

DOE's Generation IV Initiative Securing New Nuclear Plant Designs for the Future

January 2007

Key Facts

■ The United States will need 45 percent more electricity by 2030—almost 350,000 megawatts of new electric generating capacity. At the same time, the country needs to preserve and expand clean-air sources of electricity generation such as nuclear power and renewable energy sources.

■ The nuclear energy industry is developing new technologies that will be safer and more efficient than today's proven plants. These technologies are resulting in the development of Generation IV nuclear plant designs, which could play an important role in meeting future U.S. energy and air-quality needs.

■ The Department of Energy's Generation IV Initiative is developing these new technologies through public-private partnerships and international cooperation.

■ Congress recognized the need to increase the use of clean energy sources, such as nuclear energy, in the research and development provisions of the Energy Policy Act of 2005.

■ In its long-term energy plan, the Bush administration envisions a hydrogen-based economy to reduce U.S. dependence on foreign energy sources

and provide clean, abundant energy. Generation IV plants could produce the hydrogen required for that plan.

Meeting Growing U.S. Electricity Demand

The energy needs of the United States are expected to increase 45 percent by 2030, according to the Energy Information Administration's "Annual Energy Outlook 2006." The agency estimates that almost 350,000 megawatts of new electric generating capacity will be needed to meet increased demand and replace older power plants.

Currently, 27 percent of U.S. electricity is generated by clean-air sources such as nuclear energy, hydroelectric plants, wind and solar energy. The nation's 103 nuclear plants produce about three-quarters of this clean-air electricity.

As electricity demand continues to rise and air-quality concerns intensify, nuclear power plants are becoming increasingly important to America's electricity supply.

The Bush administration's long-term hydrogen fuel strategy, aimed at reducing U.S. dependence on foreign energy sources, would require alternative methods for manufacturing hydrogen that do not depend

on fossil fuels. Generation IV nuclear plant designs could offer a commercial alternative to provide process heat and energy to manufacture the hydrogen needed in the petrochemical industries, to fuel vehicles, and for emergency standby power facilities.

Generation IV Initiative Maximizes R&D Efforts

The safety and efficiency of today's nuclear power plants are well-proven, as is their value in avoiding the emission of greenhouse gases. In 2002, DOE's Office of Nuclear Energy, Science and Technology created the Generation IV Initiative to develop new plant designs that minimize waste and are even safer and more proliferation-resistant.

Although the department is supporting research on several reactor concepts, the very high temperature reactor has been given top priority.

Congress authorized continued funding for this research in the Energy Policy Act of 2005. The legislation set aside \$2.95 billion for nuclear research and development and hydrogen projects, including \$1.6 billion for general nuclear energy research and



SUITE 400
1776 I STREET, NW
WASHINGTON, DC
20006-3708
202.739.8000
www.nei.org

DOE's Generation IV Initiative Securing New Nuclear Plant Designs for the Future

Page 2 of 2—January 2007

Generation IV Technology Goals

These advanced nuclear energy systems will:

- provide sustainable energy generation that meets clean-air objectives and promotes long-term availability of systems and effective fuel utilization for worldwide energy production
- minimize and manage nuclear waste and notably reduce the long-term stewardship burden in the future, thus improving protection for public health and the environment
- increase the assurance that the plants are a very unattractive and least desirable route for diversion or theft of weapons-usable materials
- excel in safety and reliability
- have a very low likelihood and degree of reactor core damage
- eliminate the need for off-site emergency response
- have a clear life-cycle cost advantage over other energy sources
- have a level of financial risk comparable to other energy projects.

Source: DOE

development, which supports the Generation IV reactor initiative and other advanced technology programs. Generation IV systems are projected to be available as prototypes in the next decade, with commercial plants coming on line in the 2020s.

The initiative also focuses on drawing the international community together to develop long-term technologies.

DOE's Nuclear Energy Research Advisory Committee and the Generation IV International Forum—a formal, chartered organization of 10 countries

and the European atomic energy community, known as Euratom—has prepared a detailed research and development road map for achieving the initiative's goals. The forum has invited China and Russia to join the group.

This international approach will encourage development of technologies that are widely acceptable, enable DOE to access the best expertise in the world to develop innovative new technologies, and maximize scarce research and development resources.

A Key Role in Future Hydrogen Production

The Generation IV plants could play a significant role in the Hydrogen Fuel Initiative as the United States seeks to reduce its reliance on oil as a transportation fuel.

DOE created the Nuclear Hydrogen Initiative to “demonstrate the economic production of hydrogen using nuclear energy by 2020.”

DOE's hydrogen initiative seeks to demonstrate that commercial quantities of hydrogen can be manufactured economically without emitting greenhouse gases by using nuclear energy and process heat. Such a demonstration could pave the way for a hydrogen-fueled economy.

As a result, nuclear energy once again could demonstrate its value as a domestic source of clean electricity, easing America's dependence on oil from volatile regions of the world, much as it did in the wake of the 1973 oil embargo.

For more information on DOE nuclear research programs, visit www.doe.gov.

This fact sheet also is available at www.nei.org, where it is updated periodically.