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.

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## 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.

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 the "Next Generation Com-

5 puting Research and Development Act of 2021".

6 **SEC. 2. ADVANCED SCIENTIFIC COMPUTING RESEARCH.**

7 (a) IN GENERAL.—Section 304 of the Department of

8 Energy Research and Innovation Act (42 U.S.C. 18642)

9 is amended—

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

3     (2) by inserting after subsection (a) the fol-
4 lowing:

5   "(b) PROGRAM.—The Director shall carry out a re-
6 search, development, and demonstration program to ad-
7 vance computational and networking capabilities to ana-
8 lyze, model, simulate, and predict complex phenomena rel-
9 evant to the development of new energy technologies and
10 the competitiveness of the United States.".

11   (b) ADDITIONAL PROGRAMS.—Section 304 of the De-
12 partment of Energy Research and Innovation Act (42
13 U.S.C. 18642) is further amended by adding at the end
14 the following:

15   "(e) BEYOND EXASCALE COMPUTING PROGRAM.—

16     "(1) IN GENERAL.—The Secretary shall estab-
17 lish a program to develop and implement a strategy
18 for achieving computing systems with capabilities be-
19 yond exascale computing systems. In establishing
20 this program, the Secretary shall—

21       "(A) maintain foundational research pro-
22 grams in mathematical, computational, and
23 computer sciences focused on new and emerging
24 computing needs within the mission of the De-
25 partment, including but not limited to post-

1 Moore's law computing architectures, novel ap-
2 proaches to modeling and simulation, artificial
3 intelligence and scientific machine learning,
4 quantum computing, and extreme heterogeneity;
5 and

6 "(B) retain best practices and maintain
7 support for essential hardware and software ele-
8 ments of the Exascale Computing Project that
9 are necessary for sustaining the vitality of a
10 long-term exascale ecosystem.

11 "(2) REPORT.—Not later than one year after
12 the date of the enactment of the Next Generation
13 Computing Research and Development Act of 2021,
14 the Secretary shall submit to the Committee on
15 Science, Space, and Technology of the House of
16 Representatives, and the Committee on Energy and
17 Natural Resources of the Senate, a report on the de-
18 velopment and implementation of the strategy out-
19 lined in paragraph (1).

20 "(f) ENERGY EFFICIENT COMPUTING PROGRAM.—

21 "(1) IN GENERAL.—The Secretary shall sup-
22 port a program of fundamental research, develop-
23 ment, and demonstration of energy efficient com-
24 puting technologies relevant to advanced computing

1 applications in high performance computing, artifi-

2 cial intelligence, and scientific machine learning.

3 "(2) EXECUTION.—

4 "(A) PROGRAM.—In carrying out the pro-

5 gram, the Secretary shall—

6 "(i) establish a partnership for Na-

7 tional Laboratories, industry partners, and

8 institutions of higher education for co-

9 design of energy efficient hardware, tech-

10 nology, software, and applications across

11 all applicable program offices of the De-

12 partment;

13 "(ii) develop hardware and software

14 technologies that decrease the energy needs

15 of advanced computing practices;

16 "(iii) consider multiple heterogeneous

17 computing architectures, including neuro-

18 morphic computing, persistent computing,

19 and ultrafast networking; and

20 "(iv) provide, as appropriate, on a

21 competitive, merit-reviewed basis, access

22 for researchers from institutions of higher

23 education, National Laboratories, industry,

24 and other Federal agencies to the energy

1 efficient computing technologies developed

2 pursuant to clause (i).

3 "(B) SELECTION OF PARTNERS.—In se-

4 lecting participants for the partnership estab-

5 lished under subparagraph (A)(i), the Secretary

6 shall select participants through a competitive,

7 merit-review process.

8 "(3) REPORT.—Not later than one year after

9 the date of the enactment of the Next Generation

10 Computing Research and Development Act of 2021,

11 the Secretary shall submit to the Committee on

12 Science, Space, and Technology of the House of

13 Representatives, and the Committee on Energy and

14 Natural Resources of the Senate, a report on—

15 "(A) the activities conducted under para-

16 graph (2)(A); and

17 "(B) the coordination and management of

18 the Program to ensure an integrated research

19 program across the Department.

20 "(g) ENERGY SCIENCES NETWORK.—

21 "(1) IN GENERAL.—The Secretary shall provide

22 for an upgrade to the Energy Sciences Network user

23 facility in order to meet Federal research needs for

24 highly reliable data transport capabilities optimized

25 for the requirements of large-scale science.

1 "(2) CAPABILITIES.—In carrying out paragraph

2 (1), the Secretary shall ensure the following capabili-

3 ties:

4 "(A) To provide high bandwidth scientific

5 networking across the continental United States

6 and the Atlantic Ocean.

7 "(B) To maximize network reliability.

8 "(C) To protect the network and data from

9 cyber-attacks.

10 "(D) To support exponentially increasing

11 levels of data from the Department's scientific

12 user facilities, experiments, and sensors.

13 "(E) To integrate heterogeneous com-

14 puting frameworks and systems.

15 "(h) WORKFORCE DEVELOPMENT.—The Director of

16 the Office of Advanced Scientific Computing Research

17 shall support the development of a computational science

18 workforce through a program that—

19 "(1) facilitates collaboration between university

20 students and researchers at the National Labora-

21 tories; and

22 "(2) endeavors to advance science in areas rel-

23 evant to the mission of the Department through the

24 application of computational science.".

1 (c) COMPUTATIONAL SCIENCE GRADUATE FELLOW-
2 SHIP.—

3 (1) IN GENERAL.—Section 304 of the Depart-
4 ment of Energy Research and Innovation Act (42
5 U.S.C. 18642) is further amended by adding at the
6 end the following:

7 "(i) COMPUTATIONAL SCIENCE GRADUATE FELLOW-
8 SHIP.—

9 "(1) IN GENERAL.—The Secretary shall sup-
10 port the Computational Science Graduate Fellowship
11 program in order to facilitate collaboration between
12 graduate students and researchers at the National
13 Laboratories, and contribute to the development of
14 a computational workforce to help advance research
15 in areas relevant to the mission of the Department.

16 "(2) ELIGIBILITY.—Recipients of fellowships
17 under the Computational Science Graduate Fellow-
18 ship program described in paragraph (1) shall be se-
19 lected from among citizens, nationals, and lawfully
20 admitted permanent resident aliens of the United
21 States.".

22 (2) FUNDING.—From the funds authorized to
23 be appropriated for the Advanced Scientific Com-
24 puting Research program of the Department's Office
25 of Science, the Secretary shall make available for

1 carrying out the activities under section 304(i) of

2 the Department of Energy Research and Innovation

3 Act (42 U.S.C. 18642(i))—

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

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

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

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

8 (d) APPLIED MATHEMATICS AND SOFTWARE DEVEL-

9 OPMENT.—Section 304(d) of the Department of Energy

10 Research and Innovation Act (42 U.S.C. 18642(d)), as re-

11 designated by subsection (a)(1), is amended to read as fol-

12 lows:

13 "(d) APPLIED MATHEMATICS AND SOFTWARE DE-

14 VELOPMENT FOR HIGH-END COMPUTING SYSTEMS, COM-

15 PUTATIONAL, AND COMPUTER SCIENCES RESEARCH.—

16     "(1) IN GENERAL.—The Director shall carry

17 out activities to develop, test, and support—

18        "(A) mathematics, models, statistics, and

19        algorithms for modeling complex systems on ad-

20        vanced computing architectures; and

21        "(B) tools, languages, programming envi-

22        ronments, and operations for high-end com-

23        puting systems (as defined in section 2 of the

24        American Super Computing Leadership Act (15

25        U.S.C. 5541)).

1           "(2) PORTFOLIO BALANCE.—The Director shall

2     maintain a balanced portfolio within the advanced

3     scientific computing research and development pro-

4     gram established under section 976 of the Energy

5     Policy Act of 2005 (42 U.S.C. 16316) that supports

6     robust investment in—

7           "(A) applied mathematical, computational,

8         and computer sciences research needs relevant

9         to the mission of the Department, including ac-

10         tivities related to data science, artificial intel-

11         ligence, scientific machine learning, quantum

12         information science, and other emerging areas;

13         and

14         "(B) associated high-performance com-

15         puting hardware and facilities.".

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