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117TH CONGRESS
1ST SESSION

H. R. 3284

To provide for fundamental research programs in advanced scientific computing at the Department of Energy, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

MAY 17, 2021

Mr. OBERNOLTE (for himself and Mr. LUCAS) introduced the following bill; which was referred to the Committee on Science, Space, and Technology

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A BILL

To provide for fundamental research programs in advanced scientific computing at the Department of Energy, 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 the ''Next Generation Computing Research and Development Act of 2021''.

SEC. 2. ADVANCED SCIENTIFIC COMPUTING RESEARCH.

(a) IN GENERAL.—Section 304 of the Department of Energy Research and Innovation Act (42 U.S.C. 18642) is amended—

(1) by redesignating subsections (b) and (c) as subsections (c) and (d), respectively; and

(2) by inserting after subsection (a) the following:

''(b) PROGRAM.—The Director shall carry out a research, development, and demonstration program to advance computational and networking capabilities to analyze, model, simulate, and predict complex phenomena relevant to the development of new energy technologies and the competitiveness of the United States.''.

(b) ADDITIONAL PROGRAMS.—Section 304 of the Department of Energy Research and Innovation Act (42 U.S.C. 18642) is further amended by adding at the end the following:

''(e) BEYOND EXASCALE COMPUTING PROGRAM.—

''(1) IN GENERAL.—The Secretary shall establish a program to develop and implement a strategy for achieving computing systems with capabilities beyond exascale computing systems. In establishing this program, the Secretary shall—

''(A) maintain foundational research programs in mathematical, computational, and computer sciences focused on new and emerging computing needs within the mission of the Department, including but not limited to post-

Moore's law computing architectures, novel approaches to modeling and simulation, artificial intelligence and scientific machine learning, quantum computing, and extreme heterogeneity; and

''(B) retain best practices and maintain support for essential hardware and software elements of the Exascale Computing Project that are necessary for sustaining the vitality of a long-term exascale ecosystem.

''(2) REPORT.—Not later than one year after the date of the enactment of the Next Generation Computing Research and Development Act of 2021, the Secretary shall submit to the Committee on Science, Space, and Technology of the House of Representatives, and the Committee on Energy and Natural Resources of the Senate, a report on the development and implementation of the strategy outlined in paragraph (1).

''(f) ENERGY EFFICIENT COMPUTING PROGRAM.—

''(1) IN GENERAL.—The Secretary shall support a program of fundamental research, development, and demonstration of energy efficient computing technologies relevant to advanced computing

applications in high performance computing, artificial intelligence, and scientific machine learning.

''(2) EXECUTION.—

''(A) PROGRAM.—In carrying out the program, the Secretary shall—

''(i) establish a partnership for National Laboratories, industry partners, and institutions of higher education for co-design of energy efficient hardware, technology, software, and applications across all applicable program offices of the Department;

''(ii) develop hardware and software technologies that decrease the energy needs of advanced computing practices;

''(iii) consider multiple heterogeneous computing architectures, including neuromorphic computing, persistent computing, and ultrafast networking; and

''(iv) provide, as appropriate, on a competitive, merit-reviewed basis, access for researchers from institutions of higher education, National Laboratories, industry, and other Federal agencies to the energy

efficient computing technologies developed pursuant to clause (i).

''(B) SELECTION OF PARTNERS.—In selecting participants for the partnership established under subparagraph (A)(i), the Secretary shall select participants through a competitive, merit-review process.

''(3) REPORT.—Not later than one year after the date of the enactment of the Next Generation Computing Research and Development Act of 2021, the Secretary shall submit to the Committee on Science, Space, and Technology of the House of Representatives, and the Committee on Energy and Natural Resources of the Senate, a report on—

''(A) the activities conducted under paragraph (2)(A); and

''(B) the coordination and management of the Program to ensure an integrated research program across the Department.

''(g) ENERGY SCIENCES NETWORK.—

''(1) IN GENERAL.—The Secretary shall provide for an upgrade to the Energy Sciences Network user facility in order to meet Federal research needs for highly reliable data transport capabilities optimized for the requirements of large-scale science.

''(2) CAPABILITIES.—In carrying out paragraph (1), the Secretary shall ensure the following capabilities:

''(A) To provide high bandwidth scientific networking across the continental United States and the Atlantic Ocean.

''(B) To maximize network reliability.

''(C) To protect the network and data from cyber-attacks.

''(D) To support exponentially increasing levels of data from the Department's scientific user facilities, experiments, and sensors.

''(E) To integrate heterogeneous computing frameworks and systems.

''(h) WORKFORCE DEVELOPMENT.—The Director of the Office of Advanced Scientific Computing Research shall support the development of a computational science workforce through a program that—

''(1) facilitates collaboration between university students and researchers at the National Laboratories; and

''(2) endeavors to advance science in areas relevant to the mission of the Department through the application of computational science.''.

(c) COMPUTATIONAL SCIENCE GRADUATE FELLOWSHIP.—

(1) IN GENERAL.—Section 304 of the Department of Energy Research and Innovation Act (42 U.S.C. 18642) is further amended by adding at the end the following:

''(i) COMPUTATIONAL SCIENCE GRADUATE FELLOWSHIP.—

''(1) IN GENERAL.—The Secretary shall support the Computational Science Graduate Fellowship program in order to facilitate collaboration between graduate students and researchers at the National Laboratories, and contribute to the development of a computational workforce to help advance research in areas relevant to the mission of the Department.

''(2) ELIGIBILITY.—Recipients of fellowships under the Computational Science Graduate Fellowship program described in paragraph (1) shall be selected from among citizens, nationals, and lawfully admitted permanent resident aliens of the United States.''.

(2) FUNDING.—From the funds authorized to be appropriated for the Advanced Scientific Computing Research program of the Department's Office of Science, the Secretary shall make available for

carrying out the activities under section 304(i) of the Department of Energy Research and Innovation Act (42 U.S.C. 18642(i))—

(A) $21,000,000 for fiscal year 2022;

(B) $22,050,000 for fiscal year 2023;

(C) $23,152,500 for fiscal year 2024; and

(D) 24,310,125 for fiscal year 2025.

(d) APPLIED MATHEMATICS AND SOFTWARE DEVELOPMENT.—Section 304(d) of the Department of Energy Research and Innovation Act (42 U.S.C. 18642(d)), as redesignated by subsection (a)(1), is amended to read as follows:

''(d) APPLIED MATHEMATICS AND SOFTWARE DEVELOPMENT FOR HIGH-END COMPUTING SYSTEMS, COMPUTATIONAL, AND COMPUTER SCIENCES RESEARCH.—

''(1) IN GENERAL.—The Director shall carry out activities to develop, test, and support—

''(A) mathematics, models, statistics, and algorithms for modeling complex systems on advanced computing architectures; and

''(B) tools, languages, programming environments, and operations for high-end computing systems (as defined in section 2 of the American Super Computing Leadership Act (15 U.S.C. 5541)).

''(2) PORTFOLIO BALANCE.—The Director shall maintain a balanced portfolio within the advanced scientific computing research and development program established under section 976 of the Energy Policy Act of 2005 (42 U.S.C. 16316) that supports robust investment in—

''(A) applied mathematical, computational, and computer sciences research needs relevant to the mission of the Department, including activities related to data science, artificial intelligence, scientific machine learning, quantum information science, and other emerging areas; and

''(B) associated high-performance computing hardware and facilities.''.

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