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(Original Signature of Member)

117TH CONGRESS
1ST SESSION

H. R. _____

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

IN THE HOUSE OF REPRESENTATIVES

Mr. OBERNOLTE introduced the following bill; which was referred to the Committee on _____

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”.

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

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

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

7 (2) by inserting after subsection (a) the fol-
8 lowing:

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

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

19 “(e) BEYOND EXASCALE COMPUTING PROGRAM.—

20 “(1) IN GENERAL.—The Secretary shall estab-
21 lish a program to develop and implement a strategy
22 for achieving computing systems with capabilities be-
23 yond exascale computing systems. In establishing
24 this program, the Secretary shall—

25 “(A) maintain foundational research pro-
26 grams in mathematical, computational, and

1 computer sciences focused on new and emerging
2 computing needs within the mission of the De-
3 partment, including but not limited to post-
4 Moore’s law computing architectures, novel ap-
5 proaches to modeling and simulation, artificial
6 intelligence and scientific machine learning,
7 quantum computing, and extreme heterogeneity;
8 and

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

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

23 “(f) ENERGY EFFICIENT COMPUTING PROGRAM.—

24 “(1) IN GENERAL.—The Secretary shall sup-
25 port a program of fundamental research, develop-

1 ment, and demonstration of energy efficient com-
2 puting technologies relevant to advanced computing
3 applications in high performance computing, artifi-
4 cial intelligence, and scientific machine learning.

5 “(2) EXECUTION.—

6 “(A) PROGRAM.—In carrying out the pro-
7 gram, the Secretary shall—

8 “(i) establish a partnership for Na-
9 tional Laboratories, industry partners, and
10 institutions of higher education for co-
11 design of energy efficient hardware, tech-
12 nology, software, and applications across
13 all applicable program offices of the De-
14 partment;

15 “(ii) develop hardware and software
16 technologies that decrease the energy needs
17 of advanced computing practices;

18 “(iii) consider multiple heterogeneous
19 computing architectures, including neuro-
20 morphic computing, persistent computing,
21 and ultrafast networking; and

22 “(iv) provide, as appropriate, on a
23 competitive, merit-reviewed basis, access
24 for researchers from institutions of higher
25 education, National Laboratories, industry,

1 and other Federal agencies to the energy
2 efficient computing technologies developed
3 pursuant to clause (i).

4 “(B) SELECTION OF PARTNERS.—In se-
5 lecting participants for the partnership estab-
6 lished under subparagraph (A)(i), the Secretary
7 shall select participants through a competitive,
8 merit-review process.

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

16 “(A) the activities conducted under para-
17 graph (2)(A); and

18 “(B) the coordination and management of
19 the Program to ensure an integrated research
20 program across the Department.

21 “(g) ENERGY SCIENCES NETWORK.—

22 “(1) IN GENERAL.—The Secretary shall provide
23 for an upgrade to the Energy Sciences Network user
24 facility in order to meet Federal research needs for

1 highly reliable data transport capabilities optimized
2 for the requirements of large-scale science.

3 “(2) CAPABILITIES.—In carrying out paragraph
4 (1), the Secretary shall ensure the following capabili-
5 ties:

6 “(A) To provide high bandwidth scientific
7 networking across the continental United States
8 and the Atlantic Ocean.

9 “(B) To maximize network reliability.

10 “(C) To protect the network and data from
11 cyber-attacks.

12 “(D) To support exponentially increasing
13 levels of data from the Department’s scientific
14 user facilities, experiments, and sensors.

15 “(E) To integrate heterogeneous com-
16 puting frameworks and systems.

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

21 “(1) facilitates collaboration between university
22 students and researchers at the National Labora-
23 tories; and

1 “(2) endeavors to advance science in areas rel-
2 evant to the mission of the Department through the
3 application of computational science.”.

4 (c) COMPUTATIONAL SCIENCE GRADUATE FELLOW-
5 SHIP.—

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

10 “(i) COMPUTATIONAL SCIENCE GRADUATE FELLOW-
11 SHIP.—

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

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

1 (2) FUNDING.—From the funds authorized to
2 be appropriated for the Advanced Scientific Com-
3 puting Research program of the Department’s Office
4 of Science, the Secretary shall make available for
5 carrying out the activities under section 304(i) of
6 the Department of Energy Research and Innovation
7 Act (42 U.S.C. 18642(i))—

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

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

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

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

12 (d) APPLIED MATHEMATICS AND SOFTWARE DEVEL-
13 OPMENT.—Section 304(d) of the Department of Energy
14 Research and Innovation Act (42 U.S.C. 18642(d)), as re-
15 designated by subsection (a)(1), is amended to read as fol-
16 lows:

17 “(d) APPLIED MATHEMATICS AND SOFTWARE DE-
18 VELOPMENT FOR HIGH-END COMPUTING SYSTEMS, COM-
19 PUTATIONAL, AND COMPUTER SCIENCES RESEARCH.—

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

22 “(A) mathematics, models, statistics, and
23 algorithms for modeling complex systems on ad-
24 vanced computing architectures; and

1 “(B) tools, languages, programming envi-
2 ronments, and operations for high-end com-
3 puting systems (as defined in section 2 of the
4 American Super Computing Leadership Act (15
5 U.S.C. 5541)).

6 “(2) PORTFOLIO BALANCE.—The Director shall
7 maintain a balanced portfolio within the advanced
8 scientific computing research and development pro-
9 gram established under section 976 of the Energy
10 Policy Act of 2005 (42 U.S.C. 16316) that supports
11 robust investment in—

12 “(A) applied mathematical, computational,
13 and computer sciences research needs relevant
14 to the mission of the Department, including ac-
15 tivities related to data science, artificial intel-
16 ligence, scientific machine learning, quantum
17 information science, and other emerging areas;
18 and

19 “(B) associated high-performance com-
20 puting hardware and facilities.”.