

119<sup>TH</sup> CONGRESS  
2<sup>D</sup> SESSION

**S.** \_\_\_\_\_

To direct the Secretary of Energy and the Administrator of the National Oceanic and Atmospheric Administration to conduct collaborative research to advance weather models in the United States, and for other purposes.

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IN THE SENATE OF THE UNITED STATES

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Mr. LUJÁN (for himself and Mrs. BLACKBURN) introduced the following bill; which was read twice and referred to the Committee on

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**A BILL**

To direct the Secretary of Energy and the Administrator of the National Oceanic and Atmospheric Administration to conduct collaborative research to advance weather models in the United States, 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 “Advanced Weather  
5 Model Computing Development Act”.

6 **SEC. 2. DEFINITIONS.**

7 In this Act:

1           (1) ADMINISTRATION.—The term “Administra-  
2           tion” means the National Oceanic and Atmospheric  
3           Administration.

4           (2) ADMINISTRATOR.—The term “Adminis-  
5           trator” means the Administrator of the National  
6           Oceanic and Atmospheric Administration

7           (3) ADVANCED COMPUTING TECHNIQUES.—The  
8           term “advanced computing techniques” includes the  
9           hardware, software, and computational methods nec-  
10          essary to develop and deploy advanced weather mod-  
11          els, such as artificial intelligence, high-performance  
12          computing, cloud computing, numerical methods,  
13          machine learning, data assimilation, large scale data  
14          analytics, predictive analysis techniques, and quan-  
15          tum computing.

16          (4) ADVANCED WEATHER MODEL.—The term  
17          “advanced weather model” means a model or suite  
18          of models used for the prediction of physical, biologi-  
19          cal, or chemical Earth system processes spanning  
20          weather, seasonal to subseasonal, or climate time  
21          scales.

22          (5) APPROPRIATE COMMITTEES OF CON-  
23          GRESS.—The term “appropriate committees of Con-  
24          gress” means—

1 (A) the Committee on Commerce, Science,  
2 and Transportation and the Committee on En-  
3 ergy and Natural Resources of the Senate; and

4 (B) the Committee on Science, Space, and  
5 Technology of the House of Representatives.

6 (6) DEPARTMENT.—The term “Department”  
7 means the Department of Energy.

8 (7) INSTITUTION OF HIGHER EDUCATION.—The  
9 term “institution of higher education” has the  
10 meaning given that term in section 101 of the High-  
11 er Education Act of 1965 (20 U.S.C. 1001).

12 (8) NATIONAL LABORATORY.—The term “Na-  
13 tional Laboratory” has the meaning given that term  
14 in section 2 of the Energy Policy Act of 2005 (42  
15 U.S.C. 15801).

16 (9) SECRETARY.—The term “Secretary” means  
17 the Secretary of Energy.

18 **SEC. 3. COORDINATION OF RESEARCH AND DEVELOPMENT**

19 **ACTIVITIES RELATING TO IMPROVEMENT OF**  
20 **ADVANCED WEATHER MODELS.**

21 (a) IN GENERAL.—The Secretary and the Adminis-  
22 trator shall carry out collaborative research and develop-  
23 ment activities using advanced computing techniques that  
24 are focused on the improvement of advanced weather mod-

1 els relevant to the missions of the Department and the  
2 Administration.

3 (b) MEMORANDUM OF UNDERSTANDING.—

4 (1) IN GENERAL.—The Secretary and the Ad-  
5 ministrator shall carry out the activities under sub-  
6 section (a) through the establishment of a memo-  
7 randum of understanding or other appropriate inter-  
8 agency agreement.

9 (2) USE OF PROCESS.—The memorandum or  
10 agreement, as the case may be, required under para-  
11 graph (1) shall require the use of a competitive,  
12 merit-reviewed process that considers applications  
13 from Federal agencies, National Laboratories, insti-  
14 tutions of higher education, nonprofit institutions,  
15 and other appropriate entities (or a consortia there-  
16 of).

17 (c) ACTIVITIES.—In carrying out the activities under  
18 subsection (a), the Secretary and the Administrator  
19 may—

20 (1) conduct collaborative research to develop  
21 new methods and optimization of advanced com-  
22 puting techniques;

23 (2) explore options for performance portability  
24 of optimized advanced weather model codes between  
25 the operational computing systems of the Adminis-

1       tration and the high-performance computers of the  
2       Department;

3             (3) advance methods to accommodate, analyze,  
4       and extract information from large data sets of  
5       weather and climate information;

6             (4) to the maximum extent practicable, and in  
7       compliance with national security policies, promote  
8       collaboration, open community-based software devel-  
9       opment, and data sharing between Federal agencies,  
10      National Laboratories, institutions of higher edu-  
11      cation, nonprofit institutions, and other appropriate  
12      entities by providing necessary access and secure  
13      data transfer capabilities; and

14            (5) support maintenance of and improvements  
15      to scientific computing infrastructure that the Sec-  
16      retary and the Administrator determine appropriate.

17      (d) COORDINATION.—In carrying out the activities  
18      under subsection (a), the Secretary and the Administrator  
19      may—

20            (1) carry out reimbursable agreements between  
21      the Department, the Administration, and other enti-  
22      ties to maximize the effectiveness of research and  
23      development; and

24            (2) collaborate with other Federal agencies as  
25      appropriate.

1 (e) REPORT.—Not later than 2 years after the date  
2 of enactment of this Act, the Secretary and the Adminis-  
3 trator shall submit to the appropriate committees of Con-  
4 gress a report detailing the following:

5 (1) Interagency coordination between each Fed-  
6 eral agency involved in the activities carried out  
7 under this section, including activities described in  
8 subsection (c).

9 (2) Potential opportunities to expand the tech-  
10 nical capabilities of the Department and the Admin-  
11 istration with respect to those activities.

12 (3) Collaborative research achievements with re-  
13 spect to those activities.

14 (4) Areas of future mutually beneficial gains as  
15 a result of those activities.

16 (5) Continuation of coordination between the  
17 Department and the Administration on those activi-  
18 ties.

19 **SEC. 4. INITIATIVE ON DEVELOPMENT OF ADVANCED**  
20 **WEATHER MODELS USING ADVANCED COM-**  
21 **PUTING TECHNIQUES.**

22 (a) COMPUTING RESEARCH INITIATIVE.—

23 (1) IN GENERAL.—The Administrator, in col-  
24 laboration with the Secretary, shall carry out an ini-  
25 tiative that may leverage advanced computing tech-

1        niques and the expertise of the Department to de-  
2        velop and deploy advanced weather models to con-  
3        duct proof of concept scenarios in comparison with  
4        current issued models (in this section referred to as  
5        the “Initiative”).

6            (2) PROCESS.—The Administrator, in collabora-  
7        tion with the Secretary, shall carry out the Initiative  
8        through a competitive, merit-reviewed process and  
9        consider applications from Federal agencies, Na-  
10       tional Laboratories, institutions of higher education,  
11       nonprofit institutions, and other appropriate entities  
12       (or a consortia thereof).

13           (3) COMPONENTS.—In carrying out the Initia-  
14       tive, the Administrator, in collaboration with the  
15       Secretary, shall prevent duplication and coordinate  
16       research efforts in advanced computing techniques  
17       across the Administration, and may—

18            (A) leverage related efforts and data from  
19       the National Science and Technology Council,  
20       the Interagency Council for Advancing Meteorolo-  
21       gical Services, and other relevant interagency  
22       entities;

23            (B) provide sufficient capacity for long-  
24       term archive of and access to model output to  
25       support research and long-term study;

1 (C) determine computing decisions based  
2 on an agile requirements framework;

3 (D) support the training, recruitment, and  
4 retention of the next generation weather, water,  
5 and climate computing workforce through in-  
6 centives and pathways for career development  
7 and employment opportunities;

8 (E) support maintenance of and improve-  
9 ments to scientific computing infrastructure  
10 that the Administrator and the Secretary deter-  
11 mine appropriate;

12 (F) conduct comparative research between  
13 forecasts issued by the National Weather Serv-  
14 ice and operational models of the National  
15 Weather Service as compared to predictions and  
16 models developed to run using advanced com-  
17 puting techniques; and

18 (G) share relevant modeling system and  
19 application innovations developed through the  
20 Initiative, including applications based on the  
21 Unified Forecast System, through community-  
22 based activities.

23 (b) CENTERS OF EXCELLENCE.—

24 (1) IN GENERAL.—The Secretary, in collabora-  
25 tion with the Administrator, may establish at Na-

1 tional Laboratories not more than 3 centers of excel-  
2 lence to support advanced weather models by re-  
3 searching, developing, and deploying advanced com-  
4 puting techniques in collaboration with research lab-  
5 oratories of the Administration and other relevant  
6 entities.

7 (2) ACTIVITIES.—Each center established under  
8 paragraph (1) may carry out activities that include  
9 the following:

10 (A) Leveraging robust public-private part-  
11 nership models to provide access to training, ex-  
12 perience, and long-term development of work-  
13 force and infrastructure.

14 (B) Developing and optimizing tools, li-  
15 braries, algorithms, data structures, and other  
16 supporting software necessary for specific appli-  
17 cations on high-performance computing sys-  
18 tems.

19 (C) Applying advanced computing tech-  
20 niques to improve the accuracy and resolution  
21 of advanced weather model predictions and to  
22 address current and future mission challenges.

23 (c) PRIORITY.—In selecting National Laboratories at  
24 which to establish a center of excellence under subsection

1 (b), the Secretary, in collaboration with the Administrator,  
2 shall give priority to Laboratories that—

3 (1) have existing partnerships or relationships  
4 with the Administration;

5 (2) host significant artificial intelligence en-  
6 abled high-performance computing systems;

7 (3) have a workforce with experience in ad-  
8 vanced computing techniques;

9 (4) are geographically proximate to one of the  
10 research laboratories of the Administration; and

11 (5) have a workforce with experience in weather  
12 and climate modeling or computation.

13 (d) MULTI-YEAR CONTRACTS.—The Administrator  
14 and the Secretary may enter into multi-year contracts in  
15 accordance with section 3903 of title 41, United States  
16 Code, and shall ensure compliance with all provisions of  
17 that section, to support operational research and develop-  
18 ment related to advanced computing techniques.

19 (e) REPORT.—Not later than 2 years after the date  
20 of enactment of this Act, the Administrator shall submit  
21 to the appropriate committees of Congress a report evalu-  
22 ating the following:

23 (1) The effectiveness of the Initiative, including  
24 applied research discoveries and advanced modeling  
25 improvements achieved through the Initiative.

1           (2) Potential opportunities to expand capabili-  
2           ties of the Department and the Administration with  
3           respect to advanced computing techniques.

4           (3) The need for collaboration on advanced  
5           computing techniques between the Department and  
6           the Administration.

7           (f) SUNSET.—The authority under this section shall  
8           terminate on the date that is 5 years after the date of  
9           enactment of this Act.

10 **SEC. 5. RESEARCH SECURITY.**

11           The activities authorized or required to be conducted  
12           under this Act shall be carried out in a manner consistent  
13           with subtitle D of title VI of the Research and Develop-  
14           ment, Competition, and Innovation Act (42 U.S.C. 19231  
15           et seq.).