U.S. DEPARTMENT OF ENERGY

OFFICE OF SCIENCE

Atomic, Molecular, and Optical Sciences

Fundamental Interactions Team

Chemical Sciences, Geosciences, and Biosciences Division

Jeff.Krause@science.doe.gov

www.sc.doe.gov/bes

CAMOS 4/6/10

DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

$27.111 B

$33.748 B

Office of the Secretary
Dr. Steven Chu, Secretary

Daniel B. Poneman,
Deputy Secretary*

Chief of Staff

Departmental Staff and Support Offices

- Advanced Research Projects Agency -Energy
- General Counsel
- Chief Financial Officer
- Chief Information Officer
- Chief Human Capital Officer
- Management
- Public Affairs
- Assistant Secretary for Congressional & Intergovernmental Affairs
- Assistant Secretary for Policy & International Affairs
- Health, Safety & Security
- Inspector General
- Economic Impact & Diversity
- Hearings & Appeals
- Intelligence and Counterintelligence

Office of the Under Secretary For Nuclear Security/ Administrator for National Nuclear Security Administration
Thomas P. D'Agostino

- Deputy Administrator for Defense Programs
- Deputy Administrator for Defense Nuclear Nonproliferation
- Deputy Administrator for Naval Reactors
- Deputy Under Secretary for Counter-terrorism
- Associate Administrator for Defense Nuclear Security
- Associate Administrator for Emergency Operations
- Associate Administrator for Infrastructure & Environment
- Associate Administrator for Management & Administration

Office of the Under Secretary

Dr. Kristina M. Johnson
Under Secretary

- Assistant Secretary for Energy Efficiency & Renewable Energy
- Assistant Secretary for Environmental Management
- Assistant Secretary for Fossil Energy
- Assistant Secretary for Nuclear Energy
- Assistant Secretary for Electricity Delivery & Energy Reliability
- Civilian Radioactive Waste Management
- Legacy Management

Office of the Under Secretary for Science

Dr. Steven E. Koonin
Under Secretary for Science

$4.904 B

$4.722 B

Office of Science
Dr. William Brinkman

- Advanced Scientific Computing Research
- Basic Energy Sciences — $1.636 B / $1.571 B
- Biological & Environmental Research
- Fusion Energy Science
- High Energy Physics
- Nuclear Physics
- Workforce Development for Teachers & Scientists

- Energy Information Administration
- Southeastern Power Administration
- Bonneville Power Administration
- Western Area Power Administration
- Southwestern Power Administration

$ = FY2010 appropriation

$ = FY2009 appropriation

* The Deputy Secretary also serves as the Chief Operating Officer

26 May 09

Office of Basic Energy Sciences

Harriet Kung, Director

Wanda Smith, Administrative Specialist

BES Budget and Planning

Bob Astheimer, Senior Technical Advisor
Margie Davis, Financial Management
Vacant, Program Support Specialist

BES Operations

Rich Burrow, DOE Technical Office Coordination
Robin Hayes, AAAS Fellow
Katie Perine, Program Analyst / BESAC
Ken Rivera, Laboratory Infrastructure / ES&H
Vacant, DOE and Stakeholder Interactions

Materials Sciences and Engineering Division

Linda Horton, Director

Vacant, Program Analyst
☆ Charnice Waters, Secretary

Materials Discovery, Design, and Synthesis

Arvind Kini
Kerry Gorey, P.A.

- Materials Chemistry — Mary Galvin, Dick Kelley, ● Darryl Sasaki, SNL
- Biomolecular Materials — Mike Markowitz
- Synthesis and Processing — Bonnie Gersten
- Tech. Coordination Program Management — John Vetrano, Vacant

Condensed Matter and Materials Physics

Jim Horwitz
Marsophia Agnant, P.A.

- Exp. Cond. Mat. Phys. — Andy Schwartz, ●Doug Finnemore, Ames, Vacant
- Theo. Cond. Mat. Phys. — Vacant, △ Arun Bansil, NEU, ◆ Jim Davenport, BNL, ■ Kim Ferris, PNNL
- Physical Behavior of Materials — Refik Kortan
- Mechanical Behavior and Radiation Effects — John Vetrano

Scattering and Instrumentation Sciences

Helen Kerch
Cheryl Howard, P.A.

- X-ray Scattering — Lane Wilson
- Neutron Scattering — Thiyaga P. Thiyagarajan
- Electron and Scanning Probe Microscopies — Jane Zhu
- DOE EPSCoR* — ◆ Tim Fitzsimmons, Jane Zhu, ● Helen Farrell, INL, ●John Schlueter, ANL

* Experimental Program to Stimulate Competitive Research

Scientific User Facilities Division

Pedro Montano, Director

Linda Cerrone, Program Support Specialist
Rocio Meneses, Program Assistant

Operations

- X-ray and Neutron Scattering Facilities — Roger Klaffky, Peter Lee
- NSRCs & EBMCs** — Tof Carim, Carlos Sa de Melo, ◆ Joe Horton, ORNL
- Accelerator and Detector R&D — Eliane Lessner
- Facility Coordination; Metrics; Assessment — Van Nguyen

** Nanoscale Science Research Centers & Electron Beam Microcharacterization Centers

Construction

- Linac Coherent Light Source — Tom Brown
- National Synchrotron Light Source II — Tom Brown
- Spallation Neutron Source Upgrades — Tom Brown
- Instrument MIEs*** — Stephen Tkaczyk, ◆ John Tapia, LANL
- Advanced Light Source User Support Building — Tom Brown

*** Major Item of Equipment projects

Chemical Sciences, Geosciences, and Biosciences Division

Eric Rohlfing, Director

Diane Marceau, Program Analyst
Michaelene Kyler-King, Program Assistant

Fundamental Interactions

Michael Casassa
Robin Felder, P.A.

- Atomic, Molecular, and Optical Sciences — Jeff Krause
- Gas-Phase Chemical Physics — Wade Sisk, △ Larry Rahn, SNL
- Condensed-Phase and Interfacial Mol. Science — Greg Fiechtner
- Computational and Theoretical Chemistry — Mark Pederson

Photo- and Bio-Chemistry

Rich Greene
Sharron Watson, P.A.

- Solar Photochemistry — Mark Spitler, ● Arthur Frank, NREL
- Photosynthetic Systems — Gail McLean
- Physical Biosciences — Robert Stack

Chemical Transformations

John Miller
Teresa Crockett, P.A.

- Catalysis Science — Paul Maupin, Raul Miranda, ◆ Jan Hrbek, BNL
- Heavy Element Chemistry — Lester Morss, ● Norm Edelstein, LBNL
- Separations and Analysis — Bill Millman, △ Larry Rahn, SNL
- Geosciences — Nick Woodward, ● Jennifer Blank, LBNL
- Technology Office Coordination — Marvin Singer, Vacant

LEGEND

- ◆ Detailee (from DOE laboratories)
- ■ Detailee, ½ time, not at HQ
- ● Detailee, ¼ time, not at HQ
- ◆ On detail to EERE/SETP, 30%
- △ IPA (Interagency Personnel Act)
- ☆ On active military duty

P.A. Program Assistant

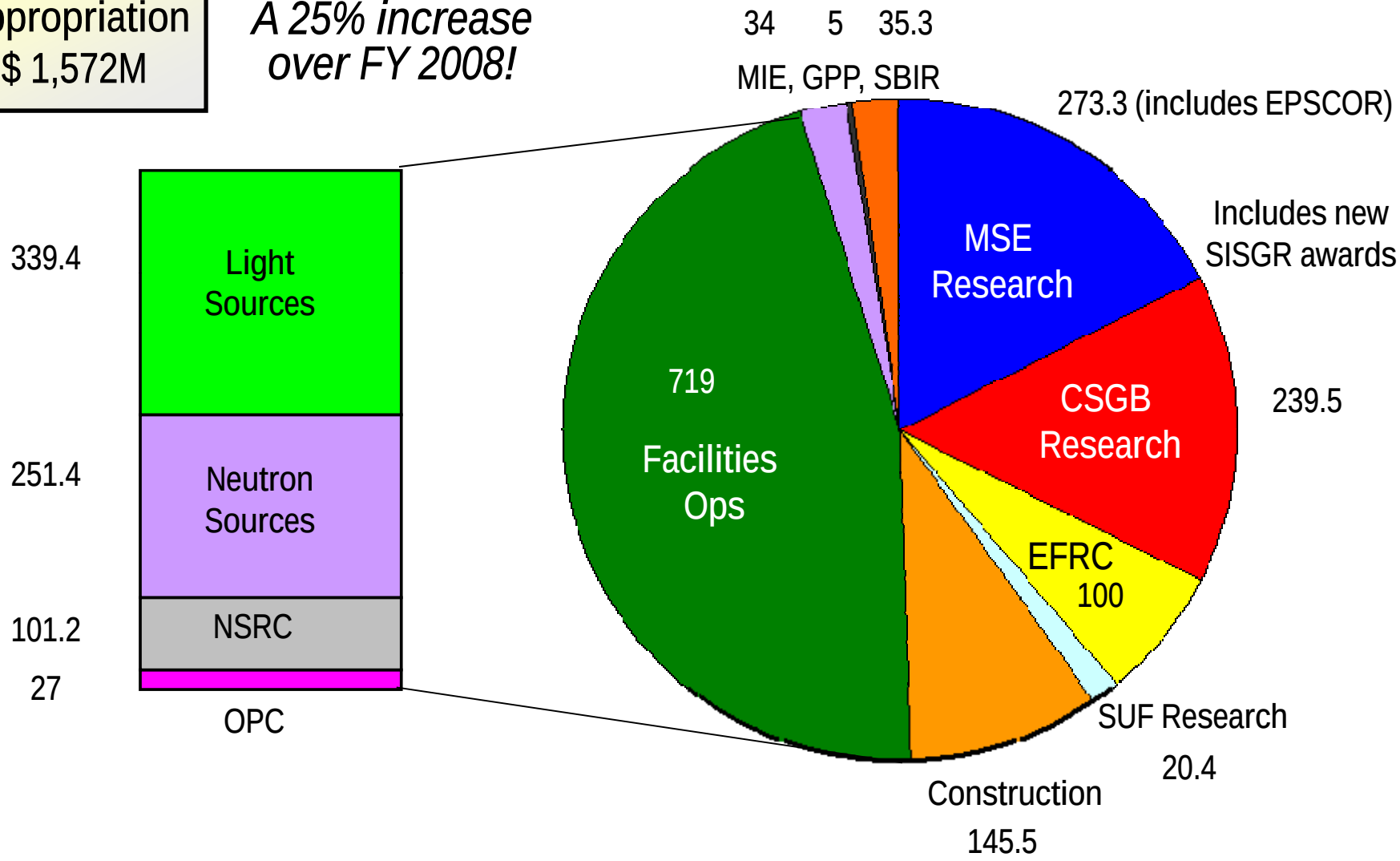
March 2010

Posted 25 FEB 10

FY 2009 BES Budget (base)

Appropriation
$ 1,572M

A 25% increase over FY 2008!



BES has invested $555.4 million of Recovery Act funding in seven activities:

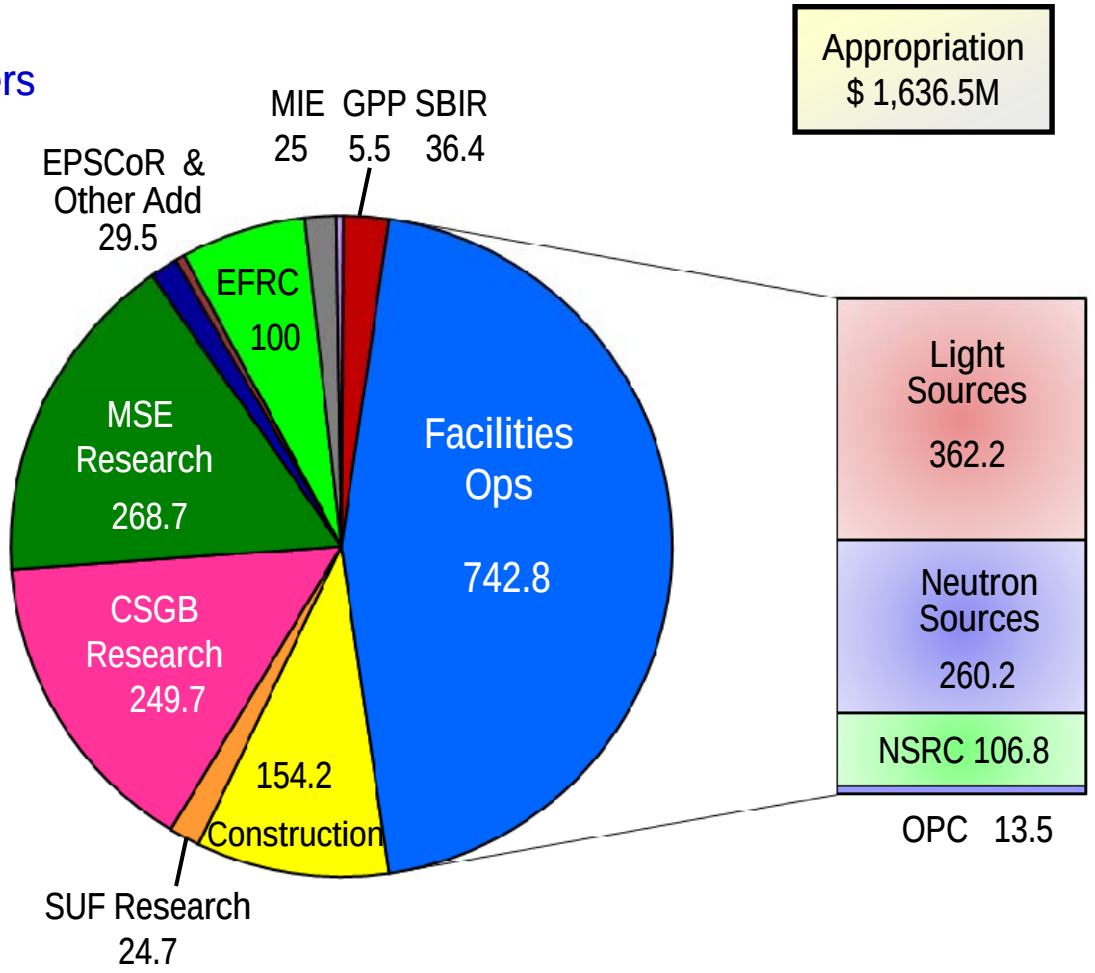
- $150.0M to accelerate the civilian construction of the **National Synchrotron Light Source II** (NSLS-II) at Brookhaven National Laboratory;
- $14.7M to complete the construction of the **User Support Building** (USB) at the Advanced Light Source (ALS) at Lawrence Berkeley National Laboratory;
- $33.6M to complete the Linac Coherent Light Source (LCLS) **Ultrafast Science Instruments** (LUSI) MIE project at SLAC National Accelerator Laboratory;
- $25.0M for capital equipment replenishment and augmentation at the five BES **Nanoscale Science Research Centers** (NSRCs);
- $24.0M for four **synchrotron radiation light sources** capital equipments, AIP, other upgrades
- $277.0M for **Energy Frontier Research Centers** (EFRCs) – funding an additional 16 EFRCs for the full five-year initial award period.
- $31.1M **for Early Career Awards** for scientists at DOE labs and universities.

FY 2010 BES Budget Appropriation (+4%)

- Core research
  - $100M for Energy Frontier Research Centers
  - Core research increases (~3%) for grand challenge science, accelerator & detector research
  - EPSCoR funded at $22M
- Scientific user facilities operations

  Increase in operation funding (~ 3%):
  - Synchrotron light sources
  - Neutron scattering facilities
  - Nanoscale Science Research Centers
- Construction and instrumentation

  Full funding per request for:
  - National Synchrotron Light Source-II
  - Linac Coherent Light Source
  - Spallation Neutron Source instruments
  - SNS Power Upgrade



FY 2011 Budget Request to Congress

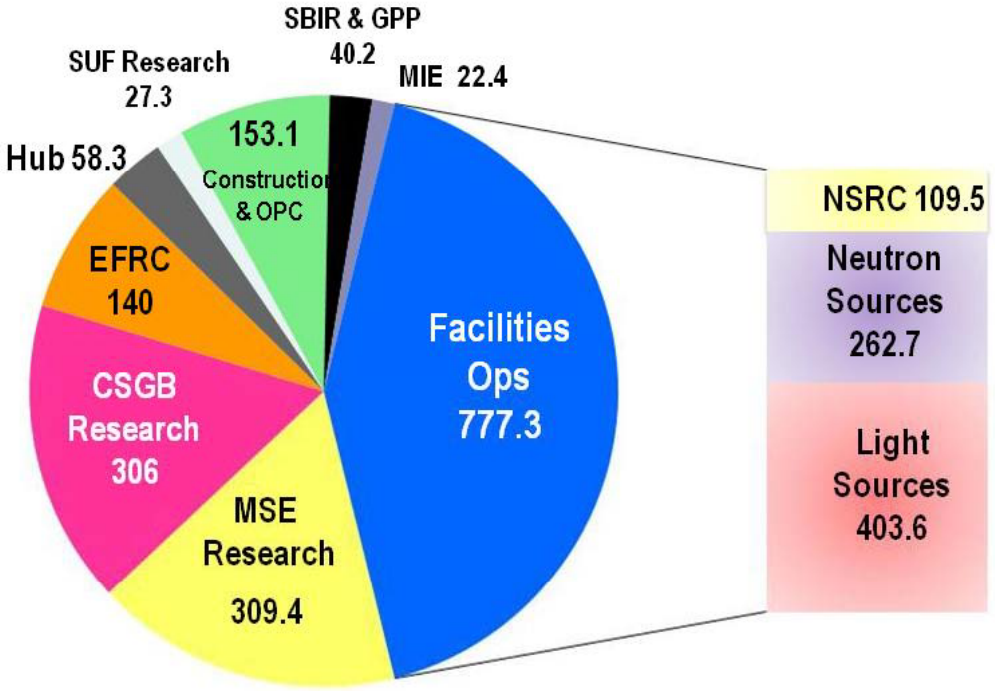
(B/A in thousands)

	FY 2009		FY 2010	FY 2011		
	Current Base Approp.	Current Recovery Act	Current Approp.	Request to Congress	Request to Congress vs. FY 2010 Approp.	
Advanced Scientific Computing Research	358,772	161,795	394,000	426,000	+32,000	+8.1%
Basic Energy Sciences	1,535,765	555,406	1,636,500	1,835,000	+198,500	+12.1%
Biological & Environmental Research	585,176	165,653	604,182	626,900	+22,718	+3.8%
Fusion Energy Sciences	394,518	91,023	426,000	380,000	-46,000	-10.8%
High Energy Physics	775,868	232,390	810,483	829,000	+18,517	+2.3%
Nuclear Physics	500,307	154,800	535,000	562,000	+27,000	+5.0%
Workforce Development for Teachers & Scientists	13,583	12,500	20,678	35,600	+14,922	+72.2%
Science Laboratories Infrastructure	145,380	198,114	127,600	126,000	-1,600	-1.3%
Safeguards & Security	80,603	——	83,000	86,500	+3,500	+4.2%
Science Program Direction	186,695	5,600	189,377	214,437	+25,060	+13.2%
Small Business Innovation Research/Technology Transfer (SC)	104,905	18,719	——	——	——	——
Subtotal, Science	**4,681,572**	**1,596,000**	**4,826,820**	**5,121,437**	**+294,617**	**+6.1%**
Congressionally-directed projects	91,064	——	76,890	——	-76,890	-100.0%
Small Business Innovation Research/ Technology Transfer (DOE)	49,534	36,918	——	——	——	——
Use of prior year balances	-15,000	——	——	——	——	——
Total, Office of Science	**4,807,170**	**1,632,918**	**4,903,710**	**5,121,437**	**+217,727**	**+4.4%**

FY 2011 BES Budget Request (+12%)

- Research programs
  - Energy Innovation Hubs
  - Energy Frontier Research Centers
  - Core research increases for grand challenge science, use-inspired science, accelerator & detector research
  - Topical areas include: basic research in ultrafast science, materials synthesis, carbon capture, radiation resistant materials, separation sciences, advanced combustion modeling for engine design, geophysics and geochemistry on CO_2/minerals & rocks interactions, and gas hydrates

- Scientific user facilities operations
  - Synchrotron light sources
  - Neutron scattering facilities
  - Nanoscale Science Research Centers



- Construction and instrumentation
  - National Synchrotron Light Source-II
  - Spallation Neutron Source instruments
  - SNS Power Upgrade

Office of Science FY11 Investment Highlights

The FY 2011 budget advances discovery science and invests in science for national needs in energy, climate, and the environment; national scientific user facilities; and education and workforce development.

Discovery science addressing national priorities

- Energy Innovation Hub for Batteries and Energy Storage (+$34,020K, BES)
- Enhanced activities in climate science and modeling (Regional and Global Climate Modeling, +$6,495K; Earth System Modeling, +$9,015K; Atmospheric System Research, +$1,944K; ARM Climate Research Facility, +$3,961K; BER)
- Individual investigator, small group, and Energy Frontier Research Centers (EFRCs) in areas complementing the initial suite of 46 EFRCs awarded in FY 2009 (+$66,246K, BES)
- Leadership Computing Facilities operations and preparation for next generation of computer acquisitions for S&T modeling and simulation ($34,832K, ASCR)
- Multiscale modeling of combustion and advanced engine systems (+$20,000K, BES)

Scientific user facilities—21st century tools of science, technology, and engineering

- Facility construction is fully funded; projects are meeting baselines
- 28 scientific user facilities will serve more than 26,000 users
- Several new projects and Major Items of Equipment are initiated (e.g., the Long Baseline Neutrino Experiment, +$12,000K, HEP)

Education and workforce development

- Expansions of the SC Graduate Fellowship Program (+$10,000K, 170 new awards, WDTS) and the SC Early Career Research Program (+$16,000K, 60 new awards, funded in all of the SC research programs)

BES FY 2011 Highlights

- ~$66,000K will be available to support single investigators, small group research awards, and Energy Frontier Research Centers in the following areas:
  - Discovery and development of new materials with emphasis on new synthesis capabilities, including bio-inspired approaches
  - Fundamental sciences for energy technologies, including carbon capture, and advanced nuclear energy systems
- Energy Innovation Hubs are initiated in the area of Batteries and Energy Storage (+$34,020K) and continued in the area of Fuels from Sunlight (+$24,300K). Hubs create large, highly integrated teams spanning basic to engineering development to accelerate solutions to priority energy technology challenges.
- An increase in Chemical Physics enables initiation of a significant effort in the area of multiscale modeling for advanced engine design (+$20,000K) .
- An increase in Geosciences Research enables new research on methane hydrates (+$17,517K) and various geophysical and geochemical investigations (+$10,000K).
- Increases for ultrafast science research in Neutron and X-ray Scattering (+$2,500K) and Atomic, Molecular, and Optical Sciences (+$2,500K) enables development of ultrafast x-ray and optical probes of matter and dynamic phenomena.
- Accelerator and Detector Research (+$2,469K) is expanded to include free-electron laser, diagnostics, detectors, and accelerator modeling.
- BES light sources facilities receive funds for critical instrumentation and device upgrades at the Advanced Photon Source ($3,000 K), the Advanced Light Source ($2,000 K), and LCLS ($1,000K).
- The Spallation Neutron Source Power Upgrade Project (PUP) (+$3,000K) efforts accelerate per its established project schedule.

BES FY 2011 Initiatives

About $66 million will be competed in the BES Program to support single investigators, small groups, and additional Energy Frontier Research Centers in the following areas:

1. **Discovery and development of new materials**
   The FY 2011 solicitation will emphasize new synthesis capabilities, including bio-inspired approaches, for science-driven materials discovery and synthesis. Research will include crystalline materials, which have broad technology applications and enable the exploration of novel states of matter.

2. **Research for energy applications**
   The FY 2011 solicitation will emphasize fundamental science related to:

   - **Carbon capture**, including the rational design of novel materials and separation processes for post-combustion CO_2 capture in existing power plants and catalysis and separation research for novel carbon capture schemes to aid the design of future power plants.
   - **Advanced nuclear energy systems** including radiation resistant materials in fission and fusion applications and separation science and heavy element chemistry for fuel cycles.

Awards will be competitively solicited via Funding Opportunity Announcements following the FY 2011 appropriation.

U.S. DEPARTMENT OF ENERGY

Early Career Program

$16 million will be available in FY 2011 to fund about 60 additional Early Career Research Program awards at universities and DOE national laboratories.

Purpose: To support individual research programs of outstanding scientists early in their careers and to stimulate research careers in the disciplines supported by the Office of Science

Eligibility: Within 10 years of receiving a Ph.D., either untenured academic assistant professors on the tenure track or full-time DOE national lab employees

Award Size:

- University grants $150,000 per year for 5 years to cover summer salary and expenses
- National lab awards $500,000 per year for five years to cover full salary and expenses

FY 2010 Results:

- 69 awards funded via the American Recovery and Reinvestment Act
- 1,750 proposals peer reviewed to select the awardees
- 47 university grants and 22 DOE national laboratory awards (BES: 17 U and 9 L)
- Awardees are from 44 separate institutions in 20 states

FY 2011 Application Process:

- Funding Opportunity Announcement issued in Spring 2010
- Awards made in the Second Quarter of 2011

Graduate Fellowship Program

$10 million will be available in FY 2011 to fund about 170 additional fellowships

Purpose: To educate and train a skilled scientific and technical workforce in order to stay at the forefront of science and innovation and to meet our energy and environmental challenges

Eligibility:

- Candidates must be U.S. citizens and a senior undergraduate or first or second year graduate student to apply
- Candidates must be pursuing advanced degrees in areas of physics, chemistry, mathematics, biology, computational sciences, areas of climate and environmental sciences important to the Office of Science and DOE mission

Award Size:

- The three-year fellowship award, totaling $50,500 annually, provides support towards tuition, a stipend for living expenses, and support for expenses such as travel to conferences and to DOE user facilities.

FY 2010 Results:

- 160 awards will be made this Spring with FY 2010 and American Recovery and Reinvestment Act funds

FY 2011 Application Process:

- Funding Opportunity Announcement issued in Fall 2010
- Awards made in March 2011

Funding Approaches

Single Investigators at Universities: $130k/year for 3 years

National Laboratory Programs: $2M/year for 3 years

Energy Frontier Research Centers: $2 to $5M/year for 5 years, groups of 6-12 investigators, 1 to 15 institutions, Universities, National Labs, private industry, fundamental science relevant to grand challenge or use-inspired topics

ARPA-E: $500k/year to $10M/year for 1 to 3 years, bridge science and engineering, focus on high-risk technological innovation

Energy Innovation Hubs: $25M/year for 5 years, large teams of scientists and engineers, discovery-oriented science to engineering research, to commercialization; first Hub on Solar Fuels; proposed in FY 11 Batteries and Energy Storage

Atomic, Molecular, and Optical Sciences

- **40% Theory, 60% Experiment (University), 34%/66% (University+Labs)**

- **Intense Field and Ultrafast X-Ray Science (50%U, 51%U+L)**

Goal: Discover, understand, and exploit fundamental phenomena associated with interactions of intense electromagnetic fields and matter on ultrashort time scales.

- **Cooperative, Correlated Phenomena (34%U, 29%U+L)**

Goal: Characterize and understand many-body phenomena under energetic, non-perturbative conditions.

- **Ultracold Atoms and Molecules (16%U, 10%U+L)**

Goal: Discover, understand, and control fundamental interactions in ultracold many-body systems.

- **Nanoscale Science (5%U, 10%U+L)**

Goal: Discover, understand, and exploit novel phenomena in light-matter interactions in nanoscale structures.

AMOS Portfolio

- 57 Principal Investigators at 33 Universities
- 6 Programs at National Laboratories with 36 Principal Investigators

Overall Budget (56% is invested in DOE labs, 44% in Universities)

FY 2009	FY 2009 SISGR	FY 2010	FY 2011*
$18,020K	$6,249	$22,717K	$26,118K

*2011 President's Request

President's FY 2011 Budget Request (Feb. 1)

BES: $1,835,000,000 (Increase of 12%)

AMOS: $26,118,000 (Increase of 15%)

"In FY 2011, there is an increase for the development and application of new ultrafast x-ray and optical probes of matter, including the first experiments to be performed on the Linac Coherent Light Source; on theoretical and computational methods for the interpretation of ultrafast measurements; and on the use of optical fields to control and manipulate quantum mechanical systems."