DOCUMENT RESUME

ED 336 084 IR 015 103

TITLE	High-Performance Computing Act of 1991. Report To Accompany H.R. 656. House of Representatives, 102d Congress, 1st Session.
INSTITUTION	Congress of the U.S., Washington, D.C. House.
REPORT NO	House-R-102-66-Part-2
PUB DATE	91
NOTE	10p.; For related reports, see ED 332 693-694, IR 015 102, IR 015 105, IR 015 125, and IR 015 204.
PUB TYPE	Legal/Legislative/Regulatory Materials (090) -- Viewpoints (Opinion/Position Papers, Essays, etc.) (120)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Computer Networks; Computer Software Development; Costs; Elementary Secondary Education; *Federal Legislation; Federal Programs; Higher Education; *Information Technology; *National Programs; Research and Development; Technological Advancement
IDENTIFIERS	Congress 102nd; *High Performance Computing; *National Research and Education Network; Supercomputers

ABSTRACT

This report, submitted by Representative Ford, of Michigan, from the House Committee on Education and Labor, is intended to accompany H.R. 656. The bill provides for a focused and coordinated federal research program to ensure continued U.S. leadership in high-performance computing through the establishment of a national network of high-performance computers and to accelerate research in the field and broaden the application of high-performance computing throughout all spheres of society. The bill also requires the Director of the Office of Science and Technology Policy to coordinate among the various federal agencies a national network of high-speed computers, which would be known as the National Research and Education Network (NREN). In addition, the bill authorizes funding for several federal agencies to carry out high-speed computer research and application. It is noted that, during consideration of the bill by the Science, Space, and Technology Committee, a number of provisions were included that will permit the participation of libraries and education institutions at all levels in NREN. The Committee on Education and Labor received the bill as a sequential referral, and adopted three amendments to the bill to enhance the ability of educators and librarians to participate in the benefits which will be provided through NREN. This Committee reports favorably on the bill as amended and recommends that it be passed. Cost estimates of the Congressional Budget Office are included in the report. (DB)

102D CONGRESS
1st Session
HOUSE OF REPRESENTATIVES
REPT. 102-66
Part 2

HIGH-PERFORMANCE COMPUTING ACT OF 1991

MAY 22, 1991.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

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Mr. FORD of Michigan, from the Committee on Education and Labor, submitted the following

REPORT

[To accompany H.R. 656]

[Including cost estimate of the Congressional Budget Office]

The Committee on Education and Labor, to whom was referred the bill (H.R. 656) to provide for a coordinated Federal research program to ensure continued United States leadership in high-performance computing, having considered the same, report favorably thereon with amendments and recommend that the bill as amended do pass.

The amendments to the bill as reported by the Committee on Science, Space, and Technology are as follows:

In section 6(e), insert "and educators" after "researchers".

In section 6(f), after "Services," insert "the Department of Education,".

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

SEC. 12. ROLE OF THE DEPARTMENT OF EDUCATION.

(a) GENERAL RESPONSIBILITIES.—In accordance with the Plan developed under section 5, the Secretary of Education is authorized to conduct basic and applied research in computational research with an emphasis on the coordination of activites with libraries, school facilities, and education research groups with respect to the advancement and dissemination of computational science and the development, evaluation of software capabilities.

(b) AUTHORIZATION OF APPROPRIATIONS.—From sums otherwise authorized to be appropriated, there are authorized to be appropriated to the Department of Education for the purposes of this section $1,500,000 for fiscal year 1992; $1,700,000 for fiscal year

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1994; $2,100,000 for fiscal year 1995; and $2,300,000 for fiscal year 1996.

SUMMARY AND PURPOSE

High-performance computing has become an indispensable tool for researchers in science and engineering, for manufacturers, for industrialists and for an ever-increasing number of others. It offers a sophisticated vehicle for retrieving and interpreting the myriad of information that is potentially available to us. By manipulating enormous quantities of numerical data in seconds, high-performance computing can, for example, create elaborate mathematical models of the world around us and can produce complex computer-generated pictures.

Our nation's success in remaining economically competitive in the world and in addressing such fundamental problems as the treatment of cancer, depends in part on our capabilities in high-performance computing.

H.R. 656 would establish a national network of high-performance computers to accelerate research in the field and to broaden the application of high-performance computing throughout all spheres of our society. Specifically, the bill would provide for a focused and coordinated Federal research program in high-performance computing throughout several Federal agencies. The bill requires the Director of the Office of Science and Technology Policy to coordinate among the various Federal agencies a national network of high-speed computers, which would be known as the National Research and Education Network. In addition, the bill authorizes funding for several Federal agencies to carry out high-speed computer research and application.

EXPLANATION OF AMENDMENTS

The Committee on Education and Labor was provided sequential referral of H.R. 656 because of the legislation's potential impact on education. During the bill's earlier consideration by the Committee on Science, Space and Technology, a number of useful provisions were included which will permit the participation of education institutions at all levels and of libraries in the National Research and Education Network. Our Committee reinforces the important role of these institutions.

The long-term application of the Network to classroom education may not be decided for years to come. However, it is extremely important that this goal be an integral objective of the Program and Network from day one. Much research, planning and thought must be undertaken to make computers an effective, integral part of education in the classroom. The Committee urges sensitivity on the part of the planners of the Network toward that objective.

During its consideration of H.R. 656, the Committee on Education and Labor adopted three amendments to the Science, Space and Technology Committee reported bill. The first amendment includes "educators" among those who would be able to receive information services over the network established by the bill. The second amendment permits Department of Education research grant recipients to use grant funds to pay for computer networking

expenses associated with the Program. The third amendment provides the Secretary of Education the authority to undertake a research program ($1.5 million authorized in FY 1992) in the use of computational sciences by libraries, school facilities and education research groups. These amendments will further enhance the ability of educators and librarians to participate in the benefits which will be provided through the National Research and Education Network.

The Committee would like to emphasize that all States and U.S. territories are eligible to participate in the National Research and Education Network as described in Section 6 of the bill, whether or not they are physically contiguous with the continental U.S.

In addition, the Committee wants to ensure that rural colleges, researchers, and students have equal access to high-performance computer networks and to this Act's programs. Therefore, we request the General Accounting Office (GAO) to conduct a study on the accessibility of high-performance computer networks at colleges, schools and libraries in rural areas. For the purposes of this study, we suggest the GAO examine these institutions located in communities with a population of less than 20,000.

COMMITTEE ACTION

H.R. 656 was introduced by Rep. George E. Brown, Jr., on January 28, 1991. It was referred to the Committee on Science, Space and Technology with sequential referral to the Education and Labor Committee.

On May 16, 1991, the Committee on Education and Labor considered H.R. 656. The Committee approved the text of H.R. 656 as reported by the Committee on Science, Space and Technology along with three amendments offered en bloc by Rep. Goodling. The bill was subsequently ordered to be reported from the Committee unanimously.

CONGRESSIONAL BUDGET OFFICE ESTIMATE

In compliance with clause 2(l)(3)(C) of Rule XI of the Rules of the House of Representatives, the estimate prepared by the Congressional Budget Office pursuant to section 403 of the Congressional Budget Act of 1974, submitted prior to the filing of this report, is set forth as follows:

U.S. CONGRESS,
CONGRESSIONAL BUDGET OFFICE,
Washington, DC, May 22, 1991.

Hon. WILLIAM D. FORD,
Chairman, Committee on Education and Labor, U.S. House of Representatives, Washington, DC.

DEAR MR. CHAIRMAN: The Congressional Budget Office has prepared the attached cost estimate for H.R. 656, the High-Performance Computing Act of 1991. Enactment of H.R. 656 would not affect direct spending or receipts. Therefore, pay-as-you-go procedures would not apply to the bill.

If you wish further details on this estimate, we will be pleased to provide them.

Sincerely,

ROBERT D. REISCHAUER,
Director.

CONGRESSIONAL BUDGET OFFICE COST ESTIMATE

1. Bill number: H.R. 656.
2. Bill title: The High-Performance Computing Act of 1991.
3. Bill status: As ordered by the House Committee on Education and Labor on May 16, 1991.
4. Bill purpose: H.R. 656 would require the President, through the Federal Coordinating Council on Science, Engineering, and Technology, to develop and implement a National High-Performance Computing Plan. It would also mandate that the National Science Foundation (NSF), in conjunction with the Department of Defense (DoD), the National Aeronautics and Space Administration (NASA), and other relevant federal agencies, establish a national network of high-speed computers. which would be known as the National Research and Education Network (NREN). The National Institute of Standards and Technology, a part of the Department of Commerce, would be charged with developing government-wide standards for computer networks.

The requirements of H.R. 656 would affect numerous federal agencies as developers and users of the NREN. For example, the bill would require the NSF to manage the network and provide computing and networking infrastructure support. The NSF, NASA, the Department of Energy (DOE), the National Oceanic and Atmospheric Administration (NOAA), and the Envionmental Protection Agency (EPA) would be charged with conducting and supporting basic research in all aspects of high-performance computing and networking and applied research relevant to their disciplines. The Department of Education (DoEd) would be authorized to conduct basic and applied computational research with emphasis on coordination of activities with libraries, educational research groups, and school facilities. The DoD, through the Defense Advanced Research Projects Agency (DARPA), would have primary responsibility for research and development of technology needed for the network. The Secretary of Commerce would be directed to conduct a study of the impact of federal procurement regulations regarding the rights to proprietary software provided by contractors.

To fund development of the network and high-performance computing research, the bill would authorize appropriations to the NSF, NASA, the Department of Commerce, EPA, DOE, and DoEd of about $2.9 billion over five years. The bill would also authorize NSF to charge a fee for use of the system.

5. Estimated cost to the Federal Government:

[By fiscal year, in millions of dollars]

	1992	1993	1994	1995	1996
Authorizations:					
National Science Foundation	213	262	305	354	413
National Aeronautics and Space Administration	72	107	134	151	145
Department of Energy	93	110	138	157	168
Department of Commerce	6	7	8	9	10
Environmental Protection Agency	5	6	6	7	7
Department of Education	2	2	2	2	2
Total Authorization Level	390	493	592	679	745
Estimated outlays	183	388	520	619	695

In addition to the funding specifically authorized in the bill, other agencies would incur costs to implement the bill's objectives. The bill has adopted goals and strategies for the program that are roughly in line with proposals from the Administration, as reported by the Office of Science and Technology Policy and proposed in the 1992 President's budget. Some of the activities mandated by the bill are already underway.

The President's budget proposed 1992 funding increases totaling $149 million for high-performance computing and communications. This includes $49 million for the Defense Advanced Research Projects Agency (DARPA), for which the bill does not provide specific authorizations. DARPA's five-year funding needs above the 1991 program levels could be $700 million to $800 million, which would result in total DARPA spending for these purposes of $1.7 billion to $1.8 billion over the 1992–1996 period.

The costs of the specific authorizations would be in budget functions 250, 270, 300, 370, and 500. Other significant costs would fall in function 050.

Basis of estimate: This estimate assumes that the full amounts authorized would be appropriated for each fiscal year. The estimated outlays are based on historical spending patterns.

CBO expects that fees for use of the network would be phased in once the network is operating, which would probably be in 1994 or later. Receipts from these fees could ultimately provide a significant offset to the operating costs of the network. Nevertheless, we do not expect that receipts would be significant during the five-year period covered by this estimate.

6. Pay-as-you-go considerations: The Budget Enforcement Act of 1990 sets up pay-as-you-go procedures for legislation affecting direct spending or receipts through 1995. CBO estimates that enactment of H.R. 656 would not affect direct spending or receipts. Therefore, pay-as-you-go procedures would not apply to the bill.

7. Estimated cost to State and local governments: None.

8. Estimate comparison: None.

9. Previous CBO estimate: On April 5, 1991, the Congressional Budget Office transmitted a cost estimate of S. 272 as ordered reported by the Senate Committee on Commerce, Science, and Transportation on March 8, 1991. S. 272 is quite similar to H.R. 656 in that both bills would establish a high-performance computing program and a high-speed network. The general scope and direction of both bills for program development is likewise similar. S. 272 does

not include authorizations of DOE, EPA, DoEd, or NOAA, and the authorizations for the remaining agencies, at about $1 billion over the five years, are much lower than in H.R. 656.

On May 15, 1991, CBO transmitted a cost estimate of H.R. 656, as ordered reported by the House Committee on Science, Space, and Technology on May 8, 1991. The current bill is quite similar to the House Science Committee version of H.R. 656. However, the House Science Committee version did not include authorizations for the DoEd (about $10 million from 1992 through 1996). Authorizations of the remaining agencies are identical in both bills.

10. Estimate prepared by: David Hull, Peter Fontaine, Kim Cawley, and Marjorie Miller.

11. Estimate approved by: C.G. Nuckols (for James L. Blum, Assistant Director for Budget Analysis).

COMMITTEE ESTIMATE

With reference to the statement required by clause 7(a)(1) of Rule XIII of the Rules of the House of Representatives, the Committee accepts the estimate prepared by the Congressional Budget Office.

INFLATIONARY IMPACT STATEMENT

Pursuant to clause 2(l)(4) of Rule XI of the Rules of the House of Representatives, the Committee estimates that the enactment of H.R. 656 will have no inflationary impact on prices and costs in the operation of the national economy. It is the judgment of the Committee that the inflationary impact of this legislation as a component of the Federal budget is negligible.

OVERSIGHT FINDINGS OF THE COMMITTEE

With reference to clause 2(l)(3)(A) of Rule XI of the Rules of the House of Representatives, the Committee's oversight findings are set forth in the Summary and Purpose section of this report. No additional oversight findings are applicable at this time.

OVERSIGHT FINDINGS AND RECOMMENDATIONS OF THE COMMITTEE ON GOVERNMENT OPERATIONS

In compliance with clause 2(l)(3)(D) of Rule XI of the Rules of the House of Representatives, no findings or recommendations by the Committee on Government Operations were submitted to the Committee with reference to the subject matter specifically addressed in H.R. 656.

SECTON-BY-SECTION ANALYSIS

A bill to provide for a coordinated federal research program to ensure continued United States leadership in high-performance computing.

Section 1 is the title of the bill.

Section 2 contains findings and purpose of the bill.

Section 3 contains definitions of terms in the bill.

Section 4 contains provisions to make clear that computer systems for classified information are not affected by this bill. In addition, federal agencies participating in the program are authorized

to purchase or lease prototype and early production models of new high-performance computer systems.

Section 5(a) requires the President to implement a National High-Performance Computing (HPC) Program. The Director of OSTP is required to (1) submit an annual report at the time of the President's budget submission describing implementation of the HPC Program; (2) provide for interagency coordination of the implementation of the Program; (3) review agency budget estimates, prior to submission of the annual report, in the context of the Program and make the results of the review known to the Office of Management and Budget; and (4) consult with non-federal entities involved in high-performance computing. The annual report must describe the planning and implementation of the HPC Program, including activities and funding levels by research area and by agency. The HPC Program must address security issues to protect national networks and information resources available through networks, and define and implement a security plan. The HPC Program must also establish policies for management and access to the National Research and Education Network (NREN), provide oversight for operation of NREN, and ensure connectivity among agency computer networks.

Section 5(b) creates a High-Performance Computing Advisory Panel (Panel), consisting of individuals from the private sector, to provide the Director with advice and information on high-performance computing. The Director is required to consider recommendations of the Panel in developing and revising the Program.

Section 5(c) requires each agency participating in the HPC Program to designate in its budget request to OMB the program elements supporting the Program. OMB is required to review the agencies' budget requests in light of the annual report and to provide with the President's budget submission to Congress a breakout of agency programs supporting the Program.

Section 6(a) requires that the OSTP Director coordinate implementation of agency activities in supporting deployment and use of NREN to link research and educational institutions, government, and industry in every State. Agency activities are broadly specified, and agencies are prohibited from purchasing networking hardware except for R&D purposes.

Section 6(b) requires broad access by researchers, educators, and students to NREN and requires NREN to provide assess for users to computers and other research facilities, data bases, and libraries. Also, to the extent practicable, NREN is required to provide access to information resources maintained by libraries, research facilities, publishers and affiliated organizations.

Section 6(c) specifies the characteristics of NREN to include (1) development jointly with industry and in collaboration with potential users, (2) fostering competition and private sector investment, (3) promoting deployment of commercial standards, (4) protection of intellectual property rights and maintenance of security, and (5) development of accounting mechanisms to allow for charging of users, (6) interoperability of agency networks and regional private networks, (7) purchasing standard, or if necessary customized, services from commercial vendors, and (8) support for research and development of networking hardware and software.

Section 6(d) designates NSF to manage NREN according to policies established for the HPC Program.

Section 6(e) requires the Director to coordinate implementation activities of appropriate agencies to promote development of information services available over NREN and defines the kinds of services that may be provided.

Section 6(f) authorizes specific agencies to allow federal research grant funds to be used to pay for computer networking expenses.

Section 7(a) defines general responsibilities of NSF for providing computing and networking infrastructure support for supporting basic research and human resource development in all aspects of high-performance computing and networking.

Section 7(b) authorizes the following amounts for NSF for the HPC Program from sums otherwise authorized (in millions of dollars):

Fiscal year:	
1992	213
1993	262
1994	305
1995	354
1996	413

Section 8(a) defines general responsibilities of NASA for conducting research in high-performance computing in fields related to the agency's mission.

Section 8(b) authorizes the following amounts for NASA for the HPC Program from sums otherwise authorized (in millions of dollars):

Fiscal year:	
1992	72
1993	107
1994	134
1995	151
1996	145

Section 9(a) defines general responsibilities of DOE for development and evaluation of computing systems, computational research, gigabit network applications research, and support of basic research and human resource development in computational science.

Section 9(b) authorizes the following amounts for DOE for the HPC Program from sums otherwise authorized (in millions of dollars):

Fiscal year:	
1992	93
1993	110
1994	138
1995	157
1996	168

Section 10(a) defines general responsibilities of NIST for standards development and test methods for interoperability of computers in networks and for benchmark tests and standards for high-performance computers and software. Also, general responsibilities are defined for NOAA for research in high-performance computing related to the agency's mission.

Section 10(b) requires NIST to conduct research to support adoption of security standards for high-performance computer systems and networks.

Section 10(c) requires the Secretary of Commerce, in consultation with the Administrator of the Office of Federal Procurement Policy, to conduct a study and report to Congress on the effect of federal procurement regulations regarding federal rights to proprietary software development tools used by contractors in federal software procurements.

Section 10(d) authorizes the following amounts for NIST and NOAA for the HPC Program from sums otherwise authorized (in millions of dollars):

Fiscal year:	
1992:	
NIST	8.0
NOAA	2.5
1993:	
NIST	3.5
NOAA	3.0
1994:	
NIST	4.0
NOAA	3.5
1995:	
NIST	4.5
NOAA	4.0
1996:	
NIST	5.0
NOAA	4.5

Section 11(a) defines general responsibilities of EPA for conducting research in high-performance computing in fields related to the agency's mission.

Section 11(b) authorizes the following amounts for EPA for the HPC Program from sums otherwise authorized (in millions of dollars):

Fiscal year:	
1992	5
1993	5.5
1994	6
1995	6.5
1996	7

Section 12(a) authorizes the Secretary of education to conduct basic and applied computational research with an emphasis on coordination of activities with libraries, school facilities and educational research groups.

Section 12(b) authorizes the following amounts for the DE from sums otherwise authorized (in millions of dollars):

Fiscal year:	
1992	1.5
1993	1.7
1994	1.9
1995	2.1
1996	2.3

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