URL: http://ptonline.aip.org/journals/doc/PHTOAD-ft/vol_61/iss_7/25_1.shtml Published: July 2008

ISSUES AND EVENTS

US stellarator aborted

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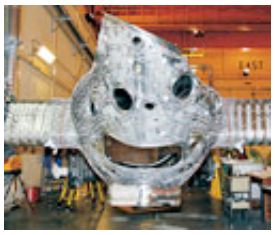
"The magnets look crazy—like they were hit by a truck—but the particles see an almost symmetric magnetic field," Stewart Prager, a plasma physicist at the University of Wisconsin– Madison and chair of the Fusion Energy Sciences Advisory Committee, talking about the National Compact Stellarator Experiment, which the US Department of Energy (DOE) announced on 22 May would be terminated midconstruction due to cost and schedule overruns.



The vacuum vessel

In 2002 when the NCSX was planned for the Princeton Plasma Physics Laboratory (PPPL), the cost was estimated at around $75 million and startup was planned for 2007. By the time the project was approved in 2004, the cost had climbed to $96 million. About $92 million has gone into the machine so far, but a review this spring put the tab at $170 million and the start date at 2013. Moreover, the review, by DOE's Office of Science, concluded that "the bottoms-up estimate is yet to achieve acceptable credibility due to design maturity, integration complexity, evolving experience base, and risk events excluded from analysis."

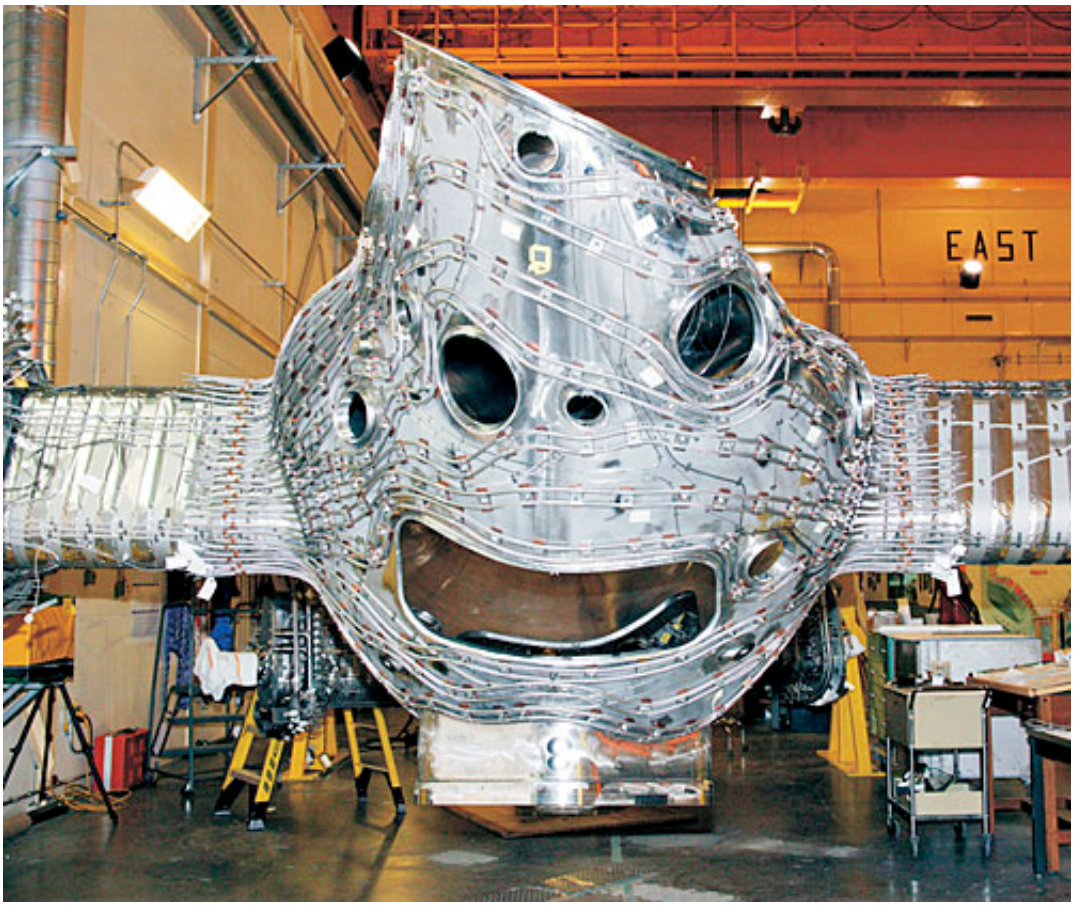
In a statement, DOE undersecretary for science Raymond Orbach said that concentrating on the National Spherical Torus Experiment "better positions PPPL to remain a center of excellence for fusion energy and plasma sciences, and thereby to compete for new areas of leadership in the future fusion program." Tokamaks like the NSTX and stellarators both use magnetic fields to confine plasmas, but in tokamaks symmetry makes the field two dimensional, whereas in stellarators the field is three dimensional. Tokamaks are better at confining plasmas, and stellarators are better at sustaining them. The idea of the NCSX was to get both advantages by creating a field that is quasi-symmetric (see the news story in PHYSICS TODAY, June 2002, page 21, and the article by Richard Hazeltine and Stewart Prager in July 2002, page 30).

Says A. J. Stewart Smith, dean of research at Princeton University, which runs PPPL for DOE, "It turned out that this complex device, with large forces and very tight tolerance requirements, was more difficult to assemble than had originally been estimated." PPPL will complete two NCSX coil systems that would be expensive to restart, will store the major components of the machine, and, at DOE's request, will document engineering

solutions. These measures, says Smith, "will be of critical value if another device of this type is undertaken in the future."

The NCSX "was a creative experiment that is important for physics and fusion energy," says Prager. Its termination "is a scientific loss, but given the cost situation, DOE made a justified decision."

Toni Feder



The vacuum vessel (segment shown) and other parts of the canceled stellarator at the Princeton Plasma Physics Laboratory have strange shapes to create quasi-symmetry for the plasma particles.

Credit: Eleanor Starkman, PPPL