United States Government Accountability Office
Washington, DC 20548

February 24, 2012

The Honorable Lamar Alexander
Ranking Member
Subcommittee on Energy and Water Development
Committee on Appropriations
United States Senate

Subject: *The Department of Energy's Office of Science Uses a Multilayered Process for Prioritizing Research*

Dear Senator Alexander:

Scientific and technological innovation is critical to the long-term economic competitiveness and prosperity of the United States. In 2006, the President introduced the American Competitiveness Initiative to address the nation's position as a global leader in scientific discovery and innovation. Shortly thereafter, Congress passed the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act (America COMPETES Act) of 2007 with the overall goal of increasing federal investment in scientific research.[1] Congress reauthorized this legislation on January 4, 2011.[2]

With a budget of nearly $5 billion in fiscal year 2011, the Department of Energy's (DOE) Office of Science (Science) has historically been the nation's single largest funding source for basic research in the physical sciences, energy sciences, advanced scientific computing, and other fields.[3] Science and its predecessor agency, the Office of Energy Research, have long served the nation in the quest for scientific knowledge and innovation. From the construction of particle accelerators—long tunnels where subatomic particles collide with targets at nearly the speed of light—to the design and launch of a satellite telescope that reveals stellar explosions in the deepest parts of space, projects overseen by Science have broadened our understanding of the cosmos and of the fundamental components of life on Earth.

In his fiscal year 2007 budget proposal, the President requested an increase in Science's annual appropriation, which was part of an effort to double Science's funding in 10 years under the goals of the American Competitiveness Initiative and the America COMPETES

[1]Pub. L. No. 110-69, 121 Stat. 572 (Aug. 9, 2007).

[2]Pub. L. No. 111-358, 124 Stat. 3982 (Jan. 4, 2011).

[3]Pub. L. No. 112-10, div. B, title IV, § 1445, 123 Stat. 38, 129 (Apr. 15, 2011) ("Notwithstanding section 1101, the level for 'Department of Energy, Energy Programs, Science' shall be $4,884,000,000.").

Act.[4] However, policy decisions made in response to the current budget environment have since shifted Science's funding trajectory away from the target of doubling funding by fiscal year 2016. As a result, Science will be confronted with complex decisions in selecting research activities that are most worthy of resources.

You asked us to review how Science determines what research to pursue. Our objectives were to describe (1) Science's research priorities and how those priorities were established and (2) how, if at all, Science coordinates with other federal agencies to identify and mitigate potential areas of duplication, overlap, and fragmentation in establishing and implementing research efforts.

To identify Science's research priorities, we reviewed key planning and budget documentation, including DOE's 2011 strategic plan and Science's fiscal year 2012 congressional budget justification. In addition, we examined, as applicable, reports Science produced in response to federal advisory committees.[5] We interviewed Science's Deputy Director for Science Programs and the Associate Directors of Science's research programs to discuss how these documents, as well as other information from both internal and external sources, inform how Science makes decisions on its research priorities. In addition, we selected a nonprobability sample of 2 of the 10 Office of Science national laboratories to visit—Brookhaven National Laboratory and Oak Ridge National Laboratory—to understand how these decisions affect Science's operations.[6] To examine how Science's research priorities are established, we interviewed Science's Director of the Office of Budget, as well as Science program management. We corroborated the officials' statements by examining supporting documentation provided by Science's Office of Budget. This documentation included, for example, budget formulation guidance issued to program management and budget tool templates, such as program and project data worksheets. In addition, we reviewed funding history data from fiscal year 2002 to fiscal year 2011.

To address our second objective, we interviewed Science program officials regarding the steps they take to coordinate with other DOE program offices and other federal agencies that fund basic research to identify and mitigate potential duplication, overlap, and fragmentation. We analyzed agency documentation to corroborate information provided by the officials. However, the scope of this request did not involve evaluating the extent to which Science's tools for coordination are effective in identifying or mitigating duplication, overlap, or fragmentation. Duplication may occur when two or more agencies or programs are engaged in the same activities or provide the same services to the same beneficiaries. Fragmentation refers to those circumstances in which more than one federal agency, or more than one organization within an agency, is involved in the same broad area of national need. Overlap occurs when fragmented agencies or programs have similar goals, engage in similar activities or strategies to achieve them, or target similar beneficiaries.

We conducted this performance audit from June 2011 to February 2012 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable

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[4]*Budget of the United States Government Fiscal Year 2007*, Department of Energy (Washington, D.C.: Feb. 6, 2006) at 90, accessed January 18, 2012, http://www.gpo.gov/fdsys/pkg/BUDGET-2007-BUD/pdf/BUDGET-2007-BUD-13.pdf.

[5]Each of the Office of Science's six research programs has a federal advisory committee that provides independent advice to the Department of Energy and the programs regarding scientific and technical issues that arise in the planning, management, and implementation of the programs.

[6]Because it was a nonprobability sample, the information we collected from our visits is not generalizeable to the other eight national laboratories but serves as an example of how prioritization decisions at these laboratories affect Science's operations.

basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Summary

Science establishes research priorities within and across its six core interdisciplinary research programs, which include a wide variety of research ranging from biology to particle physics. However, Science does not explicitly rank these programs in terms of priority. The office currently prioritizes research that aligns with the Secretary of Energy's interest in fostering the development of clean energy technologies. For example, Science supports research in materials sciences, which informs technology development of batteries and fuels cells. According to Science's Deputy Director for Science Programs, the office remains committed to all of its research programs and, in the case of stable or declining budgets, does not intend to limit funding reductions to certain programs. Science formalizes priorities annually through the budget formulation process.

With input from program management, the Director of the Office of Science reconciles priorities across programs and develops a Science-wide budget request that culminates in the President's budget request to Congress each February. The budget formulation process provides an annual opportunity for formalizing priorities, but Science develops priorities on an ongoing basis through the continuous evaluation of evolving scientific knowledge and other contextual factors. These factors include the current priorities of Congress and the administration, the extended time frames associated with conducting basic research, the need to ensure that existing and planned facilities meet current and future research needs, and past and current project performance.

Science uses a variety of formal and informal mechanisms to coordinate with other DOE entities and other agencies that fund basic research, including the National Science Foundation (NSF), the National Aeronautics and Space Administration (NASA), the National Institutes of Health (NIH), and the Department of Defense (DOD), according to DOE officials. For example, formal mechanisms include partnerships and joint projects with other agencies, while informal mechanisms include interaction among program managers and their counterparts within and outside of DOE. These formal and informal mechanisms are used by DOE officials to identify and mitigate areas of duplication, overlap, and fragmentation in establishing and implementing research efforts.

Background

DOE's mission is to ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions. The following four goals underpin DOE's mission.

> *Goal 1:* Catalyze the timely, material, and efficient transformation of the nation's energy system and secure U.S. leadership in clean energy technologies.
>
> *Goal 2:* Maintain a vibrant U.S. effort in science and engineering as a cornerstone of our economic prosperity with clear leadership in strategic areas.
>
> *Goal 3:* Enhance nuclear security through defense, nonproliferation, and environmental efforts.
>
> *Goal 4:* Establish an operational and adaptable framework that combines the best wisdom of all department stakeholders to maximize mission success.

The Office of Science directly contributes to goals 1 and 2 by supporting fundamental research through six core interdisciplinary research programs:

(1) *Advanced Scientific Computing Research*, which aims to discover, develop, and deploy computational and networking capabilities to analyze, model, simulate, and predict complex phenomena;

(2) *Basic Energy Sciences*, which supports fundamental research to understand and ultimately control matter and energy at the atomic, molecular, and electronic scales in order to provide the foundations for new energy technologies;

(3) *Biological and Environmental Research*, which seeks to understand complex biological, climatic, and environmental systems across spatial and temporal scales, ranging from submicron to global, from individual molecules to ecosystems, and from a fraction of a second to millennia;[7]

(4) *Fusion Energy Sciences*, which aims to expand the fundamental understanding of matter at very high temperatures and densities and to develop the scientific foundations needed to develop a fusion energy source;

(5) *High Energy Physics*, which aims to understand how the universe works at its most fundamental level by discovering the elementary constituents of matter and energy, probing the interactions between them, and exploring the basic nature of space and time; and

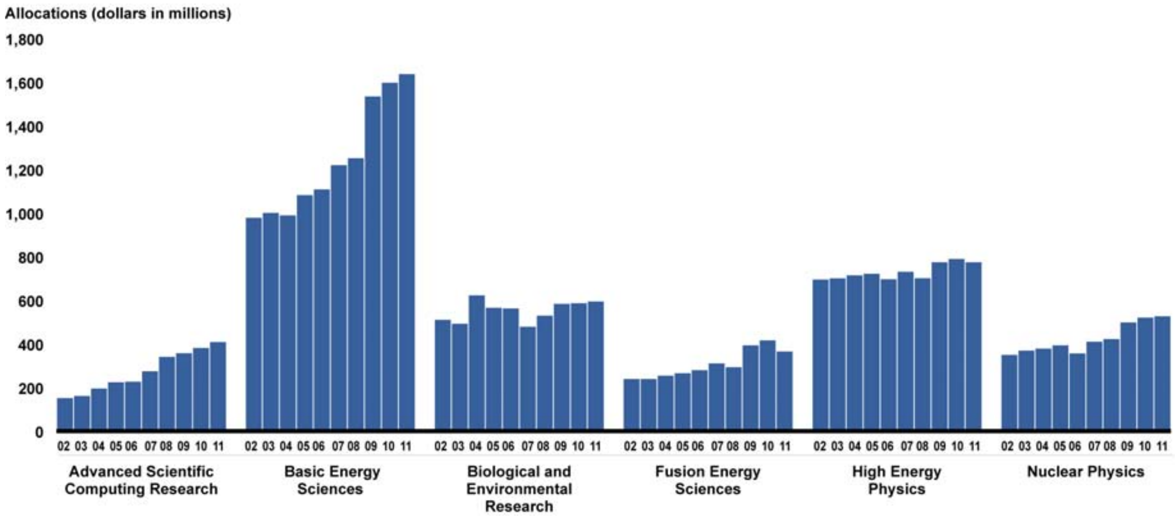
(6) *Nuclear Physics*, which supports research to discover, explore, and understand all forms of nuclear matter through experimental and theoretical research that creates, detects, and describes different forms and complexities of that matter, including those forms that are no longer commonly found in our universe.[8]

As a result of the continued national emphasis on scientific discovery and innovation over the last decade, increasing appropriations have generally resulted in increased allocations for all core research programs (see figure 1).

[7]A submicron is less than a micron, which is equivalent to one millionth of a meter.

[8]Science manages and supports programs in addition to its six core research programs, including Workforce Development for Teachers and Scientists, Science Laboratories Infrastructure, Safeguards and Security, and Science Program Direction. This correspondence only discusses the six core research programs.

Figure 1: Office of Science Program Allocations, Fiscal Years 2002 through 2011 (dollars in millions)



Source: GAO analysis of DOE budget data.

Note: Values not adjusted for inflation.

Each of the six programs supports fundamental research to address questions within its field that affect DOE's missions. Some programs' portfolios are diverse, while others are more homogenous. For instance, the Biological and Environmental Research program's portfolio consists of three broad elements—biology, climate science, and environmental science—while the High Energy Physics program's portfolio is specifically focused on particle physics research, much of which relies on the use of particle accelerators and detectors.[9] An associate director oversees each program, and activities are managed by program managers.

In addition to its research programs, Science is the steward of 10 national laboratories, which include large-scale scientific facilities and equipment.[10] Additionally, Science manages 46 Energy Frontier Research Centers (EFRC) and the Fuels from Sunlight Energy Innovation Hub.[11] Science's facilities aim to provide scientific capabilities beyond the traditional scope of academic and commercial institutions in order to facilitate the advancement of the nation's scientific knowledge.

Further, Science's research programs fund, plan, construct, and operate "scientific user facilities," which provide unique research capabilities to researchers from universities,

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[9]A particle accelerator is an apparatus for imparting high velocities to charged particles. There are proton-accelerators, such as the Large Hadron Collider, and electron-accelerators, such as the PEP-II.

[10]Science is responsible for and partially funds 10 national laboratories: Ames National Laboratory, Argonne National Laboratory, Brookhaven National Laboratory, Fermi National Accelerator Laboratory, Lawrence Berkeley National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Princeton Plasma Physics Laboratory, SLAC National Accelerator Laboratory, and Thomas Jefferson National Accelerator Facility.

[11]Energy Frontier Research Centers are integrated centers supporting multiple researchers focused on accelerating discovery. The centers involve Science's partnerships with universities, national laboratories, nonprofit organizations, and for-profit firms. Science has historically allocated between $2 million and $5 million for each center per year for a 5-year period. EFRCs are located in 35 states and the District of Columbia.

national laboratories, and private institutions.[12] For example, the Advanced Scientific Computing Research program supports the operation of the Leadership Computing Facility at Oak Ridge National Laboratory that houses the Cray XT Jaguar, one of the world's most powerful computers. In 2011, the Jaguar was used by such entities as Procter & Gamble, New York University, and University of California, Los Angeles.

Science Establishes Research Priorities through Budget Formulation and Assessment of Scientific Knowledge

Science has numerous research priorities that support DOE's mission of addressing national challenges through transformative science and technology solutions. The office establishes priorities by having its associate directors and the Director of the Office make trade-off decisions during the annual budgeting process. These trade-off decisions are informed through assessing areas of evolving scientific knowledge and other contextual factors.

Science Has Numerous Research Priorities

Science is involved in conducting or supporting research projects across many and varied scientific disciplines, including genomics research and nuclear physics. Science's 2012 budget request reflects this. The Deputy Director for Science Programs told us that the office's research priorities support DOE's mission of addressing national challenges through transformative science and technology solutions.

Each of Science's six core interdisciplinary research programs sets priorities for its portfolio. The following are examples of current research priorities for each program, according to the Deputy Director:

- Advanced Scientific Computing Research's focus is to sustain its current capabilities in mathematics and applied computing science, networking, and high-performance computer facilities while investing in the development of exascale computing—an effort aiming to create computers that operate a thousand times faster than the computers used today.

- Basic Energy Sciences is currently emphasizing research on understanding inorganic structures and their functions at the atomic, molecular, and electronic scales. The Deputy Director said that these efforts could contribute to the development of new materials for the generation, storage, and use of energy. Additionally, the Deputy Director said that Basic Energy Sciences will continue to invest in user facilities, such as photon light sources that are necessary to study the atomic structure and functions of complex materials.[13]

- Biological and Environmental Research is currently focusing on understanding organic structures and their functions at the atomic, molecular, and electronic scales. The Deputy Director said that the program also plans to sustain its capabilities in climate modeling and atmospheric measurement.

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[12]Each user facility administers a peer review process to evaluate scientific proposals for accessing that facility. The proposals are evaluated for scientific merit by independent proposal review committees or panels and for feasibility and safety by the facility, with those that are most compelling being accepted and allocated time. There is no charge for users who are doing nonproprietary work, with the understanding that they are expected to publish their results. Access is also available on a cost-recovery basis for proprietary research that is not intended for publication.

[13]Photon light sources produce bright beams of X-rays, ultraviolet light, and infrared light for research in such fields as biology, medicine, chemistry, environmental sciences, physics, and materials science.

- Fusion Energy Sciences' top priority is ITER,[14] an international nuclear fusion research and engineering project intended to demonstrate commercial electricity production from fusion.[15] Fusion Energy Science may forgo funding increases or slightly reduce funding for efforts other than ITER because of the current budget environment, according to the Deputy Director.

- High Energy Physics is focusing on particle physics in which scientists investigate fundamental forces and particle interactions through the study of events that occur rarely in nature.[16] A primary goal for this program is to develop an understanding of what lies beyond the Standard Model of particle physics. The Standard Model describes the behavior of particles, but is incomplete.

- Nuclear Physics is currently following a path set forward in the 2007 report, *The Frontiers of Nuclear Science,*[17] developed by the Nuclear Science Advisory Committee, which advises DOE and NSF on basic nuclear science research.[18] For example, the program is investing in research such as rare isotope development and facilities such as the Relativistic Heavy Ion Collider at Brookhaven.[19]

According to the Deputy Director, Science currently prioritizes research that aligns with the Secretary of Energy's interest in fostering the development of clean energy technologies. Science does not explicitly rank order its six research programs, but many of its research priorities fall within the portfolios of three programs—Advanced Scientific Computing Research, Basic Energy Sciences, and Biological and Environmental Research. For example, Science supports research in materials sciences—which primarily falls into Basic Energy Sciences' portfolio—that can inform the development of battery and fuel cell technology, among other things. The Deputy Director said that Science remains committed to all six of its research programs and that, in the case of stable or declining budgets, Science does not intend to limit funding reductions to certain programs. Additionally, the Deputy Director noted that advancements in one research program enable research in other programs. For example, Basic Energy Science supports research that relies upon the use of

[14]The ITER Project (formerly known as the International Thermonuclear Experimental Reactor) is a seven-member international collaboration to design, build, and operate a first-of-a-kind international research facility in Cadarache, France, aimed at demonstrating the scientific and technical feasibility of fusion energy. The ITER Members are China, the European Union, India, Japan, South Korea, the Russian Federation, and the United States.

[15]Fusion occurs when the nuclei of two light atoms—often hydrogen isotopes—collide and fuse together when heated at high temperatures. This reaction releases energy that may be captured to produce electricity. A challenge in producing fusion energy is to develop a device that can produce more energy than is required for achieving high temperatures.

[16]Particle physics deals with the constitution, properties, and interactions of elementary particles especially as revealed in experiments using particle accelerators. Particle physics is also known as high energy physics.

[17]The Nuclear Science Advisory Committee issued this report in response to a charge from DOE and NSF to conduct a study of the opportunities and priorities for U.S. nuclear physics research and recommend a long-range plan that will provide a framework for coordinated advancement of the nation's nuclear science research programs over the next decade.

[18]This advisory committee provides official advice to DOE and NSF on the national program for basic nuclear science research. The responsibility for appointing members and forming subcommittees is shared by the two agencies.

[19]Isotopes are used in energy, medical and national security applications, and for basic research. Nuclear Physics supports the production and the development of production techniques of radioactive and stable isotopes that are in short supply for research and other applications.

high energy electron lasers, the first of which was developed at a High Energy Physics lab at SLAC National Accelerator Laboratory.

Science Establishes Priorities through the Annual Budget Formulation Process

The budget formulation process provides an annual opportunity for Science to establish research priorities. During this process, decisions to emphasize one research project over another are made within each research program by the associate directors and across programs by the Director of the Office of Science. A description of this process, as detailed in internal Science documents and interviews with Science budget and program officials, follows.

As part of the budget formulation process, the associate directors of the six research programs annually make proposals to the Science Director, Deputy Directors, and Science Budget Office about which research projects should receive increased, decreased, and maintained levels of funding. An overall target budget allocation, determined by the Science Director and the DOE's Chief Financial Advisor, constrains these program proposals. Accordingly, associate directors must make trade-offs among research projects during this process. For example, in fiscal year 2012, Nuclear Physics decided to close its Holifield Radioactive Ion Beam Facility at Oak Ridge National Laboratory to accommodate higher-priority research. High Energy Physics ceased operations of the Tevatron at Fermi National Accelerator Laboratory and plans to continue to phase out electron accelerator-based research at SLAC as it transitions its focus toward other priorities, such as non-accelerator-based projects.

To facilitate such trade-off decisions, the associate directors develop multiple budget scenarios that detail proposed project funding levels under the various scenarios. Specifically, the Science Budget Office, in alignment with OMB guidance and requirements, asks associate directors to submit a budget for a target scenario and may also request budgets for various other scenarios for specific levels of funding above or below the target. These scenarios allow the Director, Deputy Directors, and Science Budget Director to see the potential effects of various budget decisions at the project level.

Additionally, associate directors make lists of specific projects recommended for funding increases in case funding is available and decreases in case funding is short. Associate directors are also required to submit narratives that describe the strategy behind any proposed increases or decreases in project funding. For example, Biological and Environmental Research requested decreased funding for fiscal year 2011 medical applications, citing the completion of an artificial retina project effort in its request.

Science's director reconciles priorities across programs annually by aggregating program proposals into a Science-wide budget request. The Science-wide budget request is considered in the context of other DOE priorities and incorporated into the DOE budget request. The DOE budget request is then considered by OMB against other agency requests and incorporated into the President's budget request to Congress.

Science Determines Priorities by Assessing Scientific Knowledge and Other Contextual Factors

To inform decisions on research priorities, program and senior Science management gather information to identify those areas of science that warrant further research. According to senior program officials, Science gathers information about areas of evolving scientific knowledge through a variety of means, including:

- *Recent guidance from federal advisory committees.* Each research program receives scientific and technical advice from a designated external federal advisory committee regarding the planning, management, and implementation of the program's research, according to agency documents. Federal advisory committees respond to requests from the Science Director and may be charged to identify scientific opportunities. For instance, the Fusion Energy Sciences Advisory Committee issued a report in 2009 identifying research needs in the area of high energy density laboratory plasmas, such as research on the influence of magnetic fields on these plasmas.[20] As another example of Science's information gathering efforts, in 2010, the Advanced Scientific Computing Advisory Committee reviewed the management processes for Advanced Scientific Computing Research's Applied Mathematics program. The committee found that, for example, research program managers generally used effective mechanisms to monitor ongoing projects and recommended that Science issue explicit guidelines to researchers for drafting progress reports.

- *Current findings from the National Academy of Sciences*.[21] Science's programs utilize scientific findings from National Academy of Sciences in their planning, according to Science officials. For example, their 2009 report, *A New Biology for the 21st Century*, advocates the systems-level study of biological systems using the latest interdisciplinary tools and approaches. This challenge is aligned with the Biological and Environmental Research program's Genomic Science research activities, in which researchers conduct explorations of microbes and plants at the molecular, cellular, and community levels with the goal of gaining insight about fundamental biological processes, ultimately leading to a predictive understanding of how living systems operate.

- *Participation in interagency working groups and other partnerships.* Science also collects information from international scientific partnerships that include projects such as Fusion Energy Sciences' ITER; interagency working groups, such as Basic Energy Sciences' participation in the National Science and Technology Council's (NSTC) Subcommittee on Nanoscale Science, Engineering, and Technology; and joint research efforts with other federal agencies, such as NSF.

In addition to determining research priorities by assessing areas of evolving scientific knowledge, Science considers other contextual factors when making long-term priority decisions, including:

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[20]The High Energy Density Laboratory Plasmas (HEDLP) program within Fusion Energy Sciences supports studies of ionized matter, which is heated and compressed to a point where the stored energy reaches very high temperature and density. In nature, such conditions exist in the interior of the sun, in supernovae, in accretion disks around black holes, pulsars, and astrophysical jets, while on Earth, high energy density conditions can only be created transiently by using intense laser pulses, ion or electron ion beams, or pressure from pulsed magnetic fields.

[21]Congress chartered the National Academy of Sciences, a private, nonprofit society in 1863 to provide independent advice to the federal government on subjects of science and technology.

- *Current priorities of Congress and the administration.* Congress provides input to Science's research priorities through legislation, such as appropriation acts and the Energy Policy Act of 2005.[22] The administration provides input through coordination and oversight of government wide priorities. Congress and the administration make policy and budget decisions that establish parameters with which Science prioritizes research and develops the federal budget request, according to Science officials. Additionally, administration offices such as the Office of Science and Technology Policy (OSTP)[23] and the NSTC[24] play a role in coordinating science policy across the federal government.

- *Long time frames associated with basic research.* Science supports basic, fundamental research projects, which often require extended time frames—years or even decades. For example, Basic Energy Sciences' neutron scattering efforts, which support basic research on the fundamental interactions of neutrons with matter, have evolved from the construction of nuclear power reactors in the early 1940s to the current program, which encompasses multiple techniques and disciplines.[25] Discoveries from these early activities motivated Science to construct the Spallation Neutron Source, which was completed in 2006. This tool is the most powerful neutron scattering device in the world, and neutrons are an effective tool for probing the structure of matter. Specifically, beams of neutrons are particularly well-suited for measurement, which allows physicists to understand phenomena such as melting and superconductivity in a variety of materials. This knowledge can be applied to medical sciences, engineering, and biosciences, among other disciplines, according to agency documentation.

- *Capability of facilities to meet research needs.* Science also tries to ensure that it maintains the capability to meet current and future research needs through the planning, construction, and operation of facilities. These facilities can require several years of planning and construction and typically operate for 20 to 30 years. For example, the National Synchrotron Light Source (NSLS) began operations in 1982. As Science identified the future need to produce images of structures at the nanoscale—a very small scale where the properties of materials may change—Science began planning the NSLS's replacement. The NSLS II began construction in 2009 and is scheduled to be operational in 2015, according to agency documentation.

- *Past and current project performance*. Science uses internal information, such as individual project schedule data, project cost data, and procurement cost information, to inform the prioritization of individual projects. For example, all of Science's research programs employ extensive peer reviews to determine what projects will continue to receive support, according to the Deputy Director of Science Programs.

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[22]Pub. L. No. 109-58, 119 Stat. 594 (Aug. 8, 2005).

[23]The Office of Science and Technology Policy is charged with ensuring that the scientific and technical work of the Executive Branch is properly coordinated so as to provide the greatest benefit to society.

[24]The National Science and Technology Council is the principal means within the executive branch to coordinate science and technology policy across the diverse entities that make up the federal research and development enterprise.

[25]Neutron scattering allows scientists to count scattered neutrons, measure their energies and the angles at which they scatter, and map their final positions. Neutron scattering provides information on positions, motions, and magnetic properties of solids. Neutron scattering research is used to analyze materials for medicine, energy, electronics, and other products and technologies.

As contextual factors and scientific knowledge evolve, research priorities change both within and across Science's programs. For example, the Basic Energy Sciences program phased out silicon research because it was proven unlikely to produce transformative energy technology discoveries.

Science Coordinates with Other Agencies and the Scientific Community

Science coordinates its research efforts through formal and informal mechanisms with other DOE entities—such as the Office of Energy Efficiency and Renewable Energy and the National Nuclear Security Administration (NNSA)—and externally with other agencies that fund basic scientific research—including NSF, NASA, NIH, and DOD—to identify and mitigate potential areas of inappropriate duplication, overlap, and fragmentation in establishing and implementing research efforts. Program managers are responsible for informally coordinating with their counterpart program managers within and outside of DOE, according to Science officials. Officials in Nuclear Physics, for example, communicate with officials in NSF's Nuclear Physics program, and they are partners in interacting with the nuclear physics community, according to an official in Science's Nuclear Physics program. Science also coordinates through formal mechanisms, specifically by sharing management of joint projects and funding. For example, Biological and Environmental Research and the United States Department of Agriculture recently issued a joint request for research proposals related to genomics of plants that might be used for bioenergy.[26] Additionally, principal investigators who respond to any Science funding opportunity are required to list all of their current and potential funding sources. If an area of potential duplication is found, the recipient may no longer be eligible for Science funding, according to a Science official.

Partnerships and working groups with agencies such as NSF provide other formal avenues for coordination. For example, Fusion Energy Sciences and NSF jointly sponsored the Partnership in Basic Plasma Science and Engineering to coordinate efforts and combine resources. Partnerships and working groups may also be organized by entities such as OSTP's NSTC, or specified by legislation. For example, Science is involved in the Subcommittee on Global Change Research under the NSTC Committee on Environment, Natural Resources, and Sustainability. Science also participates in the Biomass Research and Development Board, which was established by the Biomass Research and Development Act of 2000.[27] Furthermore, DOE and NSF jointly charter two of Science's program advisory committees: the High Energy Physics Advisory Panel and the Nuclear Science Advisory Committee. Additionally, Science uses memorandums of understanding to coordinate formally with other agencies. For example, Advanced Scientific Computing Research recently signed a memorandum with the National Oceanic and Atmospheric Administration (NOAA) on the development of high performance computing. While we discussed Science's coordination efforts with program officials, the scope of this request did not involve evaluating the extent to which Science's tools for coordination are effective in identifying or mitigating duplication, overlap, or fragmentation.

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[26]Genomics is a branch of biotechnology concerned with applying the techniques of genetics and molecular biology to the genetic mapping and DNA sequencing of sets of genes.

[27]Pub. L. No. 106-224, title III, § 305, 114 Stat. 358, 431 (June 20, 2000), *as amended*.

Agency Comments and Our Evaluation

We provided a copy of our draft report to the Secretary of Energy for review. DOE provided written comments expressing agreement with GAO's findings. DOE's comments are reprinted in enclosure I of this report.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Energy, and other interested parties. In addition, this report will be available at no charge on the GAO website at http://www.gao.gov.

If you or your staff members have any questions about this report, please contact Frank Rusco at (202) 512-3841 or ruscof@gao.gov or Melissa Emrey-Arras at (202) 512-6806 or emreyarrasm@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in enclosure II.

Sincerely yours,

Frank Rusco

Frank Rusco
Director, Natural Resources
and Environment

Melissa Emrey-Arras

Melissa Emrey-Arras
Director, Strategic Issues

Enclosures—2

Comments from the Department of Energy

Department of Energy
Office of Science
Washington, DC 20585

February 13, 2012

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Ms. Melissa Emrey-Arras
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Dear Mr. Rusco and Ms. Emrey-Arras:

The Department of Energy (DOE) appreciates the opportunity to review the draft Government Accountability Office (GAO) report entitled, "The Department of Energy's Office of Science Uses a Multilayered Process for Prioritizing Research" (GAO-12-410R). I am pleased to provide a response on behalf of DOE.

We believe the GAO did a commendable job of reviewing the practices used by the Office of Science to identify research priorities and the practices used by both the Office of Science and the Department to formulate the budget. The draft report provides an accurate and balanced overview of how the Office of Science gathers input from the scientific communities that we serve, how we use that information in establishing budget priorities during the annual budget formulation process, and how we coordinate across the DOE and with other Federal agencies to optimize Federal research efforts and avoid duplication.

We have no additional recommended edits or comments on the draft report.

Thank you for the opportunity to provide comments on this draft report. If you have any questions or concerns, please call me at (202) 568-5430. We look forward to receiving your final report.

Sincerely,

Patricia M. Dehmer
Deputy Director for Science Programs

Printed with soy ink on recycled paper

GAO Contacts and Staff Acknowledgments

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(361301)

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