

## **NCSX CONSTRUCTION PROGRESS AND RESEARCH PLANS\***

G.H. Neilson<sup>1</sup>, P Heitzenroeder<sup>1</sup>, B. Nelson<sup>2</sup>, W. Reiersen<sup>1</sup>, M. Zarnstorff<sup>1</sup>, T. Brown<sup>1</sup>,  
M. Cole<sup>2</sup>, J. Chrzanowski<sup>1</sup>, P. Fogarty<sup>2</sup>, P. Goranson<sup>2</sup>, J. Lyon<sup>2</sup>, J. Schmidt<sup>1</sup>,  
R. Strykowski<sup>1</sup>, M. Viola<sup>1</sup>, and D. Williamson<sup>2</sup>

<sup>1</sup>Princeton Plasma Physics Laboratory, PO Box 451, MS-40, Princeton, NJ 08543

<sup>2</sup>Oak Ridge National Laboratory, PO Box 2008, Oak Ridge, TN 37831-6169

hneilson@pppl.gov

The National Compact Stellarator Experiment (NCSX) is being constructed at the Princeton Plasma Physics Laboratory (PPPL) in partnership with the Oak Ridge National Laboratory (ORNL). The stellarator core is designed to produce a compact 3-D plasma that combines stellarator and tokamak physics advantages. The engineering challenges of NCSX stem from its complex geometry. From the project's start in April, 2003 to September, 2004, the fabrication specifications for the project's two long-lead components, the modular coil winding forms and the vacuum vessel, were developed. An industrial manufacturing R&D program refined the processes for their fabrication as well as production cost and schedule estimates. The project passed a series of reviews and established its performance baseline with the Department of Energy. In September, 2004, fabrication was approved and contracts for these components were awarded. The suppliers have completed the engineering and tooling preparations and are in production. Meanwhile, the project completed preparations for winding the coils at PPPL by installing a coil manufacturing facility and developing all necessary processes through R&D.

The main activities for the next two years will be component manufacture, coil winding, and sub-assembly of the vacuum vessel and coil subsets. Machine sector sub-assembly, machine assembly, and testing will follow, leading to First Plasma in July, 2009. Thereafter, NCSX physics research will proceed in phases, starting with e-beam mapping of the magnetic surfaces to verify global construction accuracy, measure configuration properties, and verify coil flexibility. The next two phases will address numerous plasma physics research topics using 1.5 MW and 3.0 MW, respectively, of plasma heating power. A concurrent program of equipment upgrades in the magnet power, plasma heating and fueling, divertor and first wall, diagnostic, control, and facility systems will support the research. Results from NCSX will be used to evaluate the compact stellarator as a fusion concept and advance the physics of 3-D plasmas.

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