

U.S. Department of Energy



Office of Science

*U.S. Department of Energy's*  
***Office of Science***

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Maintaining U.S. Scientific Leadership  
and Global Economic Competitiveness

*FY07 Budget Request  
for the Office of Science*

*Raymond L. Orbach*  
**Director, Office of Science**  
**NSAC Meeting**  
**March 2, 2006**



# The President's American Competitiveness Initiative

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"We must continue to lead the world in human talent and creativity. Our greatest advantage in the world has always been our educated, hardworking, ambitious people -- and we're going to keep that edge. Tonight I announce an American Competitiveness Initiative, to encourage innovation throughout our economy, and to give our nation's children a firm grounding in math and science."

"I propose to double the federal commitment to the most critical basic research programs in the physical sciences over the next 10 years. This funding will support the work of America's most creative minds as they explore promising areas such as nanotechnology, supercomputing, and alternative energy sources."

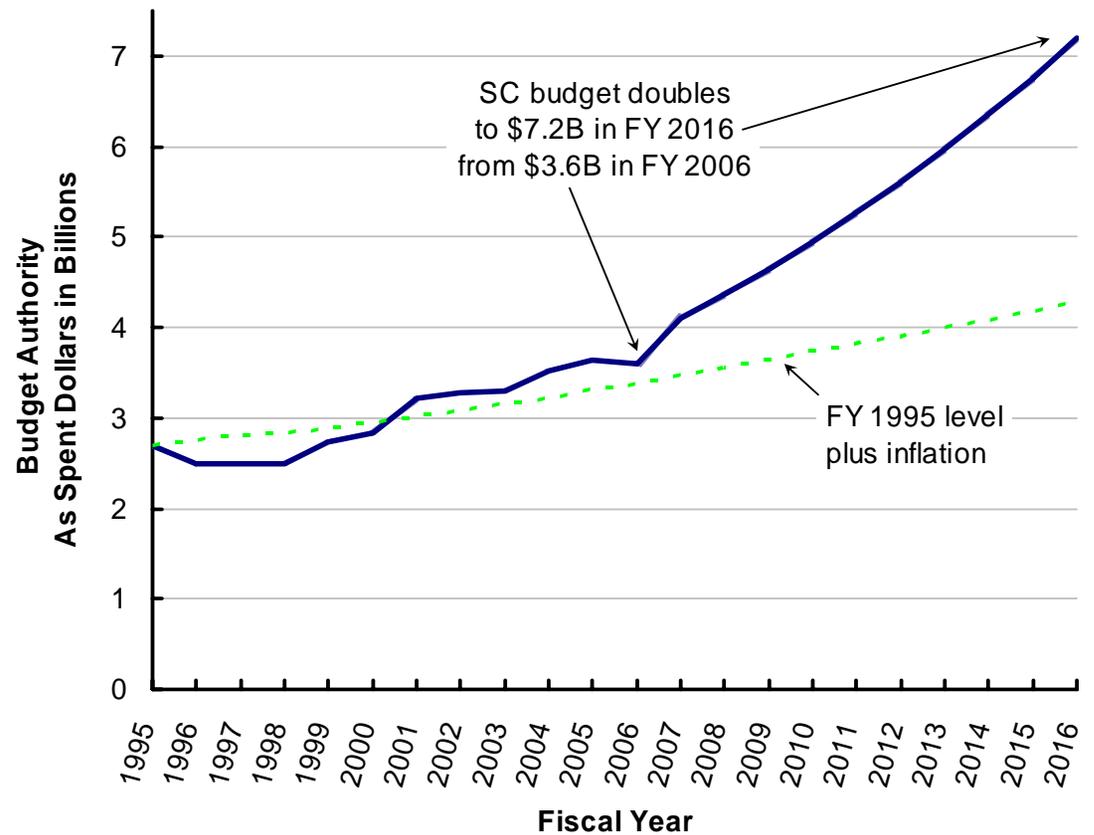
**President George W. Bush**  
**State of the Union Message**  
**January 31, 2006**



# The FY 2007 President's Request for SC funding is a 14.1% increase and sets SC on a path to doubling by 2016

An historic opportunity for our country – a renaissance for U.S. science and continued global competitiveness.

## Office of Science Budget Doubling from FY 2006 to FY 2016





# Office of Science Missions

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## Future of Science

- The Department of Energy's Office of Science is the steward of national science facilities that maintain U.S. world-leadership status in the physical sciences
- Understand Key Questions: the beginning of time, the nature of energy and matter from quarks to the cosmos
- Develop Scientific Workforce: Using the unique capabilities of the DOE laboratories for teacher professional development; enhancing the size and diversity of the scientific workforce

## Competitiveness

- Keeping U.S. Research and Development at the forefront of global science
- Scientific Computation – accelerate innovation through virtual prototypes
- Nanotechnology centers provide a unique capability for US universities and industry

## Energy Security

- Develop new sources of energy through transformational technologies, e.g., fusion and novel methods of converting biomass to ethanol
- Develop stronger, lightweight materials and improve combustion and catalytic processes to reduce energy consumption and improve efficiency



## The President's FY 2007 budget enhances the Office of Science's lead federal role in support for U.S. physical sciences

- SC facilities and instruments ensure for the U.S. an order of magnitude dominance in key scientific fields that will transform the 21st-century global economy: biotechnology, nanotechnology, materials science, and high-speed computing
- SC develops and nurtures a highly trained scientific workforce for the civilian economy and national security, with many Ph.D.'s entering industry and government
- Supports DOE energy mission through long-term, high-risk, high-payoff multidisciplinary research programs
- DOE provides 42% of federal support to the physical sciences
- We are stewards for high energy physics, nuclear physics, heavy element chemistry, plasma physics, magnetic fusion, and catalysis
- Provides and maintain ten world-class national laboratories and scientific facilities
- Directly supports (FY '07) the research of approximately 24,200 Ph.D.'s, Post Doctoral Associates, and Graduate Students (an increase of ~2600 from FY 2006)



## In FY 2007 SC will construct, operate and plan for scientific facilities for the future of science: Consequences for Competitiveness and Education

- **ITER** – the penultimate step to abundant, economical, and environmentally benign fusion energy
- **Leadership in High-End Computation**
  - Provide more than 250 teraflops capability for modeling and simulation of scientific grand-challenge problems in combustion, fusion, and complex chemical reactions
  - 100 teraflops Blue Gene P computer to expand architectural diversity in leadership computing and address scientific challenges in materials science, catalysis, protein/DNA complexes, and advanced designs of nuclear reactors
  - Increase capacity at National Energy Research Scientific Computing Center (NERSC) to 100-150 teraflops for high performance production computing.
- **Linac Coherent Light Source** construction continues – this X-Ray Free Electron Laser will allow examination of chemical reactions in real-time at the single molecule level
- **Spallation Neutron Source (SNS)** begins operations as the world's forefront neutron scattering facility by an order of magnitude



## The President's FY 2007 budget maintains U.S. leadership in the following areas:

- **DOE Nanocenters** 4 of 5 facilities begin operations, as the flagships of nanoscience – providing the U.S. with resources unmatched anywhere in the world
- **International Linear Collider** R&D funding doubled to \$60M – would give the U.S. world leadership in the study of particle physics in the next decade
- **Continuous Electron Beam Accelerator Facility (CEBAF) Upgrade** project engineering design (PED) to double energy – will give new insights on the quark structure of matter
- **RHIC** – leverage the unique capabilities of the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory for studies of the internal quark-gluon structure of nucleons and the properties of hot, dense nuclear matter
- **National Synchrotron Light Source-II**, to begin R&D and project engineering design (PED) in FY 2007 – a light source user facility with the world's finest capabilities for x-ray imaging



# Office of Science FY 2007 Congressional Budget Request

(dollars in thousands)

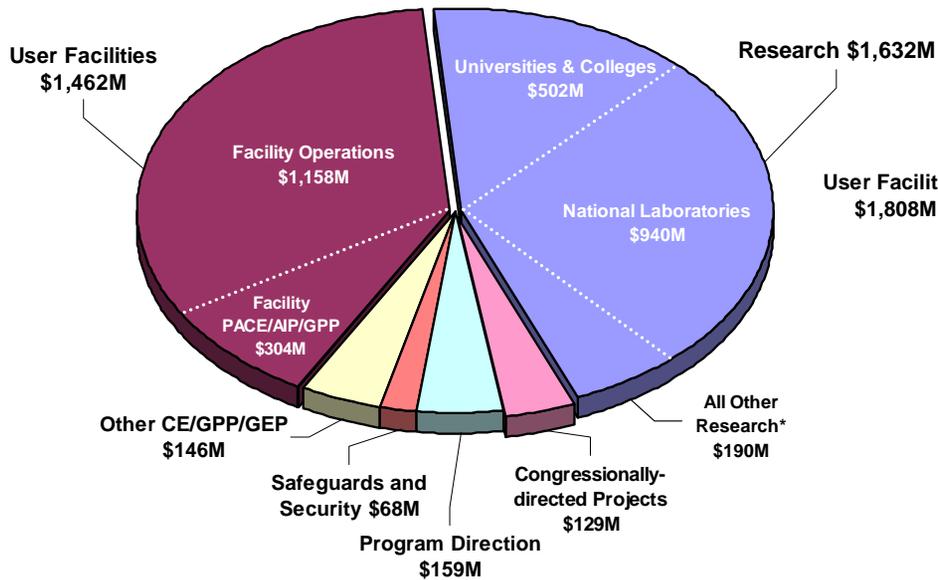
	FY 2005 Approp.	FY 2006 Approp.	FY 2007 President's Request	FY 2007 vs. FY 2006
Basic Energy Sciences.....	1,083,616	1,134,557	1,420,980	+286,423
Advanced Scientific Computing Research.....	226,180	234,684	318,654	+83,970
Biological and Environmental Research				
Base program.....	487,474	451,131	510,263	+59,132
Congressionally-directed projects.....	79,123	128,700	—	-128,700
Total, Biological and Environmental Research.....	566,597	579,831	510,263	-69,568
High Energy Physics.....	722,906	716,694	775,099	+58,405
Nuclear Physics.....	394,549	367,034	454,060	+87,026
Fusion Energy Sciences.....	266,947	287,644	318,950	+31,306
Science Laboratories Infrastructure.....	37,498	41,684	50,888	+9,204
Science Program Direction.....	154,031	159,118	170,877	+11,759
Workforce Development for Teachers and Scientists.....	7,599	7,120	10,952	+3,832
Small Business Innovation Research/Technology Transfer.....	113,621	—	—	—
Safeguards and Security.....	67,168	68,025	70,987	+2,962
Subtotal, Science.....	3,640,712	3,596,391	4,101,710	+505,319
Use of prior year balances.....	-5,062	—	—	—
Total, Science.....	<b>3,635,650</b>	<b>3,596,391</b>	<b>4,101,710</b>	<b>+505,319*</b>

\* One half of the \$505 million increase is for operations of our scientific facilities, including operations at new facilities: the Spallation Neutron Source and the Center for Nanophase Materials Sciences at Oak Ridge; the Center for Nanoscale Materials at Argonne; the Molecular Foundry at Berkeley; and the Center for Integrated Nanotechnologies at Sandia and Los Alamos National Laboratories. Research is increased by \$237 million, 47% of the \$505 million increase.

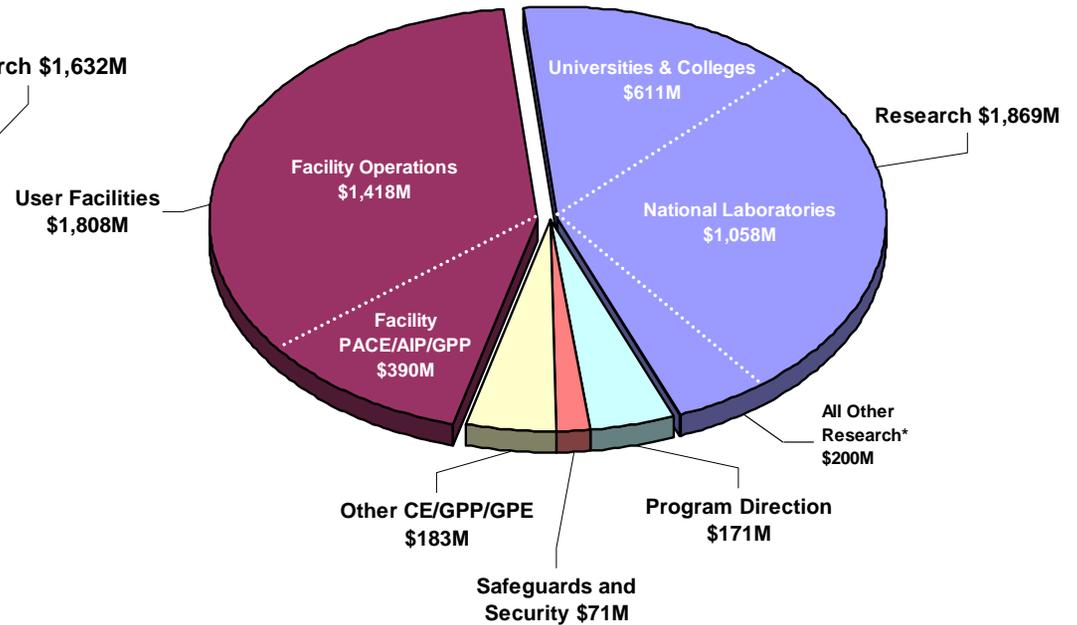


# Investments to maintain U.S. scientific leadership and ensure that leading-edge research facilities will be available in the future

FY 2006 Appropriation, \$3,596 Million



FY 2007 Request, \$4,102 Million



$\Delta(\text{FY 2007} - \text{FY 2006}) = +\$505\text{M}$  {  $\Delta(\text{Facility Operations}) = +\$260\text{M}, 51\%$   
 $\Delta(\text{Research}) = +\$237\text{M}, 47\%$

*The area of each pie chart is proportional to the funding total for the year.*

\* All Other Research includes funding for non-profits, other federal agencies, and private institutions.



# SC Opportunities

- To sustain federal funding for nuclear physics research, it is critical to support the President's FY 2007 Budget
- The President's FY 2007 Budget provides strong support for the Nuclear Physics program
  - NP Budget increases by \$87 M, to \$454 M (24%)
  - Full CEBAF and RHIC experimental programs, operations at 92% of optimum
  - \$ 7 M for Project Engineering and Design (PED) for 12 GeV CEBAF Upgrade
  - \$7.5 M for PED and construction start for RHIC Electron Beam Ion Source (EBIS)
- President has committed to doubling funding for the physical sciences (sum of DOE SC, NSF, and NIST budgets) over 10 years
- Every reduction from the President's FY 2007 SC Budget Request could be compounded over 10 years (a 1% cut could mean as much as \$550 M total reduction over the period)



## Closing Thoughts

That the Office of Science has been entrusted with this responsibility is a wonderful statement of confidence in our ability to support the President's initiative. We are fully aware that the substantial increase in the Office of Science Budget Request for Fiscal Year 2007--and the President's commitment to a doubling of federal funding for physical science research over the next decade--takes place in a period of budgetary stringency.

We are indebted to the President for his foresight in recognizing the vital importance of America's continued leadership in the physical sciences to our nation's global competitive position and our quest for greater energy security. We are committed to holding up our end of the bargain by delivering truly transformational science and technologies--breakthrough advances that will provide new pathways to energy security and ensure America's continued global economic leadership in the years ahead.