109TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { 109–36

HIGH-PERFORMANCE COMPUTING REVITALIZATION ACT OF 2005

APRIL 12, 2005.—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

together with

ADDITIONAL VIEWS

[To accompany H.R. 28]

[Including cost estimate of the Congressional Budget Office]

The Committee on Science, to whom was referred the bill (H.R. 28) to amend the High-Performance Computing Act of 1991, having considered the same, report favorably thereon with an amendment and recommend that the bill as amended do pass.

CONTENTS

39–006

I. AMENDMENT

The amendment is as follows:

Strike all after the enacting clause and insert the following:

SECTION 1. SHORT TITLE.

This Act may be cited as the "High-Performance Computing Revitalization Act of 2005".

SEC. 2. FINDINGS.

Section 2 of the High-Performance Computing Act of 1991 (15 U.S.C. 5501) is amended by adding at the end the following new paragraph:

"(10) Commercial application of the results of Federal investment in basic and computing science is consistent with longstanding United States technology transfer policy and is a critical national priority, particularly with regard to cybersecurity and other homeland security applications, because of the urgent needs of commercial, academic, and individual users as well as the Federal and State Governments.".

SEC. 3. DEFINITIONS.

Section 4 of the High-Performance Computing Act of 1991 (15 U.S.C. 5503) is amended—

(1) in paragraph (2), by inserting "and multidisciplinary teams of researchers" after "high-performance computing resources";

(2) in paragraph (3)—

(A) by striking "scientific workstations,";

(B) by striking "(including vector supercomputers and large scale parallel systems)";

(C) by striking "and applications" and inserting "applications"; and

(D) by inserting ", and the management of large data sets" after "systems software";

(3) in paragraph (4), by striking "packet switched"; and

(4) by amending paragraphs (5) and (6) to read as follows:

"(5) 'Program' means the High-Performance Computing Research and Development Program described in section 101; and

"(6) 'Program Component Areas' means the major subject areas under which are grouped related individual projects and activities carried out under the Program.".

SEC. 4. HIGH-PERFORMANCE COMPUTING RESEARCH AND DEVELOPMENT PROGRAM.

Title I of the High-Performance Computing Act of 1991 (15 U.S.C. 5511 et seq.) is amended—

(1) in the title heading, by striking "**AND THE NATIONAL RESEARCH AND EDUCATION NETWORK**" and inserting "**RESEARCH AND DEVELOPMENT**";

(2) in section 101—

(A) the section heading, by striking "national high-performance computing" and inserting "high-performance computing research and development";

(B) in subsection (a)—

(i) in the subsection heading, by striking "NATIONAL HIGH-PERFORMANCE COMPUTING" and inserting "HIGH-PERFORMANCE COMPUTING RESEARCH AND DEVELOPMENT";

(ii) by striking paragraphs (1) and (2) and inserting the following: "(1) The President shall implement a High-Performance Computing Research and Development Program, which shall—

"(A) provide for long-term basic and applied research on high-performance computing;

"(B) provide for research and development on, and demonstration of, technologies to advance the capacity and capabilities of high-performance computing and networking systems;

"(C) provide for sustained access by the research community in the United States to high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, including provision for technical support for users of such systems;

"(D) provide for efforts to increase software availability, productivity, capability, security, portability, and reliability;

"(E) provide for high-performance networks, including experimental testbed networks, to enable research and development on, and demonstration of, advanced applications enabled by such networks;

"(F) provide for computational science and engineering research on mathematical modeling and algorithms for applications in all fields of science and engineering;

"(G) provide for the technical support of, and research and development on, high-performance computing systems and software required to address Grand Challenges;

"(H) provide for educating and training additional undergraduate and graduate students in software engineering, computer science, computer and network security, applied mathematics, library and information science, and computational science; and

"(I) provide for improving the security of computing and networking systems, including Federal systems, including research required to establish security standards and practices for these systems.";

(iii) by redesignating paragraphs (3) and (4) as paragraphs (2) and (3), respectively;

(iv) in paragraph (2), as so redesignated by clause (iii) of this subparagraph—

(I) by striking subparagraph (B);

(II) by redesignating subparagraphs (A) and (C) as subparagraphs (D) and (F), respectively;

(III) by inserting before subparagraph (D), as so redesignated by subclause (II) of this clause, the following new subparagraphs:

"(A) establish the goals and priorities for Federal high-performance computing research, development, networking, and other activities;

"(B) establish Program Component Areas that implement the goals established under subparagraph (A), and identify the Grand Challenges that the Program should address;

"(C) provide for interagency coordination of Federal high-performance computing research, development, networking, and other activities undertaken pursuant to the Program;"; and

(IV) by inserting after subparagraph (D), as so redesignated by subclause (II) of this clause, the following new subparagraph:

"(E) develop and maintain a research, development, and deployment roadmap for the provision of high-performance computing systems under paragraph (1)(C); and"; and

(v) in paragraph (3), as so redesignated by clause (iii) of this subparagraph—

(I) by striking "paragraph (3)(A)" and inserting "paragraph (2)(D)";

(II) by amending subparagraph (A) to read as follows:

"(A) provide a detailed description of the Program Component Areas, including a description of any changes in the definition of or activities under the Program Component Areas from the preceding report, and the reasons for such changes, and a description of Grand Challenges supported under the Program;";

(III) in subparagraph (C), by striking "specific activities" and all that follows through "the Network" and inserting "each Program Component Area";

(IV) in subparagraph (D), by inserting "and for each Program Component Area" after "participating in the Program";

(V) in subparagraph (D), by striking "applies;" and inserting "applies; and";

(VI) by striking subparagraph (E) and redesignating subparagraph (F) as subparagraph (E); and

(VII) in subparagraph (E), as so redesignated by subclause (VI) of this clause, by inserting "and the extent to which the Program incorporates the recommendations of the advisory committee established under subsection (b)" after "for the Program";

(C) in subsection (b)—

(i) by redesignating paragraphs (1) through (5) as subparagraphs (A) through (E), respectively;

(ii) by inserting "(1)" after "ADVISORY COMMITTEE.—";

(iii) in paragraph (1)(C), as so redesignated by clauses (i) and (ii) of this subparagraph, by inserting ", including funding levels for the Program Component Areas" after "of the Program";

(iv) in paragraph (1)(D), as so redesignated by clauses (i) and (ii) of this subparagraph, by striking "computing" and inserting "high-performance computing and networking"; and

(v) by adding at the end the following new paragraph:

"(2) In addition to the duties outlined in paragraph (1), the advisory committee shall conduct periodic evaluations of the funding, management, coordination, implementation, and activities of the Program, and shall report not less frequently than once every two fiscal years to the Committee on Science of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate on its findings and recommendations. The first report shall be due within one year after the date of enactment of this paragraph."; and

(D) in subsection (c)(1)(A), by striking "Program or" and inserting "Program Component Areas or"; and

(3) by striking sections 102 and 103.

SEC. 5. AGENCY ACTIVITIES.

Title II of the High-Performance Computing Act of 1991 (15 U.S.C. 5521 et seq.) is amended—

(1) by amending subsection (a) of section 201 to read as follows:

"(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the National Science Foundation shall—

"(1) support research and development to generate fundamental scientific and technical knowledge with the potential of advancing high-performance computing and networking systems and their applications;

"(2) provide computing and networking infrastructure support to the research community in the United States, including the provision of high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, and including support for advanced software and applications development, for all science and engineering disciplines; and

"(3) support basic research and education in all aspects of high-performance computing and networking.";

(2) by amending subsection (a) of section 202 to read as follows:

"(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the National Aeronautics and Space Administration shall conduct basic and applied research in high-performance computing and networking, with emphasis on—

"(1) computational fluid dynamics, computational thermal dynamics, and computational aerodynamics;

"(2) scientific data dissemination and tools to enable data to be fully analyzed and combined from multiple sources and sensors;

"(3) remote exploration and experimentation; and

"(4) tools for collaboration in system design, analysis, and testing.";

(3) in section 203—

(A) by striking subsections (a) through (d) and inserting the following:

"(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the Secretary of Energy shall—

"(1) conduct and support basic and applied research in high-performance computing and networking to support fundamental research in science and engineering disciplines related to energy applications; and

"(2) provide computing and networking infrastructure support, including the provision of high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, and including support for advanced software and applications development, for science and engineering disciplines related to energy applications."; and

(B) by redesignating subsection (e) as subsection (b);

(4) by amending subsection (a) of section 204 to read as follows:

"(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I—

"(1) the National Institute of Standards and Technology shall—

"(A) conduct basic and applied metrology research needed to support high-performance computing and networking systems;

"(B) develop benchmark tests and standards for high-performance computing and networking systems and software;

"(C) develop and propose voluntary standards and guidelines, and develop measurement techniques and test methods, for the interoperability of high-performance computing systems in networks and for common user interfaces to high-performance computing and networking systems; and

"(D) work with industry and others to develop, and facilitate the implementation of, high-performance computing applications to solve science and engineering problems that are relevant to industry; and

"(2) the National Oceanic and Atmospheric Administration shall conduct basic and applied research on high-performance computing applications, with emphasis on—

"(A) improving weather forecasting and climate prediction;

"(B) collection, analysis, and dissemination of environmental information; and

"(C) development of more accurate models of the ocean-atmosphere system."; and

(5) by amending subsection (a) of section 205 to read as follows:

"(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the Environmental Protection Agency shall conduct basic and applied research directed toward advancement and dissemination of computational techniques and software tools for high-performance computing systems with an emphasis on modeling to—

"(1) develop robust decision support tools;

"(2) predict pollutant transport and the effects of pollutants on humans and on ecosystems; and

"(3) better understand atmospheric dynamics and chemistry.".

II. PURPOSE OF THE BILL

The purpose of the bill is to revitalize interagency coordination and planning for the interagency program established by the High-Performance Computing Act of 1991 and to focus greater attention and resources on federal high-performance computing programs. The program includes activities at the National Science Foundation (NSF), the Department of Energy (DOE) Office of Science, the National Aeronautics and Space Administration (NASA), the National Institute of Standards and Technology (NIST), the National Oceanic and Atmospheric Administration (NOAA), and the Environmental Protection Agency (EPA).

III. BACKGROUND AND NEED FOR THE LEGISLATION

State of high-performance computing in the world today

High-performance computers (also called supercomputers or high-end computers) are an essential component of U.S. scientific, industrial, and military competitiveness.

However, in June 2002, a new Japanese supercomputer—the "Earth Simulator"—was named the fastest in the world, a title it held through November 2004. The success of Japan's Earth Simulator, both its speed and its efficiency, caused a great deal of soul-searching in the high-performance computing community in the U.S. The Earth Simulator was the culmination of a serious, sustained investment by the Japanese government in research, development, and construction of a customized computer designed to be the best in the world at tackling specific scientific and engineering tasks, including climate modeling and earthquake simulation. While Japan pursued this course, the U.S. chose to favor the use of commercially available components for constructing high-performance computers. An advantage of this approach was that it made high-performance computers more cost-effective to develop by leveraging development costs against a larger market. A disadvantage was that certain kinds of research questions are difficult to pursue on the kinds of computers that can be built with commercial components.

The role of the U.S. Government in high-performance computing

Despite the technical success of the Japanese, the return of U.S.-made supercomputers to the top two positions on the November 2004 list of the fastest supercomputers in the world demonstrated that the U.S. is still highly competitive in high-performance computing. The depth and strength of U.S. capability stems in part from the sustained research and development program carried out by federal science agencies under an interagency program codified by the High-Performance Computing Act of 1991. That Act is widely credited with reinvigorating U.S. high-performance computing capabilities after a period of relative decline during the late 1980s.

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 computers for a wide variety of researchers by allowing them to use government-supported computers at universities and government laboratories.

According to the National Coordination Office of the National Information Technology Research and Development Program (NITRD), 10 agencies or offices participate in the high-end computing elements of the NITRD program. The total estimated NITRD budget for all 10 agencies in Fiscal Year 2005 (FY05) for high-performance computing is $967.1 million. The largest research and development programs are at NSF, $300.7 million, the DOE Office of Science, $205.5 million, and the National Institutes of Health (NIH), $200.4 million. Other major agency activities (with funding ranging between $54 and $66 million each) are at the Defense Advanced Research Projects Agency, the National Security Agency, NASA, and DOE's National Nuclear Security Administration (NNSA). These budget estimates do not include the procurement costs for high-performance computers purchased by agencies such as NNSA and NOAA for computational science related to their missions. In addition to high-end computing, the NITRD program includes other program component areas, such as large scale networking.

IV. Summary of Hearings

On May 13, 2004, the Committee on Science held a hearing to examine the current state of federal high-performance computing research and development activities. Dr. John Marburger, Director of the Office of Science and Technology Policy (OSTP), endorsed H.R. 4218 (the virtually identical version of this Act introduced in the 108th Congress) on behalf of the Administration. Dr. Marburger also released the report of OSTP's High-End Computing Revitalization Task Force, Federal Plan for High-End Computing, during his appearance before the Committee.

The other witnesses also voiced their support for the legislation. The Committee heard testimony from Dr. Irving Wladawsky-Berger, Vice President for Technology and Strategy, IBM Corporation; Dr. Daniel Reed, Director of the Renaissance Computing Institute at the University of North Carolina at Chapel Hill; and Dr.

Rick Stevens, Director of the Mathematics and Computer Science Division at Argonne National Laboratory. Witnesses addressed the need for an ongoing, coordinated interagency planning process to guide federal investment in high-performance computing procurements, research, and development. The witnesses noted the importance of the federal role in high-performance computing to ensure U.S. leadership in the field, and to ensure that U.S. academic and industrial researchers have access to leadership class machines.

V. COMMITTEE ACTIONS

On January 4, 2005, Representative Judy Biggert, Representative Lincoln Davis, and Representative Sherwood Boehlert introduced H.R. 28, the High-Performance Computing Revitalization Act of 2005, a bill to update the High-Performance Computing Act of 1991 and to strengthen the U.S. position in high-performance computing.

The Full Committee on Science met on Thursday, March 17, 2005, to consider the bill.

Mrs. Biggert offered an amendment to add a finding to the High-Performance Computing Act of 1991 that emphasizes the importance of commercial application of the results of Federal investment in computer science. The amendment was adopted by a voice vote.

Mr. Sherman offered an amendment to require that NSF support research into the implications of computers that would be capable of mimicking human abilities to learn, reason, and make decisions. The amendment was defeated by a roll call vote (Y–17; N–19).

Mr. Gordon moved that the Committee favorably report the bill, H.R. 28, to the House with the recommendation that the bill do pass, and that the staff be instructed to make technical and conforming changes to the bill and prepare the legislative report and that the Chairman take all necessary steps to bring the bill before the House for consideration. With a quorum present, the motion was agreed to by a voice vote.

VI. SUMMARY OF MAJOR PROVISIONS OF THE BILL

Finds that commercial application of the results of Federal investment in computer science is critical.

Defines "high-performance computing" as advanced computing, communications, and information technologies, including supercomputer systems, high-capacity and high-speed networks, special purpose and experimental systems, applications and systems software, and the management of large data sets.

Updates the authorized activities of the interagency High-Performance Computing Research and Development Program. Requires the program to provide for long-term basic and applied research on high-performance computing; sustained access by the research community in the United States 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.

Updates and strengthens the coordination responsibilities of the Director of the Office of Science and Technology Policy (OSTP). Requires the Director to establish the goals and priorities for Federal high-performance computing research, development, networking, and other activities and to develop and maintain a research, development, and deployment roadmap for the provision of high-performance computing systems for use by the research community in the United States.

Requires the President's Information Technology Advisory Committee (PITAC) to conduct periodic evaluations of the funding, management, coordination, implementation, and activities of the Program, and to report to Congress on the findings.

Authorizes specific responsibilities for the National Science Foundation, the Department of Energy Office of Science, the National Aeronautics and Space Administration, the National Institute of Standards and Technology, the National Oceanic and Atmospheric Administration, and the Environmental Protection Agency under the High-Performance Computing Research and Development Program. Requires NSF and the DOE Office of Science to provide U.S. researchers with access to world-class high-performance computing systems.

VII. Section-by-Section Analysis (by Title and Section)

SECTION-BY-SECTION ANALYSIS OF H.R. 28, THE HIGH-PERFORMANCE COMPUTING REVITALIZATION ACT OF 2005

Section 1. Short title

"High-Performance Computing Revitalization Act of 2005."

Section 2. Findings

Amends section 2 of the High-Performance Computing Act of 1991 (HPC Act) to add a finding that emphasizes the importance of commercial application of the results of Federal investment in computer science.

Section 3. Definitions

Amends section 4 of the High-Performance Computing Act of 1991 (HPC Act) to further elaborate on, or amend, the definition of terms used in the Act:

"Grand Challenge" means a fundamental problem in science or engineering, with broad economic and scientific impact, whose solution will require the application of high-performance computing resources and multidisciplinary teams of researchers;

"High-performance computing" means advanced computing, communications, and information technologies, including supercomputer systems, high-capacity and high-speed networks, special purpose and experimental systems, applications and systems software, and the management of large data sets;

"Program" means the High-Performance Computing Research and Development Program described in section 101;

"Program Component Areas" means the major subject areas under which are grouped related individual projects and activities carried out under the Program.

Strikes the definition of "Network" because it refers to the National Research and Education Network, which no longer exists as such.

Section 4. High-Performance Computing Research and Development Program

Amends section 101 of the HPC Act, which describes the organization and responsibilities of the interagency research and development program originally referred to as the National High-Performance Computing Program—and renamed the High-Performance Computing Research and Development Program in this Act. Requires the program to:

Provide for long-term basic and applied research on high-performance computing;

Provide for research and development on, and demonstration of, technologies to advance the capacity and capabilities of high-performance computing and networking systems;

Provide for sustained access by the research community in the United States to high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, including provision for technical support for users of such systems;

Provide for efforts to increase software availability, productivity, capability, security, portability, and reliability;

Provide for high-performance networks, including experimental testbed networks, to enable research and development on, and demonstration of, advanced applications enabled by such networks;

Provide for computational science and engineering research on mathematical modeling and algorithms for applications in all fields of science and engineering;

Provide for the technical support of, and research and development on, high-performance computing systems and software required to address Grand Challenges;

Provide for educating and training additional undergraduate and graduate students in software engineering, computer science, computer and network security, applied mathematics, library and information science, and computational science;

Provide for improving the security of computing and networking systems, including research required to establish security standards and practices for these systems.

Requires the Director of the Office of Science and Technology Policy (OSTP) to:

Establish the goals and priorities for Federal high-performance computing research, development, networking, and other activities;

Establish Program Component Areas that implement the goals established for the Program and identify the Grand Challenges that the Program should address;

Provide for interagency coordination of Federal high-performance computing research, development, networking, and other activities undertaken pursuant to the Program;

Develop and maintain a research, development, and deployment roadmap for the provision of high-performance computing

systems for use by the research community in the United States.

Leaves substantially unchanged the provisions of the HPC Act requiring the Director of OSTP to:

Provide an annual report to Congress, along with the annual budget request, describing the implementation of the Program, including current and proposed funding levels and programmatic changes, if any, from the previous year;

Consult with academic, State, and other appropriate groups conducting research on and using high-performance computing.

Requires the Director of OSTP to include in his annual report to Congress:

A detailed description of the Program Component Areas, including a description of any changes in the definition of activities under the Program Component Areas from the previous year, and the reasons for such changes, and a description of Grand Challenges supported under the Program;

An analysis of the extent to which the Program incorporates the recommendations of the Advisory Committee established by the HPC Act—currently referred to as the President's Information Technology Advisory Committee (PITAC).

Requires PITAC to conduct periodic evaluations of the funding, management, coordination, implementation, and activities of the Program, and to report to Congress once every two fiscal years, with the first report due within one year of enactment.

Repeals section 102 of HPC Act, the "National Research and Education Network," which required the development of a network to link research and educational institutions, government, and industry. This network was developed but has since been supplanted by the Internet.

Repeals section 103 of the HPC Act, "Next Generation Internet," as this program is no longer in existence.

Section 5. Agency activities

Amends section 201 of the HPC Act, which describes the responsibilities of the National Science Foundation (NSF) under the Program. Requires NSF to:

Support research and development to generate fundamental scientific and technical knowledge with the potential of advancing high-performance computing and networking systems and their applications;

Provide computing and networking infrastructure support to the research community in the United States, including the provision of high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, including support for advanced software and applications development, for all science and engineering disciplines;

Support basic research and education in all aspects of high-performance computing and networking.

Amends section 202 of the HPC Act, which describes the responsibilities of the National Aeronautics and Space Administration (NASA) under the Program. Requires NASA to conduct basic and applied research in high-performance networking, with emphasis on:

Computational fluid dynamics, computational thermal dynamics, and computational aerodynamics;

Scientific data dissemination and tools to enable data to be fully analyzed and combined from multiple sources and sensors;

Remote exploration and experimentation;

Tools for collaboration in system design, analysis, and testing.

Amends section 203 of the HPC Act, which describes the responsibilities of the Department of Energy (DOE) under the Program. Requires DOE to:

Conduct and support basic and applied research in high-performance computing and networking to support fundamental research in science and engineering disciplines related to energy applications;

Provide computing and networking infrastructure support, including the provision of high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, and including support for advanced software and applications development, for science and engineering disciplines related to energy applications.

Amends section 204 of the HPC Act, which describes the responsibilities of the Department of Commerce, including the National Institute of Standards and Technology (NIST) and the National Oceanic and Atmospheric Administration (NOAA), under the Program.

Requires NIST to:

Conduct basic and applied metrology research needed to support high-performance computing and networking systems;

Develop benchmark tests and standards for high-performance computing and networking systems and software;

Develop and propose voluntary standards and guidelines, and develop measurement techniques and test methods, for the interoperability of high-performance computing systems in networks and for common user interfaces to high-performance computing and networking systems;

Work with industry and others to develop, and facilitate the implementation of, high-performance computing applications to solve science and engineering problems that are relevant to industry.

Requires NOAA to conduct basic and applied research in high-performance computing applications, with emphasis on:

Improving weather forecasting and climate prediction;

Collection, analysis, and dissemination of environmental information;

Development of more accurate models of the ocean-atmosphere system.

Amends section 205 of the HPC Act, which describes the responsibilities of the Environmental Protection Agency (EPA) under the Program. Requires EPA to conduct basic and applied research directed toward the advancement and dissemination of computational techniques and software tools with an emphasis on modeling to:

Develop robust decision-support tools;

Predict pollutant transport and their effects on humans and on ecosystems;

Better understand atmospheric dynamics and chemistry.

VIII. COMMITTEE VIEWS

Interagency planning and coordination

The High-Performance Computing Act of 1991 codified an interagency planning process that remains in place today. The Committee expects all of the participating agencies to engage in a forward-looking planning and coordination process led by OSTP to coordinate high-performance computing activities across the federal government. The agencies, led by OSTP, should submit a coordinated budget for federal high-performance computing activities to the Office of Management and Budget. Furthermore, the agencies, led by OSTP, should develop and periodically refine a research, development, and deployment roadmap for high-performance computing systems. In addition, in formulating plans for the Program, the Committee expects the participating agencies to take into consideration the findings and recommendations of the President's Information Technology Advisory Committee, which is required to conduct recurring reviews of the planning, implementation, and contents of the Program.

Assuring U.S. researchers sustained access to high-performance computing infrastructure

The Committee believes that the High-Performance Computing Research and Development Program, in general, and NSF and DOE's Office of Science, in particular, must provide U.S. researchers with sustained access to high-performance computers that are among the most advanced in the world in terms of performance in solving scientific and engineering problems. This is necessary in order for the U.S. to maintain its position as a world leader in scientific and engineering fields and in technology innovation. By "among the most advanced in the world," the Committee means general purpose scientific computing systems that would rank among the top few systems in existence in performance (1) on widely accepted standardized tests, such as the LINPACK Benchmark used to generate the Top 500 list; and (2) on actual production codes for solving the most demanding problems in science and engineering disciplines. The Committee intends that such computing systems be equivalent to "Leadership Systems" as described in the May 10, 2004 report of the Office of Science and Technology Policy, Federal Plan for High-End Computing.

The Committee is supportive of recent initiatives to make DOE's Office of Science high-performance computing resources more broadly available to researchers not otherwise supported by DOE and to allocate those resources on a competitive, merit-reviewed basis. The Committee encourages DOE to increase the quantity of supercomputing resources allocated to U.S. researchers in this fashion and to provide information to the research community on the long-term availability of these resources.

The Committee is supportive of continued NSF funding of software, algorithms, networking and data storage techniques, and education and outreach activities associated with high-performance

computing. However, the Committee emphasizes that significant attention and funding must also be devoted to procurement of high-performance computing hardware for high-performance computing user facilities, including the NSF supercomputer centers.

Overall, the Committee believes that for the federal government to effectively meet the scientific community's high-performance computing needs, NSF and DOE's Office of Science each must support Leadership Systems which should be available for use by researchers from academia, industry, and government laboratories. By use of the phrase "sustained access" the Committee expects NSF and DOE to develop and maintain plans and budgets to assure ongoing improvements in the capability of high-performance computing user facilities, such as the NSF supercomputer centers and DOE's Office of Science high-end (high-performance) computing user facilities, so that the computing infrastructure made available through these facilities remains among the most advanced in the world.

But the most advanced high-performance computing hardware, on its own, will not be enough to enable researchers to conduct the most advanced science. The Committee believes that the development of software, applications, networking, and data storage and management techniques, including support for the applied mathematics required to develop advanced software and algorithms, will be essential to enable researchers to make effective use of the high-performance computing resources made available under this Act.

National Information Technology Research and Development Program (NITRD)

The NITRD program includes six program component areas: High End Computing, Large Scale Networking, Software Design and Productivity, Human Computer Interaction and Information Management, High Confidence Software and Systems, and Social, Economic, and Workforce Implications of Information Technology. While the focus of this Act is on high-performance computing, the Committee recognizes that all program component areas are essential parts of the federal information technology research and development effort and expects the planning and coordination process for the NITRD program to result in an appropriate balance of resources among the program component areas. The committee expects the annual report for the program to provide the rationale for the allocation of funding among the program component areas. The Committee expects that the allocations for the high end computing program component area will be sufficient to carry out this Act.

IX. Cost Estimate

A cost estimate and comparison prepared by the Director of the Congressional Budget Office under section 402 of the Congressional Budget Act of 1974 has been timely submitted to the Committee on Science prior to the filing of this report and is included in Section IX of this report pursuant to House Rule XIII, clause 3(c)(3).

H.R. 28 does not contain new budget authority, credit authority, or changes in revenues or tax expenditures. H.R. 28 does not authorize additional discretionary spending, as described in the Congressional Budget Office report on the bill, which is contained in Section X of this report.

X. CONGRESSIONAL BUDGET OFFICE COST ESTIMATE

APRIL 4, 2005.

Hon. SHERWOOD L. BOEHLERT,
Chairman, Committee on Science,
House of Representatives, Washington, DC.

DEAR MR. CHAIRMAN: The Congressional Budget Office has prepared the enclosed cost estimate for H.R. 28, the High-Performance Computing Revitalization Act of 2005.

If you wish further details on this estimate, we will be pleased to provide them. The CBO staff contact is Mike Waters.

Sincerely,

DOUGLAS HOLTZ-EAKIN,
Director.

Enclosure.

H.R. 28—High-Performance Computing Revitalization Act of 2005

Summary: H.R. 28 would amend existing statutory guidelines for interagency research and development (R&D) related to high-performance computing. Nondefense R&D on high-performance computing is conducted at six agencies: the National Science Foundation (NSF), the Department of Energy (DOE), the National Institutes of Health, the National Aeronautics and Space Administration, the Department of Commerce, and the Environmental Protection Agency. This bill would realign program objectives with current R&D priorities, repeal authorizations for activities that are technologically outdated and emphasize newer issues, such as providing researchers sustained access to the most advanced computing systems in the world. In addition, the bill would direct the program's advisory committee to evaluate program funding, management, and effectiveness on a periodic basis.

CBO estimates that implementing H.R. 28 would cost a total of $220 million over the 2006–2010 period, assuming appropriation of necessary funds for the new directives in the bill. CBO estimates that enacting H.R. 28 would have no effect on direct spending or revenues.

H.R. 28 contains no intergovernmental or private-sector mandates as defined in the Unfunded Mandates Reform Act (UMRA) and would impose no costs on state, local, and tribal governments.

Estimated cost to the Federal Government: The estimated budgetary impact of H.R. 28 is shown in the following table. For this estimate, CBO assumes that the bill will be enacted during 2005 and that outlays will follow historical patterns for similar R&D infrastructure programs. The cost of this legislation primarily falls within budget function 250 (general science, space, and technology).

	By fiscal year, in millions of dollars—				
	2006	2007	2008	2009	2010
CHANGES IN SPENDING SUBJECT TO APPROPRIATION					
Estimated Authorization Level	34	34	70	86	88
Estimated Outlays	10	22	45	62	81

Basis of estimate: CBO expects that agencies would need to increase spending to meet the bill's new goal of providing researchers with sustained access to "high-performance computing systems that

are among the most advanced in the world in terms of performance in solving scientific and engineering problems." (The six agencies currently conducting nondefense R&D on high-performance computing systems received appropriations of approximately $1.9 billion in 2005.) For this estimate, CBO assumes that this provision would authorize appropriations to provide sustained access to such leadership-class facilities. Under the bill, two agencies—NSF and DOE—would be required to provide such systems for researchers.

According to a May 2004 federal task report on high-end computing, leadership-class facilities are high-end computers that will enable breakthroughs in challenging scientific and engineering computational problems. There are no such systems currently available for U.S. civilian researchers, but CBO expects that DOE will build one leadership-class facility under current law.

According to DOE and NSF, such systems are typically acquired over a three-year period and need to be replaced every three or four years. Hence, it is likely that NSF and DOE would need continuous funding for facility acquisition to provide researchers with sustained access to the most advanced computers. Based on information from those agencies, CBO expects that the cost of individual facilities could range from $60 million to $150 million (or an average of about $100 million in 2005), depending on the capabilities of the facilities and the software and infrastructure needed to support them. Experience with existing systems suggest that operations and maintenance for each facility would cost about $15 million a year. For this estimate, CBO assumes that NSF would build one facility over the 2006–2008 period and would begin acquiring a replacement facility in 2009; we assume that DOE would begin acquiring its next replacement facility in 2008.

Intergovernmental and private-sector impact: H.R. 28 contains no intergovernmental or private-sector mandates as defined in UMRA and would impose no costs on state, local, and tribal governments.

Estimate prepared by: Federal Costs: Mike Waters; Impact on State, Local, and Tribal Governments: Gregory Waring; Impact on the Private Sector: Craig Cammarata.

Estimate approved by: Peter H. Fontaine, Deputy Assistant Director for Budget Analysis.

XI. Compliance With Public Law 104–4 (Unfunded Mandates)

H.R. 28 contains no unfunded mandates.

XII. Committee Oversight Findings and Recommendations

The Committee on Science's oversight findings and recommendations are reflected in the body of this report.

XIII. Statement on General Performance Goals and Objectives

Pursuant to clause (3)(c) of House rule XIII, the goals of H.R. 28 are to update the activities of the interagency High-Performance Computing Research and Development Program; to authorize specific program areas at NSF, DOE, NASA, NIST, NOAA, and EPA; and to expand the responsibilities of OSTP and PITAC in order to

enhance the planning, management, and coordination of the Program.

XIV. Constitutional Authority Statement

Article I, section 8 of the Constitution of the United States grants Congress the authority to enact H.R. 28.

XV. Federal Advisory Committee Statement

The functions of the advisory committee required by H.R. 28 could be performed by one or more agencies or by enlarging the mandate of another existing advisory committee.

XVI. Congressional Accountability Act

The Committee finds that H.R. 28 does not relate to the terms and conditions of employment or access to public services or accommodations within the meaning of section 102(b)(3) of the Congressional Accountability Act (Public Law 104–1).

XVII. Statement on Preemption of State, Local, or Tribal Law

This bill is not intended to preempt any state, local, or tribal law.

XVIII. Changes in Existing Law Made by the Bill, as Reported

In compliance with clause 3(e) of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italic, existing law in which no change is proposed is shown in roman):

HIGH-PERFORMANCE COMPUTING ACT OF 1991

* * * * * * *

SEC. 2. FINDINGS.

The Congress finds the following:

(1) * * *

* * * * * * *

(10) Commercial application of the results of Federal investment in basic and computing science is consistent with longstanding United States technology transfer policy and is a critical national priority, particularly with regard to cybersecurity and other homeland security applications, because of the urgent needs of commercial, academic, and individual users as well as the Federal and State Governments.

* * * * * * *

SEC. 4. DEFINITIONS.

As used in this Act, the term—

(1) * * *

(2) "Grand Challenge" means a fundamental problem in science or engineering, with broad economic and scientific impact, whose solution will require the application of high-per-

formance computing resources *and multidisciplinary teams of researchers*;

(3) "high-performance computing" means advanced computing, communications, and information technologies, including [scientific workstations,] supercomputer systems [(including vector supercomputers and large scale parallel systems)], high-capacity and high-speed networks, special purpose and experimental systems, [and] applications and systems software*, and the management of large data sets*;

(4) "Internet" means the international computer network of both Federal and non-Federal interoperable [packet switched] data networks;

[(5) "Network" means a computer network referred to as the National Research and Education Network established under section 102; and

[(6) "Program" means the National High-Performance Computing Program described in section 101.]

(5) "Program" means the High-Performance Computing Research and Development Program described in section 101; and

(6) "Program Component Areas" means the major subject areas under which are grouped related individual projects and activities carried out under the Program.

TITLE I—HIGH-PERFORMANCE COMPUTING [AND THE NATIONAL RESEARCH AND EDUCATION NETWORK] *RESEARCH AND DEVELOPMENT*

SEC. 101. [NATIONAL HIGH-PERFORMANCE COMPUTING] *HIGH-PERFORMANCE COMPUTING RESEARCH AND DEVELOPMENT* PROGRAM.

(a) [NATIONAL HIGH-PERFORMANCE COMPUTING] *HIGH-PERFORMANCE COMPUTING RESEARCH AND DEVELOPMENT* PROGRAM.—[(1) The President shall implement a National High-Performance Computing Program, which shall—

[(A) establish the goals and priorities for Federal high-performance computing research, development, networking, and other activities; and

[(B) provide for interagency coordination of Federal high-performance computing research, development, networking, and other activities undertaken pursuant to the Program.

[(2) The Program shall—

[(A) provide for the development of technologies to advance the capacity and capabilities of the Internet;

[(B) provide for high performance testbed networks to enable the research, development, and demonstration of advanced networking technologies and to develop and demonstrate advanced applications made possible by the existence of such testbed networks;

[(C) promote connectivity among computer networks of Federal agencies and departments;

[(D) provide for efforts to increase software availability, productivity, capability, portability, and reliability;

[(E) provide for improved dissemination of Federal agency data and electronic information;

[(F) provide for acceleration of the development of high-performance computing systems, subsystems, and associated software;

[(G) provide for the technical support and research and development of high-performance computing software and hardware needed to address Grand Challenges;

[(H) provide for educating and training additional undergraduate and graduate students in software engineering, computer science, library and information science, and computational science; and

[(I) provide—

[(i) for the security requirements, policies, and standards necessary to protect Federal research computer networks and information resources accessible through Federal research computer networks, including research required to establish security standards for high-performance computing systems and networks; and

[(ii) that agencies and departments identified in the annual report submitted under paragraph (3)(A) shall define and implement a security plan consistent with the Program and with applicable law.] *(1) The President shall implement a High-Performance Computing Research and Development Program, which shall—*

(A) provide for long-term basic and applied research on high-performance computing;

(B) provide for research and development on, and demonstration of, technologies to advance the capacity and capabilities of high-performance computing and networking systems;

(C) provide for sustained access by the research community in the United States to high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, including provision for technical support for users of such systems;

(D) provide for efforts to increase software availability, productivity, capability, security, portability, and reliability;

(E) provide for high-performance networks, including experimental testbed networks, to enable research and development on, and demonstration of, advanced applications enabled by such networks;

(F) provide for computational science and engineering research on mathematical modeling and algorithms for applications in all fields of science and engineering;

(G) provide for the technical support of, and research and development on, high-performance computing systems and software required to address Grand Challenges;

(H) provide for educating and training additional undergraduate and graduate students in software engineering, computer science, computer and network security, applied mathematics, library and information science, and computational science; and

(I) provide for improving the security of computing and networking systems, including Federal systems, including research required to establish security standards and practices for these systems.

[(3)] *(2)* The Director shall—

(A) establish the goals and priorities for Federal high-performance computing research, development, networking, and other activities;

(B) establish Program Component Areas that implement the goals established under subparagraph (A), and identify the Grand Challenges that the Program should address;

(C) provide for interagency coordination of Federal high-performance computing research, development, networking, and other activities undertaken pursuant to the Program;

[(A)] *(D)* submit to the Congress an annual report, along with the President's annual budget request, describing the implementation of the Program;

(E) develop and maintain a research, development, and deployment roadmap for the provision of high-performance computing systems under paragraph (1)(C); and

[(B) provide for interagency coordination of the Program; and]

[(C)] *(F)* consult with academic, State, industry, and other appropriate groups conducting research on and using high-performance computing.

[(4)] *(3)* The annual report submitted under [paragraph (3)(A)] *paragraph (2)(D)* shall—

[(A) include a detailed description of the goals and priorities established by the President for the Program;]

(A) provide a detailed description of the Program Component Areas, including a description of any changes in the definition of or activities under the Program Component Areas from the preceding report, and the reasons for such changes, and a description of Grand Challenges supported under the Program;

* * * * * * *

(C) describe the levels of Federal funding for the fiscal year during which such report is submitted, and the levels proposed for the fiscal year with respect to which the budget submission applies, for [specific activities, including education, research, hardware and software development, and support for the establishment of the Network] *each Program Component Area*;

(D) describe the levels of Federal funding for each agency and department participating in the Program *and for each Program Component Area* for the fiscal year during which such report is submitted, and the levels proposed for the fiscal year with respect to which the budget submission applies; *and*

[(E) include the report of the Secretary of Energy required by section 203(d); and]

[(F)] *(E)* include an analysis of the progress made toward achieving the goals and priorities established for the Program *and the extent to which the Program incorporates the recommendations of the advisory committee established under subsection (b)*.

(b) ADVISORY COMMITTEE.—*(1)* The President shall establish an advisory committee on high-performance computing consisting of non-Federal members, including representatives of the research, education, and library communities, network providers, and industry, who are specially qualified to provide the Director with advice and information on high-performance computing. The recommendations of the advisory committee shall be considered in reviewing

and revising the Program. The advisory committee shall provide the Director with an independent assessment of—

[(1)] *(A)* progress made in implementing the Program;

[(2)] *(B)* the need to revise the Program;

[(3)] *(C)* the balance between the components of the Program*, including funding levels for the Program Component Areas*;

[(4)] *(D)* whether the research and development undertaken pursuant to the Program is helping to maintain United States leadership in [computing] *high-performance computing and networking* technology; and

[(5)] *(E)* other issues identified by the Director.

(2) In addition to the duties outlined in paragraph (1), the advisory committee shall conduct periodic evaluations of the funding, management, coordination, implementation, and activities of the Program, and shall report not less frequently than once every two fiscal years to the Committee on Science of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate on its findings and recommendations. The first report shall be due within one year after the date of enactment of this paragraph.

(c) OFFICE OF MANAGEMENT AND BUDGET.—(1) Each Federal agency and department participating in the Program shall, as part of its annual request for appropriations to the Office of Management and Budget, submit a report to the Office of Management and Budget which—

(A) identifies each element of its high-performance computing activities which contributes directly to the [Program or] *Program Component Areas or* benefits from the Program; and

* * * * * * *

[SEC. 102. NATIONAL RESEARCH AND EDUCATION NETWORK.

[(a) ESTABLISHMENT.—As part of the Program, the National Science Foundation, the Department of Defense, the Department of Energy, the Department of Commerce, the National Aeronautics and Space Administration, and other agencies participating in the Program shall support the establishment of the National Research and Education Network, portions of which shall, to the extent technically feasible, be capable of transmitting data at one gigabit per second or greater by 1996. The Network shall provide for the linkage of research institutions and educational institutions, government, and industry in every State.

[(b) ACCESS.—Federal agencies and departments shall work with private network service providers, State and local agencies, libraries, educational institutions and organizations, and others, as appropriate, in order to ensure that the researchers, educators, and students have access, as appropriate, to the Network. The Network is to provide users with appropriate access to high-performance computing systems, electronic information resources, other research facilities, and libraries. The Network shall provide access, to the extent practicable, to electronic information resources maintained by libraries, research facilities, publishers, and affiliated organizations.

[(c) NETWORK CHARACTERISTICS.—The Network shall—

[(1) be developed and deployed with the computer, telecommunications, and information industries;

[(2) be designed, developed, and operated in collaboration with potential users in government, industry, and research institutions and educational institutions;

[(3) be designed, developed, and operated in a manner which fosters and maintains competition and private sector investment in high-speed data networking within the telecommunications industry;

[(4) be designed, developed, and operated in a manner which promotes research and development leading to development of commercial data communications and telecommunications standards, whose development will encourage the establishment of privately operated high-speed commercial networks;

[(5) be designed and operated so as to ensure the continued application of laws that provide network and information resources security measures, including those that protect copyright and other intellectual property rights, and those that control access to data bases and protect national security;

[(6) have accounting mechanisms which allow users or groups of users to be charged for their usage of copyrighted materials available over the Network and, where appropriate and technically feasible, for their usage of the Network;

[(7) ensure the interoperability of Federal and non-Federal computer networks, to the extent appropriate, in a way that allows autonomy for each component network;

[(8) be developed by purchasing standard commercial transmission and network services from vendors whenever feasible, and by contracting for customized services when not feasible, in order to minimize Federal investment in network hardware;

[(9) support research and development of networking software and hardware; and

[(10) serve as a test bed for further research and development of high-capacity and high-speed computing networks and demonstrate how advanced computers, high-capacity and high-speed computing networks, and data bases can improve the national information infrastructure.

[(d) DEFENSE ADVANCED RESEARCH PROJECTS AGENCY RESPONSIBILITY.—As part of the Program, the Department of Defense, through the Defense Advanced Research Projects Agency, shall support research and development of advanced fiber optics technology, switches, and protocols needed to develop the Network.

[(e) INFORMATION SERVICES.—The Director shall assist the President in coordinating the activities of appropriate agencies and departments to promote the development of information services that could be provided over the Network. These services may include the provision of directories of the users and services on computer networks, data bases of unclassified Federal scientific data, training of users of data bases and computer networks, access to commercial information services for users of the Network, and technology to support computer-based collaboration that allows researchers and educators around the Nation to share information and instrumentation.

[(f) USE OF GRANT FUNDS.—All Federal agencies and departments are authorized to allow recipients of Federal research grants to use grant moneys to pay for computer networking expenses.

[(g) REPORT TO CONGRESS.—Within one year after the date of enactment of this Act, the Director shall report to the Congress on—

[(1) effective mechanisms for providing operating funds for the maintenance and use of the Network, including user fees, industry support, and continued Federal investment;

[(2) the future operation and evolution of the Network;

[(3) how commercial information service providers could be charged for access to the Network, and how Network users could be charged for such commercial information services;

[(4) the technological feasibility of allowing commercial information service providers to use the Network and other federally funded research networks;

[(5) how to protect the copyrights of material distributed over the Network; and

[(6) appropriate policies to ensure the security of resources available on the Network and to protect the privacy of users of networks.

[SEC. 103. NEXT GENERATION INTERNET.

[(a) ESTABLISHMENT.—The National Science Foundation, the Department of Energy, the National Institutes of Health, the National Aeronautics and Space Administration, and the National Institute of Standards and Technology may support the Next Generation Internet program. The objectives of the Next Generation Internet program shall be to—

[(1) support research, development, and demonstration of advanced networking technologies to increase the capabilities and improve the performance of the Internet;

[(2) develop an advanced testbed network connecting a significant number of research sites, including universities, Federal research institutions, and other appropriate research partner institutions, to support networking research and to demonstrate new networking technologies; and

[(3) develop and demonstrate advanced Internet applications that meet important national goals or agency mission needs, and that are supported by the activities described in paragraphs (1) and (2).

[(b) DUTIES OF ADVISORY COMMITTEE.—The President's Information Technology Advisory Committee (established pursuant to section 101(b) by Executive Order No. 13035 of February 11, 1997 (62 F.R. 7131), as amended by Executive Order No. 13092 of July 24, 1998), in addition to its functions under section 101(b), shall—

[(1) assess the extent to which the Next Generation Internet program—

[(A) carries out the purposes of this Act; and

[(B) addresses concerns relating to, among other matters—

[(i) geographic penalties (as defined in section 7(1) of the Next Generation Internet Research Act of 1998);

[(ii) the adequacy of access to the Internet by Historically Black Colleges and Universities, Hispanic Serving Institutions, and small colleges and universities (whose enrollment is less than 5,000) and the

degree of participation of those institutions in activities described in subsection (a); and

[(iii) technology transfer to and from the private sector;

[(2) review the extent to which the role of each Federal agency and department involved in implementing the Next Generation Internet program is clear and complementary to, and non-duplicative of, the roles of other participating agencies and departments;

[(3) assess the extent to which Federal support of fundamental research in computing is sufficient to maintain the Nation's critical leadership in this field; and

[(4) make recommendations relating to its findings under paragraphs (1), (2), and (3).

[(c) REPORTS.—The Advisory Committee shall review implementation of the Next Generation Internet program and shall report, not less frequently than annually, to the President, the Committee on Commerce, Science, and Transportation, the Committee on Appropriations, and the Committee on Armed Services of the Senate, and the Committee on Science, the Committee on Appropriations, and the Committee on Armed Services of the House of Representatives on its findings and recommendations for the preceding fiscal year. The first such report shall be submitted 6 months after the date of the enactment of the Next Generation Internet Research Act of 1998 and the last report shall be submitted by September 30, 2000.

[(d) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated for the purposes of this section—

[(1) for the Department of Energy, $22,000,000 for fiscal year 1999 and $25,000,000 for fiscal year 2000;

[(2) for the National Science Foundation, $25,000,000 for fiscal year 1999 and $25,000,000 for fiscal year 2000, as authorized in the National Science Foundation Authorization Act of 1998;

[(3) for the National Institutes of Health, $5,000,000 for fiscal year 1999 and $7,500,000 for fiscal year 2000;

[(4) for the National Aeronautics and Space Administration, $10,000,000 for fiscal year 1999 and $10,000,000 for fiscal year 2000; and

[(5) for the National Institute of Standards and Technology, $5,000,000 for fiscal year 1999 and $7,500,000 for fiscal year 2000.

Such funds may not be used for routine upgrades to existing federally funded communication networks.]

TITLE II—AGENCY ACTIVITIES

SEC. 201. NATIONAL SCIENCE FOUNDATION ACTIVITIES.

[(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I—

[(1) the National Science Foundation shall provide computing and networking infrastructure support for all science and engineering disciplines, and support basic research and human resource development in all aspects of high-performance computing and advanced high-speed computer networking;

[(2) to the extent that colleges, universities, and libraries cannot connect to the Network with the assistance of the private sector, the National Science Foundation shall have primary responsibility for assisting colleges, universities, and libraries to connect to the Network;

[(3) the National Science Foundation shall serve as the primary source of information on access to and use of the Network; and

[(4) the National Science Foundation shall upgrade the National Science Foundation funded network, assist regional networks to upgrade their capabilities, and provide other Federal departments and agencies the opportunity to connect to the National Science Foundation funded network.]

(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the National Science Foundation shall—

(1) support research and development to generate fundamental scientific and technical knowledge with the potential of advancing high-performance computing and networking systems and their applications;

(2) provide computing and networking infrastructure support to the research community in the United States, including the provision of high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, and including support for advanced software and applications development, for all science and engineering disciplines; and

(3) support basic research and education in all aspects of high-performance computing and networking.

* * * * * * *

SEC. 202. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION ACTIVITIES.

[(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the National Aeronautics and Space Administration shall conduct basic and applied research in high-performance computing, particularly in the field of computational science, with emphasis on aerospace sciences, earth and space sciences, and remote exploration and experimentation.]

(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the National Aeronautics and Space Administration shall conduct basic and applied research in high-performance computing and networking, with emphasis on—

(1) computational fluid dynamics, computational thermal dynamics, and computational aerodynamics;

(2) scientific data dissemination and tools to enable data to be fully analyzed and combined from multiple sources and sensors;

(3) remote exploration and experimentation; and

(4) tools for collaboration in system design, analysis, and testing.

* * * * * * *

SEC. 203. DEPARTMENT OF ENERGY ACTIVITIES.

[(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the Secretary of Energy shall—

[(1) perform research and development on, and systems evaluations of, high-performance computing and communications systems;

[(2) conduct computational research with emphasis on energy applications;

[(3) support basic research, education, and human resources in computational science; and

[(4) provide for networking infrastructure support for energy-related mission activities.

[(b) COLLABORATIVE CONSORTIA.—In accordance with the Program, the Secretary of Energy shall establish High-Performance Computing Research and Development Collaborative Consortia by soliciting and selecting proposals. Each Collaborative Consortium shall—

[(1) conduct research directed at scientific and technical problems whose solutions require the application of high-performance computing and communications resources;

[(2) promote the testing and uses of new types of high-performance computing and related software and equipment;

[(3) serve as a vehicle for participating vendors of high-performance computing systems to test new ideas and technology in a sophisticated computing environment; and

[(4) be led by a Department of Energy national laboratory, and include participants from Federal agencies and departments, researchers, private industry, educational institutions, and others as the Secretary of Energy may deem appropriate.

[(c) TECHNOLOGY TRANSFER.—The results of research and development carried out under this section shall be transferred to the private sector and others in accordance with applicable law.

[(d) REPORTS.—Not later than 1 year after the date of enactment of this subsection, and thereafter as part of the report required under section 101(a)(3)(A), the Secretary of Energy shall report on activities taken to carry out this Act.]

(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the Secretary of Energy shall—

(1) conduct and support basic and applied research in high-performance computing and networking to support fundamental research in science and engineering disciplines related to energy applications; and

(2) provide computing and networking infrastructure support, including the provision of high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, and including support for advanced software and applications development, for science and engineering disciplines related to energy applications.

[(e)] *(b)* AUTHORIZATION OF APPROPRIATIONS.—(1) * * *

* * * * * * *

SEC. 204. DEPARTMENT OF COMMERCE ACTIVITIES.

[(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I—

[(1) the National Institute of Standards and Technology shall—

[(A) conduct basic and applied measurement research needed to support various high-performance computing systems and networks;

[(B) develop and propose standards and guidelines, and develop measurement techniques and test methods, for the interoperability of high-performance computing systems in networks and for common user interfaces to systems; and

[(C) be responsible for developing benchmark tests and standards for high-performance computing systems and software; and

[(2) the National Oceanic and Atmospheric Administration shall conduct basic and applied research in weather prediction and ocean sciences, particularly in development of new forecast models, in computational fluid dynamics, and in the incorporation of evolving computer architectures and networks into the systems that carry out agency missions.]

(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I—

(1) the National Institute of Standards and Technology shall—

(A) conduct basic and applied metrology research needed to support high-performance computing and networking systems;

(B) develop benchmark tests and standards for high-performance computing and networking systems and software;

(C) develop and propose voluntary standards and guidelines, and develop measurement techniques and test methods, for the interoperability of high-performance computing systems in networks and for common user interfaces to high-performance computing and networking systems; and

(D) work with industry and others to develop, and facilitate the implementation of, high-performance computing applications to solve science and engineering problems that are relevant to industry; and

(2) the National Oceanic and Atmospheric Administration shall conduct basic and applied research on high-performance computing applications, with emphasis on—

(A) improving weather forecasting and climate prediction;

(B) collection, analysis, and dissemination of environmental information; and

(C) development of more accurate models of the ocean-atmosphere system.

* * * * * * *

SEC. 205. ENVIRONMENTAL PROTECTION AGENCY ACTIVITIES.

[(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the Environmental Protection Agency shall conduct basic and applied research directed toward the advancement and dissemination of computational techniques and software tools which form the core of ecosystem, atmospheric chemistry, and atmospheric dynamics models.]

(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the Environmental Protection Agency shall conduct basic and applied research directed toward advancement and dis-

semination of computational techniques and software tools for high-performance computing systems with an emphasis on modeling to—

(1) develop robust decision support tools;

(2) predict pollutant transport and the effects of pollutants on humans and on ecosystems; and

(3) better understand atmospheric dynamics and chemistry.

* * * * * * *

XIX. COMMITTEE RECOMMENDATIONS

On March 17, 2005, a quorum being present, the Committee on Science favorably reported H.R. 28, The High-Performance Computing Revitalization Act of 2005, as amended, by a voice vote and recommended its enactment.

XX. ADDITIONAL VIEWS OF REPRESENTATIVE BRAD SHERMAN

SHOULD WE AT LEAST STUDY THE IMPLICATIONS OF COMPUTERS EXCEEDING HUMAN INTELLIGENCE

Last year, when the Committee on Science considered H.R. 4218, a bill to amend the High-Performance Computing Act of 1991, Chairman Boehlert and I reached agreement on an amendment dealing with the societal implications of future advances in information technology. It was included in the final House-passed version of the bill. Specifically, the amendment directed the National Science Foundation (NSF) to support research into the implications of computers (including both hardware and software) that would be capable of mimicking human abilities to learn, reason, and make decisions. At the time that the Science Committee marked up this bill in the 108th Congress, the Chairman pledged to work with me on this issue:

> "I think everything we should do should consider societal impact, ethical impact. So I will be glad to work with you directly, have staff talk this thing through, and see if we can't accomplish some of your original intent to focus on the issue, without being proscriptive and preventing any research going forward absent such a study."—Chairman Boehlert, Science committee markup of H.R. 4218, 6/16/2004

My amendment to H.R. 28, the 109th congress version of the High Performance Computing Revitalization Act, was identical to the compromise that the Chairman and I worked out in the 108th Congress. The amendment was defeated by a vote of 17–19, on what was unfortunately, and inexplicably, a party-line vote.

At the markup of H.R. 28, the Chairman also raised some questions about NSF's support for the amendment at the markup of H.R. 28. The NSF did express support for my amendment when it was developed as a compromise with the Chairman in the 108th Congress. NSF's Office of Legislative and Public Affairs Section Head, David Stonner, corresponded with minority professional staff on the Science Committee and confirmed that my amendment would have no negative impact on NSF. In fact, the research outlined in the amendment is not inconsistent with projects that NSF has already funded.

I am disappointed that the chairman did not support my amendment again this year. The importance of understanding how artificial intelligence achieved through information technology will impact our society has not decreased since last year. We should not rush headlong into the creation of a second cognitive intelligence on this planet without at least studying the implications.

H.R. 28 sets the goals and priorities for federal high-performance computing research, development, networking, and other activities for those agencies under the jurisdiction of the Science Committee (National Science Foundation, National Aeronautics and Space Administration, Department of Energy, National Institute of Standards and Technology, National Oceanic and Atmospheric Administration, Environmental Protection Agency). These agencies are a part of the broader multi-agency Federal networking and Information Technology Research and Development (NITRD) Program. The law that H.R. 28 amended, the High Performance Computing Act of 1991, set forth the structure for what would become NITRD. The 1991 law established a coordination and planning process for this multi-agency research and development project.

One of the agencies that participates in NITRD is the Defense Advance Research Projects Agency (DARPA). DARPA's mission statement states that it is the agency's goal to develop a computer which will learn from its experience, be aware of itself, and be able to reflect on its own behavior (see attached excerpt from DARPA strategic plan released February 2005). In this vein, DARPA contributes the research conducted by the Human-Computer Interaction and Information Management (HCI&IM) coordinating group, a part of NITRD.

While DARPA is not under the jurisdiction of the Science committee, it conducts research on artificial intelligence within NITRD, a multi-agency program that was put in place by the Science Committee. It is difficult to imagine that DARPA is the only agency in NITRD that will contribute in some way to the inevitable creation of artificial intelligence that equals or surpasses human intelligence.

We heard testimony in a Science Committee hearing on April 9, 2003 on the Societal Implications of Nanotechnology that within roughly 25 years artificial intelligence will match or exceed human cognitive abilities. No expert testified that 25 years was an unrealistically short estimate. We cannot ignore that fact and plunge forward with computers as if they are simply tools, without reflecting that we are within a generation of creating another cognitive life form. If we do not study the effects of technological advances now as they are being created and discovered, we run the risk of not realizing the true impact of this technology until it has permeated our society.

Directing the National Science Foundation (NSF) to support research into the implications of computers that would be capable of mimicking human abilities to learn, reason, and make decisions is a common-sense step that will allow us to understand the ramifications of our technological advances as we move towards a new age of artificial intelligence.

BRAD SHERMAN.

DARPA STRATEGIC PLAN: SECTION 3.7: COGNITIVE COMPUTING (RELEASED FEBRUARY 2005)

"Many elements of the information technology revolution that have vastly improved the effectiveness of the U.S. Forces and transformed American society (e.g., time-shar-

ing, personal computers, and the Internet) were given their impetus by J.C.R. Licklider, a visionary scientist at DARPA some 40 years ago. Licklider's vision was of people and computers working symbiotically. He envisioned computers seamlessly adapting to people as partners that would handle routine information processing tasks, thus freeing the people to focus on what they do best—think analytically and creatively—and greatly extend their cognitive powers. As we move to an increasingly network-centric military, the vision of intelligent, cooperative computing systems responsible for their own maintenance is more relevant than ever.

Despite the enormous progress in information technology over the years, information technology still falls well short of Licklider's vision. While computing systems are critical to U.S. national defense, they remain exceedingly complex, expensive to create, insecure, frequently incompatible, and prone to failure. And, they still require the user to adapt to them, rather than the other way around. Computers have grown ever faster, but they remain fundamentally unintelligent and difficult to use. Something dramatically different is needed.

In response, DARPA is revisiting Licklider's vision as its inspiration for the strategic thrust, "Cognitive Computing." Cognitive computers can be thought of as systems that know what they're doing. Cognitive computing systems "reason" about their environments (including other systems), their goals, and their own capabilities. They will "learn" both from experience and by being taught. They will be capable of natural interactions with users, and will be able to "explain" their reasoning in natural terms. They will be robust in the face of surprises and avoid the brittleness and fragility of expert systems.

The benefits from this cognitive computing thrust will be profound. The increasing complexity of military systems means that the level of expertise needed to maintain them is also increasing—as are the staffing requirements for virtually every military function that uses computing and communications technology. By creating systems that know what they are doing, and they can configure, maintain, and adapt themselves, we will be able to drastically reduce the staff needed for operations centers, forward command posts, and even in support of small dismounted units and special operations teams. Cognitive computing technology will also help us to deal with the increasing tempo of operations and the complexity of plans, such as Air Tasking Orders and joint hostage rescue operation plans, by allowing computers to tap into the accumulated knowledge of past experience on behalf of their human partners.

Along these lines, DARPA's Personalized Assistant that Learns (PAL) program will create intelligent personalized assistants for many tasks, such as commander's assistant, an intelligence analyst's assistant, or a decision-maker's

executive assistant. These assistants will interact with their human partners by accepting direct, naturally expressed guidance to learn their partners' preferences and procedures. Then, they will be able to anticipate the human's needs and prepare materials to be ready just in time for them. These new and unprecedented artificial helpers should reduce military staffing needs in many key places and will help ensure decisions are made in a timely fashion and with the best possible preparation.

To meet these challenges and seize these opportunities, DARPA has structured its work in cognitive computing to catalyze innovative work in single cognitive systems, collaborative teams of cognitive systems, and collective cognition from large numbers of small non-cognitive elements. Each area will demonstrate the power of merging reasoning, learning, perception, and communication technologies. These areas will be supported and complemented by broad-based technology efforts in the hardware, software, and integration techniques needed.

The strategic thrust of cognitive computing is a template shaping DARPA's core technology foundation work in information technology.

XXI. PROCEEDINGS OF THE FULL COMMITTEE MARKUP ON H.R. 28, HIGH-PERFORMANCE COMPUTING REVITALIZATION ACT OF 2005

THURSDAY, MARCH 17, 2005

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE,
Washington, DC.

The Committee met, pursuant to call, at 10:05 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Sherwood L. Boehlert [Chairman of the Committee] presiding.

Chairman BOEHLERT. The Science Committee will come to order.

Pursuant to notice, the Committee on Science meets to consider the following measures: 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.R. 1215, the *Green Chemistry Research and Development Act of 2005,* and how appropriate that we entertain this on St. Patrick's Day; 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.*

Before we proceed with the markup, however, the Committee must first dispense with some administrative business.

I recognize Mr. Gordon to offer a request regarding Democratic Subcommittee membership.

Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman.

By direction of the Democratic caucus of the Science Committee, I ask unanimous consent to ratify the election of Representative Brad Miller of North Carolina to the Subcommittee on Research, thereby filling one of the existing Democratic vacancies.

Chairman BOEHLERT. Without objection, so ordered.

I ask unanimous consent for the authority to recess the Committee at any point during consideration of these matters, and without objection, it is so ordered.

That concludes the Committee's organizational business, and we will now proceed with the markup beginning with opening statements. And I shall begin with mine.

I want to welcome everyone here for our St. Patrick's Day markup. I hope that the markup will leave everyone seeing green, not because we are spending lots of money, but because we are environmentally-friendly and because others should be green with envy over the ability of this committee to move sensible, bipartisan legislation.

The bills before us today deal with a wide variety of critical problems, including the need to improve our energy efficiency, the need to improve our technological competitiveness, the need to improve our environment, the need to protect our citizens from the impacts

of drug abuse, the need to have a more diverse scientific workforce, and the need to increase interest in science among the general public.

All of these bills have broad support. Four of them passed the House last year: the Charles "Pete" Conrad Astronomy Awards, the Steel and Aluminum Energy Conservation and Technology Competitiveness Act, the High-Performance Computing Revitalization Act, and the Green Chemistry Research and Development Act. The Senate ran out of time to take up these bills. They were still pending without prejudice when the clock ran out, and we are optimistic about moving them through the entire process in this Congress.

The other two items before us should also move swiftly: the resolution recognizing African American women in science, and the Methamphetamine Remediation Research Act, which we held a very productive hearing on earlier this month.

I want to move this markup along, so let me just close by thanking all of my colleagues on both sides of the aisle, who introduced and contributed to these important bills.

Mr. Gordon.

[The prepared statement of Chairman Boehlert follows:]

PREPARED STATEMENT OF CHAIRMAN SHERWOOD BOEHLERT

I want to welcome everyone here for our St. Patrick's Day markup. I hope that the markup will leave everyone seeing green—not because we're spending lots of money, but because we're environmentally friendly and because others should be green with envy over the ability of this committee to move sensible, bipartisan legislation.

The bills before us today deal with a wide variety of critical problems, including the need to improve our energy efficiency, the need to improve our technological competitiveness, the need to improve our environment, the need to protect our citizens from the impacts of drug abuse, the need to have a more diverse scientific workforce, and the need to increase interest in science among the general public.

All these bills have broad support. Four of them passed the House last year—the Pete Conrad Astronomy Awards, the Steel and Aluminum energy Conservation Act, the High-Performance Computing Revitalization Act, and the Green Chemistry Research and Development Act. The Senate ran out of time to take these bills up—they were still pending without prejudice when the clock ran out—and we're optimistic about moving them through the entire process this Congress.

The other two items before us should also move swiftly, the resolution recognizing African American women in science, and the Methamphetamine Remediation Research Act, which we held a hearing on earlier this month.

I want to move this markup along, so let me just close by thanking all my colleagues on both sides of the aisle who introduced and contributed to these important bills. Mr. Gordon.

Mr. GORDON. Mr. Chairman, in keeping with the date, you seem to have brought your blarney with you, and I wish to compliment you for this—for the efforts to revisit our unfinished legislative agenda from the past Congress and for your willingness to explore some new legislative areas.

I am especially pleased that Mr. Calvert and my Methamphetamine Remediation Act is getting the rapid consideration it deserves. We thank you and over 1/3 of our committee's membership for signing on as co-sponsors. The methamphetamine epidemic is a scourge on rural America, affecting many of our Congressional Districts that must be addressed. And I will explain more about the importance of this bill later in the markup.

Our committee's legislative environment in high-performance computing goes back at least 20 years. The bipartisan High-Per-

formance Computing Act of 1991 that today's bill amends was instrumental in getting the various departments of the Executive Branch working together to apply the power of supercomputers to our society's major challenges. And we have been working together on today's amendments to the High-Performance Computing Act for really two Congresses now. We on the Democratic side are very supportive of this important legislation.

We will consider another important resolution by Congresswoman Eddie Bernice Johnson, recognizing the significant contributions that African American women have made to science. Given our need to encourage young men and women of all races to enter into the science and technology fields, I compliment Congresswoman Johnson for her advocacy of this resolution.

And our former Committee colleague, Doug Walgren, introduced the Steel and Aluminum Energy Conservation and Technology Competitiveness Act of 1988 at that time when the steel industry in the United States was experiencing hard time and high energy costs and consumption. The program established under this act has led a steel industry technology roadmap and 10 cost-sharing projects that have permitted the industry to modernize and to better meet the new higher-weight products needed—or lighter-weight products needed by the auto industry and other industry customers. We on the Democratic side are supportive of the effort of Congresswoman Hart and our new Member, Congressman Lipinski, to reauthorize this important program.

The Green Chemist Research and Development Act is also an important act today, and it is an improved over last introduction. We are pleased it incorporates several Democratic amendments offered during the last consideration. However, the bill still does not do all we should be doing moving into—moving in the right direction for green chemistry practices, and I think we will see some amendments this morning that would improve that bill.

Therefore, I will yield the balance of my time and look forward to moving forward today.

[The prepared statement of Mr. Gordon follows:]

PREPARED STATEMENT OF REPRESENTATIVE BART GORDON

I wish to compliment Mr. Boehlert for his efforts to revisit our unfinished legislative agenda from the past Congress and for his willingness to explore new legislative areas.

I am especially pleased that Mr. Calvert's and my *Methamphetamine Remediation Research Act of 2005* is getting the rapid consideration it deserves. We thank you and over a third of our committee's membership for signing on as co-sponsors.

The methamphetamine epidemic is a scourge on rural America, affecting many of our Congressional districts, that must be addressed. I will explain more about the importance of this bill later in the markup.

Our committee's legislative involvement in high-performance computing goes back at least 20 years. The bipartisan *High-Performance Computing Act of 1991* that today's bill amends was instrumental in getting the various Departments of the Executive Branch working together to apply the power of supercomputers to our society's major challenges.

We have been working together on today's amendments to the High-Performance Computing Act for two Congresses now. We on the Democratic side are very supportive of this important legislation.

We will consider an important resolution by Congresswoman Eddie Bernice Johnson recognizing the significant contributions that African American Women have made to science. Given our need to encourage American young men and women of

all races to enter into scientific and technical fields, I compliment Congresswoman Johnson on her advocacy of this resolution.

Our former committee colleague Doug Walgren introduced the *Steel and Aluminum Energy Conservation and Technology Competitiveness Act of 1988* at a time when the steel industry in the United States was experiencing hard times and high energy costs and consumption.

The program established under this Act has led a steel industry technology roadmap and ten cost-shared projects that have permitted the industry to modernize and to better meet the new lighter weight products needed by the auto industry and other industry customers. We on the Democratic side are supportive of the efforts of Congresswoman Hart and our new Member, Congressman Lipinski to reauthorize this important program.

The *Green Chemistry Research and Development Act,* H.R. 1215, is improved over its last introduction.

We are pleased that it incorporates several Democratic amendments offered during its last consideration, including my amendment to establish a grant program to enable colleges and universities to update their curricula to include training in green chemistry. However, the bill still does not do all we should be doing to move green chemistry practices from the laboratory bench into everyday practice. Therefore, we will be offering several amendments today to further improve this legislation.

Chairman BOEHLERT. Thank you very much, Mr. Gordon.

Without objection, Members may place statements in the record at this point.

[The prepared statement of Mr. Costello follows:]

PREPARED STATEMENT OF REPRESENTATIVE JERRY F. COSTELLO

Good morning. Today, the House Science Committee is considering six bills for markup. Most are non-controversial and receive wide bipartisan support.

First, I would like to thank Chairman Boehlert, Ranking Member Gordon, and Representative Calvert for introducing H.R. 798, the *Methamphetamine Remediation Research Act of 2005.* As a proud co-sponsor of H.R. 798, I am pleased the legislation has moved quickly through the Science Committee and am hopeful it will come to the House Floor soon.

This legislation is urgently needed because methamphetamine abuse and addiction continues to grow throughout the United States. In my home State of Illinois, methamphetamine use has significantly increased in the last few years. Alarmingly, almost 10 percent of the meth labs seized by law enforcement officials in 2004 were in Illinois. Clearly, methamphetamine abuse is a very serious problem in my congressional district and I strongly support Ranking Member Gordon's bill because it establishes a federal research program that would develop voluntary standards to help states deal with the challenges associated with methamphetamine abuse. I worked closely with the State and local law enforcement officials in my district to secure funding in 2003 and 2004 for a grant program in Southern Illinois to train approximately 100 law enforcement officials across the region in dismantling and cleaning up meth labs. In addition, Drug Task Forces were formed in Southern Illinois to fight against the methamphetamine problem that has reached epidemic proportions. We cannot allow the methamphetamine problem to overwhelm law enforcement officials and it is critical we implement a strategy to help our communities respond.

Secondly, I would like to thank the Chairman for agreeing to markup H.R. 1158, a bill *To reauthorize the Steel and Aluminum Energy Conservation and Technology Competitiveness Act of 1998.* As a Member of the Congressional Steel Caucus, I am pleased this committee is taking an active role to keep the steel industry competitive in today's global marketplace. Many are aware that the steel industry suffered a major crisis a few years back, which caused four steel companies in Illinois to file for bankruptcy, including Laclede Steel and the parent company for Granite City Steel, which are in my district. More than 5,000 steel workers have lost their jobs in Illinois alone. Therefore, I urge my colleagues to support H.R. 1158 to reauthorize important funding measures to improve the health of the domestic steel industry.

Mr. Chairman, I want to thank the Committee for all their hard work on these important issues and look forward to today's proceedings.

Chairman BOEHLERT. We will now consider H.R. 28, *High-Performance Computing Revitalization Act of 2005.*

I recognize Chairwoman Biggert to present her remarks on the bill.

Mrs. BIGGERT. Thank you, Mr. Chairman. I appreciate the opportunity to say a few words about the bill, the High-Performance Computing, or HPC, Revitalization Act of 2005, which will ensure that America remains a leader in the development and use of supercomputers.

I want to start by recognizing the bill's chief co-sponsor, Congressman Lincoln Davis, and by thanking the other co-sponsors of this important legislation, including you, Mr. Chairman, and Ranking Member Gordon.

I will keep my remarks brief, as I know that many of you are familiar with this bill. But for those of you who may not be, it was the subject of a Full Committee hearing in May of 2004. At that hearing, Dr. John Marburger, Director of the White House Office of Science and Technology Policy, communicated the Administration's support for this bill. It subsequently passed both this committee and the Full House by voice vote. This bill has enjoyed such broad bipartisan support, because both Congress and the President recognize that high-performance computers are essential to maintaining U.S. leadership in many scientific fields.

Supercomputers also have many applications, from pharmaceuticals and climate, to national and homeland security. And that is why we must commit to providing sustained support for high-performance computers at our federal-civilian science agencies.

To achieve this aim, my bill does four things.

First, it requires that federal agencies provide the U.S. research community access to the most advanced high-performance computing systems and technical support for their users.

Second, the bill requires federal agencies to support all aspects of high-performance computing for scientific and engineering applications.

Third, the bill requires the White House Office of Science and Technology Policy to direct an interagency planning process to develop and maintain a research development and deployment roadmap for the provision of high-performance computing resources for the U.S. research community.

It is not enough simply to buy big machines. We need to have a balanced, comprehensive approach to maximize the benefits these machines can bring to science and to our nation. The original legislation that my bill amends, the *High-Performance Computing Act of 1991,* gave rise to an interagency planning process that has lost the vitality it once had. This provision will help ensure a robust planning process so that our national high-performance computing effort is not allowed to lag in the future.

Finally, the bill clarifies the missions of each of the federal agencies that have a role in developing or using high-performance computing. I believe that this bill will guide federal agencies in providing needed support to high-performance computing in its user communities. Our nation's scientific enterprise and our economy will be the stronger for it.

Thank you, Mr. Chairman, and I yield back the balance of my time.

[The prepared statement of Mrs. Biggert follows:]

PREPARED STATEMENT OF REPRESENTATIVE JUDY BIGGERT

Thank you, Mr. Chairman. I appreciate the opportunity to say a few words about my bill, the *High-Performance Computing*—or HPC—*Revitalization Act of 2005,* which will ensure that America remains a leader in the development and use of supercomputers. I want to start by recognizing the bill's chief co-sponsor, Congressman Lincoln Davis, and by thanking the other co-sponsors of this important legislation, including you, Mr. Chairman and Ranking Member Gordon.

I will keep my remarks brief, as I know many of you are familiar with this bill. For those of you who may not be, it was the subject of a Full Committee hearing in May of 2004. At that hearing, Dr. John Marburger, Director of the White House Office of Science and Technology Policy, communicated the Administration's support for this bill. It subsequently passed both this Committee and the Full House by voice vote.

This bill enjoyed such broad, bipartisan support because both Congress and the President recognize that high-performance computers are central to maintaining U.S. leadership in many scientific fields. Supercomputers also have many applications, from pharmaceuticals and climate to national and homeland security. That's why we must commit to providing sustained support for high-performance computers at our federal civilian science agencies.

To achieve this aim, my bill does four things.

First, it requires that federal agencies provide the U.S. research community access to the most advanced high-performance computing systems, and technical support for their users.

Second, the bill requires federal agencies to support all aspects of high-performance computing for scientific and engineering applications.

Third, the bill requires the White House Office of Science and Technology Policy to direct an interagency planning process to develop and maintain a research, development, and deployment roadmap for the provision of high-performance computing resources for the U.S. research community.

It's not enough to simply buy big machines. We need to have a balanced, comprehensive approach to maximize the benefits these machines can bring to science and to our nation. The original legislation that my bill amends, the *High-Performance Computing Act of 1991,* gave rise to an interagency planning process that has lost the vitality it once had. This provision will help ensure a robust planning process so that our national high-performance computing effort is not allowed to lag in the future.

Finally, the bill clarifies the missions of each of the federal agencies that have a role in developing or using high-performance computing.

I believe that this bill will guide federal agencies in providing needed support to high-performance computing and its user communities. Our nation's scientific enterprise, and our economy, will be the stronger for it.

Thank you. I yield back the balance of my time.

Chairman BOEHLERT. Thank you very much.

Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman.

I am pleased you brought H.R. 28 before the Committee for its consideration today. The bill continues the long-term efforts of the Committee to advance high-performance computing and communications technologies. And I want to commend Congresswoman Biggert and Congressman Lincoln Davis for their leadership on high-performance computing policy and for their work during the last Congress that led to the bill before us today.

And I would like to yield the balance of my time to Lincoln Davis for explaining the bill.

[The prepared statement of Mr. Gordon follows:]

PREPARED STATEMENT OF REPRESENTATIVE BART GORDON

Mr. Chairman, I am pleased you have brought H.R. 28 before the Committee for its consideration today. The bill continues the long-term efforts of the Committee to advance high-performance computing and communications technologies.

I want to commend Congresswoman Biggert and Congressman Lincoln Davis for their leadership on high-performance computing policy and for their work during the last Congress that led to the bill before the Committee today.

The *High-Performance Computing Act of 1991* authorized a jointly planned and coordinated, multi-agency research program to accelerate progress in advanced computing and networking technologies and to support computational research in a range of science and engineering fields.

H.R. 28 amends the 1991 Act to re-energize the planning and coordination processes now in place and to focus more attention on very high-performance computing in support of computational science and engineering.

Computation has become one of the principal tools, along with theory and experiment, for conducting science and engineering research and development. The legislation will help ensure that the U.S. research community has access at any time to high-end computers that are well suited to tackle the most important and computationally challenging problems.

I recommend support for the bill by my colleagues.

I now yield to Congressman Davis, who has taken the lead on this side of the aisle on this measure.

Mr. DAVIS. Chairman Boehlert and Ranking Member Gordon, I thank you again for the process of expediting House Resolution 28 very quickly through this Committee. The High-Performance Computing Revitalization Act, which Congresswoman Biggert and I have reintroduced, aims to put the United States back at the top of world leadership in this area.

I want to thank Ms. Biggert for her continued support of high-end computing legislation and for her constant effort and work on this Science Committee on legislation that impacts our country as a whole and puts us on the cutting edge in many situations and circumstances of—in the area of technology advancement.

H.R. 28 amends the *High-Performance Computing Act of 1991,* which established the major federal research and development program involving seven agencies and funded at about $2 billion a year. The bill seeks to strengthen the planning mechanisms for high-end computing and better coordinate agency efforts. We will require the Office of Science and Technology Policy to develop and maintain a roadmap for developing and employing high-end computing systems. In addition, the National Science Foundation is explicitly required to provide access for researchers. This requirement will ensure that the research community has access to the most powerful computing systems.

Mr. Chairman, the interagency research program launched in the 1991 Act has largely been a great success. It has helped provide the infrastructure needed to support cutting-edge research and to drive information technology forward for the benefit of society. I am proud that the Oak Ridge National Lab in Tennessee will stand to become the home of the world's most powerful supercomputer.

H.R. 28 will serve to strengthen and streamline our national effort in the area of high-performance computing. I ask my colleagues for their support in reporting the bill favorably to the House.

Thank you, Mr. Chairman. I yield back the rest of my time.

[The prepared statement of Mr. Davis follows:]

PREPARED STATEMENT OF REPRESENTATIVE LINCOLN DAVIS

Mr. Chairman, Mr. Ranking Member, thank you again for expediting H.R. 28 through this committee.

The High-Performance Computing Revitalization Act, which Congresswoman Biggert and I have re-introduced, aims to put the United States back at the top in world leadership in this area. I want to thank Ms. Biggert for her continued support of high end computing legislation.

H.R. 28 amends the *High-Performance Computing Act of 1991,* which established a major federal research and development program involving seven agencies and funded at about $2 billion per year. The bill seeks to strengthen the planning mechanisms for high-end computing and better coordinate agency efforts.

H.R. 28 will require the Office of Science and Technology Policy to develop and maintain a roadmap for developing and deploying high-end computing systems. In addition, the National Science Foundation is explicitly required to provide for access by researchers to these computing systems. These requirements will ensure that the research community has access to the most powerful computing systems.

Mr. Chairman, the interagency research program launched by the 1991 Act has been largely a success. It has helped provide the infrastructure needed to support cutting edge research and to drive information technology forward for the benefit of society. I am proud that the Oak Ridge National Laboratory, near my District, stands to become the home of the world's most powerful supercomputer.

H.R. 28 will serve to strengthen and streamline our national efforts in the area of high-performance computing. I ask my colleagues for their support in reporting the bill favorably to the House.

Thank you, Mr. Chairman. I yield back the balance of my time.

Chairman BOEHLERT. Thank you very much, Mr. Davis, Mr. Gordon, and Ms. Biggert.

I will ask unanimous consent that the bill is considered as read and open to amendment at any point and that Members proceed with the amendments in the order of the roster. Without objection, so ordered.

The first——

Mrs. BIGGERT. Mr. Chairman.

Chairman BOEHLERT. Yeah.

Mrs. BIGGERT. I have an amendment at the desk.

Chairman BOEHLERT. All right. The first amendment is by Mrs. Biggert. The Clerk will report the amendment.

Ms. TESSIERI. Amendment to H.R. 28 offered by Mrs. Biggert of Illinois.

Chairman BOEHLERT. I ask unanimous consent to dispense with the reading. Without objection, so ordered.

The gentlelady is recognized for five minutes to explain the amendment.

Mrs. BIGGERT. Thank you, Mr. Chairman.

I am—I have always been a "B," but I think today I have an "O" in front of my name as "O'Biggert," so I will—thank you.

This amendment simply adds a finding to the bill, a finding that was included in the *National Science Foundation Authorization Act of 2002,* which is now law. This finding articulates the importance of ensuring that the results of our federal investments in supercomputing and energy technology research are transferred to the private sector and applied commercially. A recent report from the Council on Competitiveness outlined the existing use of high-performance computers in various industries and concluded that "there is a great potential for increased productivity, innovation, and competitive advancement across the private sector" as more industries learn how to take advantage of supercomputing technologies.

This is not at all surprising. At an Energy Subcommittee hearing last year, we learned that supercomputers allow companies to anticipate how new products will behave in different environments using simulations that are called "virtual prototyping." For instance, the automotive industry uses high-performance computers to reduce costs and improve quality and safety in—during the vehi-

cle design process. Pharmaceutical companies simulate chemical interactions to design new drugs. These approaches help companies increase the speed to market for new products.

The Council on Competitiveness report went on to recommend that stronger partnerships are needed between government, industry, and academia to address key technical and educational barriers to supercomputer use by the private sector. Such partnerships would focus on developing and updating advanced software for industrial applications and growing the pool of computational scientists. While this bill will ensure that government does its part to revitalize the development and use of supercomputers in the United States, this amendment will ensure that our investment in research translates into real benefits for U.S. companies in our economy.

I ask my colleagues to support this amendment and yield back the balance of my time.

Chairman BOEHLERT. All right. Thank you, Mrs. Biggert, for all your work on the bill, and the Chair intends to support the amendment. Is there any further discussion on the amendment? If no, the vote occurs on the amendment. All in favor, say aye. Opposed, no. The ayes have it, and the amendment is agreed to.

The second amendment on the roster is one offered by Mr. Sherman. Are you ready to proceed, Mr. Sherman?

Mr. SHERMAN. Yes, I am. I have an amendment at the desk.

Chairman BOEHLERT. The Clerk will report the amendment.

Ms. TESSIERI. Amendment to H.R. 28 offered by Mr. Sherman of California.

Chairman BOEHLERT. I ask unanimous consent to dispense with the reading. Without objection, so ordered.

The gentleman is recognized for five minutes to explain the amendment.

Mr. SHERMAN. Mr. Chairman, we can be proud of the consensus building that this committee has achieved under your leadership. And we have been able often to create non-controversial bills of the various types—of the very type that should be considered by the House under suspension of the rules, thus saving the time of the House.

And it is not always just Democrat versus Republican consensus that needs to be built, but also consensus between those focused on building new tools for mankind with science and those who are concerned with how those tools might be used. Perhaps the best example, or one of the best examples of this consensus building was this very bill when it came before this committee last year. I had an amendment to require a review of certain societal and ethical implications of this research. It was thought that that might slow down the research. We worked with you, Mr. Chairman. We developed what I might call a watered down but compromised language that not only had your support, Mr. Chairman, but the support of the NSF.

And now the bill comes before us without that compromised language. And that language, I think, is important not only to improve the bill but to assure people around the country who are concerned about science that we are looking not only on how to build tools but what it will mean to possess them.

In this particular case, we are dealing with the issue of creating computers that will match or exceed human cognitive abilities. Now that may sound like science fiction, but we had hearings and a panel selected by the Chairman, not selected by wild guys like me, selected by the Chairman. And the—everyone on that panel was asked the question: "How far are we away from computers that match or exceed human cognitive abilities?" The consensus answer was 25 years. Now I don't know whether it is 25 years or not, but I do know that it is close enough so that DARPA has on its web page the statement that its mission is to develop a computer which will learn from its experience, be aware of itself, be able to reflect on its own behavior. It is DARPA, not Sherman, that uses these human pronouns. We don't know whether we are in the midst of creating data from the next generation or Hal from *2001 A Space Odyssey*. I don't think it is all that bad an idea to put some language in this bill that perhaps we ought to think about it.

Now I know that those who are interested in doing—building the tools aren't interested in—or some of them are not interested in looking at the implications of building those tools. But I think that we should not rush headlong to the creation of a cognitive intelligence on this planet without at least putting some vague language in this bill that we should take a look at the societal implications.

That is what the amendment I have at the desk would do. It was good enough for the NSF last year. I would hope that we could adopt it, that we could create a non-controversial bill, and that we could have the House consider that bill, perhaps, as a non-controversial, perhaps as a suspension bill.

I would like to reserve the balance of my time, if I am allowed to do so.

Chairman BOEHLERT. Thank you. You certainly are, Mr. Sherman. And I acknowledge the hard work you have put in on this amendment, and you have fairly characterized what has transpired previously.

The gentleman is indeed offering language that we negotiated with him last year, and I don't like to re-open past agreements, even in a new Congress, and we are not bound in the new Congress by what we did in the previous Congress.

But we have learned some things about this amendment since last year. We have learned that it is adamantly opposed by the bill's sponsor, who happens to be one my very distinguished and respected Subcommittee Chairs. We have learned that it is adamantly opposed by both industry and the Administration. We have learned that it is an obstacle to dealing with, as we like to call them, the other body. And we learned all of that the hard way while keeping to our agreement by trying to get the language through on another bill, Mrs. Biggert's Energy Department computing bill that we got signed into law last year.

Now I might be willing to continue to support this amendment despite all of that, if I thought it dealt with a crucial and pressing problem, but I don't think it really does. All of the experts tell us we are nowhere near creating what Mr. Sherman fears. And I might add, it is not completely accurate to say the National Science Foundation supports it. The National Science Foundation essen-

tially has indicated to us that they could probably live with it, and that is a little bit different.

And so I would rather see the money that would go to the studies you are proposing, Mr. Sherman, go to any of the unfunded—underfunded science projects that we have all been complaining about in recent years.

So I respect what the gentleman is trying to do. I acknowledge the accuracy of his summation of the history of this, but we are in a new Congress, and quite frankly, I am changing my position for all of the reasons enumerated at the outset. And guess what, those who are intractable, shame on them. You have got to adjust to different circumstances, and that is what I am doing. And therefore, I oppose the amendment.

[The prepared statement of Chairman Boehlert follows:]

PREPARED STATEMENT OF CHAIRMAN SHERWOOD BOEHLERT

The language the gentleman is offering is indeed language that we negotiated with him last year. And I don't like to reopen past agreements, even in a new Congress. But we've learned some things about this amendment since last year.

We've learned that it is adamantly opposed by the bill's sponsor who happens to be one of our subcommittee Chairs. We've learned that it is adamantly opposed by both industry and the Administration. We've learned that it is an obstacle to dealing with the Senate. And we learned all that the hard way while keeping to our agreement by trying to get this language through on another bill—Mrs. Biggert's Energy Department computing bill that we got signed into law last year.

Now I might be willing to continue to support this amendment despite all that if I thought that it dealt with a crucial and pressing problem. But it doesn't. All the experts tell us we are nowhere near creating the dystopia that Mr. Sherman fears.

And so I'd rather see the money that would go to the studies he's proposing go to any of the underfunded science projects that we've all been complaining about in recent weeks.

So I respect what the gentleman is trying to do; I acknowledge that in a new Congress I am changing my position, and I urge the defeat of this amendment.

Chairman BOEHLERT. Is there anyone else who seeks to be heard on this?

Mrs. Biggert.

Mrs. BIGGERT. Thank you, Mr. Chairman.

And I do regretfully, you know, oppose this amendment, because this committee seems to work so well together that we don't very often have this. But I have been opposed to this last year in the other bill, and I oppose it in this bill.

We did hold a hearing in the Science Committee on high-performance computing in May of last year. And at that time, my colleague from California asked the experts who testified at that hearing, and I have a little different take on what happened there, and his question was whether there was any danger of computers approaching the cognitive abilities of humans. And to my understanding, and from the record, is that the witnesses gave a resounding no in answer to that question. And more specifically, Mr. Sherman wanted to know how close we were to a machine that reached a level of intelligence where it could be entitled to the minimum wage. Dr. Jack Marburger, the President's Science Advisor, and I quote, "Not very, we are quite far from that. In terms of the number of components measured in neurons, for example, the interconnectivity of the human brain far exceeds anything that we could currently build or foresee in the foreseeable future with com-

puter hardware." Dr. Rick Stevens, a renowned computer scientist from Argonne National Laboratory, responded to the same question saying, and I quote, "My personal view is that I would be much more concerned with near-term issues associated with large-scale computing or the use of large-scale data systems to collect information. Right now, if you had to estimate what is the most intelligent device we can build, it is roughly between a worm and an insect in terms of what it can do."

Simply put, I think that the concern that Mr. Sherman is trying to address with this amendment is totally unfounded. It really is a solution in search of a problem. So that is why, Mr. Chairman, it would be, I think, exceedingly inappropriate for this committee to impose a requirement on our federal agencies to focus on societal implications of hypothetical human-mimicking computers. We as a Committee fundamentally misunderstand the nature and focus of high-performance computing research. In addition, as Dr. Stevens pointed out at our hearing last year, information technology has societal implications for privacy, for workplace collaboration, and for many other areas. Our federal agencies should focus any resources for societal studies on these real and immediate needs. I would also mention that DARPA is not covered by this bill or this committee.

So for these reasons, I would urge my colleagues to join me in opposing this amendment.

Thank you.

Chairman BOEHLERT. Thank you.

Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman.

There seems to be some—I won't say confusion, but maybe just a difference in opinion as to the temperature of the National Science Foundation toward this provision. It is my understanding that they have reviewed it and found it to be consistent with the kinds of research activities that they support under an existing program on social, economic, and workforce implications of information technology.

Chairman BOEHLERT. Thank you for that intervention.

Anyone else?

Mr. ROHRABACHER. Mr. Chairman.

Chairman BOEHLERT. Mr. Rohrabacher.

Mr. ROHRABACHER. Mr. Chairman, as a dear friend, and we share several Committees together, and I respect many of his—the things that he is concerned about, but let me note that, as a fellow Californian, that I believe that Mr. Sherman would not be so concerned about the social implications of the creation of these machines with the human—with traits of human intelligence if Arnold Schwarzenegger was a Democrat. The fact is that——

Mr. SHERMAN. If the gentleman will yield.

Mr. ROHRABACHER. I would be happy to terminate this part of my——

Mr. SHERMAN. I assure you that Hall is a Republican and data is a Democrat.

Mr. ROHRABACHER. But just one note, I do think the money could be spent—better spent, as the Chairman says, in these other areas of research where we are actually coming up with new capabilities and that we are so far away from having to be concerned about the

Terminator coming in and taking over the world that perhaps it would be better to put the money into machines that will help us be more competitive with our international competitors, for example. So—but I do appreciate my friend, Brad, who is a very expansive thinker.

Thank you very much.

Chairman BOEHLERT. And a thoughtful Member of the Committee.

Is there anyone else who seeks recognition?

Mr. Sherman, I hope we can make it brief, because we want to get through with our business before a series of votes that are projected.

Mr. SHERMAN. Well, I guess the question is when is an issue significant enough, close enough, that we ought to put some non-binding language in a bill that we should at least start thinking about it. The consensus from the experts who were sitting at that table was that we are about 25 years away. We can ignore the issue and not think about it, but if we remember the Transportation Committee, would you fund a bridge that was going to collapse in 26 years? When you are a Member of that Committee, you think more than 25 years into the future.

Now as to while the panel of experts that we had here dealt with the issue, they all reached the consensus of 25 years. One is the author of a book entitled "The Age of Spiritual Machines" in which he lays out the milestones that he thinks we will reach during that 25-year period. So we can use language like "far off" or we can focus on one generation, 25 years. I think that with this Congress funding DARPA, which has, as its mission statement, or the mission statement of one of its programs, the creation of this very kind of artificial intelligence, it would be short-sighted of this committee to decide the problems that won't affect us this decade are problems that don't deserve study and fund.

I would hope that some would think beyond this decade or even the next decade and vote in favor of the amendment.

I yield back.

Chairman BOEHLERT. Thank you very much.

If there is no further discussion on the amendment, the vote is on the amendment. All in favor, say aye. Opposed, no. The nos appear to have it, and the amendment is not——

Mr. SHERMAN. Mr. Chairman, I ask for a recorded vote.

Chairman BOEHLERT. The Clerk will call the roll.

Ms. TESSIERI. Mr. Boehlert.

Chairman BOEHLERT. No.

Ms. TESSIERI. Mr. Boehlert votes no.

Mr. Hall.

Mr. HALL. No.

Ms. TESSIERI. Mr. Hall votes no.

Mr. Smith.

Mr. SMITH. No.

Ms. TESSIERI. Mr. Smith votes no.

Mr. Weldon.

[No response.]

Ms. TESSIERI. Mr. Rohrabacher.

Mr. ROHRABACHER. Mr. Rohrabacher votes no.

Mr. Calvert.
Mr. CALVERT. No.
Ms. TESSIERI. Mr. Calvert votes no.
Mr. Bartlett.
Mr. BARTLETT. No.
Ms. TESSIERI. Mr. Bartlett votes no.
Mr. Ehlers.
Mr. EHLERS. No.
Ms. TESSIERI. Mr. Ehlers votes no.
Mr. Gutknecht.
Mr. GUTKNECHT. No.
Ms. TESSIERI. Mr. Gutknecht votes no.
Mr. Lucas.
Mr. LUCAS. No.
Ms. TESSIERI. Mr. Lucas votes no.
Mrs. Biggert.
Mrs. BIGGERT. No.
Ms. TESSIERI. Mrs. Biggert votes no.
Mr. Gilchrest.
Mr. GILCHREST. No.
Ms. TESSIERI. Mr. Gilchrest votes no.
Mr. Akin.
Mr. AKIN. No.
Ms. TESSIERI. Mr. Akin votes no.
Mr. Johnson.
[No response.]
Ms. TESSIERI. Mr. Forbes.
[No response.]
Ms. TESSIERI. Mr. Bonner.
Mr. BONNER. No.
Ms. TESSIERI. Mr. Bonner votes no.
Mr. Feeney.
[No response.]
Ms. TESSIERI. Mr. Inglis.
Mr. INGLIS. No.
Ms. TESSIERI. Mr. Inglis votes no.
Mr. Reichert.
Mr. REICHERT. No.
Ms. TESSIERI. Mr. Reichert votes no.
Mr. Sodrel.
Mr. SODREL. No.
Ms. TESSIERI. Mr. Sodrel votes no.
Mr. Schwarz.
Mr. SCHWARZ. No.
Ms. TESSIERI. Mr. Schwarz votes no.
Mr. McCaul.
Mr. MCCAUL. No.
Ms. TESSIERI. Mr. McCaul votes no.
Mr. Gordon.
Mr. GORDON. Aye.
Ms. TESSIERI. Mr. Gordon votes yes.
Mr. Costello.
Mr. COSTELLO. Aye.
Ms. TESSIERI. Mr. Costello votes yes.

Ms. Johnson.
Ms. JOHNSON. Aye.
Ms. TESSIERI. Ms. Johnson votes yes.
Ms. Woolsey.
Ms. WOOLSEY. Aye.
Ms. TESSIERI. Ms. Woolsey votes yes.
Ms. Hooley.
Ms. HOOLEY. Aye.
Ms. TESSIERI. Ms. Hooley votes yes.
Mr. Udall.
Mr. UDALL. Aye.
Ms. TESSIERI. Mr. Udall votes yes.
Mr. Wu.
Mr. WU. Aye.
Ms. TESSIERI. Mr. Wu votes yes.
Mr. Honda.
Mr. HONDA. Aye.
Ms. TESSIERI. Mr. Honda votes yes.
Mr. Miller.
Mr. MILLER. Aye.
Ms. TESSIERI. Mr. Miller votes yes.
Mr. Davis.
Mr. DAVIS. Aye.
Ms. TESSIERI. Mr. Davis votes yes.
Mr. Carnahan.
Mr. CARNAHAN. Aye.
Ms. TESSIERI. Mr. Carnahan votes yes.
Mr. Lipinski.
Mr. LIPINSKI. Aye.
Ms. TESSIERI. Mr. Lipinski votes yes.
Ms. Jackson Lee.
Ms. JACKSON LEE. Aye.
Ms. TESSIERI. Ms. Jackson Lee votes yes.
Mr. Sherman.
Mr. SHERMAN. Aye.
Ms. TESSIERI. Mr. Sherman votes yes.
Mr. Baird.
[No response.]
Ms. TESSIERI. Mr. Matheson.
[No response.]
Ms. TESSIERI. Mr. Costa.
Mr. COSTA. Aye.
Ms. TESSIERI. Mr. Costa votes yes.
Mr. Green.
Mr. GREEN. Aye.
Ms. TESSIERI. Mr. Green votes yes.
Mr. Melancon.
Mr. MELANCON. Aye.
Ms. TESSIERI. Mr. Melancon votes yes.
Chairman BOEHLERT. Is Mr. Feeney recorded?
Ms. TESSIERI. Mr. Feeney is not recorded, sir.
Mr. FEENEY. No.
Ms. TESSIERI. Mr. Feeney votes no.

Chairman BOEHLERT. Just let me tell you how the Chair intends to proceed, because we are advised we are going to have a series of votes coming up rather shortly. I think this is the last amendment on this bill. We will dispatch with this bill. We will then skip over the Green Chemistry bill, near and dear to my heart, very appropriate on this day, but there are a number of amendments, and there will be adequate discussion of those amendments, so we will go to the African American legislation, women's legislation, and then we will conclude the business and we will take up Green Chemistry when we get back. Oh, and the Methamphetamine. Well, that is non-controversial.

The Clerk will——

Ms. TESSIERI. Mr. Chairman, yes, 17; no, 19.

COMMITTEE ON SCIENCE - ROLL CALL – 109th CONGRESS

DATE: March 17, 2005 SUBJECT: Amendment by Mr. Sherman to H.R. 28

Rm.	Phone	Member	Yes	No	Not Voting	Present	Absent
2246	53665	Mr. Boehlert, R-NY		✓			
2405	56673	Mr. Hall, R-TX		✓			
2184	54236	Mr. Smith, R-TX		✓			
2466	52011	Mr. Weldon, R-PA					
2338	52415	Mr. Rohrabacher, R-CA		✓			
2201	51986	Mr. Calvert, R-CA		✓			
2412	52721	Mr. Bartlett, R-MD		✓			
1714	53831	Mr. Ehlers, R-MI		✓			
425	52472	Mr. Gutknecht, R-MN		✓			
2342	55565	Mr. Lucas, R-OK		✓			
1317	53515	Mrs. Biggert, R-IL		✓			
2245	55311	Mr. Gilchrest, R-MD		✓			
117	52561	Mr. Akin, R-MO		✓			
1229	52371	Mr. Johnson, R-IL					
307	56365	Mr. Forbes, R-VA		✓			
315	54931	Mr. Bonner, R-AL		✓			
323	52706	Mr. Feeney, R-FL		✓			
330	56030	Mr. Inglis, R-SC		✓			
1223	57761	Mr. Reichert, R-WA		✓			
1508	55315	Mr. Sodrel, R-IN		✓			
128	56276	Mr. Schwarz, R-MI		✓			
415	52401	Mr. McCaul, R-TX		✓			
2304	***54231***	***Mr. Gordon, D-TN***	✓				
2269	***55661***	***Mr. Costello, D-IL***	✓				
1511	***58885***	***Ms. Johnson, D-TX***	✓				
2263	***55161***	***Ms. Woolsey, D-CA***	✓				
2430	***55711***	***Ms. Hooley, D-OR***	✓				
240	***52161***	***Mr. Udall, D-CO***	✓				
1023	***50855***	***Mr. Wu, D-OR***	✓				
1713	***52631***	***Mr. Honda, D-CA***	✓				
1722	***53032***	***Mr. Miller, D-NC***	✓				
410	***56831***	***Mr. Davis, D-TN***	✓				
1232	***52671***	***Mr. Carnahan, D-MO***	✓				
1217	***55701***	***Mr. Lipinski, D-IL***	✓				
2435	***53816***	***Ms. Jackson Lee, D-TX***	✓				
1030	***55911***	***Mr. Sherman, D-CA***	✓				
1421	***53536***	***Mr. Baird, D-WA***					
1222	***53011***	***Mr. Matheson, D-UT***					
1004	***53341***	***Mr. Costa, D-CA***	✓				
1529	***57508***	***Mr. Green, D-TX***	✓				
404	***54031***	***Mr. Melancon, D-LA***	✓				
		TOTAL	17	19			

Attest: Vivian A. Venuti (Clerk)

Chairman BOEHLERT. All right. The amendment is not agreed to, and the amendment is rejected.

Are there any other amendments? Hearing none, the vote is on the bill, as amended, H.R. 28, *High-Performance Computing Revitalization Act of 2005,* as amended. All of those in favor, say aye. Opposed, no. In the opinion of the Chair, the ayes have it.

I recognize Mr. Gordon to offer a motion.

Mr. GORDON. Mr. Chairman, I move that the Committee favorably report H.R. 28, as amended, to the House with the recommendation that the bill, as amended, do pass. Furthermore, I move the staff be instructed to prepare the legislative report, make necessary technical and conforming changes, and that the Chairman take all necessary steps to bring the bill before the House for consideration.

Chairman BOEHLERT. The motion—the question is on the motion to report the bill favorably. Those in favor of passage will signify by saying aye. Opposed, no. The ayes have it, and the bill is favorably reported.

Without objection, the motion to reconsider is laid upon the table. I move that Members have two subsequent calendar days in which to submit supplemental, Minority, or additional views on the measure. I move pursuant to Clause 1 of Rule 22 of the Rules of the House of Representatives that the Committee authorize the Chairman to offer such motions as may be necessary to adopt in the House and pass H.R. 28, *High-Performance Computing Revitalization Act of 2005.* Without objection, so ordered.

Let the record reflect that Mr. Johnson would have voted no on the Sherman amendment on H.R. 28.

We don't have to come back after votes. This is it. We are going to take up the Green Chemistry bill, which is going to require a little more time right after the recess.

Mr. GORDON. Mr. Chairman, if I could just real quickly say, I know that there a lot of Members that have personal interests in this methamphetamine concern. This is just a first start. We will have some additional legislation. I know we rushed through this today, but we will have more for all of us to be involved with later.

Chairman BOEHLERT. And we are going to have it on the Floor with some considerable discussion on it.

Thank you all very much for arriving. I want to thank you for participating.

This concludes our Committee markup.

[Whereupon, at 11:10 a.m., the Committee was adjourned.]

Appendix:

H.R. 28, SECTION-BY-SECTION ANALYSIS, AMENDMENT ROSTER

109TH CONGRESS
1ST SESSION

H. R. 28

To amend the High-Performance Computing Act of 1991.

IN THE HOUSE OF REPRESENTATIVES

JANUARY 4, 2005

Mrs. BIGGERT (for herself, Mr. DAVIS of Tennessee, and Mr. BOEHLERT) introduced the following bill; which was referred to the Committee on Science

---

A BILL

To amend the High-Performance Computing Act of 1991.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "High-Performance Computing Revitalization Act of 2005".

SEC. 2. DEFINITIONS.

Section 4 of the High-Performance Computing Act of 1991 (15 U.S.C. 5503) is amended—

(1) in paragraph (2), by inserting "and multidisciplinary teams of researchers" after "high-performance computing resources";

(2) in paragraph (3)—

(A) by striking "scientific workstations,";

(B) by striking "(including vector supercomputers and large scale parallel systems)";

(C) by striking "and applications" and inserting "applications"; and

(D) by inserting ", and the management of large data sets" after "systems software";

(3) in paragraph (4), by striking "packet switched"; and

(4) by amending paragraphs (5) and (6) to read as follows:

"(5) 'Program' means the High-Performance Computing Research and Development Program described in section 101; and

"(6) 'Program Component Areas' means the major subject areas under which are grouped related individual projects and activities carried out under the Program.".

SEC. 3. HIGH-PERFORMANCE COMPUTING RESEARCH AND DEVELOPMENT PROGRAM.

Title I of the High-Performance Computing Act of 1991 (15 U.S.C. 5511 et seq.) is amended—

(1) in the title heading, by striking "**AND THE NATIONAL RESEARCH AND EDU-**

CATION NETWORK" and inserting "**RESEARCH AND DEVELOPMENT**";

(2) in section 101—

(A) the section heading, by striking "**NATIONAL HIGH-PERFORMANCE COMPUTING**" and inserting "**HIGH-PERFORMANCE COMPUTING RESEARCH AND DEVELOPMENT**";

(B) in subsection (a)—

(i) in the subsection heading, by striking "NATIONAL HIGH-PERFORMANCE COMPUTING" and inserting "HIGH-PERFORMANCE COMPUTING RESEARCH AND DEVELOPMENT";

(ii) by striking paragraphs (1) and (2) and inserting the following: "(1) The President shall implement a High-Performance Computing Research and Development Program, which shall—

"(A) provide for long-term basic and applied research on high-performance computing;

"(B) provide for research and development on, and demonstration of, technologies to advance the capacity and capabilities of high-performance computing and networking systems;

"(C) provide for sustained access by the research community in the United States to high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, including provision for technical support for users of such systems;

"(D) provide for efforts to increase software availability, productivity, capability, security, portability, and reliability;

"(E) provide for high-performance networks, including experimental testbed networks, to enable research and development on, and demonstration of, advanced applications enabled by such networks;

"(F) provide for computational science and engineering research on mathematical modeling and algorithms for applications in all fields of science and engineering;

"(G) provide for the technical support of, and research and development on, high-performance computing systems and software required to address Grand Challenges;

"(H) provide for educating and training additional undergraduate and graduate students in software engineering, computer science, computer and

network security, applied mathematics, library and information science, and computational science; and

"(I) provide for improving the security of computing and networking systems, including Federal systems, including research required to establish security standards and practices for these systems.";

(iii) by redesignating paragraphs (3) and (4) as paragraphs (2) and (3), respectively;

(iv) in paragraph (2), as so redesignated by clause (iii) of this subparagraph—

(I) by striking subparagraph (B);

(II) by redesignating subparagraphs (A) and (C) as subparagraphs (D) and (F), respectively;

(III) by inserting before subparagraph (D), as so redesignated by subclause (II) of this clause, the following new subparagraphs:

"(A) establish the goals and priorities for Federal high-performance computing research, development, networking, and other activities;

"(B) establish Program Component Areas that implement the goals established under subparagraph

(A), and identify the Grand Challenges that the Program should address;

"(C) provide for interagency coordination of Federal high-performance computing research, development, networking, and other activities undertaken pursuant to the Program;"; and

(IV) by inserting after subparagraph (D), as so redesignated by subclause (II) of this clause, the following new subparagraph:

"(E) develop and maintain a research, development, and deployment roadmap for the provision of high-performance computing systems under paragraph (1)(C); and"; and

(v) in paragraph (3), as so redesignated by clause (iii) of this subparagraph—

(I) by striking "paragraph (3)(A)" and inserting "paragraph (2)(D)";

(II) by amending subparagraph (A) to read as follows:

"(A) provide a detailed description of the Program Component Areas, including a description of any changes in the definition of or activities under

the Program Component Areas from the preceding report, and the reasons for such changes, and a description of Grand Challenges supported under the Program;";

(III) in subparagraph (C), by striking "specific activities" and all that follows through "the Network" and inserting "each Program Component Area";

(IV) in subparagraph (D), by inserting "and for each Program Component Area" after "participating in the Program";

(V) in subparagraph (D), by striking "applies;" and inserting "applies; and";

(VI) by striking subparagraph (E) and redesignating subparagraph (F) as subparagraph (E); and

(VII) in subparagraph (E), as so redesignated by subclause (VI) of this clause, by inserting "and the extent to which the Program incorporates the recommendations of the advisory com-

mittee established under subsection (b)" after "for the Program";

(C) in subsection (b)—

(i) by redesignating paragraphs (1) through (5) as subparagraphs (A) through (E), respectively;

(ii) by inserting "(1)" after "ADVISORY COMMITTEE.—";

(iii) in paragraph (1)(C), as so redesignated by clauses (i) and (ii) of this subparagraph, by inserting ", including funding levels for the Program Component Areas" after "of the Program";

(iv) in paragraph (1)(D), as so redesignated by clauses (i) and (ii) of this subparagraph, by striking "computing" and inserting "high-performance computing and networking"; and

(v) by adding at the end the following new paragraph:

"(2) In addition to the duties outlined in paragraph (1), the advisory committee shall conduct periodic evaluations of the funding, management, coordination, implementation, and activities of the Program, and shall report not less frequently than once every two fiscal years to the

Committee on Science of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate on its findings and recommendations. The first report shall be due within one year after the date of enactment of this paragraph."; and

(D) in subsection (c)(1)(A), by striking "Program or" and inserting "Program Component Areas or"; and

(3) by striking sections 102 and 103.

SEC. 4. AGENCY ACTIVITIES.

Title II of the High-Performance Computing Act of 1991 (15 U.S.C. 5521 et seq.) is amended—

(1) by amending subsection (a) of section 201 to read as follows:

"(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the National Science Foundation shall—

"(1) support research and development to generate fundamental scientific and technical knowledge with the potential of advancing high-performance computing and networking systems and their applications;

"(2) provide computing and networking infrastructure support to the research community in the United States, including the provision of high-per-

formance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, and including support for advanced software and applications development, for all science and engineering disciplines; and

"(3) support basic research and education in all aspects of high-performance computing and networking.";

(2) by amending subsection (a) of section 202 to read as follows:

"(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the National Aeronautics and Space Administration shall conduct basic and applied research in high-performance computing and networking, with emphasis on—

"(1) computational fluid dynamics, computational thermal dynamics, and computational aerodynamics;

"(2) scientific data dissemination and tools to enable data to be fully analyzed and combined from multiple sources and sensors;

"(3) remote exploration and experimentation; and

"(4) tools for collaboration in system design, analysis, and testing.";

(3) in section 203—

(A) by striking subsections (a) through (d) and inserting the following:

"(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the Secretary of Energy shall—

"(1) conduct and support basic and applied research in high-performance computing and networking to support fundamental research in science and engineering disciplines related to energy applications; and

"(2) provide computing and networking infrastructure support, including the provision of high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, and including support for advanced software and applications development, for science and engineering disciplines related to energy applications."; and

(B) by redesignating subsection (e) as subsection (b);

(4) by amending subsection (a) of section 204 to read as follows:

"(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I—

"(1) the National Institute of Standards and Technology shall—

"(A) conduct basic and applied metrology research needed to support high-performance computing and networking systems;

"(B) develop benchmark tests and standards for high-performance computing and networking systems and software;

"(C) develop and propose voluntary standards and guidelines, and develop measurement techniques and test methods, for the interoperability of high-performance computing systems in networks and for common user interfaces to high-performance computing and networking systems; and

"(D) work with industry and others to develop, and facilitate the implementation of, high-performance computing applications to solve science and engineering problems that are relevant to industry; and

"(2) the National Oceanic and Atmospheric Administration shall conduct basic and applied research

on high-performance computing applications, with emphasis on—

"(A) improving weather forecasting and climate prediction;

"(B) collection, analysis, and dissemination of environmental information; and

"(C) development of more accurate models of the ocean-atmosphere system."; and

(5) by amending subsection (a) of section 205 to read as follows:

"(a) GENERAL RESPONSIBILITIES.—As part of the Program described in title I, the Environmental Protection Agency shall conduct basic and applied research directed toward advancement and dissemination of computational techniques and software tools for high-performance computing systems with an emphasis on modeling to—

"(1) develop robust decision support tools;

"(2) predict pollutant transport and the effects of pollutants on humans and on ecosystems; and

"(3) better understand atmospheric dynamics and chemistry.".

○

SECTION-BY-SECTION ANALYSIS OF H.R. 28,
HIGH-PERFORMANCE COMPUTING REVITALIZATION ACT OF 2005

Sec. 1. Short Title

"High-Performance Computing Revitalization Act of 2005."

Sec. 2. Definitions

Amends section 4 of the *High-Performance Computing Act of 1991* (HPC Act) to further elaborate on, or amend, the definition of terms used in the Act:

- "Grand Challenge" means a fundamental problem in science or engineering, with broad economic and scientific impact, whose solution will require the application of high-performance computing resources and multidisciplinary teams of researchers;
- "High-performance computing" means advanced computing, communications, and information technologies, including supercomputer systems, high-capacity and high-speed networks, special purpose and experimental systems, applications and systems software, and the management of large data sets;
- "Program" means the High-Performance Computing Research and Development Program described in section 101;
- "Program Component Areas" means the major subject areas under which are grouped related individual projects and activities carried out under the Program.

Strikes the definition of "Network" because it refers to the National Research and Education Network, which no longer exists as such.

Sec. 3. High-Performance Computing Research and Development Program

Amends section 101 of the HPC Act, which describes the organization and responsibilities of the interagency research and development program originally referred to as the National High-Performance Computing Program—and renamed the High-Performance Computing Research and Development Program in this Act. Requires the program to:

- Provide for long-term basic and applied research on high-performance computing;
- Provide for research and development on, and demonstration of, technologies to advance the capacity and capabilities of high-performance computing and networking systems;
- Provide for sustained access by the research community in the United States to high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, including provision for technical support for users of such systems;
- Provide for efforts to increase software availability, productivity, capability, security, portability, and reliability;
- Provide for high-performance networks, including experimental testbed networks, to enable research and development on, and demonstration of, advanced applications enabled by such networks;
- Provide for computational science and engineering research on mathematical modeling and algorithms for applications in all fields of science and engineering;
- Provide for the technical support of, and research and development on, high-performance computing systems and software required to address Grand Challenges;
- Provide for educating and training additional undergraduate and graduate students in software engineering, computer science, computer and network security, applied mathematics, library and information science, and computational science;
- Provide for improving the security of computing and networking systems, including research required to establish security standards and practices for these systems.

Requires the Director of the Office of Science and Technology Policy (OSTP) to:

- Establish the goals and priorities for federal high-performance computing research, development, networking, and other activities;
- Establish Program Component Areas that implement the goals established for the Program and identify the Grand Challenges that the Program should address;
- Provide for interagency coordination of federal high-performance computing research, development, networking, and other activities undertaken pursuant to the Program;

- Develop and maintain a research, development, and deployment roadmap for the provision of high-performance computing systems for use by the research community in the United States.

Leaves substantially unchanged the provisions of the HPC Act requiring the Director of OSTP to:

- Provide an annual report to Congress, along with the annual budget request, describing the implementation of the Program, including current and proposed funding levels and programmatic changes, if any, from the previous year;
- Consult with academic, State, and other appropriate groups conducting research on and using high-performance computing.

Requires the Director of OSTP to include in his annual report to Congress:

- A detailed description of the Program Component Areas, including a description of any changes in the definition of activities under the Program Component Areas from the previous year, and the reasons for such changes, and a description of Grand Challenges supported under the Program;
- An analysis of the extent to which the Program incorporates the recommendations of the Advisory Committee established by the HPC Act—currently referred to as the President's Information Technology Advisory Committee (PITAC).

Requires PITAC to conduct periodic evaluations of the funding, management, coordination, implementation, and activities of the Program, and to report to Congress once every two fiscal years, with the first report due within one year of enactment.

Repeals section 102 of HPC Act, the "National Research and Education Network," which required the development of a network to link research and educational institutions, government, and industry. This network was developed but has since been supplanted by the Internet.

Repeals section 103 of the HPC Act, "Next Generation Internet," as this program is no longer in existence.

Sec. 4. Agency Activities

Amends section 201 of the HPC Act, which describes the responsibilities of the National Science Foundation (NSF) under the Program. Requires NSF to:

- Support research and development to generate fundamental scientific and technical knowledge with the potential of advancing high-performance computing and networking systems and their applications;
- Provide computing and networking infrastructure support to the research community in the United States, including the provision of high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, including support for advanced software and applications development, for all science and engineering disciplines;
- Support basic research and education in all aspects of high-performance computing and networking.

Amends section 202 of the HPC Act, which describes the responsibilities of the National Aeronautics and Space Administration (NASA) under the Program. Requires NASA to conduct basic and applied research in high-performance networking, with emphasis on:

- Computational fluid dynamics, computational thermal dynamics, and computational aerodynamics;
- Scientific data dissemination and tools to enable data to be fully analyzed and combined from multiple sources and sensors;
- Remote exploration and experimentation;
- Tools for collaboration in system design, analysis, and testing.

Amends section 203 of the HPC Act, which describes the responsibilities of the Department of Energy (DOE) under the Program. Requires DOE to:

- Conduct and support basic and applied research in high-performance computing and networking to support fundamental research in science and engineering disciplines related to energy applications;
- Provide computing and networking infrastructure support, including the provision of high-performance computing systems that are among the most advanced in the world in terms of performance in solving scientific and engineering problems, and including support for advanced software and applications development, for science and engineering disciplines related to energy applications.

Amends section 204 of the HPC Act, which describes the responsibilities of the Department of Commerce, including the National Institute of Standards and Tech-

nology (NIST) and the National Oceanic and Atmospheric Administration (NOAA), under the Program.

Requires NIST to:

- Conduct basic and applied metrology research needed to support high-performance computing and networking systems;
- Develop benchmark tests and standards for high-performance computing and networking systems and software;
- Develop and propose voluntary standards and guidelines, and develop measurement techniques and test methods, for the inter-operability of high-performance computing systems in networks and for common user interfaces to high-performance computing and networking systems;
- Work with industry and others to develop, and facilitate the implementation of, high-performance computing applications to solve science and engineering problems that are relevant to industry.

Requires NOAA to conduct basic and applied research in high-performance computing applications, with emphasis on:

- Improving weather forecasting and climate prediction;
- Collection, analysis, and dissemination of environmental information;
- Development of more accurate models of the ocean-atmosphere system.

Amends section 205 of the HPC Act, which describes the responsibilities of the Environmental Protection Agency (EPA) under the Program. Requires EPA to conduct basic and applied research directed toward the advancement and dissemination of computational techniques and software tools with an emphasis on modeling to:

- Develop robust decision-support tools;
- Predict pollutant transport and their effects on humans and on ecosystems;
- Better understand atmospheric dynamics and chemistry.

COMMITTEE ON SCIENCE
FULL COMMITTEE MARKUP

March 17, 2005

AMENDMENT ROSTER

H.R. 28, High-Performance Computing Revitalization Act of 2005
--Motion to adopt the bill, as amended: agreed to by a voice vote.
--Motion to report the bill, as amended: agreed to by a voice vote.

No.	Sponsor	Description	Results
1.	Mrs. Biggert	Amendment would insert a new Section— Sec.2. Findings—to emphasize the importance of commercial application as a result of Federal investment in computer science.	--Adopted by a voice vote.
2.	Mr. Sherman	Amendment would insert a new Section— Sec. 5. Societal Implications of Information Technology.	--Defeated by a roll call vote: Y-17; N-19.

AMENDMENT TO H.R. 28

OFFERED BY MRS. BIGGERT OF ILLINOIS

Page 1, line 6, page 2, line 19, and page 9, line 10, redesignate sections 2, 3, and 4 as sections 3, 4, and 5, respectively.

Page 1, after line 5, insert the following new section:

SEC. 2. FINDINGS.

Section 2 of the High-Performance Computing Act of 1991 (15 U.S.C. 5501) is amended by adding at the end the following new paragraph:

"(10) Commercial application of the results of Federal investment in basic and computing science is consistent with longstanding United States technology transfer policy and is a critical national priority, particularly with regard to cybersecurity and other homeland security applications, because of the urgent needs of commercial, academic, and individual users as well as the Federal and State Governments.".

AMENDMENT TO H.R. 28

OFFERED BY MR. SHERMAN OF CALIFORNIA

At the end of the bill, insert the following new section:

SEC. 5. SOCIETAL IMPLICATIONS OF INFORMATION TECHNOLOGY.

In carrying out its programs on the social, economic, legal, ethical, and cultural implications of information technology, the National Science Foundation shall support research into the implications of computers (including both hardware and software) that would be capable of mimicking human abilities to learn, reason, and make decisions.

○