

U.S. Department of Energy
Office of Science

***Fusion Energy Sciences Advisory
Committee Meeting***

***FY 2009 Budget Request
for the Office of Science and Perspectives***

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Under Secretary for Science
February 19, 2008
www.science.doe.gov

U.S. Department of Energy



Office of Science



The Office of Science

Office of Science FY 2009 Budget Request to Congress

(dollars in thousands)

	FY 2007 Approp.	FY 2008 Approp.	FY 2009 Request to Congress	FY 2009 Request to Congress vs. FY 2008 Approp.	
Basic Energy Sciences.....	1,221,380	1,269,902	1,568,160	+298,258	+23.5%
Advanced Scientific Computing Research.....	275,734	351,173	368,820	+17,647	+5.0%
Biological and Environmental Research.....	480,104	544,397	568,540	+24,143	+4.4%
High Energy Physics.....	732,434	689,331	804,960	+115,629	+16.8%
Nuclear Physics.....	412,330	432,726	510,080	+77,354	+17.9%
Fusion Energy Sciences.....	311,664	286,548	493,050	+206,502	+72.1%
Science Laboratories Infrastructure.....	41,986	66,861	110,260	+43,399	+64.9%
Science Program Direction.....	166,469	177,779	203,913	+26,134	+14.7%
Workforce Dev. for Teachers & Scientists.....	7,952	8,044	13,583	+5,539	+68.9%
Safeguards and Security (gross).....	75,830	75,946	80,603	+4,657	+6.1%
SBIR/STTR (SC funding).....	86,936	—	—	—	—
Subtotal, Office of Science.....	3,812,819	3,902,707	4,721,969	+819,262	+21.0%
Adjustments*.....	23,794	70,435	—	-70,435	—
Total, Office of Science.....	3,836,613	3,973,142	4,721,969	+748,827	+18.8%

* Adjustments include SBIR/STTR funding transferred from other DOE offices (FY 2007 only), a charge to reimbursable customers for their share of safeguards and security costs (FY 2007 and FY 2008), Congressionally-directed projects and a rescission of a prior year Congressionally-directed project (FY 2008 only), and offsets for the use of prior year balances to fund current year activities (FY 2007 and FY 2008).



FY 2009 Fusion Energy Sciences Congressional Budget Request Summary

(\$ Millions)	FY 2007 <u>Actual</u>	FY 2008 <u>CONG</u>	FY 2008 <u>Jan AFP</u>	FY 2009 <u>CONG</u>
Science	144.6	159.5	163.9	168.4
Facility Operations	146.3	247.5	100.8	301.9
Enabling R&D	<u>20.8</u>	<u>20.8</u>	<u>21.8</u>	<u>22.7</u>
OFES Total	311.7	427.8	286.5	493.1
Burning Plasma/Tokamak	85.7		93.8	88.1
Alternate Toroidal Configs	52.7		57.7	50.1
Plasma Science	28.7		29.5	38.4
ITER MIE	60.0	160.0	10.6	214.5
NCSX MIE	15.9	15.9	15.9	19.6



ITER

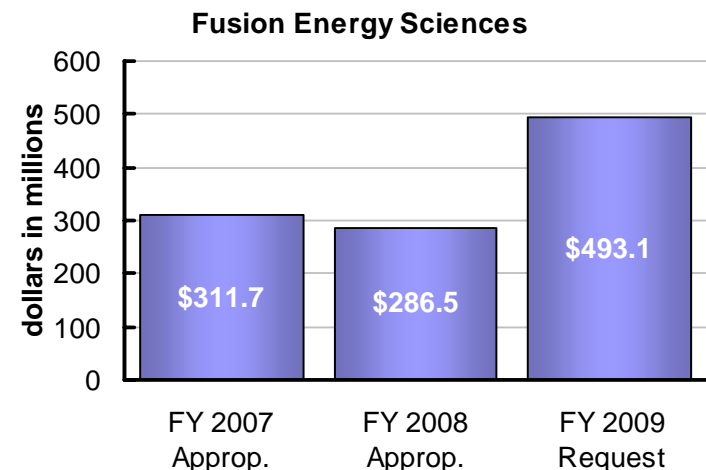
- **The FY 2008 Omnibus zeroed out the U.S. contributions to ITER, while preserving \$10.6M for ITER-related R&D**
 - Restrictive language in the Conference Report prohibits reallocation of OFES funds to support the ITER project
 - DOE is exploring other options, none of them easy, to restore partial funding for the remainder of FY 2008
 - We have funding to keep the US ITER Project Office open until around September – the FY 2009 budget may not be passed for some months beyond that.
 - We cannot withdraw from ITER during the construction phase (ten years), but may have to go into arrears
- **The FY 2009 President’s Request restores \$214.5M in funding for ITER**
 - The President has reiterated his strong support for basic science, for fusion energy and for science.
 - We need to press the President’s case for ITER within a very constrained discretionary budget
 - ITER and the Office of Science cannot become a “donor” for other programs for a third year – no “three-peats!”
 - The future for ITER is not good if we are not successful this year.



Fusion Energy Sciences (FES)

(FY 2009=\$493.1M)

- The U.S. Contributions to ITER.** The U.S. ITER Major Item of Equipment (MIE) project is in survival mode in FY 2008 because only \$10.6M of the \$160.0M requested was appropriated. Funds requested for FY 2009 will be used to resume the full range of U.S. participation in ITER. The focus will be on completing the ITER design, re-starting pre-fabrication R&D and initiating long-lead procurements for U.S. in-kind hardware, supporting the U.S. ITER Project Office, providing U.S. secondees to the international ITER Organization (IO), and providing 2008 and 2009 cash contributions to the IO per the terms of the ITER Joint Implementing Agreement. Some work planned originally for FY 2009 will be delayed into FY 2010 and beyond. (FY 2007=\$60.0M; FY 2008=\$10.6M; **FY 2009 = \$214.5M**)
- Operation and research on major facilities.** DIII-D, Alcator C-Mod, and NSTX will focus on key issues for ITER: confinement, stability, plasma boundary, and wave-plasma interaction. In addition, DIII-D will develop the physics basis for steady-state, high performance operation for next generation facilities; Alcator C-Mod will study operation with all metal walls; and NSTX will investigate operation with a liquid metal divertor plate and explore the unique physics of the spherical torus. (FY 2007=\$112.5M; FY 2008=\$125.6M; **FY 2009=\$116.7M**)
- Fabrication of the National Compact Stellarator Experiment.** Continues but is under review due to cost and schedule overruns arising from system complexity. Pending a final decision in FY2008, the budget assumes a rebaselining. (FY 2007=\$15.8M; FY 2008=\$15.9M; **FY 2009=\$19.6M**)
- Fusion Simulation Project (FSP).** Will take advantage of improvements in computational capabilities to develop a world leading predictive capability that can be applied to fusion plasmas. (FY 2007=\$0M; FY 2008=\$0M; **FY 2009=\$2.0M**)
- Other core research areas.** Theory and modeling, enabling technologies, diagnostics, experimental plasma research, high energy density physics, international research, and general plasma science, will continue to develop the knowledge base needed for an economically and environmentally attractive fusion energy source. (FY 2007=\$123.4M; FY 2008=\$134.4M; **FY 2009=\$140.3M**)





The Scientific Opportunity of FES

“As part of its current physics decadal survey, Physics 2010, the NRC was asked by the DOE, NSF, and NASA to carry out an assessment of and outlook for the broad field of plasma science and engineering over the next several years:

- **Principal Conclusion:** The expanding scope of plasma research is creating an abundance of new scientific opportunities and challenges. These opportunities promise to further expand the role of plasma science in enhancing economic security and prosperity, energy and environmental security, national security, and scientific knowledge.
- **Principal Recommendation:** To fully realize the opportunities in plasma research, a unified approach is required. Therefore, the Department of Energy’s Office of Science should reorient its research programs to incorporate magnetic and inertial fusion energy sciences; basic plasma science; non-mission-driven, high-energy-density plasma science; and low-temperature plasma science and engineering.”



The Status of FES

- **FES is in a difficult and exciting period**
 - US operates a number of fusion devices that have been extraordinarily productive and have advanced our knowledge of fusion.
 - ITER is *the* next step for magnetic fusion energy science – we cannot afford to cede our position in the world fusion program by surrendering our role in ITER
 - NIF ignition should spur increased interest in inertial fusion energy science
- **The FY 2008 Omnibus Bill funding eliminated all US contributions to the ITER project, retaining only \$10.6M for ITER R&D – Overall FES rises from \$286.5M to \$493.1M:**
 - Calls into question the US commitment to fusion energy and U.S. credibility as an international partner; and
 - Increases the possibility that fusion will become a “donor” for shorter term priorities that do not address the Nation’s long term energy needs.
- **Addressing New Challenges:**
 - Cost and schedule overruns on NCSX have forced difficult choices. I thank FESAC for their assessment of the importance of the science that will come from NCSX
- **Current circumstances are challenging for the U.S. program:**
 - Graduating from older to newer facilities that will answer pressing questions for fusion energy;
 - the budget uncertainties for all of Science.



The Plan for FES

- **The goal must be a world-class, vigorous, and productive program, which**
 - recognizes the internationalization of fusion,
 - Integrates the domestic program into the ITER burning plasma,
 - incorporates recent and likely budget realities, and
 - ensures the vitality of the field while we await scientific results from ITER and NIF.
- **A robust, scientifically compelling plan for U.S. FES must be developed that is**
 - Supported by the scientific community, the Administration, Congress and the public, and
 - addresses the long-term realities of the Nation's energy needs.
- **The scientific community is critically important:**
 - The community and FESAC need to work with OFES to continue to update a credible development path for fusion energy science.
 - The community needs to make the case for the science, and its benefits to the Nation, to Congress and the public. Funding is not an entitlement.



Our Challenge

- The very large percentage increase between the essentially flat funding for the DOE Office of Science in FY2008 and the FY2009 President's Request will be an attractive target.
 - We could easily, again, become a “donor” program. This is true for all three American Competitiveness Initiative agencies.
- Compounding the danger is the widespread attitude that the proposed increases for the physical sciences under the ACI and America COMPETES act are “a done deal”.
- There is the possibility we may see a “three-peat” and a perpetuation of flat-to-declining budget trajectories.
- If we are to avoid this scenario we need to actively and publicly make the case for LONG-TERM basic research rather than short-term applied research.

It is now up to us to make the case.



Looking Forward

The President's Budget Request for FY2009 remains a vote of confidence for the physical sciences, expressing unprecedented support:

"To keep America competitive into the future, we must trust in the skill of our scientists and engineers and empower them to pursue the breakthroughs of tomorrow . . . This funding is essential to keeping our scientific edge."

President George W. Bush
State of the Union Address
January 28, 2008