

U.S. Department of Energy
Office of Science

***Basic Energy Sciences Advisory
Committee Meeting***

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

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Under Secretary for Science
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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%

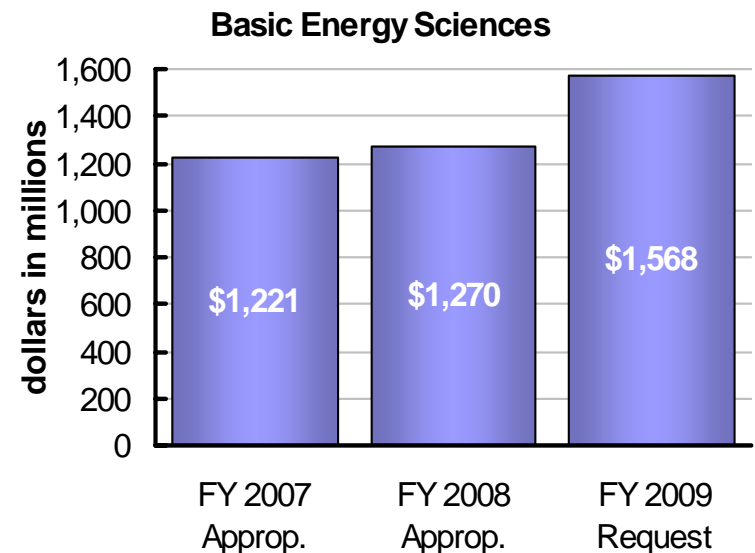
* Adjustments include SBIR/STTR funding transferred from other DOE offices (FY 2007 only), a charge to reimbursable customers for their share of safeguards and security costs (FY 2007 and FY 2008), Congressionally-directed projects and a rescission of a prior year Congressionally-directed project (FY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



Basic Energy Sciences (BES)

(FY 2009=\$1,568M)

- Core research programs in support of principal investigators.** Research activities are supported in FY 2009 in areas of condensed matter and materials physics, chemistry, biosciences, and geosciences with increased support in areas of solar energy utilization, electric-energy storage, basic research for the hydrogen economy, advanced nuclear energy systems, and other energy-related research. To accelerate the rate of scientific breakthroughs in these areas, Energy Frontier Centers will be initiated to address Grand Challenges for Basic Energy Sciences. (FY 2007=\$445.6M; FY 2008=\$451.6M; **FY 2009=\$629.9M**)
- Facilities operations.** Facility operations are increased in FY 2009 to provide for optimal operations of the four light sources, three neutron sources, and five Nanoscale Science Research Centers. (FY 2007=\$547.9M; FY 2008=\$555.8M; **FY 2009=\$593.5M**)
- National Synchrotron Light Source II (NSLS-II) Project.** FY 2009 supports Project Engineering Design, Other Project Costs, and construction for NSLS-II. NSLS-II will provide the world's finest capabilities for x-ray imaging and enable the study of material properties and functions at the nanoscale. (FY 2007=\$25.0M; FY 2008=\$49.7M; **FY 2009=\$103.3M**)
- Linac Coherent Light Source (LCLS) Project.** The LCLS will continue construction and Other Project Costs. Funding is also provided in FY 2009 to fully support operation of the SLAC linac. (FY 2007=151.7M; FY 2008=\$127.9M; **FY 2009=\$152.7M**)
- Instrumentation Fabrication and Other Construction Projects.** Instrumentation for major scientific user facilities and other construction activities. (FY 2007=\$39.8M; FY 2008=\$43.8M; **FY 2009=\$49.3M**)
- All other.** Includes SBIR/STTR and GPP/GPE. (FY 2007=\$11.4M; FY 2008=\$41.1M; **FY 2009=\$39.5M**)





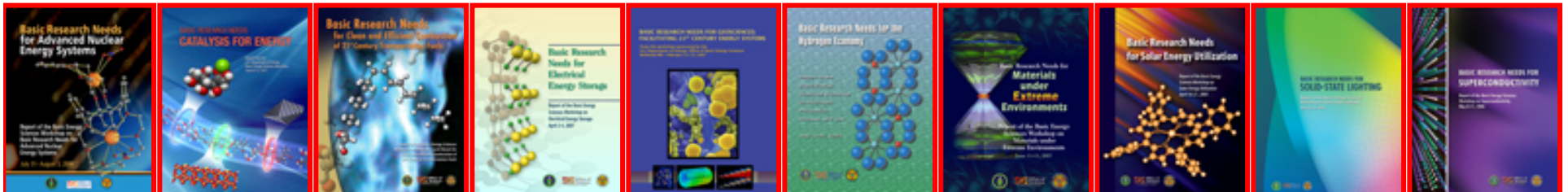
The Scientific Opportunities in BES Identified in The “Basic Research Needs ...” Workshop Series

Identifying Basic Research Directions for Today’s and Tomorrow’s Energy Technologies

Basic Research Needs for a Secure Energy Future (BESAC)

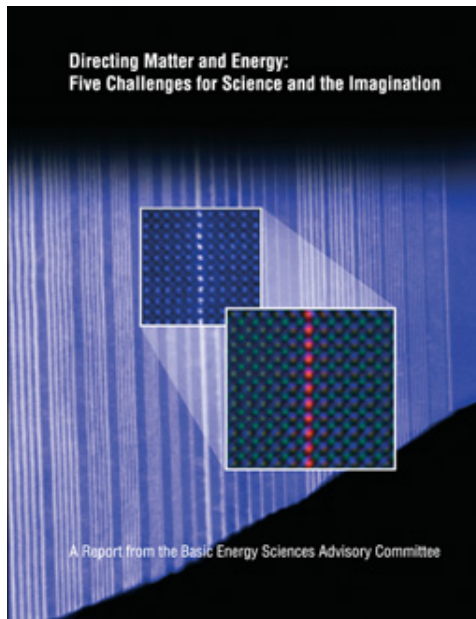


- Basic Research Needs for the Hydrogen Economy
- Basic Research Needs for Solar Energy Utilization
- Basic Research Needs for Superconductivity
- Basic Research Needs for Solid State Lighting
- Basic Research Needs for Advanced Nuclear Energy Systems
- Basic Research Needs for the Clean and Efficient Combustion of 21st Century Transportation Fuels
- Basic Research Needs for Geosciences: Facilitating 21st Century Energy Systems
- Basic Research Needs for Electrical Energy Storage
- Basic Research Needs for Catalysis for Energy Applications
- Basic Research Needs for Materials under Extreme Environments





Grand Science Challenges



*BESAC Grand Challenge
Subcommittee Report
January 2008*

- Controlling materials processes at the level of quantum behavior of electrons
- Atom- and energy-efficient syntheses of new forms of matter with tailored properties
- Emergent properties from complex correlations of atomic and electronic constituents
- Man-made nanoscale objects with capabilities rivaling those of living things
- Controlling matter very far away from equilibrium



The FY 2009 Budget Request: A New Era for Science

Energy Frontier Research Centers (~\$100M/yr)

Innovative basic research to accelerate scientific breakthroughs needed to create advanced energy technologies for the 21st century

Awards to be \$2M-\$5M per year for an initial 5-year period

The Office of Science seeks to engage the Nation's intellectual and creative talent to tackle the scientific grand challenges associated with determining how nature works, leading the scientific community to direct and control matter at the quantum, atomic, and molecular levels, and harness this new knowledge and capability for some of our most critical real-world challenges.

Energy Frontier Research Centers will pursue fundamental basic research in areas such as:

- Solar Energy Utilization
- Catalysis for Energy
- Electrical Energy Storage
- Solid State Lighting
- Superconductivity
- Geosciences for Nuclear Waste and CO₂ Storage
- Advanced Nuclear Energy Systems
- Combustion of 21st Century Transportation Fuels
- Hydrogen Production, Storage, and Use
- Materials Under Extreme Environments

U.S. universities, DOE laboratories, and other institutions are eligible.



The FY 2009 Budget Request: A New Era for Science

World-Leading Facilities

Driving transformational science and U.S. innovation

- **Spallation Neutron Source** (\$177.6M) and the **High Flux Isotope Reactor** (\$58.8M), together provide capabilities unavailable anywhere else in the world for study of the position and motion of atoms in materials – from liquid crystals to superconducting ceramics, from proteins to plastics, and from metals to cell walls.
- **Four Synchrotron Light Sources** – Extraordinary tools for determining protein structures, probing the physical properties of new materials, and studying chemical reactions
 - **Advanced Light Source** (\$51.1M)
 - **Advanced Photon Source** (\$116.5M)
 - **National Synchrotron Light Source** (\$40.1M)
 - **Stanford Synchrotron Radiation Laboratory** (\$33.0M)
- **Five DOE Nanoscale Science Research Centers** (\$101.2M) – providing unmatched capabilities for fabrication, synthesis, and characterization of matter at the nanoscale

Next Generation Tools

- **Linac Coherent Light Source** (\$56.0M) – a revolutionary x-ray free electron laser that will allow probing of chemical and biological structures and examination of chemical reactions in real time at the single molecule level
- **National Synchrotron Light Source-II** (\$103.3M) – a state-of-the-art light source for x-ray imaging, capable of nanometer resolution of structures and features of individual atoms, molecules, and crystals



The BES Challenge

The Past and Present:

- The President's Request for BES in FY 2007 was \$1,421M.
The Appropriation for BES in FY 2007 was \$1,250M. $\Delta = - \$171\text{M}$.
- The President's Request for BES in FY 2008 was \$1,499M.
The Appropriation for BES in FY 2008 was \$1,270M. $\Delta = - \$229\text{M}$.
- The President's Request for BES in FY 2009 is \$1,568M.
The Appropriation for BES in FY 2009 is ?. $\Delta = \pm \$?$ $\Sigma = - \$400\text{M} \pm ?$

The Future?

- The President's Request for FY 2009 is \$298M more than the FY 2008 appropriation, the largest dollar increase for any of the Office of Science programs. BES could easily, again, become a "donor" program.
- This possibility, a "threepeat" for BES, could doom BES to a flat to declining budget for years to come.
- Compounding the danger is the widespread attitude in the scientific community that the proposed increases for the physical sciences under the ACI and America COMPETES act are "a done deal".



The Plan for BES

- **The goal must be a world-class, vigorous, and productive program, which balance key portfolio components that together create a uniquely DOE program:**
 - **Fundamental research**
 - in support of a *mission-driven basic research* and
 - in support of *discovery science* that enables the mission; this also includes the support of a critical mass of principal investigators – “the great discovery machine”
 - **Forefront scientific user facilities for the Nation**
- **A robust, scientifically compelling plan for U.S. BES 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 BESAC need to continue to develop a strategy to communicate the long-term basic research needs for tackling the 21st century energy challenges.
 - 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.



The Office of Science Challenge

The Past and Present:

- The President's Request for SC for FY 2007 was \$4,102M.
The Appropriation for SC for FY 2007 was \$3,813M. $\Delta = - \$289\text{M}$.
- The President's Request for SC for FY 2008 was \$4,404M.
The Appropriation for SC for FY 2008 was \$3,903M. $\Delta = - \$501\text{M}$.
- The President's Request for SC for FY 2009 is \$4,722M.
The Appropriation for SC for FY 2009 in ?. $\Delta = \pm ?$ $\Sigma = - \$790\text{M} \pm ?$.

The Future?

- The President's Request for FY 2009 is \$819M more than the FY 2008 appropriation, a huge dollar increase. SC could easily, again, become a "donor" program. 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