

(i) to improve the teaching and learning of quantum information science and engineering at the undergraduate, graduate, and postgraduate levels; and

(ii) to increase participation in the quantum fields, including by individuals identified in sections 33 and 34 of the Science and Engineering Equal Opportunities Act (42 U.S.C. 1885a, 1885b);

(B) formulating goals for quantum information science and engineering research and education activities to be supported by the National Science Foundation;

(C) leveraging the collective body of knowledge from existing quantum information science and engineering research and education activities;

(D) coordinating research efforts funded through existing programs across the directorates of the National Science Foundation; and

(E) engaging with other Federal departments and agencies, research communities, and potential users of information produced under this section.

(c) GRADUATE TRAINEESHIPS.—The Director of the National Science Foundation may establish a program to provide traineeships to graduate students at institutions of higher education within the United States who are citizens of the United States and who choose to pursue masters or doctoral degrees in quantum information science.

#### SEC. 302. MULTIDISCIPLINARY CENTERS FOR QUANTUM RESEARCH AND EDUCATION.

(a) IN GENERAL.—The Director of the National Science Foundation, in consultation with other Federal departments and agencies, as appropriate, shall award grants to institutions of higher education or eligible nonprofit organizations (or consortia thereof) to establish at least 2, but not more than 5, Multidisciplinary Centers for Quantum Research and Education (referred to in this section as “Centers”).

(b) COLLABORATIONS.—A collaboration receiving an award under this subsection may include institutions of higher education, nonprofit organizations, and private sector entities.

(c) PURPOSE.—The purpose of the Centers shall be to conduct basic research and education activities in support of the goals and priorities established under section 103(d)(2), including by—

(1) continuing to advance quantum information science and engineering;

(2) supporting curriculum and workforce development in quantum information science and engineering; and

(3) fostering innovation by bringing industry perspectives to quantum research and workforce development, including by leveraging industry knowledge and resources.

(d) REQUIREMENTS.—

(1) IN GENERAL.—An institution of higher education or an eligible nonprofit organization (or a consortium thereof) seeking funding under this section shall submit an application to the Director of the National Science Foundation at such time, in such manner, and containing such information as the Director may require.

(2) APPLICATIONS.—Each application under paragraph (1) shall include a description of—

(A) how the Center will work with other research institutions and industry partners to leverage expertise in quantum science, education and curriculum development, and technology transfer;

(B) how the Center will promote active collaboration among researchers in multiple disciplines involved in quantum research, including physics, engineering, mathematics, computer science, chemistry, and material science;

(C) how the Center will support long-term and short-term workforce development in the quantum field;

(D) how the Center can support an innovation ecosystem to work with industry to translate Center research into applications; and

(E) a long-term plan to become self-sustaining after the expiration of funding under this section.

(e) SELECTION AND DURATION.—

(1) IN GENERAL.—Each Center established under this section is authorized to carry out activities for a period of 5 years.

(2) REAPPLICATION.—An awardee may reapply for additional, subsequent periods of 5 years on a competitive, merit-reviewed basis.

(3) TERMINATION.—Consistent with the authorities of the National Science Foundation, the Director of the National Science Foundation may terminate an underperforming Center for cause during the performance period.

(f) FUNDING.—The Director of the National Science Foundation shall allocate up to \$10,000,000 for each Center established under this section for each of fiscal years 2019 through 2023, subject to the availability of appropriations. Amounts made available to carry out this section shall be derived from amounts appropriated or otherwise made available to the National Science Foundation.

### TITLE IV—DEPARTMENT OF ENERGY QUANTUM ACTIVITIES

#### SEC. 401. QUANTUM INFORMATION SCIENCE RESEARCH PROGRAM.

(a) IN GENERAL.—The Secretary of Energy shall carry out a basic research program on quantum information science.

(b) PROGRAM COMPONENTS.—In carrying out the program under subsection (a), the Secretary of Energy shall—

(1) formulate goals for quantum information science research to be supported by the Department of Energy;

(2) leverage the collective body of knowledge from existing quantum information science research;

(3) provide research experiences and training for additional undergraduate and graduate students in quantum information science, including in the fields of—

(A) quantum information theory;

(B) quantum physics;

(C) quantum computational science;

(D) applied mathematics and algorithm development;

(E) quantum networking;

(F) quantum sensing and detection; and

(G) materials science and engineering;

(4) coordinate research efforts funded through existing programs across the Department of Energy, including—

(A) the Nanoscale Science Research Centers;

(B) the Energy Frontier Research Centers;

(C) the Energy Innovation Hubs;

(D) the National Laboratories;

(E) the Advanced Research Projects Agency; and

(F) the National Quantum Information Science Research Centers; and

(5) coordinate with other Federal departments and agencies, research communities, and potential users of information produced under this section.

#### SEC. 402. NATIONAL QUANTUM INFORMATION SCIENCE RESEARCH CENTERS.

(a) ESTABLISHMENT.—

(1) IN GENERAL.—The Secretary of Energy, acting through the Director of the Office of Science (referred to in this section as the “Director”), shall ensure that the Office of Science carries out a program, in consultation with other Federal departments and

agencies, as appropriate, to establish and operate at least 2, but not more than 5, National Quantum Information Science Research Centers (referred to in this section as “Centers”) to conduct basic research to accelerate scientific breakthroughs in quantum information science and technology and to support research conducted under section 401.

(2) REQUIREMENTS.—

(A) COMPETITIVE, MERIT-REVIEWED PROCESS.—The Centers shall be established through a competitive, merit-reviewed process.

(B) APPLICATIONS.—An eligible applicant under this subsection shall submit to the Director an application at such time, in such manner, and containing such information as the Director determines to be appropriate.

(C) ELIGIBLE APPLICANTS.—The Director shall consider applications from National Laboratories, institutions of higher education, research centers, multi-institutional collaborations, and any other entity that the Secretary of Energy determines to be appropriate.

(b) COLLABORATIONS.—A collaboration that receives an award under this section may include multiple types of research institutions and private sector entities.

(c) REQUIREMENTS.—To the maximum extent practicable, the Centers developed, constructed, operated, or maintained under this section shall serve the needs of the Department of Energy, industry, the academic community, and other relevant entities to create and develop processes for the purpose of advancing basic research in quantum information science and improving the competitiveness of the United States.

(d) COORDINATION.—The Secretary of Energy shall ensure the coordination, and avoid unnecessary duplication, of the activities of each Center with the activities of—

(1) other research entities of the Department of Energy, including—

(A) the Nanoscale Science Research Centers;

(B) the Energy Frontier Research Centers;

(C) the Energy Innovation Hubs; and

(D) the National Laboratories;

(2) institutions of higher education; and

(3) industry.

(e) DURATION.—

(1) IN GENERAL.—Each Center established under this section is authorized to carry out activities for a period of 5 years.

(2) REAPPLICATION.—An awardee may reapply for additional, subsequent periods of 5 years. The Director shall approve or disapprove of each reapplication on a competitive, merit-reviewed basis.

(3) TERMINATION.—Consistent with the authorities of the Department of Energy, the Secretary of Energy may terminate an underperforming Center for cause during the performance period.

(f) FUNDING.—The Secretary of Energy shall allocate up to \$25,000,000 for each Center established under this section for each of fiscal years 2019 through 2023, subject to the availability of appropriations. Amounts made available to carry out this section shall be derived from amounts appropriated or otherwise made available to the Department of Energy.

### AUTHORITY FOR COMMITTEES TO MEET

Mr. MCCONNELL. Mr. President, I have 3 requests for committees to meet during today’s session of the Senate. They have the approval of the Majority and Minority leaders.

Pursuant to rule XXVI, paragraph 5(a), of the Standing Rules of the Senate, the following committees are authorized to meet during today's session of the Senate:

COMMITTEE ON ARMED SERVICES

The Committee on Armed Services is authorized to meet during the session of the Senate on Thursday, December 13, 2018, at a time to be determined, to conduct a pending nomination.

COMMITTEE ON FINANCE

The Committee on Finance is authorized to meet during the session of the Senate on Thursday, December 13, 2018, at 1:45 p.m., to conduct a hearing on the nomination of Courtney Dunbar Jones, of Virginia, to be a Judge of the United States Tax Court.

COMMITTEE ON FOREIGN RELATIONS

The Committee on Foreign Relations is authorized to meet during the session of the Senate on Thursday, December 13, 2018, at 10 a.m., to conduct a hearing.

AMENDING THE MORRIS K. UDALL AND STEWART L. UDALL FOUNDATION ACT

Mr. McCONNELL. Mr. President, I ask unanimous consent that the Senate proceed to the immediate consideration of Calendar No. 578, S. 2827.

The PRESIDING OFFICER. The clerk will report the bill by title.

The senior assistant legislative clerk read as follows:

A bill (S. 2827) to amend the Morris K. Udall and Stewart L. Udall Foundation Act.

There being no objection, the Senate proceeded to consider the bill.

Mr. McCONNELL. I ask unanimous consent that the committee-reported substitute amendment be withdrawn and the Barrasso substitute amendment at the desk be agreed to; that the bill, as amended, be considered read a third time and passed; and that the motion to reconsider be considered made and laid upon the table.

The PRESIDING OFFICER. Without objection, it is so ordered.

The committee-reported amendment in the nature of a substitute was withdrawn.

The amendment (No. 4112) in the nature of a substitute was agreed to.

(The amendment is printed in today's RECORD under "Text of Amendments.")

The bill (S. 2827), as amended, was ordered to be engrossed for a third reading, was read the third time, and passed.

MEASURING THE ECONOMIC IMPACT OF BROADBAND ACT OF 2018

Mr. McCONNELL. Mr. President, I ask unanimous consent that the Senate proceed to the immediate consideration of Calendar No. 613, S. 645.

The PRESIDING OFFICER. The clerk will report the bill by title.

The senior assistant legislative clerk read as follows:

A bill (S. 645) to require the Secretary of Commerce to conduct an assessment and analysis of the effects of broadband deployment and adoption on the economy of the United States, and for other purposes.

There being no objection, the Senate proceeded to consider the bill, which had been reported from the Committee on Commerce, Science, and Transportation, with an amendment to strike all after the enacting clause and insert in lieu thereof the following:

SECTION 1. SHORT TITLE.

*This Act may be cited as the "Measuring the Economic Impact of Broadband Act of 2018".*

SEC. 2. ASSESSMENT AND ANALYSIS REGARDING THE EFFECT OF THE DIGITAL ECONOMY ON THE ECONOMY OF THE UNITED STATES.

(a) DEFINITIONS.—In this section:

(1) APPROPRIATE COMMITTEES OF CONGRESS.—The term "appropriate committees of Congress" means—

(A) the Committee on Commerce, Science, and Transportation of the Senate;

(B) the Committee on Environment and Public Works of the Senate;

(C) the Committee on Small Business and Entrepreneurship of the Senate;

(D) the Committee on Energy and Commerce of the House of Representatives;

(E) the Committee on Transportation and Infrastructure of the House of Representatives; and

(F) the Committee on Small Business of the House of Representatives.

(2) ASSISTANT SECRETARY.—The term "Assistant Secretary" means the Assistant Secretary of Commerce for Communications and Information.

(3) BROADBAND.—The term "broadband" means an Internet Protocol-based transmission service that enables users to send and receive voice, video, data, or graphics, or a combination of those items.

(4) DIGITAL ECONOMY.—

(A) IN GENERAL.—Subject to subparagraph (B), the term "digital economy" has the meaning given the term by the Secretary in carrying out this section.

(B) CONSIDERATIONS.—In establishing a definition for the term "digital economy" under subparagraph (A), the Secretary shall consider—

(i) the digital-enabling infrastructure that a computer network needs to exist and operate; and

(ii) the roles of e-commerce and digital media.

(5) DIGITAL MEDIA.—The term "digital media" means the content that participants in e-commerce create and access.

(6) E-COMMERCE.—The term "e-commerce" means the digital transactions that take place using the infrastructure described in paragraph (4)(B)(i).

(7) SECRETARY.—The term "Secretary" means the Secretary of Commerce.

(b) BIENNIAL ASSESSMENT AND ANALYSIS REQUIRED.—Not later than 2 years after the date of enactment of this Act, and biennially thereafter, the Secretary, in consultation with the Director of the Bureau of Economic Analysis of the Department of Commerce and the Assistant Secretary, shall conduct an assessment and analysis regarding the contribution of the digital economy to the economy of the United States.

(c) CONSIDERATIONS AND CONSULTATION.—In conducting each assessment and analysis required under subsection (b), the Secretary shall—

(1) consider the impact of—

(A) the deployment and adoption of—

(i) digital-enabling infrastructure; and

(ii) broadband;

(B) e-commerce and platform-enabled peer-to-peer commerce; and

(C) the production and consumption of digital media, including free media; and

(2) consult with—

(A) the heads of any agencies and offices of the Federal Government as the Secretary considers appropriate, including the Secretary of Agriculture, the Commissioner of the Bureau of Labor Statistics, the Administrator of the Small Business Administration, and the Federal Communications Commission;

(B) representatives of the business community, including rural and urban Internet service providers and telecommunications infrastructure providers;

(C) representatives from State, local, and tribal government agencies; and

(D) representatives from consumer and community organizations.

(d) REPORT.—The Secretary shall submit to the appropriate committees of Congress a report regarding the findings of the Secretary with respect to each assessment and analysis conducted under subsection (b).