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United States Signs International Fusion Energy Agreement

Construction to begin on large-scale, clean fusion energy project

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Washington – Officials from the U.S. Department of Energy and their counterparts from China, the European Union, India, Japan, the Republic of Korea and the Russian Federation signed an agreement November 21 to build the international fusion energy reactor known as ITER.

The International Thermonuclear Experimental Reactor is a joint international research and development project meant to demonstrate the scientific and technical feasibility of using the power of nuclear fusion – the process of combining the nuclei of two atoms – as an energy source to meet growing world demand.

ITER will be built in Cadarache, France, and will be ready for operation around 2016.

"Signing this agreement brings us one step closer to a viable source of fusion power," said Raymond Orbach, DOE under secretary for science, who represented the United States.

ITER is the first stand-alone, truly international, large-scale scientific research effort, he added. "It will surely serve as a model for future collaborative large-scale science projects."

If ITER proves to be a workable way to harness nuclear power, fusion energy could provide significant amounts of electricity and generate hydrogen to power fuel-cell vehicles.

Fusion power has many advantages over conventional forms of energy generation. It produces negligible atmospheric emissions and no greenhouse gas emissions.

Fusion reactors cannot "melt down" and do not generate long-lasting radioactive waste associated with nuclear fission, or splitting of atoms. Commercial fusion reactors would use atoms of the elements lithium and deuterium (an isotope of hydrogen), both readily available natural resources.

U.S. CONTRIBUTION

President Bush announced in 2003 that the United States would join the negotiations for building and operating ITER.

Today, fusion energy is an important component of President Bush's Advanced Energy Initiative (AEI), given fusion's potential to become an attractive long-range option for the U.S. clean-energy portfolio. In 2006, DOE allocated $25 million to ITER. As part of AEI, Bush has asked Congress for $60 million for the project in 2007.

The Cadarache site is adjacent to the main research center of the French Atomic Energy Commission. The European Union, as host, will provide about 45 percent of the construction-phase funding. The United States, as a nonhost partner, will contribute about 9 percent in the construction phase.

The U.S. contribution to ITER will consist of about 80 percent in-kind components and about 20 percent in cash to a central fund and for personnel assigned to the project at the ITER site.

DOE laboratories will subcontract with industry to build the ITER components the United States will contribute. The total value of the U.S. contribution is just more than $1 billion.

The ITER parties will share the experience and knowledge that will result from designing, building and operating the fusion project, at a greatly reduced cost to the individual partners.

The United States was an original participant in the early design and research and development for ITER, and U.S. participation in the ITER construction and operation phases capitalizes on the previous investment.

FUSION RESEARCH

Nuclear fusion and nuclear fission, also called atomic fission, are two ways of getting power from atoms. Commercial nuclear reactors around the world use atomic fission.

"Fission is getting energy from breaking up heavy atomic nuclei," said Norbert Holtkamp, ITER's principal deputy director-general nominee and project construction leader, in a recent *USINFO* interview. "Fission is a process that is controlled in a nuclear reactor and uncontrolled in a nuclear bomb.

Fusion, on the other hand, he added, "is fusing two light nuclei together. In the case of ITER, two hydrogen nuclei basically are melded together. When that happens, energy is freed up and comes out." (See related article.)

In a nuclear power plant, the fission of uranium atoms in the reactor provides the heat to produce steam for generating electricity.

"Lots of nuclear fission reactors are operational and used to make energy right now, so fission has the advantage that it works today," Holtkamp said. "Fusion is not something that works yet, it's a research project."

A much smaller version of ITER now exists. The Joint European Torus (JET), the largest nuclear fusion experimental reactor device yet built, began operating in 1983 near Culham, England. ITER is the next step toward constructing fusion power reactors to generate electricity.

"If ITER is successful," Holtkamp said, "it will be the first fusion reactor device that will create significantly more energy than it uses. That's a major step."

Information about ITER is available at the DOE Web site and the ITER Web site.

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