

## U.S. to join international fusion project

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PRINCETON, N.J., Jan. 30 (UPI) -- The United States will join negotiations to build and operate a major international fusion research project, Energy Secretary Spencer Abraham said Thursday.

Known as ITER -- from the Latin word meaning "the way" -- the project is intended to build on previous fusion concepts involving magnetic containment of high-temperature plasma, a state of matter so hot that even atoms cannot hold together.

Speaking on the campus of Princeton's Plasma Physics Laboratory, Abraham said President George W. Bush has decided U.S. participation in ITER would be a logical extension of his national energy policy, in which he called on the Department of Energy to develop next-generation energy technology, including fusion.

"The results of ITER will advance the effort to produce clean, safe, renewable, and commercially-available fusion energy by the middle of this century," Bush said in a written statement.

"Over the lifetime of a child born today, the demand for energy will more than triple," Abraham told an audience of reporters and representatives of some of the other nations involved in the ITER project -- including Canada, Britain, Russia, China and Japan. Most of that energy growth will occur in the developing world and "if fusion power proves practical, it will kick in at the right time," he said.

Princeton President Shirley M. Tilghman, who introduced Abraham, said it was fitting for him to make such an announcement at the university, where physicist Lyman Spitzer began America's first fusion research efforts more than 50 years ago, and where most of the progress in U.S. fusion research was achieved through Princeton's now-disassembled "tokamak" reactor.

Despite fusion's long research history and unresolved fate, Abraham said the Bush administration still thinks it should remain a major goal in U.S. long-term energy plans. Fusion promises to produce "no troublesome emissions," he said. "It is safe, and has few, if any, proliferation concerns. It creates no long-term waste problems and runs on fuel readily available to all nations. Moreover, fusion plants could produce hydrogen ... to power hundred of millions of hydrogen fuel cell vehicles in the U.S. and abroad."

Fusion, the process that powers the sun and all the stars, involves forcing atoms of lighter elements together to create atoms of heavier elements. A fusion reaction requires, proportionately, tremendous amounts of energy to initiate. For example, hydrogen bombs -- which represent fusion energy used explosively -- require atomic or fission bombs as detonators.

As envisioned, ITER will produce about 500 megawatts of fusion power for 500 seconds or longer during each experiment, DOE officials said in a written statement. It will be the first fusion device to produce burning plasma and operate at a high power level for long-duration experiments. The amount of energy produced by ITER's fusion reactions is expected to be 10 times greater than the external power used to start the process.

ITER is based on the tokamak concept, in which a doughnut-shaped magnetic chamber creates and maintains the extreme conditions required for fusion reactions, which take place when the contained plasma becomes hot enough, dense enough, and contained for long enough to cram the atomic nuclei in the plasma together.

The concept was first developed in Russia and has remained the primary design for all major fusion energy programs.

Negotiations about ITER's construction and operation have been under way since last year. Current candidate sites for the reactor are in Canada, the European Union and Japan.

Abraham said the U.S. government proposes to provide key hardware components for ITER's construction, be involved in project construction management and participate in ITER's scientific research and technology development. Other aspects of U.S. participation and contributions would be determined during the negotiations, he added.

The total construction cost for ITER, including buildings, hardware, installation and personnel, is estimated at about \$5 billion, although that amount will be shared among all the participants. The U.S. portion of the construction cost is expected to be about 10 percent. ITER construction could begin in 2006, the reactor could begin operating in 2014 and remain active for up to 20 years.

"Science in the 21st Century is often a global effort," Abraham said. "Time and again, homegrown scientific discoveries turn out to be not so homegrown after all. Often, international cooperation is indispensable to achieving results."

— (Reported by Phil Berardelli, UPI Deputy Science & Technology Editor, in Washington)