Union Calendar No. 450

109th Congress, 2d Session – – – – – – – – – – – – – –House Report 109–748

SUMMARY OF ACTIVITIES

OF THE

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

FOR THE

ONE HUNDRED NINTH CONGRESS

JANUARY 4, 2007

JANUARY 2, 2007.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

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***Ranking Minority Member appointments/Full Committee and Subcommittee assignments.**

****Vice Chair appointments/Full Committee and Subcommittee assignments.**

+ The Chairman and Ranking Minority Member shall serve as Ex-officio Members of all Subcommittees and shall have the right to vote and be counted as part of the quorum and ratios on all matters before the Subcommittees.

U.S. HOUSE OF REPRESENTATIVES

COMMITTEE ON SCIENCE

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LETTER OF TRANSMITTAL

January 2, 2007

The Honorable Karen L. Haas
The Clerk
U.S. House of Representatives
Washington, DC 20515

Dear Ms. Haas:

In compliance with Rule XI, Clause 1(d) of the Rules of the House of Representatives, I hereby submit the Summary of Activities for the Committee on Science for the 109TH Congress.

The purpose of this report is to provide the Members of the House of Representatives, as well as the general public, with an overview of the legislative and oversight activities conducted by this committee, as defined by Rule X, Clause 1(n) of the Rules of the House of Representatives.

This document is intended as a general reference tool, and not as a substitute for the hearing records, reports, and other committee files.

Sincerely,

SHERWOOD L. BOEHLERT
Chairman

Enclosure

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SUMMARY OF ACTIVITIES—COMMITTEE ON SCIENCE

JANUARY 2, 2007.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

MR. BOEHLERT, from the Committee on Science, submitted the following

R E P O R T

HISTORY OF THE COMMITTEE ON SCIENCE

The Committee on Science has its roots in the intense reaction to the Soviet launch of Sputnik on October 4, 1957. Early in 1958 Speaker Sam Rayburn convened the House of Representatives, and the first order of the day was a resolution offered by Majority Leader John McCormack of Massachusetts. It read, "Resolved that there is hereby created a Select Committee on Astronautics and Space Exploration. . ."

The Select Committee performed its tasks with both speed and skill by writing the Space Act creating the National Aeronautics and Space Administration (NASA) and chartering the permanent House Committee on Science and Astronautics, now known as the Committee on Science, with a jurisdiction comprising both science and space.

The Science and Astronautics Committee became the first standing committee to be established in the House of Representatives since 1946. It was also the first time since 1892 that the House and Senate acted to create a standing committee in an entirely new area.

The Committee officially began on January 3, 1959, and on its 20th Anniversary the Honorable Charles Mosher said the Committee "was born of an extraordinary House-Senate joint leadership initiative, a determination to maintain American preeminence in science and technology. . ."

The formal jurisdiction of the Committee on Science and Astronautics included outer space—both exploration and control—astro-

nautical research and development, scientific research and development, science scholarships, and legislation relating to scientific agencies, especially the National Bureau of Standards[1], NASA, the National Aeronautics and Space Council, and the National Science Foundation.

The Committee retained this jurisdiction from 1959 until the end of the 93rd Congress in 1974. While the Committee's original emphasis in 1959 was almost exclusively astronautics, over this 15-year period the emphasis and workload expanded to encompass scientific research and development in general.

In 1974, a Select Committee on Committees, after extensive study, recommended several changes to the organization of the House in H.Res. 988, including expanding the jurisdiction of the Committee on Science and Astronautics, and changing its name to the Committee on Science and Technology.

Jurisdiction over energy, environmental, atmospheric, civil aviation R&D, and National Weather Service issues was added to the general realm of scientific research and development.

In addition to these legislative functions, the Committee on Science and Technology was assigned a "special oversight" function, giving it the exclusive responsibility among all Congressional standing committees to review and study, on a continuing basis, all laws, programs, and government activities involving Federal nonmilitary research and development.

In 1977, with the abolition of the Joint Committee on Atomic Energy, the Committee was further assigned jurisdiction over civilian nuclear research and development, thereby rounding out its jurisdiction for all civilian energy R&D.

A committee's jurisdiction gives it both a mandate and a focus. It is, however, the committee's chairman that gives it a unique character. The Committee on Science and Technology has had the good fortune to have nine very talented and distinctly different chairmen, each very creative in his own way in directing the Committee's activities.

Representative Overton Brooks was the Science and Astronautics Committee's first chairman, and was a tireless worker on the Committee's behalf for the two and one-half years he served as Chairman.

When Brooks convened the first meeting of the new committee in January of 1959, Committee Member Ken Hechler recalled, "There was a sense of destiny, a tingle of realization that every member was embarking on a voyage of discovery, to learn about the unknown, to point powerful telescopes toward the cosmos and unlock secrets of the universe, and to take part in a great experiment." With that spirit the Committee began its work.

Brooks worked to develop closer ties between the Congress and the scientific community. On February 2, 1959, opening the first official hearing of the new Committee, Chairman Brooks said, "Although perhaps the principal focus of the hearings for the next several days will be on astronautics, it is important to recognize that this committee is concerned with scientific research across the

[1] Now named the National Institute of Standards and Technology (NIST) (P.L. 100–418, Title V, Part B, Subpart A, Sections 5111 through 5163, enacted August 23, 1988.)

board." And so, from the beginning, the Committee was concerned with the scope of its vision.

Overton Brooks died of a heart attack in September of 1961, and the chairmanship of the Committee was assumed by Representative George Miller of California.

Miller, a civil engineer, was unique among Members of Congress who rarely come to the legislature with a technical or scientific background. He had a deep interest in science, and his influence was clearly apparent in the broadening of the charter of the National Science Foundation and the establishment of the Office of Technology Assessment. He pioneered in building strong relationships with leaders of science in other nations. This work developed the focus for a new subcommittee established during his chairmanship, known as the Subcommittee on Science, Research and Development.

Just a few months before Miller became Chairman, President John F. Kennedy announced to a joint session of Congress the national commitment to land a man on the moon and return him safely to Earth before the end of the decade. Thus, during Miller's 11-year tenure as Chairman, the Committee directed its main efforts toward the development of the space program.

Chairman Miller was not reelected in the election of 1972, so in January of 1973, Representative Olin E. Teague of Texas took over the helm of the Committee. Teague, a man of directness and determination, was a highly decorated hero of the second World War. He was a long-standing Member of Congress and Chairman of the Veterans Committee before assuming the chairmanship of the Science and Technology Committee.

Throughout the 1960's and early 1970's, Teague chaired the Science Committee's Manned Space Flight Subcommittee, and in that capacity firmly directed the efforts to send a man to the moon.

As Chairman of the Committee, Teague placed heavy emphasis on educating the Congress and the public on the practical value of space. He also prodded NASA to focus on the industrial and human applications of the space program.

One of Teague's first decisions as Chairman was to set up a Subcommittee on Energy. During his six-year leadership of the Committee, energy research and development became a major part of the Committee's responsibilities.

In 1976, Chairman Teague saw the fruition of three years of intensive committee work to establish a permanent presence for science in the White House. The Office of Science and Technology Policy was established with a director who would also serve as the President's science advisor.

Throughout his leadership, he voiced constant concern that the complicated technical issues the Committee considered be expressed in clear and simple terms so that Members of Congress, as well as the general public, would understand the issues.

After six years as Chairman, Teague retired from the Committee and the Congress due to serious health problems and was succeeded as Chairman by Representative Don Fuqua of Florida.

Fuqua became Chairman on January 24, 1979, at the beginning of the 96th Congress.

Don Fuqua came to the Congress after two terms in the Florida State Legislature and was, at age 29, the youngest Democrat in Congress when he was elected in 1962.

Fuqua's experience on the Committee dated back to the first day of his Congressional service. Since 1963, he served as a Member of the Committee's Manned Space Flight Subcommittee. When Olin Teague became Chairman of the Full Committee in 1973, Fuqua took Teague's place as Chairman of the Subcommittee.

As the Subcommittee Chairman, he was responsible for major development decisions on the Space Shuttle and the successful Apollo-Soyuz link-up in space between American astronauts and Soviet cosmonauts. Later, the Subcommittee's responsibility was expanded to cover all other NASA activities and was renamed the Subcommittee on Space Science and Applications.

As Chairman of the Committee, Fuqua's leadership could be seen in the expansion of committee activities to include technological innovation, science and math education, materials policy, robotics, technical manpower, and nuclear waste disposal. He worked to strengthen the Committee's ties with the scientific and technical communities to assure that the Committee was kept abreast of current developments, and could better plan for the future.

During the 99th Congress, the Science and Technology Committee, under Fuqua's chairmanship, carried out two activities of special note.

- The Committee initiated a study of the Nation's science policy encompassing the 40-year period between the end of the second World War and the present. The intent was to identify strengths and weaknesses in our nation's science network. At the end of the 99th Congress, Chairman Fuqua issued a personal compilation of essays and recommendations on American science and science policy issues in the form of a Chairman's Report.
- The second activity was a direct outgrowth of the Space Shuttle "Challenger" accident of January 28, 1986. As part of the Committee's jurisdictional responsibility over all the NASA programs and policies, a steering group of Committee Members, headed by Ranking Minority Member Robert Roe, conducted an intensive investigation of the Shuttle accident. The Committee's purpose and responsibility were not only the specific concern for the safe and effective functioning of the Space Shuttle program, but the larger objective of insuring that NASA, as the Nation's civilian space agency, maintain organizational and programmatic excellence across the board.

Chairman Fuqua announced his retirement from the House of Representatives at the termination of the 99th Congress. He served 24 years on the Committee on Science and Technology and eight years as its Chairman.

Congressman Robert A. Roe of New Jersey, a long-time Member of the Committee, became its new Chairman at the beginning of the 100th Congress. Congressman Roe was trained as an engineer and brought that broad knowledge and understanding to bear on the Committee's issues from the first day of his tenure.

Congressman Roe's first official act as Chairman was to request a change in the Committee's name from the Committee on Science and Technology to the Committee on Science, Space, and Technology. This change was designed not only to reflect the Committee's broad space jurisdiction, but also to convey the importance of space exploration and development to the Nation's future.

In the 100th Congress, under Chairman Roe's stewardship, the Committee kept close scrutiny over NASA's efforts to redesign and reestablish the space shuttle program. The successful launch of the Shuttle Discovery in September, 1988 marked America's return to space after 32 months without launch capability.

The vulnerability of having the Nation's launch capability concentrated singularly in the Space Shuttle, and the rapid increase of foreign competition in commercial space activities, precipitated strong committee action to help ensure the competitive posture of the Nation's emerging commercial launch industry.

Chairman Roe's leadership to stabilize and direct the Nation's space program led to the Committee's first phase of multi-year authorizations for research and development programs with the advent of three-year funding levels for the Space Station.

Within the national movement to improve America's technological competitiveness, Chairman Roe headed the Committee's initiative to expand and redefine the mission of the National Bureau of Standards in order for it to aid American industry in meeting global technological challenges.

The Science Committee has a long tradition of alerting the Congress and the Nation to new scientific and technological opportunities that have the potential to create dramatic economic or societal change. Among these have been recombinant DNA research and supercomputer technology. In the 100th Congress, Members of the Committee included the new breakthroughs in superconductivity research in this category.

Several long-term efforts of the Committee came to fruition during the 101st Congress. As the community of space-faring nations expanded, and as space exploration and development moved toward potential commercialization in some areas, the need arose for legal certainty concerning intellectual property rights in space. Legislation long advocated by the Science Committee defining the ownership of inventions in outer space became public law during this Congress.

Continuing the Committee's interest in long-range research programs for renewable and alternative energy sources, a national hydrogen research and development program was established. The mission of the program was to foster the economic production of hydrogen from renewable resources to its use as an alternative fuel.

At the end of the 101st Congress, the House Democratic Caucus voted Representative Roe Chairman of the Public Works and Transportation Committee.

The hallmark of Representative Roe's four-year tenure as Chairman was his articulation of science, space, and technology as the well-spring for generating the new wealth for America's future economic growth and long-term security.

At the beginning of the 102nd Congress in January, 1991, Representative George E. Brown, Jr. of southern California became the sixth Chairman of the Science, Space, and Technology Committee.

Trained in industrial physics, Brown worked as a civil engineer for many years before entering politics.

Elected to the Congress in 1962, Brown was a Member of the Science, Space, and Technology Committee since 1965. During his more than two-decade tenure on the Committee before becoming its Chairman, he chaired subcommittees on the Environment, on Research and Technology, and on Transportation and Aviation R&D.

Whether from his insightful leadership as a Subcommittee Chairman or from the solitary summit of a futurist, Brown brought a visionary perspective to the Committee's dialogue by routinely presenting ideas far ahead of the mainstream agenda.

George Brown talked about conservation and renewable energy sources, technology transfer, sustainable development, environmental degradation, and an agency devoted to civilian technology when there were few listeners and fewer converts and he tenaciously stuck to those beliefs.

Consistent with his long-held conviction that the Nation needed a coherent technology policy, Brown's first action as Chairman was to create a separate subcommittee for technology and competitiveness issues. During his initial year as Chairman, Brown developed an extensive technology initiative which was endorsed by the House of Representatives in the final days of the 102nd Congress. The work articulated Brown's concept of a partnership between the public and private sectors to improve the Nation's competitiveness.

The culmination of the 102nd Congress saw Brown's persistent efforts to redirect our national energy agenda come to fruition. The first broad energy policy legislation enacted in over a decade included a strong focus on conservation, renewable energy sources, and the expanded use of non-petroleum fuels, especially in motor vehicles.

In Brown's continuing concern to demonstrate the practical application of advances in science and technology, he instituted the first international video-conferenced meetings in the U.S. Congress. In March of 1992, Members of the Science Committee exchanged ideas on science and technology via satellite with counterparts from the Commonwealth of Independent States. This pilot program in the House of Representatives resulted in a decision to establish permanent in-house capacity for video-conferencing for the House.

As a final activity in the 102nd Congress, Brown issued a Chairman's Report on the Federally funded research enterprise. The work was intended as the starting point for a comprehensive review and revision of federal science policy currently in the planning stage.

The 1994 congressional elections turned over control of the Congress to the Republican Party. The House Republican Conference acted to change the official name of the Committee from the Committee on Science, Space, and Technology to the Committee on Science. Representative Robert S. Walker of Pennsylvania became the Science Committee's first Republican Chairman, and the seventh Committee Chairman. Walker had served on the Science Committee since his election to Congress in 1976, and had been its ranking minority member since 1989.

Chairman Walker acted to streamline the subcommittee structure from five to four subcommittees: Basic Research; Energy and Environment; Space and Aeronautics; and Technology. This action

reflected the new Congress' mandate to increase efficiency and cut expenses, and also reflected Walker's personal desire to refocus the Committee's work. Due to the reduction in the number of subcommittees and a sharper focus on the issues, the number of hearings was reduced, while the number of measures passed by the House and signed into law increased.

Chairman Walker chose to use the Full Committee venue to hold hearings exploring the role of science and technology in the future. The first hearing, *Is Today's Science Policy Preparing Us for the Future?,* served as the basis for much of the Committee's work during the 104th Congress.

For the first time in recent Science Committee history, the Committee and the House of Representatives passed authorizations for every agency under the Committee's jurisdiction. To preserve and enhance the core Federal role of creating new knowledge for the future, the Science Committee sought to prioritize basic research policies. In order to do so, the Committee took strong, unprecedented action by applying six criteria to civilian R&D:

1. Federal R&D efforts should focus on long-term, non-commercial R&D, leaving economic feasibility and commercialization to the marketplace.
2. All R&D programs should be relevant and tightly focused to the agencies' missions.
3. Government-owned laboratories should confine their in-house research to areas in which their technical expertise and facilities have no peer and should contract out other research to industry, private research foundations and universities.
4. The Federal Government should not fund research in areas that are receiving, or should reasonably be expected to obtain, funding from the private sector.
5. Revolutionary ideas and pioneering capabilities that make possible the impossible should be pursued within controlled, performance-based funding levels.
6. Federal R&D funding should not be carried out beyond demonstration of technical feasibility. Significant additional private investment should be required for economic feasibility, commercial development, production and marketing.

The authorization bills produced by the Science Committee reflected those standards, thereby protecting basic research and emphasizing the importance of science as a national issue. As an indication of the Science Committee's growing influence, the recommendations and basic science programs were prioritized accordingly.

During the 104th Congress, the Science Committee's oversight efforts were focused on exploring ways to: make government more efficient; improve management of taxpayer resources; expose waste, fraud and abuse; and give the United States the technological edge into the 21st century.

The start of the 105th Congress brought another change in leadership to the Committee. Representative F. James Sensenbrenner, Jr., a Republican from Wisconsin, became the eighth Chairman after Chairman Walker retired from Congress. Sensenbrenner had

been a Member of the Committee since 1981 and prior to his appointment as Committee head, he served as Chairman of the Subcommittee on Space and Aeronautics.

At the start of the 105th Congress, the Speaker of the House charged the Science Committee with the task of developing a long-range science and technology policy. Chairman Sensenbrenner appointed the Committee's Vice Chairman, Representative Vernon Ehlers of Michigan, to lead a study of the current state of the Nation's science and technology policy. The National Science Policy Study, *Unlocking Our Future: Toward A New National Science Policy,* was unveiled in September 1998 and was endorsed by the House on Oct. 8, 1998. The Science Policy Study continues to serve as a policy guide to the Committee, Congress and the scientific community.

The Science Committee played a crucial role in numerous issues of national and international significance during Chairman Sensenbrenner's tenure. Acting in accordance with the Committee's jurisdiction over climate change issues, Chairman Sensenbrenner was chosen by the Speaker of the House to lead the U.S. delegation to the Kyoto (December, 1997), Buenos Aires (November, 1998), and The Hague (November, 2000) global warming conferences. Under Chairman Sensenbrenner's leadership, the Committee examined the science supporting the Kyoto Protocol and the economic impacts the treaty could have on the Nation.

Much of the world anxiously awaited midnight of January 1, 2000 to see if the Year 2000 (Y2K) computer problem would cause the catastrophe that some had predicted. The Science Committee through the Subcommittee on Technology, chaired by Representative Constance Morella of Maryland, held its first hearing on the Y2K problem in 1996 and held or participated in over 30 hearings on the subject. The Committee's aggressive oversight pushed Federal agencies to meet their deadlines to ensure the safety and well being of American citizens. Thankfully, the U.S. and the world experienced very minor problems associated with the Y2K rollover.

Over many years, and during the tenure of several chairmen, the Science Committee closely monitored development of the International Space Station. In October of 2000, a crew of American and Russian astronauts became the first inhabitants of the space station.

One of Chairman Sensenbrenner's priorities was to achieve a steady and sustained growth in Federal R&D investments. During his tenure, funding for civilian Federal R&D increased by 39 percent. Funding for the National Science Foundation increased 23 percent, including its highest ever appropriation in FY 2001.

The start of the 107th Congress brought another change in the Committee's leadership. Representative Sensenbrenner was elected Chairman of the Judiciary Committee and on January 3, 2001, Representative Sherwood L. Boehlert from New York became the new Chairman of the Committee on Science.

Boehlert had served on the Science Committee since first taking office in 1983 and had earned a reputation for independence, moderation and thoughtful leadership. In his first speech as Chairman, Boehlert pledged to "build the Science Committee into a significant force within the Congress," and "to ensure that we have a healthy, sustainable, and productive R&D establishment—one that educates

students, increases human knowledge, strengthens U.S. competitiveness and contributes to the well-being of the Nation and the world."

With those goals in mind, Boehlert laid out three priorities for the Committee—"The Three E's"—science and math education, energy policy, and the environment—three areas in which Boehlert believed the resources and expertise of the scientific enterprise could be brought to bear on issues of national significance.

Boehlert also reorganized the Subcommittees to reflect these new priorities. The four Subcommittees became Research; Energy; Environment, Technology, and Standards; and Space and Aeronautics.

Unexpected events in our nation's history—the terrorist attacks of September 11, 2001 and the loss of the Space Shuttle *Columbia* on February 1, 2003—would also focus the Committee's attention on preventing future terrorist attacks and charting a new course for human space exploration.

The Committee played a central role in the establishment of the new Department of Homeland Security (DHS), which represented the largest reorganization of the Federal Government since the creation of the Department of Defense in 1947. Because of the Committee's tenacious efforts, the final legislation creating the new Department, signed into law on November 22, 2002, included a Science and Technology Directorate and a Homeland Security Advanced Research Projects Agency, the two entities within DHS tasked with putting our nation's scientific ingenuity to work at protecting the American people.

Heeding Chairman Boehlert's admonition that "the War on Terrorism, like the Cold War, will be won in the laboratory as much as on the battlefield," the Science Committee also worked to ensure that agencies throughout the Federal Government were investing in the science and technology necessary to combat terrorism over the long-term.

One area of particular concern to Chairman Boehlert was the vulnerability of the Nation's power grid, financial institutions and other critical infrastructures to a cyber attack. To strengthen our nation's cyber security efforts, Boehlert authored the *Cyber Security Research and Development Act,* which was signed into law by President Bush on November 27, 2002.

Under Boehlert's leadership, the Committee also took the lead in responding to the concerns of family members of September 11th victims regarding the investigation into the collapse of the World Trade Center. After two high-profile hearings into the matter, the Committee introduced legislation to enable the government to respond more quickly to building failures and to overcome the problems that plagued the World Trade Center investigation. The Committee's legislation, signed into law on October 1, 2002, designated the National Institute of Standards and Technology as the lead agency for all future building failure investigations.

The Committee also held hearings on how to strike the proper balance between the need for openness to conduct research successfully and the need for secrecy to protect homeland security. The Committee was particularly concerned about the significant delay in the processing of student visas following 9/11 and worked closely with the Administration to streamline the application process and reduce wait times for foreign researchers.

In addition to its efforts to shape the Department of Homeland Security, the Committee also had several legislative victories in the areas of research and education policy. A signature piece of legislation from the 107th Congress, the *National Science Foundation Authorization Act,* was signed into law in December 2002, authorizing the doubling of the agency's budget over 10 years. The bill also gave additional focus to the National Science Foundation's (NSF's) education programs and set up a process for establishing priorities for large science projects.

Less than two months into the 108th Congress, the Space Shuttle *Columbia,* with her crew of seven, broke apart during re-entry into Earth's atmosphere. The Committee held several high profile hearings into the cause of the accident and exercised close oversight of the proceedings of the *Columbia* Accident Investigation Board (CAIB), the independent investigative body convened by the National Aeronautics and Space Administration (NASA) to determine the cause of the accident.

The *Columbia* accident prompted President George W. Bush to issue a new vision for NASA that calls for the return of humans to the Moon and future manned mission to Mars and beyond. Following the President's announcement, the Committee held hearings and numerous briefings to evaluate his exploration plan. Chairman Boehlert applauded the President for giving NASA a clear vision for the future, but also raised questions about the funding of the proposal and about its potential impact on NASA's work in Space and Earth Science and in aeronautics.

Determined to strike the proper balance between NASA's human exploration programs and its science and aeronautics programs, the Committee drafted an authorization bill for NASA that formally endorsed the President's exploration initiative, dubbed the *Vision for Space Exploration,* while also ensuring that NASA remains a multi-mission agency by requiring robust programs in Earth science, space science, and aeronautics. By an overwhelming vote of 383 to 15, the House of Representatives endorsed the Committee's blueprint for the future direction of NASA and, on December 30, 2005, the bill was signed into law.

President Bush also signed into law Science Committee bills that allowed NASA to adapt to the workforce challenges of the 21st Century and promoted the development of the emerging commercial human space flight industry. The *NASA Flexibility Act of 2004,* introduced by Chairman Boehlert, gave NASA new personnel tools to attract and retain a top-notch technical workforce. The *Commercial Space Launch Amendments Act of 2004,* introduced by Space and Aeronautics Subcommittee Chairman Dana Rohrabacher of California, established a regulatory regime within the Federal Aviation Administration to encourage the development of the commercial human space flight industry, while providing information to the public on the inherent risks in space tourism and limiting that risk, as appropriate.

Following the recommendation of reports on ocean policy, the Committee passed an "organic act" for the National Oceanic and Atmospheric Administration (NOAA) that would formally establish the agency in law and clearly define its role and responsibilities. The House passed the bill, which was introduced by Representative Vernon J. Ehlers of Michigan, the Chairman of the Subcommittee

on Environment, Technology, and Standards, in September 2006, but the legislative clock ran out before it could be enacted into law.

One of Chairman Boehlert's signature accomplishments in the 109th Congress was elevating the issue of U.S. economic competitiveness to the forefront of domestic policy discussions. He and Ranking Minority Member Bart Gordon of Tennessee were among those who requested the 2005 National Academy of Sciences report, *Rising Above the Gathering Storm,* which recommended increased investment in research and education.

On December 7, 2005, Chairman Boehlert, along with Representative Ehlers and Representative Frank Wolf of Virginia, hosted a day-long Innovation Summit at the Department of Commerce that brought together more than 50 chief executive officers and university presidents to discuss the Nation's economic challenges with top Administration officials, including the secretaries of Education, Energy, Commerce and Labor.

The Committee's efforts helped pave the way for President Bush's American Competitiveness Initiative (ACI), announced in the 2006 State of the Union Address. The ACI proposed doubling the budgets of NSF, the National Institute of Standards and Technology's laboratory programs, and the Department of Energy's Office of Science over 10 years.

The Committee also worked to establish a research regime to help promote the development of nanotechnology, which was estimated by the National Science Foundation to become a $1 trillion industry within a decade. Recognizing the enormous economic potential of nanotechnology, Chairman Boehlert authored the *21st Century Nanotechnology Research and Development Act,* signed into law in December 2003, which authorized increased funding and established a coordinated interagency program to carry out nanotechnology research.

Recognizing that the full economic potential of nanotechnology will only be realized if the public fully accepts the technology, the Committee also held several hearings on the potential environmental, health, and safety implications of nanotechnology and pressed the Administration to devote a greater share of research and development funding to addressing these areas of concern.

Central to the Nation's ability to compete is its ability to meet its energy demands, and the Science Committee took an active role in promoting the development of alternative energy sources. The Committee authored key provisions in the *Energy Policy Act,* enacted in 2005, that authorized research in and development of clean, domestically produced renewable energy sources. Representative Bob Inglis of South Carolina, Chairman of the Subcommittee on Research, also introduced the *H–Prize Act,* which called for the establishment of a national prize competition to summon America's best and brightest minds to the challenge of developing the technical breakthroughs that would make hydrogen vehicles technically and economically practical.

Chapter I—Legislative Activities of the Committee on Science

1.1—P.L. 109–14, SURFACE TRANSPORTATION EXTENSION ACT OF 2005 (H.R. 2566)

Background and Summary of Legislation

P.L. 109–14, the *Surface Transportation Extension Act of 2005,* extends federal highway, highway safety, motor carrier safety, and transit programs, and authorizes appropriations, through June 30, 2005. This includes the authorization of appropriations under *Transportation Equity Act for the 21st Century* for federal lands highways (Indian reservation roads, public lands highways, park roads and parkways, and refuge roads), national corridor planning and development and coordinated border infrastructure programs, and metropolitan planning. The legislation amends federal maritime law to increase the authorization of appropriations for personnel and activities expenses of the Coast Guard directly related to the national recreational boating safety program. P.L. 109–14 also amends the Internal Revenue Code to extend until July 1, 2005, the authorization of expenditures from the Highway Trust Fund (including the Mass Transit Account) and the Aquatic Resources Trust Fund, including the sport fish restoration account and the boat safety account.

Legislative History

On May 24, 2005, Representative Don Young introduced H.R. 2566, which was subsequently referred to the Committee on Transportation and Infrastructure, and in addition to the Committees on Ways and Means, Science, and Resources. On May 25, 2005, the House considered the bill under suspension of the rules, and agreed to the bill by voice vote. The bill was received in the Senate on May 26, 2005, and was passed the same day, without amendment, by unanimous consent. On May 31, 2005, the bill was signed by the President, and it became Public Law 109–14.

1.2—P.L. 109–20, SURFACE TRANSPORTATION EXTENSION ACT OF 2005, PART II (H.R. 3104)

Background and Summary of Legislation

P.L. 109–20, the *Surface Transportation Extension Act of 2005 Part II,* extends federal highway, highway safety, motor carrier safety, and transit programs, and authorizes appropriations, through July 19, 2005. This includes the authorization of appropriations under *Transportation Equity Act for the 21st Century* for federal lands highways (Indian reservation roads, public lands highways, park roads and parkways, and refuge roads), national

corridor planning and development and coordinated border infrastructure programs, and metropolitan planning. The legislation amends federal maritime law to increase the authorization of appropriations for personnel and activities expenses of the Coast Guard directly related to the national recreational boating safety program. P.L. 109–20 also amends the Internal Revenue Code to extend until July 20, 2005, the authorization of expenditures from the Highway Trust Fund (including the Mass Transit Account) and the Aquatic Resources Trust Fund, including the sport fish restoration account and the boat safety account.

Legislative History

On June 29, 2005, Representative Don Young introduced H.R. 3104, which was subsequently referred to the Committee on Transportation and Infrastructure, and in addition to the Committees on Ways and Means, Science, and Resources. On June 30, 2005, the Committee on Science discharged H.R. 3104. On June 30, 2005, the House considered the bill under suspension of the rules, and agreed to the bill by voice vote. The bill was received in the Senate on June 30, 2005, and was passed the same day, without amendment, by unanimous consent. On July 1, 2005, the bill was signed by the President, and it became Public Law 109–20.

1.3—P.L. 109–35, SURFACE TRANSPORTATION EXTENSION ACT OF 2005, PART III (H.R. 3332)

Background and Summary of Legislation

P.L. 109–35, the *Surface Transportation Extension Act of 2005 Part III,* extends federal highway, highway safety, motor carrier safety, and transit programs, and authorizes appropriations, through July 21, 2005. This includes the authorization of appropriations under *Transportation Equity Act for the 21st Century* for federal lands highways (Indian reservation roads, public lands highways, park roads and parkways, and refuge roads), national corridor planning and development and coordinated border infrastructure programs, and metropolitan planning. The legislation amends federal maritime law to increase the authorization of appropriations for personnel and activities expenses of the Coast Guard directly related to the national recreational boating safety program. P.L. 109–35 also amends the Internal Revenue Code to extend until July 22, 2005, the authorization of expenditures from the Highway Trust Fund (including the Mass Transit Account) and the Aquatic Resources Trust Fund, including the sport fish restoration account and the boat safety account.

Legislative History

On July 19, 2005, Representative Don Young introduced H.R. 3332, which was subsequently referred to the Committee on Transportation and Infrastructure, and in addition to the Committees on Ways and Means, Science, and Resources. On July 19, 2005, the Committee on Science discharged H.R. 3332. On July 19, 2005, the House considered the bill under suspension of the rules, and agreed to the bill by voice vote. The bill was received in the Senate on July 19, 2005, and was passed the same day, without amendment, by

unanimous consent. On July 20, 2005, the bill was signed by the President, and it became Public Law 109–35.

1.4—P.L. 109–37, SURFACE TRANSPORTATION EXTENSION ACT OF 2005, PART IV (H.R. 3377)

Background and Summary of Legislation

P.L. 109–37, the *Surface Transportation Extension Act of 2005 Part IV,* extends federal highway, highway safety, motor carrier safety, and transit programs, and authorizes appropriations, through July 27, 2005. This includes the authorization of appropriations under *Transportation Equity Act for the 21st Century* for federal lands highways (Indian reservation roads, public lands highways, park roads and parkways, and refuge roads), national corridor planning and development and coordinated border infrastructure programs, and metropolitan planning. The legislation amends federal maritime law to increase the authorization of appropriations for personnel and activities expenses of the Coast Guard directly related to the national recreational boating safety program. P.L. 109–37 also amends the Internal Revenue Code to extend until July 28, 2005, the authorization of expenditures from the Highway Trust Fund (including the Mass Transit Account) and the Aquatic Resources Trust Fund, including the sport fish restoration account and the boat safety account.

Legislative History

On July 21, 2005, Representative Don Young introduced H.R. 3377, which was subsequently referred to the Committee on Transportation and Infrastructure, and in addition to the Committees on Ways and Means, Science, and Resources. On July 21, 2005, the Committee on Science discharged H.R. 3377. On July 21, 2005, the House considered the bill under suspension of the rules, and agreed to the bill by voice vote. The bill was received in the Senate on July 21, 2005, and was passed the same day, without amendment, by unanimous consent. On July 22, 2005, the bill was signed by the President, and it became Public Law 109–37.

1.5—P.L. 109–40, SURFACE TRANSPORTATION EXTENSION ACT OF 2005, PART V (H.R. 3453)

Background and Summary of Legislation

P.L. 109–40, the *Surface Transportation Extension Act of 2005 Part V,* extends federal highway, highway safety, motor carrier safety, and transit programs, and authorizes appropriations, through July 30, 2005. This includes the authorization of appropriations under *Transportation Equity Act for the 21st Century* for federal lands highways (Indian reservation roads, public lands highways, park roads and parkways, and refuge roads), national corridor planning and development and coordinated border infrastructure programs, and metropolitan planning. The legislation amends federal maritime law to increase the authorization of appropriations for personnel and activities expenses of the Coast Guard directly related to the national recreational boating safety program. P.L. 109–40 also amends the Internal Revenue Code to

extend until July 31, 2005, the authorization of expenditures from the Highway Trust Fund (including the Mass Transit Account) and the Aquatic Resources Trust Fund, including the sport fish restoration account and the boat safety account.

Legislative History

On July 27, 2005, Representative Don Young introduced H.R. 3453, which was subsequently referred to the Committee on Transportation and Infrastructure, and in addition to the Committees on Ways and Means, Science, and Resources. On July 27, 2005, the Committee on Science discharged H.R. 3453. On July 27, 2005, the House considered the bill under suspension of the rules, and agreed to the bill by voice vote. The bill was received in the Senate on July 27, 2005, and was passed the same day, without amendment, by unanimous consent. On July 28, 2005, the bill was signed by the President, and it became Public Law 109–40.

1.6—P.L. 109–42, SURFACE TRANSPORTATION EXTENSION ACT OF 2005, PART VI (H.R. 3512)

Background and Summary of Legislation

P.L. 109–42, the *Surface Transportation Extension Act of 2005 Part VI,* extends federal highway, highway safety, motor carrier safety, and transit programs, and authorizes appropriations, through August 14, 2005. This includes the authorization of appropriations under *Transportation Equity Act for the 21st Century* for federal lands highways (Indian reservation roads, public lands highways, park roads and parkways, and refuge roads), national corridor planning and development and coordinated border infrastructure programs, and metropolitan planning. The legislation amends federal maritime law to increase the authorization of appropriations for personnel and activities expenses of the Coast Guard directly related to the national recreational boating safety program. P.L. 109–42 also amends the Internal Revenue Code to extend until August 15, 2005, the authorization of expenditures from the Highway Trust Fund (including the Mass Transit Account) and the Aquatic Resources Trust Fund, including the sport fish restoration account and the boat safety account.

Legislative History

On July 28, 2005, Representative Don Young introduced H.R. 3512, which was subsequently referred to the Committee on Transportation and Infrastructure, and in addition to the Committees on Ways and Means, Science, and Resources. On July 29, 2005, the Committee on Science discharged H.R. 3512. On July 29, 2005, the House considered the bill under suspension of the rules, and agreed to the bill by voice vote. The bill was received in the Senate on July 29, 2005, and was passed the same day, without amendment, by unanimous consent. On July 30, 2005, the bill was signed by the President, and it became Public Law 109–42.

1.7—P.L. 109–58, ENERGY POLICY ACT OF 2005 (H.R. 6)

Background and Summary of Legislation

H.R. 6 is omnibus energy legislation whose stated purpose is, "to ensure jobs for our future with secure, affordable, and reliable energy." The Science Committee has jurisdiction over part of the bill, primarily the authorization of research and development at the U.S. Department of Energy, but also the re-authorization of Price-Anderson and research, development, demonstration and commercial application programs authorized in other titles of the bill, including Hydrogen, Clean Coal, and Vehicles.

The Science Committee's Energy research bill, H.R. 610, was introduced by Energy Subcommittee Chairman Judy Biggert on February 8, 2005 and after amendment in committee, was incorporated in great part into H.R. 6 (see Sec. 2.5 on H.R. 610).

Legislative History

Mr. Barton introduced H.R. 6 on April 18, 2005. It was referred to the Committee on Energy and Commerce and, in addition, to the Committees on Science, Ways and Means, Resources, Education and the Workforce, Transportation and Infrastructure, Agriculture, and Financial Services. The Committee on Rules filed H.Rept. 109–49 on H.Res. 219, providing for consideration of H.R. 6.

On April 20, 2005 the House agreed to H.Res. 219 by voice vote. On April 21, 2005, the House passed H.R. 6, as amended, by: Y–249, N–183 (Roll Call No. 132).

The Senate passed H.R. 6 on June 28, 2005 by: Y–85, N–12 (Roll Call No. 158), after striking all after the enacting clause and inserting the text of S.10, the Senate companion measure, as amended. The Senate Amendment contained several titles and provisions falling within the jurisdiction of the Committee on Science, including provisions related to energy research, development and demonstrations. On July 1, 2005, the Senate requested a conference and appointed conferees.

The House disagreed with the Senate amendment to H.R. 6 and agreed to a conference. From the Committee on Science, the Speaker appointed Science Committee Chairman Sherwood Boehlert, Energy Subcommittee Chairman Judy Biggert, and Committee Ranking Minority Member Bart Gordon, provided that Representative Mr. Costello be appointed in lieu of Rep. Gordon for consideration of Secs. 401–404, 411, 416, and 441 of the House bill, and Secs. 401–407 and 415 of the Senate amendment, and modifications committed to conference.

The Conferees met on July 14, 19, 21 and 24, 2005 and reached agreement on July 26, 2005. On July 27, 2005, the conference report (H.Rept. 109–190) was filed. The conference report passed the House on July 28, 2005 and passed the Senate on July 29, 2005. It was signed into the law by the President on August 8, 2005 and became Public Law No: 109–58.

1.8—P.L. 109–59, SAFE, ACCOUNTABLE, FLEXIBLE, AND EFFICIENT TRANSPORTATION EQUITY ACT OF 2005 (H.R. 3)

Background and Summary of Legislation

P.L. 109–59, the *Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users* (SAFETEA–LU), primarily authorizes funds for federal-aid highways, highway safety programs, and transit program. The research and development provisions of H.R. 3 are similar to H.R. 3550, the *Surface Transportation Research and Development Act of 2003,* which was referred to the Committee on Science in the 108th Congress.

The Science Committee has jurisdiction over those parts of the law that relate to surface transportation research and development, including the Surface Transportation Environment Cooperative Research Program (STECRP), a road weather research and development program, and the Bureau of Transportation Statistics. P.L. 109–59 takes specific steps to increase surface transportation research spending, to tie research spending to overall transportation spending, and to fill many critical gaps in research on the entire transportation system. The law authorizes several programs to fill these gaps, including STECRP; the Future Strategic Highway Research Program to address renewal, safety, reliability and capacity; increased funding for exploratory advanced research; and increased research into the institutional barriers to the deployment of intelligent transportation systems.

Legislative History

Representative Don Young introduced H.R. 3, the *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users,* on February 9, 2005, at which time the bill was referred to the House Committee on Transportation and Infrastructure. H.R. 3 is similar to H.R. 3550 from the 108th Congress, which was referred to the Committees on Transportation and Infrastructure, Education and the Workforce, Energy and Commerce, Judiciary, Resources, and Science. While H.R. 3 was referred only to the Committee on Transportation and Infrastructure at introduction, it is important to note the context in which this bill was considered. For example, Representative Don Young's remarks at the introduction of H.R. 3 noted both the need to act quickly on a bill to reauthorize federal transportation programs and the fact that H.R. 3 reflected work done on H.R. 3550 during the previous Congress (including that by the Conference Committee on H.R. 3550, which included conferees appointed from the Science Committee). On March 2, 2005, the Committee on Transportation and Infrastructure met to consider the bill. Three amendments were offered and then withdrawn. The Committee favorably reported the bill, H.R. 3, by voice vote. On March 7, 2005, the Committee filed H.Rept. 109–12, and the bill was subsequently placed on the Union Calendar (No. 5). On March 8, 2005, the Committee filed a supplemental report, H.Rept. 109–12 Part II. On March 8, 2005, the House considered H.R. 3. On March 10, 2005, the bill passed as amended, by a roll call vote (Y–417, N–9; Roll Call No. 65).

The Senate received H.R. 3 on March 20, 2005, and on April 6, 2005, it was placed on Senate Legislative Calendar (No. 69) under

general orders. On April 27, 2005, the Senate met to consider the bill. On May 17, 2005 the bill passed as amended, by roll call vote (Y–89, N–11; Roll Call No. 125).

On May 26, 2005, the House disagreed with the Senate amendment to H.R. 3, and the Speaker appointed the following House conferees—from the Committee on Science: For consideration of Sections 2010, 3013, 3015, 3034, 3039, 3041, 4112, and Title V of the House bill, and Title II and Sections 6014, 6015, 6036, 7118, 7212, 7214, 7361, and 7370 of the Senate amendment, and modifications committed to conference: Representatives Ehlers, Reichert, and Gordon. On July 28, 2005, the Committee of Conference filed H.Rept. 109–203. On July 29, 2005, the House agreed to the Conference Report by: Y–412; N–8 (Roll Call No. 453)—clearing the measure for the Senate. The Senate agreed to the Conference Report on July 29, 2005, and agreed to it by: Y–91; N–4 (Roll Call No. 220). On August 10, 2005, the President signed H.R. 3, and it became P.L. 109–59.

1.9—P.L. 109–112, IRAN NONPROLIFERATION AMENDMENTS ACT OF 2005 (S. 1713)

Background and Summary of Legislation

Amends the *Iran Nonproliferation Act of 2000* to state that the definition of "extraordinary payments in connection with the International Space Station" does not mean U.S. cash or in-kind payments under the Agreement Concerning Cooperation on the Civil International Space Station, with annex, signed at Washington January 29, 1998, and entered into force March 27, 2001, or any protocol, agreement, memorandum of understanding, or contract related thereto (Agreement). (Under such Act the United States is prohibited from making such payments to the Russian Aviation and Space Agency unless specified determinations are made with respect to Russian cooperation in preventing proliferation to Iran, or to a foreign person identified as contributing to proliferation to Iran.)

Directs the President to submit to the Committee on Foreign Relations of the Senate and the Committee on International Relations of the House of Representatives a report that identifies each Russian entity or person to whom the United States has, since the date of enactment of this Act, made a cash or in-kind payment under the Agreement.

Requires such report to: (1) include the purpose of each payment; and (2) the assessment that the payment was not prejudicial to preventing the proliferation of ballistic or cruise missile systems in Iran and other countries that have supported acts of international terrorism.

Legislative History

H.R. 4003 was introduced by Rep. Paul of Texas on November 6, 2005 and referred to the Committee on Science, in addition to the Committee on International Relations. On November 17, 2005 the measure was referred to the Subcommittee on Space and Aeronautics. The companion bill, S. 1713, passed the Senate, without amendment on September 21, 2005. The House agreed to suspend

the rules and pass the bill, as amended, by a voice vote on November 26, 2005. The President signed S. 1713 on November 22, 2005, which became P.L. 109–112.

1.10—P.L. 109–155, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT OF 2005 (S. 1281)

Background and Summary of Legislation

The House of Representatives and Senate met to confer on S. 1281, the Senate version of the *National Aeronautics and Space Administration (NASA) Authorization Act of 2005.* The conferees used the text of the House version of the *NASA Authorization Act* (H.R. 3070) as the basis for negotiations. The conference report endorses the goals of the *Vision for Space Exploration,* including developing a sustained human presence on the Moon as a steppingstone for future exploration of Mars and other destinations. The conference report also directs NASA to carry out a balanced set of programs in human space flight, space science, Earth science and aeronautics. In addition, the report provides for the continued operation of the Space Shuttle, and directs NASA to complete assembly and continue to utilize the International Space Station.

The conference report authorizes funds for NASA in the amount of $17.93 billion for Fiscal Year 2007, and $18.68 billion for 2008. This conference report also creates a new budget account structure for four distinct areas. They include "Science, Aeronautics and Education," "Exploration Systems" and "Space Operations," as well as an account for the Inspector General. The report sets a 10 percent ceiling on the amount of funds that NASA can reprogram in the Exploration Systems and Space Operations account.

The conference report includes many of the original sections of H.R. 3070, including the provision establishing a mechanism to help both NASA and Congress spot potential cost growth and schedule problems early in the development phase of major programs. This provision ensures that Congress will have sufficient time to review any program whose costs escalate beyond 30 percent. In addition, the conference report directs NASA to develop a national aeronautics policy, a science policy with a list of prioritized science missions, and a plan for facilities and agency workforce needed to meet these goals. The conference report also includes requirements previously passed by the House Science Committee addressing remote sensing applications (H.R. 426, the *Remote Sensing Applications Act of 2005*), the detection and cataloging of near-Earth asteroids (H.R. 1022, the *George E. Brown Jr. Near-Earth Object Survey Act*) and an award program for amateur astronomers (H.R. 1023, the *Charles 'Pete' Conrad Astronomy Awards Act*).

The conference report directs NASA to conduct an independent assessment of the Landsat sensor on the NPOESS mission. NASA is also authorized to conduct a Hubble Servicing mission should the Administrator deem it feasible. In addition, the conference report requires NASA to launch payloads on foreign launch vehicles only in accordance with the President's Space Transportation Policy.

The conferees recognize that the International Space Station (ISS) is a multi-national research effort which provides NASA with

a unique opportunity to conduct research in low-Earth orbit. The conference report designates the ISS as a national laboratory, and directs NASA to complete an implementation plan to increase research opportunities as part of this designation. The conferees encourage increased application of life sciences and microgravity research and protects such fundamental research on the Station through a 15 percent funding requirement.

As a part of the conference report, NASA is urged to use commercial service providers to support human missions to the ISS as well as future missions to the Moon and Mars. This measure is complementary to the goal the conference report has set for NASA to have an increased attention to technology transfer between NASA and the private sector.

The conference report directs NASA to report on the nature and amount of contracts performed by foreign entities, and also requests that the Office of Science and Technology Policy report on its continuing efforts to ensure the effective use of R&D funds within the national science enterprise relating to NASA.

As part of the conference report, NASA is granted the authority and encouraged to undertake a national awareness campaign in order to support the United States position as a global leader in science and engineering. The conference report also authorizes NASA to establish a prize program to stimulate innovation in basic and applied research, technology development, and prototype demonstrations that have the potential for application in space and aeronautics.

As safety has been and continues to be a top priority in NASA's mission, the conferees included a requirement for a review of NASA's safety management, as well as a report on the use and dissemination of best practices and expanded whistle-blower protections. The conference report also establishes a framework for a Commission to investigate future U.S. space vehicle accidents, as well as a Task Force to evaluate and report on ISS safety. Finally, the conference report expands transfer authority to allow NASA flexibility to respond to natural disasters.

Legislative History

S. 1281 was introduced on June 21, 2005 by Sen. Hutchinson of Texas. The measure was co-sponsored by Sen. Inouye of Hawaii, Sen. Lott of Mississippi, Sen. Nelson of Florida, and Sen. Stevens of Arkansas. On June 23, 2005, the Committee on Commerce, Science, and Transportation ordered the measure, as amended, reported favorably. On July 26, 2005, the measure was reported to the Senate, as amended, with the written report, 109–108, and placed on the Senate Legislative Calendar under General Orders. On September 28, 2005, S. 1281 was laid before the Senate by unanimous consent, and passed, as amended, by unanimous consent. The measure was received in the House, and held at the desk, on September 28, 2005.

The text of H.R. 3070 was used as the basis for negotiations with the Senate for the conference of the House and Senate versions of the *NASA Authorization Act of 2005.* On December 16, 2005, conference report of the *NASA Authorization Act* (H.Rept. 109–354) was filed. On December 17, 2005, Chairman Boehlert moved to sus-

pend the rules and agree to the conference report H.Rept. 109–354. The motion to suspend the rules and agree to the conference report was agreed to by a voice vote, and motions to reconsider were laid upon the table without objection.

On December 22, 2005, the Senate agreed to the conference report by Unanimous Consent. On December 30, 2005, the President signed S. 1281, the *National Aeronautics and Space Administration Authorization Act of 2005,* which became Public Law 109–155.

1.11—P.L. 109–163, NATIONAL DEFENSE AUTHORIZATION ACT FOR FISCAL YEAR 2006 (H.R. 1815)

Background and Summary of Legislation

On December 16, 2005, the Speaker appointed Science Committee Chairman Boehlert, Rep. Akin of Missouri, and Science Committee Ranking Minority Member Gordon as additional conferees to H.R. 1815, the *National Defense Authorization Act for Fiscal Year 2006,* for consideration of Section 223 of the House bill and Sections 814 and 3115 of the Senate amendment, and modifications committed to conference.

These conference committee deliberations, contained in H.Rept. 109–360, resulted in the enactment of Sections 252 and 3117 of the *National Defense Authorization Act for Fiscal Year 2006,* which was signed into law by the President on January 6, 2006. Descriptions of those provisions follow.

Section 252—Research and Development Efforts for Purposes of Small Business Research

Amends the Small Business Act to direct the Secretary, at least every four years, to revise and update criteria and procedures utilized to identify Department of Defense (DOD) research and development (R&D) programs which are suitable for funding under the Small Business Innovation Research Program (SBIR Program). Authorizes the Secretary, and each military department Secretary, to create and administer a commercialization pilot program to accelerate the transition of technologies, products, and services developed under the SBIR Program to Phase III, including the acquisition process. Requires an evaluative report from the Secretary to Congressional committees at the end of each fiscal year. Terminates the pilot program at the end of fiscal year 2009. Directs the Small Business Administration (SBA) to provide for, and fully implement the tenets of, Executive Order No. 13329 (Encouraging Innovation in Manufacturing).

Section 3117—Savannah River National Laboratory

Makes the Savannah River National Laboratory a participating laboratory in the DOE laboratory directed research and development program.

1.12—P.L. 109–347, SECURITY AND ACCOUNTABILITY FOR EVERY (SAFE) PORT ACT (H.R. 4954)

Background and Summary of Legislation

On September 28, 2006, the Speaker appointed Science Committee Chairman Sherwood Boehlert and Science Committee Members Michael Sodrel and Charlie Melancon as additional conferees to H.R. 4954, for consideration of Sections 201 and 401 of the House bill, and Sections 111, 121, 302, 303, 305, 513, 607, 608, 706, 801, 802, and 1107 of the Senate amendment, and modifications committed to conference.

These conference committee deliberations, contained in H.Rept. 109–711 (conference report to accompany H.R. 4954), resulted in the enactment of Sections 121, 302, 303, 501, 502, 604, 605, 606, 702 of the *Security and Accountability for Every (SAFE) Port Act,* which was signed into law by the President on October 13, 2006. Descriptions of those provisions follow.

Section 121—Domestic radiation detection and imaging

The legislation instructs the Department of Homeland Security (DHS), in collaboration with the National Institute of Standards and Technology, to publish performance standards and operating procedures for the use of non-intrusive imaging and radiation detection equipment in the United States.

Section 302—Reauthorization of Homeland Security Science and Technology Advisory Committee

The Homeland Security Science and Technology Advisory Committee was established in the *Homeland Security Act of 2002* to ensure that the DHS Science and Technology Directorate received input from communities with expertise in homeland security research and technologies and the users of such technologies. The *SAFE Port Act* amends the

Homeland Security Act of 2002 to extend the authorization for the advisory committee through December 31, 2008.

Section 303—Research, development, test, and evaluation efforts in furtherance of maritime and cargo security

The legislation authorizes the Secretary of Homeland Security, in collaboration with the Under Secretary for Science and Technology and other DHS offices, to conduct research, development, testing, and evaluation efforts in furtherance of maritime and cargo security.

Title V—Domestic Nuclear Detection Office

This title of the legislation amends the *Homeland Security Act of 2002* to establish the Domestic Nuclear Detection Office (DNDO) within DHS. The responsibilities of the DNDO include conducting and supporting research and development projects to generate and improve technologies to detect and prevent the illicit entry, transport, assembly, or potential use within the United States of a nuclear explosive device or fissile or radiological material and carrying out a program to test and evaluate technology for detecting a nuclear explosive device and fissile or radiological material. The

legislation also requires DHS and other agencies to submit to Congress a research and development investment strategy for nuclear and radiological detection and DHS to submit a report on the impact of the establishment of the DNDO on the DHS Science and Technology Directorate and the coordination and prioritization of research, development, testing, and evaluation of technology at DHS.

Title VI—Commercial Mobile Service Alerts

The goal of this title of the legislation is to improve the ability of people to receive alerts in emergency situations, including via commercial mobile service devices and outdoor alerting technologies, such as loudspeakers mounted on poles. The legislation authorizes the Under Secretary of Homeland Security for Science and Technology, in consultation with the Director of the National Institute of Standards and Technology and the Chairman of the Federal Communications Commission, to establish a research, development, testing, and evaluation program to support the development of technologies to increase the number of commercial mobile service devices that can receive emergency alerts. The legislation also authorizes the Under Secretary of Commerce for Oceans and Atmosphere, in consultation with the Secretary of Homeland Security, to establish a program under which grants may be made to provide for outdoor alerting technologies in remote communities effectively unserved by commercial mobile service. Funding for the DHS research program and the Department of Commerce grant program shall be provided from the Digital Transition and Public Safety Fund.

Section 702—Disclosures regarding homeland security grants

The legislation requires that each State or local government that receives a grant made or administered by DHS to deliver to DHS annually an accounting of how funds provided under the grant are expended. Such grants include the State Homeland Security Grant Program and the Assistance to Firefighters Grant Program.

1.13—P.L. 109–364, JOHN WARNER NATIONAL DEFENSE AUTHORIZATION ACT FOR FISCAL YEAR 2007 (H.R. 5122)

Background and Summary of Legislation

On September 7, 2006, the Speaker appointed Science Committee Chairman Boehlert, Rep. Sodrel of Indiana, and Ranking Minority Member Gordon as additional conferees to H.R. 5122, the *John Warner National Defense Authorization Act for Fiscal Year 2007,* for consideration of Sections 312 and 911 of the House bill and Sections 333, 874, and 1082 of the Senate amendment, and modifications committed to conference.

These conference committee deliberations, contained in H.Rept. 109–702, resulted in the enactment of Sections 314 and 911 of the *John Warner National Defense Authorization Act for Fiscal Year 2007,* which was signed into law by the President on October 17, 2006. Descriptions of these provisions follow.

Section 314—Research on Effects of Ocean Disposal of Munitions

Requires the Secretary to: (1) conduct a historical review of the number, size, and probable locations where the Armed Forces disposed of military munitions in coastal waters; (2) periodically release any new information obtained during such review; (3) include such information in the annual report on environmental restoration activities submitted to Congress under current law; (4) complete the historical review and submit a final findings report to Congress; (5) provide information obtained to the Secretary of Commerce to assist the National Oceanic and Atmospheric Administration (NOAA) in preparing nautical charts and other navigational materials that identify known or potential hazards posed by such disposed munitions; (6) continue to inform potentially affected users of the ocean environment of such possible hazards and mitigation methods; (7) continue to conduct research on the effects on ocean environment and those who use it of such disposed munitions; and (8) institute monitoring mechanisms if the review or research indicates that contamination is being released into ocean waters from disposed munitions at a particular site or that the site poses a significant public health or safety risk.

Section 911—Designation of Successor Organizations for the Dis-established Interagency Global Positioning Executive Board

Amends the *Commercial Space Transportation Competitiveness Act of 2000* to reflect the name change of the Interagency Global Positioning System Executive Board to the National Space-Based Positioning, Navigation, and Timing Executive Committee.

1.14—P.L. 109–424, TSUNAMI WARNING AND EDUCATION ACT (H.R. 1674)

Background and Summary of Legislation

The purpose of H.R. 1674, the *Tsunami Warning and Education Act,* is to improve tsunami detection, forecasting, warnings, notification, preparedness, and mitigation to protect life and property in the United States and to assist the international community in the development of an integrated global tsunami warning and education system. On December 26, 2004, an estimated magnitude 9.2 undersea earthquake off the west coast of northern Sumatra, Indonesia, unleashed a tsunami that affected more than 12 countries throughout Southeast Asia and stretched as far as the northeastern African coast. Current estimates indicate that at least 150,000 people were killed, and millions more were injured, displaced or otherwise affected. Most experts agree that thousands of lives could have been saved if an adequate tsunami detection, warning and education program had existed in these areas. Many experts predict that an earthquake similar in magnitude and proximity to the shore as that which occurred in Sumatra has a 10 to 15 percent chance striking the West Coast of the U.S. within the next 50 years. Such a tsunami would wreak havoc on the West Coast within minutes, before any warnings could likely be issued. Therefore, the best way to save lives during such an event is for states and local officials to develop evacuation and disaster plans

and educate the public about what it must do immediately after feeling the ground shake.

H.R. 1674 directs the National Oceanic and Atmospheric Administration (NOAA) to expand its tsunami forecasting and warning capability to cover all U.S. coastlines (not just the Pacific). The bill provides flexibility to NOAA to determine the proper mix of tsunami detection equipment (buoys, tidal gauges, etc.) that it should deploy, but requires that the components be integrated with other ocean observing systems. H.R. 1674 codifies the National Tsunami Hazard Mitigation Program, an existing Federal-State partnership, to improve community awareness and preparedness for tsunamis. States would help decide what activities would be funded, such as developing and updating inundation maps and evacuation plans and installing warning sirens.

Legislative History

Representative Sherwood Boehlert, with Representatives Inslee, Ehlers, and Wu, as original co-sponsors, introduced H.R. 1674, the *Tsunami Warning and Education Act,* on April 18, 2005, at which time the bill was referred to the Committee on Science. On January 26, 2005, the Committee on Science held a hearing on the threat that tsunamis posed to the United States, as well as on steps the Federal Government should take to mitigate these threats.

The Subcommittee on Environment, Technology, and Standards met on April 20, 2005 to consider the bill. No amendments were offered, and the Subcommittee favorably reported H.R. 1674 by voice vote.

On May 4, 2005, the Committee on Science considered H.R. 1674. The Committee adopted one amendment by voice vote. The Committee favorably reported the bill as amended, by voice vote. On September 28, 2006, the Committee filed H.Rept. 109–698, and the bill was then placed on the Union Calendar (No. 422).

On December 6, 2006, the House considered H.R. 1674, and it passed as amended, by voice vote. The Senate received H.R. 1674 on December 6, 2006. On December 8, 2006, the Senate considered H.R. 1674. No amendments were offered and it passed by unanimous consent.

1.15—P.L. 109–430, NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM ACT OF 2006 (H.R. 5136)

Background and Summary of Legislation

The purpose of H.R. 5136 is to establish a National Integrated Drought Information System within the National Weather Service of the National Oceanic and Atmospheric Administration (NOAA) to improve drought forecasting and monitoring capabilities. Drought is neither sudden nor violent but it can be among the most devastating of natural disasters. Unlike other natural disasters, which have impacts that are often intense but localized, drought can simultaneously affect wide swaths of the Nation. In every one of the years from 1885 to 1995, some part of the United States has experienced a severe or extreme drought. NOAA estimates that drought results in total economic impacts in the U.S. of $6 to $8

billion each year from such impacts as crop loss; premature livestock sales; degraded water quality; decreased tourism revenue from limited rafting, boating, fishing, golfing and skiing; decreased energy generation capacity; increased groundwater pumping costs; and reduced barge tonnage for commercial shipping. According to NOAA, the total cost of particularly severe droughts, including economic impact and government aid to affected communities, has exceeded $60 billion in the past. Experts in drought mitigation argue that substantial losses from drought are not inevitable. With adequate forecasting and monitoring capabilities, government and business can adjust their activities and substantially mitigate the extent and severity of many impacts of drought.

Water managers, water users, and drought researchers have identified four primary weaknesses in current drought forecast and monitoring efforts. First, no mechanism currently exists to comprehensively assess the extent, severity, or impacts of drought with the level of detail required to support operation decision-making. Second, not all of the data collected by federal programs are delivered in a timely fashion, and in compatible formats. Third, current drought forecast and monitoring products provide general guidance on current and future drought risk, but do not provide enough detail and are not updated frequently enough to meet the operational needs of most water managers and users. While water managers can use these low resolution maps to communicate the overall state and trends of drought, the maps do not distinguish drought conditions on an individual reservoir or watershed level, which is the level at which water managers need information to make operational decisions. Finally, there is no single coordinating agency that operates a clearinghouse or a prediction model incorporating the drought-related data and tools produced by the many federal, State, and local agencies that work on drought management and that collect drought-related information.

H.R. 5136 will address these issues and facilitate the development of a more comprehensive, real-time drought information and forecasting system, the National Integrated Drought Information System (NIDIS). The Act specifies that NIDIS shall serve as an effective early drought warning system providing the following: (1) a comprehensive system to collect and integrate information on drought for usable, reliable, and timely drought assessments and forecasts; (2) a means to communicate forecasts, conditions and impacts on an ongoing basis to the private sector, and decision-makers at all levels of government to aid timely, informed decisions leading to reduced impacts and costs; and (3) a means to include timely and, to the extent practicable, real-time information reflecting local, regional, and State differences in drought conditions. The Act also specifies that NIDIS shall coordinate and integrate federal research in support of a drought early warning system. NOAA shall consult with relevant government agencies, research institutions and the private sector in the development of NIDIS.

Legislative History

Representatives Ralph Hall and Mark Udall introduced H.R. 5136, the *National Integrated Drought Information System Act of 2006,* on April 6, 2006, at which time the bill was referred to the

Committee on Science. On May 4, 2006, the Environment, Technology, and Standards Subcommittee held a hearing on the state of drought forecasting and monitoring, drought information needs of water users, and on H.R. 5136 itself.

The Subcommittee on Environment, Technology, and Standards met on May 4, 2006 to consider the bill. One amendment was adopted by a voice vote. The Subcommittee favorably reported H.R. 5136 as amended, by voice vote. On June 7, 2006, the Committee on Science considered H.R. 5136. The Committee adopted one amendment by voice vote. The Committee favorably reported the bill as amended, by voice vote. On June 15, 2006, the Committee on Science filed H.Rept. 109–503, and the bill was placed on the Union Calendar (No. 280).

The House considered H.R. 5136 on September 26, 2006, and it passed as amended, by voice vote. The Senate received H.R. 5136 on September 27, 2006, and referred it to the Committee on Commerce, Science, and Transportation. On December 6, 2006, the Committee discharged the bill. The Senate considered H.R. 5136 on December 6, 2006. No amendments were offered and the bill passed by unanimous consent.

Chapter II—Other Legislative Activities of the Committee on Science

2.1—H.R. 28, HIGH–PERFORMANCE COMPUTING REVITALIZATION ACT OF 2005

Background and Summary of Legislation

High-performance computing—also called supercomputing, high-end computing, and sometimes advanced scientific computing—refers to the use of machines or groups of machines that can perform very complex computations very quickly. They are used to solve complex scientific and engineering problems, to simulate physical systems that are often too big and complex to study experimentally, and to manage vast amounts of data. Such computers are, by definition, the most powerful in the world at a given moment, and they are an essential component of U.S. scientific, industrial, and military competitiveness.

The Federal Government promotes high-performance computing in several different ways. First, it funds research and development at universities, government laboratories, and companies to help develop new computer hardware and software; second, it funds the purchase of high-performance computers for universities and government laboratories; and third, it provides access to high-performance computer for a wide variety of researchers by allowing them to use government-supported computers at universities and government laboratories.

The purpose of H.R. 28 is to update the authorized activities of the interagency High-Performance Computing Research and Development Program, originally codified by the *High-Performance Computing Act of 1991.* It requires the program to provide for long-term basic and applied research on high-performance computing; sustained access by the research community in the U.S. to high-performance computing systems; computational science and engineering research on mathematical modeling and algorithms for applications in all fields of science and engineering; and educating and training of additional undergraduate and graduate students in fields relevant to high-performance computing. It also requires the Director of the Office of Science and Technology Policy (OSTP) to establish the goals and priorities of federal high-performance computing research and development. Finally, H.R. 28 authorizes specific activities related to high-performance computing at six federal agencies: the National Science Foundation, the National Aeronautics and Space Administration, the Department of Energy, the National Institute of Standards and Technology, the National Oceanic and Atmospheric Administration, and the Environmental Protection Agency.

Legislative History

H.R. 28 was introduced by Representative Biggert of Illinois on January 4, 2005 and was referred solely to the Committee on Science. The Committee held a markup on March 17, 2005 and ordered the measure reported, as amended, by a voice vote. The Committee filed H.Rept. 109–36 on the measure on April 12, 2005. On April 26, 2005, the House agreed to suspend the rules and pass the bill, as amended, by voice vote. It was received in the Senate on April 27, 2005 and referred to the Committee on Commerce, Science, and Transportation.

2.2—H.R. 50, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION ACT

Background and Summary of Legislation

The purpose of H.R. 50 is to establish in law the National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce and to describe the mission and functions of NOAA. In 1970 President Nixon established NOAA by Executive Order within the Department of Commerce. Since that time NOAA has evolved into the central civilian federal agency for oceans and atmospheric issues. NOAA has approximately 12,000 employees and an annual budget of about $3.9 billion. NOAA is structured around the following major offices: the National Ocean Service; the National Weather Service; the Office of Oceanic and Atmospheric Research; the National Environmental Satellite Data and Information Service; and the National Marine Fisheries Service. Throughout much of its history, NOAA has lacked a clear and consistent mission. In 2004, the U.S. Commission on Ocean Policy (a non-partisan group of ocean experts established by the *Ocean Policy Act of 2000*) found that the overlap of the more than 200 issue-specific laws under which NOAA operates causes significant programmatic and functional confusion, and that the work of the agency's line offices is not sufficiently coordinated. The Commission also noted that NOAA's unclear legal standing in some ocean and atmospheric issues has hampered its ability to form effective partnerships with other agencies, states, the private sector and academia. To establish a clear mission and legal status for the agency, the Commission strongly recommends that Congress pass an organic act for NOAA.

H.R. 50 is an organic act for NOAA. It establishes NOAA within the Department of Commerce, and maintains the current leadership structure at NOAA except that it creates a new position of Deputy Assistant Secretary for Science and Education. It maintains the National Weather Service within NOAA and requires the agency to reorganize around the issues of research and education, operations and services, and resource management. The legislation requires NOAA to contract with the National Academy of Sciences (NAS) to assess the adequacy of the environmental data and information systems of NOAA. It requires NOAA to provide two strategic plans: one to address any deficiencies identified by the NAS data and information system assessment and the second for intramural and extramural research to support the mission of NOAA.

The legislation requires NOAA to review its policy on public-private relationships once every five years.

It requires NOAA to notify Congress and the public if it plans to close or transfer a NOAA facility. The legislation establishes conditions for development of major program cost baselines and requires notification to Congress when certain cost increases or schedule delays occur in major programs.

Legislative History

Representative Vernon J. Ehlers introduced H.R. 50, the *National Oceanic and Atmospheric Administration Act,* on January 4, 2005, at which time the bill was referred to the Committee on Science, and, in addition, the Committee on Resources. H.R. 50 is similar to H.R. 4546, which was favorably reported by the Environment, Technology, and Standards Subcommittee in the 108th Congress.

The Subcommittee on Environment, Technology, and Standards met on March 15, 2005 to consider the bill. One amendment was adopted by voice vote. The Subcommittee favorably reported the bill, H.R. 50, as amended, by voice vote.

On May 17, 2005, the Committee on Science considered H.R. 50. One amendment was adopted by voice vote, and one amendment was adopted by a roll call vote (Y–18, N–17). The Committee favorably reported the bill, as amended, by voice vote. No further legislative action was taken on this measure in the 109th Congress.

2.3—H.R. 250, MANUFACTURING TECHNOLOGY COMPETITIVENESS ACT OF 2005

Background and Summary of Legislation

The purpose of H.R. 250, the *Manufacturing Technology Competitiveness Act of 2005,* is to foster innovation in the manufacturing sciences by creating a mechanism to coordinate federal manufacturing research and development and by strengthening existing programs at the National Institute of Standards and Technology (NIST) that support manufacturing research and development, including an authorization for the NIST laboratory and construction accounts.

Manufacturing remains a key sector of the U.S. economy. According to the Bureau of the Census, between 1988 and 2000, the U.S. manufacturing trade balance for advanced technology products remained positive (though shrinking), whereas all other products went from an annual deficit of $100 billion to one of more than $300 billion.

NIST plays a critical role in helping maintain and advance the U.S. manufacturing industry. NIST's two laboratories, in Gaithersburg, MD and Boulder, CO, and its extramural Manufacturing Extension Partnership (MEP) program support research and development (R&D) and technology transfer that are directly relevant to the manufacturing sector's needs. MEP center costs are divided approximately equally among the Federal Government, the State the center serves, and the center's clientele, who pay fees for services.

In June 2004, the National Academy of Public Administration (NAPA) published a report on the MEP program that concluded

that the MEP program was the only federal program that helped smaller firms modernize and compete successfully. The NAPA report also said that there were emerging challenges facing smaller firms, such as how to economically introduce the use of information technology into small manufacturing enterprises, and that MEP should introduce some changes in its current business model to help firms overcome these challenges.

H.R. 250 establishes an Interagency Committee on Manufacturing Research and Development to coordinate federal manufacturing R&D efforts, and an Advisory Committee to guide those efforts. The Interagency Committee would prepare a strategic plan for manufacturing R&D, produce a coordinated interagency budget, and write an annual report on the federal programs involved in manufacturing R&D. The bill also establishes a three-year cost-shared, collaborative manufacturing R&D pilot grant program at NIST, as well as a post-doctoral and senior research fellowship program in manufacturing sciences at NIST. It reauthorizes the MEP program with a mechanism for review and re-competition of MEP centers. It creates an additional competitive grant program from which MEP centers can obtain supplemental funding for manufacturing-related projects, and allow the MEP program to distribute funds to MEP centers without a matching funds requirement. The bill authorizes funding for NIST's Scientific, Technical, and Research Services account, the Baldrige Quality Award program, and the Construction and Maintenance account.

Legislative History

Representative Vernon J. Ehlers introduced H.R. 250, the *Manufacturing Technology Competitiveness Act,* on January 6, 2005, at which time the bill was referred to the Committee on Science. H.R. 250 is similar to H.R. 3598, which passed the House in the 108th Congress.

The Subcommittee on Environment, Technology, and Standards met on March 15, 2005 to consider the bill. One amendment in the nature of a substitute was amended by voice vote. The substitute amendment, as amended, was adopted by voice vote. The Subcommittee favorably reported the bill, H.R. 250, as amended, by voice vote.

On May 4, 2005, the Committee on Science met to consider H.R. 250. Seven amendments were offered: three were adopted by voice vote, two were withdrawn, one was defeated by voice vote, and one was defeated by a roll call vote (Y–15, N–19). The Committee favorably reported the bill, as amended, by roll call vote (Y–19, N–14). The Committee on Science filed H.Rept. 109–92 on May 23, 2005.

On May 23, 2005, the Committee filed H.Rept. 109–92, and the bill was placed on the Union Calendar (No. 49). The House considered H.R. 250 on September 21, 2005. Five amendments were offered: two were adopted by voice vote; one was agreed to by a roll call vote (Y–416, N–8; Roll Call No. 481); two were defeated by roll call votes (Y–210, N–213, Roll Call No. 482; Y–210, N–212; Roll Call No. 483). Mr. Honda offered a motion to recommit which was defeated by a roll call vote (Y–196, N–226; Roll Call No. 484). The bill passed, as amended, by roll call vote (Y–394, N–24; Roll Call No. 485). The Senate received H.R. 250 on September 22, 2005, and

referred it to the Senate Committee on Commerce, Science, and Transportation.

2.4—H.R. 426, REMOTE SENSING APPLICATIONS ACT OF 2005

Background and Summary of Legislation

The bill establishes a program within the National Aeronautics and Space Administration of competitively-awarded grants for pilot projects that use government and commercial remote sensing capabilities and other sources of geospatial information to address State, local, regional and tribal agency needs. It authorizes $15,000,000 for each of the fiscal years 2006 through 2010 for the program.

Legislative History

H.R. 426 was introduced by Rep. Udall of Colorado on January 26, 2005 and solely referred to the Committee on Science. On June 27, 2005 the Committee discharged H.R. 426 and the measure was placed on the Union Calendar.

Provisions of H.R. 426 were incorporated into Title III of H.R. 3070, the *National Aeronautics and Space Administration (NASA) Act of 2005.* On December 30, 2005, the President signed S. 1281, the *National Aeronautics and Space Administration Authorization Act of 2005,* which became Public Law 109–155.

2.5—H.R. 610, ENERGY RESEARCH, DEVELOPMENT, DEMONSTRATION, AND COMMERCIAL APPLICATION ACT OF 2005

Background and Summary of Legislation

Authorizes funding, enumerates goals and establishes new administrative procedures for energy research, development, demonstration and commercial application programs at the U.S. Department of Energy (DOE). Title I authorizes funding for basic and applied research in the Office of Science for fiscal years 2006–2010; authorizes and sets a schedule and costs for the construction and operation of the Rare Isotope Accelerator; and authorizes and limits U.S. participation in ITER, the international fusion project. Title II includes several research management provisions. Title III authorizes funding for vehicles, buildings and industrial energy efficiency research and development (R&D); authorizes a solid-state lighting initiative; and authorizes funding for R&D related to distributed energy, electricity transmission and distribution, and energy assurance. In addition, this title authorizes a new program to provide grants for energy efficient buildings; and authorizes grants to establish advanced energy technology transfer centers. Title IV authorizes funding for solar energy, bioenergy, wind energy, and geothermal energy R&D. It also authorizes a program of grants to States for the demonstration of solar energy technology. Title V authorizes funding for nuclear science and engineering, including R&D on advanced nuclear fuel recycling and advanced reactors; support for nuclear science and engineering at universities; and support for improved nuclear research infrastructure and facilities. Title VI authorizes funding for advanced coal, oil and gas tech-

nologies, transportation fuels, and fuel cells, and for carbon dioxide capture R&D. This title also authorizes a new ten-year program of R&D on ultra-deep drilling technology with mandatory funding. Title VII authorizes funding for R&D and demonstration programs for hydrogen production, infrastructure, and fuel cell vehicles. Title VIII establishes demonstration programs for alternative-fueled and advanced vehicles, including clean diesel and fuel cell school buses. Title IX authorizes funding for R&D on advanced clean coal technology, and establishes clean coal "centers of excellence" at universities. Title X designates the head of the Office of Science as an Assistant Secretary and creates an additional assistant secretary position to enable improved management of nuclear energy issues.

Legislative History

Energy legislation has been debated in the last two Congresses, and H.R. 610 includes many of the provisions related to DOE's science and technology programs from the conference report for H.R. 6, the *Energy Policy Act of 2003,* passed by the House in the 108th Congress. The science and technology provisions related to DOE in H.R. 6, in turn, were based in part on negotiated agreements reached in conference on H.R. 4, the *Securing America's Future Energy Act of 2001.*

H.R. 610 was introduced on February 8, 2005 by Representative Judy Biggert, Chairman of the Energy Subcommittee of the Committee on Science, and was referred to the Committee on Science. The Committee on Science met to consider H.R. 610 on Wednesday, February 10, 2005 and ordered the measure reported as amended, by a voice vote. On July 29, 2005 the Committee on Science filed H.Rept. 108–216 Part I, and placed it on the Union Calendar, Calendar No. 123. Provisions of H.R. 610 were incorporated into H.R. 6, the *Energy Policy Act of 2005.* (See Sec. 1.7 on H.R. 6 for further legislative action.)

2.6—H.R. 798, METHAMPHETAMINE REMEDIATION RESEARCH ACT OF 2005

Background and Summary of Legislation

The purpose of H.R. 798 is to establish a federal research program to support the development of voluntary guidelines to help states address the residual consequences of former methamphetamine laboratories. Methamphetamine, also known as 'meth,' 'speed,' or 'crank,' is a powerful stimulant that increases wakefulness and physical activity but can also induce symptoms ranging from extreme nervousness and hyperactivity to convulsions and irreversible brain damage. The use and manufacture of meth without prescription or appropriate permission is illegal under federal law. The Nation's meth problem originated in California and the Southwest, but it has spread considerably, facilitated by the proliferation of small labs that produce the drug for personal use and local distribution.

Small meth labs can be set up nearly anywhere—fields, woods, cars—but roughly two-thirds are found in residential settings. A typical lab requires little in the way of materials, and the ingredients used to manufacture meth are commercially available any-

where in the U.S. The main ingredient can be either pseudoepherine or ephedrine, two chemicals that are present in many over-the-counter cold and asthma medications, and the other chemicals are available in gasoline, drain cleaners, fertilizer and matches. The manufacture process requires almost no technical knowledge, and the recipe—as well as step-by-step instructions—is freely and easily available on the Internet. Of the 32 chemicals that can be used in varying combinations to make or 'cook' meth, one-third are extremely toxic and many are reactive, flammable, and corrosive. In fact, nearly one in five labs is found because of fire or explosion, injuring or killing those involved in the manufacture of the drug as well as the law enforcement officers and the firefighters who respond. Once a meth lab is discovered, responsibility for cleanup and remediation typically falls to state and local governments and property owners. Currently there are no national guidelines or regulations on how to clean up and remediate a residential meth lab for re-occupation, and states and localities are struggling to protect the public and find a solution that is practical for property owners.

H.R. 798 requires the Assistant Administrator of the Office of Research and Development at the Environmental Protection Agency (EPA) to establish a program of research on residues from the production of methamphetamines and to establish voluntary guidelines for preliminary site assessment and remediation of methamphetamine laboratories. The bill also requires the Assistant Administrator to convene a meeting of relevant State agencies, individuals and organizations to share best practices and identify research needs. H.R. 798 also requires the EPA to enter into an arrangement with the National Academy of Sciences to study the status and quality of research on the residual effects of meth labs, identify research gaps, and recommend an agenda for the EPA research program. The bill authorizes $3 million for each of the Fiscal Years 2006 through 2009 for EPA and authorizes $1.5 million for each of the Fiscal Years 2006 through 2009 for NIST.

Legislative History

Representatives Bart Gordon, Ken Calvert, and Sherwood Boehlert introduced H.R. 798, the *Methamphetamine Remediation Research Act of 2005,* on February 15, 2005, at which time the bill was referred to the Committee on Science. On March 15, 2005, the Environment, Technology, and Standards Subcommittee met to consider the bill. No amendments were offered, and the Subcommittee favorably reported the bill by voice vote.

On March 17, 2005, the Committee on Science considered H.R. 798. One amendment was adopted by voice vote. The Committee favorably reported the bill as amended, by voice vote. The Committee on Science filed H.Rept. 109–42 on April 13, 2005, and the bill was placed on the Union Calendar (No. 23).

The House considered H.R. 798 on December 13, 2005, and it passed, as amended, by voice vote. The Senate received H.R. 798 on December 14, 2005, and referred it to the Committee on Environment and Public Works. On December 9, 2006, the Committee on Environment and Public Works discharged the bill by unani-

mous consent. The Senate passed the bill with one amendment by unanimous consent on December 9, 2006.

2.7—H.R. 921, MINORITY SERVING INSTITUTION DIGITAL AND WIRELESS TECHNOLOGY OPPORTUNITY ACT OF 2005

Background and Summary of Legislation

Developing an educated and technologically literate workforce is crucial to maintaining the Nation's preeminence in an increasingly competitive, information-based, global economy. Sixty percent of all jobs require information technology skills, and jobs in information technology pay significantly higher salaries than jobs in non-information technology fields. Unfortunately many Americans—and minorities in particular—do not have access to computers either at home or in school. While 58 percent of the U.S. population uses the Internet regularly, only 45 percent of African-Americans and 44 percent of Hispanics access the Internet regularly, according to a 2003 report by the Pew Internet and American Life Project. The college campus is the first place many of these students will use a computer, but colleges and universities that primarily serve minority populations lack the basic information and digital technology infrastructure needed to provide their students the necessary skills to compete and qualify for America's best paying jobs.

These minority serving institutions (MSIs) help create a diverse workforce, awarding 21 percent of all degrees awarded to African-Americans, American Indians, and Hispanics. MSIs grant a significant percentage of the degrees to minorities in science, math, engineering, and technology, fields. (MSIs are defined by the Higher Education Amendments of 1998 to be institutions of higher education that have a combination of minority groups totaling at least 50 percent of their enrollment.) These institutions are often challenged by small endowments and serving a low-income population.

The purpose of H.R. 921 is to strengthen the digital capabilities of MSIs and help to close the "digital divide"—the disparity in access to technology between Caucasian and minority populations. The bill would establish the Minority Serving Institution Digital and Wireless Technology Opportunity Program, a grant program within the Department of Commerce's Technology Administration, to provide funds to MSIs to improve their access to and use of information technology. Allowable uses of funds include purchase of computer equipment, wireless technologies, and software; development of information technology education programs; and providing of training for teachers in how to use computer technology in the classroom. H.R. 921 requires the grants to be awarded via a competitive, merit review process. The bill also directs the Under Secretary of Commerce for Technology to: (1) to establish and advisory council to advise on the best approaches toward maximum program participation by eligible institutions; and (2) ensure that grant awards are made to all types of eligible institutions. H.R. 921 authorizes $250 million for this grant program for each fiscal year 2006 to 2010.

Legislative History

H.R. 921 was introduced by Representative Forbes of Virginia on February 17, 2005, and was referred to the Committee on Science, and in addition to the Committee on Education and the Workforce. The Committee held a markup on May 4, 2005 and ordered the measure reported by unanimous consent. The Committee filed report H.Rept. 109–211, Part I on the measure on July 28, 2005.

2.8—H.R. 1022, GEORGE E. BROWN, JR. NEAR-EARTH OBJECT SURVEY ACT

Background and Summary of Legislation

The bill directs the Administrator of the National Aeronautics and Space Administration (NASA) to establish a program to detect, track, catalogue, and characterize the physical characteristics of near-Earth asteroids and comets equal to or greater than 100 meters in diameter in order to assess the threat of such near-Earth objects in striking the Earth.

It amends the *National Aeronautics and Space Act of 1958* to include a Congressional declaration that the general welfare and security of the United States require that the unique competence of NASA in science and engineering systems be directed to detecting, tracking, cataloguing, and characterizing near-Earth asteroids and comets in order to provide warning and mitigation of the potential hazard of such near-Earth objects impacting the Earth.

The bill authorizes $20,000,000 for each of fiscal years 2006 and 2007 for the program.

Legislative History

H.R. 1022 was introduced by Rep. Rohrabacher of California on March 1, 2005 and solely referred to the Committee on Science. The bill was then referred to the Subcommittee on Space and Aeronautics on March 22, 2005. On June 27, 2005 the Committee discharged H.R. 1022 and the measure was placed on the Union Calendar.

Provisions of H.R. 1022 were incorporated into Title III of H.R. 3070, the *National Aeronautics and Space Administration (NASA) Act of 2005.* On December 30, 2005, the President signed S. 1281, the *National Aeronautics and Space Administration Authorization Act of 2005,* which became Public Law 109–155.

2.9—H.R. 1023, CHARLES 'PETE' CONRAD ASTRONOMY AWARDS ACT

Background and Summary of the Legislation

This bill authorizes the NASA Administrator to establish an awards program in honor of Charles 'Pete' Conrad, astronaut and space scientist, for recognizing the discoveries made by amateur astronomers of asteroids with near-Earth orbit trajectories.

Legislative History

H.R. 1023 was introduced by Rep. Rohrabacher of California on March 1, 2005 and solely referred to the Committee on Science. On March 17, 2005 the Committee met to consider H.R. 1023 and

moved, by a voice vote, to favorably report the bill, as amended, to the House. On April 12, 2005, the Committee discharged H.R. 1023 and the measure was placed on the Union Calendar. On May 10, 2005 the House agreed to suspend the rules and pass H.R. 1023 by a voice vote. On May 11, 2005 the bill was received in the Senate and referred to the Committee on Commerce, Science, and Transportation.

Provisions of H.R. 1023 were incorporated into Title VI of H.R. 3070, the *National Aeronautics and Space Administration (NASA) Act of 2005.* On December 30, 2005, the President signed S. 1281, the *National Aeronautics and Space Administration Authorization Act of 2005,* which became Public Law 109–155.

2.10—H.R. 1158, TO REAUTHORIZE THE STEEL AND ALUMINUM ENERGY CONSERVATION AND TECHNOLOGY COMPETITIVENESS ACT OF 1988

Background and Summary of Legislation

The bill amends the *Steel and Aluminum Energy Conservation and Technology Competitiveness Act of 1988.* The bill authorizes appropriations each year for fiscal years 2006 through 2010 for the U.S. Department of Energy (DOE). The bill also updates priorities to be considered in research planning, repeals a section related to National Institute of Standards and Technology programs that have been inactive, and reinstates the annual report requirement for DOE.

Legislative History

On March 4, 2004, during the 108th Congress, Ms. Hart, Mr. English, and Mr. Murphy introduced H.R. 3890, *To reauthorize the Steel and Aluminum Energy Conservation and Technology Competitiveness Act of 1988.* The bill passed the House on July 7, 2004, but was not considered by the Senate during the 108th Congress.

On March 8, 2005, Ms. Hart, Mr. Lipinski and Mr. Ehlers introduced H.R. 1158, *To reauthorize the Steel and Aluminum Energy Conservation and Technology Competitiveness Act of 1988.* The bill was referred to the Committee on Science, which met to consider H.R. 1158 on March 17, 2005 and ordered the measure reported without amendment, by a voice vote. On April 26, 2005, the House considered the bill under suspension of the rules, and agreed to the bill by voice vote. The bill was received by the Senate on April 27, 2005, and referred to the Committee on Energy and Natural Resources. On June 22, 2005, the Committee on Science filed H.Rept. 109–147. The Senate did not take up the bill.

2.11—H.R. 1215, THE GREEN CHEMISTRY RESEARCH AND DEVELOPMENT ACT OF 2005

Background and Summary of Legislation

The purpose of H.R. 1215, the *Green Chemistry Research and Development Act of 2005,* is to establish an interagency research and development (R&D) program to promote and coordinate green chemistry research, development, demonstration, education, and technology transfer activities. Green chemistry is most commonly

defined as chemistry that involves the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances. Also known as sustainable chemistry or benign chemistry, green chemistry seeks to prevent the creation of hazards, instead of focusing on cleaning up waste after the fact. Many inherent advantages come from green chemistry in the areas of worker safety, public safety, and national security. The Federal Government supports activities related to green chemistry through agencies including the National Science Foundation (NSF), the Environmental Protection Agency (EPA), the Department of Energy (DOE) and the National Institute of Standards and Technology (NIST). Some agencies—EPA, for example—run programs that are focused directly on green chemistry. Other agencies, such as DOE, fund green chemistry as byproducts of efforts to achieve other goals, such as improving energy efficiency. Because some green chemistry investments are direct and some are indirect, and because green chemistry is not broken out in agency budgets, it is difficult to determine the precise level of federal investment in green chemistry.

H.R. 1215 establishes an interagency research and development program to promote and coordinate federal green chemistry research, development, demonstration, education, and technology transfer activities. The bill also establishes an interagency working group composed of representatives from NSF, NIST, DOE, EPA, and any other agency that the President may designate, to oversee the planning, management, and coordination of all federal green chemistry R&D activities. The bill authorizes a program at NSF to award grants to institutions of higher education to support efforts to revise their undergraduate curriculum in chemistry and chemical engineering to incorporate green chemistry concepts and strategies. This program is authorized at $22.5 million total over Fiscal Years 2006–2008. H.R. 1215 requires the Director of NSF to enter into a contract with the National Research Council to conduct a study of the factors that constitute barriers to the successful commercial application of green chemistry R&D. It also authorizes a program to award grants to institutions of higher education to establish partnerships with companies in the chemical industry to retrain chemists and chemical engineers in the use of green chemistry concepts and strategies.

Legislative History

Representative Gingrey introduced H.R. 1215, the *Green Chemistry Research and Development Act of 2005,* on March 10, 2005, at which time the bill was referred to the Committee on Science. H.R. 1215 is similar H.R. 3970, which passed the House in the 108th Congress.

On April 13, 2005, the Committee on Science met to consider H.R. 1215. Five amendments were offered and four were withdrawn and one was adopted by voice vote. The Committee favorably reported the bill, as amended, by voice vote. On May 16, 2005, the Committee filed H.Rept. 109–82, and the bill was placed on the Union Calendar (No. 42).

The House considered H.R. 1215 on September 26, 2006, and it passed, as amended, by voice vote. The Senate received H.R. 1215

on September 27, 2006. On November 13, 2006, the Senate referred the bill to the Committee on Commerce, Science, and Transportation.

2.12—H.R. 1640, ENERGY POLICY ACT OF 2005

Background and Summary of Legislation

This is the portion of the omnibus energy legislation reported out by the Energy and Commerce Committee. It was subsequently referred to the Science Committee. Since the Science Committee had already passed H.R. 610, the Committee discharged the bill after an exchange of letters acknowledging the Committee's area of shared jurisdiction with Energy and Commerce. Four bills, including H.R. 1640 and H.R. 610, became the basis for H.R. 6, the omnibus energy legislation considered on the House Floor. (See Sec. 1.7 for a description of H.R. 6.)

Legislative History

Representative Joe Barton introduced H.R. 1640 on April 14, 2005. It was referred to the Committee on Energy and Commerce and, in addition, to the Committees on Science, Resources, Education and the Workforce, and Transportation and Infrastructure, for a period to be subsequently determined by the Speaker, in each case for consideration of such provisions as fall within the jurisdiction of the committee concerned. On July 29, 2005 the Committee on Energy and Commerce filed H.Rept. 109–215, Part 1 and the House Committee on Science discharged the bill. H.R. 1640 was placed on the Union Calendar, Calendar No. 122.

2.13—H.R. 1817, DEPARTMENT OF HOMELAND SECURITY AUTHORIZATION ACT FOR FISCAL YEAR 2006

Background and Summary of Legislation

The Department of Homeland Security (DHS) was established in 2003. The purpose of H.R. 1817 is to authorize fiscal year 2006 DHS programs to prevent and deter terrorist attacks, protect against and respond to threats and hazards to the Nation, and ensure safe and secure borders.

Provisions in H.R. 1817 within the jurisdiction of the Committee on Science include sections on technology development and transfer, inter-operable communications, and cyber security. Specifically, the bill establishes the position of Assistant Secretary for Cyber Security within DHS, authorizes cyber security research and development programs within the DHS Science and Technology Directorate, and establishes a program in which DHS, in conjunction with the National Science Foundation, will award grants to colleges and universities to carry out cyber security training programs and purchase related equipment. The bill also strengthens and provides guidance on DHS's technology transfer efforts to ensure that homeland security technologies are evaluated and deployed as quickly as possible. The bill also instructs DHS to establish a university-based Center of Excellence to perform research on border security technologies and systems.

Legislative History

H.R. 1817 was introduced by Representative Cox of California on April 26, 2005, and was referred to the Committee on Homeland Security. The Committee on Homeland Security held a markup on April 27, 2005 and ordered the measure reported, as amended, by a voice vote. The Committee filed report H.Rept. 109–71, Part I on the measure on May 3, 2005. The measure was referred jointly and sequentially to the Committee on Science, the Committee on Energy and Commerce, the Committee on Government Reform, the Committee on the Judiciary, the Committee on Transportation and Infrastructure, the Committee on Ways and Means, and the Permanent Select Committee on Intelligence on May 3, 2005. The Committee on Energy and Commerce held a markup on May 11, 2005 and ordered the measure reported, as amended, by a voice vote. The Committee on the Judiciary held a markup on May 12, 2005 and ordered the measure reported, as amended, by a voice vote. On May 13, 2005, the Committee on Energy and Commerce filed report H.Rept. 109–71, Part II on the measure and the Committee on the Judiciary filed report H.Rept. 109–71, Part III. Also on May 13, 2005, the Committee on Science, the Committee on Government Reform, the Committee on Transportation and Infrastructure, the Committee on Ways and Means, and the Permanent Select Committee on Intelligence discharged the measure. On May 18, 2005, the House considered the measure, and it was passed, as amended, by: Y–424; N–4 (Roll Call No. 189). It was received in the Senate on May 19, 2005 and referred to the Committee on Homeland Security and Governmental Affairs.

2.14—H.R. 2364, TO ESTABLISH A SCIENCE AND TECHNOLOGY SCHOLARSHIP PROGRAM TO AWARD SCHOLARSHIPS TO RECRUIT AND PREPARE STUDENTS FOR CAREERS IN THE NATIONAL WEATHER SERVICE AND IN NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION MARINE RESEARCH, ATMOSPHERIC RESEARCH, AND SATELLITE PROGRAMS

Background and Summary of Legislation

The purpose of H.R. 2364 is to promote scientific expertise at the National Oceanic and Atmospheric Administration (NOAA) by establishing a Science and Technology Scholarship Program to award scholarships to recruit and prepare students for careers in the National Weather Service (NWS), NOAA marine and atmospheric research, and satellite programs. There is growing concern that too few American students pursue science, math and engineering and that the Federal Government will not be able to replenish its ranks of scientists as the current cohort retires. This Act provides incentives to study science, math or engineering and to work for NOAA by awarding scholarships to students who agree to work for the agency upon completion of their degree. This Act is virtually identical to a law enacted during the 108th Congress for the National Aeronautics and Space Administration (P.L. 108–176 and P.L. 108–201). The legislation is based on the Robert Noyce Scholarship Program at the National Science Foundation under which students must teach in return for scholarship aid (P.L. 107–368). H.R. 2364

authorizes the Administrator of NOAA to establish a Science and Technology Scholarship Program to award scholarships to recruit and prepare students for careers in the National Weather Service and NOAA's marine and atmospheric research and satellite programs. The bill also requires that scholarship recipients agree to serve as full-time employees of NOAA for 24 months for every year of scholarship provided. H.R. 2364 also requires that, to be eligible for a scholarship, a student: (1) must be enrolled or accepted to be enrolled full time in an institution of higher education in a degree program in a field of study acceptable to the Administrator of NOAA; (2) must be a U.S. citizen or permanent resident; and (3) may not be a federal employee.

Legislative History

Representative Dana Rohrabacher introduced H.R. 2364 on May 16, 2005, at which time the bill was referred to the Committee on Science. On May 17, 2005, the Committee on Science considered H.R. 2364. The Committee adopted one amendment by voice vote. The Committee favorably reported the bill, as amended, by voice vote. The Committee filed H.Rept. 109–151 on June 23, 2005. The bill was placed on the Union Calendar (No. 91).

2.15—H.R. 3070, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION ACT OF 2005

Background and Summary of Legislation

The purpose of H.R. 3070 is to reauthorize the National Aeronautics and Space Administration (NASA) for Fiscal Years 2006 and 2007. The bill directs NASA to carry out a balanced set of programs in human space flight, space science, Earth science and aeronautics. The bill authorizes $16.965 billion for NASA for FY06, and $17.726 billion for FY07. The bill fully funds Exploration, the Space Shuttle and the Space Station, as well as increasing funding for priorities such as science, aeronautics, the Hubble Space Telescope Servicing Mission, and the James Webb Space Telescope. H.R. 3070 also creates a new budget account structure for four distinct areas, which include "Science, Aeronautics and Education," "Exploration Systems," "Space Operations," as well as an account for the Inspector General.

The bill establishes a mechanism to help both NASA and Congress spot potential cost growth and schedule problems early in the development phase of major programs. In addition, the bill directs NASA to develop a national aeronautics policy, a science policy with a list of prioritized science missions, and a plan for facilities and agency workforce needed to meet these goals. The bill also includes requirements previously passed by the Committee addressing remote sensing applications (H.R. 426, the *Remote Sensing Applications Act of 2005*), the detection and cataloging of near-Earth asteroids (H.R. 1022, the *George E. Brown Jr. Near-Earth Object Survey Act*) and an award program for amateur astronomers (H.R. 1023, the *Charles 'Pete' Conrad Astronomy Awards Act*).

As part of the bill, NASA and NOAA are directed to appoint a Joint Working Group to ensure maximum coordination between those agencies in the design, operation, and transition of missions.

The bill also authorizes NASA to establish a prize program to stimulate innovation in basic and applied research, technology development, and prototype demonstrations that have the potential for application in space and aeronautics. In addition, the bill urges NASA to use commercial services providers to support human missions to the Moon and Mars, to support missions to the International Space Station, and to transfer science research and technology to society.

The bill recognizes that the International Space Station is a multinational effort which provides NASA with a unique opportunity to conduct fundamental biological and physical research in low-Earth orbit. The bill directs NASA to complete an implementation plan to increase research opportunities on the Station, and be accessible by the Crew Exploration Vehicle.

As part of H.R. 3070, Congress notes that safety has been and continues to be a top priority in NASA's mission. The bill expresses its sense that NASA should return the Space Shuttle to flight as soon as the Administrator determines that it can be accomplished with an acceptable level of safety. The bill also establishes a framework for a Commission to investigate future U.S. space vehicle accidents, as well as a Task Force to evaluate and report on ISS safety.

Legislative History

H.R. 3070 was introduced by Rep. Calvert of California and Chairman Sherwood Boehlert on June 27, 2005. The bill was referred to the Subcommittee on Space and Aeronautics on June 28, 2005. The Subcommittee held a markup session on June 29, 2005, and ordered the measure reported, as amended, to the Full Committee by a roll call vote: Y–10; Present–6. On July 14, 2005, the Full Committee considered H.R. 3070, and ordered the measure, as amended, to the House by a voice vote. The Committee filed H.Rept. 109–173, on July 18, 2005. The measure was subsequently placed on the Union Calendar on July 18, 2005. On July 22, 2005, the House passed H.R. 3070, as amended, by a roll call vote: Y–383; N–15 (Roll Call No. 416). On July 25, 2005, the measure was received in the Senate and referred to the Committee on Commerce, Science, and Transportation. The text of H.R. 3070 was used as the basis for negotiations with the Senate for the conference of the Senate version of the *NASA Authorization Act of 2005* (S. 1281).

On December 16, 2005, conference report of the *NASA Authorization Act* (H.Rept. 109–354) was filed. On December 17, 2005, Chairman Boehlert moved to suspend the rules and agree to the conference report H.Rept. 109–354. The motion to suspend the rules and agree to the conference report was agreed to by a voice vote, and motions to reconsider were laid upon the table without objection.

On December 22, 2005, the Senate agreed to the conference report by Unanimous Consent, clearing the enrollment of S. 1281 for the President. On December 30, 2005, the President signed S. 1281, the *National Aeronautics and Space Administration Authorization Act of 2005,* which became Public Law 109–155.

2.16—H.R. 3929, DANA POINT DESALINATION PROJECT AUTHORIZATION ACT

Background and Summary of Legislation

The purpose of H.R. 3929 is to amend the *Water Desalination Act of 1996* to authorize the Secretary of the Interior to assist in research and development, environmental and feasibility studies, and preliminary engineering for the Municipal Water District of Orange County, California, Dana Point Desalination Project located at Dana Point, California.

H.R. 3929 amends the *Water Desalination Act of 1996* to authorize up to $2.5 million in federal funds to assist the Municipal Water District of Orange County in conducting preliminary engineering and environmental studies on the Dana Point Desalination Project. As amended, this bill also specifies that the federal cost share of the project cannot exceed 25 percent, authorizes $2.5 million for federal assistance, and limits the federal authorization to 10 years.

Legislative History

Representative Ken Calvert introduced H.R. 3929, the *Dana Point Desalination Project Authorization Act,* on September 28, 2005, at which time the bill was referred to the Committee on Science, and, in addition, the Committee on Resources. On November 16, 2005, the Committee on Resources considered H.R. 3929. One amendment was adopted by unanimous consent. The measure was discharged by the Committee on Science on December 12, 2005. The Committee favorably reported the bill, as amended, by unanimous consent. The Committee on Resources filed H.Rept. 109–335, Part I on December 12, 2005, and the bill was placed on the Union Calendar (No. 185).

The House considered H.R. 3929 on May 2, 2006 and it passed as amended, by voice vote. The Senate received H.R. 3929 on May 3, 2006, and referred it to the Committee on Environment and Public Works. On September 13, 2006, the Committee favorably reported the bill as amended. On September 27, 2006, the Committee filed S.Rept. No. 109–353, and the bill was placed on Senate Legislative Calendar under General Orders (No. 647).

2.17—H.R. 4941, HOMELAND SECURITY SCIENCE AND TECHNOLOGY ENHANCEMENT ACT OF 2005

Background and Summary of Legislation

The mission of the Department of Homeland Security (DHS) Science and Technology Directorate (S&T) is to harness the Nation's scientific and technological resources to provide federal, State, and local officials with the technology and capabilities to protect the homeland, particularly against catastrophic terrorist events. DHS S&T supports research, development, testing, and evaluation of technologies to prepare for, prevent, respond to, and recover from acts of terrorism and other disasters. DHS S&T was one of the few units of DHS that was not transferred into the department from another agency; instead, the organization and its programs were built from scratch upon the formation of the depart-

ment in 2003. The purpose of H.R. 4941 is to strengthen and focus the programs of DHS S&T.

H.R. 4941 would direct the Secretary of Homeland Security, acting through the Under Secretary for Science and Technology, to support the development and promulgation of national voluntary consensus standards for homeland security equipment and training and would require equipment purchased by DHS or with DHS funding to conform to such standards, where applicable. The legislation would require that the Secretary implement the previously-mandated Technology Clearinghouse within 90 days and establish a homeland security technology transfer program to facilitate the identification, modification, and commercialization of counterterrorism or emergency response technology and equipment. H.R. 4941 also extends the termination date of the Homeland Security Science and Technology Advisory Committee until 10 years after the date of its establishment.

Additionally, H.R. 4941 would require the Under Secretary for Science and Technology to: (1) provide technical guidance, training, and other assistance, as appropriate, to support the transfer and integration of homeland security technologies and protocols in urban and other jurisdictions under a high risk of terrorist attacks; (2) support research and development in cyber security to improve the ability of the United States to prevent, detect, respond to, and recover from cyber attacks; (3) establish a program to support the development and promulgation of national voluntary consensus standards for requirements, performance testing, and user training with respect to critical infrastructure information systems; and (4) support scholarship and fellowship programs to encourage the development of an adequate supply of scientists and engineers trained in fields relevant to homeland security. Lastly, it directs the Under Secretary for Science and Technology to conduct an inventory and evaluation of surveillance systems currently supported or utilized by DHS and authorizes DHS to establish a demonstration program to test the effectiveness and privacy and civil liberties implications of utilizing visual surveillance systems to enhance homeland security.

Legislative History

H.R. 4941 was introduced on March 14, 2006 by Representative Reichert of Washington and was referred to the Committee on Homeland Security. A markup was held on June 14, 2006. On December 8, 2006, the Committee on Homeland Security filed report H.Rept. 109–729, Part I, and the measure was referred jointly and sequentially to the Committee on Science and the Committee on Energy and Commerce, both of whom discharged the measure that same day.

2.18—H .R. 5143, THE H–PRIZE ACT OF 2006

Background and Summary of Legislation

H.R. 5143, the *H–Prize Act of 2006,* is intended to create a new incentive to achieve scientific and technical breakthroughs required to accelerate the drive to a hydrogen economy. The H–Prize bill is modeled after the Ansari X Prize, and establishes three kinds of

prizes intended to draw new players to join the race to break down technical and other barriers to the advancement of hydrogen technologies. First, four $1 million prizes are to be awarded every other year to the best technology advancements in components or systems related to hydrogen production, hydrogen storage, hydrogen distribution, and hydrogen utilization. Next, one $4 million prize is to be awarded for prototypes of hydrogen-powered vehicles or hydrogen-based products that best meet or exceed objective performance criteria. Awards for prototype prizes alternate years with the technology advancements prize. Finally, one $10 million prize is to be awarded for transformational changes in technologies for the production and distribution of hydrogen that meet or exceed far reaching objective criteria. As amended, the bill sets a private fundraising goal of $40 million to use as matching funds for every dollar of private funding raised by the winner of the transformational prize for the continued development and commercialization of their winning technology.

The bill also includes provisions to sunset the prize program in 2017; require the Secretary to enter into an agreement with a private, non-profit entity to administer the prize competitions; define contestant eligibility, waive intellectual property rights, waive federal liability, and require purchase of liability insurance by contestants; and authorize annual appropriations of $55,000,000 for fiscal years 2007 through 2016 for DOE.

Legislative History

On April 6, 2006 Representative Bob Inglis introduced H.R. 5143, a bill to authorize the Secretary of Energy to establish monetary prizes for achievements in overcoming scientific and technical barriers associated with hydrogen energy. It was referred to the House Committee on Science. On April 27, 2006 the Full Committee held a legislative hearing on H.R. 5143. On May 3, 2006, the Full Committee held a markup and ordered the measure reported, as amended, by a voice vote. On May 9, 2006 the Committee on Science filed H.Rept. 109–456, and the bill was placed on the Union Calendar, Calendar No. 254. On May 10, 2006 the House agreed to suspend the rules and pass H.R. 5143, as amended, by: Y–416; N–6; 1 Present (Roll Call No. 131). On May 11, 2006, H.R. 5143 was received in the Senate and referred to the Committee on Energy and Natural Resources.

2.19—H.R. 5316, RESTORING EMERGENCY SERVICES TO PROTECT OUR NATION FROM DISASTERS (RESPOND) ACT OF 2006

Background and Summary of Legislation

The *Homeland Security Act of 2002* moved the Federal Emergency Management Agency (FEMA), an independent agency since 1994, into the newly formed Department of Homeland Security (DHS). The unprecedented disaster wreaked by Hurricane Katrina in 2004 tested the newly restructured FEMA's ability to respond to a major catastrophe. Many observers characterized the government's response at all levels as inefficient and uncoordinated, and FEMA in particular as unprepared and slowed by unnecessary bu-

reaucracy. As one of the most visible agencies responding to the disaster, the public largely blamed FEMA for further compounding the horrendous toll the hurricane had on the people of the Gulf region.

In addition, Congress found that the onus for the poor Hurricane Katrina response did not rest on FEMA and DHS alone. Many State and local governments were unprepared for a disaster of Hurricane Katrina's magnitude. The government lacked a standard for the minimum capabilities for emergency preparedness, and there was not a comprehensive plan for response by all levels of government and for the direction and coordination of resources to fill in gaps in capabilities.

One factor that may have contributed to FEMA's difficulty in responding effectively to Hurricane Katrina was conflict between the terrorism prevention mission of DHS and the disaster management mission of FEMA. Re-establishing FEMA as an independent cabinet-level agency to coordinate the federal response and to lead the national preparedness efforts could improve the preparedness, coordination, and execution of an all-hazards emergency management system.

H.R. 5316 would remove FEMA from DHS and reestablish it as an independent, cabinet-level agency. DHS emergency management functions related to preparing for, responding to, recovering from, and mitigating against all hazards would be transferred to FEMA. The legislation would also create national and regional emergency response centers and teams, require the agency to establish a comprehensive workforce development strategy for its employees, and require all agencies to improve the monitoring and oversight of federal disaster expenditures. H.R. 5316 would create an emergency equipment grant program at FEMA to provide grants to State and local governments for the purchase or improvement of emergency communications systems. Finally, the legislation would establish a National Emergency Preparedness System to ensure a consistent approach to domestic incident management; establish target capabilities for each level of government; identify resource needs to fill existing capability gaps; and regularly assess the Nation's preparedness level.

Sections 105 and 301 of H.R. 5316 are relevant to the Science Committee's jurisdiction. Among other provisions, section 105 states the functions of the Department of Homeland Security established under the laws of the *Earthquake Hazards Reduction Act of 1977* and the *Federal Fire Prevention Act of 1974* shall be transferred to the Director of FEMA. Section 301 amends the *Robert T. Stafford Disaster Relief and Emergency Assistance Act,* creating a new Title VII. Section 703 (b)(3) and (b)(4) of the new Title VII would direct the FEMA Director to develop, publicly announce, and update as necessary national voluntary consensus standards for first responder equipment, and develop and update as necessary, national voluntary consensus standards for the training program.

Legislative History

H.R. 5316 was introduced on May 9, 2006 by Representative Young of Alaska and was referred to the Committee on Transportation and Infrastructure, the Committee on Homeland Security,

and the Committee on Government Reform. A markup was held on June 14, 2006. The Committee on Government Reform held a markup on May 18, 2006, and filed report H.Rept. 109–519, Part I on June 22, 2006. The Committee on Transportation and Infrastructure held a markup on May 17, 2006, and filed report H.Rept. 109–519, Part II on December 8, 2006. The measure was then referred sequentially to the Committee on Science, whom, like the Committee on Homeland Security, discharged the measure that same day.

2.20—H.R. 5356, RESEARCH FOR COMPETITIVENESS ACT

Background and Summary of Legislation

The United States is a leader in many key innovation indicators, such as research and development (R&D) spending, number of scientists and engineers, and scientific output. This investment in innovation has kept the U.S. strong in an increasingly competitive global economy. However, American investment in these areas is slipping relative to other countries. These other countries, especially the emerging economies of China and India, have realized that investment in scientific and technological infrastructure is vital to creating a robust and competitive economy. The U.S. must maintain strong investment in the Nation's research and development infrastructure to remain competitive in the new global economy.

In his 2006 State of the Union address, the President announced his American Competitiveness Initiative, which called for the doubling of the combined budgets of the National Science Foundation (NSF), National Institutes of Standards and Technology (NIST), and the Department of Energy (DOE) Office of Science over the next 10 years. The proposed funding increases are targeted to high-priority research areas, including alternative energy technologies, nanotechnology, supercomputing, manufacturing, cyber security, the performance of structures during disasters, and improvements in the U.S. scientific infrastructure, such as research facilities and government laboratories. These investments are expected to support the development of the next generation of transformative technologies.

A number of recent reports have outlined the issues that the U.S. faces as it tries to maintain a position of leadership and offered recommendations of what the U.S. should do to ensure its economic and national security. This bill focuses on research elements of the recommendations made in these reports by strengthening federal support for innovative research and for science and engineering researchers at the early stages of their careers, authorizing funding for research infrastructure, and establishing a program for interdisciplinary research. Support for young researchers is essential because they face the greatest hurdles in setting up laboratories and obtaining research grants, yet they are the most likely researchers to cross traditional disciplinary boundaries and do path breaking work.

The purpose of H.R. 5356 is to bolster the research base in the United States by strengthening federal investment in the basic research that provides the background knowledge necessary for fu-

ture technology developments. The bill authorizes programs at NSF, the DOE Office of Science, and the National Aeronautics and Space Administration (NASA).

The bill authorizes an existing NSF program funding young faculty, in which NSF provides grants of at least $80,000 per year for five years to help researchers at the early stage of their careers establish their research programs and laboratories and pursue risky research in emerging fields. The award recipients shall be selected on a competitive, merit-reviewed basis, based on factors including the innovative or transformative nature of the proposed research and the extent to which the proposal integrates research and education. The bill authorizes funding for this program to grow proportionally with the overall NSF research budget. The bill authorizes a similar program at the DOE Office of Science.

The bill also establishes programs at NSF and the DOE Office of Science to award grants to young faculty to conduct high-risk, high-return fundamental research with the potential for significant scientific or technical advancement. In addition to base funding, the federal agencies are authorized to provide grantees with additional support to match funds the awardee raises from industry for the proposed research. The award recipients shall be selected on a competitive, merit-reviewed basis, based on factors including the innovative or transformative nature of the proposed research and the potential interest to industry of the research.

Additionally, the bill authorizes the existing NSF Major Research Instrumentation, which provides grants to purchase and support cross-disciplinary, shared scientific and engineering equipment, such as electron microscopes, telescopes, and supercomputers, at institutions of higher education; authorizes NSF to fund potentially path-breaking basic research designed to simultaneously advance the physical and non-biomedical life sciences; allows NSF to support research on the process of innovation; and amends the *National Science Foundation Act of 1950* to allow NSF to accept donations for specific prize competitions.

Finally, the bill requires DOE and NIST to provide reports to Congress on their efforts to recruit and retain young scientists and engineers at the early stages of their careers and states the sense of Congress that a balanced science program at NASA contributes significantly to innovation in the United States and allows NASA to establish a NASA Academy to provide a scientific and engineering training program for NASA employees.

Legislative History

H.R. 5356 was introduced by Representative McCaul of Texas on May 11, 2006, and was referred solely to the Committee on Science. The Committee held a markup on June 7, 2006 and ordered the measure reported, as amended, by a voice vote. The Committee filed report H.Rept. 109–525 on the measure on June 22, 2006.

2.21—H.R. 5357, RESEARCH FOR COMPETITIVENESS ACT

Background and Summary of Legislation

A critical element of U.S. competitiveness is the culture of innovation that exists in this country and the ability of U.S. companies

to take advantage of breakthroughs in fundamental research to create new products, markets, and wholly new industries. The U.S. successes in the information technology and semiconductor industries are examples of the economic impact of investing in building strong research enterprises. Today, the amount of investment in fundamental research by companies at industrial laboratories, has declined, and the connection between university researchers and businesses is growing.

The purpose of H.R. 5357 is to strengthen the opportunities for relationships between university researchers, especially young faculty, and industry and to encourage industry awareness of fundamental research programs. The bill establishes programs at NSF and the DOE Office of Science to award grants to young faculty to conduct high-risk, high-return fundamental research with potential interest to industry.

Legislative History

H.R. 5357 was introduced by Representative McCaul of Texas on May 11, 2006 and was referred solely to the Committee on Science. The Committee held a markup on June 7, 2006, and the text of H.R. 5357 was incorporated into H.R. 5356. For further action see H.R. 5356.

2.22—H.R. 5358, SCIENCE AND MATHEMATICS EDUCATION FOR COMPETITIVENESS ACT

Background and Summary of Legislation

Over the past several years, a number of industry and policy organizations have released reports describing the critical role that science and technology play in U.S. economic competitiveness and recommending strengthening science, technology, engineering, and mathematics (STEM) education at all levels—K–12, undergraduate, and graduate—to ensure that the U.S. has a technologically literate workforce for the 21st century.

Without strong science and mathematics education at the K–12 level, efforts to increase the number of Americans training for, and choosing careers in STEM fields will be severely handicapped. Many of the reports focused their recommendations on enhancing teacher training, for both pre-service and in-service teachers.

Once students reach college and graduate school, even well prepared students are choosing not to major in, or are dropping out of STEM fields. Half of all students who begin in the physical or biological sciences and 60 percent of those in mathematics will drop out of these fields by their senior year, compared with the 30 percent drop out rate in the humanities and social sciences. The attrition rates are even higher for under-represented minorities. To increase the number of undergraduate students in STEM fields will require not only recruiting more students but also improving the quality of their education.

At the graduate level, the emphasis in many reports is on ensuring that there is a sufficient quantity of students studying STEM fields in preparation for research and technical careers and that the type of graduate education that these students receive is appro-

priate preparation for research in emerging fields and careers in industry, academia, and government laboratories.

The purpose of H.R. 5358 is to strengthen and extend existing federal programs to improve U.S. science, mathematics, engineering, and technology education at all levels through developing and providing teacher training; attracting science, mathematics, and engineering majors to teaching; improving undergraduate science, mathematics, and engineering courses; and expanding interdisciplinary graduate work.

Specifically, H.R. 5358 strengthens and expands the National Science Foundation's (NSF's) Robert Noyce Teacher Scholarship Program which provides money to colleges and universities to award scholarships to students majoring in science, math or engineering who commit to teaching two years in return for each year of aid and to provide programs to help prepare the students for teaching. The bill amends current law by specifying some of the programs grantees must provide, including field teaching experience. The bill specifies that both faculty from STEM departments and education faculty must be involved in the program.

The bill also strengthens and focuses NSF's Math and Science Partnership Program at NSF, which provides grants to institutions of higher education (or to eligible nonprofit organizations) to partner with local educational agencies to improve elementary and secondary mathematics and science instruction. The bill amends current law to give priority to proposed projects that include teacher training activities as the main focus and clarify that STEM faculty must lead the projects.

The bill also extends the authorization of and expands NSF's Science, Technology, Engineering, and Mathematics Talent Expansion Program (STEP), which provides grants to colleges and universities to improve undergraduate science, math and engineering education. The bill authorizes NSF to fund the creation of centers at colleges and universities to develop new approaches to undergraduate education programs, and expands the focus of STEP beyond its initial focus of increasing the number of graduating STEM majors to include increasing the number of non-majors taking STEM courses.

The bill also authorizes funding to increase proportionally to the overall NSF budget for the Integrative Graduate Education and Research Traineeship program, which supports graduate students in cutting-edge interdisciplinary fields. It also requires the Director of NSF to arrange for an assessment of the impact of Professional Science Master's degree programs, to evaluate the NSF broader impact grant evaluation criterion, and to conduct a study on university donation of used laboratory equipment to schools.

Lastly, the bill authorizes the Department of Energy (DOE) Office of Science to conduct education programs, which may include awarding scholarships or fellowships for study and research, providing research experiences at National Laboratories for undergraduates, and operating summer institutes to improve the content knowledge of science and mathematics teachers. The bill requires DOE to inventory and evaluate its current and future education programs.

Legislative History

H.R. 5358 was introduced by Representative Schwartz of Michigan on May 11, 2006, and was referred solely to the Committee on Science. The Committee held a markup on June 7, 2006 and ordered the measure reported, as amended, by a voice vote. The Committee filed report H.Rept. 109–524 on the measure on June 22, 2006.

2.23—H.R. 5450, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION ACT

Background and Summary of Legislation

The purpose of H.R. 5450 is to establish in law the National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce and to describe the mission and functions of NOAA. In 1970 President Nixon established NOAA by Executive Order within the Department of Commerce. Since that time NOAA has evolved into the central civilian federal agency for oceans and atmospheric issues. NOAA has approximately 12,000 employees and an annual budget of about $3.9 billion. NOAA is structured around the following major offices: the National Ocean Service; the National Weather Service; the Office of Oceanic and Atmospheric Research; the National Environmental Satellite Data and Information Service; and the National Marine Fisheries Service. Throughout much of its history, NOAA has lacked a clear and consistent mission. In 2004, the U.S. Commission on Ocean Policy (a non-partisan group of ocean experts established by the *Ocean Policy Act of 2000*) found that the overlap of the more than 200 issue-specific laws under which NOAA operates causes significant programmatic and functional confusion, and that the work of the agency's line offices is not sufficiently coordinated. The Commission also noted that NOAA's unclear legal standing in some ocean and atmospheric issues has hampered its ability to form effective partnerships with other agencies, states, the private sector and academia. To establish a clear mission and legal status for the agency, the Commission strongly recommends that Congress pass an organic act for NOAA.

H.R. 5450 is an organic act for NOAA. It establishes NOAA within the Department of Commerce, and maintains the current leadership structure at NOAA except that it creates a new position of Deputy Assistant Secretary for Science and Education. It maintains the National Weather Service within NOAA and requires the agency to reorganize around the issues of research and education, operations and services, and resource management. The legislation requires NOAA to contract with the National Academy of Sciences (NAS) to assess the adequacy of the environmental data and information systems of NOAA. It requires NOAA to provide two strategic plans: one to address any deficiencies identified by the NAS data and information system assessment and the second for intramural and extramural research to support the mission of NOAA. The legislation requires NOAA to review its policy on public-private relationships once every five years.

It requires NOAA to notify Congress and the public if it plans to close or transfer a NOAA facility. The legislation establishes con-

ditions for development of major program cost baselines and requires notification to Congress when certain cost increases or schedule delays occur in major programs.

Legislative History

Representatives Vernon J. Ehlers, Sherwood Boehlert and Wayne Gilchrest introduced H.R. 5450, the *National Oceanic and Atmospheric Administration Act* on May 22, 2006, at which time the bill was referred to the Committee on Science, and, in addition, the Committee on Resources. H.R. 5450, as introduced, is nearly identical to H.R. 50, which favorably reported by the Committee on Science on May 17, 2005. On June 14, 2006, the Committee on Science considered H.R. 5450. Five amendments were offered and three were adopted by voice vote and two were defeated by roll call vote (Y–13, N–17; Y–15, N–19). The Committee favorably reported the bill, H.R. 5450, as amended, by voice vote. The Committee on Science filed H.Rept. 109–545, Part 1 on June 29, 2006. On September 11, 2006, the Committee on Resources discharged the bill and it was placed on the Union Calendar (No. 385). The House considered H.R. 5450 on September 20, 2006, and it passed as amended, by voice vote. The Senate received H.R. 5450 on September 21, 2006, and referred it to the Committee on Commerce, Science, and Transportation.

2.24—H.R. 5656, ENERGY RESEARCH, DEVELOPMENT, DEMONSTRATION, AND COMMERCIAL APPLICATION ACT OF 2006

Background and Summary of Legislation

Affordable energy is essential to the Nation's continued prosperity. Volatile world oil markets, along with soaring natural gas and electricity prices, have replaced the relatively low energy prices enjoyed over most of the two decades before the turn of the century. World events in recent years have illustrated once again the important connections between energy policy and national security policy. In addition, there are increasing concerns about the environmental impact of energy use. Consequently, energy is once again on the front burner of the Nation's agenda.

In February 2006, President Bush announced an Advanced Energy Initiative that addressed numerous aspects of energy: clean coal, nuclear, and renewable energy, as well as battery technologies for vehicles. In addition to those technologies covered under the Advanced Energy Initiative, there are other areas that deserve additional attention, such as energy consumption in buildings. According to Department of Energy (DOE) 2003 statistics, buildings consume more energy than any other sector of the economy, including industries or transportation. In fact, U.S. buildings consume 39 percent of our nation's primary energy and 70 percent of electricity. Innovations in energy-efficient building technologies, materials, techniques and systems combined with advances in solar photovoltaic and other distributed clean energy technologies have the potential to dramatically transform today's buildings. These technologies—coupled with a whole building approach that optimizes the interactions among building systems and components—will en-

able buildings to use considerably less energy, while also helping to meet our national goals for sustainable development, environmental protection, and energy security.

The *Energy Research, Development, Demonstration and Commercialization Act of 2006* would authorize the research and development (R&D) and technology demonstration programs included under the President's Advanced Energy Initiative. The bill endorses the Administration's vision of a near-zero emissions coal-fired power plant and stipulates environmental performance requirements for the FutureGen demonstration facility. The bill also endorses an advanced nuclear power technology R&D program, but slows development of some technologies proposed under the Administration's Global Nuclear Energy Partnership (GNEP) until a more comprehensive R&D and demonstration plan is developed by DOE and reviewed by the National Academy of Sciences (NAS). The bill would also authorize a plug-in hybrid electric vehicle R&D and demonstration program, a solar photovoltaic R&D and demonstration program, a cooperative extension program for energy technology and energy efficiency information, a program to provide incentives to design and construct energy efficient buildings, and energy technology and energy efficiency education and outreach programs. Finally, the bill would require the Secretary of Energy to enter into an arrangement with the NAS to conduct a detailed study of, and make further recommendations on, the October 2005 NAS recommendation to establish an Advanced Research Projects Agency–Energy (ARPA–E).

Legislative History

On June 21, 2006 Representative Judy Biggert introduced H.R. 5656, a bill to provide for federal energy research, development, demonstration, and commercial application activities, and for other purposes. It was referred to the House Committee on Science. On June 27, 2006 the Full Committee held a markup and ordered the measure reported, as amended, by a voice vote. Amendments accepted at this markup included amendments to make technical changes; an amendment to establish a program of R&D on coal methanation; an amendment requiring cost analysis under the nuclear fuel cycle technologies program; an amendment to expand R&D on biofuels technologies to include non-liquid motor fuels; amendments to encourage minority-serving institutions to apply for grants under the plug-in hybrid and photovoltaic demonstration programs and the green energy education grant program; an amendment to authorize R&D on materials to make biobased fuels more compatible with existing fuel storage and delivery infrastructure; an amendment to require higher energy efficiency standards for the energy efficient building grant program; an amendment to authorize R&D on bioplastics and other bioproducts; and an amendment to merge the energy extension language with an existing law. On July 28, 2006 the Committee on Science filed H.Rept. 109–611, and the bill was placed on the Union Calendar, Calendar No. 352.

2.25—H.R. 6203, THE ALTERNATIVE ENERGY RESEARCH AND DEVELOPMENT ACT

Background and Summary of Legislation

H.R. 6203 contains most of the same provisions included in H.R. 5656, as amended. H.R. 6203 would authorize R&D on ethanol production from cellulosic feedstocks; technologies for hydrogen storage on-board vehicles; advanced solar photovoltaic power technologies; and wind. The bill would require that DOE continue to carry out R&D on geothermal energy, hydropower, co-generation, and distributed energy production as authorized in the *Energy Policy Act of 2005.* The bill would also authorize a plug-in hybrid electric vehicle R&D and demonstration program; a photovoltaic technology demonstration program; a pilot grant program for the design and construction of energy efficient buildings; a cooperative extension program for energy efficiency and distributed energy technologies; R&D on coal methanation; R&D on materials that can be added to biobased fuels and ultra low sulfur diesel fuels to make them more compatible with existing fuel storage and delivery infrastructure; and R&D on bioplastics. The bill would also authorize DOE to help fund energy technology and energy efficiency education programs in cooperation with the National Science Foundation and would require the Secretary of Energy to enter into an arrangement with the National Academies of Sciences to conduct a detailed study of the 2005 NAS recommendation to establish an ARPA–E.

Legislative History

On September 27, 2006 Representative Judy Biggert introduced H.R. 6203, a bill to authorize R&D and technology demonstration activities at DOE to help accelerate the development and widespread use of a broad portfolio of advanced, clean energy technologies. It was referred to the House Committee on Science. On September 29, 2006, the House agreed to suspend the rules and pass H.R. 6203, by voice vote. On September 30, 2006, H.R. 6203 was received in the Senate.

Chapter III—Commemorative Resolutions Discharged by the Committee on Science and Passed by the House of Representatives

3.1—H.CON.RES. 96, RECOGNIZING THE SIGNIFICANCE OF AFRICAN AMERICAN WOMEN IN THE UNITED STATES SCIENTIFIC COMMUNITY

Background and Summary of the Legislation

This resolution recognizes the significant contributions African American women scientists, mathematicians, and inventors have made to the advancement of scientific knowledge and supports the establishment of a special day on which these women can be honored.

Legislative History

H.Con.Res. 96 was introduced by Representative Eddie Bernice Johnson of Texas on March 15, 2005 and was referred solely to the Committee on Science. The Committee held a markup on March 17, 2005 and ordered the measure reported, as amended, by a voice vote. On April 26, 2005, the House agreed to suspend the rules and pass the bill, as amended, by voice vote. It was received in the Senate on April 27, 2005 and referred to the Committee on the Judiciary.

3.2—H.CON.RES. 180, TO SUPPORT INITIATIVES DEVELOPED BY THE FIREFIGHTER LIFE SAFETY SUMMIT

Background and Summary of the Legislation

This resolution supports the goals and initiatives developed at the Firefighter Life Safety Summit and the mission of the National Fallen Firefighters Foundation and the United States Fire Administration to reduce firefighter fatalities and injuries. It encourages the implementation of the "Everyone Goes Home Campaign" to make firefighter safety a national priority and supports the goals of the national "stand down" called for by fire organizations on June 21, 2005 to encourage all fire personnel to suspend non-emergency activities to focus solely on firefighter safety.

Legislative History

H.Con.Res. 180 was introduced by Representative Hoyer of Maryland on June 16, 2005, and was referred solely to the Committee on Science. On June 21, 2005, the Committee discharged the resolution and the House agreed to suspend the rules and passed H.Con.Res. 180, without amendment, by voice vote. It was received in the Senate on June 22, 2005 and referred to the Committee on Commerce, Science, and Transportation.

3.3—H.CON.RES. 324, DIRECTING THE SECRETARY OF THE SENATE TO MAKE A TECHNICAL CORRECTION IN THE ENROLLMENT OF S. 1281.

Background and Summary of the Legislation

This resolution directs the Secretary of the Senate to make a technical correction in the enrollment of S. 1281 (*National Aeronautics and Space Administration Authorization Act of 2005*).

Legislative History

H.Con.Res. 324 was considered as a privileged matter on December 17, 2005, and the motion to reconsider was laid on the table without objection.

3.4—H.CON.RES. 366, TO CONGRATULATE THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION ON THE 25TH ANNIVERSARY OF THE FIRST FLIGHT OF THE SPACE TRANSPORTATION SYSTEM, TO HONOR COMMANDER JOHN YOUNG AND THE PILOT ROBERT CRIPPEN, WHO FLEW SPACE SHUTTLE COLUMBIA ON APRIL 12–14, 1981, ON ITS FIRST ORBITAL TEST FLIGHT, AND TO COMMEND THE MEN AND WOMEN OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AND ALL THOSE SUPPORTING AMERICA'S SPACE PROGRAM FOR THEIR ACCOMPLISHMENTS AND THEIR ROLE IN INSPIRING THE AMERICAN PEOPLE

Background and Summary of the Legislation

This resolution congratulates the National Aeronautics and Space Administration on the 25th anniversary of the first flight of the Space Transportation System. It honors Commander John Young and Pilot Robert Crippen who flew the Space Shuttle Columbia on its first orbital test flight in April of 1981.

Legislative History

H.Con.Res. 366 was introduced by Rep. Calvert of California on March 29, 2006, and solely referred to the Committee on Science. On April 5, 2006, the Committee discharged the measure and the House agreed to suspend the rules and pass H.Con.Res. 366, without amendment, by: Y–422; N–0 (Roll Call No. 99). It was received in the Senate on April 6, 2006, considered, and agreed to, without amendment, and with a preamble by Unanimous Consent.

3.5—H.CON.RES. 448, COMMENDING THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION ON THE COMPLETION OF THE SPACE SHUTTLE'S SECOND RETURN-TO-FLIGHT MISSION

Background and Summary of the Legislation

This resolution congratulates the National Aeronautics and Space Administration and the Discovery crew of STS–121 on the successful completion of their almost 13 day flight to the International Space Station in July of 2006.

Legislative History

H.Con.Res. 448 was introduced by Rep. Paul of Texas on July 13, 2006, and solely referred to the Committee on Science. On July 19, 2006, the Committee discharged the measure and the House agreed to suspend the rules and pass H.Con.Res. 448, without amendment, by: Y–415; N–0 (Roll Call No. 393). It was received in the Senate on July 21, 2006, considered, and agreed to, without amendment, and with a preamble by Unanimous Consent.

3.6—H.RES. 441, TO CONGRATULATE THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AND THE DISCOVERY CREW OF COMMANDER EILEEN COLLINS, PILOT JIM KELLY, MISSION SPECIALIST CHARLIE CAMARDA, MISSION SPECIALIST WENDY LAWRENCE, MISSION SPECIALIST SOICHI NOGUCHI, MISSION SPECIALIST STEVE ROBINSON, AND MISSION SPECIALIST ANDY THOMAS ON THE SUCCESSFUL COMPLETION OF THEIR 14–DAY TEST FLIGHT TO THE INTERNATIONAL SPACE STATION FOR THE FIRST STEP OF THE VISION FOR SPACE EXPLORATION, BEGUN FROM THE KENNEDY SPACE CENTER, FLORIDA, ON JULY 26, 2005, AND COMPLETED AT EDWARDS AIR FORCE BASE, CALIFORNIA, ON AUGUST 9, 2005, WHICH HISTORICAL MISSION REPRESENTED A GREAT STEP FORWARD INTO THE NEW BEGINNING OF THE SECOND SPACE AGE

Background and Summary of the Legislation

This resolution commends the entire National Aeronautics and Space Administration team and community, who provided invaluable technical support and leadership for the historic mission of Space Shuttle Discovery STS flight 114.

Legislative History

H.Res. 441 was introduced by Rep. Calvert of California on September 14, 2005 and solely referred to the Committee on Science. On September 20, 2005, the Committee discharged the measure and the House agreed to suspend the rules and pass H.Res. 441, as amended, by: Y–401; N–0 (Roll Call No. 477).

3.7—H.RES. 450, RECOGNIZING SPACE SHUTTLE COMMANDER EILEEN COLLINS, MISSION SPECIALIST WENDY LAWRENCE, AND THE CONTRIBUTIONS OF ALL OTHER WOMEN WHO HAVE WORKED WITH NASA FOLLOWING THE SUCCESSFUL MISSION OF SPACE SHUTTLE DISCOVERY ON STS–114

Background and Summary of the Legislation

Recognizes the various contributions that women at NASA made to support the successful STS–114 mission.

Legislative History

H.Res. 450 was introduced on September 19, 2005 by Rep. Maloney of New York and solely referred to the Committee on Science. On September 20, 2005, the Committee discharged the

measure and the House agreed to suspend the rules and pass H.Res. 450, without amendment, by a voice vote.

3.8—H.RES. 457, NATIONAL CHEMISTRY WEEK

Background and Summary of the Legislation

This resolution recognizes the important contributions of chemical scientists and engineers to enhancing the Nation's economic growth, health, and standard of living and supports the goals of National Chemistry Week.

Legislative History

H.Res. 457 was introduced by Representative Holt of New Jersey on September 21, 2005 and was referred solely to the Committee on Science. On October 17, 2005 the Committee discharged the resolution and the House agreed to suspend the rules and pass H.Res. 457, without amendment, by: Y–366; N–2 (Roll Call No. 522).

3.9—H.RES. 491, NATIONAL CYBER SECURITY AWARENESS MONTH

Background and Summary of the Legislation

This resolution supports the goals and ideals of National Cyber Security Awareness Month and states that the House of Representatives will work with federal agencies, national organizations, businesses, and educational institutions to encourage the development and implementation of voluntary consensus standards, practices, and technologies that enhance the state of computer security in the United States.

Legislative History

H.Res. 491 was introduced by Representative Boehlert of New York on October 17, 2005 and was referred solely to the Committee on Science. On October 17, 2005 the Committee discharged the resolution and the House agreed to suspend the rules and pass H.Res. 491, without amendment, by: Y–389; N–13 (Roll Call No. 523).

3.10—H.RES. 515, OF INQUIRY REQUESTING THE PRESIDENT OF THE UNITED STATES TO PROVIDE TO THE HOUSE OF REPRESENTATIVES CERTAIN DOCUMENTS IN HIS POSSESSION RELATING TO THE ANTICIPATED EFFECTS OF CLIMATE CHANGE ON THE COASTAL REGIONS OF THE UNITED STATES

Background and Summary of Legislation

H.Res. 515 requests the President of the United States to provide to the House of Representatives, not later than 14 days after the date of adoption of this resolution, all documents (including minutes and memos) in his possession relating to the effects of climate change on the coastal regions of the United States produced by the National Aeronautics and Space Administration (NASA), the National Weather Service, the National Science Foundation (NSF), the National Oceanic and Atmospheric Administration (NOAA), the National Assessment Synthesis Team, and the U.S. Geological Survey (USGS).

Legislative History

Representative Dennis Kucinich introduced H.Res. 515 on October 26, 2005, at which time it was referred solely to the Committee on Science. The Committee considered H.Res. 515 on November 9, 2005. The Committee adversely reported the resolution by voice vote.

On November 15, 2005, the Committee on Science filed H.Rept. 109–296 with the recommendation that the resolution not be agreed to. The Resolution was placed on the Union Calendar (No. 119) on November 15, 2005.

3.11—H.RES. 541, HONORING DRS. ROY J. GLAUBER, JOHN L. HALL, AND THEODOR W. HÄNSCH FOR BEING WARDED THE NOBEL PRIZE IN PHYSICS FOR 2005, AND DRS. YVES CHAUVIN, ROBERT H. GRUBBS, AND RICHARD R. SCHROCK FOR BEING AWARDED THE NOBEL PRIZE IN CHEMISTRY FOR 2005, AND FOR OTHER PURPOSES

Background and Summary of Legislation

H.Res. 541 recognizes and honors Drs. Roy J. Glauber, John L. Hall, Theodor W. Hänsch, Yves Chauvin, Robert H. Grubbs, and Richard R. Schrock, and acknowledges the importance of National Institute of Standards and Technology research and its contributions to United States industry, academia, and government.

Legislative History

Representative Brian Baird introduced H.Res. 541 on November 8, 2005, at which time it was referred solely to the Committee on Science. On April 5, 2006, the House considered H.Res. 541 and it passed, by voice vote.

3.12—H.RES. 681, SUPPORTING THE GOALS AND IDEALS OF NATIONAL ENGINEERING WEEK

Background and Summary of the Legislation

This resolution established that the House of Representatives will work with the engineering community to ensure that the contribution of that community can be expressed through research, development, standardization, and innovations and to support the goals and ideals of National Engineers Week and its aims to increase understanding and interest in engineering and technology careers and to promote literacy in math and science.

Legislative History

H.Res. 681 was introduced by Representative Lipinski of Illinois on February 15, 2006 and was referred solely to the Committee on Science. On March 7, 2006 the Committee discharged the Resolution and the House agreed to suspend the rules and pass H.Res. 681, without amendment, by voice vote.

3.13—H.RES. 717, DIRECTING THE SECRETARY OF COMMERCE TO TRANSMIT TO THE HOUSE OF REPRESENTATIVES A COPY OF A WORKFORCE GLOBALIZATION FINAL DRAFT PRODUCED BY THE TECHNOLOGY ADMINISTRATION

Background and Summary of Legislation

H.Res. 717 directs the Secretary of Commerce to transmit to the House of Representatives, not later than 14 days after the date of the adoption of this resolution, a copy of the final draft report, produced by the professional staff of the Technology Administration, entitled: *Six-Month Assessment of Workforce Globalization in Certain Knowledge-Based Industries.*

Legislative History

Representative Bart Gordon introduced H.Res. 717 on March 9, 2006, at which time it was referred solely to the Committee on Science. On March 29, 2006, the Committee considered H.Res. 717. No amendments were offered, and the motion to adversely report the Resolution failed by roll call vote (Y–17, N–17). On April 5, 2006, the Committee on Science met to consider H.Res. 717. The Committee reported the Resolution without recommendation, by voice vote. On April 7, 2006, H.Res. 717 was placed on the Union Calendar (No. 164).

3.14—H.RES. 892, RECOGNIZING THE DEDICATION OF THE EMPLOYEES AT THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION'S MICHOUD ASSEMBLY FACILITY, THE "MICHOUD HURRICANE RIDE-OUT TEAM," WHO RISKED THEIR LIVES DURING HURRICANE KATRINA'S ASSAULT ON SOUTHEAST LOUISIANA, AND KEPT THE GENERATORS AND PUMPS RUNNING TO PROTECT THE FACILITIES AND FLIGHT HARDWARE, AND WHOSE DEDICATION KEPT MICHOUD ASSEMBLY FACILITY AN ISLAND OF DRY LAND, WHICH MADE IT POSSIBLE TO RESUME EXTERNAL TANK PRODUCTION LESS THAN FIVE WEEKS AFTER THE STORM PASSED

Background and Summary of the Legislation

Recognizes the dedication of the employees at the National Aeronautics and Space Administration's Michoud Assembly Facility, the "Michoud Hurricane Ride-Out Team," who risked their lives during Hurricane Katrina's assault on southeast Louisiana, and kept the generators and pumps running to protect the facilities and flight hardware, and whose dedication kept the Michoud Assembly Facility an island of dry land, which made it possible to resume External Tank production less than five weeks after the storm passed.

Legislative History

H.Res. 892 was introduced on June 26, 2006 by Rep. Melancon of Louisiana and solely referred to the Committee on Science. On July 24, 2006, the Committee discharged the measure and the House agreed to suspend the rules and pass H.Res. 892, without amendment, by a voice vote.

3.15—H.RES. 948, RECOGNIZING THE DEDICATION OF THE EMPLOYEES AT THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION'S STENNIS SPACE CENTER WHO, DURING AND AFTER HURRICANE KATRINA'S ASSAULT ON MISSISSIPPI, PROVIDED SHELTER AND MEDICAL CARE TO STORM RECOVERY EFFORTS, WHILE EFFECTIVELY MAINTAINING CRITICAL FACILITIES AT THE CENTER

Background and Summary of the Legislation

Commends the dedication of the employees who stayed behind at the Stennis Space Center of the National Aeronautics and Space Administration, who during and after Hurricane Katrina's assault on Mississippi, provided shelter and medical care to storm evacuees and logistical support for storm recovery efforts while effectively maintaining critical facilities at the Center.

Legislative History

H.Res. 948 was introduced on July 25, 2006 by Rep. Taylor of Mississippi and solely referred to the Committee on Science. On September 26, 2006, the Committee discharged the measure and the House agreed to suspend the rules and pass H.Res. 948, without amendment, by a voice vote.

3.16—H.RES. 993, NATIONAL CYBER SECURITY AWARENESS MONTH OF 2006

Background and Summary of the Legislation

This resolution supports the goals and ideals of National Cyber Security Awareness Month and states that the House of Representatives will work with federal agencies, national organizations, businesses, and educational institutions to encourage the development and implementation of voluntary consensus standards, practices, and technologies that enhance the state of computer security in the United States.

Legislative History

H.Res. 993 was introduced by Representative Lungren of California on September 12, 2006 and was referred solely to the Committee on Science. On November 14, 2006 the Committee discharged the Resolution and the House agreed to suspend the rules and pass H.Res. 993, without amendment, by voice vote.

CHAPTER IV—Oversight, Investigations and Other Activities of the Committee on Science, Including Selected Subcommittee Legislative Activities

4.1—COMMITTEE ON SCIENCE

4.1(a)—Tsunamis: Is the U.S. Prepared?

January 26, 2005

Hearing Volume No. 109–1

Background

On January 26, 2005, the Committee on Science held a hearing to better understand the causes of tsunamis, the risks they may pose to the U.S. and to the rest of the world, and how the U.S. should prepare for them.

On December 26, 2004, a magnitude 9.0 undersea earthquake off the west coast of northern Sumatra, Indonesia, unleashed a tsunami that affected more than 12 countries throughout Southeast Asia and stretched as far as the northeastern African coast. Massive tsunami waves hit the Indonesian coast within minutes of the earthquake, and other deadly waves raced across the entire 3,000-mile span of the Indian Ocean Basin within hours. Current estimates indicate that at least 150,000 people were killed, and millions more were injured, displaced or otherwise affected. Experts believe that the earthquake which caused the tsunami was the most powerful in 40 years and the fourth largest in the last century. The death toll appears to be the worst on record for a tsunami.

While no tsunami has caused equivalent devastation in the U.S., tsunamis have hit the U.S. in recent decades, almost all of them generated in the Pacific Ocean.

To protect the U.S., the National Oceanic and Atmospheric Administration (NOAA) operates two tsunami warning centers, one in Alaska and one in Hawaii. The Hawaiian center dates back to 1948, and the entire current warning system, which includes ocean buoys, has been in place since 2001. In response to this recent disaster, on January 14, 2005, the Administration announced an interagency plan to increase U.S. risk assessment, detection, warning and disaster planning for tsunamis. The plan would cost $37.5 million over two fiscal years.

The Committee explored the following overarching questions at the hearing:

1) Which regions of the U.S. and the rest of the world face the greatest risk from tsunamis?

2) What are the best methods to detect tsunamis and provide effective warnings? What are the best methods to educate the U.S. about the risks of tsunamis and how to be prepared for them? How well does the Administration's new tsunami plan incorporate these methods?
3) What should the U.S. do to help the rest of the world better prepare for tsunamis?

The Committee heard from: (1) The Honorable Jay Inslee, Member, U.S. House of Representatives; (2) Dr. Charles "Chip" Groat, Director of the United States Geological Survey; (3) Gen. David L. Johnson (ret.), Director of the National Oceanic and Atmospheric Administration (NOAA) National Weather Service; (4) Dr. John Orcutt, Deputy Director for Research at the Scripps Institution of Oceanography, University of California at San Diego, and President of the American Geophysical Union; (5) Dr. Arthur Lerner-Lam, Director of the Columbia Center for Hazards and Risk Research, Lamont-Doherty Earth Observatory, Columbia University; and (6) Mr. Jay Wilson, Coordinator of Earthquake and Tsunami Programs, Plans and Training Section, Oregon Emergency Management.

Summary of Hearing

Congressman Inslee testified that the country will experience future earthquakes and tsunamis and that many areas in the country are at risk. He stated that the U.S. needs to deploy significantly more buoys to detect tsunamis. In addition, he argued that buoys will not be sufficient without a warning and education system to provide people on the shorelines with a course of action in the event of an earthquake or tsunami.

Dr. Groat testified that the Pacific Northwest is at significant risk to tsunami-causing earthquakes. He said the USGS plans to significantly improve earthquake data processing and analysis. Improvement in data processing will increase the USGS's ability to discriminate likely tsunamigenic sources. In addition, the USGS will improve its information distribution capacity as well as its coastal mapping capabilities.

General Johnson stated that NOAA plans to complete the current Tsunami Warning System for the U.S. by 2007. This system will include 32 new DART buoys and 38 new sea level and tide monitoring gauges. Furthermore, NOAA's TsunamiReady program will provide education and outreach to vulnerable communities. Finally, NOAA supports the development of a Global Earth Observation System of Systems (GEOSS). This system will incorporate a real-time international tsunami warning capability. General Johnson asked for Congress's help to implement these programs.

Dr. Orcutt stressed that long-term maintenance of the Global Seismic Network (GSN) and tsunami detection systems is extremely important. He also argued that current GSN funding is inadequate. He stated there should be greater emphasis on the deployment of shore-based pressure gauges and on integration with Ocean Observatory Initiative plans. Finally, he recommended increasing our strategic knowledge of high-risk tsunami areas and

stated we should explore investing in inexpensive monitoring technology.

Dr. Lerner-Lam believes that the Administration's proposal lacks appropriate engineering R&D funds. In addition, he feels that the proposal must have a greater emphasis on involving regional, State and local agencies in the development of a comprehensive tsunami warning program. Finally, he stated that the Tsunami Warning System should be a part of GEOSS and that we must ensure interoperability among international partners.

Mr. Wilson stated that the most cost-effective means of protecting U.S. coastlines is providing long-term support for the state tsunami hazard mapping and mitigation programs. In addition, he recommended that the National Tsunami Hazard Mitigation Program be funded at an annual level of at least $7.8 million. Finally, he stressed the importance of educating the public about tsunami risks and evacuation procedures.

4.1(b)—Options for Hubble Science

February 2, 2005

Hearing Volume No. 109–2

Background

On February 2, 2005, the Science Committee held a Full Committee hearing to review options for the Hubble Space Telescope. Without servicing, Hubble is predicted to cease operation as early as 2007, though the exact time is uncertain.

The hearing's intent was to allow for discussion of various alternatives to save Hubble. These alternatives come from a report developed by the National Academy of Sciences (NAS), which proposed a Shuttle servicing mission; an analysis from the Aerospace Corporation, which proposed a rehosting option (Flying new cameras on a new satellite bus); and an internal study conducted at NASA, which proposed a robotic servicing mission. The hearing put to light each option and their different impacts on the scientific community and the space program. The hearing also considered the importance of Hubble research in general.

Summary of Hearing

Questions from the Committee Members focused on how to save Hubble rather than whether it is worth saving at all. Most Members focused on the results of the National Academy of Sciences report led by Dr. Lanzerotti who proposed that a Shuttle repair mission was the best option for saving the telescope. This suggestion was in direct conflict with NASA Administrator O'Keefe who announced that all Shuttle missions would only service ISS due to safety concerns after the *Columbia* accident.

For the Shuttle option, Members were particularly concerned with the safety of the crew. It was also unclear to the Members the exact cost of a Shuttle mission.

The other options presented were a robotic repair mission and a rehosting option. The primary concern regarding a robotic servicing mission was timing. The predicted schedule for such a mission could exceed the predicted life of the telescope. With respect to the

rehosting option, questions remained as to whether a science gap would exist between the time the Hubble would cease operations, and the time a new telescope would become operational. Additionally, the panel remained uncertain as to whether or not they would want a "Hubble Replacement" rather than another telescope if the money was available.

Discussion also focused on where funding for a Hubble repair mission would come from. For example, consideration was given to how much would come out of the science budget and how much would come out of the exploration budget. On this topic Rep. Gordon pointed out, "We really have two questions here. One is, what really is the cost, and secondly, how should it be allocated?" The panel believed that the Science program should pay the same amount it has paid in the past for Hubble servicing, about $350 million.

Finally, discussion turned to whether saving the Hubble is actually worth it in the first place given current budget constraints and the need for other priority of telescopes. Dr. Lanzerotti told Members, "As a scientist, I would say that if billions of dollars were going to come out of some other aspect of NASA's science program, such as Earth science, such as solar terrestrial science, then I would have a serious question about that."

4.1(c)—Improving the Nation's Energy Security: Can Cars and Trucks Be Made More Fuel Efficient?

February 9, 2005

Hearing Volume No. 109–3

Background

On February 9, 2005, the Committee on Science held a hearing on the availability of technologies to improve fuel economy in cars and trucks and the potential for fuel economy improvements to reduce the Nation's dependence on foreign oil.

The witness panel included: (1) the Honorable William Reilly, former Administrator of Environmental Protection Agency; (2) Dr. Paul Portney, President of Resources for the Future; (3) Mr. K.G. Duleep, Transportation Managing Director of Energy and Environmental Analysis, Inc.; (4) Mr. Michael Stanton, Vice President of Government Affairs at the Alliance of Automobile Manufacturers; (5) Dr. David Greene, Corporate Fellow at the National Transportation Research Center, Oak Ridge National Laboratory.

Summary of Hearing

The Members in attendance at the hearing expressed concern over various issues involving fuel economy, vehicle technologies, and energy independence. Discussion is summarized below.

Science Committee Chairman Boehlert opened the hearing by emphasizing that fuel economy is an energy issue, an environmental issue, and foremost, a national security issue. He highlighted that the U.S. is not doing enough to reduce reliance on foreign oil, and that almost 60 percent of U.S. oil consumption is used for transportation; 45 percent of it for cars and light trucks. He also noted that the Nation's fuel economy is lower than it was 15

years ago. The witnesses unanimously agreed with the Chairman that Corporate Average Fuel Economy (CAFE) standards could be increased without compromising safety.

Mr. Reilly stated that unless the U.S. can slow the rate of growth in oil demand and add more capacity to produce oil worldwide, the U.S. economy will continue to suffer from high and volatile oil prices, and is at risk of more frequent and serious supply disruptions. He stressed the importance of the National Commission on Energy Policy (NCEP) recommendations to boost ethanol through incentives as a means to combat any potential energy crunch. Reilly also warned of the potential harm to U.S. auto manufacturers because foreign firms have made more technological progress on advanced diesels and hybrid engines. He cited NCEP's recommendation to give domestic manufacturer incentives of $1.5 billion over 10 years for production of advanced technologies within the U.S.

Dr. Portney noted the National Academy of Sciences' conclusion that significant improvements in fuel economy are possible at reasonable costs. He noted that fuel economy of a mid-size sport utility vehicle could be improved by 24 percent from (21 to 28 miles per gallon), and that over the lifetime of a vehicle such improvements would save nearly 2,000 gallons of gasoline. He also emphasized that the quickest way to reach oil conservation goals would be to increase the gas tax, but that this might not be a popular or politically feasible solution.

Dr. Greene encouraged the adoption of technologies to improve fuel economy without leading automakers to make vehicles less safe, and explained that the aggregate national traffic fatality and fuel economy statistics provide no support for the hypothesis that increasing fuel economy leads to increased traffic fatalities. He said that weight-based standards can be formulated in various ways, be it to encourage weight increasing in cars, or discourage it. If formulated to discourage increasing car weight there would be a move toward advanced materials that could play a role in making safer and lighter cars.

Mr. Stanton agreed with Dr. Greene and National Academy of Sciences' conclusions that CAFE does not have to lead to less safe vehicles as long as fuel economy technologies are implemented by manufacturers. He said the automobile industry was not necessarily opposed to any increase in CAFE standards, but did not specify a level or schedule that would be acceptable. He also said that tax credits for advanced-technology vehicles would be a good way to promote fuel savings, and that in terms of CAFE any increased flexibility in the program would be beneficial.

Mr. Duleep discussed technologies that could improve fuel economy by about 25 percent and pay for themselves in fuel savings. He noted that under assumptions that consumer demand will reflect the same mix of vehicles and features in 2015, if you exclude hybrids or diesels, with existing conventional technologies manufacturers could get up to 33 miles per gallon for cars and 24 miles per gallon for trucks. Duleep added that many fuel economy technologies will come into the market regardless of Congressional action, and that they will eventually pay for themselves as increasing consumer demand addresses any market failure.

4.1(d)—An Overview of the Federal R&D Budget for Fiscal Year 2006

February 16, 2005

Hearing Volume No. 109–4

Background

On February 16, 2005, the House Science Committee held a hearing to consider President Bush's fiscal year 2006 (FY06) budget request for research and development (R&D). Five Administration witnesses reviewed the proposed budget in the context of the President's overall priorities in science and technology. The Science Committee held a separate hearing on February 17th to examine the budget request for the National Aeronautics and Space Administration (NASA)

The witnesses were: (1) Dr. John H. Marburger III, Science Advisor to the President, Director, Office of Science and Technology Policy; (2) Dr. Samuel W. Bodman, Secretary of Energy; (3) Dr. Arden Bement, Director, National Science Foundation; (4) Mr. Theodore W. Kassinger, Deputy Secretary of Commerce; and (5) Dr. Charles E. McQueary, Under Secretary for Science and Technology, Department of Homeland Security.

Summary of Hearing

Chairman Boehlert opened the hearing by stating that while R&D funding in the FY06 budget has kept pace with non-defense domestic discretionary spending as a whole, there are proposed cuts in funding for key science agencies. He was encouraged by plans to increase the budgets of the National Science Foundation and the National Institutes of Health, but added that reductions in funding for the Department of Energy Office of Science and education programs at NSF were detrimental to the maintenance of a healthy federal science establishment. Ranking Member Gordon added that the Administration was short-sighted in cutting the budget for R&D programs that could have a far reaching impact in the future.

Dr. Marburger summarized the highlights of the President's FY06 budget request during his testimony. He noted that the R&D budget reflects a focus on winning the war on terrorism while moderating growth in overall spending. The budget requests a record $132 billion for R&D spending, a $700 million increase over the FY05 request. Non-defense R&D spending is 5.6 percent of non-discretionary outlays, greater than the five percent average of the past three decades. Specific programs highlighted include (using the FY05 request as a base for comparison):

- The Department of Defense receives $5.5 billion for basic and applied research, a decline of $900 million. Dr. Marburger noted the dual civilian-military benefits of defense R&D.
- The National Science Foundation's budget increases 2.4 percent to $5.6 billion.

- At the Department of Energy, the Office of Science receives $3.5 billion, a $60 million decrease (in addition to a loss of $80 million in earmarks).
- The National Aeronautics and Space Administration's budget is increased by 2.4 percent to $16.5 billion. The agency will face hard choices in its programs, having to end some high-risk missions.
- The Administration allocates $1.9 billion to fund the Climate Change Science Program, leaving it at a flat funding level.
- The Hydrogen Fuel initiative receives a 16 percent increase to $260 million, leaving it on track to reach President Bush's five-year $1.2 billion goal.

Dr. Bodman testified on the FY06 request at the Office of Science in the Department of Energy (DOE). Many of its proposed research centers are moving efficiently towards operation. He added:

- DOE will move forward on FreedomCAR research and the Hydrogen Fuel Initiative. The Office fully supported the President's initiatives on fusion as well.
- DOE will move forward with U.S. participation in the International Thermonuclear Experimental Reactor. Indeed, high-energy physics continues to receive strong DOE support.
- The Department is very excited about the startup of the Spallation Neutron Source at its Oak Ridge National Laboratory, with the world's most intense neutron beam.
- Similarly, the Linac Coherent Light Source at the Stanford Linear Accelerator Center will provide drastically brighter x-rays by 2009.
- Four of five nanoscale science research centers will come on line in FY06.

Dr. Bement noted that the National Science Foundation (NSF) fared relatively well in light of the tight budget atmosphere, with a 2.4 percent increase to $5.6 billion. However, education at NSF will be decreased 12.4 percent to $737 million. Other significant investments include:

- An increase of $76 million to $250 million in funding to major research equipment, though no new projects are to begin.
- An increase of $46 million to $326 million for activities that advance organizational excellence at NSF. The added employees will augment accountability, security, and award oversight in NSF administration.
- Additionally, NSF will maintain its strong working relationship with the Department of Education to implement best practices in their math and science education initiatives.

Mr. Kassinger testified on R&D in the Department of Commerce budget request, whose Technology Administration, including the National Institute of Standards and Technology (NIST) and National Oceanic and Atmospheric Administration (NOAA), falls under the Committee's jurisdiction. He noted that the Technology

Administration received an allocation of $536 million for FY06. The details are as follows:

- The FY06 request proposes an additional $40 million for three areas of national priority: nano-manufacturing, measurement and standards for homeland security, and new measurement horizons.
- NOAA's budget request is $3.6 billion, including a $95 million increase to support Global Earth Observation System of Systems to better understand the complex interactions of Earth's climate.
- The request allocates $10 million to expand the U.S. Tsunami Warning Network, deploying 32 new advanced buoys. The system will be fully operational by mid-2007.
- Significant resources, more than $1 billion, are allocated to support the President's U.S. Ocean Action Plan for NOAA's coastal programs, fisheries, and protected species activities.

Dr. McQueary noted that the Science and Technology Directorate at the Department of Homeland Security requested a 23 percent increase to $1.37 billion. The Directorate's most important mission is to develop and deploy cutting-edge technologies and new capabilities in the service of homeland security. He continued:

- In addition to required funding, the budget will provide funds for planning for the National Bio and Agro Defense Facility, the development of a low-volatility agent warning system, consolidation of RD–10E units, and several more priorities.
- The Directorate's R&D effort is organized into four portfolios: biological countermeasures, chemical countermeasures, explosive countermeasures, and radiological/nuclear countermeasures.
- Efforts to protect the vital infrastructure are organized into two groups: threat and vulnerability testing and assessment, and critical cyber security infrastructure. Many other critical areas, such as counter-Man Portable Air Defense Systems and university fellowships, are also addressed by the Directorate.
- The Home Security Institute plays a key role in examining overall system architecture and integrating its separate pieces.

4.1(e)—NASA's Fiscal Year 2006 Budget Proposal

February 17, 2005

Hearing Volume No. 109–5

Background

On February 17, 2005, the Science Committee held a Full Committee hearing to examine the Administration's fiscal year 2006 budget request for NASA. NASA Deputy Administrator Fred Gregory was the sole witness, though other senior NASA officials joined him. While the hearing focused on the FY 2006 budget, it was also

meant to stimulate discussion on the President's Vision for Space Exploration.

Summary of Hearing

The hearing focused on several questions, which Chairman Boehlert had on NASA's current activities. Both Mr. Boehlert and Mr. Calvert said that they viewed the hearing as part of a series that will culminate in the introduction of a NASA authorization bill. Chairman Boehlert stressed his view that NASA was not the most important agency when it comes funding and that something "has to give" from their budget request.

Questions from the Members branched off of Boehlert's line of questioning which ranged from the number of Shuttle flights to plans for the CEV. Members learned that the Shuttle is the only vehicle capable of completing the ISS and that all Shuttle flights will be designated towards completing the ISS. The number of Shuttle flights is unknown, though Members were assured that NASA would fly as few as possible.

Until the Shuttle returns to flight, Members learned about the need to use Russian vehicles to reach ISS, however the *Iran Nonproliferation Act* may prevent NASA from this ability. Gregory admitted that this is an issue that still needs to be resolved and is being worked upon by the Agency, the State Department and the Administration.

Members heard foreboding news about NASA's workforce. Gregory testified that the NASA budget was stable until 2007. "We have adequate budget to cover all salaries for the next year and a half or so. During that time we will be assessing the Vision to determine the kind of resources that will be necessary including people and facilities," Gregory said. NASA expects that their workforce will be 2,000 less in 2007. "NASA is focusing on shifting activity towards the Exploration Visions," explained Gregory who added that more jobs would probably open as NASA gets a better idea of what is needed for the Vision.

4.1(f)—H.R. 798, Methamphetamine Remediation Research Act of 2005

March 3, 2005

Hearing Volume No. 109–6

Background

On Thursday, March 3, 2005, the House Science Committee held a hearing on H.R. 798, the *Methamphetamine Remediation Research Act of 2005,* legislation which would establish a federal research program and a program to develop voluntary guidelines to help states clean up and deal with the environmental consequences of methamphetamine laboratories.

Methamphetamine, also known as "meth," is a highly additive, powerful nervous system stimulant, and abuse of the drug is a growing problem throughout the United States. The availability of meth is particularly hard to control because the drug can be cheaply and easily manufactured in small clandestine laboratories, which

are located primarily in motels, rental apartments and other residential settings.

While the greatest and most obvious impacts of meth are on those who use the drug, meth labs may also harm those who come in contact with them, even after a lab is abandoned. The toxic brew involved in manufacturing meth can harm innocent parties, including first responders (such as firefighters who may become involved if a lab explodes—due to the volatility of the chemicals involved in the manufacturing process), future inhabitants of a former lab site (because chemicals may contaminate a site), and others through the environment (because chemicals may be poured down drains or otherwise enter the environment). According to the National Alliance for Model State Drug Laws, a federally funded, nonprofit organization, environmental cleanup and remediation of residential meth labs is a top issue for many State and local governments. (Cleanup refers to the initial removal of visible chemicals and equipment from a meth lab; remediation refers to dealing with residual contamination.)

On February 15, 2005, Ranking Member Bart Gordon, Congressman Ken Calvert and Chairman Sherwood Boehlert introduced H.R. 798, the *Methamphetamine Remediation Research Act of 2005.*

The Committee received testimony from: (1) Mr. Scott Burns, Deputy Director for State and Local Affairs at the White House Office of National Drug Control Policy; (2) Ms. Sherry Green, Executive Director, National Alliance for Model State Drug Laws; (3) Dr. John Martyny, Associate Professor, National Jewish Medical and Research Center; (4) Mr. Henry Hamilton, Assistant Commissioner for Public Protection, New York State Department of Environmental Conservation; (5) Mr. Gary Howard, Sheriff, Tioga County, New York; and (6) Dr. Robert Bell, President, Tennessee Technological University.

Summary of Hearing

- Mr. Burns described the extent of the meth problem in the U.S., the Federal Government's progress in reducing the number of meth labs and the findings and recommendations of the Administration's "National Synthetic Drugs Action Plan" regarding methamphetamine laboratories.
- Ms. Green described state efforts to address the cleanup and remediation of former methamphetamine laboratories.
- Dr. Martyny and Dr. Bell endorsed H.R. 798 and discussed the research needs related to residential meth labs.
- Sheriff Howard described the challenges faced by those who seize these hazardous labs and endorsed H.R. 798.
- Mr. Hamilton described the New York Department of Environmental Conservation's role in identifying and cleaning up contaminated sites and described the need for guidance to ensure the effective use of state resources and uniformity in response to meth labs.

Testimony, submitted for the record, from the National Multi-Housing Council and the National Apartment Association described

the challenges of small meth labs in residential, rental properties and expressed support for H.R. 798.

4.1(g)—The 2004 Presidential Awardees for Excellence in Mathematics and Science Teaching

April 14, 2005

Hearing Volume No. 109–9

Background

On April 14, 2005, the House Committee on Science held its annual hearing to hear from teachers on how the Federal Government can help improve K–12 math and science education. Five elementary school math and science teachers testified before the Committee. They were in town to receive the 2004 Presidential Award for Excellence in Mathematics and Science Teaching, the Nation's highest commendation for K–12 math and science educators.

The witnesses were: (1) Joyce Dodd, Bryson Middle School, Simpsonville, SC; (2) Cynthia Cliche, Homer Pittard Campus School, Murfreesboro, TN; (3) Cassandra Barnes, Oregon Trail Elementary School, Clackamas, OR; (4) Pita Martinez-McDonald, Cuba Elementary School, Cuba, NM; and (5) Lonna Sanderson, Will Davis Elementary School, Austin, TX.

Summary of Hearing

Chairman Boehlert opened the hearing by stating that he believes pre-college math and science education is the most important issue handled by the Science Committee. Educating students in math and science contributes to national security and economic development by developing a highly skilled engineering workforce. Ranking Member Gordon agreed, and added that he was interested in hearing from the teachers' perspective on the success of existing government education programs. Research Subcommittee Chairman Inglis reiterated the need for education to create workers to fill the growing domestic engineering job market.

Ms. Dodd testified that mathematics education helps prepare students for "life in the future" by stressing critical thinking skills. She endorsed the teacher education programs sponsored by the National Council of Teachers of Mathematics (NCTM), saying they helped her transition from a home economics teacher to a math teacher. She suggested that the Federal Government could improve math and science education by:

- Funding pre-service and in-service education training for elementary and high school math teachers, including certification courses and membership in professional societies to assist with content and teaching strategy education;
- Providing training for teachers on the use of innovative technologies with applications in the classroom;
- Emphasizing the need for math curriculum that teaches active learning strategies for development of critical thinking; and
- Encouraging women and girls to take math and science courses in high school and college.

Ms. Cliche reiterated the need for "meaningful learning" in math classrooms. She noted that current federal education policies encourage teachers to use textbooks rather than more effective hands-on techniques. The solution, she said, would be lifelong learning for teachers to instruct them in more creative teaching strategies. She advised that the Federal Government should:

- Encourage the use of hands-on learning to teach problem solving techniques that children can use throughout their life;
- Fund teacher travel to professional conferences to keep them up-to-date with innovative teaching practices;
- Utilize a variety of assessment tools throughout the year including journals, portfolios, and interviews instead of tests; and
- Provide computers and other technology to students and teachers.

Ms. Barnes added that the Federal Government should focus on improving teacher education programs. She argued that current programs do not have enough emphasis on active learning for teachers and described the ideal teacher education program as including:

- A long-term commitment for teachers that allows in depth discussion of mathematical concepts and teaching strategies;
- Mentoring relationships with veteran teachers to provide model lessons and advice on quality professional development programs; and
- Instruction on how to engage students in debating mathematical ideas to promote greater understanding, rather than depending on textbooks.

Ms. Sanderson agreed that hands-on education that emphasized problem solving was the best way to engage students in math and science. She suggested that science education could be improved by:

- Providing science equipment and supplies to all classrooms, including hands-on learning materials;
- Giving students and teachers access to technology in classrooms and labs; and
- Training teachers in science concepts, including those covered on standardized tests, and the use of learning technology tools.

Ms. Martinez-McDonald described the unique challenges of providing science education in a poor, rural district, including keeping students focused on learning in spite of economic and social hardship. She endorsed two existing programs as examples of methods for teacher training in rural areas, including:

- The Rural Systemic Initiative, a consortium of schools that provides professional development training;
- A long-term, National Science Foundation supported on-site workshop that identified deficiencies in science classrooms; and

- NASA online course materials and web accessible technology.

4.1(h)—NASA Earth Science

April 28, 2005

Hearing Volume No. 109–12

Background

On April 28, 2005, the Science Committee held a Full Committee hearing on the state of NASA's Earth Science efforts as the agency focuses towards space exploration. The hearing examined Earth science programs at NASA and the potential impact on those programs by the Agency's fiscal year 2006 (FY06) budget request, which would cut Earth science funding by eight percent below the FY05 appropriation and 12 percent below the FY04 request.

The witnesses included Mr. Alphonso Diaz, NASA Associate Administrator for the Science Mission Directorate; Dr. Berrien Moore, Co-Chairman of the NAS Decadal Survey, "Earth Observations from Space: A Community Assessment and Strategy for the Future," and Director of the Institute for the Study of Earth, Oceans, and Space at the University of New Hampshire; Dr. Tim Killeen, Director of the National Center for Atmospheric Research in Boulder, Colorado; Dr. Marcia McNutt, President and Chief Executive Officer of the Monterey Bay Aquarium Research Institute in Moss Landing, California; Dr. Sean Solomon, Director of the Department of Terrestrial Magnetism at the Carnegie Institution of Washington; and Dr. Ray Williamson, Research Professor in the Space Policy Institute at The George Washington University.

Summary of Hearing

A panel of expert witnesses, including the Chairman of a National Academy of Sciences (NAS) committee that recommended Earth science priorities for the next decade, warned Congress that repeated budget cuts threaten the vitality of Earth science programs at the National Aeronautics and Space Administration (NASA), as many Earth science missions have been downsized, delayed, or outright canceled.

"I'm very pleased that NASA's new Administrator, Mike Griffin, has very clearly and unequivocally reinforced NASA's commitment to Earth science," Chairman Boehlert said in convening the hearing. "The NAS report has to be a red flag for all of us. We need to stop, examine what's happening, and make sure that the fiscal 2006 budget for NASA—whatever its top-level number—include adequate funding to keep Earth science moving forward for the foreseeable future. We need a vision for Earth science, and priorities for Earth science, just as much as we do for exploration and aeronautics."

Space and Aeronautics Subcommittee Chairman Calvert said, "The insights and observations we heard today were helpful for the Committee to give appropriate oversight for NASA's long-term strategic vision for conducting Earth sciences. It is vital that Congress closely examine the limited budget resources within the agency to ensure NASA can focus on their core mission."

NASA Associate Administrator Diaz said in his testimony that the Agency's Earth science missions have been refocused to support the President's Vision for Space Exploration. "NASA is committed to making the necessary transformation to ensure our success in achieving the Vision for an affordable and sustainable space exploration program." Explaining NASA's emphasis on Earth science programs that support the exploration Vision, Mr. Diaz told the Committee, "The technological tools and scientific skills that NASA continues to develop through studying Earth. . .are critical in the exploration and search for life on other planets in our own solar system and beyond."

In response to a request from NASA, the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Geologic Survey (USGS), the National Research Council (NRC) of the National Academy of Sciences is conducting a decadal survey, "Earth Observations from Space: A Community Assessment and Strategy for the Future," in which members of the Earth science community are outlining programmatic and budgetary priorities related to Earth observation for the next decade. The final report is due in late 2006, but the NRC committee released an interim report prior to the hearing.

Citing several examples of the impact of budget cuts to NASA's Earth science missions, Dr. Moore, Co-Chair of the NRC committee, testified that the Nation's Earth observation system is "at risk of collapse." He explained, "NASA has no plan to replace its Earth Observing System platforms after their nominal six year lifetimes end—beginning with the end of the Terra satellite mission in 2005—and it has canceled, scaled back, or delayed at least six planned missions, including a Landsat continuity mission." Dr. Moore added, "These decisions at NASA appear to be driven by a major shift in priorities as the agency moves to implement a new vision for space exploration."

4.1(i)—The Future of Computer Science Research in the U.S.

May 12, 2005

Hearing Volume No. 109–14

Background

On May 12, 2005, the House Science Committee held a hearing to examine the state of computer science research in the United States and the evolution of federal support for this field. Specifically, the hearing examined the controversy surrounding the apparent shift away from basic research in overall federal support for computer science and the impact of the shift on federal agencies, academia and industry.

The witnesses were: (1) Dr. John H. Marburger III, Director, Office of Science and Technology Policy (OSTP); (2) Dr. Anthony J. Tether, Director, Defense Advanced Research Projects Agency (DARPA); (3) Dr. William A. Wulf, President, National Academy of Engineering; and (4) Dr. Tom Leighton, Chief Scientist and co-founder, Akamai Technologies.

Summary of Hearing

Chairman Boehlert stated that looking at computer science funding involves looking at our nation's future prosperity and security. Innovative information technology facilitates almost all personal and commercial activity, however it is often taken for granted. The Chairman then established the purpose of this hearing; to look at the strategic investments the Federal Government has made and will continue to make to maintain the United States' position as world leader on information technology. He illustrated the "recipe for success" which involves significant funding for long-term, fundamental computer science research (i.e., cyber security), and partnerships with universities.

Representative Davis displayed a chart from a 1995 National Academy of Sciences report on the value of the federal, multi-agency High Performance Computing and Communications programs. The chart traces the intertwined government and private sector research efforts that ultimately led to the development of the information technology industry including developments like the Internet. Representative Davis stressed how computer science research has resulted in substantial payoffs for the United States economy.

Dr. Marburger spoke to the need of federally sponsored R&D through the multi-agency Networking and Information Technology Research and Development Program (NITRD) to support advances in all areas of science and engineering that benefit our growing economy.

- FY 2006 budget for NITRD is $2.2 billion, elevating the Administration's cumulative five-year investment to $10.4 billion.
- The multi-agency approach of NITRD supports breadth and diversity of independent programs while also encouraging collaborative efforts.
- One example of collaborative work is the High-End Computing University Research Activity, a new multi-agency program emerging from OSTP's High-End Computing Revitalization Task Force of 2003. Funded by DARPA, Department of Energy, National Security Agency, and National Science Foundation (NSF), this program focuses on basic research in support of applications and software for high-performance computing systems.
- He agreed with a recent report from the President's Information Technology Advisory Committee that recommended improved coordination of federal cyber security R&D activities to increase the efficiency and effectiveness of the government's investment in information technology.
- Finally, he described several NSF information technology research programs and emphasized NSF's commitment to and increasing investments in this area. He also noted DARPA's declining funding for programs within the NITRD activity.

Dr. Tether spoke of DARPA's mission to bridge the gap between blue sky research and actual working systems.

- He described how DARPA's focus on national security problems tends to lead to funding of multi-disciplinary research,

and provided examples from DARPA's past: Material Science (1960s), Computer Science (1960s), Stealth (1970s), Analog, Optical, and Radio Frequency Electronics (1980s and 1990s), and Bio:Info:Micro (recently).

- He stated that he believed that overall DARPA funding for university research was flat (at approximately $450 million a year) and hence funding for other disciplines must be growing at the expense of computer science.
- He also mentioned DARPA's growing interest in cognitive computing, or "computers that learn."

Dr. Wulf spoke from the perspective of an academic who has received federal support from both DARPA and NSF, who has founded a software company, and who has run an NSF research directorate.

- Investing in computer science research provides an infrastructure for support of other fields such as science, engineering and commerce. The impact of computer science research can be seen in more efficient and effective computing systems in fields from cosmology to weather prediction to health care and even in Wal-Mart's "just in time" delivery system.
- He spoke of the decline in NSF grant success rate and the resulting change in behavior of the computer science research community: more time is being spent writing proposals rather than doing research, and more incremental proposals are replacing those that seek to advance bold ideas.
- He also expressed concern about DARPA's shift in focus to rapid development and near-term topics.
- At a time of growing global competition, DARPA's disinvestment in university-based, long-term computer science research poses a threat to the competitive edge the United States currently holds in innovation and hinders the U.S. ability to produce the next generation of people with expertise in information technology.

Dr. Leighton primarily focused on how the Federal Government's support of cyber security research could be improved. His comments were based on the February report on this topic by the President's Information Technology Advisory Committee (PITAC).

- Virtually every sector of the Nation's infrastructure—including communications, utilities, finance, transportation, law enforcement, and defense—is now critically reliant on networking technology. Yet while cyber attacks have continued to grow, costing the Nation billions of dollars annually, federal research and development investment in the area of cyber security has not kept up.
- Recently, DARPA has shifted information technology funding away from basic research at universities in favor of classified work and more development-related projects. The Department of Homeland Security spends less than two percent of the science and technology budget on cyber security. Of that

amount, less than one-tenth ($2 million) is spent on fundamental cyber security research.

- NSF currently has the only substantial civilian program for cyber security research, which is itself under-funded. In 2004, NSF was able to provide funding for just eight percent of the research proposals submitted in this area.
- The PITAC report recommends that the NSF budget for cyber security be increased by $90 million annually and that DARPA restore its historical role of funding basic, unclassified research in cyber security. It also recommends that DHS expand its funding for cyber security research.

4.1(j)—Business Actions Reducing Greenhouse Gas Emissions

June 8, 2005

Hearing Volume No. 109–16

Background

On June 8, 2005, the House Committee on Science, held a hearing, "Business Actions to Reduce Greenhouse Gas Emissions." The hearing focused on what several leading businesses in a variety of industries are doing to reduce emissions of greenhouse gases.

The Bush Administration has initiated a number of programs to encourage businesses to take voluntary actions to reduce emissions of greenhouse gases. Either as part of the Administration programs or other efforts, many U.S. companies are working to reduce greenhouse gas emissions. Some companies have begun simply by taking stock of the emissions they produce. Others have set targets for reducing their emissions and are taking steps to meet them by improving energy efficiency, switching to energy sources that produce fewer greenhouse gases, or eliminating greenhouse gases from manufacturing processes.

The motivations of these companies vary. Some find the scientific evidence of a changing climate compelling. Others face domestic or international competitive pressure, while others face pressure from lenders or shareholders. Some see advantage in creating new products or businesses that may hold a competitive advantage in future markets. Still others see financial risk to their businesses should the climate change substantially.

The Committee explored the following overarching questions at the hearing:

1. What concrete actions are businesses taking to reduce greenhouse gas emissions? In what ways are these actions beneficial to the company?
2. Why are businesses taking these actions and what are the most important drivers for them?

The Committee heard from: (1) Mr. James Rogers, Chairman, CEO and President, of Cinergy Corporation; (2) Dr. Mack McFarland, Environmental Manager of the Fluorochemicals Business for E.I. DuPont de Nemours and Company; (3) Mr. Ron Meissen, Senior Director of Engineering, Environment, Health & Safety for Bax-

ter International Incorporated; and (4) Robert Hobbs, Director of Operations of the United Technologies Research Center for United Technologies Corporation (UTC).

Summary of Hearing

Mr. Rogers testified that Cinergy Corporation's position on climate change has evolved. Cinergy now believes that the world is warming and that human activities have contributed to this warming. According to Mr. Rogers, Cinergy has voluntarily committed to reduce its greenhouse gas emissions to five percent below 2000 levels by the period of 2010 to 2012. Furthermore, he testified that if science concludes human activity does not affect climate, Cinergy will still benefit by having developed technology and business practices that make the economy cleaner, more efficient and more self-reliant.

Dr. McFarland testified that science underpins DuPont's approach to global climate change. In 1991, DuPont set a goal to reduce greenhouse gas emissions by 40 percent below 1990 levels on a global carbon equivalent basis by 2000. DuPont exceeded this goal and has set a new goal to reduce global carbon equivalent greenhouse gas emissions by 65 percent below 1990 levels by 2010. Furthermore, DuPont is committed to holding carbon dioxide emissions from energy use at 1990 levels. Finally, DuPont is committed to acquiring 10 percent of its global energy in the year 2010 from renewable sources. According to Dr. McFarland, DuPont had exceeded its emissions reduction goal by 2004 and had held energy use flat, while global production grew over 30 percent.

Mr. Meissen testified that Baxter has taken proactive steps to track its energy usage, improve its efficiency and eliminate production waste. Baxter achieved a 35 percent per unit reduction in greenhouse gas emissions from 1996–2004 and a 22 percent improvement in energy efficiency during the same period. According to Mr. Meissen, these efforts have yielded significant savings over the past eight years. In 2004 alone, Baxter estimated that its energy savings and cost avoidance exceeded $9 million. Mr. Meissen also stated that in addition to cost savings, Baxter's emissions reductions initiatives have yielded higher quality levels, greater productivity, and improvements in workplace safety. Finally, Mr. Meissen praised the benefits of collaboration through public and private partnerships, such as the U.S. EPA's Climate Leaders Program and the Green Supplier Network.

Dr. Hobbs testified that UTC has reduced its global energy consumption by 40 percent since 1997. During this same period UTC revenues have increased by $9.5 billion, showing that environmental quality and economic growth can go hand-in-hand. Dr. Hobbs stated that setting goals for reduced energy consumption, which leads to lower greenhouse gas emissions, has improved UTC's bottom line performance by lowering production costs and increasing competitiveness. He cited a UTC Power product, the PureComfort 240M, which is the industry's first integrated microturbine and double-effect absorption chiller system. UTC expects this product to reduce carbon dioxide emissions by 40 percent and nitrogen oxide emissions by 90 percent.

4.1(k)—The Future of NASA

June 28, 2005

Hearing Volume No. 109–19

Background

On June 28, 2005, the Science Committee held a Full Committee hearing on the Future of NASA. The hearing's intent was to examine Administrator Griffin's philosophy and plans for NASA's programs in human space flight, space science, Earth science, and aeronautics, as well as plans for the agency's workforce, organization, and infrastructure.

NASA Administrator Dr. Michael D. Griffin was the sole witness.

Summary of Hearing

Chairman Boehlert opened the hearing by stating that much is at stake at NASA and that Dr. Griffin has entered at a crucial time where NASA faces many significant hurdles. The Chairman also stated that he is solidly in support of an authorization bill that includes the President's Vision for Exploration, but also made it clear that human space flight should not be the sole mission of NASA.

Questions from the Members touched on a variety of issues confronting the Administration. On the question of research for the International Space Station (ISS), Dr. Griffin explained that a defined research agenda was still under construction; however he did hint that high priority research would concentrate on human factors for exploration. This type of research shows NASA's intent to reorient the Space Station's mission to focus on human exploration rather than fundamental life science research.

On the topic of Shuttle flights, Dr. Griffin revealed that 28 flights probably won't happen by 2010. Currently the Agency is working on a redefined manifest for Shuttle flights that can be executed with a high degree of confidence within the next five years to finish assembly of the ISS, but the amount of flights is still uncertain. He also indicated that the quantity of Shuttle flights will also affect the research agenda on the Space Station.

Griffin also revealed several other important developments to Members including the cancellation of the Prometheus demonstration mission. Dr. Griffin testified that the $11 billion price tag for the mission was just too much and explained that the near-term need for nuclear capability will be on the surface of the Moon in the middle or towards the end of the next decade.

On the issue of the Hubble Space Telescope, he disclosed that preliminary work was being done to determine if a Shuttle servicing mission is viable. If the work turned out favorable, he acknowledged that he would possibly recommend a Hubble servicing mission upon successful return-to-flight of the Shuttle.

Dr. Griffin also testified that the Lunar Architecture was still being drafted, but he would have more information for Members in September.

Regarding financial management, Dr. Griffin admitted that NASA's processes and controls were severely lacking. He vowed to make the issue a priority and indicated that he had three main

issues to resolve: first, NASA needs to be able to account for how money is spent; second, NASA needs to resolve issues of control of distribution; and third NASA needs to standardize its reporting methodologies. He stated that his major goal going forward is to reconcile the fund balance with treasury accounts.

In regards to NASA's workforce, Dr. Griffin assured Members that there would be no layoffs until 2007. He also expressed an interest and the need for a new aeronautics strategy.

On his philosophy for NASA, Dr. Griffin showed strong support for American competitiveness. Dr. Griffin told Members that he wants to narrow the gap between Shuttle retirement and the CEV development because of his concern for U.S. dependency. "The U.S. is in a position where we can not effectively utilize the ISS without Russian partners. I believe it's strategically essential that the U.S. have its own access to space, dependent on no other nation," he said.

He also expressed that "space will be explored and exploited by humans. The question is which humans from where and what language will they speak. It is my goal that Americans will be always among them."

4.1(l)—U.S. Competitiveness: The Innovation Challenge

July 21, 2005

Hearing Volume No. 109–24

Background

On July 21, 2005, the Committee on Science of the House of Representatives held a hearing to examine the relationship between federal science and engineering research and education investments and U.S. economic competitiveness.

The witnesses were: 1) Mr. Nicholas Donofrio, Executive Vice President for Innovation and Technology at IBM Corporation, 2) Mr. John Morgridge, Chairman of Cisco Systems, Incorporated, and part-time Professor at Stanford University's Graduate School of Business, and 3) Dr. William Brody, President of The Johns Hopkins University and Co-Chair of the Council on Competitiveness National Innovation Initiative.

Summary of Hearing

Chairman Boehlert opened the hearing by noting that the growth of the United States' economy is dependent on support for science, technology, and education, and that increased investments by foreign competitors in these areas has strengthened their innovation capacity and ability to compete with the U.S. on the world stage. He added that Members of Congress are working to bring more attention to the issue through the upcoming Innovation Summit and through work with the Council on Competitiveness on the National Innovation Initiative. He called on legislators to work to replicate the conditions that fostered the technology-driven economy of the 1990's in order to maintain Americans' standard of living.

Representative Costello agreed that the United States' economic competitiveness is due to the excellence of its science and tech-

nology enterprise. He urged the Congress and Administration to support additional funding for science and technology in appropriations, noting that the current proposed budget for science and technology is a reduction from the previous year and that appropriated increases fall short of inflation. He said that education should remain a primary focus in order to increase jobs in the U.S. and remain competitive in global markets.

Mr. Donofrio discussed the challenges of innovation in the information technology industry and the role that IT innovation plays in the U.S. economy. New economic growth is being driven by new computing technology and the resultant new business models, but continued competitiveness depends on the availability of an up-to-date workforce. He said:

- Innovation is driven in large part by federal supply of research and demand for products.
- Educators must address the need for a technologically-literate and innovative workforce by concentrating on problem-based learning. The U.S. economy is becoming increasingly services-based, and companies must be able to use technology to solve problems.
- IT advancements drive innovation among businesses and educational institutions by providing improved communication infrastructure.
- Minority participation in STEM fields is currently inadequate and must be increased to insure a sustainable innovation workforce.
- Collaboration between industry, government, and educational institutions is necessary for the U.S. to remain competitive in the face of rapid innovation in developing countries.

Mr. Morgridge agreed that a sound educational system is the foundation for keeping the U.S. a technology and innovation leader. Policies that support access to technology also foster innovation by expanding the pool of contributors to the "innovation ecosystem." He argued:

- U.S. high schools are not providing a curriculum that gives students the necessary background to succeed in science and engineering fields.
- Keeping U.S.-educated foreign students make important contributions to innovation in the U.S. and should be given incentives to stay following graduation.
- Increased funding for basic research at universities can nurture advanced technology development.
- Physical infrastructure improvements, especially providing universal broadband access, will support innovation at all levels.

Dr. Brody also noted that basic research in universities is critical for fostering innovation in industry. Basic research provides the background knowledge necessary for future technology developments in spite of lacking short-term goals, and is drastically under-

funded in universities because of the risk of minimal payoffs. He said:

- Basic research at universities provided the foundation for the Internet and the development of related technologies, such as routers and personal computers.
- Increased funding for NSF to provide scholarships for math, science, and engineering students would fill holes in the talent pool for industry. Doubling the Foundation's budget would help add needed funds for research in the physical sciences, mathematics, and information sciences.
- Focusing on long-term goals, especially at DARPA, will provide increased incentives for graduate research in critical areas and ensure continuity in advancing technology.
- The lack of funding for science and engineering students at American universities presents a national security dilemma. Scientists are needed for defense work, and many of these jobs require security clearance that can only go to U.S. citizens. The dearth of qualified U.S. citizens leaves the Department of Defense either understaffed or forced to take on noncitizens, which could pose a security risk.

4.1(m)—Cyber Security: U.S. Vulnerability and Preparedness

September 15, 2005

Hearing Volume No. 109–25

Background

On September 15, 2005, the House Science Committee held a hearing to examine the extent of U.S. vulnerability to cyber attacks on critical infrastructure such as utility systems, and what the Federal Government and private sector are doing, and should be doing, to prevent and prepare for such attacks. The hearing also examined what duties should be given to the new Assistant Secretary for Cyber Security and Telecommunications at the Department of Homeland Security.

The witnesses were: (1) Mr. Donald "Andy" Purdy, Acting Director of the National Cyber Security Division, Department of Homeland Security (DHS); (2) Mr. John Leggate, Chief Information Officer, BP Inc.; (3) Mr. David Kepler, Corporate Vice President of Shared Services and Chief Information Officer, The Dow Chemical Company; (4) Mr. Gerald Freese, Director of Enterprise Information Security, American Electric Power; and (5) Mr. Andrew Geisse, Chief Information Officer, SBC Services Inc..

Summary of Hearing

Chairman Boehlert opened the hearing by stressing the importance of cyber security and mentioned the implementation of the Science Committee's *Cyber Security Research and Development Act* and creation of the Assistant Secretary for Cyber Security position within DHS as examples of progress in cyber security. He cautioned that there is still a "very long way to go" in the area of preparedness and emphasized that, since cyber attacks can arise from

a variety of sources and motivations, it is important to focus cyber security preparedness on more than just cyber terrorism. Chairman Boehlert then established the goals of the hearing: help develop a cyber security agenda for the Federal Government to guide the priorities of the new DHS Assistant Secretary for Cyber Security.

Ranking Minority Member Bart Gordon also stressed the "urgency and seriousness" of cyber security and mentioned two goals for the hearing: (1) assess the progress in improving the security of computer systems on which critical industries rely and (2) explore why progress has been so slow. As an example, Mr. Gordon mentioned a GAO report that found DHS "has not yet developed national cyber threat and vulnerability assessments or government/industry contingencies to recovery plans for cyber security." In addition, he emphasized the importance of information sharing between DHS and industry in building better cyber security and the importance of preparedness in cyber security.

Mr. Purdy described the work that the DHS National Cyber Security Division (NCSD) has been doing to secure national cyberspace and infrastructure. In particular he focused on two priorities for NCSD: building an effective National Cyberspace Response System and implementing a cyber risk management program for critical infrastructure protection.

- The US–CERT Operations Center acts to facilitate information sharing and a coordinated response between public and private sectors, and DHS is working on developing additional ways to facilitate the transfer of information from the private sector to the government in a protected way.
- The National Cyber Response Coordination Group, a collaboration between NCSD, the Department of Defense, and the Department of Justice, acts to facilitate coordinated preparation and response by the federal agencies for a cyber incident.
- DHS has established an Internet Disruption Working Group to prepare for and protect against Internet disruption and aid in the recovery of Internet functions following a major incident.
- DHS has instituted a Software Assurance Program to encourage improvements in software quality and security during the software development cycle and to address defects in software that could be exploited in cyber attacks.
- One of the priorities of NCSD is the Control Systems Security Program, a partnership with the Idaho National Laboratory, other national laboratories, and the private sector. Activities include a test bed to assess control systems vulnerabilities and potential fixes and outreach efforts to raise awareness about control systems issues and encourage security improvements.

Mr. Leggate offered his testimony on the importance of cyber security as it relates to the conduct of business, especially in critical infrastructure sectors.

- Industry is currently switching from using private networks to taking advantage of the Internet. One survey estimates

that 30 percent of the revenue from the energy, chemical, and transport sectors is dependent on the Internet.

- Protection of the Internet requires a combination of cyber and physical security and requires safeguarding of critical physical points as well as security of information systems.
- He emphasized that there are two main tasks related to Internet security—securing the Internet we have today, and establishing appropriate security in the next generation of the Internet. In the first task, one of the challenges is focusing efforts toward the most serious and disruptive cyber attacks (weeding out the noise). Going forward, it will be important to coordinate internationally and to consider a worldwide strategy, or "technology development map," to ensure continued inter-operability and support world trade.

Mr. Kepler described the role of information technology in the chemical industry, the cyber threats faced, and what is being done to address these threats.

- A chemical industry assessment study indicates that a breach of cyber security "would not cause cascading impact across the chemical industry." The highest concern is a combined cyber and physical attack.
- Specific areas of concern for the chemical industry include having a person with malicious intent: (1) use shipment, product, or site information to construct a physical attack, (2) illegally obtain chemicals, or (3) gain inappropriate access to vital systems.
- To combat these concerns, Dow has conducted a comprehensive cyber security risk analysis, including a review of physical, process, and cyber vulnerabilities, and developed a company-wide cyber security management plan.
- He believes that DHS efforts and money should focus on issues that have the potential to impact the cyber security of multiple industry sectors, such as methods for protecting communication during a national emergency, threat monitoring and modeling, authentication methods, and information protection technologies.

Mr. Freese testified on cyber security issues affecting the electricity sector.

- The electricity sector is building toward a permanent, infrastructure protection standard for cyber security. Due to the integration of the electricity and telecommunications sectors, a cyber attack on one would have serious repercussions for both.
- Existing security solutions cannot be widely deployed across the electricity sector, due to the diversity and age of the control systems technologies currently installed. This old infrastructure needs to be rebuilt with the next generation of equipment and technology to create a robust and secure infrastructure.
- He believes that the Assistant Secretary for Cyber Security and Telecommunications should focus on creating greater

awareness of critical infrastructure interdependencies, strengthening information sharing between government and the private sector, and establishing true, non-prescriptive partnerships. While the sharing of information on critical infrastructure assets with DHS is important, currently there is a concern in industry that information shared with DHS can not be protected from disclosure.

Mr. Geisse addressed cyber security within the communications industry.

- SBC uses both physical and cyber measures to ensure the security of both customer-serving network facilities and internal information services.
- SBC works with government agencies on a daily basis to receive and share security-related information. Federal programs could also help educate and assist consumers to understand their roles and responsibilities in a connected world.
- The communication industry depends heavily on the products provided by information technology vendors, and hence critical infrastructure's cyber security depends on the quality and integrity of these products. Cyber security should be a priority during the creation of new information technologies.
- He believes that DHS should continue to support cyber security research, support organizations that develop cyber security standards and best practices, and provide early warnings of cyber security events. In addition, he believes that cyber security laws should carry serious penalties for those that break them.

4.1(n)—NOAA Hurricane Forecasting

October 7, 2005

Hearing Volume No. 109–26

Background

On October 7, 2005, the Committee on Science, held a hearing, "NOAA Hurricane Forecasting." The Committee held the hearing to better understand the prediction of hurricanes and the outlook for the remainder of the 2005 hurricane season.

In the United States, the Atlantic hurricane season is from June 1 to November 30. The National Weather Service (NWS), which is part of the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce, has responsibility "to provide weather, hydrologic, and climate forecasts and warnings for the United States, its territories, and adjacent waters, for the protection of life and property and the enhancement of the national economy." The National Hurricane Center in Miami, which is part of NWS, monitors and forecasts tropical storms and hurricanes in the Atlantic and Northeast Pacific oceans.

The witnesses were asked to address the following questions in their testimony.

1. What are the different responsibilities of the National Hurricane Center and local weather forecast offices when a tropical storm or hurricane threatens the United States?
2. What were the timelines of Katrina and Rita progressing from tropical depressions to major hurricanes and when were warnings issued to the public and to federal, State and local officials? Was there any difference in how the National Weather Service forecast and issued warnings for these two major hurricanes?
3. What is the outlook for the remainder of the 2005 hurricane season and for the next five to 10 years? Are we in a period of increased hurricane frequency and/or intensity? If so, what is the likely cause of this increase?
4. What can be done to improve prediction of hurricanes, both in the short-term and in the long-term?

The Committee heard from: (1) Gen. David L. Johnson (ret.), Director of the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS); and (2) Mr. Max Mayfield, Director of the NWS's National Hurricane Center.

Summary of Hearing

General Johnson testified that the National Hurricane Center (NHC) is "responsible for predicting the path and intensity of the storm, issuing coastal hurricane watches and warnings, and describing broad impacts to the areas impacted, including projected storm surge levels." Following each hurricane season, NOAA examines its efforts and determines where improvements can be made. Johnson stated that Local National Weather Service Office and River Forecast Centers also play a critical role by using their local expertise to disseminate hurricane information most effectively.

NOAA collects data from satellites, aircraft and the ocean surface to improve prediction of hurricane intensity and track. Johnson stated that storm track forecasts have improved dramatically, while storm intensity forecasts have shown less improvement. According to Johnson, NOAA will use programs such as the Global Earth Observation System of Systems (GEOSS) to improve hurricane analyses. Johnson stated that NOAA is now at the point for storm intensity prediction that it was at 10 years ago for track prediction. NOAA is developing the Hurricane Weather and Research Forecasting System to improve hurricane prediction. This system will combine an advanced wave model with a dynamic storm surge model to improve prediction of coastal impacts.

Mr. Mayfield testified that the destruction from Hurricane Katrina was "like nothing [he] ever witnessed." However, without NOAA forecasts and warnings, the loss of life from the hurricane could have been much worse. According to Mr. Mayfield, NOAA began issuing tropical cyclone forecasts every six hours when Katrina began as a tropical depression near the Southeast Bahamas on August 23rd. Mr. Mayfield stated the NHC accurately predicted that Katrina would become a Category 1 hurricane before making landfall near Miami. He said that the NHC correctly predicted a re-intensification of the storm as it moved into the Gulf of Mexico. Katrina intensified from a Tropical Storm into a Cat-

egory 2 hurricane within nine hours of entering the Gulf. It eventually reached Category 5 status. On Saturday morning, August 27th, the NHC forecast had the track of the storm curving northward and heading directly towards Southeast Louisiana and Mississippi, making landfall as a Category 4 hurricane. At 10:00 AM, August 27th, the NHC posted a hurricane watch for Southeast Louisiana. Katrina made final landfall along the Louisiana/Mississippi border on Monday morning as a Category 3 hurricane.

Hurricane Rita began as a tropical depression on Saturday, September 17th east of the Turks and Caicos Islands. According to Mr. Mayfield, the NHC correctly predicted storm to pass south of the Florida Keys as a hurricane on September 20 and predicted it to become a major hurricane as it moved over the warm waters of the Gulf of Mexico. Rita also strengthened to Category 5 status. On Thursday, approximately two days before Rita made landfall, Mr. Mayfield stated that the NHC shifted its track forecast eastward to just west of the Texas/Louisiana border. The NHC accurately predicted that Rita would weaken before making landfall but still come ashore as a Category 3 hurricane.

Mr. Mayfield described the role of the Hurricane Liaison Team (HLT), a partnership between the NWS and the Federal Emergency Management Agency (FEMA), made up of federal, State and local emergency officials. The HLT is deployed by the NHC to support hurricane response communications between the NHC and emergency managers of all levels. Once the HLT is activated, FEMA hosts national audio and video conference calls, where the NHC provides forecasts. Mr. Mayfield also recognized the critical role of the media in disseminating information.

Mr. Mayfield testified that he believes the heightened hurricane activity will continue due to multi-decadal variations. He believes the current threat of heightened hurricane activity could last another 10 to 20 years. He also stated that we also must prepare for hurricanes in the future. According to Mr. Mayfield, there are many areas in the country which are vulnerable to hurricanes, including Galveston/Houston, Tampa Bay, southwestern Florida, New York City, Long Island and New England.

During the question and answer session, Mr. Ehlers asked whether there is a mechanism in place which confirms that other federal, State and local agencies have heard the NHC warnings. Mr. Mayfield stated that the local office handles the role call. He said there is an office role call, rather than an individual role call.

Mr. Gordon asked Mr. Mayfield if he had told emergency officials to prepare for a Category Five hurricane during his August 28 briefing. Mr. Mayfield confirmed that he had.

Mr. Gutknecht asked how many hurricanes we can expect in the future as well as this year. Mr. Mayfield, citing the current increase in hurricane activity, said, "Well, we've got some not very good news here," adding, "this period will likely last another 10, 20 years or more." Mayfield also told the Committee that the U.S. can expect at least two more hurricanes this season.

General Johnson said, "Hurricanes Katrina and Rita will not be the last major hurricanes to hit a vulnerable area, and New Orleans is not the only location vulnerable to a large disaster from a land-falling hurricane. Houston/Galveston, Tampa Bay, south-

western Florida, the Florida Keys, southeastern Florida, New York City/Long Island, and New England, are all especially vulnerable."

4.1(o)—Science, Technology, and Global Economic Competitiveness

October 20, 2005

Hearing Volume No. 109–27

Background

On October 20, 2005, the House Science Committee held a hearing to receive testimony on the report released by the National Academy of Sciences on October 12 entitled, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future.* The report, which was requested by Congress, recommends ways to strengthen research and education in science and technology.

The witnesses were: (1) Mr. Norman R. Augustine, Retired Chairman and CEO of the Lockheed Martin Corporation (Mr. Augustine chaired the National Academy of Sciences (NAS) committee that wrote the report), (2) Dr. P. Roy Vagelos, Retired Chairman and CEO of Merck & Co. (Dr. Vagelos served on the NAS committee that wrote the report), and (3) Dr. William A. Wulf, President of the National Academy of Engineering and Vice Chair of the National Research Council, the principal operating arm of the National Academies of Sciences and Engineering.

Summary of Hearing

Chairman Boehlert opened the hearing by praising the National Academies for seeking effective responses to the menace to U.S. dominance in the fields of science and technology. He argued that while the Science Committee and Congress have pushed for higher funding for programs that promote innovation and basic and applied research, federal support for science and technology is inadequate. The purpose of the hearing, he said, would be to bring to Congress' attention the connection between funding for scientific research and education and U.S. economic competitiveness with newly developing countries that have established strong and quickly growing technology enterprises.

Ranking Member Gordon agreed that support for increased amounts of federal funding for R&D is an essential part of ensuring continued competitiveness in the face of new rivalry from countries that can supply many more qualified workers for much lower wages. He added that he hoped the hearing would address the connection between R&D funding and the creation of additional jobs in the U.S. as opposed to further offshoring.

Mr. Augustine discussed the findings of the National Academies committee that authored the report, including that the American standard of living in the near future will depend greatly on the quality of available jobs, and that those jobs will only be available if the Federal Government makes significant changes to its science and technology policy.

- Job competition in the near future will be global, not local. A low-cost but highly trained labor force in developing countries is the primary threat to domestic employment. However, job growth in developing countries should not be discouraged because increased purchasing power and production abroad can create both new products and customers for American companies and consumers.
- Solving the problems of global economic competition requires significant improvements to America's K–12 and higher education systems. The supply of qualified teachers should be broadened through training for those currently teaching and incentives to encourage students with science and technology degrees to go into teaching. In addition, younger students should be encouraged to pursue science and technology studies early on.
- Greater support for basic research is an additional component of a competitive national economy. Federal investments in basic research should focus on the physical sciences, mathematics, engineering, and information sciences, and federal agencies should set aside specific funding dedicated to innovative and risky research in their mission areas.
- The Federal Government must create an environment that fosters innovation in industry. Ways to improve the U.S. environment for innovation could include increasing the R&D tax credit, ensuring universal broadband access, and enhancing intellectual property protections.

Dr. Vagelos focused his testimony on the challenges facing K–12 education in the United States. He cited the concerns of the committee and the American public that the quality of the education available in the U.S. is inadequate compared with that in many countries with fewer resources.

- The committee's top recommendation is to annually recruit 10,000 college students majoring in math and science to become K–12 math and science teachers. Incentives would include merit-based scholarships and bonuses for teachers working in under-served rural and inner city schools.
- Universities should be provided with grant money to fund programs that concurrently offer science and mathematics undergraduates teacher certification with their Bachelor's degrees.
- Grant money should also be provided to support efforts to update the skills of current math and science teachers through Master's degree programs and summer institutes for teaching educators new content and pedagogy skills.
- Efforts should be made to encourage more students to go into math and science fields. Approaches could include increasing the number of high school students taking math and science advanced placement courses and offering more undergraduate and graduate scholarships in these areas.

Dr. Wulf outlined the existing and potential problems the U.S. faces with regards to competing in the global economy. He noted

that the pattern of disinvestment from basic research has led to a slow, piecemeal decline in U.S. competitiveness.

- The components of the problem include a decline in industry-based research and federal funding for research in the physical sciences and engineering, the increasingly short-term, risk-averse nature of the research that is supported, growth in the use of "sensitive but unclassified" information that chills the flow of knowledge, and the discouragement of foreign students from performing research in the U.S. through overly restrictive visa policies.
- The policy community is aware of these problems, which is the first step towards a broad, effective solution. Reports on the decline of U.S. competitiveness have come from the National Academies, the private sector, the Federal Government, and academia.
- The U.S. ability to innovate has been the source of U.S. prosperity and security. Therefore, future policy decisions should be aimed at generating an environment that supports innovation by creating a vibrant research base, educated workforce, and social climate that encourages students to pursue science and technology degrees. Investment-friendly tax policies and protection of intellectual property should also be used to promote innovation by industry.

4.1(p)—The Investigation of the World Trade Center Collapse: Findings, Recommendations, and Next Steps

October 26, 2005

Hearing Volume No. 109–28

Background

On October 26, 2005, at 11 a.m., the House Committee on Science held a hearing on the key findings and recommendations of the National Institute of Standard and Technology's (NIST) investigation into the collapse of the World Trade Center (WTC), how building and fire code organizations plan to implement the recommendations contained in that report, and what barriers exist to the development and adoption of stronger building and fire codes.

Immediately following the attacks of September 11, the Federal Emergency Management Agency (FEMA) and the American Society of Civil Engineers (ASCE) began planning a building performance study of the WTC. The week of October 7, as soon as the rescue and search efforts ceased, an ASCE team under contract with FEMA known as the Building Performance Assessment Team (BPAT) went to the site and began their assessment of why the buildings had failed. This was to be a brief effort, as the study team consisted of experts who generally had volunteered their time. In January 2002, FEMA asked the National Institute of Standards and Technology (NIST) to take over the next phase of the investigation of the collapse essentially to build upon the BPAT recommendations and conduct a more thorough investigation of the events leading to the collapse.

On October 26, 2005, NIST released its *Final Report of the National Construction Safety Team on the Collapse of the World Trade Center Towers.*

The witnesses addressed the following questions in their testimony:

1. What are the most important findings and recommendations of the World Trade Center Investigation report?
2. Are the NIST recommendations framed appropriately so that they can be adopted into national model building codes?
3. What are the prospects for the adoption of the recommendations by the code organizations? What is NIST doing to promote this process? What are the possible impediments to their adoption?
4. What lessons were learned from this investigation that could be applied to improve future investigations of building failures?

The Committee heard from (1) Ms. Sally Regenhard, Chairperson, Skyscraper Safety Commission; (2) Dr. William Jeffrey, Director, NIST; (3) Ms. Nancy McNabb, Director of Government Affairs, National Fire Protection Association (NFPA); (4) Dr. James R. Harris, Member, American Society of Civil Engineers (ASCE); (5) Mr. Glenn Corbett, Asst. Professor of Fire Science, John Jay College of Criminal Justice; and (6) Mr. Henry L. Green, President, International Code Council (ICC).

Summary of Hearing

Ms. Regenhard testified that she felt NIST's investigation should have been more aggressive, and that in general the recommendations made by NIST for improvements in building and fire codes were vague and would be difficult to translate into new codes.

Dr. Jeffrey summarized NIST's investigative methodologies and presented the major findings into why the WTC towers collapsed. He also outlined 30 specific recommendations to increase building strength, increase fire resistance, and enhance evacuation procedures in buildings to improve their safety.

Ms. McNabb testified that NIST's findings were very helpful in trying to come up with improved fire safety codes. She noted that several NIST recommendations have already been adopted, and that other recommendations should be implemented with continued input from stakeholders.

Dr. Harris testified that the ACSE supports careful consideration of NIST's recommendations. He stressed the need to seek input and participation from stakeholders during the implementation process, and the need for patience with the process.

Mr. Corbett testified that he felt that NIST's investigation should have been more aggressive, and that the recommendations as presented would be difficult to implement into new codes because they were not specific enough, or articulated in language that could be easily adopted by the codes and standards groups.. . . He also suggested that a different agency with more experience in investigation rather than research become involved in future building failure investigations.

Mr. Green described the process by which the NIST recommendations might be translated into new building and fire codes and into revised codes for existing buildings. He stressed the need for NIST to provide continued leadership in developing and implementing new codes. He also cited the need for some mechanism for code enforcement.

Members' questions focused on the specific recommendations made in the NIST report, and the role various stakeholders would play in the implementation of those recommendations. Members wanted to know how codes are adopted and standardized, and what role federal regulation should play in helping to adopt new standards.

Members were particularly emphatic that NIST needed to apply itself to the task of getting its 30 recommendations translated into meaningful changes to building and fire codes and standards as soon as possible. NIST Director Jeffrey told the Committee that NIST already had plans to work aggressively with the codes and standards groups, in particular with the International Code Council, to see that this was done. He promised that NIST would begin this process immediately through a contract with the National Institute of Building Sciences.

4.1(q)—Status of NASA's Programs

November 3, 2005

Hearing Volume No. 109–31

Background

On November 3, 2005, the Committee on Science held a Full Committee hearing to review the status of plans and programs at the National Aeronautics and Space Administration (NASA). The NASA Administrator, Michael Griffin, was the sole witness for this hearing.

Summary of Hearing

The hearing opened with Chairman Boehlert expressing his concern that NASA may be doing more than their budget can support, and that this is a recurring problem for the agency. "I don't want to see us go down that path again," he said. "Before NASA promises that it can accelerate [its programs], it ought to be able to demonstrate where the money will come from. And right now, it can't."

The NASA Administrator testified that an additional $3–$5 billion is needed to fund the Space Shuttle through 2010, but NASA is trying to close that gap. One of the money saving avenues that the agency has taken is to try and identify "synergies" between the Shuttle and Exploration programs. Members were assured by the Administrator that the Vision for Space Exploration is not about "new money for NASA," but rather "redirecting the money that we have."

To also save money, the NASA Administrator told Members that he proposes cutting funding for Space Station research, technology development and Project Prometheus—NASA's nuclear propulsion program. In six months, Dr. Griffin said he would report back to

Members about other savings NASA has found. He also testified that NASA would not suffer a financial shortfall until FY 2008.

Members learned that another funding request may be issued from the Administration for hurricane-related expenses. NASA reported an impact of $760 million as a result of Hurricane Katrina, while the Administration's request was only $325 million.

On the topic of aeronautics, the Administrator stated that NASA is coordinating with the Office of Science and Technology Policy (OSTP) to develop a national aeronautics policy.

4.1(r)—Ongoing Problems and Future Plans for NOAA's Weather Satellites

November 16, 2005

Hearing Volume No. 109–33

Background

On November 16, 2005 at 10:00 a.m., the House Science Committee held a hearing about ongoing problems and future plans for the National Oceanic and Atmospheric Administration's (NOAA) key weather satellite program, the National Polar-orbiting Operational Environmental Satellite System program (NPOESS). The Committee held the hearing to review how the program went awry, why Congress was not given more timely and accurate information on the status of the program, and, most importantly, how the program should move forward.

The NPOESS program has been deeply troubled and is now running as much as $3 billion over budget and as many as three years behind schedule, creating a possible gap in satellite coverage (if existing satellites fail before NPOESS can replace them). NOAA and the Air Force recently replaced the lead program manager, and some of the contractors have also brought in new people to oversee the program. NOAA and the Air Force will soon decide how they are going to bring the program under control. The agencies do not seem to be considering any options that would require additional funding before Fiscal Year (FY) 2008, but waiting to spend more funds is likely to increase total program costs and delays.

The witnesses addressed the following questions in their testimony:

1. What is the current estimate of the cost and launch date for the first NPOESS satellite compared to the September 2003 baseline ($7.4 billion and November 2009) and when will an official new baseline be available?
2. What program options are being considered in response to the increased cost and schedule delays?
3. It is our understanding that no options are being considered that increase spending in Fiscal Year (FY) 2006 or FY 2007. Why is that the case? Will delaying action until FY 2008 increase the lifetime cost of the NPOESS program and increase the risk that the satellite will not be ready in time to perform its mission?
4. If the last satellite from the current NOAA polar series fails during launch or in orbit, then, given the schedule delays

anticipated for NPOESS, there could be a 19- to 36-month gap in polar satellite coverage for NOAA. If a coverage gap were to occur, what are the implications for NOAA and DOD weather forecasting capabilities? What are the Federal Government's contingency plans for a gap in polar satellite coverage?

The Committee heard from: (1) Vice Admiral Conrad C. Lautenbacher, Jr. (Ret.), Administrator of the National Oceanic and Atmospheric Administration; (2) Dr. Ronald M. Sega, Under Secretary of the Air Force; (3) Dr. Alexis Livanos, President of Northrop Grumman Space Technology; and (4) Mr. David Powner, Director of Information Technology Management Issues, Government Accountability Office.

Summary of Hearing

Admiral Lautenbacher testified that the NPOESS system is one of the most complex environmental satellite programs ever developed. He stated that the ground system is on budget and that problems have been resolved for most of the sensors. However, according to Lautenbacher, the Visible Infrared Imager Radiometer Suite (VIIRS) sensor has caused most of the recent problems. He stated that NOAA expects a cost increase of at least 15 percent and a delay of at least two years.

Dr. Sega testified that NPOESS program cost growth would exceed statutory limits set by the Nunn-McCurdy amendment. He stated that the Air Force notified Congress and chartered an Independent Program Assessment (IPA) team to examine management, budget and technical issues. The IPA delivered its report to the Executive Committee on November 22.

Dr. Livanos testified that Northrop Grumman submitted 30 scenarios on cost and launch estimates, at the request of Congress. He stated that "more than 80 percent of the NPOESS cost growth and delay is attributable to sensor development by subcontractors." Northrop Grumman concluded that additional funds before FY 2008 would shorten development schedules and reduce costs.

Mr. Powner testified that cost overruns have raised the program's life-cycle cost to approximately $10 billion. He stated the first NPOESS satellite will not be available for launch until December 2010. According to Mr. Powner, ". . .improved management of this program will be essential to correct NPOESS's poor historical performance."

During the Question and Answer period, Committee Members pressed repeatedly for NOAA and DOD to justify their decision not to seek additional funding in fiscal years 2006 and 2007, even though Northrop-Grumman—the prime contractor on the NPOESS program—testified that increased funds in those years would significantly reduce life cycle costs, help resolve looming technical problems sooner, decrease the risk of a gap in weather satellite coverage, and increase the chances that the NPOESS development program overall will be successful. Admiral Lautenbacher and Dr. Sega stated they believed that planned changes to sensor production schedules would free up sufficient funds to address the concerns raised by the Committee Members.

4.1(s)—Environmental and Safety Impacts of Nanotechnology: What Research Is Needed?

November 17, 2005

Hearing Volume No. 109–34

Background

On Thursday, November 17, 2005, the Committee on Science of the House of Representatives held a hearing to examine current concerns about environmental and safety impacts of nanotechnology and the status and adequacy of related research programs and plans.

The witnesses were: 1) Dr. Clayton Teague, Director of the National Nanotechnology Coordination Office, 2) Mr. Matthew M. Nordan, Vice President of Research at Lux Research Inc., 3) Dr. Krishna C. Doraiswamy, Research Planning Manager at DuPont Central Research and Development, 4) Mr. David Rejeski, Director of the Project on Emerging Nanotechnologies at the Woodrow Wilson International Center for Scholars, and 5) Dr. Richard Denison, Senior Scientist at Environmental Defense.

Summary of Hearing

Chairman Boehlert opened the hearing by stressing that the Science Committee's 2003 *National Nanotechnology Research and Development Act* required research on increasing the understanding of the potential environmental and safety implications of nanomanufacturing and nanomaterials. Supporting research on potential risks during the early stages of nanotechnology will help prepare for problems the technology may cause in the future and allow nanotechnology to become fully integrated into the U.S. economy. He added that there was a remarkable consensus in the written testimony on the need to invest more right now in understanding what problems the technology might cause.

Ranking Member Gordon added that commercialization of nanotechnology is outpacing research into possible risks. Federal and private research initiatives into environmental and safety research are chronically underfunded, and researchers need to focus on developing the necessary tools to determine if nanotechnology products are harmful. He added he hoped all stakeholders in nanotechnology research would be involved in identifying research goals and priorities.

Dr. Teague discussed the role that the National Nanotechnology Initiative (NNI) is taking in addressing the environmental and safety issues in nanotechnology research. The NNI is committed to fostering nanotechnology research to help strengthen the economy, improve homeland security, and raise the quality of life in the U.S., and encourages participating agencies to include work on the environmental and safety implications of nanotechnology in their programs.

- The Nanotechnology Environmental and Health Implications (NEHI) working group of the National Science and Technology Council's Nanoscale Science, Engineering, and Technology (NSET) Subcommittee is developing a document for

NNI agencies and individual researchers that identifies and prioritizes nanotechnology environmental and safety research needs.

- Identified gaps in the body of knowledge concerning nanotechnology safety include: methods for determining nanoparticle exposure in workers and the environment, methods for controlling exposure in the workplace, methods for characterizing nanomaterials' behavior, and understanding of biological risk.
- The NNI will support $39M in FY 2006 for research and development with the primary purpose of understanding environmental and safety risks from nanoparticle exposure.
- The NNI will also participate in an Organization for Economic Cooperation and Development (OECD) meeting on the safety of manufactured nanomaterials in December 2005.

Mr. Nordan said there should be particular concern over environmental and safety issues in nanotechnology because of the unique material properties of nanomaterials. The industry should be prepared to address both real and perceptual risks in order to earn public acceptance of nanomaterials in the economy.

- Nanoparticles are a special concern because they have unique physical, chemical, and biological properties; have been shown to cause environmental and safety problems when unintentionally produced through traditional manufacturing processes; and have raised alarms among researchers involved in early studies of the environmental and safety implications of nanoparticles.
- There are well established frameworks that can guide nanomaterial manufacturers in assessing their environmental and safety risks, and researchers can model their efforts on risk analysis methods historically used for new materials.
- Currently, adequate data on the possible effects of exposure to nanoparticles does not exist. There are a number of studies that suggest toxicity problems may exist, but the information is insufficient to create regulations.
- To aid nanotechnology's integration into the economy, the Federal Government should coordinate public and private sector toxicology research efforts, allocate funding to those efforts, and eliminate regulatory ambiguity for businesses interested in manufacturing nanotechnology products.
- Total federal research funding for nanotechnology should be increased to $100M to $200M from the current levels in order to support innovation in the field.

Dr. Doraiswamy concurred that understanding environmental and safety implications of nanomaterials is integral to successful emergence of nanomanufacturing. He added that private industry was and would need to continue to sponsor cooperative efforts to resolve questions about the safety of nanomaterials.

- Certain nanoscale materials, such as pigments, magnetic storage media, and photographic chemicals, have been avail-

able commercially for decades, but new techniques to manipulate the structure of materials at the nanoscale will give rise to an array of new nano-enabled products which may have an adverse effect on human safety and on the environment.

- Government and private sector stakeholders should collaborate in the development of safety standards and test methods. DuPont has coordinated a consortium of government, academic, and industry groups in a two-year research project that will study the behavior of airborne particles in the workplace and the performance of related personal protective equipment.
- Targeted research efforts on environmental and safety issues in nanotechnology should address critical physical, biological, and chemical properties of nanomaterials; the presence and effect of nanomaterials in the workplace and environment; the life cycle of nanomaterials; and the development of toxicity tests.

Mr. Rejeski said that the policy response to environmental and safety concerns is not keeping pace with innovation in nanotechnology. While the public is interested in learning more about the possibilities of nanotechnology, the lack of trust in federal authorities to properly regulate nanomaterials may affect their marketability.

- Because nanotechnology is still in an emergent stage, the Federal Government still has an opportunity to make sure that nano-enabled products are introduced into the economy in a safe manner. U.S. consumers are optimistic that nanotechnology will advance medicine. The Federal Government should respond by engaging in civic forums around the country to raise public awareness and confidence.
- There is not enough information to make definite statements on the toxicity of nanomaterials. New tests must be developed to determine toxicity because: 1) bulk chemistry tests do not reflect the unique properties of nanomaterials; 2) nanomaterials may be capable of penetrating human skin or otherwise breaching human systems; 3) little is known about the hazard of engineered nanomaterials ingested as a food additive or by accident; and, 4) very little is known about the impact of engineered nanomaterials on the environment through their lifetime.
- To address public concerns, coordinated environmental and safety research efforts should focus on toxicity, epidemiology, characterization of nanomaterials, control of exposure, risk management, and product life cycle analysis. The Project on Emerging Nanotechnologies is participating in this effort by creating a publicly accessible inventory of government-supported research in these areas (a summary of which has been submitted for the hearing record).
- Research must focus more strongly on complex, state-of-the-art nanomaterials. Most of the existing body of work only examines first generation nanomaterials.

- Public information campaigns should also include efforts to reach out to small business manufacturers of nanotechnology to ensure that they have access to technical assistance. There should also be a government-administered mechanism for reporting nanotechnology safety concerns in order to track possible risks.

Dr. Denison argued that the government should take a stronger role in researching and regulating nanomaterials and nanomanufacturing.

- Federal funding for research into environmental and safety risks should increase to at least $100M annually. In FY 2004, less than one percent of federal funding for nanotechnology was directed towards environmental and safety research. To ensure that sufficient and appropriate federal research is performed in this area, one federal agency, or the NSET, should oversee and direct federal risk-related research.
- The Federal Government should also take the lead in developing tools that can track the effect of nanomaterials on humans and the environment throughout their life cycle. The research should be supported by industrial stakeholders, and companies that create nanomaterials should have responsibility for funding basic research that supports development of regulations.
- Without substantive federal involvement in environmental and safety research, there may be little public acceptance of nanomaterials. There is significant public mistrust of industrial self-regulation, and without government involvement, consumers may believe that materials were sent to the market without adequate testing and refuse to purchase them. This would mitigate the possible benefits to society that nanotechnology could offer.

4.1(t)—An Overview of the Federal R&D Budget for Fiscal Year 2007

February 15, 2006

Hearing Volume No. 109–35

Background

On Wednesday, February 15, 2006, the Committee on Science of the House of Representatives held a hearing to consider President Bush's fiscal year 2007 (FY07) budget request for research and development (R&D). Five Administration witnesses reviewed the proposed budget in the context of the President's overall priorities in science and technology. The Science Committee held a separate hearing on February 16th to examine the budget request for the National Aeronautics and Space Administration (NASA).

The witnesses were: (1) Dr. John H. Marburger III, Director, Office of Science and Technology Policy; (2) Dr. Samuel W. Bodman, Secretary of Energy; (3) Dr. David A. Sampson, Deputy Secretary of Commerce; (4) Dr. Arden Bement, Director, National Science

Foundation (NSF); and (5) Dr. Charles E. McQueary, Under Secretary for Science and Technology, Department of Homeland Security.

Summary of Hearing

Chairman Boehlert began the hearing by stating that it should be viewed as a celebration because of the FY07 budget's renewed emphasis on research in the physical sciences, science and math education, and energy policy. While generally encouraged by the FY07 budget, Chairman Boehlert was concerned that the proposed funding for education programs at the National Science Foundation was inadequate, and that the proposed *Advanced Energy Initiative* would be a necessary but hardly sufficient step towards energy independence.

Ranking Member Gordon also voiced concerns about the decrease in NSF education funding. He was also concerned that the increase in overall federal R&D proposed for FY07 was less than the rate of inflation, and that the budget request proposed decreasing the overall federal science and technology budget for FY07 by one percent.

Dr. Marburger noted that the FY07 budget priorities are the President's *American Competitiveness Initiative and Advanced Energy Initiative,* and then summarized the highlights of the FY07 budget. The overall federal R&D spending increases 2.6 percent over FY06, to an "all-time high" request of $137 billion. He agreed with Ranking Member Gordon that while the top-line federal science and technology category is down one percent, that number is actually an increase of 3.7 percent when earmarks are set aside. Specific programs highlighted include (using the FY06 request as a base for comparison):

- The National Science Foundation, the Department of Energy Office of Science, and the National Institute of Standards and Technology (NIST) core programs are requested to receive a collective increase of 9.3 percent, and a commitment to double their total over the next decade. This would require an average increase of seven percent per year.
- The National Institute of Health will see its budget request constant at $28.4 billion for FY07, after its recent doubling.
- The top-line budget for NASA will be maintained at $86.4 billion. NASA science increases 1.5 percent with or 2.1 percent without earmarks.

Dr. Bodman testified that the Office of Science in the Department of Energy would see its FY07 budget increase by $505 million (14 percent) to $4.1 billion. He noted the programs affected by the Administration's newly announced *Advanced Energy Initiative,* which include:

- $149 million for biomass and biofuel programs, an increase of about $50 million; $148 million for solar energy programs, an increase of $50 million; $228 million to support implementation of the Hydrogen Fuel Initiative; $60 million for U.S. participation in the International Thermonuclear Ex-

perimental Reactor (ITER); and $250 million in the Global Nuclear Energy Partnership (GNEP).

Dr. Sampson testified on R&D in the Department of Commerce budget request, including programs at NIST and the National Oceanic and Atmospheric Administration (NOAA), which fall under the Committee's jurisdiction. Specific highlights include:

- A request for an increase of $104 million (24 percent) for NIST's core laboratory programs, which would include $72 million for nanotechnology, hydrogen fuels, and quantum information research. $32 million of the budget would go to maintaining and upgrading NIST labs.
- NOAA would receive an increase of $345 million for its base programs, including $112 million for next-generation weather satellites.

Dr. Bement testified that the budget proposal for NSF would be an increase of 7.9 percent over FY06 to $6.02 billion—the first year of a ten-year doubling of their budget. The budget would be allocated in the following manner:

- Funding for research activities sponsored by NSF would increase 7.2 percent to $4.7 billion, allowing for 500 more research grants and 6,400 more researchers.
- NSF's investment in the Networking Information Technology Research and Development Initiative would increase by $93.4 million (11.5 percent).
- NSF's investment in the National Nanotechnology Initiative would increase by $26.4 million (8.6 percent) in FY07.
- The FY07 request includes $597 million, an increase of 15 percent, for new cyberinfrastructure.
- The NSF's education and human resources account would increase by $19 million (2.5 percent) but after accounting for various changes in the base, K–12 investments actually increase by 10 percent and undergraduate investments increase by six percent.

Dr. McQueary noted that the Science and Technology Directorate at the Department of Homeland Security requested a budget of approximately $1 billion and 383 full-time equivalent employees for FY07. Some of the Directorate's recent accomplishments include:

- Implementation, with local partners, of the second-generation enhancements to BioWatch, a bioaerosol monitoring system operating in more than 30 U.S. urban areas.
- Commencing operations of the National Bioforensics Analysis Center.
- Establishment of the Cyber Security Testbed Program to explore threats to network security without jeopardizing the Internet.
- Designation of 57 technologies as qualified anti-terrorism technologies, making them eligible for Safety Act protections and encouraging the development of countermeasures in the fight against terrorism.

4.1(u)—NASA's Fiscal Year 2007 Budget Proposal

February 16, 2006

Hearing Volume No. 109–36

Background

On February 16, 2006, the Science Committee held a full committee hearing to examine the administration's fiscal year 2007 budget request for NASA. NASA Administrator Dr. Mike Griffin and NASA Deputy Administrator Ms. Shana Dale were witnesses. The hearing focused on differences between the *NASA Authorization Act* (P.L. 109–155), past projections of the FY 2007 budget, and the current budget proposal.

Summary of Hearing

Chairman Boehlert opened the hearing by outlining his concerns for NASA's budget in the coming fiscal year. "This budget is bad for space science, worse for Earth science, perhaps worse still for aeronautics." NASA received less money from the budget request than expected and thus already difficult decisions over which programs to fund and how became even more complicated. Boehlert outlined his fears that science would become secondary at NASA, a pattern that could be difficult to change in the future. Ranking Member Bart Gordon echoed the Chairman's concerns and added that NASA's budgetary issues are being labeled as "temporary" until the Shuttle is retired but are in fact permanent and need to be dealt with accordingly.

Administrator Griffin responded to the Chairman's concerns about science when he testified about the tough choices that NASA is making as a result of budgetary constraints. "The plain fact is that NASA simply cannot afford to do everything that our many constituencies would like the Agency to do. We must set priorities, and we must adjust our spending to match those priorities. NASA needed to take budgeted funds from the Science and Exploration budget projections for FY 2007–11 in order to ensure that enough funds were available to the Space Shuttle and the ISS."

Questions ranged from specifics about future missions to general queries about how best to implement the *Vision for Space Exploration.* Congressman Gordon questioned alternatives to the Vision, including slowing or ending the Vision until the NASA was given a larger budget. Griffin answered that line of questioning by explaining that a gap between the shuttle and the CEV would be devastating. "I lived through the gap in human space flight between the end of the Apollo program to the first flight of the Shuttle in 1981, and I know firsthand that our nation's space program suffered greatly from the unintended loss of critical expertise. Our nation's space industrial base withered. A longer gap in U.S. human space flight capabilities will increase risk and overall costs and lead to even more delays."

4.1(v)—NASA's Science Mission Directorate: Impacts of the Fiscal Year 2007 Budget Proposal

March 2, 2006

Hearing Volume No. 109–38

Background

On March 2, 2006, the Science Committee held a Full Committee hearing to review the proposed fiscal year 2007 (FY07) budget for the Science Mission Directorate of the National Aeronautics and Space Administration (NASA), and to examine how that budget would affect research in space science and Earth science.

The witnesses were Dr. Mary Cleave, the Associate Administrator at NASA for the Science Mission Directorate; Dr. Fran Bagenal, a member of the National Academy of Sciences Decadal Survey for Sun-Earth Connections, "The Sun to the Earth and Beyond" (2003) and a Professor of Astrophysical and Planetary Sciences at the University of Colorado at Boulder; Dr. Wes Huntress, a member of the National Academy of Sciences Decadal Survey for Solar System Exploration, "New Frontiers in the Solar System" (2003) and the Director of the Geophysical Laboratory at the Carnegie Institution of Washington and was Associate Administrator for Space Science at NASA from 1992 to 1998; Dr. Berrien Moore, the Co-Chairman of the National Academy of Sciences Decadal Survey for Earth Sciences, "Earth Observations from Space: A Community Assessment and Strategy for the Future" (expected fall 2006) and the Director for the Institute for the Study of Earth, Oceans, and Space at the University of New Hampshire; and Dr. Joseph H. Taylor, Jr., the Co-Chairman of the National Academy of Sciences Decadal Survey for Astrophysics, "Astronomy and Astrophysics in the New Millennium" (2001) and a Nobel Laureate and Distinguished Professor of Physics at Princeton University.

Summary of Hearing

The hearing offered the Science Committee an opportunity to sit down with the head of NASA Science Mission Directorate and representatives from the four decadal surveys that were conducted to list priorities for NASA funding. Chairman Boehlert opened the hearing by emphasizing that he was looking for an open and honest conversation about changes in NASA's Science funding. He continued with a more specific directive for the hearing. "But perhaps most important, we need to hear whether, given the proposed level of funding, NASA has made the right choices about what to cancel or defer. In the written testimony, all four of our non-NASA witnesses indicate that NASA has gotten it wrong by trying to preserve flagship missions while cutting smaller missions and research grants because of the impact that will have on retaining and attracting scientists to the field. I want to pursue that issue thoroughly."

Ranking Member Bart Gordon echoed the Chairman's concerns about science programs at NASA. "I am concerned that science has become an afterthought in the Agency's exploration initiative—

largely decoupled from the exploration initiative and vulnerable to being cut back as necessary to pay for the human exploration hardware." He declared his interest in asking Dr. Cleave various questions about the current and future status of science missions.

Dr. Cleave responded by assuring that programs were being delayed, not canceled. She explained that NASA was doing its best to both fulfill the President's *Vision for Space Exploration* as well as maintain a healthy Science Mission Directorate. "The charge that Administrator Griffin has given to me is to deliver a robust and executable program that can be implemented in this resource-constrained environment. By "executable," we mean selecting, developing, and launching a slate of Science missions within cost and schedule targets."

The other witnesses, all authors of Decadal Surveys that prioritized programs for NASA funding agreed that NASA was placing an emphasis on flagship missions at the expense of smaller research missions. They feared that the loss of smaller missions would have a harmful effect on NASA's relationship with universities and scientists that would take years to redevelop.

4.1(w)—Should Congress Establish "ARPA–E," the Advanced Research Projects Agency–Energy?

March 9, 2006

Hearing Volume No. 109–39

Background

On March 9, 2006 the Committee on Science held a hearing on whether Congress should establish an Advanced Research Projects Agency in the Department of Energy, or an ARPA–E. The National Academies of Sciences (NAS), in its fall 2005 report on enhancing American competitiveness, *Rising Above the Gathering Storm,* recommended the creation of an ARPA–E to fund transformational research that could lead to new ways of fueling the Nation and its economy.

The witnesses included: (1) Dr. Steven Chu, Director, Lawrence Berkeley National Laboratory; (2) Dr. David Mowery, William A. and Betty H. Hasler Professor of New Enterprise Development, Haas School of Business, University of California at Berkeley; (3) Ms. Melanie Kenderdine, Vice President for Washington Operations, Gas Technology Institute; (4) Dr. Frank L. Fernandez, President, F.L. Fernandez, Inc.; and (5) Dr. Catherine Cotell, Vice President for Strategy, University and Early Stage Investment, In-Q-Tel.

Summary of Hearing

Science Committee Chairman Boehlert opened the hearing by noting that the biggest barrier to new energy technologies is not supply, but rather demand. He added that until the government is willing to institute policies to stimulate demand, it is going to be very hard for new technologies to enter or dominate the market. As an example of market failure he pointed to the automobile fuel economy technologies that are just "sitting on the shelf."

Energy Subcommittee Chairman Judy Biggert noted that it is not clear what problems we are trying to solve with the creation of an ARPA–E; that the proposal to create an ARPA–E is largely based on the mythology of the agencies—namely the myths that the Defense Advanced Research Projects Agency (DARPA) can't do anything wrong, and that DOE can't do anything right. She added that the Department of Homeland Security's effort to replicate DARPA, according to most accounts, did not work; questioned where funding for ARPA–E would come from; and pointed out that ARPA–E was the only recommendation in the NAS *Rising Above the Gathering Storm* report that did not receive unanimous support of the panel.

Most witnesses were open to the notion of creating a new research entity at DOE, but they cautioned that the funding for it should not be taken from the increases proposed for DOE's existing basic research programs. The witnesses also cautioned that an ARPA–E would face different challenges than DARPA because the government would not be a primary customer for the technologies advanced through an ARPA–E.

Testifying on behalf of the NAS panel that issued the ARPA–E recommendation, Dr. Chu told the Committee that ARPA–E is intended to be a research agency that will focus on transformational energy research that industry by itself cannot or will not support due to its high risk, but where success would provide dramatic benefits for the Nation. To accomplish this goal, he said, the NAS conceived a DARPA-like agency that would have a nimble structure and would fund the development of completely new energy technologies. He warned that funding for ARPA–E must not come at the expense of DOE's existing science programs. The NAS panel's top research-related recommendation is to increase basic research funding by 10 percent over the next seven years. To fund ARPA–E, the NAS panel recommended an initial investment of $300 million that would eventually grow to $1 billion annually.

Ms. Kenderdine testified that Congress should pursue alternative funding sources for ARPA–E such as oil or gas royalty payments. She noted that a one cent per gallon gasoline tax would pay for the entire ARPA–E program at levels recommended in the NAS report, and that such a policy has been supported in polls of the U.S. public.

Dr. Mowery said that the development of new technologies is important to addressing our nation's energy challenges, but that the lack of a market for the technologies could impede the success of ARPA–E. He also noted that the need for widespread adoption highlights an important issue for ARPA–E that DARPA did not face: the creation of a market for the new technologies.

Dr. Cotell added that in contrast to DARPA's reliance on DOD for the procurement of the technologies it develops, the market for the products of energy research ranges from the individual consumer who buys an alternative fuel vehicle to the large utility companies that provide power to the grid. She pointed out that there is no single procurement mechanism, and that this market can be significantly impacted by policy and regulation that may provide incentives or disincentives to early adoption.

Former DARPA Director, Dr. Fernandez, disagreed that a clear customer base would be essential to the success of ARPA–E, and said that a DARPA-like model makes sense even if the DOE is not the customer for the technology because this is not necessary for the transition of revolutionary technology.

4.1(x)—K–12 Science and Math Education Across the Federal Agencies

March 30, 2006

Hearing Volume No. 109–43

Background

On Thursday, March 30, 2006, the Committee on Science of the House of Representatives held a hearing to examine how federal agencies can improve their individual and collective efforts to strengthen K–12 science and math education.

The five witnesses were: (1) Ms. Margaret Spellings, Secretary of the U.S. Department of Education; (2) Dr. Arden Bement, Director of the National Science Foundation (NSF); (3) Ms. Shana Dale, Deputy Administrator of the National Aeronautics and Space Administration (NASA); (4) Brigadier General John Kelly, Deputy Under Secretary for Oceans and Atmosphere of the National Oceanic and Atmospheric Administration (NOAA); and (5) Dr. James Decker, Principal Deputy Director of the Office of Science at the U.S. Department of Energy (DOE).

Summary of Hearing

Chairman Boehlert began by expressing his belief that all five of the agencies represented were important to K–12 science and math education but that they needed to coordinate their approach. He asked that the agency representatives address how they view their role in math and science education, how they coordinate that role with other agencies, and how they evaluate their programs.

Ranking Minority Member Gordon stated that he was concerned that the Administration's plans for improving K–12 science, technology, engineering, and math (STEM) curriculum did not reflect the suggestions of the National Academies' report *Rising Above the Gathering Storm*. He also encouraged the Administration to give greater recognition to the capabilities of NSF in the area of K–12 STEM education.

Secretary Spellings testified that the President's *American Competitiveness Initiative* would do much to address science and math deficiencies present in the Nation's educational system. The President's budget request would devote $380 million in new federal support to strengthen K–12 science and math education, increasing the Department of Education's funding for STEM education programs by 51 percent. She then described the Department of Education's proposed and ongoing programs and its relationship with other agencies:

- Highlighted programs from the fiscal year 2007 request included $250 million for a Math Now Initiative to prepare elementary and middle school students for rigorous high school

math classes, $122 million to train 70,000 teachers to teach advanced placement and international baccalaureate classes in math and science, and $25 million to recruit math and science professionals to become teachers.

- In addition, the President has formed a National Math Panel to determine the most proven and effective methods for teaching K–12 math.
- The Academic Competitiveness Council, a commission led by the Department of Education is charged with evaluating federal STEM education programs and addressing possible redundancy in this area.
- She recognized the role of NSF and the other agencies in preparing new STEM teachers and developing new programs and explained that the Department of Education scales-up successful NSF programs to suit the needs of all students.

Dr. Bement stated that, because of the need to keep America economically competitive, bolstering K–12 education was one of four NSF stated goals for fiscal year 2007. NSF's approach to this goal will include research on STEM learning for both teachers and students, development of challenging STEM instructional materials, assessment of student and teacher knowledge, evaluation of project and program impacts, and implementation of proven STEM interventions in the Nation's schools. He added:

- The NSF's K–12 STEM education programs are primarily administered through the Education and Human Resource Directorate. Examples of these programs include:
  - The Robert Noyce Scholarship program to encourage talented STEM majors and professionals to go into K–12 science and math teaching.
  - The Math and Science Partnership program, a program to support partnerships between higher education and local schools.
- The NSF and the Department of Education are linked from the project level to the agency level.
- The NSF uses proven assessment tools to ensure that education programs meet their stated goals and provide useful results to teachers, school systems, students, and other stakeholders.

Ms. Dale was particularly concerned with how the quality of science and math education affects NASA's ability to carryout its scientific and exploration missions as its current workforce moves into retirement. She argued that NASA's exciting mission and research activities can inspire students to pursue STEM fields. She added:

- NASA has three primary objectives in improving STEM education:
  - To identify and develop the critical skills and capabilities needed to ensure NASA's space exploration and scientific research goals.

- To attract and retain STEM students through science and math educational opportunities for students, teachers, and faculty.
- To engage all Americans in its missions through hands-on, interactive, educational activities in ways that will increase the public's scientific literacy.

General Kelly stated that NOAA needed a well trained STEM staff and a scientifically literate public to be able to effectively use the tools and products the agency develops. They aim to educate the public in oceanic and atmospheric sciences by providing development opportunities and scholarships to teachers and students at all levels. Additionally, NOAA's priorities include increasing the public's environmental literacy. Ongoing efforts for students, teachers, and the public include:

- The John A. Knauss Policy Fellowship Program, which has placed more than 500 graduate students at federal science agencies and Congressional offices to learn about policy issues affecting ocean, coastal, and Great Lakes resources.
- The Teacher at Sea Program, which has given 430 teachers the opportunity to do science on a NOAA research vessel.
- The Educational Partnership Program, which provides financial assistance to Minority Serving Institutions to support and encourage minorities and women pursuing advanced degrees in STEM fields relevant to NOAA's mission.

Dr. Decker noted that his decision to go into science after the Sputnik Challenge stemmed from excellent science and math teachers, the challenging nature of the career, and a desire to serve the country. Equally important in his decision, though, was the promise of jobs, which is a key factor in the choice of major by most students. DOE has a vested interest in the U.S. maintaining a well-trained STEM workforce, as it depends on these professionals to run the organization. He added:

- DOE's main contribution to STEM education is its support and training of graduate students through its funding of research at universities and its research laboratories that are accessible to graduate students under the auspices of different agencies.
- DOE also directly works to improve K–12 STEM education programs through a research experience program for current and in-training K–12 teachers.
- DOE has sponsored the National Science Bowl for the past 16 years. Students from over 1,800 high schools compete annually in the competition.

4.1(y)—H.R. 5143, the H–Prize Act of 2006

April 27, 2006

Hearing Volume No. 109–45

Background

On April 27, 2006 the Committee on Science held a hearing on a bill introduced by Research Subcommittee Chairman Bob Inglis (R–SC) that would establish a prize competition to encourage the research and development necessary to overcome the technical barriers that currently stand in the way of hydrogen becoming a practical alternative to oil in fueling our transportation sector.

The witnesses included: (1) Dr. Peter Diamandis, Chairman, X Prize Foundation; (2) Dr. David Bodde, Director of Innovation and Public Policy, International Center for Automotive Research, Clemson University; (3) Dr. David L. Greene, Corporate Fellow, Oak Ridge National Laboratory; and (4) Mr. Phillip Baxley, President, Shell Hydrogen, L.L.C.

Summary of Hearing

Chairman Boehlert opened the hearing by noting the promise of a hydrogen economy, as well as the great hurdles that must be overcome to achieve it. He highlighted the challenges to developing hydrogen as a fuel source, from knowing how to create, store, distribute the fuel, to being able to use hydrogen cleanly and efficiently. The Chairman commended the legislation for encouraging ongoing work that can lead to incremental improvements in hydrogen technology, and for drawing more scientists and engineers into efforts to remove the highest hurdles on the hydrogen highway.

Chairman Inglis elaborated on the bill by explaining that the goal of the prize is to capitalize on a promising non-governmental tool to encourage innovation and invention. He noted that a hydrogen economy can be closer than we think if we inspire some innovation; that such innovation could free the U.S. of dependence on unstable suppliers of energy like Iran, Nigeria, Chad and Venezuela; help improve air quality; and create new job opportunities.

Dr. Greene noted that major technical barriers stand in the way of achieving such goals, but that H.R. 5143 would increase the likelihood of overcoming these technical barriers by mobilizing creative minds that might not otherwise tackle them.

Mr. Baxley agreed with Dr. Greene's assessment and highlighted the legislation's ability to stimulate involvement and innovation across a much broader community than is possible even with DOE funding, including universities, small labs, startup companies, and even inventors working out of their garages.

Dr. Diamandis said that prizes can leverage significant private investment many times greater than the prize itself, and that prizes can generate significant investment from the private sector because victory often leads to highly desirable prestige and publicity. He also noted that prize teams are able to attract risk-taking capital which is put up by corporate sponsors or wealthy individuals who actually encourage risk-taking because they seek the publicity and desire to win.

Dr. Bodde praised the H–Prize as an innovative policy that could accelerate the Nation's transition toward more secure and sustainable energy, but expressed concerns that the $100 million grand prize might prove redundant. He also mentioned that entrepreneurs and venture capital investors seek opportunities with demonstrable potential for exponential growth—exactly the kind of venture that appears to be contemplated in the prize description.

Energy Subcommittee Chairman Judy Biggert questioned the size of the $100 million grand prize, and questioned whether market rewards would not be sufficient to encourage scientists, engineers, entrepreneurs, and energy companies large and small to invest in the development of fuel cells and new and innovative ways to produce and store hydrogen.

4.1(z)—The Role of the National Science Foundation in K–12 Science and Math Education

May 3, 2006

Hearing Volume No. 109–46

Background

On Wednesday, May 3, 2006, the Committee on Science of the House of Representatives held a hearing to review the effectiveness and value of the National Science Foundation's (NSF's) past and present programs in support of improvement of K–12 science and math education and to examine what role the Foundation should play in future federal initiatives for strengthening K–12 science and math education.

The witnesses were: (1) Dr. Dennis Bartels, Executive Director of the Exploratorium, a science museum in San Francisco; (2) Dr. Joseph Heppert, Professor and Chair of Chemistry and Director of the Center for Science Education at the University of Kansas and Chair of the American Chemical Society Committee on Education; (3) Ms. Rebecca Pringle, science teacher, Susquehanna Township Middle School, Harrisburg, Pennsylvania, and member, Executive Board of the National Education Association; (4) Ms. Judy Snyder, math teacher, Eastside High School, Taylor, South Carolina.

Summary of Hearing

Chairman Inglis began the hearing by stating that he believed NSF played a vital role in guiding K–12 science and math education and that its prominence in this area should be preserved. Several factors contribute to the success of NSF's programs in this area, including the selection of projects via a competitive process and the external review of ongoing projects. He also noted that NSF is uniquely positioned to keep its educational programs consistent with the latest research. It concerned him that the newly proposed programs for K–12 science and math education in the President's *American Competitiveness Initiative* (ACI) fall under the jurisdiction of the Department of Education.

Ranking Member Gordon also expressed concerns over the programs in the ACI and NSF's education budget. He noted that the proposals put forth in the ACI differ from those called for in the National Academies' report on competitiveness, *"Rising Above the*

Gathering Storm." He wanted to know the whether Congress should put the bulk of new funding into the development of new math curriculum for middle school students, as suggested by the President, or into improvements in science and math education and teacher professional development, as suggested by the National Academies.

Dr. Bartels spoke of NSF's key role in bridging the gap between educational research and usable classroom tools and stressed that it was important for the Department of Education to utilize NSF's research results. He also wanted to see NSF maintain its historically effective role in science and math teacher development and continue with its support for informal science education as part of both teacher and student development. He added:

- NSF programs have created effective learning tools from science and math education research, but in recent years these programs have not been adequately funded. This has slowed the progress from science and math learning theory to practice and also hampered the evolution of technology in the classroom.
- Both NSF and the Department of Education have a role in science and math education. Ideally, NSF should draw on its unique position to research and develop effective science and math teaching methods, while the Department of Education should be responsible for the implementation of these methods across the country and adapting them to meet the needs of all students.
- The most cost-effective professional development programs are those that focus on teachers in their first two years of teaching.
- Since many teachers of color begin their post-high school studies at two-year colleges, the NSF must focus resources at such institutions to attract more teachers of color to math and science, and in turn attract more students of colors to technical fields.

Dr. Joseph Heppert argued that the NSF is one of world's premier institutions for innovation in science and math education, and retaining this distinction should be part of its mission. He recommended that the Science Committee continue efforts to develop bipartisan legislation that strategically addresses the Nation's innovation and competitiveness challenges and that this legislation gives NSF a major role in improving science and math education and increasing the number of science and math teachers. He added:

- Legislation regarding NSF's role in education must specifically address how the NSF Education and Human Resources Directorate will work with the Department of Education to improve K–12 science and math education and ensure NSF's role in educational research and in science and math teacher development.
- Schools and departments of science, math, and engineering on university campuses need to forge relationships with the education schools and programs. Teacher programs that

have a strong science component, including a research experience, are effective at attracting and retaining teachers, as are those that pair science and math teachers with mentors. NSF is active in supporting both of these types of programs.

- Mentoring for new and continuing teachers should be a priority.

Ms. Rebecca Pringle stated that, based on her experience as a science teacher and board member of the National Education Association, the most important factor in improving K–12 science and math education is having teachers highly trained in their chosen technical field and very well versed in pedagogical methods. She was dismayed that the ACI did not prioritize teacher training. She added:

- NSF has a long history of developing and funding effective programs for science, technology, engineering, and math (STEM) teachers, such as workshops that help train teachers in how to explain complex scientific principals.
- Partnerships between teachers and local universities or industries would greatly benefit STEM teaching. Mentoring programs for STEM teachers would be similarly beneficial.
- The role of the Department of Education in K–12 STEM education should be as a clearinghouse, gathering effective programs developed by the NSF and adapting them to wider use. They also have a large role to play in ensuring all students, regardless of race or location, have equitable access to effective STEM education.
- Teachers' pay should not be linked to what subject they teach. In the long run, this could compromise the entire education system.

Ms. Judy Snyder said that pedagogy and content should not be considered separate entities, and that NSF programs do a good job of teaching these in concert. As an agency, NSF is less subject to short-term political movements, and its funding goes directly to education projects without a state or local intermediary. She also stated that the mentoring of teachers by university and industry science professionals is beneficial for teachers at all levels. She added:

- Gifted students should have the opportunity for immersion experiences in university classrooms, as well as research experiences.
- NSF should continue to fund teacher enhancement programs at universities that deepen knowledge for K–12 teachers and open up new ways for them to teach.
- Teachers should receive compensation for time spent with students outside the classroom (like special labs on weekends). With extra compensation, more teachers might be persuaded to extend the science and math learning hours.

About a dozen recipients of the 2005 Presidential Awards for Excellence in Mathematics and Science Teaching were also present at the hearing. They each provided brief remarks on the rewards and

challenges they face as science and math teachers and on actions policy-makers could take to help them be more effective.

4.1(aa)—Innovation and Information Technology: The Government, University, and Industry Roles in Information Technology Research and Commercialization

May 5, 2006

Hearing Volume No. 109–48

Background

On Friday, May 5, 2006, the Committee on Science of the House of Representatives held a field briefing in Austin, Texas to examine how information technology (IT) research and development (R&D) sponsored or performed by government, industry, and universities contributes to U.S. competitiveness in the global IT market.

The witness were: (1) Dr. Peter Freeman, Assistant Director for Computer and Information Science and Engineering, National Science Foundation (NSF); (2) Mr. Pike Powers, Partner, Fulbright & Jaworski L.L.P.; (3) Dr. Juan Sanchez, Vice President for Research, The University of Texas at Austin; (4) Dr. Randal Goodall, Director, External Programs, SEMATECH; (5) Dr. Neil Iscoe, Director, Office of Technology Commercialization, The University of Texas at Austin.

Summary of Hearing

Representative Smith, presiding as Chair of the briefing, began by stating the vital role intellectual property industries play in keeping the American economy competitive. In order to secure American economic leadership, government, industry, and the universities must work together to protect American intellectual property and enhance the ability to innovate in these fields. Increased attention to math and science education is a key component to these efforts. Representative Smith also noted the appropriateness of holding the field briefing in Austin, Texas, a city renowned for its high-tech industries.

Representative McCaul emphasized that university research programs, like those at the University of Texas, funded by federal agencies like NSF and the Defense Advanced Research Projects Agency, have led to many of the technologies that enable modern, electronic commerce and have kept the U.S. economically competitive. In the face of increasing global competition in high-tech industries, the U.S. must continue its commitment to fund the R&D and educate the workforce that make high-tech industries work.

Dr. Freeman focused his remarks on the ways in which NSF investment in IT research promotes innovation and helps commercialize new applications. For example, Google's founders were recipients of an NSF grant who later commercialized their application with great success. In addition to funding 86 percent of the computer science research on university campuses, NSF works with the IT industry, both directly, and in programs that complement on-going research supported by industry and other government agencies. One way in which NSF does this is through support

for Industry/University Cooperative Research Centers; current centers cover areas ranging from wireless technologies to cyber security.

Mr. Pike Powers discussed the commercialization process for university research and claimed that issues ranging from a lack of commercialization experience to a lack of seed funding were preventing universities from making the most of the research performed at their institutions. He also mentioned programs under NSF, the National Institute of Standards and Technology, the U.S. Department of Agriculture, and the Department of Commerce whose continued support by Congress were important for maximizing the success of the transfer of university research to commercial applications.

Mr. Sanchez described how programs using the simulation capabilities of advanced cyberinfrastructure (advanced computing technologies, such as supercomputers and high-speed networking) enable developments in emergent technologies from medicine to geology. U.S. leadership in simulation-based engineering and science relies on federal investment, specifically through NSF. He called for federal support in three areas: cyberinfrastructure, development of applications to run on advanced cyberinfrastructure, and research on the next generation of software and hardware.

Mr. Goodall stated that federal funding for basic computer science R&D is the base of the entire U.S. IT industry. However, universities that perform this research often face challenges to the successful commercialization of new technologies. These challenges include: the timelines of graduate research (which are often much longer the industry's own timeline for introducing and developing new technologies); the typically narrow scope of university research; and the difficulty universities have in maintaining intellectual property portfolios. He recommended that, in the future, the Federal Government, in addition to supporting emerging fields such as nanomanufacturing and nanofabrication, should form partnerships with States to support State development efforts targeted at the semiconductor industry and technology development.

Mr. Iscoe noted that the interplay of federal funding, university exploration, and industrial application is vital to keeping the U.S. IT industry competitive, and that university research is necessary to help create disruptive new technologies when industries become too entrenched in the last set of innovations. He also mentioned the importance of state programs in supporting innovation and fostering technology transfers from local universities to local industries.

4.1(bb)—Inspector General Report on NOAA Weather Satellites

May 11, 2006

Hearing Volume No. 109–49

Background

On May 11, 2006, the House Committee on Science held a hearing to discuss the report released by the Inspector General (IG) en-

titled "Poor Management Oversight and Ineffective Incentives Leave NPOESS Program Well Over Budget and Behind Schedule."

The National Polar-orbiting Operational Environmental Satellite System (NPOESS) satellites are under development and are designed to become the Nation's key weather satellites, replacing the current generation of both civilian and military weather satellites as they reach the end of their useful lives. Yet the program is more than 25 percent or as much as $3 billion over budget and anywhere from 17 months to three years behind schedule, creating a possible gap in weather satellite coverage (if current satellites fail before new ones can be launched).

The IG report examines how the NPOESS program got so off track. The first finding is that the top officials at the agencies responsible for NPOESS did not exercise sufficient oversight and did not seek sufficient information from sources who were independent of the NPOESS program. The second is that the way the contract for NPOESS is written and the way it was implemented enabled the contractor to receive sizable award fees even when the program was not performing well.

The agencies in charge of NPOESS are the National Oceanic and Atmospheric Administration (NOAA), the Department of Defense (DOD), and the National Aeronautics and Space Administration (NASA). The IG report only examines actions by NOAA (which is the only NPOESS agency within the Commerce Department IG's jurisdiction). NOAA is responsible for overall program management of NPOESS and, during most of the period under review, a NOAA employee was the day-to-day official in charge of the NPOESS program.

The Committee heard from: (1) Mr. Johnnie E. Frazier, Inspector General, U.S. Department of Commerce; (2) Vice Admiral Conrad C. Lautenbacher (ret.), Administrator, National Oceanic and Atmospheric Administration;

Summary of Hearing

Mr. Frazier outlined the two major findings from the Inspector General's audit of the NPOESS program, stating first that EXCOM did not "effectively challenge optimistic assessments of the impact of VIIRS [Visible Infrared Imager Radiometer Suite] problems on NPOESS." Mr. Frazier also discussed flaws in the incentive fee plan and mentioned the underlying fact that the incentive fee, though distributed, did not promote exceptional work. Mr. Frazier called for routine, independent reviews and evaluation of the progress on NPOESS.

Admiral Lautenbacher described the background of the NPOESS program and the difficulties with the VIIRS sensor. Admiral Lautenbacher explained how NOAA has been addressing the recommendations. He said that he agreed with restructuring the award process, and that he receives monthly status reports on the NPOESS program. Regarding the future of the NPOESS program, Admiral Lautenbacher stated that they will wait to receive the final Nunn-McCurdy decision before making changes. He also described the Program Management Council that he formed to regularly evaluate other NOAA programs and projects, specifically NOAA's other main satellite program, GOES–R. Additionally, he

described the GOES–R Independent Review Team that has been established.

4.1(cc)—The Future of NPOESS: Results of the Nunn-McCurdy Review of NOAA's Weather Satellite Program

June 8, 2006

Hearing Volume No. 109–53

Background

On June 8, 2006 the House Committee on Science held a hearing to discuss the results of the statutorily required review, known as a Nunn-McCurdy review, of the National Polar-orbiting Operational Environmental Satellite System (NPOESS). This program, key to building new weather satellites for both military and civilian forecasting, is jointly run by the Department of Defense (DOD), the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA), with DOD and NOAA evenly splitting the costs, except for the costs of providing one preliminary satellite, which are being borne by NASA.

Under the law, any DOD-funded program that is more than 25 percent over budget must be reviewed to see if it should be continued and, if so, in what manner. The review, which was carried out under the auspices of DOD by all three NPOESS agencies, determined that the program should be continued, but the number of satellites and their capabilities will be scaled back. The NPOESS agencies argue that the scaled back program will be able to capture all weather data collected by current satellites and will minimize the chance of having gap periods when a full complement of satellites is not flying.

The revamped program is estimated to have acquisition (as opposed to operational) costs of $11.1 billion ($11.5 billion if launch costs are included). That is an increase of about 50 percent, or $3.7 billion over the most recent official baseline of $7.4 billion issued in 2004. The original cost estimate for the program as configured before the Nunn-McCurdy review, which was issued in 2000, was $6.5 billion. No additional funds beyond those already projected will be needed until fiscal year (FY) 2010, according to the three NPOESS agencies. The first NPOESS satellite would be launched in 2013. The 2004 estimate assumed a first launch in 2010; the 2000 estimate assumed a launch in 2008. The Committee is seeking background materials to better evaluate and understand these estimates.

The Committee heard from: (1) Vice Admiral Conrad C. Lautenbacher, Jr. (ret.), Administrator, National Oceanic and Atmospheric Administration; (2) Dr. Michael Griffin, Administrator, National Aeronautics and Space Administration; (3) Dr. Ronald M. Sega, Under Secretary of the Air Force, U.S. Department of Defense.

Summary of Hearing

Admiral Lautenbacher discussed the results of the Nunn-McCurdy certification from NOAA's point of view, including data con-

tinuity and minimizing the potential for a gap in coverage; the status of all sensors and satellites in use; and the scheduled launch of the NPOESS satellites with respect to the duration of the program. He also emphasized NOAA's commitment to meeting expectations concerning cost and schedule margins, management reserves and oversight, and the performance requirements of the technology used in weather forecasting systems.

Dr. Griffin outlined NASA's commitment to supporting the development of technology that allows for long-term climate measurement. He affirmed that the continuity of existing environmental monitoring sensors is a priority for NASA, and that personnel there are doing their best to set priorities within the provided resources.

Dr. Sega emphasized the Department of Defense's (DOD) commitment to preserving the operational capabilities of NPOESS and the military's dependence on the system. Dr. Sega added that determining the number and type of sensors used in weather forecasting systems is contingent on assuring core capability and continuity while minimizing technology risks.

4.1(dd)—Voting Machines: Will the New Standards and Guidelines Help Prevent Future Problems?

July 19, 2006

Hearing Volume No. 109–56

Background

On July 19, 2006, the House Committee on Science and the Committee on House Administration held a joint hearing to review new federal voluntary standards for voting equipment, which were issued late last year, to see if they are likely to improve the accuracy and security of voting, and to see if states are likely to adopt the standards.

The new standards, known as the Voluntary Voting Systems Guidelines (VVSG), were required by the *Help America Vote Act* (HAVA), which was enacted in 2002. Under the Act, the Election Assistance Commission (EAC) promulgates the standards, based on recommendations from the Technical Guidelines Development Committee (TGDC), which is chaired by the National Institute of Standards and Technology (NIST). The language in the Act regarding the standards was written by the House Science Committee and the House Administration Committee. The EAC approved the first edition of these standards, the 2005 Voluntary Voting Systems Guidelines (VVSG), in December 2005, but made the new standards (the 2005 VVSG) officially effective as of December 2007.

The 2005 VVSG standards are voluntary and states are free to adopt them, wholly or partially, as they see fit. In a recent GAO report, The Nation's Evolving Election System as Reflected in the November 2004 General Election, the GAO noted widespread inconsistency in the use of federal technology standards. In addition, the same GAO study noted that the performance of the voting systems—such as accuracy, reliability, and efficiency—was not consistently measured by states.

The Committees heard from: (1) Ms. Donetta Davidson, Commissioner, Election Assistance Commission; (2) Dr. William Jeffrey, Di-

rector, National Institute of Standards and Technology; (3) Ms. Mary Kiffmeyer, Secretary of State for Minnesota; (4) Ms. Linda Lamone, Administrator of Elections, Maryland State Board of Elections; (5) Mr. John Groh, Chairman, Election Technology Council; and (6) Dr. David Wagner, Professor, University of California at Berkeley.

Summary of Hearing

Ms. Davidson testified that the EAC's program to verify the voting system is in the first phase of development, and that it will be "more rigorous. . .than ever before." She emphasized the importance of voter education, which she said is just as important as the machine's ability to function without error.

Dr. Jeffrey testified that NIST is on track to help achieve the three main responsibilities that HAVA assigned to the institute—prepare a report addressing the human factors in voting error; chair and provide support to the Technical Guidelines Development Committee (TGDC); and recommend a testing laboratories accreditation process to the EAC. He clarified that the NIST process of accrediting and verifying these machines is a new one, and still under work; he described NVLAP, a program within NIST that establishes a process to accredit testing labs. He also emphasized that the 2007 guidelines will need to be clarified and made more precise before they can really assure security.

Ms. Kiffmeyer described how Minnesota selected its new voting system, and emphasized that current security guidelines are not sufficient to ensure voting accuracy. She said improvements to guidelines for the use of wireless components and the establishment of a paper trail are two areas in states could use assistance.

Ms. Lamone outlined the four main aspects of the voting process—the actual machines, the people voting, the examination of the process, and then voting security itself. She also discussed the problems with paper trails, including how they contain the possibility of stifling the development of other verification technologies, and how they relate to disabled voters, especially the blind.

Dr. Wagner testified that in general, the federal process to ensure voting accuracy and security is not working—the laboratories cannot "weed out" machines that are not functioning properly, occasionally approve faulty machines, and that the federal guidelines are not addressing these issues. He also underlined his belief that a voter-verified paper trail is the only real way to assure accurate voting.

Mr. Groh described how the Information Technology Association of America, and its partner groups, like the Election Technology Council, are working to provide accurate and secure voting—firstly, ensuring "fiscal and operational feasibility;" secondly, the impact of testing and certification on voting; thirdly, the need for continued funding streams; and finally, the need for phased-in implementation of any future changes.

4.1(ee)—Science and Technical Advice for the U.S. Congress

July 25, 2006

Hearing Volume No. 109–57

Background

On Tuesday, July 25, 2006, the House Science Committee held a hearing to examine how Congress receives advice about science, and whether and how the mechanisms for providing that advice need to be improved.

The five witnesses were: (1) The Honorable Rush Holt, Representative from the 12th District of New Jersey; (2) Dr. Peter Blair, Executive Director of the Division on Engineering and Physical Sciences at the National Academies; (3) Dr. Catherine Hunt, President of the American Chemical Society and the Leader for Technology Partnerships (Emerging Technologies) at the Rohm and Haas Company; (4) Dr. Jon Peha, Professor in the Departments of Engineering and Public Policy and Electrical and Computer Engineering at Carnegie Mellon University; and (5) Dr. Al Teich, Director of Science and Policy Programs at the American Association for the Advancement of Science (AAAS).

Summary of Hearing

Chairman Boehlert opened the hearing by saying that though he did not agree with the defunding of the Congress' Office of Technology Assessment (OTA) in 1995, he also thought that its proponents have overstated the effect the OTA's loss has had on the quality and impact of the scientific and technical (S&T) information advice used by Congress. He hoped that the witnesses today would give ideas and suggestions on how the mechanisms by which Congress receives such advice could be improved.

Ranking Member Gordon recalled the forty year history that lead to the creation of the OTA. Created with bipartisan support, OTA was relied upon by Congress for reports on S&T issues for twenty years. Rep. Gordon stated his belief that Congress could use OTA today as many issues before the legislature are technical in nature and few Members have technical backgrounds.

Rep. Holt stated his view that Members do not suffer from a lack of S&T information; they are actually inundated with too much information. However, they lack the tools to gauge the validity, credibility, and usefulness of that information. He argued that reviving OTA would alleviate this problem, adding:

- Members voted in 1995 to de-fund OTA, claiming dissatisfaction with the tardiness of reports. However, this was due to the fact that the office was under funded and over requested (in the last year of its existence, fiscal year 1995, OTA's budget was slightly over $20 million).
- Since the OTA's dissolution, Congress has not received the quality scientific advice from outside sources that they assumed would replace the S&T information coming from the OTA.

Dr. Peha testified that Congress needs an organization to frame S&T issues instead of appealing to organizations or groups offering their own recommendations. One problem with the current situation is that experts may give misleading simplifications to Members. As non-experts, Members cannot decipher substance from rhetoric. Peha recommended that:

- For many complex issues, like communications technology, there is no organization to synthesize all the information.
- To provide synthesis of technical information and issues, Congress needs a new program or agency or needs to establish such an agency in an existing organization.
- To be successful this program must be responsive to the needs of Congress, credible in technical communities, impartial, bipartisan and sufficiently independent from Congress. With sufficient independence, the agency could release controversial studies without being concerned that its funding would be eliminated.

Dr. Teich discussed the role of organizations, like AAAS, in addressing complex scientific issues for Congress. He identified the interpretation of available information as the main hurdle that Members face when trying to effectively utilize scientific and technical information. He added:

- The National Academies take up to 12–18 months to produce reports—too long when information is needed quickly.
- Additionally, input from scientists tends to focus on data and not large scale policy analyses; Members need the historical, sociologic and comparative aspects of S&T information.
- AAAS's Congressional Science Fellows program places approximately 35 Ph.D. level scientists and engineers in professional staff positions in Congressional offices. This program is an effective way to improve the S&T expertise available to Members, but as this program is paid for by the fellows' supporting scientific societies, the number of scientists and Member offices participating has been limited by funding.
- The advantage of re-establishing OTA is that Congress would not need to draft new legislation. However, the re-established organization would need to produce a product relevant to Members to ensure its existence through consecutive Congresses.

Dr. Blair agreed with other panelists that the problem for Congress is not the quantity of information but how to gauge the validity and usefulness of available information. He focused on the resources Congress already has, noting:

- Congress already receives information from universities, think tanks, professional societies, trusted constituents, existing congressional agencies, and the National Academies.
- The National Academies have a long history of credibility, expertise, and objectivity and regularly provide reports to Congress with findings and recommendations that reflect the consensus of the scientific community. However, the Academies' expertise and processes do not readily extend past

technical analysis to provide recommendation on broader policy implications which may require value judgments or tradeoffs on which it may be difficult or impossible to achieve consensus.

- Congress needs an S&T organization that can evaluate policy options. This need could be fulfilled by re-establishing and restructuring OTA, modifying an existing Congressional office or agency to take on new responsibilities, or even adapting the processes and products of an outside organization.
- If OTA were re-established, it would need to be structured differently, including having a bipartisan staff that gave both sides of the aisle a sense of ownership of the office. Advances in technology since 1995 have the potential to allow a new OTA to function more efficiently and to react faster to the requests of Members.

Dr. Hunt discussed the use of the organizations and agencies already in place and the potential benefit of establishing a new unit for interpreting S&T information. She added:

- Outside experts can provide Congress with nonpartisan analysis of complex issues. The Government Accountability Office and the Congressional Research Service can also provide this type of analysis. However, neither group is equipped to meet all of Congress' frequent and extensive needs.
- Congress should also charter an in-house S&T unit characterized by bipartisanship, with sufficient, skilled, professional staff and strong links to outside experts. Re-establishing OTA could be done quickly, but first Congress would need to address the concerns about its performance that existed when Congress de-funded OTA in 1995.

4.1(ff)—How Can Technologies Help Secure Our Borders?

September 13, 2006

Hearing Volume No. 109–60

Background

On Wednesday, September 13, 2006, the House Science Committee held a hearing to consider the role of technology in securing the country's land borders. Five witnesses testified on the availability and practicality of technologies like surveillance cameras, unmanned aerial vehicles (UAVs), and sensors to monitor and secure the borders. The witnesses also discussed on-going programs and priorities for future research and development of technology for border security.

The witnesses were: (1) Admiral Jay M. Cohen, Under Secretary for Science and Technology, Department of Homeland Security (DHS); (2) Mr. Gregory Giddens, Director of the Secure Border Initiative Program Executive Office, DHS; (3) Dr. Peter R. Worch, Independent Consultant and Member of the U.S. Air Force Science Advisory Board; (4) Mr. G. Daniel Tyler, Department Head of the

National Security Technology Division, Johns Hopkins University Applied Physics Laboratory; (5) Dr. Gervasio Prado, President of SenTech Inc.; and (6) Dr. Gregory Pottie, Associate Dean for Research and Physical Resources, Henry Samueli School of Engineering and Applied Science, University of California Los Angeles.

Summary of Hearing

Chairman Boehlert began the hearing by noting the important role technology can play in carrying out the missions of DHS, including the potential deployment of technology to thwart illegal border crossings. He felt, to date, there was no established and adequately funded plan for the research, development, and deployment of technology for border security. Chairman Boehlert stated that he hoped to hear the witnesses' views on the direction the DHS Directorate of Science and Technology (DHS S&T) should take.

Ranking Member Gordon wanted the witnesses to explore the question of what detection, surveillance, communication, and computer-aided analysis and control techniques are appropriate and cost-effective, and how they can be integrated into an effective border security system. He was also interested in how DHS S&T would be assisting the Border Patrol in its procurement stage for the Secure Borders Initiative (SBI).

Admiral Jay M. Cohen delivered testimony for DHS, representing himself and Mr. Giddens. He explained that the SBI will integrate the Department's efforts, from systems through policies, against activities that threaten border security. DHS S&T is supporting SBI by providing systems engineering tools, processes and staff to evaluate technologies and analyze the risks, gaps and trade-offs involved in various potential investment strategies. DHS S&T will provide this technical information to DHS staff making decisions about SBI acquisitions and investment strategies, but DHS S&T does not have responsibility for making the decisions or overseeing the contracts. Admiral Cohen provided examples of the work DHS S&T has supported for the SBI:

- A Border Watch Program which includes the evaluation of technologies for border surveillance and the development of tools for enhanced communication in the field to facilitate apprehension and situational awareness and technologies for pattern discovery and prediction to improve intelligence collection.
- Unmanned aerial vehicles (UAVs): In fiscal year 2004, DHS S&T led an extensive interagency evaluation of existing UAV technologies to determine which UAVs should be purchased for use at the borders. Currently, DHS S&T is working with the Department of Defense and the Federal Aviation Administration to improve technologies and determine policies to allow UAVs to be used in commercial airspace.

Mr. Tyler testified on several major projects, like AT&T's switch of the telecommunications infrastructure from analog to digital technology, which serve as examples where systems engineering was used to successfully tackle a massive and complex technical issue. As a similarly large-scale and complex problem, securing the borders is thus a prime candidate for a systems engineering ap-

proach, which relies on solving problems in phases with a disciplined methodology. He added:

- A two-year timescale for this problem should first ensure the existence of major hardware and infrastructure. Second, an open architecture would be necessary to allow many organizations to freely participate. Third, to avoid lengthy delays, program coordinators should ensure contractors are already in place before the implementation phase. Fourth, critical technology needs to be in the pipeline so that it is available when needed, thus necessitating an active research and development (R&D) program.
- Technical research priorities for DHS S&T should be the development of algorithms for automated detection and elimination of false alarms from unattended ground sensors.

Dr. Peter Worch testified that the problem of securing the border was a layered "systems" problem. He stated that developers should insist on the integration of information, not systems, and also on the implementation of an evolutionary approach to the acquisition of new technologies. He added:

- The first layer of the system is "intelligence" on the habits of people crossing the borders, as well as on the topography and terrain of the area. The next is a "tripwire" in the form of either ground sensors or UAVs, followed by investigation by UAVs. Then people, with real-time, integrated information, can make the decision on whether and how to respond.
- Three critical areas for border security R&D are: sensors (basic ground sensors, improved processing techniques to allow people to be more clearly identified using radar, and automatic target recognition), UAVs (more closely match the human user's experience with that of flying a manned plane, programs for air safety), and information management (to put output from sensors in a form that allows the border patrol agents to quickly and easily judge and act on the information). The parties doing this research should work in conjunction with military laboratories.

Dr. Prado testified as to the capabilities of the unattended ground sensors his company develops and works to integrate into systems that can produce usable intelligence for an end-user. He also stated that investment in international development could decrease the number of people attempting illegal immigration into this country, thus contributing to border security. He added:

- In order to be effectively deployed in the field, unattended ground sensor systems will have to have extremely low power consumption, operate in extreme weather, be designed to operate in concert, and provide usable information to an end-user who may be hundreds of miles away.
- Top priorities for DHS S&T should be to give companies doing security technology R&D feedback from agents using the sensors in the fields, allowing them to appropriately direct future research.

Dr. Pottie testified on his research and that of the Center for Embedded Network Sensing at UCLA on wireless sensor networks. He noted that detecting ground vehicles, which make a lot of noise and cause vibrations is relatively easy, but detecting people is considerably more difficult, especially since the environment in which they are moving can change the characteristics of the signals the sensors detect. He noted that information integration is extremely important and cautioned against creating a system where personnel spend more time supporting the system than the system spends supporting them, adding:

- DHS contracts tend to have short-term objectives. When looking for funding an academic has to ensure long-term funding for his/her Ph.D. students.

4.1(gg)—Research on Environmental and Safety Impacts of Nanotechnology: What Are the Federal Agencies Doing?

September 21, 2006

Hearing Volume No. 109–63

Background

On Thursday, September 21, 2006, the House Committee on Science held a hearing to examine whether the Federal Government is adequately funding, prioritizing, and coordinating research on the environmental and safety impacts of nanotechnology. Nanotechnology, the science of materials and devices of the scale of atoms and molecules, has entered the consumer marketplace. Today, there are over 300 products on the market claiming to contain nanomaterials (materials engineered using nanotechnology or containing nano-sized particles), generating an estimated $32 billion in revenue. There is significant concern in industry that the projected economic growth of nanotechnology could be undermined by either real environmental and safety risks of nanotechnology or the public's perception that such risks exist.

There is an unusual level of agreement among researchers, and business and environmental organizations that the basic scientific information needed to assess and protect against potential risks does not yet exist. In October 2003, the White House National Science and Technology Council organized an interagency Nanotechnology Environmental and Health Implications (NEHI) Working Group, composed of agencies with research and regulatory responsibilities for nanotechnology, to coordinate environmental and safety research. The NEHI Working Group is charged with "facilitate[ing] the identification, prioritization, and implementation of research. . .required for the responsible" development and use of nanotechnology. The Food and Drug Administration serves as the current Chair of the NEHI Working Group.

One of the NEHI Working Group's initial tasks was developing a report describing research needs for assessing and managing the potential environmental and safety risks of nanotechnology. In March 2006, the Administration informed the Science Committee that this report would be completed that spring. The report was re-

leased on the day of the hearing. The report was a list of research needs and not a prioritized strategy.

In July 2006, the Wilson Center's Project on Emerging Nanotechnologies released a report proposing a research strategy for "systematically exploring the potential risks of nanotechnology." The report highlights critical federal research that urgently needs to be carried out in the next two years. The report also finds that current federal coordination does not yet have an effective mechanism to set research priorities, distribute tasks among the agencies, and ensure that adequate resources are provided for the most urgent research.

The Committee heard from: (1) Dr. Norris E. Alderson, Chair of the interagency NEHI Working Group, and Associate Commissioner for Science at the Food and Drug Administration; (2) Dr. Arden L. Bement, Jr., Director, National Science Foundation (NSF); (3) Dr. William Farland, Deputy Assistant Administrator for Science, Environmental Protection Agency (EPA); (4) Dr. Altaf H. (Tof) Carim, Program Manager, Nanoscale Science and Electron Scattering Center, Department of Energy (DOE); (5) Mr. Matthew M. Nordan, President, Director of Research, Lux Research, Inc.; and (6) Dr. Andrew Maynard, Chief Science Advisor, Project on Emerging Nanotechnologies, Woodrow Wilson International Center for Scholars.

Summary of Hearing

Dr. Alderson outlined the purpose of the NEHI Working Group, which he said was to ease the exchange of information among the agencies which support nanotechnology research, and those organizations which provide regulations and guidelines for the implementation of research. He also described a report, entitled "Environmental Health and Safety Research Needs for Engineered Nanoscale Materials," which he identified as the "first step" in addressing upcoming nanotechnology research needs. He also clarified that the NEHI was not responsible for reviewing the environmental, health, and safety budgets of the agencies participating in the NNI.

Dr. Bement described the NSF's research into nanotechnology, which is divided into three main groups: environmental health and safety, education, and ethical and legal issues. He explained that the NSF sets its internal annual priorities for nanoscale research based on input from several organizations, including the NSF's nanotech working group, the National Academies, and industry.

Dr. Farland emphasized the importance of understanding the impacts of nanoparticles on the environment and on human health. As more and more products on the market contain nanoparticles, the EPA "has an obligation to ensure that potential environmental risks are adequately understood." He also described that programs and research initiatives at the EPA to better understand nanotechnology, including Science to Achieve Results Program, and the Small Business Innovation Research programs.

Dr. Carim described how the DOE prioritizes core research, saying that only a few solicitations have concentrated specifically on nanotechnology. Decisions, he said, are based on peer review and merit evaluations. The five Nanoscale Science Research Centers

which the DOE operates work indirectly on environmental, safety, and health issues raised by nanotechnology.

Dr. Maynard emphasized the importance of top-down research strategy for nanotechnology, and identified the Federal Government as a good tool by which to do that. He estimated that, at a minimum, the Federal Government will need to invest $100 million in targeted research to get a "strong science-based foundation for safe nanotechnology." He recommended, among other things, that the National Academy of Sciences be called upon to develop an overarching research strategy for environmental, health and safety issues.

Mr. Nordan outlined the three main concerns that private industry has with nanotechnology: real risk, perceived risk, and regulatory risks. Even if no real, tangible harm comes from nanotechnology, Mr. Nordan described how a perceived risk by the public could cripple the use of nanotechnology. He also emphasized that corporations actually want increased regulation to get rid of ambiguity and lack of guidelines. He identified a "specific game plan for accomplishing research" as the most important factor in achieving sound nanotechnology research.

4.1(hh)—Implementing the Vision for Space Exploration: Development of the Crew Exploration Vehicle

September 28, 2006

Hearing Volume No. 109–65

Background

On Thursday, September 28th at 2:00 p.m. the House Committee on Science held a hearing to review the National Aeronautics and Space Administration's efforts to develop the Crew Exploration Vehicle (CEV), which NASA has recently announced will be called Orion. NASA selected Lockheed Martin as its industry partner for the development and production of Orion. The Government Accountability Office (GAO) released a report critical of NASA's contracting approach for the acquisition of Orion. The report, entitled "NASA: Long-Term Commitment to and Investment in Space Exploration Program Requires More Knowledge," faults the agency for committing to a long-term contract for Orion before reaching an appropriate level of understanding of the design and risks of the program. Following discussions with the GAO and the Science Committee, NASA revised its then pending contract with Lockheed Martin to address some of the GAO's concerns.

This hearing sought to explore NASA's development schedule and costs and provide a basis for ongoing oversight of this program. Witnesses were Dr. Scott J. Horowitz, Associate Administrator, Exploration Systems Mission Directorate, NASA; and Mr. Allen Li, Director, Acquisition and Sourcing Management, Government Accountability Office.

Summary of Hearing

The Members' began questioning by asking how Congress should monitor Orion development. Mr. Li explained the *NASA Authoriza-*

tion Act requires NASA to report on the program's progress and technical risks to the Science Committee. NASA is required to provide reports to the Committee and promised open communication. Dr. Horowitz stressed that he plans on keeping Congress well informed so that no one will "have to wait for a report to know what is going on."

Members also asked how well NASA responded to the GAO report. Mr. Li felt the report prompted Congress to investigate the Orion program, which in turn caused NASA and GAO to meet and discuss their differences. Mr. Li did feel NASA underestimated what NASA considers to be low risk technology. He expressed the fear NASA will succumb to the "pressures of both money and time, and maybe bypassing and shortchanging what I would consider to be some basic, sound systems engineering practices, and that is making sure that you do the testing, making sure that there are certain reviews that are done."

Despite uncertainties, Dr. Horowitz told the Members that the program will avoid overruns with adequate oversight and stable funding. Members asked how NASA would respond to a formal cost cap on the CEV program. Dr. Horowitz noted the budget is essentially a cost cap. NASA is motivated to keep the CEV program within the budget to achieve later goals, like going to the Moon. He explained if the program is short-funded in the near-term then it will stretch out and increase costs in the long-term.

GAO, however, recommended that Congress restrict annual appropriations and limit NASA's obligations to the project's preliminary design. Mr. Li felt NASA should follow a knowledge-based acquisition strategy and currently NASA did not have enough knowledge to proceed. He cited programs, such as NPOESS and SBIRS, which misjudged their technological risks and exceeded their costs. Dr. Horowitz responded that NASA had reached a point where they could not learn more about the designs without choosing a contractor.

Discussion also focused on potential complications during the transition from the Shuttle to Orion and Aries. According to NASA, they plan to address potential layoffs and make use of their workers as much as possible.

Finally, discussion turned to controlling cost and performance for Orion. Members asked how NASA plans to control performance margin. Dr. Horowitz reassured Members that the planned margins are sufficient and workable. He plans on maintaining stability by restricting excess requirements that ask the program to do more than they have the margin to protect.

4.1(ii)—GAO Report on NOAA's Weather Satellite Program

September 29, 2006

Hearing Volume No. 109–66

Background

On September 29, 2006, the House Committee on Science held a hearing about the status of a critical weather satellite program, the National Oceanic and Atmospheric Administration's (NOAA) Geo-

stationary Operational Environmental Satellite (GOES) system. NOAA is beginning the process of purchasing the next generation of the GOES system, which has been designated GOES–R. Cost estimates for the system have escalated, and NOAA has already announced the elimination of one new sensor that was to be part of the satellite. The Government Accountability Office (GAO) recently completed a report about GOES–R, "Geostationary Operational Environmental Satellites: Steps Remain in Incorporating Lessons Learned from Other Satellite Programs."

Government satellite programs have a history of technical problems and major cost overruns. Most recently, NOAA and its government partners (the Department of Defense and the National Aeronautics and Space Administration) have experienced massive cost overruns on another weather satellite program, the National Polar-orbiting Operational Environmental Satellite System (NPOESS). The GOES–R program is at a much earlier stage than NPOESS is at this point. NOAA has nearly completed the preliminary design of GOES–R. Original estimates for GOES–R placed the total cost at $6.2 billion, but as of May 2006 the program office estimated costs could be as high as $11.4 billion. In an effort to lessen these costs, NOAA is currently looking at options to reduce the scope and capabilities of GOES–R.

The GAO report, requested by the Committee, examines the status of the GOES–R program and reasons for the cost increases and problems to date, and identifies program management actions NOAA should take to ensure past problems with satellite programs are not repeated with GOES–R. GAO identified four major lessons from previous satellite programs and found that, while NOAA has some plans to address those lessons, actions remain for NOAA to fully implement the lessons and decrease the risk of future cost overruns and technical problems.

The Committee heard from: (1) Vice Admiral Conrad C. Lautenbacher (ret.), Administrator, National Oceanic and Atmospheric Administration; and (2) Mr. David Powner, Director of Information Technology Management Issues, U.S. Government Accountability Office.

Summary of Hearing

Vice-Admiral Lautenbacher spoke extensively on the changes made to the management of the GOES–R program, based on lessons learned from the NPOESS program, the reviews from the GAO, and the Department of Commerce Inspector General. These changes include the creation of a NOAA program management council, quarterly briefings to the Department of Commerce, and consulting a former NASA program manager on the GOES–R program. He identified a potential cost of ultimately $11.4 billion to complete the GOES–R program and explained that NOAA decided to remove one sensor, the Hyperspectral Environmental Suite (HES), from GOES–R to reduce the cost and technical risk of the program.

Mr. Powner explained the current cost and schedule estimates for GOES–R, which he placed at $11 to 12 billion, with the first satellite expected to launch in 2014 (with coverage lasting until 2028). Despite an increase in the expected cost, Mr. Powner ex-

plained that the GAO's findings shows that NOAA's management team has taken some important steps towards improving the execution of the GOES–R program, but still has more to do.

During questions, members of the Committee emphasized that Congress should maintain close oversight of GOES–R to ensure NOAA continues to execute the program in a cost-effective manner.

4.2—SUBCOMMITTEE ON ENERGY

4.2(a)—Priorities in the Department of Energy Budget for Fiscal Year 2006

April 27, 2005

Hearing Volume No. 109–11

Background

On April 27, 2005, the Subcommittee on Energy held a hearing on the Department of Energy's fiscal year 2006 budget request. Five Department of Energy (DOE) witnesses reviewed the proposed research and development (R&D) budgets and clarified the President's energy-related science and technology priorities.

The witness panel included: (1) Dr. Ray Orbach, Director of the Office of Science, DOE; (2) Mr. Douglas Faulkner, Principal Deputy Assistant Secretary for Energy Efficiency and Renewable Energy, DOE; (3) Mr. Mark Maddox, Principal Deputy Assistant Secretary for Fossil Energy, DOE; (4) Mr. Robert Shane Johnson, Deputy Director for Technology in the Office of Nuclear Energy, Science and Technology, DOE; (5) Mr. Kevin Kolevar, Director of the Office of Electricity Delivery and Energy Reliability, DOE.

Summary of Hearing

The Members in attendance at the hearing expressed concern about various issues involving DOE and its research and development activities. The discussion is summarized below.

Demonstration and Commercialization

Mrs. Biggert asked the panel about the criteria that DOE uses to graduate activities from the laboratory to the demonstration phase. Mr. Johnson described the process as beginning with a laboratory demonstration, then a pilot-scale demonstration, and eventually, assuming it has merit, an engineering-scale demonstration. A project remains at the laboratory scale until it is sufficiently mature for a larger scale operation. For example, in the Nuclear Energy Office, the labs are looking at thermo-chemical reactions, which are characterized on a watt scale. Scaling the project up to the kilowatt scale would be equivalent to a pilot demonstration. An engineering scale demonstration would be in the megawatt range.

Mr. Honda questioned what role the government could play in helping private industry to bring their research projects to commercialization. Mr. Kolevar answered that the task of bringing these projects to commercialization would be so varied that the model would probably have to be changed in each individual case. Mr. Kolevar also noted that the success of these projects would rely heavily on their public-private partnerships.

Nuclear Construction

Dr. Schwarz asked the panel when they believe a new nuclear power-generating plant will be built in the United States and what impediments stand in the way. Mr. Johnson stated that new power plant construction depends on industry. He also stated that DOE's nuclear power 2010 program is partnering with industry to look at regulatory processes at the Nuclear Regulatory Commission for identification of reactor technologies, the identification of new sites to build upon, and the issuance of combined construction operation licenses. Mr. Johnson believes that a decision could be made by industry to move forward with a plant order in the 2009 to 2010 time frame.

Hydrogen

Mr. Inglis asked what the Department is doing with regard to solving the problems of hydrogen storage and distribution. Dr. Orbach discussed some of the major technical challenges for the hydrogen economy: production, storage, and fuel cells. Dr. Orbach stated that the Department is using modern tools to research better catalysts to lower the temperature for the cracking process of hydrogen. Also, the Department is looking at open structures that can be artificially created for hydrogen storage with just the right amount of absorption. For fuel cells, the Department is looking at new membrane materials that will be cheaper and more efficient.

Energy Conservation and Efficiency

Dr. Ehlers asked the panel if they could assure him that DOE is putting full efforts into leading the way for energy independence through energy conservation and energy efficiency. Mr. Faulkner replied that DOE is working on educating the public to be more energy efficient in their homes and offices. Dr. Orbach said that the Department has been working on developing new light sources that are solid state and much more efficient than incandescent and fluorescent.

Coal

Mr. Costello inquired into the progress of FutureGen, the clean coal demonstration project. Mr. Maddox said that he is confident that the Federal Government will meet its commitments on funding going forward. The Federal Government has joined the DOE in negotiations for the legal agreements, and Mr. Maddox stated that DOE has begun looking for other countries to join FutureGen.

Nuclear Waste

Mrs. Biggert asked about the possibility of recycling spent nuclear fuel and reusing it rather than storing it. Mr. Johnson answered that DOE is pursuing separations technology for spent nuclear fuel as part of the Advanced Fuel Cycle program. The focus of that program is to see how they can safely and securely treat the spent fuel from the current fleet of reactors. DOE is looking into separating spent fuel constituents and refabricating spent fuel into new fuel to be recycled back into existing reactors or Generation IV fast reactors.

4.2(b)—Nuclear Fuel Reprocessing

June 16, 2005

Hearing Volume No. 109–18

Background

On June 16, the Energy Subcommittee of the Committee on Science held a hearing to examine the status of nuclear fuel reprocessing technologies in the United States.

The Subcommittee heard testimony from: (1) Mr. Robert Shane Johnson, Acting Director of the Office of Nuclear Energy, Science and Technology and the Deputy Director for Technology, Department of Energy (DOE); (2) Dr. Phillip J. Finck, Deputy Associate Laboratory Director, Applied Science and Technology and National Security at Argonne National Laboratory; (3) Dr. Roger Hagengruber, Director of Office for Policy, Security and Technology and Director of the Institute for Public Policy at the University of New Mexico; (4) Matthew Bunn, Senior Research Associate in the Project on Managing the Atom at Harvard University's John F. Kennedy School of Government.

Summary of Hearing

The hearing examined the status of reprocessing technologies and the impact reprocessing would have on nuclear waste management, weapons proliferation and efficiency of nuclear fuel use.

Subcommittee Chairman Judy Biggert (R–IL) commented on misperceptions about spent nuclear fuel, noting that the nuclear 'waste' coming out of a power reactor actually contains much of its original energy content and can still be used as 'fuel.' She argued that current policy is wasting uranium resources because of this missed opportunity. She also noted that without a change in policy, a second repository, or an expanded Yucca Mountain, will be required. She urged a closer examination of these issues on the assumption that better use of emissions-free nuclear power could help greatly with energy demand.

Mr. Bunn said that there is no need to rush to make any decision on nuclear fuel reprocessing by 2007. He stated that while research and development on advanced concepts may offer promise for the future, any near-term decision to reprocess U.S. commercial spent nuclear fuel would be a serious mistake, with costs and risks far outweighing its potential benefits. Bunn continued by noting that dry storage casks offer the option of storing spent fuel cheaply, safely, and securely for decades, and that during that time, technological developments and economic and political circumstances may very well shift in favor of reprocessing.

Dr. Roger Hagengruber stated that having a 2007 deadline would serve to "motivate" research and development, but cautioned that science may not be able to deliver proliferation-resistant and cost-effective technologies by 2007. Dr. Hagengruber suggested that, rather than forcing DOE to recommend a specific technology in 2007 for implementation, the Department should instead be required to identify the most promising technology at that juncture and include in its report a detailed discussion of the relationship

of the technology to the prospect of proliferation. He emphasized that DOE should keep a reprocessing decision as a goal it but shouldn't rush the decision.

Dr. Finck was more optimistic about the 2007 deadline given the present state of development for reprocessing technologies. He said that the level of development of at least one reprocessing technology, UREX+, is satisfying program goals, and by 2007 will be advanced to the stage where pilot-scale testing is warranted. At that time it should also be possible to evaluate whether any of the other promising technologies currently being studied have proven capable of meeting program goals, and are also near to pilot-scale testing.

Mr. Johnson did not take a position on the 2007 deadline, but cited advanced fuel cycle technologies, such as UREX+, that could be ready for deployment in the near future. He told the Subcommittee that commercial scale-up of spent fuel technologies can, based on our recent analysis, be performed relatively rapidly, if existing domestic facilities could be substantially modified and utilized.

4.2(c)—Economic Aspects of Nuclear Fuel Reprocessing

July 12, 2005

Hearing Volume No. 109–22

Background

On July 12, the Energy Subcommittee of the Committee on Science held a hearing to examine whether it would be economic for the U.S. to reprocess spent nuclear fuel, and what the potential cost implications are for both the nuclear power industry and the Federal Government. This hearing was a follow-up to the June 16th Energy Subcommittee hearing that examined the status of reprocessing technologies and the impact reprocessing would have on nuclear waste management, weapons proliferation and efficiency of nuclear fuel use.

The Subcommittee heard testimony from: (1) Dr. Richard K. Lester, Director of the Industrial Performance Center and a Professor of Nuclear Science and Engineering at the Massachusetts Institute of Technology; (2) Dr. Donald W. Jones, Vice President of Marketing and Senior Economist at RCF Economic and Financial Consulting, Inc; (3) Dr. Steve Fetter, Dean of the School of Public Policy at the University of Maryland; (4) Mr. Marvin Fertel, Senior Vice President and Chief Nuclear Officer at the Nuclear Energy Institute.

Summary of Hearing

The purpose of the hearing was to examine various views held by economists, public policy experts, and a representative of the nuclear industry, on the economic viability of reprocessing spent nuclear fuel and the impact that reprocessing would have on the future of the nuclear power industry.

Subcommittee Chairman Judy Biggert (R–IL) opened the hearing by stating that economics alone should not dictate a decision to

close the fuel cycle, and emphasized the importance of understanding the relationship between costs and benefits in order to make informed decisions about managing the growing stockpile of spent nuclear fuel. She said that understanding the economics of the advanced fuel cycle will allow prioritization of research and development (R&D), which reduces cost and improves economic feasibility of closing the fuel cycle.

Dr. Lester focused on the competitiveness of the nuclear industry, and stated that nobody on the panel disagrees that electricity generation using reprocessing is more expensive than generation using a once-through fuel cycle and disposal of the waste. He added that opinions differ as to how large the cost penalty would be. He said that unfavorable economics has been one of the main barriers to nuclear energy investment for decades, it remains a major issue today, and any proposed course of action that would result in an increase in nuclear generating costs should be viewed with caution.

Dr. Fetter commented on the current technologies and how they may make reprocessing economically impractical today, but that new technological advances could change the economics of reprocessing in the future. He said that it is conceivable that at some point in the long-term future, R&D could lead to a fundamentally different approach that might have lower costs, but it does not appear likely that costs associated with reprocessing will be reduced to levels that would be economically competitive with direct disposal in the foreseeable future.

Dr. Jones testified that reprocessing would not have a significant impact on the development costs of new nuclear power plants and would not undermine the competitiveness of nuclear power vis-à-vis fossil fuel sources. He said that the first new nuclear plants would not be competitive with fossil generation without some form of temporary assistance, and that reprocessing would have little influence on the assistance required to make it competitive. He added that if carbon sequestration were to be required for fossil-fired generation plants, new nuclear power plants, even with reprocessing, would be competitive.

Mr. Fertel said that reprocessing holds great promise to address such issues as nuclear fuel supplies and waste disposal, but that additional R&D is needed to make reprocessing economically viable. He added that future reprocessing of used nuclear fuel is a worthy goal, but must overcome several challenges before it can be used in the United States, citing cost and nuclear proliferation concerns.

4.2(d)—Fueling the Future: On the Road to the Hydrogen Economy

July 20, 2005

Hearing Volume No. 109–23

Background

On July 20, 2005, the Energy and Research Subcommittees of the Science Committee held a joint hearing to examine the progress that has been made in hydrogen research since the launch of the

President's Hydrogen Initiative and the next steps the Federal Government should take to best advance a hydrogen economy.

The witness panel included: (1) Mr. Douglas Faulkner, Acting Assistant Secretary for Energy Efficiency and Renewable Energy at the Department of Energy (DOE); (2) Dr. David Bodde, Director of Innovation and Public Policy at Clemson University's International Center for Automotive Research; (3) Mr. Mark Chernoby, Vice President for Advanced Vehicle Engineering at the DaimlerChrysler Corporation; (4) Dr. George Crabtree, Director of the Materials Science Division at Argonne National Laboratory; (5) Dr. John Heywood, Director of the Sloan Automotive Laboratory at the Massachusetts Institute of Technology.

Summary of Hearing

In his 2003 State of the Union speech, President Bush announced the creation of a new Hydrogen Fuel Initiative, which built on the FreedomCAR initiative he announced in 2002. Together, the initiatives aim to provide the technology for a hydrogen-based transportation economy, including production of hydrogen, transportation and distribution of hydrogen, and the vehicles that will use the hydrogen. Fuel cell cars running on hydrogen would emit only water vapor and, if domestic energy sources were used, would not be dependent on foreign fuels. The Members in attendance at the hearing expressed concern about various issues involving this initiative and DOE execution of the program in particular. Discussion is summarized below.

Subcommittee on Energy Chairman Biggert opened the hearing by stressing the importance that hydrogen and fuel cells hold for a cleaner and more efficient nation that is less dependent on foreign sources of oil. She noted that many of the benefits of a hydrogen economy, such as reduced greenhouse gas emissions, are not currently accounted for in the marketplace, which will make it difficult for hydrogen vehicles to compete with conventional technology.

Subcommittee on Research Chairman Bob Inglis advocated the transition to a hydrogen economy for the sake of cleaner air, and to reduce dependence on Middle Eastern oil. He added that hydrogen entrepreneurs will be making money and employing people, and that the U.S. will be winning our energy independence. He admitted technology and cost challenges ahead, but countered that the U.S. is up to the challenge.

Mr. Faulkner cited significant advances that DOE has made in helping realize the President's hydrogen initiative, and that fuel cell activities recently achieved an important technology cost goal—the high-volume cost of automotive fuel cells being reduced from $275 per kilowatt to $200 per kilowatt. He stated that this accomplishment is a major step toward the Program's goal of reducing the cost of transportation fuel cell power systems to $45 per kilowatt by 2010.

The non-government witnesses urged the government to adopt incentives to encourage additional research and development in hydrogen technologies and urged a dual-path approach that would focus on developing more immediate technologies that could im-

prove fuel efficiency, while continuing research into alternative energy forms such as hydrogen, electricity and biomass.

While citing hydrogen's benefits as a fuel that can be made from a variety of sources and it's lack of emissions of pollutants and greenhouse gasses, witnesses told the Subcommittees that before a hydrogen economy can become reality significant obstacles related to the production and storage of hydrogen must be resolved. Dr. Bodde discussed the challenge in hydrogen storage, noting that the most important long-term research goal is to provide a more effective means of storing hydrogen on vehicles than the compressed gas or cryogenic liquid now in use.

Most hydrogen today is produced from natural gas, which does not resolve the issue of U.S. reliance on foreign energy or greenhouse gas emissions. Dr. Crabtree emphasized that advances in the production of hydrogen are imperative for the fuel to become a practical solution. He added that to power cars and light trucks in the coming decades we will need 10 to 15 times the amount of hydrogen we now produce, and that hydrogen cannot continue to come from natural gas, as that production route simply exchanges a dependence on foreign oil for a dependence on foreign gas, and it does not reduce the production of environmental pollutants or greenhouse gases. He said that we must find carbon-neutral production routes for hydrogen.

Mr. Chernoby discussed the advances his company has made in developing hydrogen powered vehicles, stating that DaimlerChrysler has been working on fuel cell technology for transportation utilizing hydrogen for over ten years and they have invested over $1 billion in R&D and have developed five generations of vehicles. He said that they have 100 fuel cell vehicles participating in various international demonstration projects in the United States, Europe, and Asia.

Citing the significant technical barriers that must be overcome, Dr. Heywood told the Subcommittees that hydrogen will not become a widely used fuel for a number of years. He urged improving fuel efficiency in the short-term, and continued development of alternatives to fossil fuels, such as hydrogen, electricity, and biomass fuels. He also recommended that the U.S. Government play a more active role in increasing fuel efficiency standards, as well as in R&D for alternative fuels; and that there are many ways to improve current vehicle technology to increase efficiency.

4.2(e)—Winning Teams and Innovative Technologies From the 2005 Solar Decathlon

November 2, 2005

Hearing Volume No. 109–30

Background

On Wednesday November 2, 2005 the Energy Subcommittee of the House Committee on Science held a hearing to discuss the 2005 Solar Decathlon competition, an event that challenges the Nation's colleges and universities to construct livable homes that are energy efficient and completely powered by solar energy. Sponsored by the Department of Energy (DOE), the competition was held on the Na-

tional Mall and drew 120,000 visitors; the first, held in 2002, drew 100,000. Competing homes in the Decathlon are judged in 10 categories: architecture, dwelling, documentation, communications, comfort zone, appliances, hot water, lighting, energy balance, and getting around.

The Subcommittee heard testimony from: (1) Mr. Richard F. Moorer, Deputy Assistant Secretary for Technology Development, Office of Energy Efficiency and Renewable Energy, DOE; (2) Mr. Robert P. Schubert, Professor and Team Faculty Coordinator, College of Architecture and Urban Studies, Virginia Polytechnic Institute; (3) Mr. Jeffrey R. Lyng, Graduate Student and Team Project Manager, Civil, Environmental, and Architectural Engineering, University of Colorado; (4) Mr. Jonathan R. Knowles, Professor and Team Faculty Advisor, Department of Architecture, Rhode Island School of Design; and 5) Mr. David G. Schieren, Graduate Student and Energy Team Leader, Energy Management, New York Institute of Technology.

Summary of Hearing

The purpose of the hearing was to examine how the Solar Decathlon can help move new solar technologies into the marketplace by showcasing real, working solar-powered homes to the general public, and to discuss some of the barriers involved.

Subcommittee Chairman Judy Biggert (R–IL) opened the hearing by highlighting the positive effects solar energy and energy efficient design in buildings could have on our energy outlook. She noted that through the Solar Decathlon, young scientists, engineers, and architects are offered a great way to learn about the latest energy technologies, and inspire their peers, the public, and policy-makers to think in new ways about how energy is consumed.

Richard Moorer gave background on the competition, stating that it is specifically designed to help teams integrate solar energy and energy efficient building technologies and practices into their designs, and that it was accomplished by fully involving DOE's Solar Program and Building Technologies program in Solar Decathlon team activities, including materials development, pre-competition meetings, and contest designs. Moorer also emphasized that sponsors like the American Institute of Architects and BP Solar were intended to improve outreach capability with professional builders, architects and solar equipment manufacturers in the U.S.

Robert Schubert testified that the relationships built between competing academic institutions and private industry are important for facilitating technology transfer. He explained that collaboration was essential between Virginia Tech and GE Specialty Film as well as Sheet and Cabot Corporation to come up with new innovations on sustainable, environmentally friendly designs. He suggested that the main technical and other barriers to greater use of solar energy are: public perception, conservatism of the building industry; cost, time of return on investment; and the paucity of new architectural ideas relative to new technology. Schubert added that the most important initial step for homeowners concerned with energy consumption is to invest in conservation.

Jeffrey Lyng of Colorado (UC), the winning team in both 2005 and 2002, focused on the Decathlon guidelines and how they could

limit successful outreach; he added that UC's house would not be very attractive to the mainstream market because it was designed for a specific client and with the objective of being transported over long distances. According to Lyng, the competition's design limitations, which result in model homes quite unlike a home that would be occupied by the general public, will have a hindering effect on widespread adoption of the technologies. He suggested that DOE consider increasing the 800 square foot size maximum, establish a mini grid from which the houses could draw power—as they would in a real-world application—and replace the current energy balance contest for a life cycle contest that would more accurately reflect true operational costs of the houses. Lyng also discussed the importance of the Decathlon as a rare learning experience for students.

Jonathan Knowles pointed out that nothing presented at the Decathlon is out of the public's reach, but that while many states, especially in New England and New York, offer generous incentives to build energy efficient, solar-powered homes, each state has different rules; and that in places like New York State it can be difficult to elicit help from some organizations that manage these programs. Because of this he recommended that the Federal Government streamline rules governing these programs, and embark upon a nationwide public awareness campaign.

David Schieren discussed his team's use of hydrogen fuel cells. He stated that the demonstration of fuel cells and other innovative technologies featured in the Solar Decathlon helps further advancements in the technologies and has a positive impact on moving solar and efficiency technologies into the mainstream building market. Schieren went on to suggest that distributed generation with systems such as the hydrogen fuel cell will redefine the energy paradigm in the U.S. In addition to listing some of the barriers to a hydrogen economy, Schieren cited the main barriers to mass market penetration of solar technologies as: lack of public awareness about benefits of solar energy and true costs of current fossil fuel-based systems; high cost of solar materials and raw materials; inconsistency of government incentives for homeowners and developers; and a lack of engineer, construction worker, and architect training.

4.2(f)—Assessing the Goals, Schedule, and Costs of the Global Nuclear Energy Partnership

April 6, 2006

Hearing Volume No. 109–44

Background

On April 6, 2006, the Subcommittee on Energy held a hearing to examine the goals, schedules and costs of the advanced fuel cycle technologies research and development program in the Administration's Global Nuclear Energy Partnership (GNEP) proposal.

The witness panel included: (1) Mr. Shane Johnson, Deputy Director for Technology, Office of Nuclear Energy Science and Technology, DOE; (2) Dr. Neil Todreas, Kepco Professor of Nuclear Engineering and Professor of Mechanical Engineering, Massachusetts Institute of Technology; (3) Dr. Richard Garwin, IBM Fellow Emer-

itus, Thomas J. Watson Research Center, Yorktown Heights, NY; and (4) Mr. David Modeen, Vice President for Nuclear Power and Chief Nuclear Officer, Electric Power Research Institute (EPRI).

Summary of Hearing

Noting that domestic electricity demand will grow by 50 percent in the next 20 years, Chairman Biggert asserted that nuclear energy production must keep pace with this increasing demand. She reminded the witnesses that there must be a strategy for reducing the volume of waste destined for geologic disposal in order for nuclear energy production to increase. She outlined two potential options for reducing waste: recycling spent fuel using current technology, which would result in a 10 percent volume reduction; and developing an advanced fuel cycle that included fast reactors, which would result in a ten-fold reduction in volume. Although supportive of GNEP, Chairwoman Biggert expressed concern that no systems analysis had been completed and that the timetable was too aggressive.

Mr. Johnson described the current status of the GNEP R&D program, including an overview of the technology demonstration timeline and an estimate of the total cost associated with the construction and operation of the demonstration facilities.

Dr. Todreas agreed that GNEP is worthy of pursuit but expressed concern in his testimony about the aggressive timeline proposed under GNEP, suggesting that rapid implementation of technology choices could threaten successful execution of GNEP. He testified that simulation capability must be the first step underlying all subsequent technology and process selections. He added that there are insufficient funds to support the necessary technical expertise and infrastructure in the academic community.

Dr. Garwin compared the costs, proliferation-resistance, and feasibility of the once-through versus advanced fuel cycle, suggesting that GNEP would be much more expensive than building several geologic repositories. He also stressed the need for a systems analysis tool to guide decisions.

Mr. Modeen summarized EPRI's report on industry's nuclear R&D agenda. He indicated that EPRI supports long-term R&D leading to the recycling of spent fuel, but expressed concern about that lack of alignment between government and industry on goals, priorities and timelines.

Ranking Member Mike Honda (D–CA) asked Mr. Johnson if the decision to choose uranium extraction (UREX) reprocessing technology had been peer reviewed, and Mr. Johnson answered that it had been. Dr. Todreas, while defending the use of UREX, answered that there had not been enough R&D on the cost and safety of UREX to determine if it was the best technology and that no demonstration project had been completed. However, he voiced concern over the proposed DOE demonstration project, stating that it was ten times too large. Mr. Johnson explained to the Members that despite mixed messages from the Department, DOE would not be undertaking a demonstration project of this scale. In addition, he answered Rep. Davis's (D–TN) concerns about the locations of projects, stating that no sites had yet been selected. Mr. Johnson assured Rep. Neugebauer (R–TX) that DOE was taking action to

help with the construction of new nuclear power plants in the near future, citing the Nuclear 2010 program, a cost-share initiative with industry.

Rep. Rohrabacher (R–CA) asked witnesses about the high-temperature helium gas reactor technology, citing that this reactor had been built in Japan and that it produced less waste to begin with. All four witnesses had a favorable impression of the reactor, though Mr. Modeen added that it would be decades before such a reactor would be widely used.

4.2(g)—The Plug-in Hybrid Electric Vehicle Act of 2006 (Discussion Draft)

May 17, 2006

Hearing Volume No. 109–50

Background

On May 17, 2006, the Subcommittee on Energy held a hearing on a discussion draft of legislation to promote research and development on plug-in hybrid electric vehicles and related advanced-vehicle technologies. The *Plug-in Hybrid Electric Vehicle Act of 2006* was proposed by Representative Lamar Smith (R–TX) to spur the commercialization of plug-in hybrid electric vehicles, through R&D on batteries and other enabling technologies, and through a demonstration program to study the performance of plug-in hybrid vehicles under real-world driving conditions. Unlike today's hybrids, plug-in hybrids are designed to be driven for extended periods solely on battery power, thus moving energy consumption from the gasoline tank to the electric grid—batteries are charged overnight on the grid—and emissions from the tailpipe to the power plant, where, in theory, they are more easily controlled.

The witness panel included: (1) Dr. Andrew Frank, Professor of Mechanical and Aeronautical Engineering, University of California, Davis; (2) Mr. Roger Duncan, Deputy General Manager, Austin Energy; (3) Dr. Mark Duvall, Technology Development Manager for Electric Transportation and Specialty Vehicles, Science and Technology Division, Electric Power Research Institute (EPRI); (4) Mr. John German, Manager of Environmental and Energy Analyses, American Honda Motor Company; (5) Dr. Cliff Ricketts, Professor of Agricultural Education, School of Agribusiness and Agriscience, Middle Tennessee State University; and (6) Dr. Danilo Santini, Senior Economist and Section Leader for Technology Analysis, Center for Transportation Research, Argonne National Laboratory.

Summary of Hearing

Energy Subcommittee Chairman Judy Biggert opened the hearing by noting that plug-in hybrid vehicles would allow us to power our cars with clean energy, including from renewable sources such as solar and wind. Rep. Smith added that for economic, environmental and strategic reasons, it makes sense to encourage automakers to go beyond their already popular hybrid vehicles to produce plug-in hybrids. Rep. Smith said that the proposed legislation would allow cities across the Nation to take advantage of plug-in hybrid technology.

Witnesses expressed unanimous support for the discussion draft provided to them by Rep. Smith, although they had some suggestions on other needs that could be addressed in legislation. Witnesses told the Subcommittee that the size and cost of the battery are significant technical challenges and that limited demonstration of existing technologies has kept plug-in hybrids from penetrating the market-place—no plug-in hybrids are currently offered to consumers. The witnesses agreed that the programs proposed in Rep. Smith's draft bill would help overcome these hurdles and advance the commercialization of plug-in hybrids.

Dr. Frank testified that plug-in hybrid technology pre-production and development of standards should be given a higher priority than R&D, because a lot of the R&D has already been done. He discussed the need to obtain feedback from customers and manufacturers on a demonstration fleet, and expressed the importance of figuring out how plug-ins would be integrated with the electric grid.

Mr. Duncan praised the proposed demonstration program because it would directly address what he sees as the most pressing need—providing demonstration vehicles to State and local governments, businesses and other Plug-in Partners. He said that his organization would help in matching the great consumer demand that could be uncovered with the demonstration program proposed in this legislation. He also suggested that Members consider adding federal fleet commitments to any legislation.

Mr. German testified that hybrids, including plug-in hybrids have a great deal of promise and that potential challenges, especially energy storage, should be actively investigated for solutions. He said that the proposed research program is the best way for the Federal Government to accelerate the development and deployment of plug-in hybrid electric vehicles.

Mr. Duvall testified that EPRI believes that the draft legislation addresses the most critical technical challenges to the development and adoption of plug-in hybrid vehicles. He added that there is a high degree of correlation between the draft bill and the six priorities outlined by EPRI to advance plug-in hybrid technology: establish a program with major auto manufacturers to create prototype demonstrations; acquire a fleet of plug-in vehicles to demonstrate throughout the United States; collect and share data from consumers and fleet operators about the benefits of plug-in hybrids; develop a certification test protocol for plug-in hybrid drive systems; establish a program to educate the public about plug-in hybrid technology; and focus federal R&D efforts on increasing performance of batteries, drive systems and power electronics.

Dr. Rickets focused his testimony on flex-fuel plug-in hybrid vehicles, and suggested that the proposed legislation could do more to address the flex-fuel aspect of plug-ins to get away from gasoline altogether.

Dr. Santini discussed the specifics of battery technologies, in particular lithium-ion batteries, and the benefits they would offer with more R&D. He also discussed some of the issues with all-battery vehicle operation versus intermittent engine operation. He added that the current electric grid infrastructure is adequate to support

a larger market penetration of plug-in hybrids than in likely over the next few decades.

4.2(h)—Ending Our Addiction to Oil: Are Advanced Vehicles and Fuels the Answer?

June 5, 2006

Hearing Volume No. 109–52

Background

On June 5, 2006 the House Science Committee's Energy Subcommittee met for a field hearing in Naperville, Illinois to examine advances in vehicle and fuel technology that could strengthen U.S. energy security. Chairman Biggert was joined by Energy Subcommittee Ranking Minority Member Michael Honda (D–CA) and Representative Daniel Lipinski (D–IL).

Testifying before the Subcommittee were: (1) Dr. Daniel Gibbs, President, General Biomass Company; (2) Mr. Philip G. Gott, Director for Automotive Custom Solutions, Global Insight; (3) Mr. Deron Lovaas, Vehicles Campaign Director, Natural Resources Defense Council; (4) Mr. Jerome Hinkle, Vice President for Policy and Government Affairs, National Hydrogen Association; (5) Dr. James F. Miller, Manager of the Electrochemical Technology Program, Argonne National Laboratory; (6) and Mr. Al Weverstad, Executive Director for Mobile Emissions and Fuel Efficiency, General Motors Public Policy Center.

Summary of Hearing

Chairman Biggert opened the hearing by noting the importance of examining new vehicles that can reduce fuel costs and consumption of oil, which in turn, would improve our national security, our economic security, and our environment, not to mention the family budget. She then highlighted some of the most pressing questions to be asked: what are the technical or cost-competitiveness issues with important components, such as batteries, fuel cells or power electronics? What major hurdles stand in the way of the production or distribution of advanced biofuels? What technical challenges have not received sufficient attention? She added that one of the most significant potential benefits of plug-in hybrids is that they do not require a whole new "refueling" infrastructure, and that the U.S. needs to be working towards cars that can run on whichever energy source is available at the lowest cost—be it electricity, gasoline, biofuel, hydrogen, or some combination of these.

Ranking Member Honda expressed concerns over the possibility of missing hidden obstacles after significant initial investments have already been made. Because of this concern he noted the importance of demonstration projects. He also highlighted the projects in his district such as the Santa Clara Valley Transportation Authority's Zero Emission Bus program, and the use of natural gas vehicles at the San Jose airport, both of which have helped to demonstrate the feasibility of alternative fuel vehicles.

Addressing questions regarding market barriers, Mr. Gott explained that consumer values are focused on attributes other than fuel efficiency, and that policy based on any assumption otherwise

is not going work. He added that transparency is the primary condition that must be met for the consumer to adopt a new technology in today's marketplace. He also stated that cost, reliability, durability, range, refuel time and convenience all need to be equal or better than the current technology. Mr. Lovaas testified that the price signals are there for consumers to look at new technologies, but the problem is a lack of choices in terms of fuel and vehicles.

In terms of biofuel production, Dr. Gibbs pointed out major hurdles in hauling low density biomass with diesel trucks over long distances to production plants, including the fact that trucks come back empty. He added that new technologies are needed to resolve the inherent conflict between the need to build larger plants and the need to deal with low density biomass. He also expressed the need for critical components for converting biomass, and gave the example that just one billion gallons of cellulosic ethanol would require an amount of enzyme that is about twice the annual production for all industry enzymes in 1994.

Mr. Miller discussed plug-in hybrid vehicles, testifying that a solution to the battery problem is to install public charging stations at places where one might go for an hour, such as a restaurant or parking lot. He said that it would cost much less to install an electric charging station that it would a fuel station for alcohol or hydrogen. Mr. Hinkle added that because hydrogen is not going to be fungible worldwide, it is like an electricity grid and will vary from region to region. As a result hydrogen could work with individual states and regions that have a renewable portfolio standard.

Mr. Weverstad pointed out that lithium-ion batteries are the most promising, but that overall plug-in hybrids are very complex and that simpler is better. He also said that GM needs to do a better job of explaining that they have the most vehicle models that get over 30 miles per gallon. As an example he claimed that the GM Yukon would save 133 gallons in comparison to Toyota's Prius over the course of a year of operation.

4.2(i)—Renewable Energy Technologies—Research Directions, Investment Opportunities, and Challenges to Commercial Application in the United States and the Developing World

August 2, 2006

Hearing Volume No. 109–59

Background

On August 2, 2006 the Energy Subcommittee of the House Committee on Science held a hearing to examine the potential of renewable energy technologies to reduce dependence on foreign energy sources, lower the cost of energy to consumers and boost U.S. competitiveness. Testimony was taken by experts in the field, including two Nobel Prize winners in physics. The hearing was held at the San Jose, California, City Hall Council Chambers.

The witnesses included: (1) Dr. Steven Chu, Director, Lawrence Berkeley National Laboratory; (2) Dr. Arno Penzias, Venture Partner, New Enterprise Associates, Palo Alto, CA; (3) Christian Larsen, Vice President for Generation, Electric Power Research In-

stitute, Palo Alto, CA; (4) David Pearce, President and CEO, Miasolé; and (5) Ron Swenson, co-founder, ElectroRoof and EcoSage.

Summary of Hearing

Energy Subcommittee Chairman Biggert opened the hearing by noting that Americans want affordable energy and a clean and safe environment; however, because renewable energy research has been undervalued, the United States acts as though the two are mutually exclusive. She added that in order to address the threat of climate change, we must reduce emissions of greenhouse gases. This requires not only improved energy efficiency, but also greatly expanded use of renewable and non-greenhouse gas-emitting energy technologies, including nuclear power. Chairman Biggert asserted that, because of population growth and economic expansion, it is essential to expand use of renewable energy and energy efficiency technologies faster than the growth in energy consumption.

Ranking Member Honda observed that, throughout history, wars have been fought over non-renewable natural resources, and in a world focused on using renewable energy, these conflicts could be avoided and greater stability achieved. The big challenge he highlighted was being able to convince consumers to adopt renewable energy. In order to do so renewables must be cost effective. According to Honda the United States was once the leader in solar technologies, but last year, only 11 percent of the photovoltaic generating capacity was manufactured here. He went on to explain that the United States has fallen behind global competitors, such as Germany and Japan, which saw solar installation increase as a result of significant incentive programs.

Mr. Swenson, who works on renewable energy systems in developing nations, testified that fossil fuel subsidies penalize the economics of renewable energy as much around the world as in the United States. He noted that, according to the International Energy Agency, energy subsidies total about $200 billion worldwide each year, and wondered what would happen to energy markets if that money was invested in long-term solutions instead of propping up a failing fossil fuel infrastructure. Swenson also pointed to the benefits of creating a government-industry education partnership, through which students could receive support for training in management of renewable energy systems. Such a partnership with universities could help the United States politically and economically, through collaboration with developing nations that need to supply growing energy demands with carbon-neutral sources.

Dr. Chu testified that energy efficiency remains the "lowest hanging fruit." He went on to discuss the gains made in energy efficiency standards since the 1970's and how increased efficiency standards for refrigerators alone has saved nearly double the amount of electricity from all U.S. hydropower and comparable to that of all nuclear. Chu praised the work being done in synthetic biology, a new field which can be used to engineer organisms to produce ethanol, methanol, or other hydrocarbon fuels. When it comes to developing renewable infrastructures he underlined the rarely mentioned but important factor of transmitting electricity.

He noted that, once electricity can be transmitted over 2,000 miles efficiently, renewables can be a larger part of the energy portfolio.

Mr. Pierce focused on the evolution of the solar cell industry and the promise of ultra thin films for solar cells. He observed that, due to such high demand for solar cells, the basic silicon material based on crystalline silicon technology is scarce. He noted that this 50-year-old technology represents 94 percent of the market. Pierce testified that thin films represent a class of semiconductor material 1/100th the thickness of standard silicon solar cells, which allows for easier installation, upgrades, and eventually lower costs. Pierce recommended expanded federal tax credits for solar energy, and a federal loan guarantee program for distributed generation for commercial buildings.

Mr. Larsen underlined the importance of the United States keeping all energy options open by improving the economics of electricity, and integrating renewables and energy efficiency, as well as ensuring the continued use of coal, nuclear and natural gas. He noted that a major technological barrier to renewable energy implementation is related to dispatching and controlling those resources, which presents a significant integration challenge to the grid.

Dr. Penzias also linked U.S. energy independence and world security to international renewable energy collaboration. He explained how developing nations can use U.S. technology to harvest crops that could be useful as biofuels. Through partnerships the U.S. economy can benefit and the developing world can fundamentally link their nascent economies to renewable, carbon-neutral energy sources. Penzias also suggested that, by separating pieces of the electricity grid, the grid would not only be more secure and reliable, but also more compatible with renewable energy generating systems.

4.2(j)—Department of Energy's Plan for Climate Change Technology Programs

September 20, 2006

Hearing Volume No. 109–62

Background

On September 20, 2006 the House Science Committee's Energy Subcommittee held a hearing to examine the scope of the Administration's Climate Change Technology Program (CCTP) Strategic Plan. Established by President Bush in 2001, CCTP is a multi-agency research and development (R&D) coordination activity led by the Department of Energy (DOE) to focus R&D activities more effectively on the President's near- and long-term climate change goals. The CCTP Strategic Plan was originally slated for public release by July 2002. The first draft of the plan was not made available until September 2005. The final plan was released on September 20, 2006, following a public comment period in which approximately 30 individuals and organizations commented on the plan.

The witnesses included: (1) Mr. Stephen Eule, Director, U.S. Climate Change Technology Program, DOE; (2) Ms. Judi Greenwald, Director of Innovative Solution, Pew Center on Global Climate

Change; (3) Mr. Chris Mottershead, Distinguished Advisor on Energy and the Environment, BP; and (4) Dr. Martin Hoffert, Emeritus Professor of Physics, New York University.

Summary of Hearing

Energy Subcommittee Chairman Biggert opened the hearing by noting that the hearing should be examining progress in year three of the plan, which was released four years and two months past the deadline former DOE Under Secretary Robert Card set for release of the draft technology plan. She pointed to key questions that needed to be addressed such as: whether the strategic plan can be used to guide R&D investment decisions; whether it will enable the United States to achieve the Administration's stated goals; and how the CCTP plan and DOE planning process can be improved.

Ranking Member Honda highlighted that there is no mention of cross-cutting enabling technologies or integrated approaches to greenhouse gas emissions reduction, and no timelines or technology roadmaps. He also asked why the plan places a low priority on measurement and monitoring technologies, makes no mention of adaptation to climate change, and lacks any policy framework for technology transfer and use.

Mr. Eule testified that the plan provides a comprehensive, long-term look at the nature of climate change challenge and its potential solutions. He explained that it defines clear and promising roles for advanced technologies by grouping technologies for near-, mid- and long-term deployment, which together will facilitate meeting CCTP goals. He also stated that the plan outlines a process and criteria for setting priorities by organizing and aligning federal climate change R&D, and discusses in detail the current climate change technology portfolio, with links to individual technology roadmaps and goals. He added that CCTP would conduct and support strategic planning exercises to identify gaps and opportunities in climate change technology and realign the portfolio as appropriate.

Ms. Greenwald agreed that the draft Strategic Plan provides a fine overview of greenhouse gas (GHG)-reducing technologies and the opportunities each could present over the long-term, but criticized the plan for not charting how to deploy these technologies, or provide a path for stabilizing GHG concentrations. Greenwald testified that compiling information about the technologies in the plan is not sufficient to ensure their widespread penetration into the marketplace, and that the plan ought to encourage a combination of "pushing" and "pulling" activities that would force carbon-reducing technologies into the marketplace through the use of both R&D incentives and mandatory carbon caps.

Mr. Mottershead viewed the CCTP Strategic Plan as comprehensive, but expressed concern that the plan gave insufficient attention to technology deployment. He noted that many technologies already exist, and that there should be greater focus upon deployment and diffusion of such technologies, particularly engineering cost reduction, removal of institutional barriers and the building of material new markets.

Dr. Hoffert told the Subcommittee that the plan should focus on a broader array of technologies and the infrastructure needed to

enable those technologies. He explained that, in order to address climate change and energy security, the right infrastructure for renewable energy must be built. He elaborated that the greatest potential for a solution is from solar and wind, which are intermittent, dispersed and low power density sources, but that the right kind of electric utility grids to accommodate those energy sources is still needed. He also mentioned that if renewable sources are part of the answer to energy security and climate change there needs to be a discussion about what types of grids will provide the transmission and storage capabilities to allow renewable energy to provide roughly thirty percent of our nation's energy.

4.3—SUBCOMMITTEE ON ENVIRONMENT, TECHNOLOGY, AND STANDARDS

4.3(a)—China, Europe, and the Use of Standards as Trade Barriers: How Should the U.S. Respond?

May 11, 2005

Hearing Volume No. 109–13

Background

On May 11, 2005, the Subcommittee on Environment, Technology, and Standards held a hearing to review the increasing use by U.S. trading partners of technical standards and other standards-related requirements as barriers to trade, and what U.S. companies, standards development organizations, and the Federal Government are doing, and could do, to overcome or reduce these barriers.

A standard is a technical specification for a product, process, or service. Standards are used to ensure uniformity and inter-operability. Standards play a powerful role in domestic and international markets. If a standard achieves broad acceptance in a market, it may lead to the abandonment of technologies supported by alternative standards and the domination of a market by a specific technology.

Countries can use standards as trade barriers by setting domestic standards that are different from those which foreign manufacturers would have normally used. (This can happen inadvertently as well as deliberately.) This increases the costs of exporting to the country in question because the companies trying to export there must change their product lines to meet the special standards requirements of that country. Companies worldwide are worried that such measures could escalate into "standards wars," with countries closing their markets to imports with technical requirements, rather than tariffs.

The Subcommittee heard from: (1) Dr. Hratch Semerjian, Acting Director of the National Institute of Standards and Technology (NIST); (2) Mr. Robert Noth, Manager of Engineering Standards for Deere & Company; (3) Dr. Don Deutsch, Vice President for Standards Strategy and Architecture for Oracle; (4) Mr. Joe Bhatia, Vice President for International Operations at Underwriters Laboratory; and (5) Mr. David Karmol, Vice President of Public Policy and Government Affairs at the American National Standards Institute.

Summary of Hearing

Dr. Semerjian testified that the U.S. standards system reflects the country's diverse, demand-driven economy. He said that in the United States, standards are generally developed in response to

specific concerns and issues expressed by both industry and government. He stated that this bottom-up, grass-roots approach to standards development contrasts with the top-down, government-driven approach used by many of our trading partners. Dr. Semerjian stated that both the private and public sectors of the United States should move quickly to strengthen the interface between the U.S. standards system and the international system to ensure that U.S. interests receive consideration in international processes.

Mr. Noth called for better communication between the private sector and government to ensure an equal playing field for U.S.-based industry. He urged Congress to consider endorsement of the United States Standards Strategy, which is being developed under ANSI management. And, he argued that the Federal Government must promote U.S.-based standards and technology with our trading partners as an alternative to the European approach. Finally, Mr. Noth called for the creation of a policy-level council responsible for coordination of standards at a strategic level.

Dr. Deutsch testified that the development and use of market-led, voluntary standards played a significant role in the growth and success of the U.S.-led global IT industry. The Information Technology Industry Council's standards committee, which Dr. Deutsch chairs, recommends that the government do the following: strengthen Department of Commerce standards liaison programs; continue to promote the use of global, voluntary, market-led standards; and develop metrics to analyze the global economic impact of standards.

Mr. Bhatia testified that the U.S. standards system works effectively for all stakeholders. However, he stated that certain international governments often exclude non-native entities from conducting testing and certification, increasing the costs associated with compliance. Mr. Bhatia called upon the government to ensure that trade partners comply with agreements that they have signed; link standards and conformity issues to broader dialogue and agreements with trade partners; negotiate new trade agreements that allow recognized domestic certifiers to offer marks which are accepted in international markets; and adequately fund U.S. outreach, promotion and technical assistance programs internationally.

Mr. Karmol testified that China should be persuaded to embrace the globally-accepted principles of standardization endorsed by the World Trade Organization, and should adopt existing, globally-accepted voluntary standards. He also said that the American National Standards Institute believes that European standards organizations should allow U.S. stakeholders to participate in the development of EU standards. He stated the government should work with the private sector to improve standards education and outreach activities as well as technical support and assistance. In addition, he requested more resources to assure a strong U.S. presence at international standards meetings. Finally, he called on Congress to offer a resolution endorsing the U.S. Standards Strategy, when it is completed.

4.3(b)—Small Business Innovation Research: What Is the Optimal Role of Venture Capital?

June 28, 2005

Hearing Volume No. 109–20

Background

On June 28th, 2005 the Subcommittee on Environment, Technology, and Standards of the Science Committee held a hearing, "Small Business Innovation Research: What Is the Optimal Role of Venture Capital?" The hearing focused on the issues associated with awarding Small Business Innovation Research (SBIR) grants to small businesses owned, or partly owned by venture capital firms. The hearing also addressed the different roles that SBIR grants and venture capital (VC) play in the development of new technologies, and ways to improve the SBIR program to more efficiently promote the development of new technologies and help bring them to market.

A spirited debate is underway in the research and venture capital communities on whether it is appropriate for SBIR awards to be given to small companies that are majority-owned by venture capital (VC) companies.

On December 3, 2004, the Small Business Administration (SBA) issued a final rule saying that to be eligible for an SBIR award, an entity must be a for-profit business at least 51 percent owned and controlled by one or more U.S. individuals, or 51 percent owned and controlled by another small business owned and controlled by Americans. Typically, VC firms are not controlled by individuals, but rather by entities such as private and public pension funds, financial and insurance investors, and endowments and foundations.

Proponents of changing the current rule argue that VC firms are a major source of financing in certain industries, such as biotechnology, and that VC support can help a firm continue research and commercialize products. Opponents contend that VC firms are often run by large corporations. Therefore, opponents argue, small businesses that are controlled by VC firms should not be seen as independent small businesses in need of special research funding, but rather as arms of large corporations that do not merit SBIR support.

The Subcommittee heard from (1) The Honorable Sam Graves, Member, U.S. House of Representatives; (2) Ms. Ann Eskesen, President of Innovation Technology Institute; (3) Dr. Ron Cohen, CEO of Accorda Technologies; (4) Mr. Jonathon Cohen, President and CEO of 20/20 Gene Systems; (5) Dr. Carol Nacy, CEO of Sequella Inc.; and (6) Dr. Frederic Abramson, President and CEO of AlphaGenetics Inc.

Summary of Hearing

Congressman Graves testified about a recent ruling by the Small Business Administration (SBA) that makes businesses that are majority-owned by venture capital ineligible for SBIR grants. He argued that the prohibitive costs of doing biotechnology research re-

quire that small companies be allowed to seek both SBIR grants and venture capital funds.

Ms. Eskesen presented data about the SBIR program and the involvement of VC-funded companies in the SBIR program throughout the program's history. Using this data, she suggested the discussion should be shifted away from the current controversy and should focus instead on developing rules which would distinguish firms based on the state and stage of the firm and the technology being developed, rather than on the level of VC participation. This would effectively shut the door to SBIR funding for later-stage premarket technologies but would allow SBIR participation by those VC-funded companies that most criteria would be considered "small businesses."

Dr. Ron Cohen testified that excluding VC-backed companies from SBIR grants will result in lower quality science due to decreased competition in the award process. He also noted that in companies with both VC and SBIR funds, the VC money is earmarked for the later-stage product development, and SBIR money is used to develop new ideas that are deemed too risky be venture funded. He supports SBIR eligibility for VC-backed companies.

Mr. Jonathon Cohen testified that writing SBIR grant proposals is extremely resource intensive, and VC-backed companies have an unfair advantage. He also believes that the SBIR program should be a set-aside for companies that are doing important work but are unattractive to VCs because the products these companies are developing serve a limited market or have low profit potential. He supported the current SBA ruling.

Dr. Nacy testified that the reality of the drug development process requires VC money, and that her company would not have been able to develop tuberculosis diagnostic and treatment technologies without both SBIR and VC funding. She also noted that SBIR and VC money and SBIR grant monies do not co-mingle; rather that they are used sequentially in research (SBIR) and then clinical trials (VC). She felt that VC-backed companies should be eligible for SBIR funding.

Dr. Abramson testified that allowing VC backed firms to obtain SBIR grants would reduce the money available to small companies in the earliest stages of development. He supported the current SBA ruling.

4.3(c)—Health Care Information Technology: What Are the Opportunities For and Barriers to Inter-operable Health Information Technology Systems?

February 23, 2006

Hearing Volume No. 109–37

Background

On February 23, 2006, the Subcommittee on Environment, Technology, and Standards of the House Committee on Science held a field hearing, *"Health Care Information Technology: What are the Opportunities For and Barriers to Inter-operable Health Information Technology Systems?"* The Committee held the hearing to learn about the potential benefits of IT to health care providers and con-

sumers, the impact of IT on health care costs and quality, and about the major challenges to implementing a national health information technology system.

Inter-operability allows different information technology systems and software applications to communicate, exchange data, and use that information. Inter-operable health IT systems can involve the use of and the ability to share: up-to-date patient electronic health records (EHRs); electronic physician orders for drug prescriptions and lab tests; electronic referrals to specialists and other health care providers; and electronic access to current treatments and research findings. For these systems to share information, especially if they are different IT systems, they must use common standards for data transmission, medical terminology, security, and other features.

The hearing reviewed federal, State and private-sector efforts to promote connectivity, which enables health care providers to access patient data from any location. The hearing also examined efforts to develop standards for security, privacy and inter-operability, which are crucial to the adoption of nationwide health IT systems.

The Subcommittee heard from: (1) Dr. William Jeffrey, Director of the National Institute of Standards and Technology (NIST); (2) Dr. Jody Pettit, Project Chair at the Oregon Health Care Quality Corporation; (3) Ms. Diane Cecchettini, RN, President and CEO of MultiCare Health System; (4) Mr. John Jay Kenagy, Chief Information Officer at Oregon Health and Science University; (5) Dr. Homer Chin, Medical Director for Clinical Information Systems at Kaiser Permanente Northwest; (6) Mr. Luis Machuca, President and CEO of Kryptiq Corporation; and (7) Mr. Prem Urali, President and CEO of HealthUnity Corporation.

Summary of Hearing

Dr. Jeffrey testified that NIST has been working with the Office of the National Coordinator for Health Information Technology (ONC) on standards harmonization, conformity assessment, developing the architectural management system for the health information network, and privacy and security. He said that because there are so many health IT standards in existence and development, NIST is working with the health care community "to develop and demonstrate a prototype health care standards landscape."

Dr. Pettit testified that the goal of the Oregon Health Information Infrastructure (OHII) is to "catalyze the formation of a regional health information organization." She emphasized that the patient must be at the center of the health IT system development process, and that free flow of information is key. Finally, she argued that while federal initiatives are moving forward, state initiatives are not being given enough support. She called on the Federal Government to provide assistance or start-up capital.

Ms. Cecchettini testified that implementing EHR's has helped MultiCare Health System by reducing errors and redundant costs; helping to contact patients for drug recalls; and improving childhood immunization and mammogram compliance figures. Ms. Cecchettini called for the Federal and State Governments to adopt common standards to support inter-operability; provide payment incentives for adopters of technology; ensure protection of consumer

privacy by enforcing security measures; and support common vocabulary for medical terminology.

Mr. Kenagy testified that the large number of choices rather than lack of choices available for health IT adoption is a problem. In addition, he stated that learning and implementing a new health IT system takes significant time for clinicians and other health care professionals. He called on the Federal Government to expand research in health IT, to support training programs for clinicians and IT professionals, and to address the economic disincentives to invest in health IT.

Dr. Chin testified that Kaiser Permanente Northwest (KPNW) has been successful at utilizing health IT because KPNW offers an integrated comprehensive health care system and because it provides prepaid insurance to its members, providing an incentive to keep members healthy. He identified a lack of incentives to be efficient and effective at delivering health care, and the subjective and changing nature of health care as the two primary problems facing effective health care. Dr. Chin stated that the Federal and State Governments should provide incentives for health care organizations to implement IT, and more stringent standards.

Mr. Machuca testified that health IT adoption strategies should focus on collaboration and communication in addition to EHR's. He called on the government to fund the implementation of electronic collaboration in public health settings; and mediate a standard for patient medical record.

Mr. Urali testified that efforts to promote health IT adoption must start with clinicians. He encouraged the government to fund education and training to promote best practices, and to focus on creating the right policy and incentives environment, and that the private sector should innovate. Finally, he stated there should be a greater focus on the regional level for adoption, rather than the national level.

4.3(d)—EPA's Fiscal Year 2007 Science and Technology Budget Proposal

March 16, 2006

Hearing Volume No. 109–41

Background

On March 16, 2006 the Subcommittee on Environment, Technology, and Standards of the House Committee on Science held a hearing to examine the Environmental Protection Agency's (EPA) fiscal year 2007 (FY07) budget request for Science and Technology (S&T).

EPA's overall FY07 budget request is $7.3 billion. The S&T portion of the budget request is $788 million or slightly more than 10 percent of the total. Nearly $528 million (72 percent) of S&T funding is for EPA's Office of Research and Development (ORD), which is the primary research arm of the agency. ORD also receives a small amount of funding from the agency's Superfund program for research on hazardous waste remediation. Typically, most of the remaining S&T funds go to the Office of Air and Radiation, and a smaller amount to the Office of Water. The agency's FY07 budget

request proposes a larger share of S&T funds than in past years for the Office of Water's homeland security activities.

ORD conducts and sponsors both fundamental research in environmental science and more targeted research that informs EPA's regulatory programs. For example, ORD develops the scientific risk information for the agency's Integrated Risk Information System (IRIS), a database about human health effects from chemicals in the environment. It is used by EPA programs and states to help determine hazardous waste site clean up levels and drinking water standards. In air quality, ORD develops the scientific underpinning for EPA's air quality standards in areas such as particulate matter and ozone. And ORD also investigates newer environmental questions such as the environmental implications and applications of nanotechnology.

The Subcommittee heard from: (1) Dr. George Gray, Assistant Administrator for the Office of Research and Development and Science Advisor, U.S. Environmental Protection Agency; (2) Dr. M. Granger Morgan, Chair, EPA's Science Advisory Board (SAB); (3) Dr. Don Langenberg, Vice-Chair, the National Council for Science and the Environment; (4) Mr. Jeff Ruch, Executive Director, Public Employees for Environmental Responsibility.

Summary of Hearing

Dr. Gray testified that the President has requested $788.3 million for EPA's science and technology budget, of which $557 million will be allocated for the Office of Research and Development. He identified homeland security research as one of the primary priorities of the EPA, as it contributes to the general expertise within the Office of Research and Development. Dr. Gray also addressed IRIS, the Integrated Risk Information System, stating that its goal is to be open, transparent and accepting of data and expertise from the scientific community.

Dr. Morgan testified that the inflation adjusted budget for the Office of Research and Development has declined by over 16 percent in four years while the environmental challenges have grown. Dr. Morgan called for a more comprehensive approach to environmental research that is currently being conducted throughout the United States. He also stated that the homeland security research program is more like an operational program, and thus should not be funded by the Office of Research and Development.

Dr. Langenberg called for increased funding for EPA's Office of Research and Development, in order for EPA scientists to continue contributing to improving the scientific basis for environmental decision making. Dr. Langenberg pointed out that Science to Achieve Results (STAR) has been a very successful program that has been receiving less funding in recent years.

Mr. Ruch called for a halt to the political intervention in the dialogue between the public and EPA scientists. Mr. Ruch said that the science and technology budget shows a shift towards corporate regulatory needs rather than human and ecological research. Mr. Ruch called for an independent survey of the Agency's scientists.

4.3(e)—Great Lakes Restoration: How? How Soon?

April 21, 2006

Hearing Volume No. 109–A

Background

On April 21, 2006, the House Subcommittee on Environment, Technology, and Standards of the House Committee on Science held a field briefing to explore how agencies and policy-makers prioritize and manage science to meet resource management information needs for Great Lakes restoration. The Great Lakes Regional Collaboration (GLRC), a consortium of federal, State, regional, local, and non-governmental stakeholders led by the Environmental Protection Agency (EPA), recently completed a comprehensive strategy for restoring the Great Lakes and associated watersheds. The strategy, which is strongly supported by the many organizations involved in its creation, establishes goals and provides guidance to the many agencies, organizations, and resource managers involved in Great Lakes restoration. It also describes the science and scientific tools needed to support the restoration priorities.

The Great Lakes are the largest surface freshwater system in the world. Over 35 million people use the Great Lakes system for drinking water, irrigation, commerce, transportation, food, recreation, and cultural needs. Early concerns with the health of the Great Lakes and those that depend on them focused on industrial pollution and sewage.

In 1972, the United States and Canada signed the Great Lakes Water Quality Agreement formally recognizing the need for a comprehensive and coordinated approach to address water quality concerns in the Great Lakes basin. Since then, even as progress has been made reducing point source pollution, there has been growing concern with non-point source pollution, such as urban and agricultural runoff, contaminated sediment and the growth of nonnative species.

The Subcommittee heard from: (1) Ms. Jan O'Connell, Sierra Club of Michigan Treasurer; (2) Mr. George Heartwell, Mayor of Grand Rapids, Michigan; (3) Mr. Gary V. Gulezian, Director of EPA Great Lake National Program Office; (4) Dr. Steven Brandt, Director of the Great Lakes Environmental Research lab at the National Oceanic and Atmospheric Administration (NOAA); (5) Ms. Katherine Cunningham Ballard, Chief of Coastal Management Program in the Michigan Department of Environmental Quality; (6) Dr. Alan Steinman, Director of Grand Valley State University's Annis Water Resources Institute; (7) Dr. Don Scavia, Professor of Natural Resources at the University of Michigan and head of the Michigan Sea Grant Program.

Summary of Hearing

Ms. O'Connell cited a lack of adequate funding as a primary problem facing Great Lake restoration, despite the fact that Great Lakes account for over 42 million people's water needs and 20 percent of the world's fresh water. She also discussed the December

2005 report on the condition of the Great Lakes, which identified the deteriorating condition of the lakes, the rapid disappearance of important species, and the resurgence of Lake Erie's dead zone as areas of concern. O'Connell said that in order to prevent the further deterioration of the lakes, funding should be increased and action taken to avoid the introduction of aquatic invasive species and enforcing water standards more stringently.

Mayor Heartwell identified a lack of both action and funding as problem areas, and described the need to reduce sewer overflows, eliminate beach closures, protect and restore key habitats and wetlands, clean up contaminated areas of concern, and dispose of hazardous waste in a non-invasive way. He also suggested introducing invasive species legislation; increasing funding for an updated water infrastructure and wetlands programs; and introducing an electronic fish barrier on the Chicago Sanitary and Ship Canal. He stressed the significance of efficient and comprehensive monitoring of the environment, as well as forecasting tools for predicting how specific management actions can improve problems that arise.

Mr. Gulezian stated that it would be more effective to redistribute funds and resources than to continue using current funding. He cited the fact that federal agencies get $500 million per year for Great Lakes funding, and that under the *Great Lakes Legacy Act,* three projects were already in progress and obtained their funding from other agencies within the system. He also emphasized that the EPA was integral to restoring the lakes, since it acts as a coordinator of federal resources for all active parties.

Dr. Brandt introduced NOAA's five-year research plan, which involves four principles: management and restoration; the integration of research and observation; a focus on prediction and forecasting; and using research findings to develop decision-making tools. He emphasized the importance of working with stakeholders and policy-makers for feedback on the plan.

Ms. Ballard made several recommendations about restoring the Great Lakes, including adopting an Implementation Plan to prioritize actions, allocate funding, and increase collaboration; increasing both short- and long-term monitoring of environmental trends; focusing on the health of nearshore and tributary areas; providing more data and managing resources to coastal ocean state governments; and increased funding to implement the GLRC recommendations.

Dr. Steinman discussed invasive species, nearshore and coastal protection, and non-point source pollution. He said that organizations should take advantage of their current programs to re-examine ocean shipping and its economic ramifications, enforce regulatory and incentive-based programs, educate the public, and implement a basin-wide ban on phosphorus-based lawn fertilizers. He also advised that funding and monitoring activities be increased.

Dr. Scavia emphasized the importance of restoring the Great Lakes to our local, regional, and national economic and ecological health, and added that delaying restoration could push the Lakes past the "tipping point," after which it is nearly impossible to recover. He discussed the particularly dramatic effects of food-web disruptions and invasive species, and stated that restoring nearshore regions, stopping invasive species, and increasing monitoring

and basic research should all be priorities for restoring the Great Lakes.

4.3(f)—Improving Drought Monitoring and Forecasting: H.R. 5136, the National Integrated Drought Information System Act of 2006

May 4, 2006

Hearing Volume No. 109–47

Background

On May 4, 2006, the Subcommittee on Environment, Technology, and Standards of the House Committee on Science held a hearing to better understand ways to forecast and predict occurrences of drought, which can have profound economic, social, and environmental impacts, and to receive comments on H.R. 5136, the *National Integrated Drought Information System Act of 2006.*

The National Oceanic and Atmospheric Administration (NOAA) estimates that drought results in total economic costs in the U.S. of $6 to $8 billion each year from such impacts as crop loss; premature livestock sales; degraded water quality; decreased tourism revenue from limited rafting, boating, fishing, golfing and skiing; decreased energy generation capacity; increased ground-water pumping costs; and reduced barge tonnage for commercial shipping. While drought is not sudden or violent, it can be among the most devastating of natural disasters, and it affects all parts of the country. In every one of the hundred years ending in 1995, some part of the United States has experienced a severe or extreme drought.

Experts in drought mitigation contend that substantial losses due to drought are not inevitable, because with adequate prior knowledge, the extent and severity can be substantially mitigated. Investments by Federal, State and local governments have targeted research on and monitoring of droughts. However, these efforts have generally been unconnected and uncoordinated. Many researchers and water users believe that tying together and building upon current drought research and monitoring efforts will result in significant improvements in forecasting and mitigating drought.

NOAA has collaborated closely with other federal agencies, the Western Governors' Association (WGA) and other stakeholders to develop a plan for a National Integrated Drought Information System (NIDIS). Coordination of monitoring efforts across agencies is expected to lead to more efficient and effective data collection, especially soil moisture data and ground water, decreased duplication of effort, and more even and complete monitoring of critical regions.

The Subcommittee heard from: (1) Dr. Chester Koblinsky, Director, Climate Program Office, NOAA; (2) Mr. Duane Smith, Vice Chair, Western States Water Council and ; (3) Mr. Kenneth Dierschke, President, Texas Farm Bureau; (4) Mr. Marc D. Waage, P.E., Manager, Raw Water Supply, Denver Water; (5) Dr. Donald A. Wilhite, Director, National Drought Mitigation Center, University of Nebraska;

Summary of Hearing

Dr. Koblinsky discussed the role that NOAA plays in monitoring droughts, specifically mentioning the *U.S. Drought Monitor,* a weekly update of drought conditions throughout the United States. He said that because drought is an interplay between water availability and human use, supplying better information to natural resource managers will help alleviate the effects of drought. According to Dr. Koblinsky, NIDIS would provide this critical information. He stated that NIDIS will take five to six years to fully implement and will incorporate existing drought information and forecasts, while supplementing missing data with additional observations and research.

Mr. Smith testified that much of the currently available information is not presented in a usable format. NIDIS, Mr. Smith says, will incorporate a variety of forecasting methods, analysis techniques and observations. This integration will allow decision makers to easily access climatic information. Mr. Smith stated that NIDIS will include assessments from sectors that have not previously been considered, such as livestock, timber, wildlife, energy, recreation, and tourism sectors. Mr. Smith reported that the Western Governors Association unanimously supports NIDIS.

Mr. Dierschke discussed the devastating effects of drought on his home state of Texas. He reported that in 2005, the Texas Cooperative Extension Service estimated over $1 billion in damages to the agricultural community. Beyond direct crop loss, Mr. Dierschke mentioned the long-term effect of deteriorated range land. He argued in support of long-term weather and climate forecasting, citing the limitations of current weather information in decision making. Mr. Dierschke concluded by saying that the Farm Bureau supports H.R. 5136, and that NIDIS will help farmers and ranchers better prepare for the future.

Mr. Waage discussed the severity of drought in Colorado and how Denver has used weather related information to budget water. According to Mr. Waage, NIDIS would: provide a database of up-to-date information; facilitate interaction between the government and those affected by droughts and; would provide much needed long-range weather forecasts. He also discussed the benefits that could come from knowing the amount of snowmelt and long-term weather forecasts.

Dr. Wilhite discussed the role that the National Drought Mitigation Center (NDMC) has in drought monitoring and mitigation. According to Dr. Wilhite, the NDMC developed the first Internet based drought impact database. He emphasized the need for accurate information to be readily available for decision-makers. Dr. Wilhite said that the NDMC could be a helpful partner for NOAA throughout the implementation of NIDIS. He concluded by discussing how better climate data, more reliable forecasts and a more timely communication of this data will improve water management.

4.3(g)—Views of the NIST Nobel Laureates on Science Policy

May 24, 2006

Hearing Volume No. 109–51

Background

On May 24, 2006, the Subcommittee on Environment, Technology, and Standards of the House Committee on Science held a hearing to better understand the views of three Nobel Prize winning scientists on American Science Policy, including the role of the Federal Government and the National Institute of Standards and Technology (NIST) in supporting American leadership in the fields of science and technology.

Created by Congress in 1901, NIST promotes U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life. NIST houses major facilities that play a critical role in measurement and standards research, as well as supporting technology development for future industries. These facilities include the atomic clock, the National Center for Neutron Research, and the National Nanotechnology and Nanometrology Facility.

NIST rewards and encourages promising scientists in several ways: the Competence program, the Presidential Early Career Award for Scientists and Engineers (PECASE), and increasing support for individual scientists from NIST's base funding. Each of NIST's Nobel laureates benefited from one or all of these rewards. In competing for the best and the brightest with the Nation's top universities NIST provides gifted scientists with the long-term, stable research funding and an interdisciplinary environment not generally available elsewhere.

The Subcommittee heard from: (1) Dr. William Phillips, Scientist, Physics Division, National Institute of Standards and Technology; (2) Dr. Eric Cornell, Senior Scientist, National Institute of Standards and Technology; (3) Dr. John "Jan" Hall, Scientist Emeritus, National Institute of Standards and Technology;

Summary of Hearing

Dr. Phillips discussed his work at NIST, which began as a side project in cooling atoms, and concluded with his Nobel Prize-winning research on laser trapping and cooling. His work has applications for atomic clocks and also for security, in the form of code-breaking abilities and guaranteed privacy. Dr. Phillips emphasized the crucial role that NIST played in supporting his work, stating that the resources present at NIST, his qualified colleagues, and especially the encouraging environment all contributed to his success. He emphasized the importance of basic research, because while industries may let this fall by the way side, he said, the government must "step up" and take a long-term view of research.

Dr. Cornell re-emphasized how helpful the management and environment at NIST had been in supporting his research. He also explained how his work with quantum physics can apply to code

breaking and computers, and those implications for our national and economic security-quantum based computers can break codes "a billion times" faster than a regular computer. He emphasized that welcoming the brightest foreign scientists to study and work in our country will be very important for the U.S.'s keeping the leading edge in science and technology.

Dr. Hall reiterated how NIST's flexibility and responsiveness to new ideas was critical in encouraging his research; without rigid objectives, the scientists were allowed to follow where there research took them. He emphasized the importance of science education for school children, specifically those in middle school, as well as welcoming foreign scientists, and increasing funding in basic research. He identified the lack (or perceived lack) of well paying jobs in certain science fields, which discourages students from aiming towards those fields.

4.3(h)—Undersea Research and Ocean Exploration: H.R. 3835, the National Ocean Exploration Program Act of 2005 and the Undersea Research Program Act of 2005

July 27, 2006

Hearing Volume No. 109–58

Background

On July 27, 2006, the Subcommittee on Environment, Technology, and Standards of the House Committee on Science held a hearing to examine the National Oceanic and Atmospheric Administration's (NOAA) National Undersea Research Program (NURP) and Ocean Exploration (OE) Program and to receive comments on H.R. 3835, the *National Ocean Exploration Program Act of 2005 and the Undersea Research Program Act of 2005.*

NURP, which had its origins in the 1970s, funds applied research in areas such as ecology and fisheries management that can be of use to policy-makers, and generally focuses on areas that are relatively close to shore. NURP also funds the development of technology for undersea research, and education and outreach programs (such as the Aquarius underwater habitat, and JASON, which lets schools participate in undersea research).

The OE program provides grants to researchers for expeditions to discover and document unknown or little know features of the oceans and Great Lakes. The program focuses on a smaller pool of scientists who attempt to discover and record new and novel physical, biological or chemical aspects of the deep ocean far from the continental shelf, often deeper than 10,000 feet. The program supports development of new technologies and works with academic and industry partners to adapt commercial and experimental technologies to deep-water exploration activities. Education and outreach is a high priority, and OE uses its high-profile expeditions to engage students and the general public in the exploratory process and raise awareness of marine issues and their impacts on people's daily lives.

The Subcommittee heard from: (1) Hon. Jim Saxton, Representative in Congress, State of New Jersey; (2) Dr. Richard Spinrad, As-

sistant Administrator, NOAA; (3) Andrew Shepard, Director, Southeastern U.S. and Golf of Mexico, National Undersea Research Center; (4) Dr. Marcia McNutt, President and Chief Executive Officer, Monterey Bay Aquarium Research Institute;

Summary of Hearing

Hon. Saxton discussed the specifics of H.R. 3835, for example the increased coordination between NOAA and the National Science Foundation. He explained that the purpose of the act is to expand ocean exploration, discover new marine substances to provide therapeutic benefits. He then emphasized that both NURP and OE are core to the mission of NOAA.

In his testimony, Dr. Spinrad expressed strong support for the overall intent of H.R. 3835, saying that this ". . .legislation elevates the importance of science-based ocean exploration and undersea technology development." He discussed the decrease in Congressional funding for these programs, citing the fiscal year 2006 appropriation which was substantially below previous years' budget.

Mr. Shepard described the history of NURP, crediting the program with being the primary organization for scientific diving. He praised the bill for authorizing NURP and OE and addressing the major weakness of under-funding and instability of funding. Mr. Shepard endorsed the merger of the two programs. He added that having a regional presence allows a direct conduit from ocean exploration directly into the management community to address coastal issues including hurricanes, shoreline erosion, and sea level rise.

Dr. McNutt explained the importance of the OE program to the Nation with the example of the discovery of hot-vent communities that has resulted in the study of a completely new ecosystem which led to new understanding of how life might be sustained elsewhere in the universe. She saw the primary weakness as being that ocean exploration is not explicitly part of NOAA's mission, not a lack of funding. She called for the addition of exploration to the mission of NOAA. She expressed concern that the intentions of NURP might not be in line with the goals of OE, and that a merger of the two could therefore hurt the OE program.

4.4—SUBCOMMITTEE ON RESEARCH

4.4(a)—National Science Foundation Budget and Management Challenges

March 9, 2005

Hearing Volume No. 109–7

Background

On March 9, 2005, the Research Subcommittee of the Committee on Science of the House of Representatives held a hearing to examine the fiscal year 2006 (FY06) budget request for the National Science Foundation (NSF), as well as longer-term budget and management challenges facing the Foundation.

The witnesses were: (1) Dr. Arden L. Bement, Director, National Science Foundation; (2) Dr. Christine C. Boesz, Inspector General, National Science Foundation; and (3) Dr. Mark S. Wrighton, Chairman, Audit and Oversight Committee, National Science Board and Chancellor, Washington University in St. Louis.

Summary of Hearing

Chairman Inglis spoke of the need for expanded investment in scientific research and education in order to continue the development of innovative technological solutions. He described how the U.S. will lose its edge in science and an "innovation gap" will form if necessary research is not supported by NSF. He therefore called for a larger investment in NSF's budget, citing last year's budget cut and the promise Congress made to double the NSF budget over five years. He believes economic growth will be achieved through innovation and that we must invest in the future and that the edge the United States enjoys in science and technology will continue to slip away unless more attention is paid to education.

Ranking Minority Member Hooley spoke of NSF's historic role, nurturing the research and education capabilities of the Nation in the fields of science and engineering. She was concerned about the level of resources proposed for NSF in the President's budget, stating it would not be enough to sustain future U.S. leadership in science and technology. The budget request would result in a cumulative shortfall of $5.8 billion in meeting the doubling goal set out by Congress. Also noted was the lack of resources set out in the budget request for educational activities despite widespread concerns about the quality of science and math education in schools.

Dr. Bement addressed the management challenges and questions concerning NSF's priorities set forth by the Committee.

- This year's budget request was built on four priorities—strengthening core disciplinary research, providing broadly accessible cyberinfrastructure and world class research facili-

ties, broadening participation in the science and engineering workforce, and sustaining organizational excellence in NSF management practices.

- Over the last 12 years, the number of proposals NSF processes has grown by more than 50 percent to 44,000 each year. Yet the number of full-time employees has increased by only 5.7 percent. Additionally, the success rate for proposals is decreasing. NSF is seeking ways to improve its solicitation and evaluation of proposals to ensure that the time of applicants and NSF staff is used as efficiently as possible.
- Another challenge is determining the appropriate lifespan of research facilities and processes for phasing out these facilities at the right time.
- An NSF priority is encouraging students from all backgrounds to enter into science and engineering careers, and therefore a number of education and human resources programs in this area were protected from reductions in the FY06 budget request. Programs to increase the number of science and engineering baccalaureate degrees and support for graduate fellowships also continue.

Dr. Wrighton commented on the NSF fiscal year 2006 budget, gave an update on the National Science Board (NSB) activities over the past year and also discussed future goals and priorities.

- The Board approved the budget NSF submitted to the Office of Management and Budget and supports the President's budget request. The Board supports the FY06 budget focus on the four priorities mentioned by Dr. Bement.
- If more funding were made available to NSF in FY06, the NSB recommends it go toward (1) science and engineering education, (2) Major Research Equipment and Facilities Construction projects (MREFC), and (3) the financial burden NSF will encounter with the transfer of icebreakers from the Coast Guard to NSF.
- NSB activities over the past year have included the following:
    - Board re-prioritization of all MREFC projects.
    - Provisionally approved the report on Setting Priorities for Large Research Facility Projects by the National Science Foundation. Board approval and implementation of revised process is expected by fall 2005.
    - Examined policies relating to the National Academy for Public Administration report, including implementation of the Sunshine Act, the use of Intergovernmental Personnel Act and rotator-type employees, and the role of NSB in setting policies for NSF.
- NSB in the coming year plans to undertake a project on establishing a new vision for NSF in the 21st century.

Dr. Boesz spoke of the work she had done alongside NSB and NSF management to identify and address NSF management challenges. She highlighted two of the most important short-term and

long-term management challenges facing NSF: the strategic management of NSF resources and improved financial performance.

- While NSF's workload has rapidly increased, the agency has not identified the amount of staffing and administrative resources needed to address the disparity.
- For four consecutive years, auditors have found that NSF's monitoring of grantee institutions has significant weaknesses. A more effective monitoring program would ensure that awardees are complying with federal requirements, are making adequate progress toward achieving research objectives, and are charging allowable costs. Much needs to be done to improve NSF post-award administration.
- The Inspector General also described her office's audit and investigative activities, including reports on questioned costs, recommendations for improving grants management controls and oversight processes at both NSF and its awardee institutions, and involvement in information gathering for civil/criminal and administrative cases.

4.4(b)—The National Nanotechnology Initiative: Review and Outlook

May 18, 2005

Hearing Volume No. 109–15

Background

On May 18, 2005, the Research Subcommittee of the Committee on Science of the House of Representatives held a hearing to review the activities of the National Nanotechnology Initiative (NNI).

The witnesses were: (1) Mr. Scott Donnelly, Senior Vice President for Global Research, General Electric Company; (2) Dr. John Kennedy, Director, Center for Advanced Engineering Fibers and Films, Clemson University; (3) Dr. John Cassady, Vice President for Research, Oregon State University; and (4) Mr. Michael Fancher, Director of Economic Outreach, Albany NanoTech.

Summary of Hearing

Chairman Inglis began the hearing by citing a recent survey which found that more than half of all Americans have no familiarity with nanotechnology. He stated the importance of understanding a technology that is changing products and revitalizing our manufacturing base. The day of the hearing, the President's Council of Advisors on Science and Technology (PCAST) released a report on the state of and outlook for nanotechnology in the U.S. According to the report, the U.S. leads the world in the amount of funding, patents and scientific publications, but other countries are not far behind. He asked the witnesses to discuss how to maintain the Untied States' position as world leader in this area of technology and what the government should and should not be doing in this area.

Ranking Minority Member Hooley discussed the role of the National Nanotechnology Initiative (NNI) as a coordinated Federal R&D effort that seeks to ensure that the U.S. remains at the fore-

front of nanotechnology and is positioned to directly benefit from its many potential applications. She expressed interest in the role of the NNI in helping facilitate commercialization of nanotechnology-related products and emphasized that the States play a leading role in economic development.

Mr. Donnelly discussed the importance of nanotechnology at General Electric, and the promise this revolutionary technology holds for future products and applications. He stated that:

- New material systems based on nanotechnology have the potential to impact numerous industries, e.g., by enabling higher efficiency in jet engines, lower emissions in energy technologies, improved detection of biological or chemical agents for homeland security, and better protective gear for soldiers.
- He emphasized that advances in new materials historically require long, sustained research and development efforts. Federal funding, through agencies like the National Science Foundation, Department of Energy, National Institutes of Health, and Department of Defense, coordinated by the NNI, is essential to support R&D programs, especially at colleges and universities.
- Federal support of research programs at universities is particularly valuable to GE in that these programs produce graduates who GE can hire and who already have an appreciation for nanotechnology and its role in the development of new materials.

Dr. Kennedy described Clemson University's Center for Advanced Engineering Fibers and Films (CAEFF), an NSF-funded engineering research center that promotes the transformation of the fibers and films industry from trial-and-error development to computer-based design. He added:

- CAEFF conducts research in areas where nanotechnology is close to being applied in a commercial venture, such as work on bio-sensors, infection prevention, and improved wound and incision healing, as well as longer-term research, such as study of how nanotechnology can be used in hydrogen storage systems.
- In addition to research programs, CAEFF also emphasizes education activities, such as the development of multi-disciplinary courses in macro-molecular engineering, and diversity activities, such as scholarships, fellowships, and collaborations with universities that serve under-represented populations.
- Dr. Kennedy emphasized the importance of the Federal/ state/ industry/academe Partnership in nanotechnology. He also suggested that, in addition to federal support of research programs, federal agencies (like NASA and DOD) that are potential users of nanotechnology-enhanced products should accelerate the development of such products via demonstration programs.

Dr. Cassidy described the Oregon Nanoscience and Microtechnologies Institute (ONAMI), which combines research universities, high tech industries, and Pacific Northwest National Laboratory in

a collaborative research program focused on innovation, collaboration, and commercialization.

- ONAMI research is organized into three areas—Microtechnology-Based Energy, Chemical and Biological Systems; Safer Nanomaterials and Nanomanufacturing; and Nanoscale Metrology for Nanoelectronics—which reflect the focus of technology-based industries in Oregon.
- He described ties between ONAMI and companies, but noted that several barriers to academic-industry collaboration exist. These barriers include who will control the intellectual property generated in university research, a lack of career rewards for academics performing industrially-relevant research, and a lack of funding for joint industry/university research.
- He described how federal funds for nanotechnology research are critical for attracting faculty and graduate students into this field and developing the workforce the U.S. needs to compete in nanotechnology.

Mr. Fancher spoke of a new model for technology, business, and education which involves an "innovation cluster" of academia, governmental agencies, and industry. He also illustrated the rising cost of commercializing nanotechnology. He added:

- New York State is an example of this "new model." New York State has four key drivers: selecting an overarching discipline (nanotechnology), investing in state-of-the-art infrastructure (Albany NanoTech complex), focusing on world class, hands-on education and training (world's first college of nanoscale science and engineering), and leverage public-private partnerships.
- Albany NanoTech focuses on nanoelectronics specifically, and the European Union, Japan, and France are also investing in government-university-industry partnerships in this area as well.
- Science, technology, engineering, and math education is vitally important for generating the intellectual capital that is needed for the continued growth of nanotechnology research and development.
- New York State and various companies have made significant investments in Albany NanoTech, particularly in its infrastructure. Mr. Fancher believes that federal funding is needed for university-based technology, educational, and business models that concurrently support long-term research, medium-term development and short-term manufacturing.

4.4(c)—Nanotechnology: Where Does the U.S. Stand?

June 29, 2005

Hearing Volume No. 109–21

Background

On June 29, 2005, the Research Subcommittee of the Committee on Science of the House of Representatives held a hearing to examine the findings and recommendations of the recent assessment of the National Nanotechnology Initiative (NNI) by the President's Council of Advisors on Science and Technology (PCAST) and to hear from the nanotechnology community on how U.S. research and business activities in nanotechnology measure up to those of international competitors.

The witnesses were: (1) Mr. Floyd Kvamme, Co-Chair of the President's Council of Advisors on Science and Technology and a partner at Kleiner Perkins Caufield & Byers, a high-technology venture capital firm; (2) Mr. Jim O'Connor, Vice President of Technology Incubation and Commercialization at Motorola, Inc; (3) Mr. Sean Murdock, Executive Director of the NanoBusiness Alliance and (4) Mr. Matthew M. Nordan, Vice President of Research at Lux Research Inc., a nanotechnology research and advisory firm.

Summary of Hearing

Chairman Inglis spoke of the recently released PCAST report on the state of and outlook for nanotechnology in the U.S. While the United States currently leads the world in funding, patents and scientific publications, the rest of the world is catching up. Nanotechnology has the potential to revitalize our entire manufacturing base and impact fields from defense to health care to energy and transportation. He also mentioned the importance of continued improvements in math and science education to ensure that the U.S. maintains its role as the best place in the world for innovation. The goal of the hearing, he said, would be to discuss ways the U.S. can maintain its status as a world leader in nanotechnology and other emerging technologies, and to learn what barriers exist to commercializing nanotechnology, how we can overcome them, and the Federal Government's role in the process.

Ranking Minority Member Hooley spoke of her interest in the role the National Nanotechnology Initiative (NNI) can play in facilitating the commercialization of nanotechnology. She described a recent Research Subcommittee hearing in which witnesses suggested that federal nanotechnology funding could include support for applied, pre-competitive research and asked this hearing's witnesses for suggestions on the kinds of activities that would ensure effective technology transfer to the private sector.

Mr. Kvamme discussed PCAST's biennial report on the NNI.

- The report found that federal funding for nanotechnology R&D is money well spent and the program is well managed. In addition, NNI is taking appropriate steps to understand and address societal concerns and potential risks.
- The U.S. is the leader in nanotechnology R&D. The $1 billion dollar annual federal funding is one-quarter of the cur-

rent global investment by all other nations. When all public and private funding is considered, the U.S. is funding approximately $3 billion, or one-third, of the $9 billion in total worldwide spending for nanotechnology R&D.

- U.S. also leads in research output (patents and publications) and in the number of nanotechnology-based startup companies; however other countries are chasing U.S. leadership through coordinated national programs.
- Mr. Kvamme described some of the recommendations from the PCAST report, including that NNI should (1) increase its outreach to States to facilitate tech transfer and commercialization; (2) continue efforts to understand the possible toxological effects of nanotechnology; and (3) strengthen ties with the Departments of Education and Labor to help with the establishment of an infrastructure capable of educating and training researchers, teachers, and technical workers in nanotechnology.

Mr. Nordan described how the U.S. leads the world in nanotechnology today, but then noted that this lead is tenuous. He outlined five steps the U.S. should take to maintain and extend its lead.

- First, the U.S. should increase federal funding for nanotechnology research, as nanotechnology is an enabling technology that will stimulate economic development in a wide variety of sectors.
- Second, the U.S. needs to eliminate regulatory uncertainty surrounding environmental, health, and safety issues in nanotechnology to allow companies to confidently invest in nanotechnology-related product lines. He described the need to be sensitive to both perceived and real risks associated with nanotechnology and emphasized that concerns exist not only about workplace exposure, but also about "end-of-life" issues for products with nanotechnology within them.
- Third, the U.S. needs to attract U.S. students to the physical sciences and develop incentives to retain foreign students who train in the U.S. so that the U.S. remains home to a technologically-trained workforce that can power nanotechnology-related innovation.
- Fourth, individual federal agencies should support programs designed to develop applications and products needed by those agencies.
- Fifth, the U.S. should be mindful that export controls in nanotechnology are not applied so broadly that they choke commercialization.

Mr. Murdock spoke of the United States' competitive position in the commercialization of nanotechnology.

- The U.S. is currently a leader in nanotechnology commercialization, and it is vital to maintain this leadership position in order for the U.S. to retain jobs in existing companies and industries and integrate nanotechnology innovations into existing industry sectors.

- Venture capital firms are shying away from investments in nanotechnology start-ups because these technologies have longer-term commercialization processes and unclear market economics. Many larger companies plan to innovate through acquisition, by relying upon start-up companies to take the risks of developing and commercializing innovations and then purchasing the successful start-ups.
- The Federal Government could help bridge the gap by fully and effectively using the Small Business Innovation Research program and other programs at its disposal to enhance commercialization activity. Creating greater incentives for the private sector to invest and aggressively participate in the commercialization process (such as research and development tax credits) is also essential to achieving the full potential of nanotechnology.

Mr. O'Connor gave his perspective on the U.S. competitive position in nanotechnology.

- Much of the success of nanotechnology can be attributed to public-private partnerships between Federal and State Governments and business and academia. Strong partnerships between universities and industry promote research, education, and commercialization. Motorola, like its competitors, is committed to long-term investments in nanotechnology research and development, both in internal programs and in partnerships with universities.
- Asian countries are providing significant competition for the U.S. in nanotechnology. Some of the countries have been successful by strategically choosing to concentrate their investments in particular areas of nanotechnology in order to make significant strides sooner in a specific sector. In addition, these countries are investing in their undergraduate and graduate training systems to ensure they develop a supply of highly-skilled workers.
- A well-educated talent pool is critical to competitiveness, and hence Motorola strongly supports the PCAST Report recommendation that the NNI establish relationships with the Department of Education and Labor to establish nanotechnology education and training programs to produce appropriate researchers and technical workers in the U.S.

4.4(d)—Fueling the Future: On the Road to the Hydrogen Economy

July 20, 2005

Hearing Volume No. 109–23

Background

On July 20, 2005, the Energy and Research Subcommittees of the Science Committee held a joint hearing to examine the progress that has been made in hydrogen research since the launch of the President's Hydrogen Initiative and the next steps the Federal Government should take to best advance a hydrogen economy.

The witness panel included: (1) Mr. Douglas Faulkner, Acting Assistant Secretary for Energy Efficiency and Renewable Energy at the Department of Energy (DOE); (2) Dr. David Bodde, Director of Innovation and Public Policy at Clemson University's International Center for Automotive Research; (3) Mr. Mark Chernoby, Vice President for Advanced Vehicle Engineering at the DaimlerChrysler Corporation; (4) Dr. George Crabtree, Director of the Materials Science Division at Argonne National Laboratory; (5) Dr. John Heywood, Director of the Sloan Automotive Laboratory at the Massachusetts Institute of Technology.

Summary of Hearing

In his 2003 State of the Union speech, President Bush announced the creation of a new Hydrogen Fuel Initiative, which built on the FreedomCAR initiative he announced in 2002. Together, the initiatives aim to provide the technology for a hydrogen-based transportation economy, including production of hydrogen, transportation and distribution of hydrogen, and the vehicles that will use the hydrogen. Fuel cell cars running on hydrogen would emit only water vapor and, if domestic energy sources were used, would not be dependent on foreign fuels. The Members in attendance at the hearing expressed concern about various issues involving this initiative and DOE execution of the program in particular. Discussion is summarized below.

Subcommittee on Energy Chairman Biggert opened the hearing by stressing the importance that hydrogen and fuel cells hold for a cleaner and more efficient nation that is less dependent on foreign sources of oil. She noted that many of the benefits of a hydrogen economy, such as reduced greenhouse gas emissions, are not currently accounted for in the marketplace, which will make it difficult for hydrogen vehicles to compete with conventional technology.

Subcommittee on Research Chairman Bob Inglis advocated the transition to a hydrogen economy for the sake of cleaner air, and to reduce dependence on Middle Eastern oil. He added that hydrogen entrepreneurs will be making money and employing people, and that the U.S. will be winning our energy independence. He admitted technology and cost challenges ahead, but countered that the U.S. is up to the challenge.

Mr. Faulkner cited significant advances that DOE has made in helping realize the President's hydrogen initiative, and that fuel cell activities recently achieved an important technology cost goal—the high-volume cost of automotive fuel cells being reduced from $275 per kilowatt to $200 per kilowatt. He stated that this accomplishment is a major step toward the Program's goal of reducing the cost of transportation fuel cell power systems to $45 per kilowatt by 2010.

The non-government witnesses urged the government to adopt incentives to encourage additional research and development in hydrogen technologies and urged a dual-path approach that would focus on developing more immediate technologies that could improve fuel efficiency, while continuing research into alternative energy forms such as hydrogen, electricity and biomass.

While citing hydrogen's benefits as a fuel that can be made from a variety of sources and it's lack of emissions of pollutants and greenhouse gasses, witnesses told the Subcommittees that before a hydrogen economy can become reality significant obstacles related to the production and storage of hydrogen must be resolved. Dr. Bodde discussed the challenge in hydrogen storage, noting that the most important long-term research goal is to provide a more effective means of storing hydrogen on vehicles than the compressed gas or cryogenic liquid now in use.

Most hydrogen today is produced from natural gas, which does not resolve the issue of U.S. reliance on foreign energy or greenhouse gas emissions. Dr. Crabtree emphasized that advances in the production of hydrogen are imperative for the fuel to become a practical solution. He added that to power cars and light trucks in the coming decades we will need 10 to 15 times the amount of hydrogen we now produce, and that hydrogen cannot continue to come from natural gas, as that production route simply exchanges a dependence on foreign oil for a dependence on foreign gas, and it does not reduce the production of environmental pollutants or greenhouse gases. He said that we must find carbon-neutral production routes for hydrogen.

Mr. Chernoby discussed the advances his company has made in developing hydrogen powered vehicles, stating that DaimlerChrysler has been working on fuel cell technology for transportation utilizing hydrogen for over ten years and they have invested over $1 billion in R&D and have developed five generations of vehicles. He said that they have 100 fuel cell vehicles participating in various international demonstration projects in the United States, Europe, and Asia.

Citing the significant technical barriers that must be overcome, Dr. Heywood told the Subcommittees that hydrogen will not become a widely used fuel for a number of years. He urged improving fuel efficiency in the short-term, and continued development of alternatives to fossil fuels, such as hydrogen, electricity, and biomass fuels. He also recommended that the U.S. Government play a more active role in increasing fuel efficiency standards, as well as in R&D for alternative fuels; and that there are many ways to improve current vehicle technology to increase efficiency.

4.4(e)—The Role of Social Science Research in Disaster Preparedness and Response

November 10, 2005

Hearing Volume No. 109–32

Background

On November 10, 2005, the Research Subcommittee of the Committee on Science held a hearing to better understand how the social sciences can inform planning for, response to, and recovery from natural hazards and disasters.

The witnesses were: (1) Dr. Susan Cutter, Professor of Geography at the University of South Carolina and Director of the Hazard Research Laboratory; (2) Dr. Roxane Silver, Professor in the Department of Psychology and Social Behavior in the Department

of Medicine at the University of California, Irvine; (3) Dr. H. Dan O'Hair, Professor and Chair of the Department of Communication at the University of Oklahoma; and (4) Dr. Shirley Laska, Professor of Environmental Sociology and Director of the Center for Hazards Assessment, Response and Technology at the University of New Orleans.

Summary of Hearing

Chairman Inglis opened the hearing by discussing the human and economic toll of recent natural disasters and the looming threats of terrorism and avian flu. He stated that while science and technology have aided the ability to predict, manage, and mitigate natural disasters, a better understanding of the social, behavioral, and economic aspects of disaster planning would also be beneficial. Chairman Inglis then established the focus of the hearing as a discussion on: (1) how the social sciences assess the vulnerability of a group or region, (2) how individuals perceive and respond to risk and disaster warnings, and (3) how disasters impact individuals and groups.

Ranking Minority Member Darlene Hooley joined the Chairman in stressing the importance and timeliness of focusing on disaster preparedness, response, and recovery. In particular, she mentioned that continued population growth in hazardous coastal and earthquake-prone regions, threats of terrorism, and a potential avian flu pandemic increased our vulnerability to disasters. She next noted the contributions of social science in increasing our understanding of disasters and emphasized the importance of acting on this information. Representative Hooley then listed three questions that she hoped would be addressed by the hearing. (1) What is the state of current and future research in social and behavioral sciences? (2) Are important research areas not being addressed? (3) How have social and behavioral research translated into practice?

Dr. Cutter focused her testimony on the emergent field of vulnerability science and offered the following examples of how social science has contributed to a better understanding of vulnerability science:

- Improved metrics, models, and methods have improved social vulnerability assessments. Two examples are the identification of pre-existing conditions that make certain groups more vulnerable to disaster and the development of a quantitative method for determining social vulnerability of specific geographic areas.
- Social science research has improved understanding of evacuation behavior. For example, people tend to evacuate as family units, avoid public shelters if possible, and stay in harm's way because of pets. In addition, people tend to overrespond to evacuation orders, placing additional and unexpected burdens on local resources.
- While social science is often not translated into practice, there are exceptions, such as NSF support of the Association of American Geographers to develop a strategy for understanding terrorism after 9/11 and the establishment of the DHS Center on Social and Behavioral Responses to Ter-

rorism. To improve disaster preparedness and response, Dr. Cutter recommends (1) creating a national inventory on hazard events and losses, (2) establishing a national center for vulnerability science, (3) reducing the preparedness divide, (4) bringing social science findings to practitioners, and (5) increasing support of rapid response research.

- An annual workshop at the University of Colorado-Boulder brings together the research community, state and local governments, and federal agency personnel to discuss hazards and disasters.

Dr. Laska spoke about three Center for Hazards Assessment, Response and Technology (CHART) projects in Louisiana that are partnerships between social sciences and communities to understand risk, increase safety, and facilitate recovery from environmental factors.

- The first project, initiated at the request of the Federal Emergency Management Agency, is a repetitive flood loss project to maintain records of repeatedly flooded residential structures within the most flooded parishes in Louisiana. These records have been used to demonstrate that repeatedly flooded structures are found in clusters, due to watershed problems, allowing the problem to be addressed at the community level.
- The second, funded by NSF, provides support for CHART to test a method to help at-risk communities deal with natural hazards. This process, called Participatory Action Research, involves collaboration between academics, practitioners, and community residents.
- The third project was a large-scale survey on hurricane evacuation behavior that was tailored to each parish. One finding was that two-thirds of respondents felt safe in their homes in a Category 3 hurricane. These findings were used to develop an evacuation campaign prior to Hurricane Katrina.
- Dr. Laska encouraged federal agencies, including the Environmental Protection Agency, the National Oceanographic and Atmospheric Administration, the Department of Housing and Urban Development, and the Department of Transportation, to fund social science and hazard research.

Dr. O'Hair talked about factors that influence the perception and acceptance of risk and effective communication of risk. The findings of social science research are as follows:

- Multiple factors play a role in an individual's perception and acceptance of risk, including socio-political factors such as power, status, ethnicity, culture, education, and trust.
- During disasters, the media serves a valuable role for victims, government, and consumers but also fails to include critical information and sensationalize the situation. This is termed the "paradox of media coverage."
- The most important principals for communicating risk are (1) a consistent, accurate, clear message provided repeatedly

through multiple methods, (2) timely information, and (3) information that is specific to the risk.

- Federal spokespersons are preferred for national events, whereas local events are best expressed by someone known to the community.
- The most pressing remaining issues for disaster research are building a community-based communication infrastructure and understanding which media outlets are viewed as most effective and trustworthy for delivering information. The Disaster Knowledge Management System takes information from multiple expert sources and targets it specific communities that are at risk for the flu pandemic.

Dr. Silver testified on the critical role of social science research in disaster response.

- Despite many assumptions, models, and beliefs, there is no universal response to traumatic events.
- Psychological responses are not limited to those directly exposed to trauma and are not proportional to the degree of exposure. It is important to obtain data concerning the adjustment process following disasters to aid mental health providers.
- Social research can aid in effectively communicating risk, identifying factors that promote resilience and adjustment to prolonged stress, uncertainty, and loss, and help policy-makers plan efforts.
- There is competition between social science researchers and the for-profit trauma industry in dealing with individuals affected by disasters.

4.4(f)—Undergraduate Science, Math, and Engineering Education: What's Working?

March 15, 2006

Hearing Volume No. 109–40

Background

On Wednesday, March 15, 2006, the Research Subcommittee of the Committee on Science of the House of Representatives held a hearing to examine how colleges and universities are improving their undergraduate science, math and engineering programs and how the Federal Government might help encourage and guide the reform of undergraduate science, math and engineering education to improve learning and to attract more students to courses in those fields.

The witnesses were: (1) Dr. Elaine Seymour, Author of *Talking About Leaving: Why Undergraduates Leave the Sciences,* former Director of Ethnography and Evaluation Research at the University of Colorado, Boulder; (2) Dr. Carl Wieman, Distinguished Professor of Physics, University of Colorado, Boulder; (3) Dr. John Burris, President, Beloit College; (4) Dr. Daniel Goroff, Vice President and Dean of Faculty, Harvey Mudd College; (5) Ms. Margaret Semmer

Collins, Assistant Dean of Science, Business, and Computer Technology, Moraine Valley Community College.

Summary of Hearing

Chairman Inglis stressed the need to make science and math careers captivating and compelling for students so that the U.S. will continue to lead the world in the development of new technology. Undergraduate institutions play the biggest role in creating new K–12 science, technology, engineering, and mathematics (STEM) teachers, and the Chairman asked the panelists' opinions on striking a balance between creating teachers with expertise in STEM fields but with little training in pedagogy versus those with less depth in a STEM field but with greater training in pedagogy.

Congressman Udall hoped to learn from the hearing what barriers exist to improving STEM education at the undergraduate level and if the Federal Government needs to create programs to address this issue. He expected the hearing to address the issues both of attracting and retaining students in STEM majors, and also ensuring that all students receive a high quality STEM education.

Dr. Seymour spoke about the results of her research into why undergraduates leave STEM majors and why those that do complete STEM degrees often do not go into K–12 teaching. She was alarmed about the current and growing national shortage of qualified K–12 STEM teachers. She added:

- A decline in the perceived value of teaching in society in general and on college campuses in particular is part of the cause of the lack of interest in K–12 STEM teaching.
- The university salary structure for STEM faculty does not reward teaching efforts as it does research efforts, leading to poorer quality teaching of undergraduates. Inadequate preparation of graduate teaching assistants exacerbates this problem, as does the fact many students arrive on college campuses without adequate math and science preparation for college work.
- There are many STEM teaching vacancies filled by people who are only marginally qualified in STEM areas, a problem often concentrated in large, minority serving school districts.

Dr. Wieman stated that he found through scientifically rigorous research that undergraduate science education is based on an obsolete model. Until colleges and universities fix how they teach science, future K–12 science teachers will not receive the necessary science training, and the overall problems with K–12 STEM education cannot be fixed. However university departments' approaches to teaching have been static despite evidence that their methods are ineffective. He added:

- Recent evaluation of science education done by STEM faculty shows that at best undergraduates are not gaining worthwhile information in their STEM classes, and at worse they are forming the impression that science is dull and uninteresting.

- Their research also showed that K–12 STEM teachers are also those who did most poorly in their undergraduate STEM education, making them less effective.
- Large research universities set the standard for undergraduate STEM education and train most of the country's K–12 STEM teachers. The departments that actually control the teaching, with their tradition of autonomy and drive for research-related prestige, have no incentive for large, wholescale change. However, if universities and outside agencies made the development of new teaching methods competitive, intellectually challenging, and professionally rewarding, they could gain the interest of faculty.

Dr. Burris spoke from the perspective of a president of a small, liberal arts college and a former scientific researcher. He discussed the success that small colleges like Beloit have in educating undergraduates in STEM fields and listed several recommendations for STEM undergraduate education. He added:

- With the doubling of NSF's budget over the next ten years should come the doubling of NSF's funding for undergraduate STEM education.
- Students learn STEM subjects best in small classes, with hands-on teaching methods using an inquiry-based approach. Colleges and universities need to eliminate overly-large introductory courses whose main purpose is often to discourage, not encourage, potential majors.
- Programs to provide colleges with professional-grade research equipment have been enormously successful in that faculty can show students how modern science is done and also keep up active research programs.
- The culture at smaller colleges is more collaborative between departments and the administration and the reward system at these institutions is more tied to teaching.
- NSF is the agency best-suited to support programs that encourage women and minorities to pursue STEM careers.

Dr. Goroff noted that people work effectively in any field if they have a sense of purpose and belonging. He hoped that the incentives put forth in the *American Competitiveness Initiative,* and other programs to draw students to STEM majors, are accompanied by teaching methods that involve students in current research and related real-world scientific activities. Dr. Goroff believes that the U.S. is uniquely capable of delivering this kind of hands-on education, and he stated that an emphasis on quality will spark more scientific advances than a focus only on the quantity of STEM majors universities and colleges produce. He added:

- It is difficult for undergraduate-serving institutions to keep their curriculum and facilities up to date, given the costs associated with the rapidly changing pace of science. Maintaining undergraduate STEM educational programs at NSF is absolutely critical to preserving and improving the quality of STEM education at colleges and universities.

- Government agencies and private organizations should work with universities to give STEM students opportunities to work on real-world STEM research projects.
- Programs like the Derek Bok Center for Teaching and Learning at Harvard have been very successful in teaching STEM professors how to teach. These types of centers should be replicated.

Ms. Collins noted that community colleges also have trouble retaining STEM majors, with added difficulties unique to community colleges such as demographics, geographic boundaries, and open admission policies. She added:

- Students are more likely to come to community colleges less prepared for math and science. Moraine Valley Community College (MVCC) has worked with high schools to create ways to bridge this gap.
- MVCC has used on funds and programs from various agencies to support mentoring, expanded curricula, internships, and dual-credit programs. These programs have greatly aided in retaining and encouraging STEM majors.
- MVCC has also conducted successful community outreach programs with NSF funding, such as activities for economically disadvantaged Hispanic youth interested in information technology careers.
- Community colleges have a big role to play in providing a path to STEM careers for people of diverse backgrounds. The college has a strong commitment to employing a diverse faculty, thus providing more mentors for a diverse student body.
- With funding from the NSF Advanced Technology Education program, MVCC has created a information security center to develop curriculum, expand internships opportunities, build a Women in Technology mentoring program, produce a video that shows technology in more appealing ways, and offer a career development course that highlights science and technology careers. These efforts have been successful in bridging the gap to college-level STEM course work and attracting students to STEM careers.

4.4(g)—International Polar Year: The Scientific Agenda and the Federal Role

September 20, 2006

Hearing Volume No. 109–61

Background

On Wednesday, September 20, 2006, the Subcommittee on Research held a hearing to examine the research planned for the upcoming International Polar Year (IPY) and the role the U.S. will play in the IPY. The upcoming IPY, set to run from March 2007 until March 2009, will consist of an intense, internationally coordinated effort of polar observations, research and analysis in many scientific fields, including the study of how the Earth's remote

polar regions influence global climate systems. The IPY also hopes to inspire the next generation of scientists and to educate the public about the polar regions. The National Science Foundation (NSF) is the lead U.S. federal agency.

The witnesses were: (1) Dr. Arden Bement, Director of NSF; (2) Dr. Robin Bell, Senior Research Scientist at Columbia University's Lamont-Doherty Earth Observatory and Chair of both the National Research Council and the U.S. Committee to the IPY; (3) Dr. Kelly K. Falkner, Professor of Chemical Oceanography at Oregon State University and member of the Advisory Committee to the NSF Office of Polar Programs; (4) Dr. Donal T. Manahan, Professor of Biology at the University of Southern California; and (5) Mr. Mark S. McCaffrey, associate scientist and science communications specialist at the Cooperative Institute for Research in Environmental Sciences at University of Colorado, Boulder.

Summary of Hearing

Chairman Inglis opened the hearing by praising the research efforts that he has witnessed first-hand in Antarctica and stressing the importance of having a strong education and outreach component for the upcoming IPY. Ranking Member Hooley echoed Chairman Inglis' sentiments and added that polar research results are important to help guide global warming policy choices.

Dr. Bement testified that NSF has been tasked to provide leadership for the U.S. in the IPY. He described how the IPY fosters international collaboration and reemphasizes a structure for polar research. Specifically he explained that:

- NSF will focus on three scientific themes for this IPY; 1) how organisms adapt to climate extremes, with a focus on the genetic level; 2) a Circum-Arctic Observation Network that will provide missing data essential to modeling and predicting Arctic climate change; 3) research to understand changes in the ice sheets.
- The IPY activities are NSF-wide efforts, and NSF is also collaborating with other federal agencies (such as the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA) and with other countries (including European and Canadian partners for the Circum-Arctic system).
- NSF outreach and education for the IPY will focus on both students and parents. With new tools like the Internet, iPods and broadband connections, scientists will be able to share their information faster and more richly.

In response to questions from the Members, Dr. Bement also described NSF's efforts to improve use of alternative energy sources and environmentally sound building technologies at U.S. facilities in the polar regions.

Dr. Bell testified that the polar questions researchers are posing are broad and multi-disciplinary. She also discussed the unique, international aspect of the IPY. She added:

- IPY planning has identified five major challenges or areas to research: large scale environmental change, conducting mo-

lecular to continental scientific exploration of the poles, observing the polar regions in depth, looking at the human dimensions of the environment, and looking for ways to build new connections between the IPY science and the public.

- One of the areas of emphasis for this IPY that has not been a focus in past IPYs is the study of how changes in the polar regions impact the human communities living there.
- The IPY will help develop and stimulate the next generation of scientists and act as a powerful arena for international cooperation and public interest in Earth science.

Dr. Bell also offered four suggestions for how the preparation for the IPY could be improved: 1) Stronger engagement from more agencies, like NOAA and NASA; 2) Increased funding; 3) More coordination nationally and internationally; 4) Fostering interdisciplinary research.

Dr. Manahan testified that the IPY was hugely important to the U.S. leadership role in science. Additionally, it offers a unique opportunity to answer critical questions about the Earth and engage the public, noting that none of the other research he performs captures people's attention like his polar research. He elaborated:

- In the past scientists believed environmental change happened slowly, over a geologic time period. The speed with which the hole in the ozone layer opened and with which temperatures have recently risen, especially at the poles, suggest beyond a certain point the environmental change associated with a particular forcing greatly accelerates. The IPY offers a great opportunity to study this tipping point phenomenon.
- The IPY is also a suitable time to study the incredible abundance and diversity of life in cold and dark environments, which scientists estimate contain 90 percent, by mass, of the organisms on Earth.
- Researchers have found that the interdisciplinary approach to science is increasingly important. By embracing this approach for the IPY the U.S. will strengthen its position as a leader in the world scientific community. This IPY should engage the life, physical, and social sciences, treating them as part of one, complex system.
- The IPY comes at a very critical time when scientists, and also the public, are recognizing the critical role the polar regions have in climate stability and other global environmental processes.

Mr. McCaffrey testified on the IPY Education, Outreach and Communication's (IPY EOC) plans for the upcoming polar year. Their goal is to use the IPY to help foster a scientifically literate society. McCaffrey explained:

- The IPY should explore the role of technology in our society and should demystify and articulate how science is conducted, including how data is collected, analyzed, modeled, reviewed and communicated.

- The IPY EOC has held workshops to develop an integrated approach to international education efforts. Polar literacy themes and a narrative based approach to communication evolved from an online workshop with the IPY EOC.
- The rich potential of IPY education and outreach will not be realized if not adequately funded and coordinated domestically and internationally.

Dr. Falkner testified that the scientific community hopes to learn more about dramatic ecological changes and their effects on the world climate system. The Environmental Arctic Change Program will investigate whether the Arctic is transitioning toward a new state. She explained:

- Ecological changes to investigate include an increase in air temperatures, increase in land temperatures, diminished sea ice area and thickness, methane emissions from Siberian Fall Lakes, and melting of the Greenland ice sheet. All of these changes have potential implications for global weather patterns, global warming, habitat destruction, shipping routes and access to resources.
- The IPY also provides an opportunity for scientists to mobilize concurrently in the Arctic to answer basic science questions.
- New discoveries are possible in areas like sea floor dynamics, the Earth's magnetic field, biology, and contaminant transport.
- The IPY demonstrates the U.S. role of leadership in science, as well as sparking student and public interest in research and Earth science.

4.5—SUBCOMMITTEE ON SPACE AND AERONAUTICS

4.5(a)—The Future of Aeronautics at NASA

March 16, 2005

Hearing Volume No. 109–8

Background

On March 16, 2005, the Subcommittee on Space and Aeronautics held a hearing to discuss the future of aeronautics at the National Aeronautics and Space Administration (NASA).

The witnesses included Dr. John Klineberg, Chair of a 2004 National Academy of Sciences panel that examined NASA's aeronautics programs; Dr. Philip Antón, principal investigator of a 2004 RAND Corporation report that examined NASA's wind tunnel propulsion test facilities; Dr. Mike Benzakein, Chairman of the Department of Aerospace Engineering at Ohio State University, and former General Manager of Advanced Technology and Military Engineering at GE Aircraft Engines; and Dr. John Hansman, Professor of Aeronautics and Astronautics at Massachusetts Institute of Technology, and Director of the International Center for Air Transportation.

Summary of Hearing

The panel of expert witnesses warned the Subcommittee that the significant proposed reductions in aeronautics research at NASA poses a serious economic and national security threat to the United States.

The witnesses also said they were concerned that the cuts in aeronautics were being driven by budgetary concerns rather than by any strategy or plan. Because of this, the witnesses called for the development of a national vision for aeronautics research to focus on priorities and to guide funding.

Chairman Ken Calvert, opened the hearing by stating, "The Europeans have thrown down the gauntlet and said that they will dominate aerospace in the world by the year 2020. The U.S. aerospace industry has expressed alarm at the reductions in NASA's aeronautics investment, pointing out that aerospace products are a huge source of export sales and a major contributor to the United States' international balance of trade. Our nation's preeminence in commercial aircraft is being seriously challenged by Airbus and many believe that reduced aeronautics research and development funding has directly played a role in the cause of this weakened position of the American aerospace industry. There is a lot of concern that the investment in aeronautics research and development by this nation has been limping along for several years, and that there is a lack of a national strategy."

Dr. Antón, who led the RAND study, testified that despite the maturity of the aeronautics industry NASA's wind tunnels remain critical. Indeed, he said, "that maturity relies on the test facility infrastructure." Dr. Antón told the Committee that based upon four criteria—alignment with national needs, technical competitiveness, redundancy, and usage—the RAND study identified 29 of NASA's 31 test facilities that would be "detrimental to close." He added, "Nearly all existing NASA facilities serve at least one strategic need category important to the Nation's continuing ability to design aeronautics vehicles. We found very little overlap and very few gaps in coverage."

Dr. Klineberg told the Subcommittee that the 2004 National Academies panel he chaired concluded, "The government should continue to support air transportation, which is vital to the U.S. economy and the well-being of its citizens," and that "NASA should develop consistent strategic and long-range plans to focus the aeronautics program in areas of national importance. NASA should have well-formulated, measurable, attainable goals at all program levels."

When asked by Chairman Calvert if the proposed aeronautics budget matches the Nation's priorities, Dr. Klineberg, said, "The budget is driving the strategic plan, and not the other way. I don't think that's right." He further said that the budget proposal for aeronautics "is not satisfying the needs of the country because we haven't really looked hard at what those aeronautics needs are separately from the budget."

"It looks like the budget is driving the agenda, which is really in our opinion the wrong way to go," Dr. Benzakein added. "We need an aeronautics mission, an agenda agreed to, and then after that you can put a budget around it."

Explaining the potential impact of reductions in NASA's aeronautics programs, Dr. Benzakein told the Subcommittee that "The U.S. has enjoyed a favorable balance of trade in aeronautics every year since 1970. In 2003, this was $27 billion—not an insignificant number. Aeronautics research is key to maintaining our leadership." He added that this research must be conducted by NASA because "there is no other agency that can take that role in the United States today." Dr. Benzakein said that further cuts to the aeronautics budget "will have serious implications on the ability of NASA to continue to play a relevant role in aeronautics in the future."

Discussing the security implications of cuts to the Nation's aeronautics enterprise, Dr. Hansman said, "I believe that the Nation must recognize the civil and military importance of aeronautics and commit to maintaining the health and vitality of the national capability in aeronautics. A vital element of this capability is a healthy research program which builds core knowledge, stimulates innovation, builds intellectual capital, creates opportunity and solves emergent problems in the civil air transportation system." He warned that NASA's proposed workforce reductions could hinder the ability of NASA to maintain a sufficiently skilled workforce and added, "The workforce actions appear to be motivated by budget pressures rather than strategic efforts at intellectual renewal."

Testifying on behalf of the Administration, Dr. Vic Lebacqz, NASA Associate Administrator for Aeronautics Research, defended the proposed reductions to aeronautics saying such changes are necessary to move ahead with the agency's new exploration mission. "To ensure maximum benefit to the taxpayer, and to embrace the Vision for Space Exploration, we are transforming our investment in Aeronautics Research in order to more sharply focus our investment on revolutionary, high-risk, 'barrier breaking' technologies."

4.5(b)—Future Markets for Commercial Space

April 20, 2005

Hearing Volume No. 109–10

Background

On April 20, 2005, the Subcommittee on Space and Aeronautics held a hearing on the future market for commercial space. The purpose of the hearing was to discuss the future markets for the commercial space industry, including the nascent human space flight enterprise, and suggested ways in which the Federal Government could further enable industry growth.

The witnesses included Mr. Burt Rutan, Founder, Scaled Composites, Inc. and winner of the Ansari X-Prize for his design of SpaceShipOne; Mr. Will Whitehorn, President, Virgin Galactic and Brand Development Director for Virgin Management Limited; Mr. Elon Musk, CEO and Chief Technology Officer, Space Exploration Technologies (SpaceX); Mr. John W. Vinter, Chairman, International Space Brokers (ISB); Mr. Wolfgang Demish, Founder, Demisch Associates, LLC; Dr. Molly Macauley, Senior Fellow and Director of Academic Programs at the Resources for the Future.

Summary of Hearing

Burt Rutan joined the President of Virgin Galactic and other leaders in the commercial space industry in testifying before the Subcommittee on the future of the commercial space market.

The witnesses discussed the future markets for the commercial space industry, including the nascent human space flight enterprise, and suggested ways in which the Federal Government could further enable the industry's growth.

In his opening remarks, Subcommittee Chairman Calvert stated, "As we enter the Second Space Age, I anticipate entrepreneurs and commercial ventures will create many of the new rules and tools that will make personal space flight and low cost launch as ubiquitous as commercial flight is today."

Scaled Composites President Burt Rutan, the pioneering designer of SpaceShipOne, the first private manned craft to reach space, testified that two types of markets will likely emerge for the commercial human space flight industry. The first he described as one fraught with risk, in which courageous adventure seekers pay large sums of money for flights; a scenario he described as being akin to treks to the summit of Mount Everest.

The second scenario, he said, is one "in which the players do not find the dangers of space flight acceptable and recognize that ex-

tensive improvements in safety are more important than extensive improvements in affordability. Those that attack the problem from this viewpoint will be faced with a much greater technical challenge: the need for new innovations and breakthroughs. If successful, however, they will enjoy an enormous market, not one that is limited to servicing only a few courageous adventurers." While Rutan was unable to discuss the specific future plans for his company, he did tell the Subcommittee, "I can assure you that they do not involve a 'scenario one' approach."

Just prior to Rutan's successful X–Prize flights last September, Sir Richard Branson of the Virgin group announced the creation of Virgin Galactic, which will offer commercial flights to space. Virgin Galactic President Will Whitehorn said the company intends to purchase at least five vehicles from Rutan—which they have dubbed SpaceShipTwo—and plans to be operational by the end of the decade. "We are not doing this as a rich billionaire's tour adventure. . .or as just a brand representation. We are doing this to create a profitable and viable business," Mr. Whitehorn said. "We believe within five years [or operation] we can create a viable business that will be profitable, and that will allow us to bring down the cost of personal space flight to levels which will be affordable across the board in the United States and around the world."

Explaining the size of Virgin Galactic's potential market, Mr. Whitehorn said that the company has received more than 29,000 applications to fly since its announced formation last fall. "That is 29,000 people who said they are willing to pay a deposit of up to $20,000 for space flights within a range of prices of up to $200,000. We've also had 100 people who have actually signed 'terms and conditions' with us now to pay the full cost of $200,000 to fly on SpaceShipTwo."

A second panel of witnesses testified on the future markets of the wider commercial space industry, including launch vehicles and satellites. The witnesses were: Mr. Elon Musk, Chairman and CEO, Space Exploration Technologies (SpaceX); Mr. John Vinter, Chairman, International Space Brokers (ISB); Mr. Wolfgang Demisch, President, Demisch Associates, LLC; and Dr. Molly Macauley, Senior Fellow and Director, Academic Programs, Resources for the Future.

Discussing his company's business plan, Mr. Musk said, "SpaceX is dedicated to improving the reliability and cost of access to space for the greater purpose of helping us become a true space-faring civilization." He noted that his company's Falcon I rocket has the "lowest cost per flight in the world for a production rocket," and he said his Falcon V was rated as the most reliable rocket, outperforming the Boeing Delta IV and the Lockheed Atlas V, which currently are the most commonly used heavy-lift rockets.

Musk said the Federal Government could help the nascent commercial space industry by offering prizes for new technologies and by purchasing launches from new companies like his. He said the Department of Defense has purchased two of SpaceX's four launches to date. "Regrettably, however, NASA has not yet procured a launch and has provided less financial support than the Malaysian Space Agency, which has bought and paid for a flight on Falcon I," he said.

A major issue facing companies like SpaceX is ensuring financial protection in the event of a catastrophic mishap. International Space Brokers insures nine of the world's twenty satellite companies and is the only insurance broker focused exclusively on the space industry. "We address satellite insurance and risk management needs from 'cradle to grave,'" said ISB Chairman Vinter. "For us, commercial space begins with the arrival of people or equipment at the various launch sites, continues through launch, deployment, testing, and on-orbit operations of satellites through the end of their expected lives."

Mr. Demish, an aerospace financial analyst, said the large costs associated with space access will limit the industry's growth. "Access to space will stay expensive until we can achieve something like the proposed space elevator that Arthur C. Clarke, among others, has written about," Demish testified. "In the interim, perhaps for the next two or three decades, it will remain uneconomical to send anything other than information up into or back down from space. This suggests that, absent some astonishingly serendipitous discovery, a cancer cure for instance, entry into space will grow about in line with the general economy, rather than some multiple thereof."

Regarding the role of the Federal Government in enabling the growth of the commercial space sector, Dr. Macauley said, "My overall observation is that U.S. commercial space policy to date has been appropriately supportive of U.S. industry and sets a good precedent for the future. The interests of the taxpayer and industry are most likely to flourish mutually by way of a conservative approach to legislative and regulatory intervention, coupled with an innovative, incentive-oriented philosophy. I also recommend the usefulness of demonstration or pathfinder, experimental approaches to policy."

4.5(c)—Live From Space: The International Space Station

June 14, 2005

Hearing Volume No. 109–17

Background

On June 14, 2005, the Subcommittee on Space and Aeronautics held a historic hearing via satellite with a witness testifying from space aboard the International Space Station (ISS). The purpose of the hearing was to give Members a chance to review current activities onboard ISS, learn about the accomplishments of the crew, get an update on the current status of research on the Station, and to gain insight about extended human space flight from those who have experienced it.

Witnesses were Dr. John Phillips, the current U.S. astronaut on the ISS; Dr. Peggy Whitson who was on the ISS Expedition 5 mission from June through December 2002; and Lt. Col. Mike Fincke, member of Expedition 9 mission from April through October 2004.

Summary of Hearing

In his opening statement, Chairman Calvert announced to Members that the hearing was a chance to hear first-hand from astronauts about what it is like to live and to work in space. "This hearing gives us a chance to learn about what is going on in space—rather than to delve into the programmatic and budgetary details of the ISS program," Mr. Calvert said.

Questions from the Members took advantage of this historic opportunity, which covered a variety of topics ranging from the research the astronauts were conducting and the psychological impact of being away from their families, to the view of Earth from space. Some of the research which Members learned about included a new ultrasound capability which could be innovatively applied to study osteoporosis. The astronauts testified that one of the ailments of extended space flight is the loss of bone mass.

A question asked of all the astronauts was what kinds of lessons were learned during their stay at ISS and how could those lessons be applied to future exploration. Dr. Whitson responded about the importance of robotic support, while Lt. Col. Fincke indicated that tele-engineering (the ability to communicate with a team on Earth in order to complete operations in space) was important. Dr. Phillips answered that building in redundancy is a key to safety. "If one thing fails, we have another to back it up," he said.

Members were also interested in the astronaut's views about the value of research aboard the ISS. Dr. Whitson admitted that this is not always an easy question. "Sometimes it is very hard for us to predict what the outcome is and what will be the best research to do on board the Station," she said. She gave an example of technology used on the Station that inadvertently helped heart transplant operations. Lt. Col. Fincke spoke about the ability to observe weather patterns and provide natural disaster warnings. Dr. Whitson also mentioned the possibility of commercial companies conducting pharmaceutical and materials research in the future.

4.5(d)—Financial Management at NASA: Challenges and Next Steps

October 27, 2005

Hearing Volume No. 109–29

Background

On October 27, 2005, the Committee on Science, Subcommittee on Space and Aeronautics and the Committee on Government Reform, Subcommittee on Government Management, Finance and Accountability, held a joint hearing to examine the difficulties that the National Aeronautics and Space Administration (NASA) faces in managing and reporting its finances, the effects these difficulties have on NASA's ability to manage its programs, and the Agency's current and planned efforts to address these challenges.

Witnesses included Mr. Robert Cobb, Inspector General, NASA; Ms. Gwendolyn Sykes, Chief Financial Officer, NASA; Mr. Patrick Ciganer, Executive Officer, Integrated Financial Management Program, NASA; and Mr. Gregory Kutz, Managing Director, Forensic

Audits and Special Investigations, Government Accountability Office, (GAO).

Summary of Hearing

During the hearing, Members were informed by NASA's Inspector General (IG), and the Government Accountability Office (GAO), that NASA has made very little progress in reforming its troubled financial management system.

In a telling response, NASA's Chief Financial Officer, Gwendolyn Sykes, told the Committee that she would not certify the Agency's financial statements if she were bound by Sarbanes-Oxley, the federal law that provides severe penalties to private sector officials for financial misstatements.

At the hearing, the GAO released a report, requested by the Science Committee, examining NASA's implementation of 45 recommendations GAO issued to the Agency in four reports in 2003. GAO found that of the 45 recommendations, only three had been closed out by NASA; 13 were found to be partially implemented.

Space and Aeronautics Subcommittee Chairman Ken Calvert said, "I want NASA to be successful. However, as a businessman, I also know that without sound financial management, NASA will not be able to achieve the goals set for its programs."

Chairman Calvert continued, "I am concerned that in three of the past four years, independent auditors have been unable to give NASA's financial records a passing grade. Administrator Griffin, when he testified before the Science Committee in June, characterized the status of NASA's financial management as 'deplorable.' Not only is financial management critical to successful operation of the Agency, but we in the Congress also need reliable financial information in order to carry out effective oversight. We don't want to risk the future of NASA's new programs and ventures, by having them built on a shaky financial infrastructure. I want to see this great nation lead in the areas of exploration, aeronautics and the sciences, and don't want us to risk this leadership with unstable underpinnings in the Agency's financial system."

Gregory Kutz, GAO's Managing Director of Forensic Audits and Special Investigations, testified that, "Our report today shows some progress, however overall progress to date has been slow."

"In summary, NASA currently lacks the systems, processes, and human capital needed to produce credible cost estimates, oversee its contractors and their financial and program performance, control program costs, and produce timely, reliable financial information and auditable annual financial statements," Kutz explained, adding, "NASA has fundamental problems with its financial management operations that not only affect its ability to externally report reliable information, but more importantly, hamper its ability to effectively manage and oversee its major programs, such as the Space Station and Shuttle program."

In the report it released, the GAO found that NASA's new core financial management system has not resolved the Agency's most serious management challenges. "Because NASA did not use disciplined acquisition and implementation practices, the new system lacks basic functionality—such as the ability to (1) produce transaction-level support for key account balances, (2) properly identify

adjustments or correcting entries, and (3) correctly and consistently post transactions to the right accounts. In addition, NASA did not use the implementation of its new system as an opportunity to transform its operations and instead, automated many of its existing, ineffective processes. Compounding its problems, NASA also failed to recognize the importance and need for highly skilled, well-trained financial personnel."

GAO added that while most federal agencies have obtained unqualified (passing) audits, "NASA's financial statements remain unauditable."

Robert Cobb, NASA's IG, said, "NASA does not currently have a financial system that can properly account for the taxpayers' dollars, or support program managers with accurate financial information necessary to carry out their responsibilities. For fiscal years 2003 and 2004, the independent public accountant auditing NASA's financial statements was unable to render an opinion on those statements. The primary reason was that NASA could not provide sufficient evidence to support the statements throughout the year and at year end. My office, which hires and supervises the auditor, expects that the auditor will be unable to render an opinion on NASA's fiscal year 2005 statements for the same reasons. The auditor's report is due by November 15."

Cobb added, "Our continuing efforts to obtain comprehensive corrective action plans to address the internal control deficiencies identified during NASA's financial statement audits have largely been unsuccessful. NASA senior management continues to provide only high-level, broadly worded proposed initiatives that lack sufficient detail and strategies to address the outstanding deficiencies."

Also testifying at today's hearing were Patrick Ciganer, Executive Officer of NASA's Integrated Enterprise Management Program, and Allen Li, Director of Acquisition and Source Management at GAO.

4.5(e)—The Future of Air Traffic Control: The R&D Agenda

March 29, 2006

Hearing Volume No. 109–42

Background

On March 29, 2006, the Space and Aeronautics Subcommittee held a hearing on the ability of the Joint Planning and Development Office (JPDO) to establish and manage an R&D program to create a new air-traffic control system. In 2003, Congress created JPDO within the Federal Aviation Administration (FAA) to guide the activities of seven federal agencies, particularly the FAA and NASA, as they design and implement the Next Generation Air Transportation System (NGATS).

The witnesses were the Honorable Jeffrey N. Shane, the Under Secretary of the U.S. Department of Transportation (DOT); Dr. Lisa Porter, the Associate Administrator for Aeronautics Research Mission Directorate at the NASA; Mr. Bob Pearce, the Acting Director of JPDO; Mr. David Dobbs, the Assistant Inspector General for Aviation and Special Projects, U.S. Department of Transpor-

tation; Mr. Mike Hudson, Chair of the National Academy of Sciences' Committee on Technology Pathways: Assessing the Integrated Plan for a Next Generation Air Transportation System, which issued a report in 2005; and Dr. Gerald Dillingham, Director of Civil Aviation Issues at the General Accountability Office. At the request of the Science Committee and the Transportation and Infrastructure Committee, GAO is working on a study of JPDO's structure, challenges, and international collaboration.

Summary of Hearing

Subcommittee Chairman Ken Calvert could not be present at the hearing but his opening statement reflected his major concern that the United States would not be able to maintain its lead in the development of a new air traffic management system. He questioned whether JPDO was the right office to most effectively and efficiently develop the Next Generation Air Transportation System (NGATS).

Congressman Ralph Hall acted as Chairman at the hearing. He agreed with Chairman Calvert on the importance of the hearing and the development of the NGATS and explained that his goal was to determine if JPDO was as efficient an organization as it could be.

Ranking Subcommittee Member Mark Udall questioned the R&D challenges facing the development of the NGATS and how JPDO was prioritizing and working to overcome those challenges.

The Honorable Jeffrey Shane, the Under Secretary of the DOT, testified to the challenges facing the development of the NGATS. He explained that the program's goal was to create an entirely new system of air transportation, elements of which are still unknown. He outlined how JPDO was progressing in this task. "The Joint Planning and Development Office (JPDO) achieved important milestones in 2005 towards building the NGATS system. The JPDO completed its internal organization and created eight government/industry Integrated Product Teams (IPTs) to break this large and complex project into manageable strategies. These strategies focus on those aspects of aviation that hold the keys to capacity and efficiency improvements—airport infrastructure, security, a more agile air traffic system, shared situational awareness, safety, environmental concerns, weather and global harmonization of equipage and operations."

Dr. Lisa Porter, the Associate Administrator for Aeronautics Research Mission Directorate at the NASA, explained NASA's role in developing the NGATS and working with the JPDO. "We have four major programs—the Airspace Systems Program, the Aviation Safety Program, the Fundamental Aeronautics Program, and the Aeronautics Test Program—each of which contributes to the research needs of the future air transportation system." She also outlined a major R&D challenge that NASA faces in developing the NGATS: creating a new, more flexible Air Traffic Management system capable of supporting increased capacity.

Mr. Bob Pearce, the Acting Director of JPDO, outline five areas that JPDO would be focusing on in the coming year to work toward the NGATS. He saw 2006 as a breakthrough year for the Next Generation System initiative and the JPDO and testified that "All

of the initial hard work is starting to pay off and we must now sustain the momentum generated in 2005."

Mr. David Dobbs, the Assistant Inspector General for Aviation and Special Projects, U.S. Department of Transportation testified that, "Overall, we found that progress has been made with the JPDO since the office was established two years ago. . .however, the cost and schedule of the next system remains unknown, and considerable work remains to align Agency budgets and plans."

Mr. Mike Hudson, chair of the National Academy of Sciences' Committee on Technology Pathways: Assessing the Integrated Plan for a Next Generation Air Transportation System testified that, "The assessment committee considers the timely preparation of the first edition of the Integrated Plan to be a positive first step. Even so, substantial improvements in the Integrated Plan and the method by which it is being implemented are essential." Improvements included defining operational concepts, transforming the eight IPT's into three, and undertaking a more vigorous effort to collaborate with foreign governments and institutions.

Dr. Gerald Dillingham, Director of Civil Aviation Issues at the General Accountability Office stated that "ultimate responsibility for the success of JPDO and the broader NGATS is shared among JPDO and its partner agencies, nonfederal stakeholders, and the Congress. . .failure in any one of these areas will significantly affect JPDO's chances of achieving a three-fold increase in airspace capacity by 2025."

4.5(f)—The NASA Workforce: Does NASA Have the Right Strategy and Policies to Retain and Build the Workforce It Will Need?

June 13, 2006

Hearing Volume No. 109–54

Background

On June 13, 2006, the Space and Aeronautics Subcommittee held a hearing on the future of NASA's Workforce. The hearing focused on NASA's strategy to grow and maintain a workforce that has the skills to see the agency through the completion of the Shuttle program and implement the *Vision for Space Exploration.*

The witnesses were Ms. Toni Dawsey, NASA Assistant Administrator for Human Capital Management; Dr. Lee Stone, Legislative Representative, International Federation of Professional and Technical Engineers (IFPTE), and an employee at NASA Ames Research Center; Dr. David Black, Co-Chair, National Academy of Sciences Committee on Meeting the Workforce Needs for the National Vision for Space Exploration, and President and CEO, Universities Space Research Association; and Mr. John W. Douglass, President and CEO, Aerospace Industries Association.

Summary of Hearing

Subcommittee Chairman Ken Calvert opened the hearing by discussing the importance of solving NASA's workforce issues. "There are hard fiscal realities facing NASA, but just as important and disconcerting are the hard technical realities of which the agency

will be reliant on its workforce to manage." Ranking Member of the Subcommittee echoed the Chairman's concerns. "Ensuring that NASA has the right workforce for the future is going to be no small task and we owe it both to the highly talented NASA employees as well as to the broader aerospace community to make sure NASA and Congress 'get it right' in attempting to shape NASA's future workforce."

The issues facing NASA's workforce are varied and complex. One major challenge is preventing a workforce gap between the completion of the Shuttle and the start of the CEV program. Another challenge is the question of "uncovered capacity." Ms. Toni Dawsey testified as to how uncovered capacity across all centers has led to the equivalent of 800 full time employees not having sufficient work. Dr. Black, however, testified that these numbers are inexact, and urged NASA to stay away from reducing its force until it did more research into the skills it already possesses. In response, Dawsey assured, "As we have testified before, NASA will conduct a reduction in force of any of our civil servants only as an action of last resort consistent with our statutory constraints."

Another issue of debate in the hearing was how much work should NASA do in-house versus out of house. Dr. David Black, President and Chief Executive Officer of Universities Space Research Association, advocated further review of which space systems will be developed by NASA and which ones will be contracted out, in order to better realize workforce needs. "The extent to which NASA decides to develop and operate space systems in-house at its field centers or to contract such work out will have a substantial influence on the skills needed in-house," he said. "Moreover, such make/buy decisions also have a strong influence on recruitment of future NASA employees."

Mr. John Douglass, President and Chief Executive Officer of Aerospace Industries Association of America, also was critical of NASA's Strategy, saying that NASA should contract more of its work out to industry, while still preserving certain highly specialized labor skills.

4.5(g)—The National Academy of Sciences' Decadal Plan for Aeronautics: A Blueprint for NASA?

July 18, 2006

Hearing Volume No. 109–55

Background

On July 18, 2006, the Subcommittee on Space and Aeronautics held a hearing on the National Academy's Decadal Plan for Aeronautics. Witnesses from industry and academia discussed the report itself as well as ways in which NASA could implement its findings.

The witnesses were Dr. Paul Kaminski, Chairman of the National Research Council's Steering Committee that produced the *Decadal Survey of Civil Aeronautics* (released in June 2006); Dr. Steven Merrill, Executive Director of the National Research Council's Board on Science, Technology, and Economic Policy; Dr. Michael Romanowski, Vice President for Civil Aviation, Aerospace In-

dustries Association; and Dr. Parviz Moin, a Professor of Mechanical Engineering at Stanford University and Director of the Institute for Computational and Mathematical Engineering, the Center for Turbulence Research, and the ASCI Center for Integrated Turbulence Simulations.

Summary of Hearing

Subcommittee Chairman Ken Calvert opened the hearing. "We, in the United States, must focus on our economic strengths and invest in high technology sectors to maintain global leadership. It is important to realize that NASA-developed technology can be found in virtually every airplane flying today. The return on the original investment has been tremendous!"

The hearing focused on the National Research Council's *Decadal Survey of Civil Aeronautics.* The survey identifies 51 high priority research challenges, grouped into five broad categories where it recommends that NASA focus its energies: Aerodynamics and Aeroacoustics; Propulsion and Power; Materials and Structures; Dynamics, Navigation, Control and Avionics; and Intelligent and Autonomous Systems, Operations and Decision Making, Human Integrated Systems, and Networking and Communications. These areas are broadly in line with NASA's stated priorities.

Dr. Paul Kaminski told the Subcommittee that, "Advances in these areas would have a significant, long-term impact on civil aeronautics. Accordingly, federal funds, facilities and staff should be made available to advance the high-priority Research and Technology challenges in each area."

Dr. Michael Romanowski continued, "The Aerospace Industries Association agrees with the five common themes the study identified among the 51 high-priority research challenges. We also agree that NASA needs to create a more balanced split in the allocation of aeronautics R&D funding between in house research and external research."

Referring to the Decadal Survey, Dr. Parviz Moin said, "I do believe that it was an excellent study." He went on to stress the importance of hypersonics and role it could play in moving forward with manned missions to the Moon and Mars if provided sufficient resources. "I think the aeronautics directorate can play a significant role in this area but I don't think it has the means or budgetary resources to do so. Some of the funding for this research can come from the space exploration groups," Moin testified.

Dr. Stephen A. Merrill said "There is, in fact, a growing discrepancy between the needs said to be served by NASA's [aeronautics] program and the resources available to it. Yet there is no agreed upon articulation of what the program should be trying to accomplish in this budget environment. Lacking clear direction, ARMD [Aeronautics Research Mission Directorate] and its predecessors have been attempting to do as much or more with less, spreading resources too thinly to ensure their effectiveness and the applicability of the R&D results."

All the witnesses also concluded that NASA's Aeronautics budget was too slim to accomplish all the priorities. This led to controversy over whether transitional, cutting edge demonstrations, or basic research should be the focus of ARMD in the future.

Another hearing, featuring Dr. Lisa Porter, Associate Administrator for Aeronautics, will be held in the fall to get NASA's perspective on the survey.

4.5(h)—The National Academy of Sciences' Decadal Plan for Aeronautics: NASA's Response

September 26, 2006

Hearing Volume No. 109–64

Background

On Tuesday, September 26, 2006, the Space and Aeronautics Subcommittee held a hearing to discuss NASA's reaction to the National Academy of Sciences (NAS) recommendations on how NASA should run its civil aeronautics research and development (R&D) program. The hearing is a follow-up to a Subcommittee hearing on July 18, 2006, which took testimony from four witnesses representing industry, academia, and the National Academy of Sciences on two reports recently published by the Academy—*Aeronautics Innovation: NASA's Challenges and Opportunities,* published in early May; and the first ever *Decadal Survey of Civil Aeronautics: Foundation for the Future,* published in early June.

The hearing sought to address The witnesses were: (1) Dr. Lisa Porter, NASA Associate Administrator for the Aeronautics Research Mission Director; and (2) Gen. William Hoover, Co-Chair of the National Academy of Sciences' Steering Committee that produced the report: *Decadal Survey of Civil Aeronautics: Foundation for the Future.*

Summary of Hearing

General Hoover began his testimony by summarizing the Decadal Survey discussed during July's hearing. The Decadal Survey recommended NASA increase its aeronautics budget in order to mature developing technologies and work with industry to increase funding for external research. identified challenges for transitioning NASA's technology to the public and highlighted the need for sufficient research and technology funding. Hoover explained NASA needs to develop some research to higher levels of maturity depending on which organization or industry will be using their information. Aeronautics research also needs "a more homogeneous organizational approach." In terms of funding, Hoover recommended that the budget for in-house and external organizations is "skewed too far" towards in-house operations. Finally, he urged the government to conduct a review of organizational options to ensure U.S. leadership in civil aeronautics. Along these lines, Hoover acknowledged the need to improve the transition of technology and fundamental research, but thought the solution lay in organizational changes or a national aeronautics policy.

NASA has responded to the report by citing several changes already made within the organization. Dr. Porter explained the NAS recommendations are in line with the newly restructured Aeronautics Research Mission Directorate (ARMD). Porter maintains aeronautics research is adequately funded and that the fiscal year decline does not apply to research content. The $200 million decline

will occur because ARMD will no longer have to pay a large portion of the research Center's overhead costs. All ARMD programs will also emphasize improving knowledge rather than focusing solely on technology with high maturity or Technology Readiness Levels (TRL). Changes have also been made beyond the study's recommendations. Porter explained ARMD is reaching out to industry, academia, expanded partnerships with the Department of Defense (DOD) and the Joint Planning and Development Office (JPDO).

Members began questioning by asking NASA to clarify their budget rationale, specifically in regard to the large amount of funding allocated to hypersonics. Porter explained that hypersonics is a high priority because much remains to be researched. When it was suggested that hypersonics should seek funding from outside organizations, Dr. Porter said NASA had secured that very funding from DOD and DARPA. Chairman Calvert also asked why industry is not included from the onset of research. Dr. Porter explained ARMD requests information from many different companies and continuously meets with industry.

Members also asked how budget cuts would affect the Next Generation Air Transportation System (NGATS). Dr. Porter pointed out that the Aerospace Systems Program is only handling the air traffic management part of NGATS. Mr. Udall also wanted to know what role the JPDO played in guiding the budget cuts. According to Dr. Porter, the JPDO, as well as the FAA, and NOAA, reviewed and commented on the proposals.

Discussion turned to the labor force and Members asked if there were cuts in human expertise at NASA and how the cuts could affect airline safety. Dr. Porter explained the previous program, Human Measures and Performance, was restructured. Instead of establishing a separate unit researching the human factors, human factors are now integrated into general research. General Hoover mentioned Ames Research Center as an area involved in human factors. Members then asked with losses at Ames and other contractors, is there a concern experts will not be available? Dr. Porter answered that human factors is still a strong component, but was unable to comment on how many human factors experts have been lost.

Members asked NASA to clarify the distinction between demonstrations and experiments. Dr. Porter explained that demonstrations are conducted to expand on prior work, while experiments are conducted to "pursue the unknown." According to Dr. Porter, "You are not trying to prove you are right, you are trying to find out where truth lies, and how to use that to get much better." As the government tries to develop cutting edge technologies, experimentation, rather than demonstration, is a more appropriate method. As such, ARMD is conducting more experimentation than demonstration.

Finally Members asked for the witnesses if they had any recommendations to Congress, and specifically if ARMD had any unfunded priorities. Dr. Porter said they did not and that all priorities are included on the current budget. Gen. Hoover suggested that the Decadal Survey could provide a basis for determining future priorities.

Appendix

U.S. HOUSE OF REPRESENTATIVES
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March 3, 2005

The Honorable Jim Nussle
Chairman
Committee on the Budget
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Pursuant to the provisions of clause 4(f) of House Rule X of the Rules of the House of Representatives for the 108th Congress and Section 301(d) of the Congressional Budget Act of 1974, as amended, I am transmitting the Views and Estimates of the Committee on Science for Fiscal Year 2006.

Sincerely,

SHERWOOD BOEHLERT
Chairman

SB/dm
Enclosure

Cc: The Honorable Bart Gordon
The Honorable John M. Spratt, Jr.

VIEWS AND ESTIMATES
COMMITTEE ON SCIENCE
FISCAL YEAR 2006

BACKGROUND

As the House and Senate begin consideration of the President's Fiscal Year 2006 (FY06) budget request, there is no question that a great deal of debate will revolve around the budget deficit and its impact on the long-term economic health of the Nation. As these discussions move forward, the Science Committee urges Congress to recognize the importance and contributions of science and technology to productivity and economic growth—and consequently—fiscal security.

Indeed, nothing benefits federal revenues over the long-term as much as accelerated economic growth, and nothing fuels long-term growth more than science and technology. Further, the strength of the U.S. scientific enterprise has long been a crucial component of America's national security. Advancements in science and technology were critical to the Nation's ability to triumph in the Cold War. (Indeed, Cold War-era investments in science and technology, especially those made in the wake of the Soviet launch of Sputnik, laid much of the foundation for the broad, successful scientific and engineering enterprise the U.S. boasts today.) New ideas, understandings and technologies spawned by research and development are just as essential to winning the war against terrorism.

As the President's Science Advisor Dr. John Marburger noted in testimony before the Science Committee, "This Administration understands that science and technology are major drivers of economic growth and important for securing the homeland and winning the war on terrorism." Department of Homeland Security (DHS) Under Secretary Charles McQueary echoed this sentiment at the same hearing, stating that "the Nation's advantage in science and technology is key to securing the homeland."

SCIENCE COMMITTEE AGENDA

In the first session of the 109th Congress, the Science Committee's top objective will be to pass authorization legislation for the National Aeronautics and Space Administration (NASA). This legislation is needed to provide Congressional direction in the wake of the President's Space Exploration Vision. The Committee also intends to pass an Organic Act for the National Oceanic and Atmospheric Administration (NOAA), as well as other bills related to NOAA's operations, including one authorizing tsunami detection, warning, education and research programs. The Committee has already passed its portions of the comprehensive Energy Bill.

The Committee also will work to strengthen funding and activities at the National Science Foundation (NSF), the Department of Energy (DOE) Office of Science, and the National Institute of Standards and Technology (NIST). With respect to NSF, the Committee places particular priority on preserving the agency's critical role in supporting math and science education, especially at the K–12 level.

The Committee also will conduct ongoing oversight of some of the key programs it has helped put into place, including the work of the DHS Science and Technology (S&T) Directorate, and important interagency research and development (R&D) activities such as nanotechnology, climate change research, networking and information technology, and cyber security.

OVERALL R&D FUNDING

The President proposes to spend $132.3 billion on R&D in FY06, about a one percent increase over FY05. The proposed R&D budget increases are heavily weighted toward development (a two percent increase), while applied research would remain flat, and basic research would decline by 1.2 percent.

The Committee believes the proposed funding for basic research is insufficient. Funding short-term development at the expense of longer-term basic and applied research is not advisable, and neglects those portions of R&D where government support is most crucial. The Committee also believes that the budget must fully consider appropriate balances between defense and non-defense R&D spending and between biomedical and non-biomedical spending. At $71 and $29 billion, respectively, the R&D budgets of DOD and the National Institutes of Health (NIH) account for more than 75 percent of the total R&D budget. Further, the increase for defense development ($1.4 billion) amounts to almost twice the overall increase in R&D ($733 million). While fully acknowledging the important contributions of defense and biomedical R&D, the Committee urges that similar attention be given to other important R&D agencies, such as NSF, DOE, and NIST.

The Committee notes R&D rated higher than all other investment categories in the Office of Management and Budget's (OMB) Program Assessment Rating Tool

(PART) analysis. Further, the Committee notes that the agencies under its jurisdiction scored very well on the President's Executive Branch Management Scorecard, with DOE, NASA, and NSF among seven of the 26 federal agencies evaluated to receive three or more "green lights."

INTERAGENCY ACTIVITIES

Presidential Initiatives

The Administration's budget highlights five "multi-agency R&D priorities" and provides a precise budget breakdown for three of them—nanotechnology, climate change, and networking and information technology. The Committee strongly endorses these initiatives, and agrees that they deserve priority in funding, but is concerned that all three receive cuts in the budget request.

The Administration proposes a 2.5 percent decrease from the FY05 estimated level for the interagency program on nanotechnology. This decrease includes a drop of seven percent at the five agencies under the Science Committee's jurisdiction that participate in the program (NSF, DOE, NIST, NASA, and the Environmental Protection Agency (EPA)). The Committee believes that Congress should fund these activities, to the extent possible, at the levels called for by the *21st Century Nanotechnology Research and Development Act* (P.L. 108–153). The Committee endorses the new nanomanufacturing and nanometrology initiatives at NIST, but is concerned that the request may not support all the equipment needs of its nanoscience facility.

The Administration proposes spending $1.9 billion for the interagency Climate Change Science Program, approximately the same level as in FY05. As part of that Program, the Committee continues to support the interagency Climate Change Research Initiative (CCRI), which focuses on shorter-term research to support improved public debate and decision-making. The Committee is concerned that the FY06 request cuts the CCRI by $38 million, or 17 percent below the FY05 level. It is unclear why the CCRI activities were reduced when they are designed to provide information on the most pressing questions and uncertainties in climate research.

The Administration proposes a 4.5 percent decrease from the FY05 estimated level for the interagency program on Networking and Information Technology Research and Development (NITRD). This program includes important work on high-end computing and high-confidence software and systems, and the Committee believes that funding for work in this area should be raised, not lowered.

While cyber security R&D is not a formal Presidential initiative, significant effort is being put into programs in this area at a number of agencies. The budget request for cyber security is basically flat at NSF, NIST, and DHS, and well below the levels authorized in the *Cyber Security Research and Development Act* (P.L. 107–305). The Committee believes that increased funding for, and increased coordination of, cyber security R&D programs are needed.

The Committee also endorses the two other multi-agency R&D initiatives, which relate to combating terrorism (discussed in the next section) and to hydrogen (discussed in the section on the Department of Energy).

RECOMMENDATIONS FOR AGENCIES

FULL COMMITTEE

Department of Homeland Security (DHS)

The Committee wrote the portion of the Homeland Security Act that created the DHS S&T Directorate, and has exercised close oversight of DHS R&D programs since the Department's inception. The Committee is pleased that the Administration has requested a 23 percent increase in funding for this directorate.

A significant part of the increase ($127 million) reflects the transfer of R&D programs currently located elsewhere in DHS (primarily at the Transportation Security Administration) into the S&T Directorate. The Committee is supportive of this consolidation, and looks forwarded to the increased coordination of R&D that it expects to result from it.

The remainder of the increase is spread among several new initiatives, the largest of which is the formation of a $227 million Domestic Nuclear Detection Office (DNDO).

The Committee remains concerned about the balance between short- and long-term research programs at DHS. The requested funding for university programs and for research on emerging threats is flat. The Committee is concerned that if DHS does not make and maintain investments in longer-term basic research, including

research at universities, the next generation of homeland security technologies will not be available to counter the next generation of threats.

SUBCOMMITTEE ON ENERGY

Department of Energy (DOE)

The Committee has jurisdiction over DOE's non-military national laboratories, civilian energy research, development, and demonstration programs, and commercial application of energy technology activities.

Office of Science

The Committee believes that the Administration's FY06 request for DOE's Office of Science, which funds 40 percent of the Nation's physical science research, is inadequate. The budget proposes funding the Office at $3.46 billion, a reduction of 3.8 percent. This is significantly less (25 percent) than the $4.6 billion included in all three versions of the House-passed H.R. 6, the *Energy Policy Act of 2003.* It also is well below (nine percent) the $3.8 billion authorized in H.R. 610, the *Energy Research, Development, Demonstration, and Commercial Application Act of 2005,* which was passed by the Science Committee on February 10, 2005.

The proposal also does little to advance the goal of the President's Council of Advisors on Science and Technology (P–CAST), which recommended in a 2002 report that future Administration budget requests bring funding for the physical sciences into parity with that of the life sciences. DOE's Office of Science is the largest federal supporter of the civilian physical sciences, a critical component of the federal research portfolio that has been dwarfed by support for biomedical research in recent years.

The Committee is particularly concerned about relative balance between funding for user facilities and for academic research by the Office of Science. The Committee supports the proposed funding of operations for the newest user facilities such as the Spallation Neutron Source (+$74 million) and the four new Nanoscale Science Research Centers (+$43 million) at Oak Ridge, Sandia, Argonne, and Brookhaven National Laboratories.

The Committee is concerned, however, that such support could come at the expense of research grant funding, which is down by about 10 percent in this request.

But funding for the user facilities themselves is inadequate. Under the budget proposal, existing user facilities would be shut down for more weeks of the year because of lack of funds. These facilities are used by industrial and academic researchers as well as by researchers at the National Laboratories themselves. Taxpayers have already invested heavily in these facilities, and it is wasteful to allow them to sit idle for much of the year.

Budgetary constraints are also leading DOE to cut back on its plans to open future facilities. In November 2003, the Office of Science released a Facilities Plan, a prioritized list of 20 new facilities it hoped to open over the next 20 years. The Plan was well thought out and required difficult decisions, but its implementation is already being adversely affected by the budget. The FY06 budget proposal would cancel one project included in the Plan (at Fermilab) and would defer another (the Rare Isotope Accelerator). However, the Committee understands that an ambitious construction program in the face of a constrained budgetary environment may cause either the construction of the facilities to be prolonged—increasing their costs—or core research and existing user facilities' programs to be cut.

Finally, the ten-fold increase (from $4.9 million to $52 million) in funding proposed for the preliminary design and long-lead acquisition for ITER, the international fusion research project, seems premature for a project for which the site has not yet been chosen.

Energy Supply R&D

The Committee is concerned that R&D related to energy efficiency and alternative sources of energy is inadequate, especially during a time of high energy prices. Energy efficiency and renewable energy research would be reduced by 5.3 percent under the FY06 proposal.

The Committee continues to support the President's initiative calling for America to lead the world in the development of hydrogen-powered automobiles and the necessary fueling infrastructure to support them. The Committee remains concerned, however, that the proposed increases in hydrogen programs would come at the expense of much of the rest of the R&D funded by DOE's Energy Efficiency and Renewable Energy account, which includes programs for hybrid vehicles and advanced diesels that can lead to significant near-term reductions in oil consumption.

The Committee applauds the Administration's additional funding for nuclear energy research, but is concerned with the proposal to merge the Nuclear Energy Research Initiative (NERI) with the remaining programs of nuclear R&D. NERI, which funds innovative, peer-reviewed nuclear research at universities, has been the source of new ideas for improving the safety and performance of nuclear energy. These technologies may also enhance national security by reducing the danger of proliferation of nuclear materials.

The Committee continues to support the Clean Coal program with the requirements that are included in H.R. 610, but has concerns about the FutureGen project, which is to be funded with rescinded Clean Coal funds. While the Committee supports the goals of FutureGen and believes DOE should be investing more in studying carbon sequestration, the Administration's request for $237 million for the transfer of funds to the FutureGen project may be premature, given that design and scope of the project have not been completed.

Also, the Committee is troubled by the cut of nearly 20 percent proposed for electricity transmission and distribution research, given that power disturbances are an important national security matter and are estimated to cost the U.S. up to $80 billion a year.

SUBCOMMITTEE ON ENVIRONMENT, TECHNOLOGY, AND STANDARDS

Environmental Protection Agency (EPA)

EPA's Office of Research and Development (ORD) is responsible for 80 percent of EPA's R&D activities, and it receives the majority of funds available in the agency's Science and Technology (S&T) account. ORD serves a unique role in environmental R&D: it conducts the basic and applied research that supports EPA's regulatory programs and investigates the next generation of environmental challenges. To meet these needs, ORD conducts intramural research at EPA's many laboratories, and it supports extramural research at colleges and universities through the Science to Achieve Results (STAR) grant program.

For FY06, the budget request includes $761 million for S&T at EPA, a two percent increase from FY05. Funding for the Office of Research and Development (ORD), the primary recipient of S&T funds, would decrease by one percent to $569 million. The Committee is pleased with the overall requested funding levels and applauds the Administration for recognizing the importance of science at the Environmental Protection Agency.

The Committee supports the proposed continuation of the agency's building decontamination research (with $19 million FY06) and the proposed continuation of the National Homeland Security Research Center. The budget request recognizes EPA's important homeland security contributions in buildings, water and food security.

But while the Committee strongly supports EPA's role in homeland security, it is concerned that security research could be funded at the expense of other areas of environmental research.

The FY06 proposal includes a 168 percent increase in S&T funding going to homeland security activities. The largest share of the increase ($44 million) is proposed for a five-city pilot program called the Water Sentinel to develop a drinking water monitoring and surveillance system. Given the relatively flat S&T budget, the Committee is concerned that core environmental research activities will be reduced to fund such initiatives. The $44 million for a five-city pilot appears to be a very expensive undertaking. The Committee plans to look more closely at this and other homeland security proposals and their effect on ORD's core research.

The Committee also remains concerned with proposed cuts in the ecological research program and the pollution prevention research program (now called Sustainability Research), which are based on the FY05 PART reviews. At a hearing on the ecological research program last year, Administration officials did not provide a clear rationale for the cut. In FY06, ecological research would receive $84 million, which is $10 million (or 11 percent) less than FY05. This would be especially harmful because the program has already been reduced by $32 million or 38 percent since FY04.

The Committee is pleased that the budget includes funding for the Science to Achieve Results (STAR) Fellowship program, which supports graduate student fellowships in environmental science. However, the Committee believes the program should be funded at $10 million, the level restored by Congress in FY03, FY04, and FY05. It appears that EPA's budget proposal would fund STAR fellowships, along with three other fellowship programs, at $8.3 million, with the result once again of cutting STAR fellowship funding.

The Committee also plans to examine the following proposed reductions: (1) an 80 percent reduction in the Superfund Innovative Technology Evaluation (SITE) program, which demonstrates innovative clean up technologies; (2) elimination of $5 million for the Exploratory STAR Research Grants, which the Agency's Science Advisory Board has repeatedly recommended that EPA expand; and (3) a $2.4 million reduction in mercury research that will eliminate EPA's investment in tracking how mercury moves through the environment.

The budget proposes a new funding approach between ORD and the other program offices, such as the air, water and waste offices. Approximately, $20 million of ORD's funds are being transferred to the control of the other program offices, which will then contract with ORD on a fee-for-service basis for research. Although the Committee is not averse to the concept of fee-for-service research, it is not clear what problem this new approach is designed to fix. The Committee plans to look closely at this new approach.

Department of Commerce—Technology Administration

The bulk of the Technology Administration's funding goes to the National Institute of Standards and Technology (NIST), the Nation's oldest federal laboratory, which has consistently provided high-quality research in a wide variety of fields, including industrial sciences, homeland security, nanotechnology, health care, building science, and computer security. The budget request includes $426 million for the core NIST laboratory programs and facilities in FY06, an increase of about $47 million or 12 percent. The Committee strongly supports this request, as it represents the necessary level of funding for NIST to fulfill all its mandates and missions.

The Committee supports the budget request of $59 million for NIST's construction account, which includes funding to complete the upgrades at the Central Utility Plant at NIST's laboratory in Boulder, Colorado, continue building improvements in Boulder and Gaithersburg, Maryland, and establish a funding mechanism for regular maintenance at the Advanced Measurement Laboratory (AML) in Gaithersburg. The Committee is pleased that the construction of the AML in Gaithersburg is completed and the President's request includes funds to make this facility available to outside researchers. The Committee nevertheless remains concerned because the FY05 request for $25 million in specialized equipment was not funded in the FY05 appropriation and must be provided in FY06 or the massive investment for the AML will not be fully utilized.

The Committee continues to support the Advanced Technology Program (ATP) and is disappointed that the Administration has again included no funds for the program in the budget request. In addition, the Committee is concerned that the proposed budget does not even fund the costs associated with closing the program. The closing of the program would require funds from the NIST laboratory budget because ATP currently spends about $13 million at NIST's own labs. Funding would also be required to cover the cost of laying off the more than 200 ATP employees, about $20 million. These costs would have to be absorbed by the NIST labs, eating into the proposed increases for the laboratory programs.

The Committee is disappointed that the Administration has requested only $47 million for the Manufacturing Extension Partnership (MEP). This would cut the program by 56 percent from the $107 million appropriated in FY05, leaving the national network of Centers with insufficient funding. MEP has demonstrated its effectiveness as the only program that offers direct technical assistance to small and medium-sized manufacturers to help them thrive in a globalized economy. The House has spoken overwhelmingly in favor of MEP, both through the FY05 appropriation and in the passage last year of H.R. 3598, the *Manufacturing Technology Competitiveness Act of 2004.*

Department of Commerce—National Technical Information Service (NTIS)

The Committee looks forward to working with the Administration to keep NTIS functioning as a self-sustaining entity.

Department of Commerce—National Oceanic and Atmospheric Administration (NOAA)

NOAA's activities include providing weather forecasts and warnings, charting the seas for navigation, developing guidelines for the use and protection of ocean and coastal resources, and performing research to improve understanding of marine, coastal and atmospheric environments. The Committee has jurisdiction over four of NOAA's five line offices—the National Ocean Service, the Office of Atmospheric and Oceanic Research, the National Environmental Satellite Data and Information Service, and the National Weather Service.

The FY06 budget request for NOAA is $3.6 billion, a decrease of $300 million (eight percent) compared to the FY05 enacted level of $3.9 billion. Most of the reduc-

tion is due to the elimination of earmarks, and the Committee supports the proposed overall level of funding for NOAA.

The Committee supports the request of $964 million for satellite programs at NOAA. This request is a $57 million (six percent) increase over the FY05 enacted level of $907 million. The increase is for the procurement, acquisition, and construction of the next generation of weather satellites, and it is in line with the long-term budget plans for these satellite systems. The Committee remains concerned about cost overruns and technical challenges that have delayed the launch date for the new polar satellite system. Last year, the Government Accountability Office (GAO) completed a report for the Committee on the costs and risks associated with NOAA's next-generation polar satellite program. The current projection for the cost of the next generation polar satellite system has risen from $6.5 billion to $8.1 billion, and GAO estimates it is likely to rise by another $500 million before the system is complete. Additionally, the Committee recently learned that availability of one of the key sensors on the new polar satellite will be delayed by 16 months due to technical difficulties in developing the sensor.

The Committee strongly supports NOAA's request for $28 million for satellite data product processing and distribution, and $26 million for satellite product development, readiness and application. The Committee is concerned about NOAA's current and future capability to utilize, manage, and store satellite and weather data critical for forecasting and research. These funding levels will ensure that the Nation can take full advantage of the large investment in satellites through timely and useful satellite data products.

The Committee supports NOAA's request for $9.5 million to expand the U.S. Tsunami Warning Network. The Committee held a hearing about the proposed expansion of the U.S. Tsunami Warning Network on January 26, 2005. This request, combined with $14.5 million in supplemental funds in FY05, will allow NOAA to procure and deploy tsunami detection buoys in a system designed to provide continuous tsunami warning capability for both the Pacific and Atlantic coasts of the United States. However, the Committee is particularly concerned that the Administration has cut nearly in half from $4.3 million to $2.3 million the funding that goes to help educate communities about, and prepare them for tsunamis. Experts testified at the Committee's January hearing that while detection is important, it is unlikely to save lives unless local communities have plans in place, and the public is educated about how to react in the event of a tsunami.

SUBCOMMITTEE ON RESEARCH

National Science Foundation (NSF)

The National Science Foundation (NSF) is the primary source of federal funding for non-medical basic research conducted at colleges and universities. NSF funds basic research across nearly all disciplines of science and engineering, making NSF-supported research integral to progress in national priority areas such as health care and national security, among others. In addition, NSF sponsors programs to improve K–12 and undergraduate education, and its fellowships and research assistantship programs support many graduate and post-doctoral students.

NSF continues to receive high marks from the Office of Management and Budget for the quality of its management and the excellence of its programs. Building on its performance in the FY05 budget, NSF was one of only seven agencies awarded three green lights on the Executive Branch Management Scorecard. In addition, eight NSF programs were examined using PART. All eight programs received ratings of "Effective" (the highest rating). NSF was the only agency in the Federal Government to receive the highest rating on every program that underwent a PART evaluation.

The FY06 budget request for NSF is $5.61 billion, an increase of 2.4 percent, or $132 million over the FY05 level. However, because NSF received a 3.1 percent ($180 million) cut in FY05, the overall request level for FY06 is approximately one percent below the FY04 level. In addition, the proposed increase includes money provided to foot the bill for ice-breaking expenses currently paid by the U.S. Coast Guard, so the increase for NSF in reality comes to about 1.5 percent. Meanwhile, NSF has faced increasing proposal pressure in virtually every scientific field. The Foundation now funds only about 20 percent of the proposals it receives, down from the 33 percent level that had held for many years.

While recognizing that budget realities may not allow Congress to fund NSF at the level provided in the current authorization (the *National Science Foundation Authorization Act of 2002,* P.L. 107–368), the Committee believes that the proposed FY06 request is inadequate. Congress should provide as much funding as possible

to strengthen support for core science and education programs, and priority areas such as information technology and nanoscale science and engineering research.

The Committee is especially disturbed by the proposed cuts in NSF's Education and Human Resources (EHR) Directorate. Since 1950, NSF has been tasked with strengthening math and science education programs at all levels. Yet under the budget proposal, the overall investment in education at NSF would drop from $841.4 million in FY05 to $737 million in FY06 (down 12 percent). Much of the decrease would occur in the Elementary, Secondary, and Informal Education (ESIE) and Undergraduate Education accounts, which would drop from $182 million to $141 million, and from $154 million to $135 million, respectively.

NSF's education programs are unique in their capacity to develop new and improved materials and assessments, create better teacher training techniques and move promising ideas from research to practice. The Committee fears that disinvestments in this area will deprive states, school districts and schools of the tools and ideas they need to achieve the goals of the *No Child Left Behind Act.* NSF's EHR programs should receive at least level funding in FY06.

United States Fire Administration (USFA)

The U.S. Fire Administration (USFA), which is now part of DHS, was created in 1974 to aid localities in reducing the loss of life and property from fires and related emergencies. The budget request for USFA is $52.6 million, well below its authorized level of $64.8 million. The Committee also notes its support for USFA's National Fire Academy training center and its budget request of $10 million.

From FY01 through FY03, USFA administered the (separately authorized) Assistance to Firefighters Grant Program, which is authorized by the Science Committee. This program provides direct assistance to local fire departments for training, purchase of equipment, and other purposes. The program is now run by the Office of Domestic Preparedness (ODP). The FY06 budget request includes $500 million for the fire grant program at ODP. This is a $150 million cut from FY05, and $450 million less than authorized under legislation signed into law last November (P.L. 108–375). In addition, the Administration has requested no funds for the SAFER Program, which awards grants to fire departments for the purpose of hiring new firefighters. SAFER is authorized at $1.061 billion in FY06 and received an appropriation of $65 million in FY05. The Committee feels that both of these important programs should receive higher funding.

National Earthquake Hazards Reduction Program (NEHRP)

NEHRP is an interagency program that Congress created in 1977 and reauthorized last November (P.L. 108–360). It includes NSF, NIST, the Federal Emergency Management Agency (FEMA), and the U.S. Geological Survey (USGS), and aims to reduce the loss of life and property from earthquakes by improving emergency response, increasing understanding of earthquake risks, and improving earthquake engineering.

The President's overall FY05 request for NEHRP is about $127 million, including $54.0, $51.3, $20.6 and $1.0 million, for NSF, USGS, FEMA, and NIST, respectively. The Committee believes that NEHRP should be funded at the levels in the *National Earthquake Hazards Reduction Program Reauthorization Act of 2004* (P.L. 108–360). The Committee is most concerned that the NEHRP budget request for NIST of only $1 million will not be enough to enable NIST to carry out its new responsibilities as the lead agency for the program, a role previously performed by FEMA. The Committee believes that a minimum of $3.5 million is needed for NIST's lead agency tasks. The Committee is pleased that the Advanced National Seismic System (ANSS)—a critical seismic monitoring program administered by USGS—would receive a significant increase to $8.1 million, and urges funding for ANSS at or above this level.

SUBCOMMITTEE ON SPACE AND AERONAUTICS

National Aeronautics and Space Administration (NASA)

The budget request provides $16.456 billion for NASA in FY06, an increase of 2.4 percent (excluding from the base the $126 million in emergency supplemental funding provided to fix NASA facilities damaged from last year's hurricanes). While this year's 2.4 percent increase for NASA is larger than for most other science agencies, the Administration did not seek the 4.7 percent increase it had previously projected for FY06 in last year's budget request.

The Space Shuttle and International Space Station programs remain the centerpieces of NASA's human space flight program for the near-term. About 40 percent of NASA's FY06 budget request is dedicated to these two programs.

The Committee is divided over the NASA budget request as of now even though there is broad support for the basic thrust of the Space Exploration Vision outlined by the President on January 14, 2004. Key questions include the relative priority of NASA funding as compared to that of other science agencies; the adequacy of funding for science and aeronautics within NASA; and the future of the NASA workforce.

NASA is still in the process of making fundamental implementation decisions related to carrying out the President's vision, and as a result numerous figures in the proposed FY06 budget are described by NASA as "placeholders." For example, NASA is still determining what research it will conduct on the Space Station; what the final configuration of the Space Station will look like; how many more Space Shuttle flights will be required to complete construction of the Space Station; what many of the specifications for the new Crew Exploration Vehicle (CEV) will be (including how many people it will carry, whether it will be reusable, and whether it will go to the Space Station); what launch vehicle to use for the CEV; what activities will take place when Americans return to the Moon; and what project will be used to test the nuclear propulsion technologies being developed under Project Prometheus.

Many questions also remain about the Space Shuttle, which has been grounded since the February 1, 2003 loss of the *Columbia.* The program's future and spending needs will be unclear at least until the Shuttle returns to flight, now scheduled for this May. The President's Vision is predicated on the Shuttle returning to flight and on Space Station construction being completed by 2010, enabling the Shuttle to be retired to free up funds for other activities.

The Administration also has not presented any plan for dealing with the Iran Nonproliferation Act (INA), which could bring the Space Station program to a virtual halt during FY06. Under U.S. rules, astronauts are not allowed to remain aboard the Space Station unless a crew rescue vehicle is available. The Russian Soyuz spacecraft is used for that purpose. But in April 2006, the agreement under which the Russians have provided the Soyuz vehicles will, in effect, expire. The INA prevents the U.S. from making payments to the Russians for any further space services, including Soyuz vehicles, unless the President can certify that the Russians are not helping proliferate nuclear weapons to Iran. The Administration has indicated it is reviewing proposals to amend the INA to allow a new agreement with the Russians, but no such language has been forthcoming thus far, and it is unclear how Congress would react to such a proposal. Thus, the future use of the Space Station is in doubt.

NASA's proposed FY06 budget for its Science Directorate, which now includes both Space Science and Earth Science, is $5.5 billion, slightly down from FY05, but several hundred million dollars below the level NASA projected last year for FY06. A number of previously planned missions would be either delayed or eliminated.

The Committee is troubled by the limited funding the budget provides for NASA's Aeronautics program. The budget cuts the program by nearly six percent, down to $852 million for FY06. Aeronautics research has long been level funded, and it is especially disadvantaged as NASA's overhead costs of operating infrastructure fall disproportionately on this program.

Federal Aviation Administration (FAA)

The Committee continues to be disappointed with the tepid support for Federal Aviation Administration research and development activities. The budget request of $256.2 million represents a slight decrease from FY05 enacted levels, and is significantly less than the $352.2 million authorized by the *Vision 100—Century of Aviation Reauthorization Act* (P.L. 108–176).

The FAA, together with other federal departments and agencies, is embarking on an extensive, long-term project, the Joint Planning and Development Office, to develop a next generation air traffic management system. The Committee believes this activity, coupled with ongoing research, demands greater investment.

The FY06 request for the FAA's Office of the Associate Administrator for Commercial Space Transportation (AST) is $11.8 million, which is below the $12.3 million Congress authorized for FY06. The Committee, however, remains concerned that AST is continuing to develop burdensome and costly launch regulations that will undermine the competitiveness of the existing U.S. expendable launch industry. The Committee will also closely monitor AST's development of regulations for the space tourism industry that are consistent with legislation, the *Commercial Space Launch Amendments Act of 2004* (P.L. 108–492).

Department of Commerce—Office of Space Commercialization

The Committee urges continued support for this Office. The Office has played a useful role in promoting the commercial space industry and in removing unnecessary impediments to its development. The Office needs to take a stronger role in legal and policy discussions within the government and be more aggressive in assisting U.S. commercial space providers in their efforts to conduct business with the government.

Committee on Science – FY 2006 Views and Estimates

Member Signatures

The Honorable Sherwood L. Boehlert, *Chairman*

The Honorable Curt Weldon

The Honorable Roscoe G. Bartlett

The Honorable Gil Gutknecht

The Honorable Wayne T. Gilchrest

The Honorable Timothy V. Johnson

The Honorable Dave G. Reichert

The Honorable J. Randy Forbes

The Honorable Jo Bonner

The Honorable Bob Inglis

The Honorable John J.H. "Joe" Schwarz

The Honorable Judy Biggert

The Honorable Vernon J. Ehlers

Committee on Science – FY 2006 Views and Estimates

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The Honorable Eddie Bernice Johnson

The Honorable Michael M. Honda

The Honorable Lincoln Davis

The Honorable Daniel Lipinski

The Honorable Brian Baird

The Honorable Al Green

The Honorable Mark Udall

The Honorable Brad Miller

The Honorable Russ Carnahan

The Honorable Jim Matheson

The Honorable Jim Costa

The Honorable David Wu

The Honorable Charlie Melancon

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ENERGY AND COMMERCE
CHAIRMAN, ENERGY AND AIR QUALITY
HEALTH

SCIENCE
ENERGY
SPACE AND AERONAUTICS

Supplemental Views of
Congressman Ralph M. Hall
On the Need to Support the President's Vision for Space Exploration

I am concerned that the Committee's Views and Estimates are not more supportive of President Bush's Vision for Space Exploration. The Committee will attempt to write a NASA authorizing bill this year, and I am hopeful that we will embrace the goals of the President's Vision and help NASA in their efforts to restructure the agency toward those goals.

Some of the questions that the Committee raised in the Views and Estimates are good, and I expect that they will be answered in the course of normal Committee proceedings and dialog between Congress and the Executive branch. Indeed, I expect to raise some questions about the phase down of cellular science activities at the bioreactor lab. But, this concern does not color my overall view of the President's Vision to restructure NASA towards manned space flight to the Moon, Mars, and beyond. I am excited about NASA's future, and I don't share the Committee's pessimism over the space program as it is expressed in this document.

I look forward to working with Chairman Boehlert, Ranking Member Gordon and all of the Committee Members on the NASA authorization bill. I certainly support and admire Chairman Boehlert's leadership, and while we may not agree on all aspects of NASA's future, I am sure that we agree that space exploration is vital to our economy and national security.

Sincerely,

Ralph M. Hall

Ralph M. Hall
Member of Congress

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Supplemental Views of
Ralph M. Hall, Ken Calvert, Sheila Jackson Lee, Al Green, Charlie Melancon, Jim Matheson
On the Need for Continuation of
DOE Oil and Natural Gas Research and Development Programs

We are concerned that the Committee's Views and Estimates do not properly address provisions in the Administration's budget request to terminate the oil and natural gas research and development programs at the Department of Energy. We respectfully submit that as domestic oil and natural gas production is declining precipitously, the Administration appears to be missing the opportunity to substantially increase domestic oil and gas production through the deployment of the products of DOE research and development.

While we agree with the thrust of the Administration's program to develop hydrogen-powered vehicles and the infrastructure to support them, we believe it is premature to curtail oil and gas research programs that provide the means to support future successful exploration and production activities – in essence the energy bridge to the hydrogen economy. In fact the hydrogen program in its infancy could be highly dependent on natural gas, at least until non-fossil hydrogen sources are developed.

Today, the composition of the domestic oil and gas industry is substantially different than it was even a few years ago. The major multinational integrated oil and gas companies have largely ceased exploration and production activities in Lower 48 states, except for their offshore programs. The primary beneficiaries of DOE research, independent oil and gas producers, now account for about 85 percent of U.S. natural gas and more than 68 percent of oil production. The composition of the independent sector differs substantially from the major multinational oil companies. Among other things, they do not have access to the in-house technology development capabilities of the multinationals, nor do they have the resources necessary to conduct internal R&D programs. They typically operate in more mature basins where technology plays a pivotal role in getting the harder-to-get oil and gas out of the ground. These 7,000 producers have an average of only 12 employees, yet they drill 85 percent of the wells.

Virtually all of these DOE programs are targeted toward the exploration and production needs of the independents. The survival of these companies, and the production of an increasing portion of the nation's remaining oil and natural gas resources will depend on technologies not yet in existence – technologies that will be developed through government-industry partnerships and deployed by the industry to produce oil and gas to offset our dependence on foreign sources.

These programs have already provided oil and gas producers with the technologies to achieve major increases in production quickly. For example, mid-1980s DOE contributions to developing the technologies for producing natural gas from coalbed methane enabled natural gas production, which now totals more than 2 trillion cubic per

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year. Natural gas from coalbed methane accounts for about 10 percent of total domestic production. DOE Fossil Energy Fracture R&D programs provided the industry the tools to begin development of natural gas tight sands reservoirs. Today tight sands production is about 17 percent of total domestic production. As a result of these technologies, developed in part by DOE, large fields like the Barnett Shale in Texas have the potential to produce as much as 20 trillion cubic of gas – an amount almost equal to one year's domestic consumption.

These programs have proven their worth. They can help reduce oil and gas prices and increase the resource base. We join with other Committees to urge our colleagues to restore and enhance the funding of these programs so that they may continue to provide the benefits of dependable domestic oil and gas production for years to come.

Ralph M. Hall

Ken Calvert

Al Green

Sheila Jackson Lee

Chris Shays

Jim Matheson

ADDITIONAL VIEWS

FROM: BOB INGLIS
DATE: 03/03/2005

I largely agree with the Views and Estimates presented by the Science Committee, but I would like to say a few words about the Advanced Technology Program (ATP) and Manufacturing Extension Partnership (MEP). When I was on the Budget Committee, we fought hard against what is known as "corporate welfare." Many people attack ATP and MEP as the worst offenders and examples of the saying, "if you offer something for free, a line will form."

However, the government can and should support certain types of research and development, if (1) the market faces barriers to adoption, and (2) the national interest overrides the market's timing. Hydrogen is an excellent example of this. We need to reduce our dependence on foreign oil. The costs and technological barriers of a hydrogen economy slow the rate of adoption. Therefore, it is in our national interest to fund the research and development.

My concern with ATP is that is difficult to demonstrate the national interest. ATP funds research that companies would otherwise not do; that is the point. But if the companies don't think the R&D is important enough to invest in without government assistance, why should we foot the bill? I recognize that this is a complicated issue, but I have strong reservations about this program.

MEP is harder to criticize because it impacts individuals in a way that endears it to many people. My own district has several success stories. However, the government helping small manufacturing firms to be more efficient cuts both ways. It champions the little guy, but sounds an awful lot like a handout aimed at specific types of businesses.

In speaking with the folks who run that program, I'm encouraged to see that they have structured it so that it is not a handout; rather, it is an aid to position the companies to make their own wise investments in technology. From that standpoint, I do not believe it is "corporate welfare." I am looking forward to learning more about how the program practically works. I hope to find that this program operates in line with NIST's high standards of quality and efficiency.

Bob Inglis

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Additional Views
Rep. Bart Gordon of Tennessee
Rep. Mark Udall of Colorado
Rep. David Wu of Oregon
Views and Estimates
Committee on Science
Fiscal Year 2006

While we may agree with the general tone and recommendations in the Committee's Views and Estimates, we do not agree that the overall funding level proposed for the National Oceanic and Atmospheric Administration is sufficient. An example of the short-sightedness of such budget cuts: A recent article in the Washington Post reported that chronic under-funding of the National Weather Service budget in recent years – including a cut in the FY05 budget of $45 million below the FY04 budget – will potentially impact the delivery of weather services.

A proposed cut from FY05 funding for the agency overall of over $300 million dollars is not justifiable by simply restating the Administration's explanation that these funds were Congressional earmarks. Congress is constitutionally granted the power of the purse. The fact that Congress may disagree with the Administration about the appropriate level of funding or the desirability of a particular program does not by itself justify a cut to that program or its elimination. The tsunami warning system, which the Administration is now proposing to expand, is a recent example of a Congressional program that would not exist without Congress's interest and willingness to fund it.

In addition to funding shortfalls at the National Weather Service, other areas of NOAA's budget do not fare well when compared to the FY05 enacted budget and to the need for NOAA services. The Administration's budget cuts funding for the Oceanic and Atmospheric research (OAR) office by 10 percent from the FY05 enacted levels. Midterm to long-term research is essential if we are to achieve improvements in weather forecasting and resource management, NOAA's core operational missions. Our need for more refined information on climate and weather to support economic and resource management decisions across the nation has increased over time. Transportation, agriculture, forestry, ranching and hydropower generation are a few of the industries that rely on both short-term forecasting and long-term climate trend information for planning. We cannot generate this information if we do not continue to support the work of NOAA's laboratories and their academic partners.

We also need more information to address the resource management, conservation and pollution control issues impacting our oceans. Many of our fisheries are in trouble. Harmful algal blooms and hypoxic zones have increased in their frequency and intensity in a number of our coastal areas, creating human

health risks and resulting in significant economic costs to the communities that rely upon recreation and fishing for their livelihoods. The cuts to the OAR budget are proposed as the Ocean Commission has completed its report recommending the doubling of funding for ocean and coastal science.

We need to be realistic about the budget needed to support NOAA's activities. The Administration's budget is not realistic. If Congress enacts an overall budget level for NOAA consistent with the Administration's request, research and development and operational programs will suffer. NOAA's missions in weather forecasting, conservation and resource management and the employees who carry them out must be given adequate resources to deliver the services the public requires.

With respect to NASA, we echo the Committee's concern that many of NASA's plans remain ill-defined. However, we are equally troubled by a number of the decisions that NASA has *already* made as part of its FY 2006 budget request. For example, NASA has decided to eliminate funding for servicing the highly productive Hubble Space Telescope despite a unanimous recommendation by a distinguished National Academies committee that NASA should reinstate a Shuttle servicing mission to Hubble.

NASA has decided to impose a disproportionate share of the White House-mandated reduction in NASA's outyear funding plan on the Earth and space science programs, as well as on NASA's aeronautics research program. One particularly ill-advised consequence of that decision will be the necessity to terminate a number of scientifically productive missions – such as Voyager, Ulysses, and TRACE – late this year, with additional missions having to be terminated in late 2006.

NASA is eliminating essentially all research on the International Space Station that does not directly support the President's exploration initiative—thus walking away from investments in basic and applied research that NASA has long touted as providing important benefits to society—and in the process breaking faith with a research community that made career decisions on the basis of NASA's long-standing commitment to that research.

Finally, we are deeply troubled that in its haste to redirect its activities to support the President's exploration mission under questionable budgetary assumptions, NASA is seeking to make changes in its workforce that risk irretrievably losing highly skilled scientists and engineers from NASA's research Centers.

Bart Gordon
Ranking Member
Committee on Science

Mark Udall
Ranking Member
Subcommittee on Space
And Aeronautics
Committee on Science

David Wu
Ranking Member
Subcommittee on Environment
Technology and Standards
Committee on Science

Congress of the United States
Washington, DC 20515

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES
Additional Views and Budget Estimates

We concur with the Majority budget views and estimates that there are insufficient amounts of funding in the Administration's R&D budget and stand in unison with the Science Committee's position that more robust funding of science and technology is needed for FY06. In addition to the support expressed in the Majority budget views and estimates for FutureGen and greater DOE investment in carbon sequestration, we would ask the Budget committee to look favorably on the Administration's request to transfer $257 million in prior Clean Coal funds to the FutureGen project.

Since President Bush announced the FutureGen Initiative in February 2003, the project has received $27 million in funding to date ($9 million in FY04 and $18 million in FY05), and continues to move along steadily. In June 2003, ten of the largest coal-fueled utilities and coal companies expressed their interest in providing at least $200 million in private sector cost-share for the FutureGen Initiative. Most recently, in February 2005, the DOE invited the members of the Alliance to form a public-private partnership, which will lead the project and provide opportunities for State, technology vendor, scientific, and stakeholder involvement. Clearly, the FutureGen Initiative has formed a strong government-industry partnership that is financially committed and strongly supports the President's clean coal technology project.

In addition to private funding sources, the FutureGen Initiative must secure congressional approval of the Administration's request. As a signal to Congress that he is committed to building the first near-zero emission coal-fueled hydrogen and electricity plant, the President again requested $18 million for the FutureGen Initiative in his FY06 budget proposal. Furthermore, the President proposed to defer unused Clean Coal Technology Program funds for FutureGen until FY07. It is important to note that this action has **zero-net budget impact for FY06.** Thus, the DOE and the industrial consortium can continue to move forward with their project plan, which involves detailed planning, design, and site selection, without a financial strain on the government.

Each year, this Committee agrees that more R&D funding for science and technology is needed to develop and deploy more efficient, cleaner technologies in the marketplace that satisfy America's need for more electricity and a cleaner environment for years to come. In order to reduce our dependence on foreign oil, we must act now to develop and advance clean coal technologies, such as the FutureGen Initiative, as America has the ability to accomplish this project.

Congress has the opportunity to work in collaboration with the President, the Department of Energy, coal producing states, labor unions, environmental groups, the mining industry, coal-fueled utilities and companies, and international countries to

mining industry, coal-fueled utilities and companies, and international countries to combine new and tested techniques of emissions management with carbon sequestration to economically produce zero emissions energy. By providing significant funding, we allow the DOE to continue with structuring the industrial partnership, engineering design, and site selection for FutureGen enabling the project to succeed.

Again, we are pleased the Science Committee Majority views expressed support for advancing and studying carbon sequestration because FutureGen seeks to combine carbon sequestration and hydrogen production to create the world's cleanest coal-fired power plant. The plant will serve as a living prototype of new carbon sequestration technologies and produce both electricity and hydrogen.

At a time when we must advance toward a more secure energy future, the use of coal will help ensure America's energy security by developing technologies that utilize a plentiful domestic resource. FutureGen is a vital piece of the efforts to start producing more of our energy needs here at home. We firmly support efforts to develop clean coal technology and will continue to support the President's budget request to build and operate the world's first near-zero emission coal-fueled hydrogen and electricity plant, and urge the Budget Committee to do the same by transferring $257 million of funds to the FutureGen project.

Sincerely,

Jerry F. Costello
Member of Congress

Judy Biggert
Member of Congress

Tim Johnson
Member of Congress

Daniel Lipinski
Member of Congress

Additional Views and Estimates for Fiscal Year 2006
Committee on Science
A Balanced Oversight for the President's Budget Request for NASA

As the Budget Committee prepares to report the FY06 Budget Resolution, we would like to offer our additional views in relation to the Views and Estimates submitted by the Science Committee. We support and admire Chairman Boehlert's leadership, but respectfully take another view on some aspects of NASA's future. We look forward to working with Chairman Boehlert, Ranking Member Gordon and all of the Committee Members to address these differences through the procedures of the Committee.

During the first session of the 109th Congress, the Subcommittee on Space and Aeronautics of the House Science Committee has as its top objective to pass an authorization for the National Aeronautics and Space Administration (NASA). The legislation is necessary to provide Congressional direction and oversight for the President's Space Exploration Vision, which includes the shuttle return to flight, completion of the International Space Station, missions to the Moon and Mars; aeronautics; earth and space sciences; and other important initiatives for the agency.

We fully support the President's budget request for NASA of $16.456 billion for FY06, a 2.4% increase over FY05. This funding level is necessary to keep our Nation as the global leader in the areas of space exploration, in space and earth science, and in aerospace competitiveness. We appreciate the severity of the current fiscal environment, but believe that a relatively small investment can yield a significant return to the American people, both technologically and economically.

In addition to an authorization for NASA, the Committee plans to conduct its oversight by examining such areas as the impact of the Iran Nonproliferation Act on maintenance of the International Space Station, financial management issues within NASA, the role of aeronautics to our Nation's competitiveness, the range and direction of NASA's science programs and their relationship to the new Vision program, examination of NASA's infrastructure and NASA centers' roles and missions, and the efforts of NASA to involve, facilitate or foster commercial entrepreneurs as they contribute to America's use of space.

The Committee is looking forward to offering the agency guidance as they move forward to achieve the goals laid out in the President's proposal. We enthusiastically encourage you to support full funding for NASA as the Committee drafts the FY06 Budget Resolution.

Ken Calvert
Member of Congress

Ralph Hall
Member of Congress

Lamar Smith
Member of Congress

Tom Feeney
Member of Congress

Michael McCaul
Member of Congress

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March 7, 2006

The Honorable Jim Nussle
Chairman
Committee on the Budget
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Pursuant to the provisions of clause 4(f) of House Rule X of the Rules of the House of Representatives for the 109th Congress and Section 301(d) of the Congressional Budget Act of 1974, as amended, I am transmitting the Views and Estimates of the Committee on Science for Fiscal Year 2007.

Sincerely,

SHERWOOD BOEHLERT
Chairman

SB/dm
Enclosure

Cc: The Honorable Bart Gordon
The Honorable John M. Spratt, Jr.

VIEWS AND ESTIMATES
COMMITTEE ON SCIENCE
FISCAL YEAR 2007

BACKGROUND

As the House and Senate begin consideration of the President's Fiscal Year (FY) 2007 budget request, there is no question that a great deal of debate will revolve around the budget deficit and its impact on the long-term economic health of the Nation. As these discussions move forward, the Science Committee urges Congress to recognize the importance and contributions of science and technology to productivity and economic growth—and consequently—fiscal security.

Indeed, nothing benefits federal revenues over the long-term as much as accelerated economic growth, and nothing fuels long-term growth more than science and technology. With that in mind, the President has proposed the *American Competitiveness Initiative,* which aims to strengthen American innovation and maintain the U.S. position as a global economic leader by increasing the federal investment in basic research, improving math and science education, and providing tax credits to stimulate private sector research and development. The Committee strongly supports the *American Competitiveness Initiative* and the related *Advanced Energy Initiative.*

Further, the strength of the U.S. scientific enterprise has long been a crucial component of America's national security. Advancements in science and technology were critical to the Nation's ability to triumph in the Cold War. (Indeed, Cold War-era investments in science and technology, especially those made in the wake of the Soviet launch of Sputnik, laid much of the foundation for the broad, successful scientific and engineering enterprise the U.S. boasts today.) New ideas, understandings and technologies spawned by research and development are just as essential to winning the war against terrorism.

SCIENCE COMMITTEE AGENDA

In the second session of the 109th Congress, the Science Committee's top priority will be to see that the appropriations required to carry out the President's *American Competitiveness Initiative* are enacted. To the extent that authorizing legislation is required to support and guide appropriations related to the initiative, the Committee will move such legislation.

The Committee will also work to enact legislation passed out of Committee during the first session, including a National Oceanic and Atmospheric Administration (NOAA) organic act, a bill authorizing tsunami detection, warning, education and research programs, a bill authorizing an interagency green chemistry R&D program, a reauthorization of the *High-Performance Computing Act of 1991* (P.L. 102–194), and a bill authorizing research on environmental cleanup of methamphetamine labs.

The Committee also will conduct ongoing oversight of the agencies and programs it has helped put into place, including the work of the Department of Homeland Security (DHS) Science and Technology (S&T) Directorate, and important interagency research and development (R&D) activities such as nanotechnology, climate change research, networking and information technology, cyber security, and math and science education programs. The Committee will continue to conduct close oversight of weather satellite programs at NOAA and the climate change technology programs at the Department of Energy (DOE).

OVERALL R&D FUNDING

The President proposes to spend $137.2 billion on R&D in FY07, about a 2.6 percent increase over FY06. The proposed R&D budget increases are heavily weighted toward development, which would receive a seven percent increase, while basic research would receive a one percent increase, and applied research would decline by seven percent.

As part of the *American Competitiveness Initiative,* the budget request includes significant funding increases—a total of about $1 billion—for three agencies that support the physical sciences and engineering research critical to American innovation: the National Science Foundation (NSF), the DOE Office of Science, and the National Institute of Standards and Technology (NIST). The proposed funding increases are targeted to high-priority research areas, including alternative energy technologies, nanotechnology, supercomputing, manufacturing, cyber security, the performance of structures during disasters, and improvements in the U.S. scientific infrastructure, such as research facilities and government laboratories. The Committee believes that these investments are critical to support the development of the next generation of transformative technologies and urges that the requested funds be provided.

INTERAGENCY ACTIVITIES

Presidential Initiatives

The Administration's budget highlights five "multi-agency R&D priorities" and provides a precise budget breakdown for three of them—nanotechnology, climate change science, and networking and information technology. The Committee strongly endorses these initiatives, and agrees that they deserve priority in funding.

The Administration proposes a 1.8 percent decrease from the FY06 estimated funding level for the interagency program on nanotechnology. This decrease is mainly due to removal of funding appropriated for specific projects at the Department of Defense and the National Aeronautics and Space Administration (NASA). The Committee is very pleased that for the five agencies under the Science Committee's jurisdiction that participate in the nanotechnology program (NSF, DOE, NIST, NASA, and the Environmental Protection Agency (EPA)), the FY07 budget requests a 10.1 percent increase over the FY06 level. The Committee believes that Congress should fund these activities, to the extent possible, at the levels called for by the *21st Century Nanotechnology Research and Development Act* (P.L. 108–153) and particularly urges increased funding for research on potential environmental and safety issues associated with nanotechnology.

The Committee continues to support the interagency Climate Change Science Program (CCSP), for which the Administration has proposed to spend $1.7 billion, about the same level as in FY06. As part of the CCSP, the Committee continues to support the interagency Climate Change Research Initiative (CCRI), which focuses on shorter-term research to support improved public debate and decision-making. The FY07 request is $200 million for CCRI, which is about the same level as enacted in FY06.

Information technology research has played a critical role in U.S. economic strength over the past several decades. Consistent with the President's prioritization of areas that contribute to U.S. competitiveness, the budget request recommends $3.07 billion for the interagency program on Networking and Information Technology Research and Development (NITRD) in FY07, a 7.7 percent increase over FY06. The Committee applauds the increased funding for important areas such as high-end computing systems and software and urges the funding be provided for NITRD at or above the requested level.

While cyber security R&D is not a formal Presidential initiative, significant effort is being put into programs in this area at a number of agencies as authorized in the *Cyber Security Research and Development Act* (P.L. 107–305). The Committee is particularly pleased to note that increases in funding in the area have been requested for FY07 at NSF, NIST, and DHS and urges funding at or above these levels. The Committee also is pleased that coordination of cyber security and information assurance is being integrated into the NITRD interagency coordination process.

The Committee also endorses the two other multi-agency R&D initiatives, which relate to combating terrorism (discussed in the next section) and to hydrogen (discussed in the section on DOE).

RECOMMENDATIONS FOR AGENCIES

FULL COMMITTEE

Department of Homeland Security (DHS)

The Committee wrote the portion of the *Homeland Security Act of 2002* (P.L. 107–296) that created the DHS S&T Directorate, and has exercised close oversight of DHS R&D programs since the Department's inception. The Committee is concerned that the Administration has requested a 33 percent decrease in funding for the S&T Directorate. While a significant part of the decrease ($334 million) reflects the transfer of almost all nuclear and radiological programs to the DHS Domestic Nuclear Detection Office (DNDO), the programs remaining within DHS S&T still would be reduced by $151 million, 13 percent below FY06. Much of the reduction ($104 million) is due to the conclusion of a program to develop countermeasures to shoulder-fired anti-aircraft missiles.

The Committee is particularly concerned about the significant reduction proposed for work on standards for homeland-security related equipment. This decrease will hamper DHS's ability to provide standards and guidelines for the performance and use of existing commercial technologies as well as for novel products being developed by other DHS programs. The Committee is also concerned about proposed decreases for work in the area of emergent and prototypical technologies. Reductions in this area will limit DHS's ability to perform basic research in vulnerability char-

acterization and countermeasure identification and to quickly address DHS-specific requirements for technology development.

The Committee is pleased with the $8.3 million increase proposed for cyber security R&D and supports the request.

The Committee remains concerned about the balance between short- and long-term research programs at DHS. There is increasing emphasis on development to meet near-term requirements and diminishing funding directed at more basic research. Such research is needed to ensure that the Nation is adequately prepared for future threats and that the Nation has a cadre of S&T professionals with appropriate training.

The Committee is also concerned about how DHS will balance its research priorities, given that the agency must deal with a wide range of threats—from cyber attacks to dirty bombs to foot and mouth disease—through technologies that must be able to be used in a wide variety of environments. Declining funding will make priority-setting even more essential. DHS will need to develop robust methods to determine which threats pose the greatest risks to help determine the distribution of funding across its portfolios.

SUBCOMMITTEE ON ENERGY

Department of Energy (DOE)

The Committee has jurisdiction over DOE's non-military national laboratories, civilian energy research, development and demonstration programs, and commercial application of energy technology activities.

Office of Science

The Committee strongly endorses the Administration for its support of the Office of Science as part of the *American Competitiveness Initiative.* The Administration meets the levels authorized for the Office of Science in the *Energy Policy Act of 2005* (P.L. 109–58) with its request of $4.1 billion for FY07, a 14 percent increase over FY06. This $505 million increase is 50 percent larger than the largest increase requested for the Office of Science in the preceding decade. The Committee believes the FY07 request will restore to health the Office of Science, an office which provides more than 40 percent of federal support for basic research in the physical sciences. The Administration's outyear commitment to provide annual increases averaging roughly seven percent over the next 10 years will enable dramatic advances in the cutting-edge research underpinning our economic competitiveness and national security.

Using the funding requested for FY07, the Office of Science will be able to operate its suite of scientific user facilities on average 96 percent of their optimal number of operating hours, up from 88 percent in FY06. For Nuclear Physics, the improvement is dramatic—facilities will be able to operate at 84 percent of optimum compared to 50 percent in FY06. DOE's neutron sources and x-ray light sources will have the resources necessary to modernize beamlines and other high-tech instrumentation, considerably improving the scientific productivity of these sources. Just as significantly, the FY07 request allows the Office of Science to bring on line the new Spallation Neutron Source (SNS) and four of five Nanoscale Science Research Centers. The Committee enthusiastically supports the FY07 funding levels that allow the Office of Science to re-instrument and maximize operations of its growing suite of scientific user facilities. The Committee believes these facility operations are one of the primary benefits the Office of Science provides to the researchers at universities, in industry, and in government labs across the Nation.

The request also allows the Office of Science to seize scientific opportunities by implementing key components of its 20-year facilities plan. The request includes $60 million for FY07 in the Fusion Energy Sciences program for ITER, the plan's top priority. Investments are made in leadership computing facilities at Oak Ridge and Argonne National Laboratories that significantly advance the plan's second-ranked priority to develop ultra-scale scale scientific computing capabilities. An additional $20 million keeps project engineering and design (PED) funding on track for the Linac Coherent Light Source at Stanford, one of the third-ranked priorities in Science's facilities plan. The Committee believes that PED funding for National Synchrotron Light Source II (NSLS II), an upgrade to the existing light source at Brookhaven National Laboratory, is a nationally important investment.

The Committee is disappointed, however, that the budget requests neither construction funding, nor PED funding, nor even R&D funding for the Rare Isotope Accelerator (RIA), a nuclear physics facility accorded high priority in the early period of the 20-year facilities plan. The budget does continue to request $4 million for ex-

otic beam R&D, which are the capabilities RIA or a RIA-like machine would deliver. In light of the lack of PED funding for RIA, it is difficult to see how the Administration will be able to meet its obligation under section 981 of the *Energy Policy Act of 2005* to commence construction of the facility no later than September 30, 2008.

Finally, the Committee notes with pleasure the balance struck between support for researchers (45 percent) and the operation of national scientific user facilities (38 percent). For example, major increases in research support are seen in university-based nuclear physics, which is up by 17 percent; the development of advanced computing software, which is up by 51 percent; and nanotechnology research, which is up by 62 percent. Funding within the Office of Science for the President's Hydrogen Fuel Initiative increases 54 percent to $50 million. The Committee is concerned that climate change research is reduced $6.6 million, including reductions to ocean carbon sequestration research (cut by $4.9 million) and climate modeling (cut by $1.5 million).

Applied Energy R&D

The Committee applauds the increases in funding proposed for renewable energy research as part of the *Advanced Energy Initiative.* In particular, the Administration requests increases for solar, wind, and biomass research, which collectively grow by 45 percent. The Committee is also pleased with the increase in funding for long-term hydrogen R&D. Combined, such activities will help reduce U.S. dependence on fossil fuels. However, the Committee is concerned by the accompanying decrease in funding across the board for efficiency programs. With the noted exceptions of advanced battery research, and equipment standards and analysis funding, most activities in the Buildings program, the Vehicles program, and the Industries program suffered from the zero-sum nature of funding for the Office of Energy Efficiency and Renewable Energy: overall, the Office receives a 0.2 percent increase, insufficient to keep up with inflation. Given the generally short- to mid-term, moderate-risk and high-payoff nature of energy efficiency activities, the Committee is concerned that the proposal misses an opportunity to couple short-term demand reductions—and the associated potential for lower prices—with longer-term policies to move away from foreign energy supplies.

In Nuclear Energy, the Committee applauds the increase in funding, much of which will go toward the *Advanced Fuel Cycle Initiative.* The Committee is concerned, however, that the underlying simultaneous commitments to several new project starts—the sodium-cooled fast reactor, the high-temperature gas reactor, and the demonstration-scale nuclear fuel reprocessing plant—all require large outyear commitments of funds. Therefore, the Committee especially applauds the Administration's commitment to conduct a comprehensive and rigorous systems analysis of the advanced fuel cycle and its associated research facility needs. The Committee is also concerned with the proposal to eliminate University Reactor Infrastructure and Education Assistance, especially in light of the recent announcement of the President's *American Competitiveness Initiative.* The university funding has provided crucial support to a new generation of nuclear science and engineering students who will help continue U.S. advancements in nuclear energy and security.

In Fossil Energy, the Committee applauds the increase in funding to keep the FutureGen project on schedule. FutureGen is a coal-based power plant that would capture and dispose of carbon dioxide (CO_2), resulting in near-zero emissions. The Committee also applauds the funding of the associated carbon sequestration science activities necessary to extend the lessons from FutureGen across the country.

The Committee notes with concern the 22 percent reduction proposed for the Office of Electricity Delivery and Energy Reliability. DOE has noted that this office, formerly the Office of Electric Transmission and Distribution, has been restructured to "capitalize on the complementary synergies and programmatic alignments that have emerged since the merger of its predecessor organizations." While the Committee supports DOE efforts to obtain synergies and efficiencies, it also notes that this Office is responsible for R&D to ensure transmission grid reliability, and hopes that these changes do not result in reduced emphasis on this important effort. This Office is now responsible for Distributed Energy Resources (DER), the primary home of many combined heat and power technologies that the Committee has encouraged in the past. The Committee is concerned that the 48 percent reduction in DER programs appears to go beyond synergies and likely will result in staff and contractor layoffs.

The Climate Change Technology Program (CCTP) is a cross-cutting effort that includes activities in almost all of DOE's applied R&D programs. The Administration anticipates releasing a tally of its FY 2007 request for the CCTP in late March. Currently, it is possible to determine that many of the major CCTP components are up or flat. The most important recent development in the program was the release on

August 5, 2005 of the CCTP draft strategic plan for public comment. The Committee is disappointed with both the content of the plan and the long delay in its release. The Committee is concerned the draft strategic plan does little to advance the Administration's position that advanced technology development must form the core of the national response to climate change.

SUBCOMMITTEE ON ENVIRONMENT, TECHNOLOGY, AND STANDARDS

Environmental Protection Agency (EPA)

EPA's Office of Research and Development (ORD) is responsible for 80 percent of EPA's R&D activities, and it receives the majority of funds available in the agency's Science and Technology (S&T) account. ORD serves a unique role in environmental R&D: it conducts the basic and applied research that supports EPA's regulatory programs and investigates the next generation of environmental challenges. To meet these needs, ORD conducts intramural research at EPA's many laboratories, and it supports extramural research at colleges and universities through the Science to Achieve Results (STAR) grant program.

The FY07 the budget request includes $788 million for S&T at EPA, an apparent eight percent ($58 million) increase from the FY06 enacted level of $730 million. However, that figure includes an accounting change, which transfers $62 million from the Environment Programs and Management (EPM) account to the S&T account. The accounting change is intended to more accurately allocate facility rents to the appropriate account. Although the Committee has no objection to the accounting change, the $62 million has been excluded from the Committee's analysis to enable a meaningful comparison between the FY07 request and the FY06 enacted budget. Excluding the accounting change, the S&T budget request is $726 million, one percent less than the FY06 enacted level.

The Committee is concerned by the continuing erosion in funding for the Office of Research and Development (ORD). Under the President's FY07 request, ORD's total budget would decrease to $557 million, six percent ($38 million) less than the FY06 enacted level, both because of the elimination of earmarks and because S&T funding that otherwise would have been available to ORD is going to other offices within EPA (in particular for homeland security work). More troubling is the overall trend in ORD's funding level. The FY07 request for ORD would be its lowest since FY00 and 14 percent less than its peak funding level of $646.5 million in FY04. The decline in resources, coupled with ORD's newer responsibilities in the important area of homeland security, is eroding ORD's ability to carry out its traditional environmental research responsibilities.

The Committee supports the request of $9 million for research on the implications of nanotechnology, a nearly 80 percent increase over the FY06 enacted level. At a recent Committee hearing on nanotechnology, industry observers called for a substantial increase in the federal R&D investment in environmental implications of nanotechnology.

The Committee supports the agency's $0.5 million proposal to improve its Integrated Risk Information System (IRIS), the agency's electronic database of human health effects that may result from exposure to various chemicals. The Committee will be watching these reforms carefully to ensure they do not lead to undue delays in updating information in IRIS or compromise the integrity and public health protections IRIS is designed to support.

The Committee strongly supports EPA's role in homeland security and agrees with the agency's FY07 goals to increase decontamination research and expand the Water Sentinel pilot program that is helping develop a drinking water monitoring and surveillance system. The knowledge that would be gained from Water Sentinel could be critical in the event of a chemical or biological attack on the Nation's drinking water systems. However, the Committee is concerned that the agency's heavy reliance on the S&T account to fund homeland security activities would continue to erode ORD's investments in other important areas of environmental research.

In particular, in EPA's homeland security budget request the Committee is concerned with the source of funding for the Water Sentinel pilot project. EPA requests $45 million from the S&T account for the Water Sentinel pilot, a more than 500 percent increase over the FY06 enacted level of $8.1 million. Water Sentinel is a hybrid program managed by the Office of Water, but involving R&D and more traditional water system operations. The Committee believes that funding for the program should be drawn from multiple accounts, rather than exclusively from the S&T account. The savings from this arrangement could be used to restore core ORD research programs discussed in more detail below.

The Committee is disappointed with the proposed $7 million (eight percent) reduction from the FY06 enacted level in ORD's Ecosystem Research. If enacted, it would culminate in a $28 million (26 percent) reduction since 2004. Among the most troubling decreases within this program is the proposed $3.4 million (or 26 percent) reduction in the Science to Achieve Results (STAR) Graduate Fellowships. The Committee believes the fellowship program should be funded at $10 million, the level restored by Congress in each year beginning with FY03. The Committee is also concerned about the proposed $5 million reduction in the Environmental Monitoring Assessment Program, (EMAP), which supports states' measurements of water quality conditions.

The Committee is also disappointed with further reductions in ORD's Sustainability Research program (formerly called the Pollution Prevention Research). The FY07 request proposes an $8 million or 23 percent decrease from the FY06 enacted level of $29 million, and would result in a 43 percent decline since 2005. Past requests have sought to reduce funding for the Environmental Technology Verification (ETV) program, and the FY07 request eliminates the entire program ($3 million). The ETV program verifies the performance of a new technology at the request of and with joint funding from a technology manufacturer. The program was originally created to help technology developers convince prospective purchasers that a new, innovative technology would perform as promised.

The Committee also plans to examine the following proposed reductions: (1) the termination of the mandatory Superfund Innovative Technology Evaluation (SITE) program, which demonstrates innovative clean up technologies; (2) a reduction in the global change research program, (3) flat funding for the Advanced Monitoring Initiative (EPA's contribution to the Global Earth Observing System of Systems); and (4) a $4 million (16 percent) reduction in pesticide and toxics research that will slow research on high volume chemicals and endocrine disruptor chemicals.

Department of Commerce—Technology Administration/National Institute of Standards and Technology (TA/NIST)

The National Institute of Standards and Technology is the Nation's oldest federal laboratory. Its mission explicitly includes promoting U.S. innovation and industrial competitiveness. Because NIST consistently provides high-quality, cutting-edge research in a wide range of scientific and technical fields critical to U.S. industry, it is perfectly placed to play a central role as proposed in the President's *American Competitiveness Initiative.*

The budget request includes $467 million for the core NIST laboratory programs and facilities as part of the President's *American Competitiveness Initiative.* This increase includes $72 million for new research initiatives and enhancements to NIST's user facilities, an 18 percent increase over FY06. The Committee enthusiastically supports this request, as it represents a significant and sensible investment in programs that keep the U.S. at the forefront of economically important emerging technologies.

The Committee also strongly supports the budget request of $68 million for NIST's construction account. This includes $12 million for construction expenses at the NIST Center for Neutron Research, which will allow more scientists to use this unique, world-class facility. The request also includes $10 million in the Safety, Capacity, Maintenance, and Major Repairs (SCMMR) account for building maintenance at NIST's laboratory in Boulder, Colorado. The Committee believes this funding will have a positive effect on the efficiency and stability of many of NIST's research projects in Boulder. Currently, fluctuations in the environmental and electrical systems at the Boulder labs frequently disrupt research at the labs and the maintenance will allow the scientists to focus on their important work.

The Committee continues to support the Advanced Technology Program (ATP) and is concerned that the Administration has again requested no funds for the program and is seeking to terminate the program. The Committee is concerned that terminating ATP would reduce the NIST laboratory budget since 10 percent of ATP funds, $8 to $13 million a year, was spent inside NIST.

The Committee is disappointed that the Administration has requested only $46 million for the Manufacturing Extension Partnership (MEP) program. This would cut the program by 56 percent from the $106 million appropriated in FY06, leaving the national network of Centers with insufficient funding to maintain their assistance to small and medium-sized manufacturing firms. MEP has demonstrated its effectiveness as the only program (private or public) that offers direct technical assistance to small and medium-sized manufacturers. The Federal Government funds only a third of the operating expenses of the MEP Centers, with the remainder shared between states and users. The House has spoken overwhelmingly in favor

of MEP, both through amounts appropriated in FY05 and FY06 and in the passage of H.R. 250, the *Manufacturing Technology Competitiveness Act of 2005.*

Department of Commerce—National Technical Information Service (NTIS)

The Committee looks forward to working with the Administration to keep NTIS functioning as a self-sustaining entity and would like to explore, with the Department of Commerce, ways that NTIS can contribute to innovation in the U.S. economy.

Department of Commerce—National Oceanic and Atmospheric Administration (NOAA)

Among other activities, NOAA provides weather forecasts and warnings, charts the seas for navigation, develops guidelines for the use and protection of ocean and coastal resources, and performs research to improve understanding of marine, coastal and atmospheric environments. The Committee has jurisdiction over four of NOAA's five line offices—the National Ocean Service, the Office of Atmospheric and Oceanic Research, the National Environmental Satellite Data and Information Service, and the National Weather Service.

The FY07 budget request for NOAA is $3.7 billion, a decrease of $227 million (six percent) compared to the FY06 enacted level of $3.9 billion. Most of the reduction is due to the elimination of earmarks, and the Committee supports the proposed overall level of funding for NOAA.

The Committee supports the request of $882 million for the National Weather Service (NWS), an increase of $33.6 million (four percent) over the FY06 enacted level. The increase includes $29 million to develop, operate, and maintain a variety of warning and forecast systems such as the Tsunami Warning Program, the Air Quality Forecasting Program, and the Wind Profiler Network (which is important for tornado, severe storm, and flash flood forecasting). Also in NWS, the Committee supports the request of $7.5 million for the U.S. Weather Research Program. This $2.5 million (50 percent) increase over FY06 levels will accelerate current research efforts to improve hurricane forecasting models.

The Committee also supports the request in the Office of Atmospheric and Oceanic Research for $13 million for high performance computing (100 percent or $6.5 million increase over FY06 enacted levels). High performance computing is integral to NOAA's ability to provide timely and accurate weather forecasts and warnings, including those for hurricanes.

The Committee supports the request of $1 billion for satellite programs at NOAA. This request is an $82 million (8.6 percent) increase over the FY06 enacted level of $952 million. The increase is for the procurement, acquisition, and construction of the next generation of weather satellites, and it is in line with the long-term budget plans for these satellite systems. Satellite funding in FY07 is particularly important because NOAA plans to let the prime contract for its next generation of geostationary satellites.

Also, the Committee remains concerned about cost overruns and technical challenges that have delayed the launch date for NOAA's new polar satellite system, the National Polar-orbiting Operational Environmental Satellite System (NPOESS). The Committee recently held a hearing about NPOESS and learned it is currently running as much as $3 billion (more than 25 percent) over budget and as many as three years behind schedule. The NPOESS program is in the midst of a detailed external review and currently no increased funding is anticipated (or requested) in the FY07 budget. However, additional funding will be required in future years, and the Committee is extremely concerned that NOAA has not explained how it can pay for those increases without damaging other programs.

The Committee strongly supports NOAA's request for $27 million for satellite data product processing and distribution, and $25 million for satellite product development, readiness and application. The Committee is concerned about NOAA's current and future capability to utilize, manage, and store satellite and weather data critical for forecasting and research. These funding levels will ensure that the Nation can take full advantage of the large investment in satellites through timely and useful satellite data products.

SUBCOMMITTEE ON RESEARCH

National Science Foundation (NSF)

NSF is the primary source of federal funding for non-medical basic research conducted at colleges and universities. NSF funds basic research across nearly all disciplines of science and engineering, making NSF-supported research integral to

progress in national priority areas such as health care, national security, and other areas of importance where U.S. innovation is the key to maintaining our competitive advantage. In addition, NSF sponsors programs to improve K–12 and undergraduate education, and its fellowships and research assistantship programs support many graduate and post-doctoral students.

NSF continues to receive high marks from the Office of Management and Budget for the quality of its management and the excellence of its programs. NSF is one of only three agencies (of the 26 evaluated) to be awarded four or more green lights on the Executive Branch Management Scorecard. In addition, ten NSF programs have been examined to date using Office of Management and Budget's Program Assessment Rating Tool (PART) analysis, and all ten programs received ratings of "effective," the highest possible rating. NSF remains the only agency in the Federal Government to receive the highest rating on every program that underwent a PART evaluation.

As part of the *American Competitiveness Initiative,* the FY07 budget request for NSF is $6.02 billion, an increase of 7.9 percent, or $439 million over the FY06 level. The funding increase in the FY07 budget mainly goes to scientific research programs and research facilities and is spread fairly evenly among all fields NSF supports, including engineering, non-biomedical life sciences, physics, and geosciences. The Committee strongly endorses the proposed overall budget level proposed for NSF, while acknowledging that even with that healthy increase, funding will lag behind the levels authorized in the *National Science Foundation Authorization Act of 2002* (P.L. 107–368).

While the Committee is pleased to see funding increases across all NSF research fields, it is deeply troubled by the modest 2.5 percent increase for NSF's Education and Human Resources (EHR) directorate, given the President's emphasis on math and science education in the *American Competitiveness Initiative.* Since 1950, NSF has been tasked with strengthening math and science education programs at all levels, and NSF's education programs are unique in their peer review processes, their linkage to higher education and their resulting capacity to develop new and improved materials and assessments, create better teacher training techniques and move promising ideas from research to practice. The budget request of $816 million for NSF Education and Human Resources (EHR) Directorate for FY07 allows for only about inflationary growth over FY06 and does little to restore the significant funding reductions that have occurred since FY04. In addition, within EHR, funding for elementary, secondary and informal education programs and research and evaluation activities would continue to decline. The Committee recommends that NSF EHR receive at least $913 million in FY07, with particular emphasis on increasing funding for the new Division of Research on Learning in Formal and Informal Settings, the Robert Noyce Scholarship Program, the Science, Technology, Engineering, and Mathematics Talent Expansion Program; the Course, Curriculum and Laboratory Improvement program, and the Math and Science Partnership program.

United States Fire Administration (USFA)

The U.S. Fire Administration (USFA), which is now part of DHS, was created in 1974 to aid localities in reducing the loss of life and property from fires and related emergencies. The budget request for USFA is $46.8 million, a five percent increase over FY06, but well below its authorized level of $66.8 million. The Committee also notes its support for USFA's National Fire Academy training center.

From FY01 through FY03, USFA administered the (separately authorized) Assistance to Firefighters Grant Program, which is authorized by the Science Committee. This program provides direct assistance to local fire departments for training, purchase of equipment, and other purposes. The program is now run by the Office of Grants and Training within the new Preparedness Directorate at DHS. The FY07 budget request includes $293 million for the fire grant program. This is a $355 million cut from FY06, and more than $700 million less than is authorized under legislation signed into law in November 2004 (P.L. 108–375). In addition, the Administration has requested no funds for the SAFER Program, which awards grants to fire departments for the purpose of hiring new firefighters. SAFER is authorized at $1.1 billion in FY07 and received an appropriation of $106 million in FY05. The Committee feels that both of these important programs should receive higher funding.

National Earthquake Hazards Reduction Program (NEHRP)

NEHRP is an interagency program that Congress created in 1977 and reauthorized last November. It includes NSF, NIST, the Federal Emergency Management Agency (FEMA), and the U.S. Geological Survey (USGS), and aims to reduce the loss of life and property from earthquakes by improving emergency response, increasing understanding of earthquake risks, and improving earthquake engineering.

The President's overall FY05 request for NEHRP is $112 million, including $54.7, $55.4, and $1.7 million, for NSF, USGS, and NIST, respectively. Additional funding for NEHRP related activities will come from FEMA, but the amount of FEMA's FY07 budget request for this program is not available at this time. The Committee believes that NEHRP should be funded at the levels in the *National Earthquake Hazards Reduction Program Reauthorization Act of 2004* (P.L. 108–360). The Committee is most concerned that the NEHRP budget request for NIST of only $1.7 million will not be enough to enable NIST to carry out its responsibilities as the lead agency for the program, a role previously performed by FEMA. The Committee believes that a minimum of $3.5 million is needed for NIST's lead agency tasks. The Committee also is concerned that the request for the Advanced National Seismic System (ANSS), a critical seismic monitoring program administered by USGS, is only $8.1 million, the same level as in FY06 and well below the authorized level of $36 million.

National Windstorm Impact Reduction Program (NWIRP)

The NWIRP was authorized in 2004 (also in P.L. 108–360) as an interagency effort geared towards improving scientific understanding of wind hazards and developing cost-effective measures to reduce their impact on lives and property through atmospheric research, code development, and creation of risk assessment tools. The participating agencies include NSF, NIST, FEMA, and NOAA. An implementation plan establishing one of the participating agencies as the lead for the program was due to Congress from the Office of Science and Technology Policy (OSTP) in October 2005 but has not been received.

Funding explicitly designated for NWIRP is not included in any of the participating agencies' budget requests for FY 2007, in spite of funding authorization totaling $25 million: $9.4 million for FEMA, $9.4 million for NSF, $4 million for NIST, and $2.2 million for NOAA. The Committee believes that coordination and funding of NWIRP is critically necessary to save lives and reduce the economic costs of windstorms, which average $1.1 billion annually.

SUBCOMMITTEE ON SPACE AND AERONAUTICS

National Aeronautics and Space Administration (NASA)

The budget request seeks $16.792 billion for NASA in FY07, an increase of 3.2 percent over the FY06 appropriation, excluding supplemental funding for Katrina-related damages.

As it made clear in the *NASA Authorization Act of 2005* (P.L. 109–155), the Committee wants to enable NASA to thrive as a multi-mission agency with robust activities in the human exploration of space, Earth science, space science and aeronautics.

NASA has made significant progress in a number of areas since the Committee last prepared Views and Estimates. In the past year, NASA has achieved a greater degree of fidelity in its understanding of the costs and priorities of the programs within the agency. The new administrator, Michael Griffin, has overseen a number of changes and agenda-setting activities. NASA has completed the Exploration Systems Architecture Study (ESAS), providing the first baseline for pursuing the *Vision for Space Exploration.* Furthermore, the agency continues to identify and correct the safety concerns of the Space Shuttle and prepare for an orderly completion of the Space Station and retirement of the Shuttle in 2010 after over 25 years of service to the Nation. NASA has also begun restructuring its aeronautics research program.

The five-year budget projection for the Space Shuttle program is designed to fully fund the Shuttle through its retirement, making up for a shortfall in previous projections. Taking into account program transfers, the FY07 budget increases funding for the Space Shuttle by $2.2 billion through 2010 and for the Space Station by $1.5 billion.

Restoring funding for the Shuttle and Station accounts has come at the cost of slowed growth in NASA's other program areas. The Exploration Systems Mission Directorate, which oversees the Vision for Space Exploration, will receive $2 billion less through 2010, and NASA has replaced significant projected growth in the FY06 request for the Science Directorate with annual growth of 1.5 percent in FY07 and one percent thereafter, less than the projected rate of inflation.

The significantly reduced growth of the Science Directorate is of serious concern to the Committee. These reductions will necessitate the cancellation or lengthy deferral of several planned earth science and space science missions.

In FY07, the request increases the amount available for Exploration by $928 million compared to last year's appropriated level. This funding is focused on developing the next-generation hardware to replace the Shuttle, the Crew Exploration

Vehicle and its launcher. NASA expects to award contracts for the new vehicle at the end of FY06. The request reduces the amounts available for other, longer-term activities within the Science Directorate.

The Committee is again concerned about the limited funding for NASA's Aeronautics program. The budget cuts the program by 18.1 percent, down to $724.4 million. Reductions of this size may jeopardize NASA's ability to retain critical skills and perform ground-breaking research in support of this nationally important industry.

Federal Aviation Administration (FAA)

The request for the FAA's Office of the Associate Administrator for Commercial Space Transportation (AST) is $12.0 million, an increase of $200,000 from FY06. The Committee continues to monitor the implementation of the *Commercial Space Launch Amendments Act of 2004* (P.L. 108–492) to ensure AST avoids overly burdensome or costly regulatory structures on the nascent commercial space industry.

The Committee is once again disappointed with the support given by the FAA to research and development. The budget request of $236.7 million falls short of addressing issues related to the agency's challenge of designing, developing and implementing a follow-on air traffic control system, while continuing to deal with ongoing safety-related research.

The Joint Planning and Development Office, located within the FAA's Air Traffic Organization, and authorized by the *Vision 100—Century of Aviation Reauthorization Act* (P.L. 108–176), must receive greater agency attention if it is to succeed.

Department of Commerce—Office of Space Commercialization

The Committee urges support for this Office, which has played a useful role in promoting the commercial space industry. The Office needs to take a stronger role within the government and increase their efforts to support U.S. commercial space providers.

Committee on Science – FY 2007 Views and Estimates

Member Signatures

The Honorable Sherwood Boehlert

The Honorable Lamar Smith

The Honorable Bob Inglis

The Honorable David G. Reichert

The Honorable John J.H. "Joe" Schwarz

The Honorable Ralph M. Hall

The Honorable Jo Bonner

The Honorable Roscoe G. Bartlett

The Honorable Vernon J. Ehlers

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ENERGY AND COMMERCE
Chairman, ENERGY AND AIR QUALITY
HEALTH
ENVIRONMENT AND HAZARDOUS MATERIALS

SCIENCE
ENERGY
SPACE AND AERONAUTICS

Additional Views
Committee on Science
Rep. Ralph M. Hall
February 16, 2006

I join with the Science Committee in supporting the President's Competitiveness Initiative. Economic growth in America depends on knowledge-based industries and resources. To that end, this year's budget proposal bolsters math and science education, extends research and development tax credits for businesses, and promotes basic and applied scientific research.

I would like to add to the Committee's Views and Estimates my concerns about provisions in the Administration's budget that request a termination of the oil and natural gas research and development programs at the Department of Energy. These technology programs develop vital research to enhance and sustain domestic oil and natural gas production. In keeping with the President's mission to wean America off foreign oil, these are precisely the type of programs that we need to be funding because the research is particularly significant to the independent producers who drill 90% of the nation's wells and produce 85% of the nation's natural gas. The independent sector differs substantially from the major multinational oil companies. They typically do not have in-house research and development capabilities and rely heavily on university collaboration.

The Department of Energy's programs have already proven to help producers achieve major increases in production quickly. For instance, these programs have helped develop technologies that enabled natural gas production from coalbed methane which

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accounts for about 10 percent of total domestic production. Likewise, Energy Fracture R&D programs helped develop natural gas tight sands reservoirs. Today tight sands production is about 17 percent of total domestic production.

Equally troubling is a proposal in the budget to eliminate the Ultra-deepwater and Unconventional Onshore Natural Gas Research and Development Program. Since its introduction in 2001, the provision has passed the House three times, the Senate once, and was included in the Energy Policy Act signed by the President last year. The program is expected to tap 1900 trillion cubic feet of recoverable reserves in North America—enough to meet 60 years of demand. The Energy Information Administration indicates that the program will save consumers $2.2 billion in 2015 and will pay for itself in the form of increased royalties to the Treasury. The program is a win-win for America. Not only do we get technologies that tap into American reserves and help wean us off foreign energy, but also we get a program that pays for itself.

This is a new program and a number of parties have already submitted bids. Therefore, this year is vital to making sure that the program gets off the ground. This is exactly the type of innovative research and development we need to tap domestic supplies and help meet America's energy needs in the foreseeable future. I support the goal of reducing America's dependence on oil and gas by 2025—but until that time, we must not abandon oil and gas research programs that will increase domestic production, help secure America's energy needs, and reduce the current dependence on foreign oil.

I urge Congress to continue to fund these vital programs that help ensure America's national and economic security.

Ralph M. Hall

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Additional Views and Estimates for Fiscal Year 2007
Committee on Science

I am of the same mind as the Science Committee as to most of the observations presented in the Views and Estimates, but I would like to comment further on the Advanced Technology Program (ATP) and Manufacturing Extension Partnership (MEP). When I was on the Budget Committee, we waged war against "corporate welfare." Many people attack ATP and MEP as the worst offenders and examples of the saying, "if you offer something for free, a line will form."

However, the government can and should support certain types of research and development, if (1) the technology faces barriers to adoption in the market, and (2) the national interest overrides the market's timing. Hydrogen is an excellent example of this. We need to reduce our dependence on foreign oil. The costs and technological barriers of a hydrogen economy slow the rate of adoption. Therefore, it is in our national interest to fund the research and development (and especially basic research).

It is difficult to demonstrate that the research & development performed in ATP meet the nation's priorities as opposed to the company's priorities. ATP funds applied research that companies would otherwise not do; that is their reason for being. But if the companies don't think this applied research and product development is part of their reason for being, and it is not in the nation's interest apart from that, why should the American people foot the bill? I concede to the issue being more complicated than that, but I am pleased to see that the Congress has pursued phasing-out the program in last year's appropriations.

MEP can be a challenge to criticize because it impacts individuals in a way that endears it to many people. Companies in my district have taken advantage of this program. However, the government helping small manufacturing firms to be more efficient cuts both ways. It champions the little guy, but sounds an awful lot like a handout aimed at specific types of businesses. I'm concerned that MEP is crowding out an entire industry of small businesses and entrepreneurs that could be providing consulting services to manufacturers. I support the President's request to reduce funding to this marginal program in a time where other initiatives deserve higher priority.

Sincerely,

Bob Inglis

Bob Inglis
Member of Congress

COMMITTEE ON SCIENCE
DEMOCRATIC VIEWS AND ESTIMATES
ON THE FY 2007 BUDGET FOR CIVILIAN SCIENCE AND TECHNOLOGY PROGRAMS

MARCH 6, 2006

> "Special attention should go to the physical sciences, engineering, mathematics, and information sciences and to Department of Defense (DOD) basic-research funding. *This special attention does not mean that there should be a disinvestment in such important fields as the life sciences. . .or the social sciences.* A balanced research portfolio in all fields of science and engineering research is critical to U.S. prosperity.
>
> From the Executive Summary of *Rising Above the Gathering Storm,* National Academies report (emphasis added).

While there have been numerous reports on American competitiveness in recent years, *Gathering Storm* has had a rare impact on policy-makers and the public. A consensus seems to have emerged on two points. First, that we have to invest in our most important resource—our people—by improving the quality of science and math education offered in our schools. Second, we have to create an economy that fully embraces innovation.

The National Academies panel, chaired by Norm Augustine, chose twenty recommendations it believed would lay the groundwork for building an economy that holds the promise of good, high-paying employment for Americans. These policy initiatives are about creating jobs and a brighter future for Americans and that is why we have embraced the findings of the Augustine Report.

The Bush Administration seems to have joined the bandwagon in support of the Augustine Committee, at least rhetorically. The Research and Development (R&D) budget request presented to Congress this year has as its centerpiece the "American Competitiveness Initiative." This effort would promote increases in physical sciences Research and Development at the National Science Foundation (NSF), the Department of Energy (DOE) and the National Institute of Standards and Technology (NIST) to put them on a path to double the relevant funding in ten years. The Administration also has proposals to increase science education support through the Department of Education and enhance energy independence through investments in the Department of Energy (primarily in the fields of renewable energy sources).

Unfortunately, these initiatives are funded through cuts in other areas. For the American Competitiveness Initiative, the proposed $900 million increase at NSF, DOE, and NIST comes at the expense of other programs at those agencies and at the other federal science agencies. In fact, despite the hoopla surrounding the President's FY 2007 budget initiatives, the Federal Science &Technology request for FY 2007 is $1 billion less than the Administration requested for FY 2006. Comparing this year's request to last year's enacted levels, the overall federal science and technology budget across the government would drop by one percent.

So while the Administration says the right words about helping America invest in those areas that will help America grow, the reality is that the request contradicts the recommendation of the National Academies panel—both because it boosts some science at the expense of other science, and because the net consequence of this budget is that we would be disinvesting rather than investing in science and technology.

We find it impossible to see how less science and technology research investment would help to increase—or even sustain—America's rapidly dwindling competitive edge. This budget request would invest less than the rate of inflation at a time when many of our international competitors are increasing their investment in science and technology at faster rates than ever before.

According to the newly-released UNESCO *Science Report 2005,* Asia is now close to spending one-third of all the money the world is devoting to R&D. In 2002, Asia accounted for 31.5 percent, up from 27.9 percent in 1997. The Asian spurt was led by China, whose gross expenditure on research and development went from 3.9 percent in 1997 to 8.7 percent of the world total in 2002. The proportion of China's GDP devoted to R&D more than doubled in less than a decade.

Although the United States currently remains the leader in research investment, our competitors are rapidly catching up. Quite simply, the United States cannot rest on its laurels. Nor can it just move around the chairs on the *Titanic.* We find the priorities in the budget request.amount to little more than sleight of hand—taking

from one pocket and putting into another and calling that shift an increase. This country has to do more than what this budget requests if we are indeed to remain competitive.

The Committee on Science Majority's Views and Estimates question some Administration cuts and correctly note areas of particular bipartisan concern such as the continued erosion in funding for the EPA Office of Research and Development (ORD) and the Administration's request to again terminate the Advanced Technology Program (ATP) and cut the Manufacturing Extension Partnership (MEP) program by 56 percent. However, the Majority's uncritical support for the President's Competitiveness proposal, with all the loss that lies behind the selected program increases, makes it impossible to support the Republican Views and Estimates. Thus we file these dissenting views.

We find the budget request to be a complete contradiction to the recommendations of the nonpartisan expert recommendations of the Augustine Committee. We can support some of the President's initiatives, but not at the expense of deeper cuts in other important areas for innovation. The future of the Nation's economy is riding on making smart decisions today. The President's budget is an inadequate guide to the task. We would encourage the Budget Committee to make room in the appropriate functional categories for funding sufficient to embrace the full scope of the Augustine Commission's recommendations.

We will close with a few specific observations regarding proposals at particular agencies.

The Administration's National Science Foundation Request

While we were pleased to see the Administration putting forth a plan to follow through on their commitment to double NSF funding, the Administration is four years behind on that commitment and $3.8 billion, or 39 percent, short of the goal. In 2002, the Congress passed, and the President signed into law, an authorization bill doubling NSF funding over five years. However, the President's requests for NSF since the NSF doubling signing ceremony had been anemic until this, the FY 2007 budget request.

As a result, even with the FY 2007 proposed increase, the NSF budget is still below the 15 percent annual rate of increase needed to meet the five-year doubling profile called for in the NSF authorization statute. In fact, the President's plan for NSF does not guarantee a doubling even in ten years. All that the American Competitiveness Initiative promises is that we will see the combination of NSF, DOE basic research and NIST cumulatively double in ten years, without committing to the distribution among those agencies. NSF—really all three agencies—deserve guidance clearer than this as they plan for future investments.

We were very disappointed to see a continued de-emphasis of K–12 science education at NSF. Even as the NSF budget grows overall, the Administration proposes a seven percent cut to K–12 programs. NSF has been a leader in improving science and math education for over 50 years. We do not understand how ignoring NSF's expertise in the education component of the President's initiative helps competitiveness.

Relative to the FY 2004 funded level, the NSF FY 2007 science education request would represent a 37 percent decline. One of this nation's highest priorities should be to increase America's talent pool by vastly improving K–12 science and mathematics education. Cutting funding to NSF K–12 programs undercuts this important goal.

The Administration's Request for the Manufacturing Extension Partnership Program

From our point of view, competitiveness is about keeping good jobs and creating even more and better jobs in this country. Yet, the Administration proposed to cut Manufacturing Extension Partnership funding by 56 percent. MEP is the only federal program designed specifically to assist small manufacturers. MEP is the only program with a proven track record in creating and retaining manufacturing jobs right now. We have lost 2.8 million manufacturing jobs since 2001. This last year alone, we lost another 55,000 manufacturing jobs.

Knowing these facts, we just don't see how cutting MEP 56 percent, and NIST overall by 23 percent, increases American competitiveness. The bipartisan National Association of Governors, the U.S. Chamber of Commerce, the National Association of Manufacturers—and many others—wholeheartedly endorse MEP. Yet, this Administration again chooses to ignore this consensus support.

The Administration's Request for the National Oceanic and Atmospheric Administration (NOAA)

The Majority Views endorse the President's proposed reduction in NOAA's budget of over $200 million dollars—a six percent reduction from the FY 2006 enacted level. The primary science accounts at NOAA also would be reduced by eight percent as compared to this year's budget. We do not believe NOAA can meet the demands for its operational and research services with this budget.

We have serious concerns about the present and future budget implications of the National Polar-Orbiting Environmental Satellite System (NPOESS) acquisition program. NPOESS is substantially over-budget and behind schedule. Final decisions about moving this program forward are now being decided through the Department of Defense's Nunn-McCurdy process. The request offered by the Administration offers no room to maneuver as regards reasonable and prudent steps managers might otherwise take to limit the likely gaps in weather and climate data coverage implicit in this badly-managed program.

The constrained budget offered for NOAA for FY 2007 affords little opportunity for NOAA to meet the needs and expectations of the communities it serves through its weather forecasting, coastal zone management, fisheries, and research activities. This matters to citizens whose livelihoods and safety are tied to the swift, sure performance of those duties we entrust to NOAA.

Approved by:

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Committee on Science
Democratic Views and Estimates
FY 2007 Budget for Civilian Science and Technology Programs
March 6, 2006

BART GORDON
Ranking Member

Committee on Science
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FY 2007 Budget for Civilian Science and Technology Programs
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Committee on Science
Democratic Views and Estimates
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RUSS CARNAHAN

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES
Additional Views and Budget Estimates

While we disagree with the overall Science Committee Majority's budget views and estimates, we do support the Majority views for continued funding for the President's clean coal technology project, the FutureGen Initiative and ask the Budget committee to look favorably on the Administration's request to transfer $203 million in prior Clean Coal funds to the FutureGen project for FY08 and beyond. Further, we concur with the Majority's views supporting increased funding levels for carbon sequestration programs. Last, we are disappointed to learn that the Clean Coal Power Initiative (CCPI) and Fossil energy research and development received a decrease from FY06 and encourage the Budget committee to restore funding to these vital coal programs in order to move towards a more secure energy future.

Developing clean coal technologies will help ensure America's energy security by fully utilizing a plentiful domestic resource. The FutureGen Initiative is a great national investment and will jump-start our efforts to begin producing more of our energy needs here at home. The project seeks to combine carbon sequestration and hydrogen production to create the world's cleanest coal-fired power plant. The plant will serve as a living prototype of new carbon sequestration technologies and produce both electricity and hydrogen.

The remaining balance set aside for FutureGen is critical to the project's success because it ensures the DOE and the industrial consortium can move forward with their project plan, which involves detailed planning, design, and site selection, without a financial strain on the government.

Sincerely,

Jerry F. Costello
Member of Congress

Dan Lipinski
Member of Congress

Date	Committee on Science List of Hearings with Publication Numbers plus List of Legislative Reports filed in the 109th Congress	Publication Number
Jan. 26, 2005	Tsunamis: Is the U.S. Prepared? (Hearing held by the Committee on Science.)	109–1
Feb. 2, 2005	Options for Hubble Science (Hearing held by the Committee on Science.)	109–2
Feb. 9, 2005	Improving the Nation's Energy Security: Can Cars and Trucks Be Made More Fuel Efficient? (Hearing held by the Committee on Science.)	109–3
Feb. 10, 2005	Organizational Meeting (Held by the Committee on Science.)	N/A
Feb. 10, 2005	Markup: H.R. 610, Energy Research, Development, Demonstration, and Commercial Application Act of 2005 (Markup held by the Committee on Science.)	H.Rept. 109–216, Pt. 1 (H.R. 610)
Feb. 16, 2005	An Overview of the Federal R&D Budget for Fiscal Year 2006 (Hearing held by the Committee on Science.)	109–4
Feb. 17, 2005	NASA's Fiscal Year 2006 Budget Proposal (Hearing held by the Committee on Science.)	109–5
Mar. 3, 2005	H.R. 798, Methamphetamine Remediation Research Act of 2005 (Hearing held by the Committee on Science.)	109–6
Mar. 9, 2005	National Science Foundation Budget and Management Challenges (Hearing held by the Subcommittee on Research.)	109–7

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Mar. 15, 2005	Subcommittee Markup: H.R. 50, National Oceanic and Atmospheric Administration Act; H.R. 250, Manufacturing Technology Competitiveness Act of 2005; and H.R. 798, Methamphetamine Remediation Research Act of 2005 (Markup held by the Subcommittee on Environment, Technology, and Standards.)	H.Rept. 109–42 (H.R. 798) H.Rept. 109–92 (H.R. 250)
Mar. 16, 2005	The Future of Aeronautics at NASA (Hearing held by the Subcommittee on Space and Aeronautics.)	109–8
Mar. 17, 2005	Markup: H.R. 1023, Charles ''Pete'' Conrad Astronomy Awards Act; H.R. 1158, To reauthorize the Steel and Aluminum Energy Conservation and Technology Competitiveness Act of 1988; H.R. 28, High-Performance Computing Revitalization Act of 2005; H.Con.Res. 96, Recognizing the significance of African American women in the United States scientific community; and, H.R. 798, Methamphetamine Remediation Research Act of 2005 (Markup held by the Committee on Science.)	H.Rept. 109–36 (H.R. 28) H.Rept. 109–147 (H.R. 1158) H.Rept. 109–37 (H.R. 1023) H.Rept. 109–42 (H.R. 798)
Apr. 13, 2005	Markup: H.R. 1215, Green Chemistry Research and Development Act of 2005 (Markup held by the Committee on Science.)	H.Rept. 109–82 (H.R. 1215)
Apr. 14, 2005	The 2004 Presidential Awardees for Excellence in Mathematics and Science Teaching (Hearing held by the Committee on Science.)	109–9
Apr. 20, 2005	Future Markets for Commercial Space (Hearing held by the Subcommittee on Space and Aeronautics.)	109–10
Apr. 20, 2005	Markup: H.R. 1674, United States Tsunami Warning and Education Act (Markup held by the Subcommittee on Environment, Technology, and Standards.)	H.Rept. 109–698 (H.R. 1674)

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Apr. 27, 2005	Priorities in the Department of Energy Budget for Fiscal Year 2006 (Hearing held by the Subcommittee on Energy.)	109–11
Apr. 28, 2005	NASA Earth Science (Hearing held by the Committee on Science.)	109–12
May 11, 2005	China, Europe, and the Use of Standards as Trade Barriers: How Should the U.S. Respond? (Hearing held by the Subcommittee on Environment, Technology, and Standards.)	109–13
May 12, 2005	The Future of Computer Science Research in the U.S. (Hearing held by the Committee on Science.)	109–14
May 17, 2005	Markup: H.R. 50, National Oceanic and Atmospheric Administration; H.R. 426, Remote Sensing Applications Act of 2005; H.R. 1022, George E. Brown, Jr., Near-Earth Object Survey Act; and H.R. 2364, Science and Technology Scholarship Program for Careers in the National Weather Service and NOAA (Markup held by the Committee on Science.)	H.Rept. 109–xx (H.R. 50) H.Rept. 109–157 (H.R. 426) H.Rept. 109–158 (H.R. 1022) H.Rept. 109–151 (H.R. 2364)
May 18, 2005	The National Nanotechnology Initiative: Review and Outlook (Hearing held by the Subcommittee on Research.)	109–15
Jun. 8, 2005	Business Actions Reducing Greenhouse Gas Emissions (Hearing held by the Committee on Science.)	109–16
Jun. 14, 2005	Live From Space: The International Space Station (Hearing held by the Subcommittee on Space and Aeronautics.)	109–17
Jun. 16, 2005	Nuclear Fuel Reprocessing (Hearing held by the Subcommittee on Energy.)	109–18
Jun. 28, 2005	The Future of NASA (Hearing held by the Committee on Science.)	109–19

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Jun. 28, 2005	Small Business Innovation Research: What Is the Optimal Role of Venture Capital? (Hearing held by the Subcommittee on Environment, Technology, and Standards.)	109–20
Jun. 29, 2005	Nanotechnology: Where Does the U.S. Stand? (Hearing held by the Subcommittee on Research.)	109–21
Jun. 29, 2005	Markup: H.R. 3070, National Aeronautics and Space Administration Authorization Act of 2005 (Markup held by the Subcommittee on Space and Aeronautics.)	H.Rept. 109–173 (H.R. 3070)
Jul. 12, 2005	Economic Aspects of Nuclear Fuel Reprocessing (Hearing held by the Subcommittee on Energy.)	109–22
Jul. 14, 2005	Markup: H.R. 3070, National Aeronautics and Space Administration Authorization Act of 2005 (Markup held by the Committee on Science.)	H.Rept. 109–173 (H.R. 3070)
Jul. 20, 2005	Fueling the Future: On the Road to the Hydrogen Economy (Joint hearing held by the Subcommittee on Energy and the Subcommittee on Research.)	109–23
Jul. 21, 2005	U.S. Competitiveness: The Innovation Challenge (Hearing held by the Committee on Science.)	109–24
Sept. 15, 2005	Cyber Security: U.S. Vulnerability and Preparedness (Hearing held by the Committee on Science.)	109–25
Oct. 7, 2005	NOAA Hurricane Forecasting (Hearing held by the Committee on Science.)	109–26
Oct. 20, 2005	Science, Technology, and Global Economic Competitiveness (Hearing held by the Committee on Science.)	109–27

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Oct. 26, 2005	The Investigation of the World Trade Center Collapse: Findings, Recommendations, and Next Steps (Hearing held by the Committee on Science.)	109–28
Oct. 27, 2005	Financial Management at NASA: Challenges and Next Steps (Joint hearing held by the Subcommittee on Space and Aeronautics, Committee on Science and the Subcommittee on Government Management, Finance, and Accountability, Committee on Government Reform.)	109–29
Nov. 2, 2005	Winning Teams and Innovative Technologies From the 2005 Solar Decathlon (Hearing held by the Subcommittee on Energy.)	109–30
Nov. 3, 2005	Status of NASA's Programs (Hearing held by the Committee on Science.)	109–31
Nov. 9, 2005	Markup: H.Res. 515, Requesting the President to provide documents relating to the anticipated effects of climate change on coastal regions of the U.S. (Markup held by the Committee on Science.)	H.Rept. 109–296 (H.Res. 515)
Nov. 10, 2005	The Role of Social Science Research in Disaster Preparedness and Response (Hearing held by the Subcommittee on Research.)	109–32
Nov. 16, 2005	Ongoing Problems and Future Plans for NOAA's Weather Satellites (Hearing held by the Committee on Science.)	109–33
Nov. 17, 2005	Environmental and Safety Impacts of Nanotechnology: What Research Is Needed? (Hearing held by the Committee on Science.)	109–34
Feb. 15, 2006	An Overview of the Federal R&D Budget for Fiscal Year 2007 Hearing held by the Committee on Science.)	109–35
Feb. 16, 2006	NASA's Fiscal Year 2007 Budget Proposal (Hearing held by the Committee on Science.)	109–36

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Feb. 23, 2006	Health Care Information Technology: What Are the Opportunities For and Barriers to Inter-operable Health Information Technology Systems? (Field Hearing held by the Subcommittee on Environment, Technology, and Standards.)	109–37
Mar. 2, 2006	NASA's Science Mission Directorate: Impacts of the Fiscal Year 2007 Budget Proposal (Hearing held by the Committee on Science.)	109–38
Mar. 9, 2006	Should Congress Establish ''ARPA–E,'' the Advanced Research Projects Agency–Energy? (Hearing held by the Committee on Science.)	109–39
Mar. 15, 2006	Undergraduate Science, Math, and Engineering Education: What's Working? (Hearing held by the Subcommittee on Research.)	109–40
Mar. 16, 2006	EPA's Fiscal Year 2007 Science and Technology Budget Proposal (Hearing held by the Subcommittee on Environment, Technology, and Standards.)	109–41
Mar. 29, 2006	Markup: H.Res. 717, Directing the Secretary of Commerce to transmit to the House of Representatives a copy of a workforce globalization final draft report produced by the Technology Administration. (Markup held by the Committee on Science.)	H.Rept. 109–415 (H.Res. 717)
Mar. 29, 2006	The Future of Air Traffic Control: The R&D Agenda (Hearing held by the Subcommittee on Space and Aeronautics.)	109–42
Mar. 30, 2006	K–12 Science and Math Education Across the Federal Agencies (Hearing held by the Committee on Science.)	109–43

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Apr. 5, 2006	Markup: H.Res. 717, Directing the Secretary of Commerce to transmit to the House of Representatives a copy of a workforce globalization final draft report produced by the Technology Administration. (Markup held by the Committee on Science.)	H.Rept. 109–415 (H.Res. 717)
Apr. 6, 2006	Assessing the Goals, Schedule, and Costs of the Global Nuclear Energy Partnership (Hearing held by the Subcommittee on Energy.)	109–44
Apr. 21, 2006	Great Lakes Restoration: How? How Soon? (Field Briefing held by the Subcommittee on Environment, Technology, and Standards.)	109–A
Apr. 27, 2006	H.R. 5143, The H–Prize Act of 2006 (Hearing held by the Committee on Science.)	109–45
May 3, 2006	The Role of the National Science Foundation in K–12 Science and Math Education (Hearing held by the Committee on Science.)	109–46
May 3, 2006	Markup: H.R. 5143, The H–Prize Act of 2006 (Markup held by the Committee on Science.)	H.Rept. 109–456 (H.R. 5143)
May 4, 2006	Improving Drought Monitoring and Forecasting: H.R. 5136, the National Integrated Drought Information System Act of 2006 (Hearing held by the Subcommittee on Environment, Technology, and Standards.)	109–47
May 4, 2006	Markup: H.R. 5136, National Integrated Drought Information System Act of 2006 (Markup held by the Subcommittee on Environment, Technology, and Standards.)	H.Rept. 109–503 (H.R. 5136)
May 5, 2006	Innovation and Information Technology: The Government, University, and Industry Roles in Information Technology Research and Commercialization (Field Hearing held by the Committee on Science.)	109–48

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May 11, 2006	Inspector General Report on NOAA Weather Satellites (Hearing held by the Committee on Science.)	109–49
May 17, 2006	The Plug-in Hybrid Electric Vehicle Act of 2006 (Discussion Draft) (Hearing held by the Subcommittee on Energy.)	109–50
May 24, 2006	Views of the NIST Nobel Laureates on Science Policy (Hearing held by the Subcommittee on Environment, Technology, and Standards.)	109–51
June 5, 2006	Ending Our Addiction to Oil: Are Advanced Vehicles and Fuels the Answer? Field Hearing held by the Subcommittee on Energy.)	109–52
June 7, 2006	Markup: H.R. 5136, National Integrated Drought Information System Act of 2006; H.R. 5356, Early Career Research Act of 2006 H.R. 5358, Science and Mathematics Education for Competitiveness Act of 2006 (Markup held by the Committee on Science.)	H.Rept. 109–503 (H.R. 5136) H.Rept. 109–525 (H.R. 5356) H.Rept. 109–524 (H.R. 5358)
June 8, 2006	The Future of NPOESS: Results of the Nunn-McCurdy Review of NOAA's Weather Satellite Program (Hearing held by the Committee on Science.)	109–53
June 13, 2006	The NASA Workforce: Does NASA Have the Right Strategy and Policies to Retain and Build the Workforce It Will Need? (Hearing held by the Subcommittee on Space and Aeronautics.)	109–54
June 14, 2006	Markup: H.R. 5450, National Oceanic and Atmospheric Administration Act (Markup held by the Committee on Science.)	H.Rept. 109–545, Pt. 1 (H.R. 5450)

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June 27, 2006	Markup: H.R. 5656, Energy Research, Development, Demonstration, and Commercial Application Act of 2006 (Markup held by the Committee on Science.)	H.Rept. 109–611 (H.R. 5656)
July 18, 2006	The National Academy of Sciences' Decadal Plan for Aeronautics: A Blueprint for NASA? (Hearing held by the Subcommittee on Space and Aeronautics.)	109–55 w/109–64
July 19, 2006	Voting Machines: Will the New Standards and Guidelines Help Prevent Future Problems? (Joint Hearing held by the Committee on Science and the Committee on House Administration.)	109–56
July 25, 2006	Scientific and Technical Advice for the U.S. Congress (Hearing held by the Committee on Science.)	109–57
July 27, 2006	Undersea Research and Ocean Exploration: H.R. 3835, the National Ocean Exploration Program Act of 2005 and the Undersea Research Program Act of 2005 (Hearing held by the Subcommittee on Environment, Technology, and Standards.)	109–58
August 2, 2006	Renewable Energy Technologies—Research Directions, Investment Opportunities, and Challenges to Commercial Application in the United States and the Developing World (Field Hearing held by the Subcommittee on Energy.)	109–59
Sept. 13, 2006	How Can Technologies Help Secure Our Borders? (Hearing held by the Committee on Science.)	109–60
Sept. 20, 2006	International Polar Year: The Scientific Agenda and the Federal Role (Hearing held by the Subcommittee on Research.)	109–61
Sept. 20, 2006	Department of Energy's Plan for Climate Change Technology Programs (Hearing held by the Subcommittee on Energy.)	109–62

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Sept. 21, 2006	Research on Environmental and Safety Impacts of Nanotechnology: What Are the Federal Agencies Doing? (Hearing held by the Committee on Science.)	109–63
Sept. 26, 2006	The National Academy of Sciences' Decadal Plan for Aeronautics: NASA's Response (Hearing held by the Subcommittee on Space and Aeronautics.)	109–64 w/109–55
Sept. 28, 2006	Implementing the Vision for Space Exploration: Development of the Crew Exploration Vehicle (Hearing held by the Committee on Science.)	109–65
Sept. 29, 2006	GAO Report on NOAA's Weather Satellite Program (Hearing held by the Committee on Science.)	109–66
Dec. 31, 2006	Compilation of Markups (Markups held by the Committee on Science.)	109–67

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