

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 tril-  
7        lion 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 collaboratory 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 puting.

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 puting Act of 1991 (15 U.S.C. 5523(a)) is amended—

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

1           (2) in paragraph (4), by striking the period and  
2       inserting “; and”; and

3           (3) by adding after paragraph (4) the following:  
4       “(5) conduct an integrated program of research, de-  
5       velopment, and provision of facilities to develop and  
6       deploy to scientific and technical users the high-per-  
7       formance computing and collaboration tools needed  
8       to fulfill the statutory missions of the Department of  
9       Energy in conducting basic and applied energy re-  
10      search.”.

11       (d) COORDINATION WITH THE DOE NATIONAL NU-  
12      CLEAR SECURITY AGENCY ACCELERATED STRATEGIC  
13      COMPUTING INITIATIVE AND OTHER NATIONAL COM-  
14      PUTING PROGRAMS.—The Secretary shall ensure through  
15      the Director of the Office of Science, that this program,  
16      to the extent feasible, is integrated and consistent with  
17      the National Nuclear Security Agency’s Accelerated Stra-  
18      tegic Computing Initiative. The Secretary through the Di-  
19      rector of the Office of Science shall ensure that this pro-  
20      gram is integrated and consistent with other national ef-  
21      forts related to advanced scientific computing for science  
22      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 collaboratory 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 plications 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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