Program Plan for Fusion Energy Sciences: Roadmap of Objectives and Performance Targets

2006 | 2008 | 2010 | 2012 | 2014 | 2016

Burning Plasma

- The Department's role in the ITER is established **(2005)** INTL

⬡ Demonstrate progress in developing a predictive capability for key aspects of burning plasmas using advances in theory and simulation benchmarked against a comprehensive experimental database of stability, transport, wave-particle interaction, and edge effects. **(2015)**

Initiate experiments on the National Ignition Facility (NIF) to study ignition and burn propagation in IFE relevant fuel pellets **(2012)** NNSA

Fundamental Understanding

Achieve a fundamental understanding of tokamak transport and stability in pre-ITER plasma experiments **(2009)**

Major aspects relevant to burning plasma behavior observed in experiments prior to full operation of ITER are predicted with high accuracy and are understood **(2015)**

Evaluate the process affecting the transport of petawatt laser energy in dense plasmas **(2009)** NNSA

Create and measure properties of high energy density plasmas using intense ion beams, dense plasma beams and lasers **(2012)**

⬡ Demonstrate progress in developing the fundamental understanding and predictability of high energy density plasma physics, including potential energy producing applications. **(2015)** NNSA

and here

Configuration Optimization

Evaluate the ability of the compact stellarator configuration to confine a high temperature plasma **(2012)**

⬡ Demonstrate enhanced fundamental understanding of magnetic confinement and in improving the basis for future burning plasma experiments through research on magnetic confinement configuration optimization. **(2015)**

Achieve long-duration, high-pressure, well-confined plasmas in a spherical torus sufficient to design and build fusion power-producing Next-Step Spherical Torus **(2008)**

Demonstrate use of active plasma controls and self-generated plasma current to achieve high-pressure/well-confined steady-state operation for ITER **(2008)**

● Advance plasma science and computer modeling to obtain a comprehensive, and fully validated, plasma configuration simulation capability. **(2020)**

Materials, Components, & Technologies

Start production of superconducting wire needed for ITER magnets **(2006)**

Deliver to ITER for testing the blanket test modules needed to demonstrate t feasibility of extracting high temperature heat from burning plasmas and for self-sufficient fuel cycle **(2013)** BES

Future Facilities

(Cross cut and support multiple objectives and targets):

ITER: construction begins for this international collaboration to build the first fusion burning plasma experiment capable of a self-sustaining fusion reaction. **(2006)** INTL

ITER: operation begins. **(2014)** INTL

Next-Step Spherical Torus (NSST) Experiment: construction begins to test the spherical torus, an innovative concept for magnetically confining a fusion reaction. **(2010)**

NSST: operation begins (2016)

Integrated Beam Experiment (IBX): Begin construction of an intermediate-scale experiment to understand how to generate and transmit the focused, high energy ion beam needed to power an IFE reaction **(2013)**

Interdependencies:

(Descriptions)

*Broadly with **ASCR** on computational developments, both hardware and software, affecting all facets of basic research and advanced instrumentation.*

INTL *=with international community on ITER*

BES *=with BES on nano-designed materials*

NNSA *=with NNSA*

● =Key Intermediate Objective from DOE Strategic Plan
⬡ =Long Term Success Measure from PART

This timeline is for planning purposes only and does not constitute financial or contractual commitments by the Federal Government.