

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.

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## 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.

1       *Be it enacted by the Senate and House of Representa-  
2       tives of the United States of America in Congress assembled,*

**3       SECTION 1. SHORT TITLE.**

4       This Act may be cited as “Department of Energy Ad-  
5       vanced Scientific Computing Act”.

**6       SEC. 2. FINDINGS.**

7       The Congress finds the following:

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

1 role in the development of high performance com-  
2 puting, networking, and information technology.  
3 These capabilities have been readily accessible to the  
4 U.S. scientific community for a diverse set of grand  
5 challenge scientific computational problems. Con-  
6 tributions by the Department include pioneering the  
7 concept of remote, interactive access to supercom-  
8 puters (developing the first interactive operating sys-  
9 tem for supercomputers, establishing the first na-  
10 tional supercomputer center); developing the mathe-  
11 matical foundations for high performance computing  
12 with numerical linear algebra libraries used world-  
13 wide; leading the transition to massively parallel  
14 supercomputing by developing software to allow  
15 processors to communicate with each other; and con-  
16 tributing to the development of the Internet with  
17 software that dramatically speeds up the trans-  
18 mission of messages.

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

1       ticular users of the computing facilities have been  
2       high energy physicists who model electromagnetic  
3       fields and beam dynamics in accelerators, materials  
4       scientists who model and design materials using  
5       computational techniques, chemists who model the  
6       chemical processes involved in combustion, atmos-  
7       pheric scientists who model global climate patterns,  
8       geologists who model ground transport of fluids and  
9       waste, and biologists who want to predict protein  
10      structures. Continued accomplishments in these  
11      areas will be needed to continue to carry out future  
12      DOE missions.

13           (3) The Department of Energy has unique  
14      multi-disciplinary facilities for advancing basic and  
15      applied science which include the high energy and  
16      nuclear laboratories, neutron sources and synchro-  
17      tron facilities, and advanced computing and commu-  
18      nications facilities such as the National Energy Re-  
19      search Scientific Computing Center, the Advanced  
20      Computing Research Facilities, and the Energy  
21      Sciences Network. Each facility when networked to  
22      share large amounts of scientific data will better be  
23      able to advance the fundamental understanding in  
24      their respective areas as well as the overall net-

1 working and information technology infrastructure  
2 for the Nation.

3 (4) Many challenges are associated with mod-  
4 eling complex physical, chemical, and biological phe-  
5 nomena, especially on massively parallel computers  
6 with peak speeds in hundreds of teraflops (100 tri-  
7 llion arithmetic operations per second). These chal-  
8 lenges include the management and analysis of  
9 petabyte-scale data sets. A program to address these  
10 challenges will require multi-disciplinary collabora-  
11 tions between theoretical and computational sci-  
12 entists, computer scientists, and applied mathemati-  
13 cians at universities, national laboratories, and in-  
14 dustry. Such a program will enhance the ability of  
15 DOE to meet its mission goals and advance the  
16 state of the art for the U.S. economic and industrial  
17 base in the fields of energy, geology, genetics, chem-  
18 ical processing, electronics and transportation.

19 (5) Solving the challenges facing the Depart-  
20 ment of Energy in developing and using high-per-  
21 formance computing, networking, and information  
22 technologies will be of immense value to the Nation.  
23 Potential benefits include: reliable prediction of the  
24 Earth's climate as well as the performance of energy  
25 systems; understanding aging and fatigue effects in

1 materials crucial to energy and transportation sys-  
2 tems; promoting energy-efficient chemical production  
3 through improved chemical processes, including ra-  
4 tional catalyst design; predicting the structure and  
5 functions of the proteins coded by DNA and their  
6 response to chemical and radiation damage; design-  
7 ing more efficient combustion systems; and under-  
8 standing turbulent flow in plasmas in energy and  
9 advanced materials applications.

10 **SEC. 3. DEPARTMENT OF ENERGY PROGRAM.**

11 (a) ESTABLISHMENT.—The Secretary of Energy,  
12 through the Office of Science, shall support a program to  
13 advance the Nation’s computing capability across a diverse  
14 set of grand challenge computationally based science prob-  
15 lems.

16 (b) DUTIES OF THE OFFICE OF SCIENCE.—In car-  
17 rying out the program under this Act, the Director of the  
18 Office shall—

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

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

1 vantage of the computing capabilities of computers  
2 with peak speeds of 100 teraflops or more, some of  
3 which may be unique to the scientific problem of in-  
4 terest,

5 (3) enhance national collaborative and net-  
6 working capabilities by developing software to inte-  
7 grate geographically separated researchers into ef-  
8 fective research teams and to facilitate access to and  
9 movement and analysis of large (petabyte) data sets,  
10 and

11 (4) maintain a robust scientific computing  
12 hardware infrastructure to ensure that the com-  
13 puting resources needed to address DOE missions  
14 are available; explore new computing approaches and  
15 technologies that promise to advance scientific com-  
16 putting.

17 Within the funds authorized to be appropriated pursuant  
18 to this Act, the amounts specified under this section shall,  
19 subject to appropriations, be available for the above re-  
20 search activities.

21 (c) HIGH-PERFORMANCE COMPUTING ACT PRO-  
22 GRAM.—Section 203(a) of the High-Performance Com-  
23 putting Act of 1991 (15 U.S.C. 5523(a)) is amended—

24 (1) in paragraph (3), by striking “and”;

(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.

23 (e) MERIT REVIEW REQUIRED.—All grants, con-  
24 tracts, cooperative agreements, or other financial assist-

1 ance awards under this Act shall be made only after inde-  
2 pendent merit and peer review.

3 **SEC. 4. AUTHORIZATION OF APPROPRIATIONS.**

4 (a) **TOTAL AUTHORIZATION.**—The following sums  
5 are authorized to be appropriated to the Secretary of En-  
6 ergy, to remain available until expended, for the purposes  
7 of carrying out this Act:

8 (1) \$250,000,000 for fiscal year 2002.  
9 (2) \$285,000,000 for fiscal year 2003.  
10 (3) \$300,000,000 for fiscal year 2004.  
11 (4) \$310,000,000 for fiscal year 2005.

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

16 (1) \$39,500,000 for fiscal year 2002.  
17 (2) \$45,000,000 for fiscal year 2003.  
18 (3) \$45,000,000 for fiscal year 2004.  
19 (4) \$50,000,000 for fiscal year 2005.  
20 (5) \$50,000,000 for fiscal year 2006.

21 (c) **LARGE-SCALE COMPUTING AND COLLABORATORY  
22 RESEARCH.**—Of the funds under subsection (a), the fol-  
23 lowing sums are authorized to be appropriated to carry  
24 out large-scale computing and collaborative research in  
25 section 3(b)(3):

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

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

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

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

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

## 6 (d) HIGH-END COMPUTING INFRASTRUCTURE AND

## 7 APPLICATIONS.—Of the funds under subsection (a), the

8 following sums are authorized to be appropriated to carry

9 out high end computing infrastructure and associated ap-

## 10 Applications in section 3(b)(4):

11 (1) \$156,000,000 for fiscal year 2002.

12 (2) \$183,000,000 for fiscal year 2003.

13 (3) \$197,000,000 for fiscal year 2004.

14 (4) \$200,000,000 for fiscal year 2005.

15 (5) \$200,000,000 for fiscal year 2006.

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