107TH CONGRESS
1ST SESSION

S. 193

To authorize funding for Advanced Scientific Research Computing Programs at the Department of Energy for fiscal years 2002 through 2006, and for other purposes.

IN THE SENATE OF THE UNITED STATES

JANUARY 29, 2001

Mr. BINGAMAN (for himself, Mr. CRAIG, Mr. SCHUMER, and Mrs. MURRAY) introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

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A BILL

To authorize funding for Advanced Scientific Research Computing Programs at the Department of Energy for fiscal years 2002 through 2006, and for other purposes.

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 ''Department of Energy Advanced Scientific Computing Act''.

SEC. 2. FINDINGS.

The Congress finds the following:

(1) The Department of Energy and its Office of Science research programs has played an important

role in the development of high performance computing, networking, and information technology. These capabilities have been readily accessible to the U.S. scientific community for a diverse set of grand challenge scientific computational problems. Contributions by the Department include pioneering the concept of remote, interactive access to supercomputers (developing the first interactive operating system for supercomputers, establishing the first national supercomputer center); developing the mathematical foundations for high performance computing with numerical linear algebra libraries used worldwide; leading the transition to massively parallel supercomputing by developing software to allow processors to communicate with each other; and contributing to the development of the Internet with software that dramatically speeds up the transmission of messages.

(2) The Department of Energy's Office of Science's contributions to networking and information technology have played a key role in its ability to accomplish its statutory mission to promote the basic sciences critical to the Nation's energy future through the development of remote access to its shared computing and experimental facilities. Par-

ticular users of the computing facilities have been high energy physicists who model electromagnetic fields and beam dynamics in accelerators, materials scientists who model and design materials using computational techniques, chemists who model the chemical processes involved in combustion, atmospheric scientists who model global climate patterns, geologists who model ground transport of fluids and waste, and biologists who want to predict protein structures. Continued accomplishments in these areas will be needed to continue to carry out future DOE missions.

(3) The Department of Energy has unique multi-disciplinary facilities for advancing basic and applied science which include the high energy and nuclear laboratories, neutron sources and synchrotron facilities, and advanced computing and communications facilities such as the National Energy Research Scientific Computing Center, the Advanced Computing Research Facilities, and the Energy Sciences Network. Each facility when networked to share large amounts of scientific data will better be able to advance the fundamental understanding in their respective areas as well as the overall net-

working and information technology infrastructure for the Nation.

(4) Many challenges are associated with modeling complex physical, chemical, and biological phenomena, especially on massively parallel computers with peak speeds in hundreds of teraflops (100 trillion arithmetic operations per second). These challenges include the management and analysis of petabyte-scale data sets. A program to address these challenges will require multi-disciplinary collaborations between theoretical and computational scientists, computer scientists, and applied mathematicians at universities, national laboratories, and industry. Such a program will enhance the ability of DOE to meet its mission goals and advance the state of the art for the U.S. economic and industrial base in the fields of energy, geology, genetics, chemical processing, electronics and transportation.

(5) Solving the challenges facing the Department of Energy in developing and using high-performance computing, networking, and information technologies will be of immense value to the Nation. Potential benefits include: reliable prediction of the Earth's climate as well as the performance of energy systems; understanding aging and fatigue effects in

materials crucial to energy and transportation systems; promoting energy-efficient chemical production through improved chemical processes, including rational catalyst design; predicting the structure and functions of the proteins coded by DNA and their response to chemical and radiation damage; designing more efficient combustion systems; and understanding turbulent flow in plasmas in energy and advanced materials applications.

SEC. 3. DEPARTMENT OF ENERGY PROGRAM.

(a) ESTABLISHMENT.—The Secretary of Energy, through the Office of Science, shall support a program to advance the Nation's computing capability across a diverse set of grand challenge computationally based science problems.

(b) DUTIES OF THE OFFICE OF SCIENCE.—In carrying out the program under this Act, the Director of the Office shall—

(1) advance basic science through computation by developing software to solve grand challenge science problems on new generations of computing platforms,

(2) enhance the foundations for scientific computing by developing the basic mathematical and computing systems software needed to take full ad-

vantage of the computing capabilities of computers with peak speeds of 100 teraflops or more, some of which may be unique to the scientific problem of interest,

(3) enhance national collaboratory and networking capabilities by developing software to integrate geographically separated researchers into effective research teams and to facilitate access to and movement and analysis of large (petabyte) data sets, and

(4) maintain a robust scientific computing hardware infrastructure to ensure that the computing resources needed to address DOE missions are available; explore new computing approaches and technologies that promise to advance scientific computing.

Within the funds authorized to be appropriated pursuant to this Act, the amounts specified under this section shall, subject to appropriations, be available for the above research activities.

(c) HIGH-PERFORMANCE COMPUTING ACT PROGRAM.—Section 203(a) of the High-Performance Computing Act of 1991 (15 U.S.C. 5523(a)) is amended—

(1) in paragraph (3), by striking ''and'';

(2) in paragraph (4), by striking the period and inserting ''; and''; and

(3) by adding after paragraph (4) the following: ''(5) conduct an integrated program of research, development, and provision of facilities to develop and deploy to scientific and technical users the high-performance computing and collaboration tools needed to fulfill the statutory missions of the Department of Energy in conducting basic and applied energy research.''.

(d) COORDINATION WITH THE DOE NATIONAL NUCLEAR SECURITY AGENCY ACCELERATED STRATEGIC COMPUTING INITIATIVE AND OTHER NATIONAL COMPUTING PROGRAMS.—The Secretary shall ensure through the Director of the Office of Science, that this program, to the extent feasible, is integrated and consistent with the National Nuclear Security Agency's Accelerated Strategic Computing Initiative. The Secretary through the Director of the Office of Science shall ensure that this program is integrated and consistent with other national efforts related to advanced scientific computing for science and engineering.

(e) MERIT REVIEW REQUIRED.—All grants, contracts, cooperative agreements, or other financial assist-

ance awards under this Act shall be made only after independent merit and peer review.

SEC. 4. AUTHORIZATION OF APPROPRIATIONS.

(a) TOTAL AUTHORIZATION.—The following sums are authorized to be appropriated to the Secretary of Energy, to remain available until expended, for the purposes of carrying out this Act:

(1) $250,000,000 for fiscal year 2002.

(2) $285,000,000 for fiscal year 2003.

(3) $300,000,000 for fiscal year 2004.

(4) $310,000,000 for fiscal year 2005.

(b) HIGH-END COMPUTING R&D.—Of the funds under subsection (a), the following sums are authorized to be appropriated to carry out high-end computing R&D in section 3(b) (1) and (2):

(1) $39,500,000 for fiscal year 2002.

(2) $45,000,000 for fiscal year 2003.

(3) $45,000,000 for fiscal year 2004.

(4) $50,000,000 for fiscal year 2005.

(5) $50,000,000 for fiscal year 2006.

(c) LARGE-SCALE COMPUTING AND COLLABORATORY RESEARCH.—Of the funds under subsection (a), the following sums are authorized to be appropriated to carry out large-scale computing and collaboratory research in section 3(b)(3):

(1) $54,500,000 for fiscal year 2002.

(2) $57,000,000 for fiscal year 2003.

(3) $58,000,000 for fiscal year 2004.

(4) $60,000,000 for fiscal year 2005.

(5) $60,000,000 for fiscal year 2006.

(d) HIGH-END COMPUTING INFRASTRUCTURE AND APPLICATIONS.—Of the funds under subsection (a), the following sums are authorized to be appropriated to carry out high end computing infrastructure and associated applications in section 3(b)(4):

(1) $156,000,000 for fiscal year 2002.

(2) $183,000,000 for fiscal year 2003.

(3) $197,000,000 for fiscal year 2004.

(4) $200,000,000 for fiscal year 2005.

(5) $200,000,000 for fiscal year 2006.

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