**Calendar No. 255**

116TH CONGRESS
*1st Session*

SENATE

REPORT
116–135

# BETTER ENERGY STORAGE TECHNOLOGY ACT

OCTOBER 22, 2019.—Ordered to be printed

Ms. MURKOWSKI, from the Committee on Energy and Natural Resources, submitted the following

# R E P O R T

[To accompany S. 1602]

[Including cost estimate of the Congressional Budget Office]

The Committee on Energy and Natural Resources, to which was referred the bill (S. 1602) to amend the United States Energy Storage Competitiveness Act of 2007 to establish a research, development, and demonstration program for grid-scale energy storage systems, and for other purposes, having considered the same, reports favorably thereon with an amendment (in the nature of a substitute) and an amendment to the title and recommends that the bill, as amended, do pass.

## AMENDMENTS

The amendments are as follows:

Strike all after the enacting clause and insert the following:

**SECTION 1. SHORT TITLE.**

This Act may be cited as the "Better Energy Storage Technology Act" or the "BEST Act".

**SEC. 2. DEFINITIONS.**

In this Act:

(1) DEPARTMENT.—The term "Department" means the Department of Energy.

(2) ENERGY STORAGE SYSTEM.—The term "energy storage system" means any system, equipment, facility, or technology that—

(A) is capable of absorbing or converting energy, storing the energy for a period of time, and dispatching the energy; and

(B)(i) uses mechanical, electrochemical, thermal, electrolysis, or other processes to convert and store electric energy that was generated at an earlier time for use at a later time; or

(ii) stores energy in an electric, thermal, or gaseous state for direct use for heating or cooling at a later time in a manner that avoids the need to

use electricity or other fuel sources at that later time, such as a grid-enabled water heater.

(3) NATIONAL LABORATORY.—The term "National Laboratory" has the meaning given the term in section 2 of the Energy Policy Act of 2005 (42 U.S.C. 15801).

(4) SECRETARY.—The term "Secretary" means the Secretary of Energy, unless otherwise specified.

**SEC. 3. ENERGY STORAGE SYSTEM RESEARCH, DEVELOPMENT, AND DEPLOYMENT PROGRAM.**

(a) ESTABLISHMENT.—Not later than 180 days after the date of enactment of this Act, the Secretary shall establish a program, to be known as the "Energy Storage System Research, Development, and Deployment Program" (referred to in this section as the "program").

(b) INITIAL PROGRAM OBJECTIVES.—The program shall focus on research, development, and deployment of—

(1) energy storage systems designed to further the development of technologies—

(A) for large-scale commercial deployment;

(B) for deployment at cost targets established by the Secretary;

(C) for hourly and subhourly durations required to provide reliability services to the grid;

(D) for daily durations, which have—

(i) the capacity to discharge energy for a minimum of 6 hours; and

(ii) a system lifetime of at least 20 years under regular operation;

(E) for weekly or monthly durations, which have—

(i) the capacity to discharge energy for 10 to 100 hours, at a minimum; and

(ii) a system lifetime of at least 20 years under regular operation; and

(F) for seasonal durations, which have—

(i) the capability to address seasonal variations in supply and demand; and

(ii) a system lifetime of at least 20 years under regular operation;

(2) distributed energy storage technologies and applications, including building-grid integration;

(3) transportation energy storage technologies and applications, including vehicle-grid integration;

(4) cost-effective systems and methods for—

(A) the reclamation, recycling, and disposal of energy storage materials, including lithium, cobalt, nickel, and graphite; and

(B) the reuse and repurposing of energy storage system technologies;

(5) advanced control methods for energy storage systems;

(6) pumped hydroelectric energy storage systems to advance—

(A) adoption of innovative technologies, including—

(i) adjustable-speed, ternary, and other new pumping and generating equipment designs;

(ii) modular systems;

(iii) closed-loop systems, including mines and quarries; and

(iv) other critical equipment and materials for pumped hydroelectric energy storage, as determined by the Secretary; and

(B) reductions of equipment costs, civil works costs, and construction times for pumped hydroelectric energy storage projects, with the goal of reducing those costs by 50 percent;

(7) models and tools to demonstrate the benefits of energy storage to—

(A) power and water supply systems;

(B) electric generation portfolio optimization; and

(C) expanded deployment of other renewable energy technologies, including in hybrid energy storage systems; and

(8) energy storage use cases from individual and combination technology applications, including value from various-use cases and energy storage services.

(c) Testing and Validation.—In coordination with 1 or more National Laboratories, the Secretary shall accelerate the development, standardized testing, and validation of energy storage systems under the program by developing testing and evaluation methodologies for—

(1) storage technologies, controls, and power electronics for energy storage systems under a variety of operating conditions;

(2) standardized and grid performance testing for energy storage systems, materials, and technologies during each stage of development, beginning with the research stage and ending with the deployment stage;

(3) reliability, safety, and durability testing under standard and evolving duty cycles; and

(4) accelerated life testing protocols to predict estimated lifetime metrics with accuracy.

(d) PERIODIC EVALUATION OF PROGRAM OBJECTIVES.—Not less frequently than once every calendar year, the Secretary shall evaluate and, if necessary, update the program objectives to ensure that the program continues to advance energy storage systems toward widespread commercial deployment by lowering the costs and increasing the duration of energy storage resources.

(e) ENERGY STORAGE STRATEGIC PLAN.—

(1) IN GENERAL.—The Secretary shall develop a 10-year strategic plan for the program, and update the plan, in accordance with this subsection.

(2) CONTENTS.—The strategic plan developed under paragraph (1) shall—

(A) be coordinated with and integrated across other relevant offices in the Department;

(B) to the extent practicable, include metrics that can be used to evaluate storage technologies;

(C) identify Department programs that—

(i) support the research and development activities described in subsection (b) and the demonstration projects under section 4; and

(ii)(I) do not support the activities or projects described in clause (i); but

(II) are important to the development of energy storage systems and the mission of the Department, as determined by the Secretary;

(D) include expected timelines for—

(i) the accomplishment of relevant objectives under current programs of the Department relating to energy storage systems; and

(ii) the commencement of any new initiatives within the Department relating to energy storage systems to accomplish those objectives; and

(E) incorporate relevant activities described in the Grid Modernization Initiative Multi-Year Program Plan.

(3) SUBMISSION TO CONGRESS.—Not later than 180 days after the date of enactment of this Act, the Secretary shall submit to the Committee on Energy and Natural Resources of the Senate and the Committees on Energy and Commerce and Science, Space, and Technology of the House of Representatives the strategic plan developed under paragraph (1).

(4) UPDATES TO PLAN.—The Secretary—

(A) shall annually review the strategic plan developed under paragraph (1); and

(B) may periodically revise the strategic plan as appropriate.

(f) LEVERAGING OF RESOURCES.—The program may be led by a specific office of the Department, but shall be cross-cutting in nature, so that in carrying out activities under the program, the Secretary (or a designee of the Secretary charged with leading the program) shall leverage existing Federal resources, including, at a minimum, the expertise and resources of—

(1) the Office of Electricity Delivery and Energy Reliability;

(2) the Office of Energy Efficiency and Renewable Energy, including the Water Power Technologies Office; and

(3) the Office of Science, including—

(A) the Basic Energy Sciences Program;

(B) the Advanced Scientific Computing Research Program;

(C) the Biological and Environmental Research Program; and

(4) the Electricity Storage Research Initiative established under section 975 of the Energy Policy Act of 2005 (42 U.S.C. 16315).

(g) PROTECTING PRIVACY AND SECURITY.—In carrying out this section, the Secretary shall identify, incorporate, and follow best practices for protecting the privacy of individuals and businesses and the respective sensitive data of the individuals and businesses, including by managing privacy risk and implementing the Fair Information Practice Principles of the Federal Trade Commission for the collection, use, disclosure, and retention of individual electric consumer information in accordance with the Office of Management and Budget Circular A–130 (or successor circulars).

**SEC. 4. ENERGY STORAGE DEMONSTRATION PROJECTS; PILOT GRANT PROGRAM.**

(a) DEMONSTRATION PROJECTS.—Not later than September 30, 2023, the Secretary shall, to the maximum extent practicable, enter into agreements to carry out not fewer than 5 energy storage system demonstration projects, including at least 1 energy storage system demonstration project designed to further the development of technologies described in subparagraph (E) or (F) of section 3(b)(1).

(b) ENERGY STORAGE PILOT GRANT PROGRAM.—

(1) DEFINITION OF ELIGIBLE ENTITY.—In this subsection, the term "eligible entity" means—

(A) a State energy office (as defined in section 124(a) of the Energy Policy Act of 2005 (42 U.S.C. 15821(a)));

(B) an Indian tribe (as defined in section 4 of the Native American Housing Assistance and Self-Determination Act of 1996 (25 U.S.C. 4103);

(C) a tribal organization (as defined in section 3765 of title 38, United States Code);

(D) an institution of higher education (as defined in section 101 of the Higher Education Act of 1965 (20 U.S.C. 1001));

(E) an electric utility, including—

(i) an electric cooperative;

(ii) a political subdivision of a State, such as a municipally owned electric utility, or any agency, authority, corporation, or instrumentality of a State political subdivision; and

(iii) an investor-owned utility; and

(F) a private energy storage company that is a small business concern (within the meaning of section 3 of the Small Business Act (15 U.S.C. 632)).

(2) ESTABLISHMENT.—The Secretary shall establish a competitive grant program under which the Secretary shall award grants to eligible entities to carry out demonstration projects for pilot energy storage systems.

(3) SELECTION REQUIREMENTS.—In selecting eligible entities to receive a grant under paragraph (2), the Secretary shall, to the maximum extent practicable—

(A) ensure regional diversity among eligible entities awarded grants, including ensuring participation of eligible entities that are rural States and States with high energy costs;

(B) ensure that grants are awarded for demonstration projects that—

(i) expand on the existing technology demonstration programs of the Department;

(ii) are designed to achieve 1 or more of the objectives described in paragraph (4); and

(iii) inject or withdraw energy from the bulk power system, electric distribution system, building energy system, or microgrid (grid-connected or islanded mode) where the project is located; and

(C) give consideration to proposals from eligible entities for securing energy storage through competitive procurement or contract for service.

(4) OBJECTIVES.—Each demonstration project carried out by a grant awarded under paragraph (2) shall have 1 or more of the following objectives:

(A) To improve the security of critical infrastructure and emergency response systems.

(B) To improve the reliability of transmission and distribution systems, particularly in rural areas, including high-energy-cost rural areas.

(C) To optimize transmission or distribution system operation and power quality to defer or avoid costs of replacing or upgrading electric grid infrastructure, including transformers and substations.

(D) To supply energy at peak periods of demand on the electric grid or during periods of significant variation of electric grid supply.

(E) To reduce peak loads of homes and businesses.

(F) To improve and advance power conversion systems.

(G) To provide ancillary services for grid stability and management.

(H) To integrate renewable energy resource production.

(I) To increase the feasibility of microgrids (grid-connected or islanded mode).

(J) To enable the use of stored energy in forms other than electricity to support the natural gas system and other industrial processes.

(K) To integrate fast charging of electric vehicles.

(L) To improve energy efficiency.

(c) REPORTS.—Not less frequently than once every 2 years for the duration of the programs under subsections (a) and (b), the Secretary shall submit to Congress and make publicly available a report describing the performance of those programs.

(d) NO PROJECT OWNERSHIP INTEREST.—The Federal Government shall not hold any equity or other ownership interest in any energy storage system that is part of a project under this section unless the holding is agreed to by each participant of the project.

**SEC. 5. LONG DURATION DEMONSTRATION INITIATIVE AND JOINT PROGRAM.**

(a) DEFINITIONS.—In this section:

(1) DIRECTOR OF ARPA–E.—The term "Director of ARPA–E" has the meaning given the term in section 5012(a) of the America COMPETES Act (42 U.S.C. 16538(a)).

(2) DIRECTOR OF ESTCP.—The term "Director of ESTCP" means the Secretary of Defense, acting through the Director of the Environmental Security Technology Certification Program of the Department of Defense.

(3) INITIATIVE.—The term "Initiative" means the demonstration initiative established under subsection (b).

(4) JOINT PROGRAM.—The term "Joint Program" means the joint program established under subsection (d).

(5) SECRETARY.—The term "Secretary" means the Secretary of Energy, acting through the Director of ARPA–E.

(b) ESTABLISHMENT OF INITIATIVE.—Not later than 180 days after the date of enactment of this Act, the Secretary shall establish a demonstration initiative composed of demonstration projects focused on the development of long-duration energy storage technologies.

(c) SELECTION OF PROJECTS.—To the maximum extent practicable, in selecting demonstration projects to participate in the Initiative, the Secretary shall—

(1) ensure a range of technology types;

(2) ensure regional diversity among projects; and

(3) consider bulk power level, distribution power level, behind-the-meter, microgrid (grid-connected or islanded mode), and off-grid applications.

(d) JOINT PROGRAM.—

(1) ESTABLISHMENT.—As part of the Initiative, the Secretary, in consultation with the Director of ESTCP, shall establish within the Department of Energy a joint program to carry out projects—

(A) to demonstrate promising long-duration energy storage technologies at different scales; and

(B) to help new, innovative long-duration energy storage technologies become commercially viable.

(2) MEMORANDUM OF UNDERSTANDING.—Not later than 200 days after the date of enactment of this Act, the Secretary shall enter into a memorandum of understanding with the Director of ESTCP to administer the Joint Program.

(3) INFRASTRUCTURE.—In carrying out the Joint Program, the Secretary and the Director of ESTCP shall—

(A) use existing test-bed infrastructure at—

(i) Department of Energy facilities; and

(ii) Department of Defense installations; and

(B) develop new infrastructure for identified projects, if appropriate.

(4) GOALS AND METRICS.—The Secretary and the Director of ESTCP shall develop goals and metrics for technological progress under the Joint Program consistent with energy resilience and energy security policies.

(5) SELECTION OF PROJECTS.—

(A) IN GENERAL.—To the maximum extent practicable, in selecting projects to participate in the Joint Program, the Secretary and the Director of ESTCP shall—

(i) ensure that projects are carried out under conditions that represent a variety of environments with different physical conditions and market constraints; and

(ii) ensure an appropriate balance of—

(I) larger, higher-cost projects; and

(II) smaller, lower-cost projects.

(B) PRIORITY.—In carrying out the Joint Program, the Secretary and the Director of ESTCP shall give priority to demonstration projects that—

(i) make available to the public project information that will accelerate deployment of long-duration energy storage technologies; and

(ii) will be carried out in the field.

**SEC. 6. TECHNICAL AND PLANNING ASSISTANCE PROGRAM.**

(a) DEFINITIONS.—In this section:

(1) ELIGIBLE ENTITY.—The term "eligible entity" means—

(A) an electric cooperative;

(B) a political subdivision of a State, such as a municipally owned electric utility, or any agency, authority, corporation, or instrumentality of a State political subdivision;

(C) a not-for-profit entity that is in a partnership with not less than 6 entities described in subparagraph (A) or (B); and

(D) an investor-owned utility.

(2) PROGRAM.—The term "program" means the technical and planning assistance program established under subsection (b)(1).

(b) ESTABLISHMENT.—

(1) IN GENERAL.—The Secretary shall establish a technical and planning assistance program to assist eligible entities in identifying, evaluating, planning, designing, and developing processes to procure energy storage systems.

(2) ASSISTANCE AND GRANTS.—Under the program, the Secretary shall—

(A) provide technical and planning assistance, including disseminating information, directly to eligible entities; and

(B) award grants to eligible entities to contract to obtain technical and planning assistance from outside experts.

(3) FOCUS.—In carrying out the program, the Secretary shall focus on energy storage system projects that have the greatest potential for—

(A) strengthening the reliability and resiliency of energy infrastructure;

(B) reducing the cost of energy storage systems;

(C) improving the feasibility of microgrids (grid-connected or islanded mode), particularly in rural areas, including high energy cost rural areas;

(D) reducing consumer electricity costs; or

(E) maximizing local job creation.

(c) TECHNICAL AND PLANNING ASSISTANCE.—

(1) IN GENERAL.—Technical and planning assistance provided under the program shall include assistance with 1 or more of the following activities relating to energy storage systems:

(A) Identification of opportunities to use energy storage systems.

(B) Feasibility studies to assess the potential for development of new energy storage systems or improvement of existing energy storage systems.

(C) Assessment of technical and economic characteristics, including a cost-benefit analysis.

(D) Utility interconnection.

(E) Permitting and siting issues.

(F) Business planning and financial analysis.

(G) Engineering design.

(H) Resource adequacy planning.

(I) Resilience planning and valuation.

(2) EXCLUSION.—Technical and planning assistance provided under the program shall not be used to pay any person for influencing or attempting to influence an officer or employee of any Federal, State, or local agency, a Member of Congress, an employee of a Member of Congress, a State or local legislative body, or an employee of a State or local legislative body.

(d) INFORMATION DISSEMINATION.—The information disseminated under subsection (b)(2)(A) shall include—

(1) information relating to the topics described in subsection (c)(1), including case studies of successful examples;

(2) computational tools or software for assessment, design, and operation and maintenance of energy storage systems;

(3) public databases that track existing and planned energy storage systems;

(4) best practices for the utility and grid operator business processes associated with the topics described in subsection (c)(1); and

(5) relevant State policies or regulations associated with the topics described in subsection (c)(1).

(e) APPLICATIONS.—

(1) IN GENERAL.—The Secretary shall seek applications for the program—

(A) on a competitive, merit-reviewed basis; and

(B) on a periodic basis, but not less frequently than once every 12 months.

(2) APPLICATION.—An eligible entity desiring to apply for the program shall submit to the Secretary an application at such time, in such manner, and containing such information as the Secretary may require, including whether the eligible entity is applying for—

(A) direct technical or planning assistance under subsection (b)(2)(A); or

(B) a grant under subsection (b)(2)(B).

(3) PRIORITIES.—In selecting eligible entities for technical and planning assistance under the program, the Secretary shall give priority to eligible entities described in subparagraphs (A) and (B) of subsection (a)(1).

(f) REPORTS.—The Secretary shall submit to Congress and make available to the public—

(1) not less frequently than once every 2 years, a report describing the performance of the program, including a synthesis and analysis of any information

the Secretary requires grant recipients to provide to the Secretary as a condition of receiving a grant; and

(2) on termination of the program, an assessment of the success of, and education provided by, the measures carried out by eligible entities under the program.

(g) COST-SHARING.—Activities under this section shall be subject to the cost-sharing requirements under section 988 of the Energy Policy Act of 2005 (42 U.S.C. 16352).

**SEC. 7. ENERGY STORAGE MATERIALS RECYCLING PRIZE COMPETITION.**

Section 1008 of the Energy Policy Act of 2005 (42 U.S.C. 16396) is amended by adding at the end the following:

"(g) ENERGY STORAGE MATERIALS RECYCLING PRIZE COMPETITION.—

"(1) DEFINITION OF CRITICAL ENERGY STORAGE MATERIALS.—In this subsection, the term 'critical energy storage materials' includes—

"(A) lithium;

"(B) cobalt;

"(C) nickel;

"(D) graphite; and

"(E) any other material determined by the Secretary to be critical to the continued growing supply of energy storage resources.

"(2) PRIZE AUTHORITY.—

"(A) IN GENERAL.—As part of the program established under subsection (a), the Secretary shall establish an award program, to be known as the 'Energy Storage Materials Recycling Prize Competition' (referred to in this subsection as the 'program'), under which the Secretary shall carry out prize competitions and make awards to advance the recycling of critical energy storage materials.

"(B) FREQUENCY.—To the maximum extent practicable, the Secretary shall carry out a competition under the program not less frequently than once every calendar year.

"(3) ELIGIBILITY.—

"(A) IN GENERAL.—To be eligible to win a prize under the program, an individual or entity—

"(i) shall have complied with the requirements of the competition as described in the announcement for that competition published in the Federal Register by the Secretary under paragraph (6);

"(ii) in the case of a private entity, shall be incorporated in the United States and maintain a primary place of business in the United States;

"(iii) in the case of an individual, whether participating singly or in a group, shall be a citizen of, or an alien lawfully admitted for permanent residence in, the United States.

"(B) EXCLUSIONS.—The following entities and individuals shall not be eligible to win a prize under the program:

"(i) A Federal entity.

"(ii) A Federal employee (including an employee of a National Laboratory) acting within the scope of employment.

"(4) AWARDS.—In carrying out the program, the Secretary shall award cash prizes, in amounts to be determined by the Secretary, to each individual or entity selected through a competitive process to develop advanced methods or technologies to recycle critical energy storage materials from energy storage systems.

"(5) CRITERIA.—

"(A) IN GENERAL.—The Secretary shall establish objective, merit-based criteria for awarding the prizes in each competition carried out under the program.

"(B) REQUIREMENTS.—The criteria established under subparagraph (A) shall prioritize advancements in methods or technologies that present the greatest potential for large-scale commercial deployment.

"(C) CONSULTATION.—In establishing criteria under subparagraph (A), the Secretary shall consult with appropriate members of private industry involved in the commercial deployment of energy storage systems.

"(6) ADVERTISING AND SOLICITATION OF COMPETITORS.—

"(A) IN GENERAL.—The Secretary shall announce each prize competition under the program by publishing a notice in the Federal Register.

"(B) REQUIREMENTS.—Each notice published under subparagraph (A) shall describe the essential elements of the competition, such as—

"(i) the subject of the competition;

"(ii) the duration of the competition;
"(iii) the eligibility requirements for participation in the competition;
"(iv) the process for participants to register for the competition;
"(v) the amount of the prize; and
"(vi) the criteria for awarding the prize.

"(7) JUDGES.—
"(A) IN GENERAL.—For each prize competition under the program, the Secretary shall assemble a panel of qualified judges to select the winner or winners of the competition on the basis of the criteria established under paragraph (5).
"(B) SELECTION.—The judges for each competition shall include appropriate members of private industry involved in the commercial deployment of energy storage systems.
"(C) CONFLICTS.—An individual may not serve as a judge in a prize competition under the program if the individual, the spouse of the individual, any child of the individual, or any other member of the household of the individual—
"(i) has a personal or financial interest in, or is an employee, officer, director, or agent of, any entity that is a registered participant in the prize competition for which the individual will serve as a judge; or
"(ii) has a familial or financial relationship with a registered participant in the prize competition for which the individual will serve as a judge.

"(8) REPORT TO CONGRESS.—Not later than 60 days after the date on which the first prize is awarded under the program, and annually thereafter, the Secretary shall submit to Congress a report that—
"(A) identifies each award recipient;
"(B) describes the advanced methods or technologies developed by each award recipient; and
"(C) specifies actions being taken by the Department toward commercial application of all methods or technologies with respect to which a prize has been awarded under the program.

"(9) ANTI-DEFICIENCY ACT.—The Secretary shall carry out the program in accordance with section 1341 of title 31, United States Code (commonly referred to as the 'Anti-Deficiency Act').

"(10) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to carry out this subsection $10,000,000 for each of fiscal years 2020 through 2024, to remain available until expended.".

**SEC. 8. REGULATORY ACTIONS TO ENCOURAGE ENERGY STORAGE DEPLOYMENT.**

(a) DEFINITIONS.—In this section:
(1) COMMISSION.—The term "Commission" means the Federal Energy Regulatory Commission.
(2) ELECTRIC STORAGE RESOURCE.—The term "electric storage resource" means a resource capable of receiving electric energy from the grid and storing that electric energy for later injection back into the grid.

(b) REGULATORY ACTION.—
(1) IN GENERAL.—Not later than 1 year after the date of enactment of this Act, the Commission shall issue a regulation to identify the eligibility of, and process for, electric storage resources—
(A) to receive cost recovery through Commission-regulated rates for the transmission of electric energy in interstate commerce; and
(B) that receive cost recovery under subparagraph (A) to receive compensation for other services (such as the sale of energy, capacity, or ancillary services) without regard to whether those services are provided concurrently with the transmission service described in subparagraph (A).
(2) PROHIBITION OF DUPLICATE RECOVERY.—Any regulation issued under paragraph (1) shall preclude the receipt of unjust and unreasonable double recovery for electric storage resources providing services described in subparagraphs (A) and (B) of that paragraph.

(c) ELECTRIC STORAGE RESOURCES TECHNICAL CONFERENCE.—
(1) IN GENERAL.—Not later than 180 days after the date of enactment of this Act, the Commission shall convene a technical conference on the potential for electric storage resources to improve the operation of electric systems.
(2) REQUIREMENTS.—The technical conference under paragraph (1) shall—
(A) identify opportunities for further consideration of electric storage resources in regional and interregional transmission planning processes within the jurisdiction of the Commission;

(B) identify all energy, capacity, and ancillary service products, market designs, or rules that—

(i) are within the jurisdiction of the Commission; and

(ii) enable and compensate for the use of electric storage resources that improve the operation of electric systems;

(C) examine additional products, market designs, or rules that would enable and compensate for the use of electric storage resources for improving the operation of electric systems; and

(D) examine the functional value of electric storage resources at the transmission and distribution system interface for purposes of providing electric system reliability.

**SEC. 9. COORDINATION.**

To the maximum extent practicable, the Secretary shall coordinate the activities under this Act (including activities conducted pursuant to the amendments made by this Act) among the offices and employees of the Department, other Federal agencies, and other relevant entities—

(1) to ensure appropriate collaboration; and

(2) to avoid unnecessary duplication of those activities.

**SEC. 10. AUTHORIZATION OF APPROPRIATIONS.**

There are authorized to be appropriated—

(1) to carry out section 3, $100,000,000 for each of fiscal years 2020 through 2024, to remain available until expended;

(2) to carry out section 4, $100,000,000 for each of fiscal years 2020 through 2024, to remain available until expended;

(3) to carry out section 5, $50,000,000 for each of fiscal years 2020 through 2024, to remain available until expended; and

(4) to carry out section 6, $20,000,000 for each of fiscal years 2020 through 2024, to remain available until expended.

Amend the title so as to read:

"A bill to support research, development, and demonstration programs relating to energy storage systems, and for other purposes.".

## PURPOSE

The purpose of S. 1602, as ordered reported, is to support research, development, and demonstration programs relating to energy storage systems.

## BACKGROUND AND NEED

Energy storage technologies convert captured electricity into another form of energy (such as kinetic or chemical) and later convert that energy back into electricity. These technologies can take many forms, but three of the most common are pumped hydro, lithium-ion batteries, and flywheels. New installations of battery energy storage, particularly lithium-ion battery systems, have accelerated in recent years and show increasing promise although technical and deployment challenges persist.

Energy storage can offer multiple benefits to the electric grid spanning power generation, transmission, and distribution, including applications for frequency regulation, spinning reserve, load leveling, peak shaving, power quality, and capacity firming. Beyond benefits that directly affect the traditional grid, energy storage can also provide flexibility to hybrid energy microgrid systems.

Lithium ion batteries are one of the fastest growing energy storage markets due to their high energy densities, high power, near 100 percent efficiency, and low self-discharge. However, the dominant energy storage technology deployed in the United States for use in the electric power system remains pumped hydropower,

which comprised more than 94 percent of installed energy storage capacity as of June 2018.

Recognizing the potential benefits and the increased pace of deployment of energy storage systems, in February 2018, the Federal Energy Regulatory Commission (FERC) issued Order No. 841, which requires the nation's energy markets to remove barriers to market access for energy storage.

Pursuant to multiple laws, including the Energy Policy Act of 2005 (Public Law 109–58) and the Energy Independence and Security Act of 2007 (Public Law 110–140), the Department of Energy (DOE or Department) is authorized to conduct research and development activities on energy storage technologies. S. 1602, as amended, would encourage further development and commercialization of energy storage technologies by (1) establishing a research, development, and deployment program to advance energy storage technologies; (2) directing the Secretary of Energy (Secretary) to carry out at least five demonstration projects as well as a competitive pilot project grant program; (3) establishing a joint long-term demonstration initiative with the Secretary of Defense; (4) carrying out a technical and planning assistance program that prioritizes rural electric cooperatives and municipal utilities; (5) establishing an energy storage materials recycling prize competition; and (6) directing FERC to issue a regulation on energy storage cost recovery.

## LEGISLATIVE HISTORY

S. 1602 was introduced by Senators Collins, Heinrich, Smith, Gardner, King, McSally, and Coons on May 22, 2019. Senators Murkowski, Crapo, Stabenow, Hirono, Manchin, Klobuchar, Hassan, Whitehouse, Reed, Cortez-Masto, Wyden, and Duckworth are also cosponsors. The Subcommittee on Energy held a hearing on the bill on July 9, 2019.

S. 1602, as amended, includes language from the following four measures: S. 1183, the Expanding Access to Sustainable Energy Act of 2019, which was introduced by Senators Klobuchar and Moran on April 11, 2019, and cosponsored by Senators Gardner, Collins, Stabenow and King; S. 1593, the Promoting Grid Storage Act of 2019, which was introduced by Senators Smith, Collins, Hirono, Duckworth, Cortez-Masto, Stabenow, Heinrich, Gardner, and Hassan on May 22, 2019 and cosponsored by Senator King; S. 1741, the Reducing the Cost of Energy Storage Act of 2019, which was introduced by Senators Wyden, Whitehouse, Coons, and Reed on June 5, 2019; and S. 2048, the Joint Long-Term Storage Act of 2019, which was introduced by Senators King and McSally on June 27, 2019, and cosponsored by Senators Gardner and Heinrich. The Subcommittee on Energy held a hearing on S. 1183, S. 1593, S. 1741, and S. 2048 on July 9, 2019.

During the 115th Congress, Senator Franken introduced similar legislation to S. 1593, S. 1851, on September 25, 2017, and the Senate Energy and Natural Resources Committee conducted a hearing on S. 1851 on December 5, 2017.

Senator Wyden introduced similar legislation to S. 1741, S. 1876, on September 27, 2017. The Senate Energy and Natural Resources Committee conducted a hearing on S. 1876 on December 5, 2017.

Senator Smith introduced similar legislation to S. 1593, S. 3376, on August 23, 2018, and the Senate Energy and Natural Resources Committee conducted a hearing on S. 3376 on November 29, 2018.

During the 114th Congress, Senator Franken introduced similar legislation to S. 1593, S. 1256, on May 22, 2015, and the Senate Energy and Natural Resources Committee conducted a hearing on S. 1256 on June 9, 2015.

The Senate Committee on Energy and Natural Resources met in open business session on September 25, 2019, and ordered S. 1602 favorably reported, as amended.

## COMMITTEE RECOMMENDATION

The Senate Committee on Energy and Natural Resources, in open business session on September 25, 2019, by a majority voice vote of a quorum present, recommends that the Senate pass S. 1602, if amended as described herein. Senator Lee asked to be recorded as voting no.

## COMMITTEE AMENDMENTS

During its consideration of S. 1602, the Committee adopted an amendment in the nature of a substitute and an amendment to the title.

The amendment in the nature of a substitute is a combination of S. 1602 and select language from four other bills: S. 1183, the Expanding Access to Sustainable Energy Act of 2019; S. 1593, the Promoting Grid Storage Act of 2019; S. 1741, the Reducing the Cost of Energy Storage Act of 2019; and S. 2048, the Joint Long-Term Storage Act of 2019.

Specifically, the amendment expands the research and development program in S. 1602 to include other energy storage technologies, and requires that at least one of the five demonstration projects provided in S. 1602 shall be a long-term energy storage demonstration. The amendment also retains the language on testing and validation and strategic planning contained in S. 1602. In addition, section 4(b) of the amendment includes the competitive grant pilot language from S. 1593, section 6 of the amendment combines the technical assistance program language from S. 1593 and S. 1183, and section 5 of the amendment includes the long-duration demonstration language from S. 2048. With respect to S. 1741, the amendment includes language on protecting the privacy of individuals and businesses participating in the research and development program authorized in section 3.

The amendment in the nature of a substitute also includes new language on energy storage materials recycling and regulatory actions. Specifically, section 7 of the amendment amends the Energy Policy Act of 2005 to authorize the Secretary to carry out prize competitions to advance the recycling of critical energy storage materials. Section 8 of the amendment directs FERC to issue a regulation to identify the eligibility of, and process for, energy storage resources to receive cost recovery for transmission and other services. Section 8 also directs FERC to convene a technical conference to identify opportunities for energy storage to be considered in transmission planning and to be compensated for various market services.

SECTION-BY-SECTION ANALYSIS

*Section 1. Short title*

Section 1 sets forth the short title of the bill.

*Sec. 2. Definitions*

Section 2 sets forth key definitions.

*Sec. 3. Energy storage system research, development, and deployment program*

Section 3(a) directs the Secretary to establish the "Energy Storage System Research, Development, and Deployment Program."

Subsection (b) states that the program shall focus on energy storage systems designed to further the development of technologies for the following purposes: large-scale commercial deployment of energy storage; distributed energy storage; transportation energy storage; the reclamation, recycling, repurposing, and disposal energy storage materials; advanced control methods; pumped hydroelectric energy storage systems; models and tools to demonstrate the benefits of energy storage technologies; and energy storage use cases.

Subsection (c) directs the Secretary to coordinate with at least one National Laboratory to accelerate standardized testing and validation of energy storage systems.

Subsection (d) directs the Secretary to review the program objectives at least once annually and update as needed to ensure the program continues to advance energy storage systems toward widespread commercial deployment.

Subsection (e) requires the Secretary to develop a 10-year strategic plan for the program to identify Department programs that support the program activities and are important to the development of energy storage systems. The strategic plan must also include expected timelines for accomplishing program objectives; be submitted to relevant Congressional committees within 180 days of enactment; and be reviewed annually. The Secretary is further authorized to periodically revise the strategic plan.

Subsection (f) provides that the program shall be cross-cutting and shall leverage the expertise and resources of various offices of the Department.

Subsection (g) provides that, in carrying out the program, the Secretary shall follow best practices for protecting the privacy of individuals and businesses.

*Sec. 4. Energy storage demonstration projects; pilot grant program*

Section 4(a) directs the Secretary to enter into agreements to carry out at least five energy storage system demonstration projects by September 30, 2023. At least one of those projects must be designed to further the development of long-term or seasonal energy storage technologies.

Subsection (b)(1) defines key terms for this subsection.

Subsection (b)(2) directs the Secretary to establish a competitive grant program for the pilot energy storage systems demonstration projects. State energy offices, tribes, institutions of higher education, electric utilities, and private energy storage companies that

are small business concerns are eligible to participate in such program.

Subsection (b)(3) specifies the selection requirements the Secretary must consider in awarding grants, including ensuring regional diversity among awardees and that the grants are provided to projects in diverse regions and the grants further the objectives of the energy storage research, development, and deployment program established in section 3.

Subsection(b)(4) requires each project carried out by a grant to fulfill at least one of the specified objectives, including improving grid reliability and security, supplying peak power, integrating renewables, and improving the feasibility of microgrids.

Subsection (c) requires the Secretary to submit to Congress and make publicly available a report describing the performance of the demonstration and pilot grant programs at least once every two years.

Subsection (d) provides that the Federal government shall not hold any ownership interest in any energy storage a system that is a part of a demonstration or pilot project under this section.

*Sec. 5. Long-duration demonstration initiative and joint program*

Section 5(a) defines key terms for this section. In this section, the term "Secretary" means the Secretary of Energy, acting through the Director of ARPA–E.

Subsection (b) requires the Secretary to establish a demonstration initiative (Initiative) composed of demonstration projects focused on the development of long-duration energy storage technologies within 180 days of enactment.

Subsection (c) provides that, in selecting demonstration projects under the Initiative, the Secretary shall ensure a range of technology types, ensure regional diversity, and consider a variety of storage applications.

Subsection (d)(1) requires the Secretary to consult with the Director of the Environmental Security Technology Certification Program (ESTCP) of the Department of Defense to establish within the Department of Energy a joint program to carry out projects to demonstrate long-duration energy storage technologies and to help such technologies become commercially viable.

Subsection (d)(2) directs to Secretary to enter into a memorandum of understanding with the ESTCP Director to administer the joint program within 200 days of enactment.

Subsection (d)(3) specifies that in carrying out the joint program, the Secretary and the ESTCP Director shall use existing test-bed infrastructure and, if appropriate, develop new infrastructure.

Subsection (d)(4) directs the Secretary and the ESTCP Director to develop goals and metrics for the joint program.

Subsection (d)(5) directs the Secretary and ESTCP Director, in selecting projects for the joint program, to ensure projects are carried out with a variety of environments and an appropriate balance of larger, more expensive projects and smaller, less expensive projects. This subsection further specifies that priority is to be given to demonstration projects that make public project information available that will accelerate deployment of long-duration energy storage technologies and will be carried out in the field.

*Sec. 6. Technical and planning assistance program*

Section 6 (a) defines key terms for this section.

Subsection (b) directs the Secretary to establish a technical and planning assistance program to assist eligible entities in identifying, evaluating, planning, designing, and developing processes to procure energy storage systems. In carrying out the program, the Secretary shall provide technical and planning assistance directly to eligible entities and via grant awards that allow eligible entities to contract for technical and planning assistance. This subsection also request the Secretary to focus such assistance on projects that have the greatest potential for strengthening grid reliability, reducing the cost of energy storage systems, and reducing consumer electricity costs, among other goals.

Subsection (c) states that technical and planning assistance under the program shall include assistance with identifying opportunities for energy storage systems, assessing technical and economic characteristics of energy storage systems, permitting and siting issues, and other activities. This subsection further excludes the use of technical and planning assistance to pay for Federal, State, or local lobbying efforts.

Subsection (d) provides that information disseminated under the program shall include case studies and successful examples of energy storage projects, best practices, relevant state policies and regulations, and other information.

Subsection (e) provides that applications for technical and planning assistance shall be granted by the Secretary on a competitive, merit-reviewed basis, and shall be sought at least once every 12 months. The subsection also states the Secretary shall give electric cooperatives and municipal utilities priority for technical and planning assistance under the program.

Subsection (f) requires the Secretary to submit to Congress and make available to the public a report describing the performance of the program at least once every two years.

Subsection (g) provides that activities under the program shall be subject to the cost-sharing requirements under section 988 of the Energy Policy Act of 2005 (42 U.S.C. 16352).

*Sec. 7. Energy storage materials recycling prize competition*

Section 7 amends section 1008 of the Energy Policy Act of 2005 (42 U.S.C. 16396) to establish the Energy Storage Materials Recycling Prize Competition as the new subsection (g).

The new subsection (g)(1) defines critical energy storage materials to include lithium, cobalt, nickel, graphite, and any other material determined by the Secretary to be critical to the continued growing supply of energy storage resources.

The new subsection (g)(2) directs the Secretary to establish the Energy Storage Materials Recycling Prize competition award program to carry out prize competitions and make awards to advance the recycling of critical energy storage materials at least once every calendar year.

The new subsection (g)(3) sets forth eligibility requirements to receive prizes under the competition and specifically excludes a Federal entity or a Federal employee from being eligible.

The new subsection (g)(4) states that the Secretary shall award cash prizes to each individual or entity selected through a competi-

tive process to develop advanced methods or technologies to recycle critical energy storage materials from energy storage systems.

The new subsection (g)(5) requires the Secretary to establish merit-based criteria to award prizes under the competitions, and the criteria must prioritize advancements in methods or technologies that present the greatest potential for large-scale commercial deployment.

The new subsection (g)(6) states that the Secretary shall announce each prize competition by public notice in the Federal Register, and such notice shall describe the essential elements of the competitions.

The new subsection (g)(7) directs the Secretary to assemble a panel of qualified judges to select the competition winners. The panel of judges shall include appropriate members of private industry involved in the commercial deployment of energy storage systems. The subsection also states that no individual may not serve as a judge if they have a personal interest in any participant in the competitions.

The new subsection (g)(8) requires the Secretary to submit an annual report to Congress identifying award recipients, the technologies developed by such recipients, and other information.

The new subsection (g)(9) requires the Secretary to comply with the Anti-Deficiency Act (31 U.S.C. 1341) when carrying out the program.

The new subsection (g)(10) authorizes to be appropriated for the program $10,000,000 for each of fiscal years (FYs) 2020 through 2024, to remain available until expended.

*Sec. 8. Regulatory actions to encourage energy storage development*

Section 8 (a) defines key terms for this section.

Subsection (b) directs FERC to issue a regulation to identify the eligibility of, and process for, electric storage resources to receive cost recovery through FERC-regulated rates for transmission service and the sale of energy, capacity, or ancillary services. This subsection also prohibits duplicate recovery for electric storage resources.

Subsection (c) directs FERC to convene a technical conference within 180 days of enactment on the potential for electric storage resources to improve the operation of electric systems.

*Sec. 9. Coordination*

Section 9 directs the Secretary to coordinate the activities under this Act among the offices and employees of the Department, other Federal agencies, and other relevant entities.

*Sec. 10. Authorization of appropriations*

Section 10 sets forth the authorization amounts under the Act. Section 3 is authorized at $100 million for each of FYs 2020 through 2024. Section 4 is authorized at $100 million for each of FYs 2020 through 2024. Section 5 is authorized at $50 million for each of FYs 2020 through 2024. Section 6 is authorized at $20 million for each of FYs 2020 through 2024. The total authorization for all programs and activities under the Act is $1.4 billion over a five year period.

## COST AND BUDGETARY CONSIDERATIONS

The following estimate of the costs of this measure has been provided by the Congressional Budget Office:

**S. 1602, BEST Act**

**As ordered reported by the Senate Committee on Energy and Natural Resources on September 25, 2019**

| By Fiscal Year, Millions of Dollars | 2020 | 2020-2024 | 2020-2029 |
|---|---|---|---|
| Direct Spending (Outlays) | 0 | 0 | 0 |
| Revenues | 0 | 0 | 0 |
| Increase in the Deficit | 0 | 0 | 0 |
| Spending Subject to Appropriation (Outlays) | 65 | 995 | 1,400 |

| | | | |
|---|---|---|---|
| Statutory pay-as-you-go procedures apply? | No | Mandate Effects | |
| Increases on-budget deficits in any of the four consecutive 10-year periods beginning in 2030? | No | Contains intergovernmental mandate? | No |
| | | Contains private-sector mandate? | No |

S. 1602 would require the Department of Energy (DOE) to establish a research, development, and deployment program for energy storage systems. The bill would authorize the appropriation of $280 million annually over the 2020–2024 period for those purposes.

Under S. 1602, DOE would:

- Enter into agreements to carry out demonstration projects for energy storage systems;
- Establish a competitive grant program to help state governments, tribal governments, institutions of higher education, or utilities carry out demonstration projects for energy storage systems;
- Establish a joint program with the Department of Defense aimed at improving the performance of energy storage technologies designed for extended operations;
- Provide technical, financial, and planning assistance to help certain electric cooperatives, nonprofit organizations, and utilities procure energy storage systems; and
- Award competitive prizes for advancing the recycling of critical energy storage materials such as lithium, cobalt, nickel, and graphite.

Based on historical rates of spending for similar activities, and assuming appropriation of the specified amounts, CBO estimates that implementing S. 1602 would cost $995 million over the 2020 2024 period and $405 million after 2024. The costs of the legislation (detailed in Table 1) fall within budget function 270 (energy).

TABLE 1.—ESTIMATED INCREASES IN SPENDING SUBJECT TO APPROPRIATION UNDER S. 1602

| | By fiscal year, millions of dollars— | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2020–2024 | 2020–2029 |
| Authorization | 280 | 280 | 280 | 280 | 280 | 0 | 0 | 0 | 0 | 0 | 1,400 | 1,400 |
| Estimated Outlays | 65 | 168 | 224 | 263 | 275 | 215 | 112 | 56 | 17 | 5 | 995 | 1,400 |

In 2019, the Congress appropriated $46 million to DOE's Office of Electricity for research on energy storage technologies.

The CBO staff contact for this estimate is Aaron Krupkin. The estimate was reviewed by H.Samuel Papenfuss, Deputy Assistant Director for Budget Analysis.

## REGULATORY IMPACT EVALUATION

In compliance with paragraph 11(b) of rule XXVI of the Standing Rules of the Senate, the Committee makes the following evaluation of the regulatory impact which would be incurred in carrying out S. 1602. The bill is not a regulatory measure in the sense of imposing Government-established standards or significant economic responsibilities on private individuals and businesses.

No personal information would be collected in administering the program. Therefore, there would be no impact on personal privacy.

Little, if any, additional paperwork would result from the enactment of S. 1602, as ordered reported.

## CONGRESSIONALLY DIRECTED SPENDING

S. 1602, as ordered reported, does not contain any congressionally directed spending items, limited tax benefits, or limited tariff benefits as defined in rule XLIV of the Standing Rules of the Senate.

## EXECUTIVE COMMUNICATIONS

The testimony provided by the Department of the Energy at the July 9, 2019, hearing on S. 1602, S. 1741, S. 1593, S. 1183, and S. 2048 follows:

### TESTIMONY OF THE HONORABLE BRUCE J. WALKER, ASSISTANT SECRETARY, OFFICE OF ELECTRICITY, U.S. DEPARTMENT OF ENERGY

#### INTRODUCTION

Chairman Cassidy, Ranking Member Heinrich, and Members of the Subcommittee, it is an honor and a privilege to serve at the Department of Energy (DOE or the Department), as Assistant Secretary for the Office of Electricity. DOE is charged with, among other important responsibilities, providing our Nation with premier energy research and development (R&D) activities. The work being conducted by DOE is setting the course for various advancements in the energy field and beyond. Issues like energy storage, improving energy efficiency, creating breakthroughs in how we extract and utilize our Nation's fossil fuels, and Artificial Intelligence are just some of the important areas of DOE research. These are also the topics being covered at today's hearing.

Thank you for the opportunity to testify today on behalf of the Department regarding these various pieces of legislation. The Administration continues to review all eleven of these bills. Below are some highlights and perspectives regarding the legislation being discussed today.

ENERGY STORAGE

DOE applauds Congress in recognizing that energy storage is a technology of national interest and the backbone of a future resilient energy system. With benefits extending to transportation, the power grid, and throughout the economy, DOE has been proactive in developing new tools and technologies to accelerate energy storage development, such as through the Grid Modernization Initiative (GMI), the Advanced Energy Storage Initiative (AESI), and the Grid Storage Launchpad (GSL).

In May of this year, DOE issued its most recent Grid Modernization Lab Call, with Energy Storage and System Flexibility as one of the major topic areas. The lab call placed a particular emphasis on developing the storage functions that enhance system resilience and flexibility.

The proposed GSL will extend U.S. R&D leadership in energy storage through validation, collaboration, and acceleration. By validating new technologies at earlier maturity stages, the GSL will lower the time and expense of storage chemistry innovations. Through collaboration with universities and the commercial sector, the GSL will augment the industry with enhanced testing protocols and in-operando characterization capabilities. Finally the GSL will accelerate and de-risk new technologies by propagating rigorous grid performance requirements to all stages of storage development, from benchtop to systems.

DOE established the Mission Need for the GSL at Critical Decision 0 (CD–0) in November of 2018. We anticipate finalizing the preferred alternative facility and cost range as part of CD–1 this summer. The FY 2020 Budget requested funds for design and construction planning of the GSL.

The FY 2020 Budget also proposes an AESI led by DOE's Offices of Electricity (OE) and Energy Efficiency and Renewable Energy (EERE), in conjunction with the Offices of Fossil Energy (FE) and Nuclear Energy (NE). AESI will provide a platform to coordinate R&D activities across these programs—and existing energy storage efforts in the Office of Science (SC) and the Advanced Research Projects Agency (ARPA–E)—to establish aggressive, achievable, and measurable goals for cost-competitive energy storage technologies, services, and applications. In FY 2020, AESI will establish application-specific cost and performance metrics to align research objectives and to coordinate the development of new energy storage and flexibility technologies.

Finally, OE's Energy Storage Program continues to conduct research and development to expand storage capabilities and shared industry knowledge. From performance breakthroughs in batteries based on earth-abundant materials to evaluation tools and workshops for state regulators, OE is at the forefront in helping communities realize the benefits of energy storage.

Last month, Chairman Murkowski visited one of our most recent projects, a megawatt-scale battery designed for load following and frequency regulation, located at Cordova Electricity Co-operative in Alaska. In FY 2020 and beyond, OE will continue work that lowers cell and system costs; reduces critical element usage; increases performance; and elevates safety of grid-connected energy storage systems. In general, all of these bills would build on the successes underway with energy storage technologies at DOE.

To focus any new program's efforts on the highest-impact breakthrough technologies, we recommend replacing the term "energy storage system" with the term "electrical energy storage system" to refer to bidirectional electrical energy storage systems that have capability to both absorb electric energy and inject the stored energy back into the grid and introducing the term "flexible energy resource" for other technologies that can shift energy demand in time and provide other services to the grid.

*S. 1602—Better Energy Storage Technology (BEST) Act*

This bill requires the Secretary to establish a "research, development, and demonstration program of grid-scale energy storage systems'" within OE.

The new R&D activities would be focused on cost-effective energy storage systems with specific performance characteristics that would be applicable to daily, weekly, or seasonal cycling.

The bill would also direct the Secretary to establish technology-neutral cost targets, taking into account electricity market prices and the goal of being cost-competitive in specific markets for electric grid products and services.

Finally, the bill would direct the Secretary to "accelerate the standardized testing and validation of grid-scale energy storage systems'" in collaboration with our National Laboratories.

DOE agrees with the bill in recognizing that energy storage is a cross-cutting activity. Many of these activities, such as establishing market-aware, cost-competitive, and technology-neutral cost targets, are currently underway as part of the AESI, which includes activities in OE and across multiple programs in EERE. The Office of Science also supports extensive battery R&D efforts specifically through the Joint Center for Energy Storage Research. Providing resources and a formal structure for these activities will help the Department accelerate storage technology development and commercialization.

*S. 1741—Reducing the Cost of Energy Storage Act of 2019*

This bill requires the Secretary of Energy (Secretary) to "establish a cross-cutting national program within the Department of Energy to advance energy storage deployment."

The goals of the new program will include considerations of lifecycle management, cost-competitiveness, innovation,

use cases, market barrier reductions, safety, deployment pathways, analytical assistance, manufacturing leadership, and supply chain risks.

The program would also establish technology cost targets differentiated by technology class, such as electrochemical, pumped hydro, mechanical, or thermal.

DOE agrees with the bill in recognizing that energy storage is a cross-cutting activity.

The program should have the flexibility to establish cost targets by application (i.e., seasonal storage or peak shifting) rather than by technology. An application-centric approach would help stakeholders evaluate storage benefits and accelerate the path toward commercialization.

*S. 1593—Promoting Grid Storage Act of 2019*

This bill requires the Secretary to establish a "cross-cutting national program . . . for the research of energy storage systems, components, and materials." The bill would also require a "technical assistance and grant program" to provide technical assistance and grants to facilitate energy storage adoption.

DOE agrees with and recognizes the need to provide analytical technical assistance, especially for state, local, and other relevant stakeholders as they seek to understand the benefits of energy storage systems.

*S. 1183—Expanding Access to Sustainable Energy Act of 2019*

DOE has provided support for state and local governments to integrate renewable energy and utilize new applications such as cybersecurity and smart grid technologies. The Expanding Access to Sustainable Energy Act would establish an energy storage and microgrid grant and technical assistance program within the Department, focusing on rural electric cooperatives.

The Department continues to review the legislation and looks forward to working with Congress as the legislative process moves forward.

*S. 2048 Joint Long Term Storage Act of 2019*

The purposes of this legislation are to facilitate the development of long-duration energy storage technologies, increase commercial viability of long-duration energy storage technologies, and increase the energy resilience, energy security, and national security of the United States through the use of long-duration energy storage technologies.

This legislation establishes a demonstration initiative to pilot the potential benefits of long-duration energy storage, increase commercial viability, recognize the range of grid services, quantify the value of those services, identify a range of technology types, and improve integration of energy storage and the grid.

The bill requires ARPA–E and the Department of Defense's Environmental Security Technology Certification Program to establish a joint program to carry out dem-

onstration projects at scale and help technologies become commercially viable with priority given to demonstration projects that will be carried out in the field.

DOE appreciates Congress's attention to energy storage issues, and continues to evaluate this legislation.

CONCLUSION

Thank you again for the opportunity to testify today on behalf of DOE. The Department appreciates the ongoing bipartisan efforts to address our nation's energy challenges, and looks forward to working with the Committee on the legislation on today's agenda and any future legislation.

I would be happy to answer your questions.

CHANGES IN EXISTING LAW

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, the changes in existing law made by S. 1602, as reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italic, existing law in which no change is proposed is shown in roman):

# ENERGY POLICY ACT OF 2005

Public Law 109 58, as Amended

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## TITLE IX—DEPARTMENT OF ENERGY MANAGEMENT

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**SEC. 1008. PRIZES FOR ACHIEVEMENT IN GRAND CHALLENGES OF SCIENCE AND TECHNOLOGY.**

(a) AUTHORITY.—The Secretary may carry out a program to award cash prizes in recognition of breakthrough achievements in research, development, demonstration, and commercial application that have the potential for application to the performance of the mission of the Department.

* * * * * * *

*(g) ENERGY STORAGE MATERIALS RECYCLING PRIZE COMPETITION.—*

*(1) DEFINITION OF CRITICAL ENERGY STORAGE MATERIALS.—In this subsection, the term "critical energy storage materials" includes—*

*(A) lithium;*

*(B) cobalt;*

*(C) nickel;*

*(D) graphite; and*

*(E) any other material determined by the Secretary to be critical to the continued growing supply of energy storage resources.*

*(2) PRIZE AUTHORITY.—*

*(A) IN GENERAL.—As part of the program established under subsection (a), the Secretary shall establish an award program, to be known as the "Energy Storage Mate-*

*rials Recycling Prize Competition" (referred to in this subsection as the "program"), under which the Secretary shall carry out prize competitions and make awards to advance the recycling of critical energy storage materials.*

*(B) FREQUENCY.—To the maximum extent practicable, the Secretary shall carry out a competition under the program not less frequently than once every calendar year.*

*(3) ELIGIBILITY.—*

*(A) IN GENERAL.—To be eligible to win a prize under the program, an individual or entity—*

*(i) shall have complied with the requirements of the competition as described in the announcement for that competition published in the Federal Register by the Secretary under paragraph (6);*

*(ii) in the case of a private entity, shall be incorporated in the United States and maintain a primary place of business in the United States;*

*(iii) in the case of an individual, whether participating singly or in a group, shall be a citizen of, or an alien lawfully admitted for permanent residence in, the United States.*

*(B) EXCLUSIONS.—The following entities and individuals shall not be eligible to win a prize under the program:*

*(i) A Federal entity.*

*(ii) A Federal employee (including an employee of a National Laboratory) acting within the scope of employment.*

*(4) AWARDS.—In carrying out the program, the Secretary shall award cash prizes, in amounts to be determined by the Secretary, to each individual or entity selected through a competitive process to develop advanced methods or technologies to recycle critical energy storage materials from energy storage systems.*

*(5) CRITERIA.—*

*(A) IN GENERAL.—The Secretary shall establish objective, merit-based criteria for awarding the prizes in each competition carried out under the program.*

*(B) REQUIREMENTS.—The criteria established under subparagraph (A) shall prioritize advancements in methods or technologies that present the greatest potential for large-scale commercial deployment.*

*(C) CONSULTATION.—In establishing criteria under subparagraph (A), the Secretary shall consult with appropriate members of private industry involved in the commercial deployment of energy storage systems.*

*(6) ADVERTISING AND SOLICITATION OF COMPETITORS.—*

*(A) IN GENERAL.—The Secretary shall announce each prize competition under the program by publishing a notice in the Federal Register.*

*(B) REQUIREMENTS.—Each notice published under subparagraph (A) shall describe the essential elements of the competition, such as—*

*(i) the subject of the competition;*

*(ii) the duration of the competition;*

*(iii) the eligibility requirements for participation in the competition;*

*(iv) the process for participants to register for the competition;*

*(v) the amount of the prize; and*

*(vi) the criteria for awarding the prize.*

*(7) JUDGES.—*

*(A) IN GENERAL.—For each prize competition under the program, the Secretary shall assemble a panel of qualified judges to select the winner or winners of the competition on the basis of the criteria established under paragraph (5).*

*(B) SELECTION.—The judges for each competition shall include appropriate members of private industry involved in the commercial deployment of energy storage systems.*

*(C) CONFLICTS.—An individual may not serve as a judge in a prize competition under the program if the individual, the spouse of the individual, any child of the individual, or any other member of the household of the individual—*

*(i) has a personal or financial interest in, or is an employee, officer, director, or agent of, any entity that is a registered participant in the prize competition for which the individual will serve as a judge; or*

*(ii) has a familial or financial relationship with a registered participant in the prize competition for which the individual will serve as a judge.*

*(8) REPORT TO CONGRESS.—Not later than 60 days after the date on which the first prize is awarded under the program, and annually thereafter, the Secretary shall submit to Congress a report that—*

*(A) identifies each award recipient;*

*(B) describes the advanced methods or technologies developed by each award recipient; and*

*(C) specifies actions being taken by the Department toward commercial application of all methods or technologies with respect to which a prize has been awarded under the program.*

*(9) ANTI-DEFICIENCY ACT.—The Secretary shall carry out the program in accordance with section 1341 of title 31, United States Code (commonly referred to as the 'Anti-Deficiency Act').*

*(10) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to carry out this subsection $10,000,000 for each of fiscal years 2020 through 2024, to remain available until expended.*

* * * * * * *

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