119TH CONGRESS
1ST SESSION

S. _____

To establish a national programmable cloud laboratories network to enhance research efficiency, innovation, and collaboration, and for other purposes.

IN THE SENATE OF THE UNITED STATES

Mr. FETTERMAN (for himself and Mr. BUDD) introduced the following bill; which was read twice and referred to the Committee on _____

A BILL

To establish a national programmable cloud laboratories network to enhance research efficiency, innovation, and collaboration, 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 ''National Programmable Cloud Laboratories Network Act of 2025''.

SEC. 2. DEFINITIONS.

(a) DEFINITIONS.—In this Act:

(1) ARTIFICIAL INTELLIGENCE.—The term ''artificial intelligence'' has the meaning given such

term in section 5002 of the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 (15 U.S.C. 9401).

(2) DIRECTOR.—Unless otherwise provided, the term ''Director'' means the Director of the National Science Foundation.

(3) INSTITUTION OF HIGHER EDUCATION.—The term ''institution of higher education'' has the meaning given the term in section 101 of the Higher Education Act of 1965 (20 U.S.C. 1001).

(4) NETWORK.—The term ''Network'' means the National Programmable Cloud Laboratories Network.

(5) NODE.—The term ''node'' means a programmable cloud laboratory designated as part of the Network.

(6) NON-DESIGNATED LABORATORY.—The term ''non-designated laboratory'' means any Federal, academic, nonprofit, or private industry programmable cloud laboratory not selected as a node under section 3.

(7) PROGRAMMABLE CLOUD LABORATORY.—The term ''programmable cloud laboratory'' means a physical laboratory that is equipped with research instrumentation and advanced manufacturing capa-

bilities, including robotics and artificial intelligence, that can be securely and remotely programmed and controlled in order to conduct experiments and collect associated data.

SEC. 3. NATIONAL PROGRAMMABLE CLOUD LABORATORIES NETWORK.

(a) PURPOSES.—The purposes of the Network established under this Act are—

(1) to maintain leadership by the United States in advanced experimentation, laboratory automation, and artificial intelligence for scientific research, advanced manufacturing, long-term economic competitiveness, and national security;

(2) to reduce the cost of federally funded research through automation and reproducibility;

(3) to accelerate national competitiveness by transferring government-funded research to private-sector commercial applications;

(4) to improve collaboration among federally funded national laboratories, institutions of higher education, and private industry;

(5) to ensure that investment in programmable cloud laboratories results in measurable cost savings, efficiencies, and long-term fiscal sustainability;

(6) to incentivize private-sector cost-sharing in research infrastructure and equipment;

(7) to support workforce development aligned with the technical needs of industry in the United States;

(8) to advance the development of a domestic industrial base for scientific automation tools, artificial intelligence systems for experimentation, and robotics platforms for use in laboratory settings; and

(9) to further programmable cloud laboratory research in areas such as materials science, biotechnology, chemistry, and other scientific or engineering disciplines where automation and cloud-enabled experimentation can deliver transformative results, including advanced materials synthesis and characterization, scalable biotechnology experimentation, and high-throughput chemical catalyst development.

(b) ESTABLISHMENT.—

(1) IN GENERAL.—Not later than 1 year after the date of enactment of this Act, the Director, in consultation with the Director of the National Institute of Standards and Technology, shall designate and oversee a National Programmable Cloud Laboratories Network of not more than 6 nodes to sup-

port secure, standards-based, and cost-effective remote experimentation and automated research.

(2) ASSESSMENT SEQUENCING.—The assessment required under section 5 shall be conducted only after the final designation of nodes under paragraph (1).

(3) NODES.—The Network shall consist of nodes that—

(A) enable programmable workflows and automated science;

(B) provide access to advanced scientific and manufacturing instruments, including artificial intelligence-enabled tools;

(C) collaborate to establish and adopt common standards, protocols, and best practices; and

(D) support interoperability across and between nodes.

(c) APPLICATION AND SELECTION.—

(1) IN GENERAL.—The Director shall issue a public solicitation for eligible entities to apply for node designation.

(2) ELIGIBLE ENTITIES.—Eligible entities that may apply for designation as a node include—

(A) institutions of higher education;

(B) nonprofit research organizations;

(C) private-sector research entities; and

(D) consortia or collaborations of the entities described in subparagraphs (A) through (C).

(d) APPLICATIONS FOR DESIGNATION.—An eligible entity that desires to apply for designation as a node in the Network shall submit an application to the Director at such time and in such manner as the Director may require. The application shall include—

(1) a technical and programmatic plan for laboratory operations, automation capabilities, and data integration;

(2) a plan to achieve long-term self-sustainability, including metrics, interim milestones, and a timeline for reducing reliance on Federal funding; and

(3) evidence of non-Federal cost share, private capital, or other third-party contributions demonstrating self-sustainability potential.

(e) EVALUATION OF APPLICANTS.—The Director shall ensure that the process for selecting eligible entities for designation in the Network shall be competitive, merit-reviewed, and transparent, evaluating—

(1) pre-existing laboratory infrastructure and suitability for automated science;

(2) capacity to support distributed, cloud-enabled programmable workflows for multiple users;

(3) likelihood of achieving long-term sustainability without continued Federal funding;

(4) demonstrated ability to collaborate with other nodes, academic partners, industry partners, or other Federal research agencies (as defined in section 10002 of the Research and Development, Competition, and Innovation Act (42 U.S.C. 18901));

(5) protocols for research security, cybersecurity, and responsible access; and

(6) demonstration of user interest and research needs.

(f) DESIGNATION.—In designating nodes, the Director shall provide preference for applications demonstrating meaningful third-party cost share and pre-existing infrastructure.

(g) RESPONSIBILITIES.—Each node selected by the Director shall—

(1) support the purposes described in subsection (a)(9);

(2) facilitate collaboration among Network members to expand and integrate automated science capabilities and best practices;

(3) actively participate with the Director of National Institute of Standards and Technology in developing network-wide interoperability, data-sharing, cybersecurity, and artificial intelligence-assisted experimentation standards;

(4) support secure sharing of experimental data, models, and results across institutions of higher education participating in the Network, if applicable;

(5) provide a secure digital infrastructure to enable remote experimentation, artificial intelligence-assisted analysis, and reproducible science;

(6) engage in public-private partnerships to streamline the transfer of technology developed using Network infrastructure;

(7) develop and maintain a financial sustainability plan to reduce long-term reliance on Federal funds, including through user fees, licensing, consortia membership, or other revenue-generating models;

(8) establish performance metrics, including scientific output, cost-effectiveness, academic engage-

ment, private-sector engagement, user satisfaction, and reproducibility of results; and

(9) where practicable, leverage commercially available hardware and software solutions to minimize cost and accelerate deployment of automated science capabilities.

SEC. 4. INTERAGENCY COLLABORATION.

Not later than 180 days after all nodes of the Network are designated, the Director of the National Institute of Standards and Technology, in cooperation with the Director and participating eligible entities (including institutions of higher education), shall—

(1) develop and promulgate standards to ensure interoperability across Network nodes, including laboratory instrumentation, data infrastructure, communication protocols, and experiment execution systems;

(2) establish protocols for secure, seamless, and standardized data-sharing among all members of the Network aligned with node-level cybersecurity and research security protocols;

(3) define minimum technical requirements and operating procedures to support remote experimentation, experiment reproducibility, and artificial intelligence-assisted workflows; and

(4) periodically update such standards in consultation with private-sector partners and nodes of the Network to reflect advancements in hardware, software, and automation technology.

SEC. 5. ASSESSMENT OF NON-DESIGNATED LABORATORIES.

(a) ASSESSMENT REQUIREMENT.—Not later than 180 days after the Director designates the final node of the Network under section 3, the Director, in consultation with the Secretary of Energy and the Director of the National Institute of Standards and Technology, shall conduct and submit to the appropriate committees of Congress, a comprehensive assessment of non-designated laboratories.

(b) SCOPE.—The assessment shall identify, to the extent practicable—

(1) Federal laboratories, institutions of higher education, nonprofit organizations, and private-sector laboratories that possess or are developing programmable, automated, or remotely accessible research infrastructure;

(2) the instrumentation, automation, and data capabilities of such laboratories;

(3) cybersecurity and research security measures relevant to interoperability;

(4) existing or potential pathways for such laboratories to coordinate with Network nodes in areas such as data-sharing, standards adoption, or pilot interoperability projects; and

(5) legal, contractual, or intellectual property considerations that may affect participation.

(c) CONFIDENTIALITY AND SECURITY.—Proprietary information shall be protected from public disclosure consistent with applicable law. The Director shall publish a nonproprietary public summary of the assessment and may submit a proprietary annex to the congressional committees of jurisdiction.

SEC. 6. REPORTING AND OVERSIGHT.

(a) ANNUAL BRIEFINGS.—Not later than 1 year after the date of enactment of this Act, and annually thereafter, the Director shall brief the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science, Space, and Technology of the House of Representatives on the status of the Network.

(b) CONTENTS.—Each briefing required under subsection (a) shall include an assessment of—

(1) the alignment of supported research with national scientific and economic priorities;

(2) the progress each node of the Network has made toward achieving self-sustainability as described in section 3(d)(2); and

(3) the performance metrics established in section 3(g)(8).

SEC. 7. SUNSET.

The National Programmable Cloud Laboratories Network, including all authorities, programs, and funding provided under this Act, shall terminate on September 30, 2031.