U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON ENERGY

HEARING CHARTER

An Overview of Fusion Energy Science

April 20, 2016
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building

Purpose

On April 20, 2016, the Energy Subcommittee will hold a hearing on fusion energy research and development in Room 2318 of the Rayburn House Office Building. The hearing will examine progress in the area of fusion energy sciences as well as a status update of ITER. Based in southern France, 35 nations are collaborating on the ITER project to build the world's largest tokamak, which is a magnetic fusion device designed to prove the feasibility of fusion as an energy source.[1]

Witnesses

- **Dr. Bernard Bigot**, Director General, ITER Organization
- **Dr. Stewart Prager**, Director, Princeton Plasma Physics Laboratory
- **Dr. Scott Hsu**, Scientist, Physics Division, Los Alamos National Laboratory

Background

The pursuit of a fusion-based reactor represents mankind's attempt to replicate the power of a star on earth. The potential benefits to society from a net-power fusion reactor are beyond calculation, yet fusion energy science remains one the most challenging areas of experimental physics. The Department of Energy (DOE) supports fusion research primarily through its Fusion Energy Sciences (FES) program within the Office of Science. The mission of FES is "to expand the fundamental understanding of matter at very high temperatures and densities and to build the scientific foundation needed to develop a fusion energy source."[2] FES funding has declined in recent years from $468 million in FY2015 to $438 million in FY2016 while the current DOE FY2017 budget request is $398 million (including U.S. contributions to the ITER project).[3]

The Princeton Plasma Physics Laboratory (PPPL) is the DOE's primary laboratory dedicated to developing a scientific and technical knowledge base relevant to fusion energy and

[1] See ITER website here: http://www.iter.org/proj/inafewlines
[2] U.S. Department of Energy, FY 2017 Congressional Budget Request, Vol. 4 at page 137, available here: http://energy.gov/sites/prod/files/2016/02/f29/FY2017BudgetVolume%204.pdf
[3] See DOE FY2017 Congressional Budget Request *supra* at page 138.

plasma physics.[4] PPPL's research focuses on activities with breakthrough potential to understand phenomena involving matter at very high temperatures and very high density. PPPL recently completed an upgrade to its national user facility, the National Spherical Torus Experiment (NSTX), which enables research for users across the United States and abroad.[5] PPPL also maintains expertise and supports research on nonconventional fusion concepts (non-tokamak), including the recent stellarator experiment in Germany (known as the Wendelstein 7-X).[6] Other DOE laboratories, such as Los Alamos National Laboratory (LANL), maintain expertise in alternative fusion concepts including magnetized target fusion research.[7]

The ITER project is a major scientific collaboration between the European Union, Japan, South Korea, China, India, the Russian Federation, and the United States to design, build, and operate what will be the world's largest tokamak reactor.[8] The reactor itself will be the world's "first magnetic confinement long-pulse, high-power burning plasma experiment aimed at demonstrating the scientific and technical feasibility of fusion energy."[9] The FY2017 budget request for ITER is $125 million.[10] The projected total cost for the U.S. participation in ITER is approximately $4 - 6.5 billion.[11]

In 2005, Congress authorized the Secretary of Energy to negotiate an agreement for U.S. participation in ITER ("the ITER Agreement" or "the Agreement"),[12] which entered into force in 2007.[13] The ITER Agreement is the controlling document for the United States' membership in the project and the DOE fulfills its obligations under the Agreement by supplying personnel, delivering predetermined hardware components, and cash contributions to the ITER Organization for the United States' share of common expenses.[14] Under the Agreement, the European Union is obligated to pay for 45.46 percent of the construction costs, while the United States as a non-host member is obligated to contribute 9.09 percent of construction costs. The United States' cost allocation is 13 percent of the total for operations, deactivation, and decommissioning of the facility. As a member of the ITER organization, the U.S. will have full access to the ITER reactor to carry out experiments and draw knowledge from the cutting-edge research capabilities that will be offered from this first-of-a-kind facility.

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[4] See PPPL website here: http://www.pppl.gov/about
[5] See PPPL website here: http://www.pppl.gov/nstx
[6] See more on PPPL collaboration on the Wendelstein 7-x stellerator here: http://www.princeton.edu/main/news/archive/S45/46/76M62/
[7] See more on magnetized target fusion here: http://www.hyperv.com/pubs/Scientia-Article.pdf
[8] For more information on tokamaks, see the ITER website here: https://www.iter.org/mach/tokamak
[9] See DOE FY2017 Congressional Budget Request *supra* at page 137.
[10] See *Id.* at page 138.
[11] These costs span a wide range based on various contingencies and factors to be determined as the ITER project moves forward. See more information from the Government Accountability Office here: http://www.gao.gov/assets/670/663832.pdf
[12] Energy Policy Act of 2005 §972, 42 U.S.C. §16312 (2005).
[13] See DOE FES website here: http://science.energy.gov/fes/research/
[14] See U.S. ITER website here: https://www.usiter.org/about/index.shtml; For more information on hardware contributions, see here: https://www.usiter.org/about/ushardware/index.shtml