

U.S. Department of Energy
Office of Science

***Nuclear Science
Advisory Committee Meeting***

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

Dr. Raymond L. Orbach
Under Secretary for Science
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www.science.doe.gov

U.S. Department of Energy



Office of Science



Setting the Nation's Priorities

“To build a future of energy security, we must trust in the creative genius of American researchers and entrepreneurs and empower them to pioneer a new generation of clean energy technology. . .

So I ask Congress to double Federal support for critical basic research in the physical sciences and ensure America remains the most dynamic nation on Earth.”

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



The Office of Science

Office of Science FY 2009 Budget Request to Congress (dollars in thousands)

	FY 2007 Approp.	FY 2008 Request	FY 2008 Approp.	FY 2009 Request to Congress	FY 2009 Request to Congress vs. FY 2008 Approp.	
Basic Energy Sciences.....	1,221,380	1,498,497	1,269,902	1,568,160	+298,258	+23.5%
Advanced Scientific Computing Research.....	275,734	340,198	351,173	368,820	+17,647	+5.0%
Biological and Environmental Research.....	480,104	531,897	544,397	568,540	+24,143	+4.4%
High Energy Physics.....	732,434	782,238	689,331	804,960	+115,629	+16.8%
Nuclear Physics.....	412,330	471,319	432,726	510,080	+77,354	+17.9%
Fusion Energy Sciences.....	311,664	427,850	286,548	493,050	+206,502	+72.1%
Science Laboratories Infrastructure.....	41,986	78,956	66,861	110,260	+43,399	+64.9%
Science Program Direction.....	166,469	184,934	177,779	203,913	+26,134	+14.7%
Workforce Dev. for Teachers & Scientists.....	7,952	11,000	8,044	13,583	+5,539	+68.9%
Safeguards and Security (gross).....	75,830	76,592	75,946	80,603	+4,657	+6.1%
SBIR/STTR (SC funding).....	86,936	—	—	—	—	—
Subtotal, Office of Science.....	3,812,819	4,403,481	3,902,707	4,721,969	+819,262	+21.0%
Adjustments*.....	23,794	-5,605	70,435	—	-70,435	—
Total, Office of Science.....	3,836,613	4,397,876	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).

The Increase for Nuclear Physics includes the Isotope Production Program, transferred from NE to NP



The Status of NP

- **NP is in a challenging and exciting period**
 - The U.S. operates world-class nuclear physics accelerator facilities with strong international communities that are producing outstanding results, advancing the knowledge of the origin, evolution and structure of matter.
 - The 12 GeV CEBAF Upgrade is moving forward which will offer scientists insight into the structure of the nucleon and the nature of confinement.
 - The Program is positioning itself to initiate conceptual design activities for a Facility for Rare Isotope Beams.
 - Cutting-edge advances in beam cooling techniques at the Relativistic Heavy Ion Collider are allowing new records to be achieved in beam luminosity.
- **The FY 2008 Omnibus Bill was \$39 Million less than the FY 2008 Request:**
 - Construction projects and MIEs were stretched out, increasing project costs, and schedule and risks.
 - NP research programs nearly flat funded with FY 2007, resulting in reductions in effort due to inflation.
 - Operations at all four national user facilities severely impacted, in particular RHIC and TJNAF.
 - Increased support for the Advanced Fuel Cycle initiative and theoretical topical collaboration deferred.
- **The FY 2008 Appropriation follows two very difficult financial years for the Nuclear Physics Program**
 - The Appropriation supported the 12 GeV Upgrade Project within the appropriated amount.



The FY 2009 Budget Request: A New Era for Science

Nuclear Physics (\$510M)

The U.S. is today a world-leader in the studies of quark structure of the atomic nucleus, and behavior of matter under extreme conditions

Nuclear Physics Research seeks to understand the origin of the universe and the evolution of the cosmos

- What is the nature of the nuclear force that binds protons and neutrons into stable nuclei and rare isotopes?
- What is the nature of neutron stars and dense nuclear matter?
- What is the nature of neutrinos and how have they shaped the evolution of the universe?

Maintaining U.S. leadership in nuclear physics research – understanding the nature of matter and energy – is also central to the development of technologies for nuclear energy, nuclear medicine, and national security

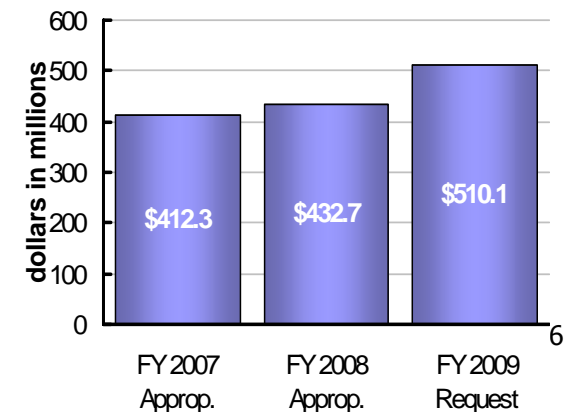
- Maintaining status as the world's most powerful "microscope" for studying the underlying structure of protons and neutrons – **Continuous Electron Beam Accelerator Facility Upgrade** – Thomas Jefferson National Accelerator Facility
- Leading studies of the nature of the universe several microseconds after the Big Bang – **Relativistic Heavy Ion Collider** – Brookhaven National Lab
- Developing advanced capabilities for rare isotope beams and a next generation U.S. facility for nuclear structure studies and astrophysics – **Facility for Rare Isotope Beams** – competition in 2008



Nuclear Physics (NP)

(FY 2009=\$510.1M)

- **Core research programs.** Studies of hot, dense nuclear matter; the quark structure of matter; nuclear structure & astrophysics; fundamental interactions; and neutrinos. (FY 2007=\$136.0M; FY 2008=\$139.5M; **FY 2009=\$159.5M**)
- **Facility Operations.** RHIC, CEBAF, ATLAS and HRIBF are operated at near optimum levels. The Electron Beam Ion Source (EBIS) being fabricated at RHIC will lead to more cost-effective operations. (FY 2007=\$237.6M; FY 2008=\$237.1M; **FY 2009=\$257.8M**)
- **12 GeV CEBAF Upgrade Project.** Construction for the upgrade of beam energy and research capabilities of CEBAF. (FY 2007=\$9.5M; FY 2008=\$14.4M; **FY 2009=\$28.6M**)
- **Facility for Rare Isotope Beams.** Conceptual design and R&D for FRIB, a next-generation facility for nuclear structure and astrophysics. (FY 2007=\$0; FY 2008=\$0; **FY 2009=\$7M**)
- **Advanced Instrumentation.** Detector upgrades at RHIC and for the heavy-ion program at LHC, the GRETINA detector for nuclear structure studies, a double-beta decay experiment (CUORE) to measure the neutrino mass, and a detector and beamline at the SNS for measurements of fundamental neutron properties. (FY 2007=\$13.1M; FY 2008=\$14.6M; **FY 2009=\$17.2M**)
- **Accelerator R&D.** Accelerator R&D, including superconducting radio-frequency developments at TJNAF and electron cooling at RHIC are supported. (FY 2007=\$6.8M; FY 2008=\$7.3M; **FY 2009=\$3.7M**)
- **Isotope Production.** The Isotope Production and Applications subprogram, transferred to SC/NP from NE, will support R&D and production of stable and radioactive isotopes. (FY 2007=\$0; FY 2008=\$0; **FY 2009=\$19.8M**)
- **Other.** Includes SBIR/STTR, laboratory infrastructure. (FY 2007=\$9.3M; FY 2008=\$19.8M; **FY 2009=\$16.5M**)





A Long Range Plan for NP

- NSAC has recently completed a Long Range Plan: *The Frontiers of Nuclear Science* which identifies the tools needed to be world leaders in primary scientific thrusts of Nuclear Physics and pursue compelling scientific opportunities

“The U.S. nuclear science program will erode without significant new capital investments.”

“The United States has long played a leading role in this quest, and with the new investments outlined in this Long Range Plan, we will continue to be a leader in the field well into the future.”

- This is a well-developed and articulated plan that showcases the important science, identifies future opportunities, and explains the importance of nuclear science in training a workforce and developing technological advances that are important for energy, medicine, homeland security, and materials research.
- **The scientific community is critically important:**
 - 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.



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 is ?. $\Delta = \pm ?$ $\Sigma = - \$790\text{M} \pm ?$.

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 demonstration projects using today's technology.

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.”

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