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PPPL to phase out compact stellarator experiment, upgrade spherical torus program

by Cass Cliatt · Posted May 23, 2008; 08:00 a.m.

The Princeton Plasma Physics Lab <<http://www.pppl.gov/>> (PPPL) will phase out construction of the National Compact Stellarator Experiment (NCSX) and instead ensure the lab's future as a world-leading center of fusion energy and plasma sciences by enhancing its flagship program, the National Spherical Torus Experiment (NSTX). The new approach is being implemented at the direction of the U.S. Department of Energy, which funds the lab managed by Princeton University.

The lab began construction of the stellarator in April 2003, with the goal of developing the physics for and determining the attractiveness of the compact stellarator as the basis for a fusion power reactor.

However, the complex and precise assembly process for the first-of-its-kind research facility resulted in an underestimation of its cost and a more prolonged construction process. An 18-month series of project reviews by the University, the lab and the Department of Energy (DOE) determined that the stellarator experiment could not be completed at its approved initial project cost of \$102 million or on schedule to be operational by July 2009.

"We are gratified that the NCSX consistently received positive reviews from DOE's Fusion Energy Sciences Advisory Committee for its scientific promise, but recognize that extreme challenges of this complex scientific instrument had not been fully appreciated when the initial cost was established," said A.J. Stewart Smith, the University's dean for research. "The decision to focus on the NSTX will strengthen PPPL's position as a world leader in fusion science, and enables the lab to work with the world community on the cutting edge of fusion research."

The lab's currently operating spherical torus experiment is the most powerful device of its kind in the world. Since it began operation in 1999, the NSTX has demonstrated the effectiveness of the spherical plasma geometry, coupled with innovative plasma heating and current-drive techniques. This may result in smaller, more powerful fusion reactors.

In a statement released Thursday, May 22, by the Department of Energy's Raymond L. Orbach, he confirmed that focusing efforts on the spherical torus experiment will help assure the continued vitality of "a proven, productive, world-leading scientific facility."

"The highest priority of the U.S. fusion program is participation in the international ITER burning plasma experiment, which is based on the tokamak concept," said Orbach, undersecretary for science and director of DOE's Office of Science. "The spherical torus is closely related to the tokamak, and experiments planned for the next several years in the NSTX facility promise many exciting discoveries that should directly impact our ability to understand the new plasma regimes expected in ITER.

"The spherical torus may also prove to be a prototype for the next step for the U.S. domestic fusion program," he said. "Proposed upgrades for the spherical torus experiment at PPPL can keep this facility at the forefront of fusion science research in the world well into the future. As such, a concentration on the spherical torus better positions PPPL to remain a center of excellence for fusion energy and plasma sciences, and thereby compete for new areas of leadership in the future fusion program."

The Department of Energy has said the lab will spend the remaining part of this fiscal year, ending Sept. 30, 2008, completing work on some special coils that make up parts of the stellarator design. Also, the research and development efforts of the project will be documented "to allow revisiting this particular design if future developments in the fusion program warrant it."

This process will ultimately be managed by a new director of PPPL, as a University search is under way to replace Director Robert Goldston, who announced in December that he would step down to pursue policy and research initiatives after more than 10 years leading the lab.

The University has managed PPPL since the beginning of the lab in 1951, when plasma physics pioneer professor Lyman Spitzer initiated the study of fusion at Princeton. Officially named the Princeton Plasma Physics Laboratory in 1961, the facility performs advanced research on fusion energy, which is hailed as an environmentally benign and abundant energy source.

"As part of our commitment to the future of PPPL's research program, we continue to be actively engaged in the broad range of strategic planning discussions taking place in the fusion community," Smith said. "The University is strengthening our involvement with the laboratory as part of our commitment to the future of plasma research."

Orbach affirmed in his statement that the decision about the lab's new direction "reflects our strong commitment to the future of PPPL as a center of scientific excellence, including the prospect that it will compete successfully for opportunities to extend its work in plasma and fusion science in a number of important and promising new directions."

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