Overview of the Office of Science

Dr. James Decker
Principal Deputy Director
Office of Science

October 31, 2000
The U.S. Department of Energy is a Science Agency

Top Five Government Research Organizations for*:

<table>
<thead>
<tr>
<th>Total Basic and Applied</th>
<th>Basic Research</th>
<th>Applied Research</th>
<th>Academic Research**</th>
<th>R&amp;D Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. HHS (16.3)</td>
<td>1. HHS (10.4)</td>
<td>1. HHS (5.9)</td>
<td>1. DOD (33.9)</td>
<td>1. Energy (0.9)</td>
</tr>
<tr>
<td>2. NASA (4.7)</td>
<td>2. NSF (3.0)</td>
<td>2. DOD (3.1)</td>
<td>2. NASA (4.9)</td>
<td>2. NASA (0.4)</td>
</tr>
<tr>
<td>3. Energy (4.6)</td>
<td>3. Energy (2.4)</td>
<td>3. NASA (2.8)</td>
<td>3. HHS (2.4)</td>
<td>3. DOD (0.4)</td>
</tr>
<tr>
<td>4. DOD (4.2)</td>
<td>4. NASA (1.9)</td>
<td>4. Energy (2.2)</td>
<td>4. Energy (2.2)</td>
<td>4. NSF (0.3)</td>
</tr>
<tr>
<td>4. NSF (3.0)</td>
<td>5. DOD (1.2)</td>
<td>5. DOC (0.8)</td>
<td>5. DOC (0.2)</td>
<td>5. HHS (0.2)</td>
</tr>
</tbody>
</table>

* Numbers are the FY 2001 President’s Request in Billions - Source: OMB
## Department of Energy Science

### Top Five Government Research Organizations for*

<table>
<thead>
<tr>
<th>Physical Sciences</th>
<th>Environmental Sciences</th>
<th>Mathematics &amp; Computing</th>
<th>Engineering</th>
<th>Life Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Energy (2,012)</td>
<td>1. NASA (1,051)</td>
<td>1. DOD (657)</td>
<td>1. NASA (1,948)</td>
<td>1. HHS (11,838)</td>
</tr>
<tr>
<td>2. NASA (1,019)</td>
<td>2. NSF (481)</td>
<td>2. Energy (623)</td>
<td>2. DOD (1,837)</td>
<td>2. USDA (1,215)</td>
</tr>
<tr>
<td>3. NSF (515)</td>
<td>3. DOD (383)</td>
<td>3. NSF (399)</td>
<td>3. Energy (851)</td>
<td>3. DOD (519)</td>
</tr>
<tr>
<td>4. DOD (412)</td>
<td>4. INTERIOR (364)</td>
<td>4. HHS (127)</td>
<td>4. NSF (484)</td>
<td>4. NSF (403)</td>
</tr>
<tr>
<td>5. HHS (205)</td>
<td>5. Energy (335)</td>
<td>5. COMMERCE (89)</td>
<td>5. TRANS (323)</td>
<td>5. Energy (288)</td>
</tr>
</tbody>
</table>

*Numbers are FY 1999 Dollars in Millions - Source: NSF -- Preliminary Federal obligations for research, by agency and field of science and engineering: fiscal year 1999*
DOE Mission Areas

Energy Resources - To Foster a Secure and Reliable National Energy Supply

National Security - To Maintain the Safety and Reliability of the Nuclear Stockpile

Environmental Quality - To Repair the Environmental Consequences of the Cold War

Science...
U.S. Department of Energy
Budget by Business Line

- National Security ($6.6 Billion)
- Environmental Quality ($6.8 Billion)
- Science ($3.2 Billion)
- Energy Resources ($2.2 Billion)

FY 2001 Request
U.S. Department of Energy
R&D Budget by Business Line

National Security
($3.20 Billion)

Energy Resources
($1.15 Billion)

Science
($3.02 Billion)

Environmental Quality
($0.29 Billion)

FY 2001 Request
DEPARTMENT OF ENERGY

Secretary
Bill Richardson
Deputy Secretary*
T.J. Glaubiger

Under Secretary for Nuclear Security/Administrator for Nuclear Security
- Deputy Administrator for Defense Programs
- Deputy Administrator for Defense Nuclear Nonproliferation
- Deputy Administrator for Naval Reactors

Under Secretary for Energy, Science and Environment
- Director, Office of Science
- Assistant Secretary for Fossil Energy
- Assistant Secretary for Energy Efficiency and Renewable Energy
- Office of Nuclear Energy, Science and Technology
- Energy Information Administration
- Power Marketing Administrations
- Assistant Secretary for Environmental Management

Assistant Secretary for Environmental Management
- Office of Civilian Radiation Waste Management

Departmental Staff and Support Offices
- General Counsel
- Chief Financial Officer
- Assistant Secretary for Environment, Safety and Health
- Assistant Secretary for Congressional & Intergovernmental Affairs
- Assistant Secretary for International Affairs
- Office of Economic Impact and Diversity
- Inspector General
- Counterintelligence
- Intelligence
- Office of Security and Emergency Operations/Chief Information Officer
- Office of Independent Oversight and Performance Assurance
- Office of Public Affairs
- Office of Policy
- Office of Management and Administration
- Office of Worker and Community Transition
- Office of Hearings and Appeals
- Contract Reform and Privatization Project Office
- Secretary of Energy Advisory Board
- Defense Nuclear Facilities Safety Board Liaison

* The Deputy Secretary also serves as the Chief Operating Officer
Office of Science Scientific User Facilities and the Universities That Utilize Them

- Stanford Linear Accelerator Center
- Advanced Light Source
- National Center for Electron Microscopy
- Stanford Synchrotron Radiation Laboratory
- Combustion Research Facility
- 88" Cyclotron
- National Energy Research Scientific Computing Facility
- Environmental Molecular Sciences Lab
- Los Alamos Neutron Science Center
- General Atomics
- Fermilab
- Intense Pulsed Neutron Source
- Advanced Proton Source
- National Synchrotron Light Source
- MIT-Bates Accelerator Center
- High-Flux Beam Reactor
- Relative Heavy Ion Collider
- Princeton Plasma Physics Lab
- Continuous Electron Beam Accelerator Facility
- Surface Modification & Characterization Center
- Shared Research Equipment Program
- Holyfield Radioactive Ion Beam Facility
- High-Flux Isotope Reactor
- National Synchrotron Light Source
- Los Alamos Neutron Science Center
- Intense Pulsed Neutron Source
- Advanced Proton Source
- National Synchrotron Light Source
- MIT-Bates Accelerator Center
- High-Flux Beam Reactor
- Relative Heavy Ion Collider
- Princeton Plasma Physics Lab
- Continuous Electron Beam Accelerator Facility
- Surface Modification & Characterization Center
- Shared Research Equipment Program
- Holyfield Radioactive Ion Beam Facility
- High-Flux Isotope Reactor

**SC User Facilities**
- Universities that Use SC Facilities

*50% of Facility Users are University Researchers*
The Programs of the Office of Science

- Advanced Scientific Computing Research
- Basic Energy Sciences
- Biological and Environmental Research
- Fusion Energy Sciences
- High Energy and Nuclear Physics
Office of Science Advisory Committees

• **Who**
  – Basic Energy Sciences Advisory Committee (BESAC)
  – High Energy Physics Advisory Panel (HEPAP)*
  – Nuclear Science Advisory Committee (NSAC)*
  – Biological and Environmental Sciences Advisory Committee (BERAC)
  – Fusion Energy Sciences Advisory Committee (FESAC)

• **What**
  – Reviews Large Portions of the Program
  – Conducts Program Balance Reviews
  – Develops Long Range Plans

• **How**
  – Formal Charges -> Formal Reports or Plans
  – Public Meetings

*Joint with the National Science Foundation*
The Federal Advisory Committee Act

- Congress formally recognized the merits of seeking the advice and assistance of our Nation's citizens.

- Under FACA, advisory committees are created only when they are essential to the performance of a duty or responsibility conveyed upon the Executive Branch by law.

- Through the expertise of the advisory committee members, Federal officials and the Nation have access to information and advice on a broad range of issues affecting Federal policies and programs.

- FACA requires advisory committees to be fairly balanced in terms of the points of view represented and the functions to be performed. This includes sometimes strongly opposing views of members in order to provide a foundation for developing advice and recommendations to DOE that are fair and comprehensive.

- Federal Advisory Committees are the only mechanism by which federal officials may obtain consensus advice.

http://www.fda.gov/opacom/laws/fedadvca.htm
Example: *Basic Energy Sciences Advisory Committee (BESAC)*

- Operates in accordance with the Federal Advisory Committee Act (FACA, Public Law 92-463; 92nd Congress, H.R. 4383; Oct. 6, 1972) and all applicable FACA Amendments, Federal Regulations, and Executive Orders.

- Reports to the Director of the Office of Science, who provides the charge to the committee annually or as needed. The charter allows BESAC to provide:
  - Periodic reviews of elements of the Basic Energy Sciences (BES) program and recommendations based thereon.
  - Advice on long-range plans, priorities, and strategies to address more effectively the scientific aspects of energy-related BES.
  - Advice on appropriate levels of funding to develop those plans, priorities, and strategies and to help maintain appropriate balance between competing elements of the BES program.
  - Advice on scientific aspects of BES issues of concern to the Department of Energy as requested by the Secretary or the Director of SC.

- Subcommittees are appointed and charged by the Chair of BESAC. They may meet in closed session but must report to BESAC in open session. BESAC considers the recommendations of the subcommittee and acts upon them. BESAC then reports to DOE. *Much of the work of BESAC occurs between meeting by subcommittees.*
How We Manage Science Development of SC Programs

- Peer Review
- Program Reviews
- Advisory Committees Reviews
- User Facility Committees
- Relevance Reviews
- Performance Measures
- Construction Project Reviews
- Research Performer Meetings
- Laboratory Appraisals
- Institutional Plan On-site Reviews
Office of Science Budget History

*Total Science Budget (in Millions of Constant FY 2000 Dollars)
Normalized Growth (1980 = 1 for all)
obligations in billions of constant FY 2000 dollars


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DOE Office of Science Budget

Basic Energy Sciences
Biological & Environmental Research
Fusion Energy Science
Advanced Scientific Computing Research
High Energy Physics
Nuclear Physics
Multiprogram Energy Labs-Facilities Support

Congressional Mandates

Spallation Neutron Source

FY 2000
FY 2001 Amended Request
FY 2001 Appropriation with General Reduction allocated; includes $24 Million for Waste Management activities

Yellow: FY 2000
Green: FY 2001 Amended Request
Red: FY 2001 Appropriation with General Reduction allocated; includes $24 Million for Waste Management activities
Dramatic Increases in High-Performance Computing Required for 21st Century Scientific Leadership

- Combustion turbulence modeling
- Turbulent methane flame
- Clay-mineral geochemistry
- Two spheres mixing in a stream
- Vortices in a superfluid
- Protein dynamics
- Fusion magnetic field
- Perturbation in clear-sky and cloud albedo
- HEP particle beam halo
- Transport barrier dynamics
- Combustion turbulence modeling
- Perturbation in clear-sky and cloud albedo
- Au-Au collision
- Crystal structure for C_{36} solid
- Lattice quantum chromodynamics
- Binary alloy solidification
- Perturbed plasma density
- DOE Parallel Climate Model
- Sea surface temperature
- Molecular simulation of complex fluids
- Structural biology
- Nuclear theory
- Waveguide optics
Proposed FY2001 Investments
Scientific Discovery through Advanced Computing

Investments in computational modeling and simulation in the Office of Science are driven by scientific problems derived from DOE’s missions.

Scientific Code Development Teams (+$20.0M)
Enabling Technology Centers (+$27.0M)
Computing Hardware Infrastructure (+$12.3M)

Collaboratory Software Infrastructure (+$10.1M)
Advanced Computation and More

Office of Advanced Scientific Computing
C. Edward Oliver, Associate Director

Mathematical, Information and Computational Sciences Division
C. Edward Oliver (acting)

- Mathematics
- Advanced Networking
- Advanced Computation

Technology Research Division
Walt Polansky

- Laboratory Partnerships
  - Advanced Materials
  - Intelligent Processing & Manufacturing Research
  - Environmental and Biomedical Research
  - Advanced Computational Technology Initiative
  - American Textiles (AMTEX) Partnerships
  - Technical Assistance and
  - Small CRADAs

- Small Business Innovation Research
- Small Business Technology Transfer

Office of Scientific and Technical Information (OSTI)
Walt Warnick

- Energy Files
- Energy Portal
- PubScience
- DOE Information Bridge
- Pre-Print Network
Backup
ASCR Advisory Committee Members

Chair
• Dr. Margaret H. Wright, Bell Laboratories/Lucent Technologies

Co-Chair
• Dr. John W. D. Connolly, Center for Computational Sciences

Members
• Dr. Jill P. Dahlburg, Tactical Electronic Warfare Division, Naval Research Laboratory
• Dr. Roscoe C. Giles, Electrical & Computer Engineering - Boston University
• Ms. Helene E. Kulsrud, Center for Communications Research
• Dr. William A. Lester, Jr., Chemistry - University of California – Berkeley
• Dr. Gregory J. McRae, Chemical Engineering - MIT
• Dr. Juan C. Meza, Sandia National Laboratories - Dept. of Computational Sciences and Mathematics Research
• Dr. Karen R. Sollins, National Science Foundation
• Dr. Ellen B. Stechel, Ford Motor Company Scientific Research Laboratory
• Dr. Warren Washington, National Center for Atmospheric Research
• Dr. Stephen Wolff, CISCO Systems