouse gases from plant operations, which makes nuclear a compellingly green alternative to coal, oil and natural gas."

*—USA Today
Editorial
May 16, 2007*