116TH CONGRESS
2d Session
HOUSE OF REPRESENTATIVES
REPORT
116–472

BETTER ENERGY STORAGE TECHNOLOGY ACT

AUGUST 7, 2020.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Ms. JOHNSON of Texas, from the Committee on Science, Space, and Technology, submitted the following

R E P O R T

[To accompany H.R. 2986]

[Including cost estimate of the Congressional Budget Office]

The Committee on Science, Space, and Technology, to whom was referred the bill (H.R.2986) 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 and recommends that the bill as amended do pass.

CONTENTS

99–006

I. AMENDMENT

The amendment is 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. ENERGY STORAGE.

(a) IN GENERAL.—The United States Energy Storage Competitiveness Act of 2007 (42 U.S.C. 17231) is amended—

(1) by redesignating subsections (l) through (p) as subsections (p) through (t), respectively; and

(2) by inserting after subsection (k) the following:

"(l) ENERGY STORAGE RESEARCH AND DEVELOPMENT PROGRAM.—

"(1) IN GENERAL.—Not later than 180 days after the date of enactment of the Better Energy Storage Technology Act, the Secretary shall establish a research and development program for energy storage systems, components, and materials across multiple program offices of the Department.

"(2) REQUIREMENTS.—In carrying out the program under paragraph (1), the Secretary shall—

"(A) coordinate across all relevant program offices throughout the Department, including the Office of Electricity, the Office of Energy Efficiency and Renewable Energy, the Advanced Research Projects Agency – Energy, the Office of Science, and the Office of Cybersecurity, Energy Security, and Emergency Response;

"(B) adopt long-term cost, performance, and demonstration targets for different types of energy storage systems and for use in a variety of regions, including rural areas;

"(C) incorporate considerations of sustainability, sourcing, recycling, reuse, and disposal of materials, including critical elements, in the design of energy storage systems;

"(D) identify energy storage duration needs;

"(E) analyze the need for various types of energy storage to improve electric grid resilience and reliability; and

"(F) support research and development of advanced manufacturing technologies that have the potential to improve United States competitiveness in energy storage manufacturing.

"(3) STRATEGIC PLAN.—

"(A) IN GENERAL.—No later than 180 days after the date of enactment of the Better Energy Storage Technology Act, the Secretary shall develop a 5-year strategic plan identifying research, development, demonstration, and commercial application goals for the program in accordance with this section. The Secretary shall submit this plan to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate.

"(B) CONTENTS.—The strategic plan submitted under subparagraph (A) shall—

"(i) identify programs at the Department related to energy storage systems that support the research and development activities described in paragraph (4), and the demonstration projects under subsection (m); and

"(ii) include timelines for the accomplishment of goals developed under the plan.

"(C) UPDATES TO PLAN.—Not less frequently than once every 3 years, the Secretary shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate an updated version of the plan under subparagraph (A).

"(4) RESEARCH AND DEVELOPMENT.—In carrying out the program established in paragraph (1), the Secretary shall focus on developing—

"(A) energy storage systems that can store energy and deliver stored energy for a minimum of 6 hours in duration to balance electricity needs over the course of a single day;

"(B) long-duration energy storage systems that can store energy and deliver stored energy for 10 to 100 hours in duration; and

"(C) energy storage systems that can store energy and deliver stored energy over several months and address seasonal scale variations in supply and demand.

"(5) TESTING AND VALIDATION.—The Secretary shall support the standardized testing and validation of energy storage systems under the program through collaboration with 1 or more National Laboratories, including the development of methodologies to independently validate energy storage technologies by—

"(A) performance of energy storage systems on the electric grid, including—

"(i) when appropriate, testing of application-driven charge and discharge protocols;

"(ii) evaluation of power capacity and energy output;

"(iii) degradation of the energy storage systems from cycling and aging;

"(iv) safety; and

"(v) reliability testing under grid duty cycles; and

"(B) prediction of lifetime metrics.

"(6) COORDINATION.—In carrying out this subsection, the Secretary shall coordinate with—

"(A) programs and offices that aim to increase domestic manufacturing and production of energy storage systems, such as those within the Department and within the National Institute of Standards and Technology;

"(B) other Federal agencies that are carrying out initiatives to increase energy reliability through the development of energy storage systems, including the Department of Defense; and

"(C) other stakeholders working to advance the development of commercially viable energy storage systems.

"(7) TECHNICAL ASSISTANCE PROGRAM.—

"(A) IN GENERAL.—The Secretary shall provide technical assistance for commercial application of energy storage technologies to eligible entities.

"(B) TECHNICAL ASSISTANCE.—Technical assistance provided under this paragraph—

"(i) may include assistance with—

"(I) assessment of relevant technical and geographic characteristics;

"(II) interconnection of electricity storage systems with the electric grid; and

"(III) engineering design; and

"(ii) may not include assistance relating to modification of Federal, State, or local regulations or policies with respect to energy storage systems.

"(C) APPLICATIONS.—

"(i) IN GENERAL.—The Secretary shall seek applications for technical assistance and grants under the program—

"(I) on a competitive basis; and

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

"(ii) PRIORITIES.—In selecting eligible entities for technical assistance for commercial applications, the Secretary shall give priority to eligible entities with projects that have the greatest potential for—

"(I) strengthening the reliability and resilience of the electric grid to the impact of extreme weather events, power grid failures, and interruptions in supply of electricity;

"(II) reducing the cost of energy storage systems; or

"(III) facilitating the use of net zero emission energy resources.

"(8) PROGRAM DEFINED.—In this subsection, the term 'program' means the research and development program established under paragraph (1).".

(b) ENERGY STORAGE DEMONSTRATION PROGRAM.—The United States Energy Storage Competitiveness Act of 2007 (42 U.S.C. 17231), as amended, is further amended by inserting after subsection (l), as added by subsection (a), the following:

"(m) ENERGY STORAGE DEMONSTRATION PROGRAM.—

"(1) ESTABLISHMENT.—The Secretary shall establish a competitive grant program for the demonstration of energy storage systems, as identified by the Secretary, that use either—

"(A) a single system; or

"(B) aggregations of multiple systems.

"(2) ELIGIBILITY.—Entities eligible to receive a grant under paragraph (1) include—

"(A) a State, territory, or possession of the United States;

"(B) a State energy office;

"(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) a rural electric cooperative;

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

"(iii) an investor-owned utility; and

"(F) a private company, such as but not limited to an energy storage company.

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

"(A) ensure regional diversity among eligible entities that receive the grants, including participation by rural States and small States;

"(B) ensure that specific projects selected for grants—

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

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

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

"(D) prioritize projects that leverage matching funds from non-Federal sources.

"(4) OBJECTIVES.—Each demonstration project selected for a grant under paragraph (1) shall include one or more of the following objectives:

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

"(B) To improve the reliability of the transmission and distribution system, 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 or demand.

"(E) To reduce peak loads of homes and businesses, particularly to defer or avoid investments in new electric grid capacity.

"(F) To advance power conversion systems to make the systems smarter, more efficient, able to communicate with other inverters, and able to control voltage.

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

"(H) To integrate one or more energy resources, including renewable energy resources, at the source or away from the source.

"(I) To increase the feasibility of microgrids or islanding.

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

"(5) RESTRICTION ON USE OF FUNDS.—Any eligible entity that receives a grant under paragraph (1) may only use the grant to fund programs relating to the demonstration of energy storage systems connected to the electric grid, or that provides bi-directional energy storage capable of providing back-up energy in the event of grid outages, including energy storage systems sited behind a customer revenue meter.

"(6) COST SHARING.—In carrying out this section, the Secretary shall require cost sharing under this section in accordance with section 988 of the Energy Policy Act of 2005 (42 U.S.C. 16352).

"(7) NO PROJECT OWNERSHIP INTEREST.—The United States shall hold no equity or other ownership interest in an energy storage system for which a grant is provided under paragraph (1).

"(8) RULES AND PROCEDURES; AWARDING OF GRANTS.—

"(A) RULES AND PROCEDURES.—Not later than 180 days after the date of enactment of the Better Energy Storage Technology Act, the Secretary shall adopt rules and procedures for carrying out the grant program under subsection (m).

"(B) AWARDING OF GRANTS.—Not later than 1 year after the date on which the rules and procedures under paragraph (A) are established, the Secretary shall award the initial grants provided under this section.

"(9) REPORTS.—The Secretary shall submit to Congress and make publicly available—

"(A) not less frequently than once every 2 years for the duration of the grant program under subsection (m), a report describing the performance of the grant 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

"(B) on termination of the grant program under subsection (m), an assessment of the success of, and education provided by, the measures carried out by grant recipients under the grant program.

"(10) PROGRAM DEFINED.—In this subsection, the term 'program' means the demonstration program established under paragraph (1).".

(c) AUTHORIZATION OF APPROPRIATIONS.—The United States Energy Storage Competitiveness Act of 2007 (42 U.S.C. 17231) is amended, in subsection (t) (as redesignated by subsection (a)(1))—

(1) in paragraph (5), by striking "and" at the end;

(2) in paragraph (6), by striking the period at the end and inserting ";"; and

(3) by adding at the end the following:

"(7) the research and development program for energy storage systems under subsection (l)—

"(A) $62,000,000 for fiscal year 2020;

"(B) $ 65,100,000 for fiscal year 2021;

"(C) $ 68,355,000 for fiscal year 2022;

"(D) $ 71,773,000 for fiscal year 2023; and

"(E) $ 75,362,000 for fiscal year 2024; and

"(8) the demonstration program for energy storage systems under subsection (m), $50,000,000 for each of fiscal years 2020 through 2024.".

SEC. 3. CRITICAL MINERAL RECYCLING AND REUSE RESEARCH, DEVELOPMENT, AND DEMONSTRATION PROGRAM.

The United States Energy Storage Competitiveness Act of 2007 (42 U.S.C. 17231) is amended by inserting after subsection (m), as added by section 2(b) of this Act, the following:

"(n) CRITICAL MINERAL RECYCLING AND REUSE RESEARCH, DEVELOPMENT, AND DEMONSTRATION PROGRAM.—

"(1) DEFINITIONS.—In this subsection:

"(A) CRITICAL MINERAL.—The term 'critical mineral' means any of a class of chemical elements that have a high risk of a supply disruption and are critical to one or more new, energy-related technologies such that a shortage of such element would significantly inhibit large-scale deployment of technologies that store energy.

"(B) RECYCLING.—The term 'recycling' means the separation of critical minerals embedded within an energy storage system through physical or chemical means and reuse of those separated critical minerals in other technologies.

"(2) ESTABLISHMENT.—Not later than 180 days after the date of enactment of the BEST Act, the Secretary shall establish a research, development, and demonstration program of recycling of energy storage systems containing critical minerals.

"(3) RESEARCH, DEVELOPMENT, AND DEMONSTRATION.—In carrying out the program, the Secretary may focus research, development, and demonstration activities on—

"(A) technologies, process improvements, and design optimizations that facilitate and promote recycling, including—

"(i) improvement of efficiency and rates of collection of products and scrap containing critical minerals from consumer, industrial, and other waste streams;

"(ii) separation and sorting of component materials in energy storage systems containing critical minerals, including improving the recyclability of such energy storage systems;

"(iii) safe storage of energy storage systems, including reducing fire risk;

"(iv) safe transportation of energy storage systems and components; and

"(v) development of technologies to advance energy storage recycling facility infrastructure, including integrated recycling facilities that can process multiple materials;

"(B) research and development of technologies that mitigate emissions and environmental impacts that arise from recycling, including disposal of toxic reagents and byproducts related to recycling processes;

"(C) research and development of technologies to enable recycling of critical materials from batteries in electric vehicles;

"(D) research on and analysis of non-technical barriers to improving the transportation of energy storage systems containing critical minerals; and

"(E) research on technologies and methods to enable the safe disposal of energy storage systems containing critical minerals, including waste materials and components recovered during the recycling process.

"(4) REPORT TO CONGRESS.—Not later than 2 years after the date of enactment of the BEST Act, and every 3 years thereafter, the Secretary shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate a report summarizing the activities, findings, and progress of the program.

"(o) DEFINITIONS.—For purposes of subsections (l), (m), and (n), the following definitions apply:

"(1) ENERGY STORAGE SYSTEM.—The term 'energy storage system' means a system, equipment, facility, or technology relating to the electric grid that—

"(A) is capable of absorbing energy, storing such energy for a period of time, and dispatching such energy after storage; and

"(B) uses a mechanical, electrical, chemical, electrochemical, or thermal process to store such energy, or any other process that the Secretary determines relevant.

"(2) ISLAND.—The term 'island' means one or more distributed generators or energy storage systems that continues to power a location in the absence of electricity from the electric grid.

"(3) MICROGRID.—The term 'microgrid' means an integrated energy system consisting of inter-connected loads and distributed energy resources, including generators and energy storage systems, within clearly defined electrical boundaries that—

"(A) acts as a single controllable entity with respect to the grid;

"(B) can connect and disconnect from the grid to operate in either grid-connected mode or island-mode; or

"(C) can operate in the absence of the grid.

"(4) 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).".

II. PURPOSE OF THE BILL

The purpose of the Better Energy Storage Technology Act (H.R. 2986) is to amend the United States Energy Storage Competitiveness Act to authorize a cross-cutting, research, development, and demonstration program to further the development of a variety of energy storage technologies. H.R. 2986 is sponsored by Mr. Foster and cos-sponsored by Mr. Casten, Ms. Herrera Beutler, Mr. Gonzalez, Mr. Fitzpatrick, Mr. Welch, Mr. Bacon, Mr. Grijalva, Mr. Crenshaw, Mr. Kennedy, Mr. Gallagher, Mr. Lipinski, Mr. Stivers, Ms. Fletcher, Mr. McHenry, Mr. Case, Mr. Calvert, Mr. Weber, Ms. Lee, Ms. Spanberger, Mr. Katko, Ms. Kuster, Mr. Kind, Mr. Quigley, Ms. Lofgren, Mr. Cox, Ms. Norton, Ms. Dingell, Mr. Hime, Ms. Haaland, Ms. Luria, Mr. Lewis, Mr. Bluemenauer, Mr. Larsen, Mr. Smith, Ms. Stefanik, Mr. Brindsi, Mr. Cohen, Mr. Connolly, Mr. Kim, Mr. Schneider, Ms. Beatty, Mr. Scott, Mr. Harder, Mr. Suozzi, Mr. Keating, Mr. Meeks, Ms. Napolitano, Chairwoman Eddie Bernice Johnson, Ms. Pingree, Mr. Price, Ms. Barragán, Mr. Cole, Mr. Fortenberry, Mr. Meuser, Mr. McAdams, Ms. Sherrill, Mr. Olson, Mr. DeFazio, Ms. Escobar, Mr. Steil, Mr. Soto, Ms. Chu, Mr. Cicilline, Miss Rice, Mr. Khanna, Mr. Pocan, Mr. Crist, Mr. Joyce, Mr. Aguilar, Ms. Brownley, Mr. Cooper, Mr. Castro, Ms. McMorris Rodgers, Mr. Phillips, Mr. San Nicolas, Ms. Bonamici, Mr. Thompson, Ms. Sánchez, Mr. Rose, Ms. Watson Coleman, Mr. Golden, Mr. Pappas, Mr. Langevin, Mr. Gallego, Ms. Eshoo, Ms. Houlahan, Mr. Doyle, Mr. Bera, Mr. Heck, Ms. Hayes, Mr. Amodei, Ms. Jayapal, Ms. Roybal-Allard, Mr. Luján, Mr. Horsford, Mr.

Sherman, Mr. Curtis, Ms. Titus, Mr. Trone, Mr. Peters, Ms. Craig, and Ms. Stevens.

III. Background and Need for the Legislation

The Department of Energy (DOE) supports research on a variety of energy storage systems including battery storage at the Office of Electricity,[1] the Office of Science,[2] and the Advanced Research Projects Agency—Energy (ARPA–E);[3] pumped-storage hydropower at the Water Power Technologies Office;[4] and geothermal storage at the Geothermal Technologies Office,[5] among others. Energy storage technologies offer a variety of benefits, including providing more stability for variable renewable energy generation sources and providing a variety of other grid services such as frequency regulation, voltage control, and load following. According to the Congressional Research Service, energy storage systems may be a key technology to enabling a future electric grid with low greenhouse gas emissions when paired with low-emissions energy generation sources.[6]

In a 2017 report on electric grid resilience, the National Academies noted that energy storage systems could improve the resilience of the electric grid and recommended improved modeling to account for an electric grid system that includes significant storage capacity; consideration of storage resources in recovery strategies from power outages; and analyses of how electric vehicles might be used to provide emergency power for customers.[7] Other reports have indicated the need for a cross-cutting, coordinated research effort at the Department to advance energy storage systems, and an increased focus on long-duration energy storage.[8,9] The Better Energy Storage Technology Act (H.R. 2986) incorporates many of these recommendations by authorizing a cross-cutting research, development, demonstration, and commercial application program to advance a variety of energy storage technologies for these purposes.

IV. Committee Hearings

Pursuant to Section 103(i) of H. Res. 6, the Committee designates the following hearings as having been used to develop or consider the legislation:

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[1] Energy Storage, Office of Electricity, U.S. Department of Energy, https://www.energy.gov/oe/activities/technology-development/energy-storage.

[2] Joint Center for Energy Storage Research, Office of Science, U.S. Department of Energy, https://www.jcesr.org/.

[3] Storage, ARPA–E, U.S. Department of Energy, https://arpa-e.energy.gov/?q=project-tech-areas/storage.

[4] Pumped-Storage Hydropower, Water Power Technologies Office, U.S. Department of Energy, https://www.energy.gov/eere/water/pumped-storage-hydropower.

[5] *GTO Announces Beyond Batteries Lab Call Selections*, Geothermal Technologies Office, U.S. Department of Energy, August 28, 2018, https://www.energy.gov/eere/geothermal/articles/gto-announces-beyond-batteries-lab-call-selections.

[6] *Electricity Storage: Applications, Issues, and Technologies*, Congressional Research Service, Report No. R45980, https://www.crs.gov/reports/pdf/R45980.

[7] *Enhancing the Resilience of the Nation's Electricity System*, National Academies of Science, Engineering, and Medicine, https://www.nap.edu/catalog/24836/enhancing-the-resilience-of-the-nations-electricity-system.

[8] *Making "Beyond Lithium" a Reality: Fostering Innovation in Long-Duration Grid Storage*, Information Technology & Innovation Foundation, https://itif.org/publications/2018/11/28/making-beyond-lithium-reality-fostering-innovation-long-duration-grid.

[9] *Harnessing the Potential of Energy Storage*, Edison Electric Institute, https://www.eei.org/issuesandpolicy/generation/Documents/EEI_HarnessingStorage_Final.pdf.

On July 17, 2019 the Honorable Conor Lamb presiding, the Energy Subcommittee of the Committee on Science, Space, and Technology held a hearing to examine research needs to modernize and secure our nation's electricity grid, including energy storage. Witnesses and Members discussed the need for a more coordinated investment on research and development of energy storage technologies at the Department of Energy and the need for more energy storage demonstration projects.

WITNESSES

The Honorable Karen Evans, Assistant Secretary, Office of Cybersecurity, Energy Security, and Emergency Response, U.S. Department of Energy

Mr. Juan J. Torres, Associate Laboratory Director, Energy Systems Integration, National Renewable Energy Laboratory and Co-Chair, Grid Modernization Lab Consortium

Ms. Kelly Speakes-Backman, CEO, Energy Storage Association

Ms. Katherine Hamilton, Chair, 38 North Solutions and Executive Director, Advanced Energy Management Alliance

V. Committee Consideration and Votes

The Energy Subcommittee of the Committee on Science, Space, and Technology met to consider H.R. 2986 on December 19, 2019 and considered the following amendment to the bill:

Mr. Foster offered an amendment in the nature of a substitute that would expand the activities authorized in the bill to include a technical assistance program to aid in the commercial application of energy storage technologies and an energy storage demonstration program. *The amendment was agreed to by a voice vote.*

Mr. Lamb moved that the Committee favorably report the bill, H.R. 2986, as amended, to the Full Committee with the recommendation that the bill be approved. *The motion was agreed to by a voice vote.*

The Committee on Science, Space, and Technology met to consider H.R. 2986 on February 12, 2020 and considered the following amendments to the bill:

Mr. Foster offered a Manager's amendment that would make technical and conforming changes to the bill. *The amendment was agreed to by a voice vote.*

Mr. Tonko offered an amendment that would add a critical mineral recycling and reuse research, development and demonstration program to the bill. *The amendment was agreed to by a voice vote.*

Ms. Sherrill offered an amendment that would add support for research and development of advanced manufacturing technologies to improve U.S. energy storage manufacturing competitiveness. *The amendment was agreed to by a voice vote.*

Chairwoman Johnson moved that the Committee favorably report the bill, H.R. 2986, as amended, to the House of Representatives with the recommendation that the bill be approved. *The motion was agreed to by a voice vote.*

VI. Summary of Major Provisions of the Bill

The Better Energy Storage Technology (BEST) Act (H.R. 2986) would authorize a cross-cutting, research, development, and dem-

onstration program to further the development of a variety of energy storage systems, components, and materials. The bill also directs the Secretary of Energy to develop a strategic plan for energy storage research; to establish a technical assistance program for the commercial application of energy storage systems; and to establish a research, development, and demonstration program for recycling of energy storage systems containing critical minerals.

VII. SECTION-BY-SECTION ANALYSIS (BY TITLE AND SECTION)

Sec. 1 Short title

"Better Energy Storage Technology Act"

Sec. 2 Energy storage

This section authorizes a cross-cutting research and development program at the Department of Energy on energy storage, including instructing the Secretary to coordinate across relevant program offices in carrying out the program and to adopt long-term cost and performance targets for the program. Additionally, this section requires the Secretary to develop a 5-year strategic plan to identify goals and timelines for the research and development program. Furthermore, this section instructs the Secretary to develop testing and validation methodologies for a variety of energy storage technologies. This section also authorizes a technical assistance program to assist with interconnection of energy storage systems with the electric grid and assessment of technical and geographic characteristics in addition to an energy storage demonstration program. Lastly, this section authorizes the following amounts for appropriations: for research and development, $62 million in fiscal year 2020 with 5% annual increases through fiscal year 2024 and for a demonstration program, $50 million for each of fiscal years 2020 through 2024.

VIII. COMMITTEE VIEWS

As part of the report authorized in this legislation, the Committee intends that the Department shall study ways to standardize and streamline the process for approving interconnection of energy storage systems onto the electric grid.

IX. COST ESTIMATE

Pursuant to clause 3(c)(2) of rule XIII of the Rules of the House of Representatives, the Committee adopts as its own the estimate of new budget authority, entitlement authority, or tax expenditures or revenues contained in the cost estimate prepared by the Director of the Congressional Budget Office pursuant to section 402 of the Congressional Budget Act of 1974.

X. CONGRESSIONAL BUDGET OFFICE COST ESTIMATE

U.S. CONGRESS,
CONGRESSIONAL BUDGET OFFICE,
Washington, DC, June 22, 2020.

Hon. EDDIE BERNICE JOHNSON,
Chairwoman, Committee on Science, Space, and Technology,
House of Representatives, Washington, DC.

DEAR MADAM CHAIRWOMAN: The Congressional Budget Office has prepared the enclosed cost estimate for H.R. 2986, the BEST Act.

If you wish further details on this estimate, we will be pleased to provide them. The CBO staff contact is Aaron Krupkin.

Sincerely,

PHILLIP L. SWAGEL,
Director.

Enclosure.

H.R. 2986, BEST Act
As ordered reported by the House Committee on Science, Space, and Technology on February 12, 2020

By Fiscal Year, Millions of Dollars	2020	2020-2025	2020-2030
Direct Spending (Outlays)	0	0	0
Revenues	0	0	0
Increase or Decrease (-) in the Deficit	0	0	0
Spending Subject to Appropriation (Outlays)	*	572	not estimated

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 2031?	No	Contains intergovernmental mandate?	No
		Contains private-sector mandate?	No

* = between zero and $500,000

H.R. 2986 would reauthorize and expand the Department of Energy's (DOE's) research and development (R&D) program for energy storage systems. Under the program, DOE would develop a strategic plan, conduct research, support testing and validation of energy storage systems, and provide technical assistance. The bill would authorize the appropriation of specific amounts for each year from 2020 through 2024 for those purposes. In 2020, the authorization would be $62 million. However, DOE's Office of Electricity has allocated $55 million in 2020 for research on energy storage technologies. As a result, CBO estimates that H.R. 2986 would increase authorizations in 2020 by $7 million, the difference between the amount authorized to be appropriated in the bill and the amount allocated for that year.

The bill also would authorize the appropriation of $50 million annually through 2024 for DOE to award grants for the demonstration of energy storage systems.

Finally, H.R. 2986 would require DOE to conduct research, development, and demonstration activities to advance the recycling of

energy storage systems that contain critical minerals (lithium, cobalt, nickel, graphite, etc.). Based on the cost of similar programs, CBO estimates the authorization in 2020 would be $25 million, with that amount increasing each year to account for anticipated inflation.

For this estimate, CBO assumes that the bill will be enacted in fiscal year 2020. Under that assumption, DOE could incur some costs in 2020, but CBO expects that most of the costs would be incurred in 2021 and later. Based on historical spending patterns for similar programs, CBO estimates that implementing H.R. 2986 would cost $572 million over the 2020–2025 period, assuming appropriation of the authorized and estimated amounts.

The costs of the legislation, detailed in Table 1, would primarily fall within budget function 270 (energy).

TABLE 1.—ESTIMATED INCREASES IN SPENDING SUBJECT TO APPROPRIATION UNDER H.R. 2986

	By fiscal year, millions of dollars—						
	2020	2021	2022	2023	2024	2025	2020–2025
Energy Storage R&D:							
Authorization	7	65	68	72	75	0	288
Estimated Outlays	*	17	42	56	68	55	238
Demonstration Grants:							
Authorization	50	50	50	50	50	0	250
Estimated Outlays	*	23	48	50	54	40	215
Critical Mineral Recycling:							
Estimated Authorization	25	26	26	27	27	28	159
Estimated Outlays	*	12	25	26	28	28	119
Total Changes:							
Estimated Authorization	82	141	144	149	152	28	697
Estimated Outlays	*	52	115	132	150	123	572

Components may not sum to totals because of rounding; R&D = research and development; * = between zero and $500,000.

[a] H.R. 2986 would authorize the appropriation of $62 million in 2020 for the Department of Energy (DOE) to conduct energy storage R&D. However, DOE has allocated $55 million in 2020 for those purposes. As a result, CBO estimates that H.R.2986 would increase authorizations in 2020 by $7 million, the difference between the amount authorized to be appropriated in the bill and the amount allocated for that year.

On October 22, 2019, CBO transmitted a cost estimate for S. 1602, the BEST Act, as ordered reported by the Senate Committee on Energy and Natural Resources on September 25, 2019. The two pieces of legislation are similar, but each has a different scope and would authorize the appropriation of different amounts. CBO's cost estimates reflect those differences.

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

XI. Federal Mandates Statement

H.R. 2986 contains no unfunded mandates.

XII. Committee Oversight Findings and Recommendations

The Committee's oversight findings and recommendations are reflected in the body of this report.

XIII. Statement on General Performance Goals and Objectives

Pursuant to clause (3)(c) of House rule XIII, the goals of H.R. 2986 are to direct Federal research on energy storage systems,

components, and materials; establish a technical assistance program for energy storage systems; and direct a research, development, and demonstration program on recycling of energy storage systems containing critical minerals.

XIV. Federal Advisory Committee Statement

H.R. 2986 does not authorize any federal advisory committees.

XV. Duplication of Federal Programs

Pursuant to clause 3(c)(5) of rule XIII of the Rules of the House of Representatives, the Committee finds that no provision of H.R. 2986 establishes or reauthorizes a program of the federal government known to be duplicative of another federal program, including any program that was included in a report to Congress pursuant to section 21 of Public Law 111–139 or the most recent Catalog of Federal Domestic Assistance.

XVI. Earmark Identification

Pursuant to clause 9(e), 9(f), and 9(g) of rule XXI, the Committee finds that H.R. 2986 contains no earmarks, limited tax benefits, or limited tariff benefits.

XVII. Applicability to the Legislative Branch

The Committee finds that H.R. 2986 does not relate to the terms and conditions of employment or access to public services or accommodations within the meaning of section 102(b)(3) of the Congressional Accountability Act (Public Law 104–1).

XVIII. Statement on Preemption of State, Local, or Tribal Law

This bill is not intended to preempt any state, local, or tribal law.

XIX. Changes in Existing Law Made by the Bill, as Reported

In compliance with clause 3(e) of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italics, and existing law in which no change is proposed is shown in roman):

UNITED STATES ENERGY STORAGE COMPETITIVENESS ACT OF 2007

* * * * * * *

TITLE VI—ACCELERATED RESEARCH AND DEVELOPMENT

* * * * * * *

Subtitle D—Energy Storage for Transportation and Electric Power

* * * * * * *

SEC. 641. ENERGY STORAGE COMPETITIVENESS.

(a) SHORT TITLE.—This section may be cited as the "United States Energy Storage Competitiveness Act of 2007".

(b) DEFINITIONS.—In this section:

(1) COUNCIL.—The term "Council" means the Energy Storage Advisory Council established under subsection (e).

(2) COMPRESSED AIR ENERGY STORAGE.—The term "compressed air energy storage" means, in the case of an electricity grid application, the storage of energy through the compression of air.

(3) ELECTRIC DRIVE VEHICLE.—The term "electric drive vehicle" means—

(A) a vehicle that uses an electric motor for all or part of the motive power of the vehicle, including battery electric, hybrid electric, plug-in hybrid electric, fuel cell, and plug-in fuel cell vehicles and rail transportation vehicles; or

(B) mobile equipment that uses an electric motor to replace an internal combustion engine for all or part of the work of the equipment.

(4) ISLANDING.—The term "islanding" means a distributed generator or energy storage device continuing to power a location in the absence of electric power from the primary source.

(5) FLYWHEEL.—The term "flywheel" means, in the case of an electricity grid application, a device used to store rotational kinetic energy.

(6) MICROGRID.—The term "microgrid" means an integrated energy system consisting of interconnected loads and distributed energy resources (including generators and energy storage devices), which as an integrated system can operate in parallel with the utility grid or in an intentional islanding mode.

(7) SELF-HEALING GRID.—The term "self-healing grid" means a grid that is capable of automatically anticipating and responding to power system disturbances (including the isolation of failed sections and components), while optimizing the performance and service of the grid to customers.

(8) SPINNING RESERVE SERVICES.—The term "spinning reserve services" means a quantity of electric generating capacity in excess of the quantity needed to meet peak electric demand.

(9) ULTRACAPACITOR.—The term "ultracapacitor" means an energy storage device that has a power density comparable to a conventional capacitor but is capable of exceeding the energy density of a conventional capacitor by several orders of magnitude.

(c) PROGRAM.—The Secretary shall carry out a research, development, and demonstration program to support the ability of the United States to remain globally competitive in energy storage systems for electric drive vehicles, stationary applications, and electricity transmission and distribution.

(d) COORDINATION.—In carrying out the activities of this section, the Secretary shall coordinate relevant efforts with appropriate Federal agencies, including the Department of Transportation.

(e) ENERGY STORAGE ADVISORY COUNCIL.—

(1) ESTABLISHMENT.—Not later than 90 days after the date of enactment of this Act, the Secretary shall establish an Energy Storage Advisory Council.

(2) COMPOSITION.—

(A) IN GENERAL.—Subject to subparagraph (B), the Council shall consist of not less than 15 individuals appointed by the Secretary, based on recommendations of the National Academy of Sciences.

(B) ENERGY STORAGE INDUSTRY.—The Council shall consist primarily of representatives of the energy storage industry of the United States.

(C) CHAIRPERSON.—The Secretary shall select a Chairperson for the Council from among the members appointed under subparagraph (A).

(3) MEETINGS.—

(A) IN GENERAL.—The Council shall meet not less than once a year.

(B) FEDERAL ADVISORY COMMITTEE ACT.—The Federal Advisory Committee Act (5 U.S.C. App.) shall apply to a meeting of the Council.

(4) PLANS.—No later than 1 year after the date of enactment of this Act and every 5 years thereafter, the Council, in conjunction with the Secretary, shall develop a 5-year plan for integrating basic and applied research so that the United States retains a globally competitive domestic energy storage industry for electric drive vehicles, stationary applications, and electricity transmission and distribution.

(5) REVIEW.—The Council shall—

(A) assess, every 2 years, the performance of the Department in meeting the goals of the plans developed under paragraph (4); and

(B) make specific recommendations to the Secretary on programs or activities that should be established or terminated to meet those goals.

(f) BASIC RESEARCH PROGRAM.—

(1) BASIC RESEARCH.—The Secretary shall conduct a basic research program on energy storage systems to support electric drive vehicles, stationary applications, and electricity transmission and distribution, including—

(A) materials design;

(B) materials synthesis and characterization;

(C) electrode-active materials, including electrolytes and bioelectrolytes;

(D) surface and interface dynamics;

(E) modeling and simulation; and

(F) thermal behavior and life degradation mechanisms.

(2) NANOSCIENCE CENTERS.—The Secretary, in cooperation with the Council, shall coordinate the activities of the nanoscience centers of the Department to help the energy storage research centers of the Department maintain a globally competitive posture in energy storage systems for electric drive ve-

hicles, stationary applications, and electricity transmission and distribution.

(3) FUNDING.—For activities carried out under this subsection, in addition to funding activities at National Laboratories, the Secretary shall award funds to, and coordinate activities with, a range of stakeholders including the public, private, and academic sectors.

(g) APPLIED RESEARCH PROGRAM.—

(1) IN GENERAL.—The Secretary shall conduct an applied research program on energy storage systems to support electric drive vehicles, stationary applications, and electricity transmission and distribution technologies, including—

(A) ultracapacitors;

(B) flywheels;

(C) batteries and battery systems (including flow batteries);

(D) compressed air energy systems;

(E) power conditioning electronics;

(F) manufacturing technologies for energy storage systems;

(G) thermal management systems; and

(H) hydrogen as an energy storage medium.

(2) FUNDING.—For activities carried out under this subsection, in addition to funding activities at National Laboratories, the Secretary shall provide funds to, and coordinate activities with, a range of stakeholders, including the public, private, and academic sectors.

(h) ENERGY STORAGE RESEARCH CENTERS.—

(1) IN GENERAL.—The Secretary shall establish, through competitive bids, not more than 4 energy storage research centers to translate basic research into applied technologies to advance the capability of the United States to maintain a globally competitive posture in energy storage systems for electric drive vehicles, stationary applications, and electricity transmission and distribution.

(2) PROGRAM MANAGEMENT.—The centers shall be managed by the Under Secretary for Science of the Department.

(3) PARTICIPATION AGREEMENTS.—As a condition of participating in a center, a participant shall enter into a participation agreement with the center that requires that activities conducted by the participant for the center promote the goal of enabling the United States to compete successfully in global energy storage markets.

(4) PLANS.—A center shall conduct activities that promote the achievement of the goals of the plans of the Council under subsection (e)(4).

(5) NATIONAL LABORATORIES.—A national laboratory (as defined in section 2 of the Energy Policy Act of 2005 (42 U.S.C. 15801)) may participate in a center established under this subsection, including a cooperative research and development agreement (as defined in section 12(d) of the Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3710a(d))).

(6) DISCLOSURE.—Section 623 of the Energy Policy Act of 1992 (42 U.S.C. 13293) may apply to any project carried out

through a grant, contract, or cooperative agreement under this subsection.

(7) INTELLECTUAL PROPERTY.—In accordance with section 202(a)(ii) of title 35, United States Code, section 152 of the Atomic Energy Act of 1954 (42 U.S.C. 2182), and section 9 of the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5908), the Secretary may require, for any new invention developed under this subsection, that—

(A) if an industrial participant is active in a energy storage research center established under this subsection relating to the advancement of energy storage technologies carried out, in whole or in part, with Federal funding, the industrial participant be granted the first option to negotiate with the invention owner, at least in the field of energy storage technologies, nonexclusive licenses, and royalties on terms that are reasonable, as determined by the Secretary;

(B) if 1 or more industry participants are active in a center, during a 2-year period beginning on the date on which an invention is made—

(i) the patent holder shall not negotiate any license or royalty agreement with any entity that is not an industrial participant under this subsection; and

(ii) the patent holder shall negotiate nonexclusive licenses and royalties in good faith with any interested industrial participant under this subsection; and

(C) the new invention be developed under such other terms as the Secretary determines to be necessary to promote the accelerated commercialization of inventions made under this subsection to advance the capability of the United States to successfully compete in global energy storage markets.

(i) ENERGY STORAGE SYSTEMS DEMONSTRATIONS.—

(1) IN GENERAL.—The Secretary shall carry out a program of new demonstrations of advanced energy storage systems.

(2) SCOPE.—The demonstrations shall—

(A) be regionally diversified; and

(B) expand on the existing technology demonstration program of the Department.

(3) STAKEHOLDERS.—In carrying out the demonstrations, the Secretary shall, to the maximum extent practicable, include the participation of a range of stakeholders, including—

(A) rural electric cooperatives;

(B) investor owned utilities;

(C) municipally owned electric utilities;

(D) energy storage systems manufacturers;

(E) electric drive vehicle manufacturers;

(F) the renewable energy production industry;

(G) State or local energy offices;

(H) the fuel cell industry; and

(I) institutions of higher education.

(4) OBJECTIVES.—Each of the demonstrations shall include 1 or more of the following:

(A) Energy storage to improve the feasibility of microgrids or islanding, or transmission and distribution capability, to improve reliability in rural areas.

(B) Integration of an energy storage system with a self-healing grid.

(C) Use of energy storage to improve security to emergency response infrastructure and ensure availability of emergency backup power for consumers.

(D) Integration with a renewable energy production source, at the source or away from the source.

(E) Use of energy storage to provide ancillary services, such as spinning reserve services, for grid management.

(F) Advancement of power conversion systems to make the systems smarter, more efficient, able to communicate with other inverters, and able to control voltage.

(G) Use of energy storage to optimize transmission and distribution operation and power quality, which could address overloaded lines and maintenance of transformers and substations.

(H) Use of advanced energy storage for peak load management of homes, businesses, and the grid.

(I) Use of energy storage devices to store energy during nonpeak generation periods to make better use of existing grid assets.

(j) VEHICLE ENERGY STORAGE DEMONSTRATION.—

(1) IN GENERAL.—The Secretary shall carry out a program of electric drive vehicle energy storage technology demonstrations.

(2) CONSORTIA.—The technology demonstrations shall be conducted through consortia, which may include—

(A) energy storage systems manufacturers and suppliers of the manufacturers;

(B) electric drive vehicle manufacturers;

(C) rural electric cooperatives;

(D) investor owned utilities;

(E) municipal and rural electric utilities;

(F) State and local governments;

(G) metropolitan transportation authorities; and

(H) institutions of higher education.

(3) OBJECTIVES.—The program shall demonstrate 1 or more of the following:

(A) Novel, high capacity, high efficiency energy storage, charging, and control systems, along with the collection of data on performance characteristics, such as battery life, energy storage capacity, and power delivery capacity.

(B) Advanced onboard energy management systems and highly efficient battery cooling systems.

(C) Integration of those systems on a prototype vehicular platform, including with drivetrain systems for passenger, commercial, and nonroad electric drive vehicles.

(D) New technologies and processes that reduce manufacturing costs.

(E) Integration of advanced vehicle technologies with electricity distribution system and smart metering technology.

(F) Control systems that minimize emissions profiles in cases in which clean diesel engines are part of a plug-in hybrid drive system.

(k) SECONDARY APPLICATIONS AND DISPOSAL OF ELECTRIC DRIVE VEHICLE BATTERIES.—The Secretary shall carry out a program of research, development, and demonstration of—

(1) secondary applications of energy storage devices following service in electric drive vehicles; and

(2) technologies and processes for final recycling and disposal of the devices.

(l) ENERGY STORAGE RESEARCH AND DEVELOPMENT PROGRAM.—

(1) IN GENERAL.—Not later than 180 days after the date of enactment of the Better Energy Storage Technology Act, the Secretary shall establish a research and development program for energy storage systems, components, and materials across multiple program offices of the Department.

(2) REQUIREMENTS.—In carrying out the program under paragraph (1), the Secretary shall—

(A) coordinate across all relevant program offices throughout the Department, including the Office of Electricity, the Office of Energy Efficiency and Renewable Energy, the Advanced Research Projects Agency – Energy, the Office of Science, and the Office of Cybersecurity, Energy Security, and Emergency Response;

(B) adopt long-term cost, performance, and demonstration targets for different types of energy storage systems and for use in a variety of regions, including rural areas;

(C) incorporate considerations of sustainability, sourcing, recycling, reuse, and disposal of materials, including critical elements, in the design of energy storage systems;

(D) identify energy storage duration needs;

(E) analyze the need for various types of energy storage to improve electric grid resilience and reliability; and

(F) support research and development of advanced manufacturing technologies that have the potential to improve United States competitiveness in energy storage manufacturing.

(3) STRATEGIC PLAN.—

(A) IN GENERAL.—No later than 180 days after the date of enactment of the Better Energy Storage Technology Act, the Secretary shall develop a 5-year strategic plan identifying research, development, demonstration, and commercial application goals for the program in accordance with this section. The Secretary shall submit this plan to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate.

(B) CONTENTS.—The strategic plan submitted under subparagraph (A) shall—

(i) identify programs at the Department related to energy storage systems that support the research and development activities described in paragraph (4), and the demonstration projects under subsection (m); and

(ii) include timelines for the accomplishment of goals developed under the plan.

(C) UPDATES TO PLAN.—Not less frequently than once every 3 years, the Secretary shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate an updated version of the plan under subparagraph (A).

(4) RESEARCH AND DEVELOPMENT.—In carrying out the program established in paragraph (1), the Secretary shall focus on developing—

(A) energy storage systems that can store energy and deliver stored energy for a minimum of 6 hours in duration to balance electricity needs over the course of a single day;

(B) long-duration energy storage systems that can store energy and deliver stored energy for 10 to 100 hours in duration; and

(C) energy storage systems that can store energy and deliver stored energy over several months and address seasonal scale variations in supply and demand.

(5) TESTING AND VALIDATION.—The Secretary shall support the standardized testing and validation of energy storage systems under the program through collaboration with 1 or more National Laboratories, including the development of methodologies to independently validate energy storage technologies by—

(A) performance of energy storage systems on the electric grid, including—

(i) when appropriate, testing of application-driven charge and discharge protocols;

(ii) evaluation of power capacity and energy output;

(iii) degradation of the energy storage systems from cycling and aging;

(iv) safety; and

(v) reliability testing under grid duty cycles; and

(B) prediction of lifetime metrics.

(6) COORDINATION.—In carrying out this subsection, the Secretary shall coordinate with—

(A) programs and offices that aim to increase domestic manufacturing and production of energy storage systems, such as those within the Department and within the National Institute of Standards and Technology;

(B) other Federal agencies that are carrying out initiatives to increase energy reliability through the development of energy storage systems, including the Department of Defense; and

(C) other stakeholders working to advance the development of commercially viable energy storage systems.

(7) TECHNICAL ASSISTANCE PROGRAM.—

(A) IN GENERAL.—The Secretary shall provide technical assistance for commercial application of energy storage technologies to eligible entities.

(B) TECHNICAL ASSISTANCE.—Technical assistance provided under this paragraph—

(i) may include assistance with—

(I) assessment of relevant technical and geographic characteristics;

(II) interconnection of electricity storage systems with the electric grid; and

(III) engineering design; and

(ii) may not include assistance relating to modification of Federal, State, or local regulations or policies with respect to energy storage systems.

(C) APPLICATIONS.—

(i) IN GENERAL.—The Secretary shall seek applications for technical assistance and grants under the program—

(I) on a competitive basis; and

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

(ii) PRIORITIES.—In selecting eligible entities for technical assistance for commercial applications, the Secretary shall give priority to eligible entities with projects that have the greatest potential for—

(I) strengthening the reliability and resilience of the electric grid to the impact of extreme weather events, power grid failures, and interruptions in supply of electricity;

(II) reducing the cost of energy storage systems; or

(III) facilitating the use of net zero emission energy resources.

(8) PROGRAM DEFINED.—In this subsection, the term "program" means the research and development program established under paragraph (1).

(m) ENERGY STORAGE DEMONSTRATION PROGRAM.—

(1) ESTABLISHMENT.—The Secretary shall establish a competitive grant program for the demonstration of energy storage systems, as identified by the Secretary, that use either—

(A) a single system; or

(B) aggregations of multiple systems.

(2) ELIGIBILITY.—Entities eligible to receive a grant under paragraph (1) include—

(A) a State, territory, or possession of the United States;

(B) a State energy office;

(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) a rural electric cooperative;

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

(iii) an investor-owned utility; and

(F) a private company, such as but not limited to an energy storage company.

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

(A) ensure regional diversity among eligible entities that receive the grants, including participation by rural States and small States;

(B) ensure that specific projects selected for grants—

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

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

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

(D) prioritize projects that leverage matching funds from non-Federal sources.

(4) OBJECTIVES.—Each demonstration project selected for a grant under paragraph (1) shall include one or more of the following objectives:

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

(B) To improve the reliability of the transmission and distribution system, 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 or demand.

(E) To reduce peak loads of homes and businesses, particularly to defer or avoid investments in new electric grid capacity.

(F) To advance power conversion systems to make the systems smarter, more efficient, able to communicate with other inverters, and able to control voltage.

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

(H) To integrate one or more energy resources, including renewable energy resources, at the source or away from the source.

(I) To increase the feasibility of microgrids or islanding.

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

(5) RESTRICTION ON USE OF FUNDS.—Any eligible entity that receives a grant under paragraph (1) may only use the grant to fund programs relating to the demonstration of energy storage systems connected to the electric grid, or that provides bi-directional energy storage capable of providing back-up energy in the event of grid outages, including energy storage systems sited behind a customer revenue meter.

(6) COST SHARING.—In carrying out this section, the Secretary shall require cost sharing under this section in accordance with section 988 of the Energy Policy Act of 2005 (42 U.S.C. 16352).

(7) NO PROJECT OWNERSHIP INTEREST.—The United States shall hold no equity or other ownership interest in an energy

storage system for which a grant is provided under paragraph (1).

(8) RULES AND PROCEDURES; AWARDING OF GRANTS.—

(A) RULES AND PROCEDURES.—Not later than 180 days after the date of enactment of the Better Energy Storage Technology Act, the Secretary shall adopt rules and procedures for carrying out the grant program under subsection (m).

(B) AWARDING OF GRANTS.—Not later than 1 year after the date on which the rules and procedures under paragraph (A) are established, the Secretary shall award the initial grants provided under this section.

(9) REPORTS.—The Secretary shall submit to Congress and make publicly available—

(A) not less frequently than once every 2 years for the duration of the grant program under subsection (m), a report describing the performance of the grant 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

(B) on termination of the grant program under subsection (m), an assessment of the success of, and education provided by, the measures carried out by grant recipients under the grant program.

(10) PROGRAM DEFINED.—In this subsection, the term "program" means the demonstration program established under paragraph (1).

(n) CRITICAL MINERAL RECYCLING AND REUSE RESEARCH, DEVELOPMENT, AND DEMONSTRATION PROGRAM.—

(1) DEFINITIONS.—In this subsection:

(A) CRITICAL MINERAL.—The term "critical mineral" means any of a class of chemical elements that have a high risk of a supply disruption and are critical to one or more new, energy-related technologies such that a shortage of such element would significantly inhibit large-scale deployment of technologies that store energy.

(B) RECYCLING.—The term "recycling" means the separation of critical minerals embedded within an energy storage system through physical or chemical means and reuse of those separated critical minerals in other technologies.

(2) ESTABLISHMENT.—Not later than 180 days after the date of enactment of the BEST Act, the Secretary shall establish a research, development, and demonstration program of recycling of energy storage systems containing critical minerals.

(3) RESEARCH, DEVELOPMENT, AND DEMONSTRATION.—In carrying out the program, the Secretary may focus research, development, and demonstration activities on—

(A) technologies, process improvements, and design optimizations that facilitate and promote recycling, including—

(i) improvement of efficiency and rates of collection of products and scrap containing critical minerals from consumer, industrial, and other waste streams;

(ii) separation and sorting of component materials in energy storage systems containing critical minerals, in-

cluding improving the recyclability of such energy storage systems;

(iii) safe storage of energy storage systems, including reducing fire risk;

(iv) safe transportation of energy storage systems and components; and

(v) development of technologies to advance energy storage recycling facility infrastructure, including integrated recycling facilities that can process multiple materials;

(B) research and development of technologies that mitigate emissions and environmental impacts that arise from recycling, including disposal of toxic reagents and byproducts related to recycling processes;

(C) research and development of technologies to enable recycling of critical materials from batteries in electric vehicles;

(D) research on and analysis of non-technical barriers to improving the transportation of energy storage systems containing critical minerals; and

(E) research on technologies and methods to enable the safe disposal of energy storage systems containing critical minerals, including waste materials and components recovered during the recycling process.

(4) REPORT TO CONGRESS.—Not later than 2 years after the date of enactment of the BEST Act, and every 3 years thereafter, the Secretary shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate a report summarizing the activities, findings, and progress of the program.

(o) DEFINITIONS.—For purposes of subsections (l), (m), and (n), the following definitions apply:

(1) ENERGY STORAGE SYSTEM.—The term "energy storage system" means a system, equipment, facility, or technology relating to the electric grid that—

(A) is capable of absorbing energy, storing such energy for a period of time, and dispatching such energy after storage; and

(B) uses a mechanical, electrical, chemical, electrochemical, or thermal process to store such energy, or any other process that the Secretary determines relevant.

(2) ISLAND.—The term "island" means one or more distributed generators or energy storage systems that continues to power a location in the absence of electricity from the electric grid.

(3) MICROGRID.—The term "microgrid" means an integrated energy system consisting of inter-connected loads and distributed energy resources, including generators and energy storage systems, within clearly defined electrical boundaries that—

(A) acts as a single controllable entity with respect to the grid;

(B) can connect and disconnect from the grid to operate in either grid-connected mode or island-mode; or

(C) can operate in the absence of the grid.

(4) 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).

[(l)**]** *(p)* COST SHARING.—The Secretary shall carry out the programs established under this section in accordance with section 988 of the Energy Policy Act of 2005 (42 U.S.C. 16352).

[(m)**]** *(q)* MERIT REVIEW OF PROPOSALS.—The Secretary shall carry out the programs established under subsections (i), (j), and (k) in accordance with section 989 of the Energy Policy Act of 2005 (42 U.S.C. 16353).

[(n)**]** *(r)* COORDINATION AND NONDUPLICATION.—To the maximum extent practicable, the Secretary shall coordinate activities under this section with other programs and laboratories of the Department and other Federal research programs.

[(o)**]** *(s)* REVIEW BY NATIONAL ACADEMY OF SCIENCES.—On the business day that is 5 years after the date of enactment of this Act, the Secretary shall offer to enter into an arrangement with the National Academy of Sciences to assess the performance of the Department in carrying out this section.

[(p)**]** *(t)* AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to carry out—

(1) the basic research program under subsection (f) $50,000,000 for each of fiscal years 2009 through 2018;

(2) the applied research program under subsection (g) $80,000,000 for each of fiscal years 2009 through 2018; and;

(3) the energy storage research center program under subsection (h) $100,000,000 for each of fiscal years 2009 through 2018;

(4) the energy storage systems demonstration program under subsection (i) $30,000,000 for each of fiscal years 2009 through 2018;

(5) the vehicle energy storage demonstration program under subsection (j) $30,000,000 for each of fiscal years 2009 through 2018; **[**and**]**

(6) the secondary applications and disposal of electric drive vehicle batteries program under subsection (k) $5,000,000 for each of fiscal years 2009 through 2018**[**.**]***;*

(7) the research and development program for energy storage systems under subsection (l)—

(A) $62,000,000 for fiscal year 2020;

(B) $ 65,100,000 for fiscal year 2021;

(C) $ 68,355,000 for fiscal year 2022;

(D) $ 71,773,000 for fiscal year 2023; and

(E) $ 75,362,000 for fiscal year 2024; and

(8) the demonstration program for energy storage systems under subsection (m), $50,000,000 for each of fiscal years 2020 through 2024.

* * * * * * *

XX. PROCEEDINGS OF THE SUBCOMMITTEE MARKUP

MARKUPS: H.R. 2986, BEST ACT; H.R. 5374, ADVANCED GEOTHERMAL RESEARCH AND DEVELOPMENT ACT OF 2019; AND H.R. 5428, GRID MODERNIZATION RESEARCH AND DEVELOPMENT ACT OF 2019

MARKUP

BEFORE THE

SUBCOMMITTEE ON ENERGY

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ONE HUNDRED SIXTEENTH CONGRESS

FIRST SESSION

DECEMBER 19, 2019

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C O N T E N T S

Thursday, December 19, 2019

Appendix I: Additional Material for the Record

Markups on H.R. 2986, BEST Act; H.R. 5374, Advanced Geothermal Research and Development Act of 2019; and H.R. 5428, Grid Modernization Research and Development Act of 2019

THURSDAY, DECEMBER 19, 2019

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.

The Subcommittee met, pursuant to notice, at 10:46 a.m., in room 2318 of the Rayburn House Office Building, Hon. Conor Lamb [Chairman of the Subcommittee] presiding.

Chairman LAMB. Good morning. The Subcommittee will come to order. Without objection, the Chair is authorized to declare a recess at any time. Pursuant to Committee Rule 2(e) and House Rule 11, the Chair announces that he may postpone roll call votes. Pursuant to notice, the Subcommittee on Energy meets to consider the following measures: H.R. 2986, the *BEST Act*; H.R. 5374, the *Advanced Geothermal Research and Development Act of 2019*; and H.R. 5428, the *Grid Modernization Research and Development Act of 2019*.

We meet today to mark up three good bipartisan bills. The *BEST Act* is authored by our colleague from Illinois, Dr. Foster. It will authorize research, development, and demonstration of energy storage technologies, specifically aiming at advanced technologies with varying energy storage durations, and ensuring that the research covers a diverse set of technologies, including batteries, pumped hydro, and others. National labs, academia, private industry, and environmental groups all deserve credit because they were all engaged in the making of this bill. It is endorsed by the Energy Storage Association, Chamber of Commerce, ClearPath, and Duke Energy, among others.

Next is the *Advanced Geothermal Research and Development Act of 2019*, and we are authorizing DOE (Department of Energy) to research, develop, demonstrate geothermal energy technologies, and it's sponsored by our Ranking Member of the full Committee, Mr. Lucas. He will talk more about it, I'm sure, but it requires DOE to explore oil and gas technologies that could be used for geothermal, advancing the use of computer modeling, establishing up to three field research sites to advance the development and demonstration of enhanced geothermal energy technologies in varying geographies across the U.S. It's particularly important for encouraging exploration of this resource in the eastern U.S. We have received a lot of input supported by the Geothermal Resources Council, Chamber of Commerce, ClearPath, and Third Way. Very much appreciate Ranking Member Lucas' effort to reach across the aisle on this one, and that is why the Chair of the full Committee, Ms. Johnson, is an original co-sponsor. This week of all weeks I think we can applaud that bipartisan work.

Finally we will consider the *Grid Modernization Research and Development Act of 2019*. In order for us to use all the new energy technologies that we've been talking about and authorizing on this Committee all year, we also need to seriously advance our electric grid. This bill seeks to do that, addressing the R&D (research and development). I would like to thank my colleague from Washington, Ms. Herrera Beutler, for joining me in introducing this legislation, and I urge my colleagues on both sides of the aisle to support it. Look forward to advancing it out of our Subcommittee today.

[The prepared statement of Chairman Lamb follows:]

We meet today to markup three good bipartisan bills.

The first we will consider today, the *Better Energy Storage Technology Act*, or *BEST Act*, is authored by our colleague from Illinois, Dr. Foster. The bill will authorize DOE to conduct cross-cutting research, development, and demonstration of energy storage technologies. Specifically, the bill authorizes research aimed to advance technologies with varying energy storage durations, and ensures research covers a diverse set of technologies, including batteries, pumped hydro systems, and others. National labs, academia, private industry, and environmental groups were

all engaged in the making of this bill. The bill is now endorsed by the Energy Storage Association, the Chamber of Commerce, ClearPath, and Duke Energy, just to name a few.

The next bill on the roster is H.R. 5374. As its title suggests, the *Advanced Geothermal Research and Development Act of 2019* authorizes DOE to pursue research, development, and demonstration of geothermal energy technologies and is sponsored by the Ranking Member, Mr. Lucas. Amongst other activities, it requires DOE to explore oil and gas technologies that could be used for geothermal applications and advances the use of computer modeling to explore geothermal resources and systems.

The bill also authorizes DOE to establish up to three field research sites that will advance the development and demonstration of enhanced geothermal energy technologies in varying geographies across the U.S. This is a particularly important activity for spurring the exploration of this resource in the eastern U.S. The bill has received extensive stakeholder input and is supported by the Geothermal Resources Council, Chamber of Commerce, ClearPath, and Third Way. I appreciate Ranking Member Lucas's effort to reach across the aisle to cooperatively construct this bill, and that is why the Chair of the Full Committee, Ms. Johnson, is an original cosponsor. I applaud their continued bipartisan work on this committee.

Finally, we will consider my own legislation: the *Grid Modernization Research and Development Act of 2019*. In order for our country to utilize all the new energy technologies that we are developing and moving to market, we will need serious advancements to our electric grid. This bill seeks to address the research and development required to make those grid advancements. I'll speak more about this bill in just a minute, but I would like to thank my colleague from Washington, Ms. Herrera Beutler, for joining me in introducing this legislation.

I urge my colleagues on both sides of the aisle to support these bills and look forward to advancing them out of our Subcommittee today.

Chairman LAMB. I would now normally recognize the Ranking Member of the Subcommittee, Mr. Weber, for opening remarks, but I believe he's going to submit a statement for the record before he joins us.

[The prepared statement of Mr. Weber follows:]

Good morning. Thank you, Chairman Lamb, for the opportunity to speak on the three bills before us today: H.R. 2986, the *Better Energy Storage Technology Act*, H.R. 5374, the *Advanced Geothermal Research and Development Act*, and H.R. 5428, the *Grid Modernization Research and Development Act*.

H.R. 2986, the *Better Energy Storage Technology*, or *BEST Act*, directs the Department of Energy (DOE) to develop energy storage technologies through a cross-cutting research, development, and demonstration program.

Today, advanced renewable and distributed energy resources are changing the way that U.S. electricity is produced and delivered.

But as we all know, these sources are intermittent and dependent on the sun to shine or the wind to blow.

Without the capacity to efficiently store this energy at the grid scale, we limit the ability of renewable energy sources to meet U.S. energy needs. It is clear that advanced energy storage technology is the key to maximizing our clean energy resources and modernizing our electric grid, without sacrificing energy reliability and security.

That is why I'm pleased to see that the *BEST Act* authorizes critical, fundamental research that will enable U.S. researchers to test and validate grid-scale systems that can store and generate energy over a range of time, from 6 hours to several months.

I want to thank my colleagues Mr. Foster, Ms. Herrera Beutler, Mr. Casten, and Mr. Gonzalez for working together to produce this bipartisan legislation.

The next bill on the docket is H.R. 5374, the *Advanced Geothermal Energy Research and Development Act of 2019*. Introduced by Ranking Member Lucas and cosponsored by Chairwoman Johnson, H.R. 5374 authorizes DOE programs in a number of high-priority geothermal technology areas including, enhanced geothermal energy systems, subsurface technologies for geothermal energy production, reservoir thermal energy storage, and advanced computing to accelerate the development of geothermal energy.

This legislation also supports innovative experimental user facilities known as "Frontier Observatory for Research in Geothermal Energy" or FORGE sites.

With limited Federal dollars and a responsibility to spend those resources wisely, I believe that user facilities, like those authorized in this bill, can give us the high-

est return on our investment and produce advanced energy technologies that will greatly accelerate innovation in the private sector.

By making these strategic investments in advanced geothermal energy technologies, we can tap into a truly renewable source of baseload power that will help diversify our energy portfolio and strengthen American energy independence.

The final bill we will consider today is H.R. 5428, the *Grid Modernization Research and Development Act of 2019*, which was introduced by Chairman Lamb and co-sponsored by Representative Herrera Beutler.

H.R. 5428, establishes a research, development, and demonstration program at the Department of Energy, focused on grid modeling, sensing, resilience, reliability, and emergency response.

This work is already a critical priority for the Administration and the Department. Through the Department-wide Grid Modernization Initiative (GMI) and the Grid Modernization Lab Consortium (GMLC), DOE is uniquely positioned to drive innovation in technologies that will help counter grid vulnerabilities and provide necessary updates to our energy infrastructure.

Modernizing our grid will also require cooperation from many federal agencies, states, and industry partners. That is why I am glad to see that this legislation includes a technical assistance program to identify the evolving R&D needs of U.S. industry and the electric grid.

I want to thank all of my colleagues involved today for putting forward 3 bipartisan bills today that have been thoroughly reviewed by stakeholders and the Department. Thank you and I yield back the balance of my time.

Chairman LAMB. If there are Members who wish to submit additional opening statements, your statements will be added to the record at this point.

[The prepared statement of Chairwoman Johnson follows:]

Good afternoon and thank you, Chairman Lamb, for holding this mark-up to advance legislation that prioritizes research activities in geothermal energy production.

Americans have used various forms of geothermal energy since the 1800s. Despite this long history, geothermal energy technologies have largely struggled to become or remain competitive in modern energy markets, yet huge potential exists for further advancement and commercialization.

In my home state of Texas, there is great potential for geothermal energy production that remains untapped, with naturally occurring large wells of hot water as well as other promising heat reservoirs below the ground.

Energy produced by geothermal technologies does not emit greenhouse gases. Just this Congress alone, this Committee has passed several bills that would reduce the impacts of climate change. I am hoping we can help a few more along today. Additionally, not only can geothermal technologies produce clean electricity, but they can also be used for industrial applications, such as through heat production for manufacturing processes or critical mineral extraction.

These are all reasons why I am pleased these issues received serious attention during a Subcommittee hearing held last month. That hearing brought together esteemed experts - one of which from the Great State of Texas I might add - who reinforced our understanding that geothermal energy production has huge potential as an essential resource in our clean energy technology portfolio.

I am glad that we are addressing this important issue today by considering the *Advanced Geothermal Research and Development Act* introduced by my friend Ranking Member Lucas, which I am proud to co-sponsor. Thank you, Mr. Lucas, for working with us and introducing this great piece of legislation. The bill includes research initiatives on oil and gas technology transfer to geothermal research, secondary use research areas such as minerals recovery and storage, and new areas of research in enhanced geothermal systems. It also authorizes groundbreaking new research activities in advanced geothermal computing and data science.

I want to thank Chairman Lamb once again for convening this mark-up, and I look forward to continuing to work together with my colleagues on both sides of the aisle to pass legislation that helps advance geothermal energy as well as a broad range of other clean energy technologies.

With that, I yield back.

[The prepared statement of Mr. Lucas follows:]

Thank you, Chairman Lamb. This morning, I am grateful for the opportunity to discuss my bill, H.R. 5374, the *Advanced Geothermal Research and Development Act of 2019*, which is cosponsored by Chairwoman Johnson and authorizes research, de-

velopment, and demonstration of innovative geothermal energy technologies at the Department of Energy (DOE).

Geothermal energy systems draw from the constant and naturally occurring heat that radiates beneath the surface of the earth. This heat is a source of clean and renewable energy that is always "on." Our country has significant geothermal energy resources, and if harnessed correctly, these resources can provide secure, base-load power and energy storage for Americans across the country.

Yet although the United States leads the world in installed geothermal capacity, geothermal energy contributes less than one percent to the total utility-scale U.S. electricity generation.

This is because today's geothermal energy technologies are often too expensive, time-consuming, or risky for industry to take to scale. While I've seen the potential of geothermal energy in my district in Oklahoma, more work needs to be done to allow the rest of the country to access the full power of this resource.

In order to effectively leverage these vast untapped energy resources, geothermal technologies and techniques must become more efficient and less expensive for American consumers. Fortunately, we are uniquely positioned to prioritize the basic and early stage research that leads to groundbreaking technology.

Federally funded research programs have a history of paving the way for industry innovation. So I am pleased to see DOE and its Geothermal Technologies Office taking the lead in this valuable science.

It is critically important to our clean energy future that they have the support they need to pursue research that industry cannot undertake.

My legislation will provide DOE with critical funding and program direction to enable innovative research in advanced geothermal technologies, strengthen the U.S. geothermal workforce, and encourage international collaboration. More specifically, it will authorize and expand the Department's early-stage research in enhanced geothermal systems and the major user facilities needed to support this work.

H.R. 5374 will also authorize a new program in advanced geothermal computing and data science R&D. This will leverage DOE's best-in-the-world computational capabilities to provide geothermal researchers with modeling and simulation tools that will allow them to more accurately understand complex subsurface systems.

With these tools, industry can improve the next generation of geothermal energy technologies, using advanced designs to save time and money in planning, and producing power more efficiently with less impact on the environment.

We know that American industry has the resources to successfully commercialize new technology. What they often lack is the infrastructure to conduct early stage research and test new technologies. This is where DOE, the national labs, and academia can help, providing experimental facilities and computational tools that will drive costs down and innovation forward.

If we want to ensure a diverse portfolio of clean energy technologies now and in the future, we in Congress should prioritize this important fundamental research.

I want to thank Chairwoman Johnson and her staff for working with me on this legislation. I believe this bill is an excellent example of our shared goals on this Committee, and I look forward to continuing to work with you all to support this common sense, productive, and bipartisan legislation. I yield back the balance of my time.

H.R. 2986

Chairman LAMB. And we will move on to consider H.R. 2986, the *BEST Act*. The Clerk will report the bill.

The CLERK. H.R. 2986, a bill——

[The bill follows:]

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116TH CONGRESS
1ST SESSION

H. R. 2986

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.

IN THE HOUSE OF REPRESENTATIVES

MAY 23, 2019

Mr. FOSTER (for himself, Mr. CASTEN of Illinois, Ms. HERRERA BEUTLER, and Mr. GONZALEZ of Ohio) introduced the following bill; which was referred to the Committee on Science, Space, and Technology

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A BILL

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.

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 "Better Energy Storage Technology Act" or the "BEST Act".

SEC. 2. GRID-SCALE ENERGY STORAGE SYSTEM RESEARCH, DEVELOPMENT, AND DEMONSTRATION PROGRAM.

(a) IN GENERAL.—The United States Energy Storage Competitiveness Act of 2007 (42 U.S.C. 17231) is amended—

(1) by redesignating subsections (l) through (p) as subsections (m) through (q), respectively; and

(2) by inserting after subsection (k) the following:

"(l) GRID-SCALE ENERGY STORAGE SYSTEM RESEARCH, DEVELOPMENT, AND DEMONSTRATION PROGRAM.—

"(1) DEFINITIONS.—In this subsection:

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

"(i) is capable of absorbing energy, storing that energy for a period of time, and dispatching the stored energy; and

"(ii)(I) uses a mechanical, electrical, chemical, electrochemical, or thermal process to store energy that—

"(aa) was generated at an earlier time for use at a later time; or

"(bb) was generated from a mechanical process, and would otherwise be wasted, for delivery at a later time; or

"(II) stores thermal energy for direct use for heating or cooling at a later time in a manner that avoids the need to use electricity at that later time, in the same manner as the storage and use offered by a grid-enabled water heater.

"(B) PROGRAM.—The term 'program' means the research, development, and demonstration program established under paragraph (2)(A).

"(2) ESTABLISHMENT.—

"(A) IN GENERAL.—Not later than 180 days after the date of enactment of the BEST Act, the Secretary shall establish within the Office of Electricity of the Department of Energy a research, development, and demonstration program of grid-scale energy storage systems, in accordance with this subsection.

"(B) GOALS, PRIORITIES, COST TARGETS.—The Secretary shall develop goals, priorities, and cost targets for the program.

"(3) STRATEGIC PLAN.—

"(A) IN GENERAL.—Not later than 180 days after the date of enactment of the BEST Act, the Secretary shall submit to the Committee on Energy and Natural Resources of the Senate and the Committee on Science, Space, and Technology of the House of Representatives a 10-year strategic plan for the program.

"(B) CONTENTS.—The strategic plan submitted under subparagraph (A) shall—

"(i) identify Department of Energy programs that—

"(I) support the research and development activities described in paragraph (4) and the demonstration projects under paragraph (6); and

"(II)(aa) do not support the activities or projects described in subclause (I); but

"(bb) are important to the development of grid-scale energy storage systems and the mission of the Office of Electricity of the Department of Energy, as determined by the Secretary; and

"(ii) include expected timelines for—

"(I) the accomplishment of relevant objectives under current programs of the Department of Energy relating to grid-scale energy storage systems; and

"(II) the commencement of any new initiatives within the Department of Energy relating to grid-scale energy storage systems to accomplish those objectives.

"(C) UPDATES TO PLAN.—Not less frequently than once every 2 years, the Secretary shall submit to the Committee on Energy and Natural Resources of the Senate and the Committee on Science, Space, and Technology of the House of Representatives an updated 10-year strategic plan, which shall identify, and provide a justification for, any major deviation from a previous strategic plan submitted under this paragraph.

"(4) RESEARCH AND DEVELOPMENT.—In carrying out the program, the Secretary shall focus research and development activities on developing cost-effective energy storage systems that—

"(A)(i) to balance day-scale needs, are capable of highly flexible power output for not less than 6 hours; and

"(ii) have a lifetime of—

"(I) not less than 8,000 cycles of discharge at full output; and

"(II) 20 years of operation;

"(B)(i) can provide power to the electric grid for durations of approximately 10 to 100 hours; and

"(ii) have a lifetime of—

"(I) not less than 1,500 cycles of discharge at full output; and

"(II) 20 years of operation; and

"(C) can store energy over several months and address seasonal scale variations in supply and demand.

"(5) COST TARGETS.—

"(A) IN GENERAL.—Cost targets developed by the Secretary under paragraph (2)(B) shall—

"(i) be for energy storage costs across all types of energy storage technology; and

"(ii) include technology costs, installation costs, balance of services costs, and soft costs.

"(B) TARGET UPDATES; SUBTARGETS.—Not less frequently than once every 5 years during the 10-year period beginning on the date of enactment of the BEST Act, the Secretary shall—

"(i) revise the cost targets developed under paragraph (2)(B) to be more stringent, based on—

"(I) a technology-neutral approach that considers all types of energy storage deployment scenarios, including individual technologies, technology combination use profiles, and integrated control system applications;

"(II) input from a variety of stakeholders, including the stakeholders described in subsection (i)(3);

"(III) the inclusion and use of existing infrastructure; and

"(IV) the ability to optimize the integration of intermittent renewable

energy generation technology and distributed energy resources; and

"(ii) establish cost subtargets for technologies and applications relating to the energy storage systems described in paragraph (4), taking into consideration—

"(I) electricity market prices; and

"(II) the goal of being cost-competitive in specific markets for electric grid products and services.

"(6) DEMONSTRATION PROJECTS.—

"(A) IN GENERAL.—Not later than September 30, 2023, under the program, the Secretary shall, to the maximum extent practicable, enter into agreements to carry out not more than 5 grid-scale energy storage system demonstration projects.

"(B) OBJECTIVES.—Each demonstration project carried out under subparagraph (A) shall be designed to further the development of the energy storage systems described in paragraph (4).

"(C) NO OWNERSHIP INTEREST.—The Federal Government shall not hold any equity or other ownership interest in any grid-scale en-

ergy storage system that is part of a demonstration project under this paragraph.

"(7) TESTING AND VALIDATION.—The Secretary shall accelerate the standardized testing and validation of grid-scale energy storage systems under the program through collaboration with 1 or more National Laboratories (as defined in section 2 of the Energy Policy Act of 2005 (42 U.S.C. 15801)), including by developing testing and evaluation methodologies for—

"(A) standardized 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, including performance testing with charge and discharge protocols to evaluate power capability, energy output, and degradation during cycling and calendar aging on earliest stage commercially viable prototypes (commonly less than 100 kilowatts); and

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

"(8) COORDINATION.—To accelerate the development of grid-scale energy storage systems under

the program, and pursuant to subsection (n), the Secretary shall coordinate with—

"(A) offices within the Department of Energy conducting energy storage research, such as the Advanced Research Projects Agency–Energy, the Office of Science, and the Office of Energy Efficiency and Renewable Energy;

"(B) Federal agencies that are carrying out initiatives to increase energy security or reliability, such as the Department of Defense, the National Science Foundation, the Federal Energy Regulatory Commission, and the Department of Homeland Security;

"(C) program offices that aim to increase domestic manufacturing and production, such as the Office of Advanced Manufacturing in the Department of Energy and the National Institute of Standards and Technology in the Department of Commerce; and

"(D) members of private industry to advance the development of commercially viable grid-scale energy storage systems.".

(b) AUTHORIZATION OF APPROPRIATIONS.—The United States Energy Storage Competitiveness Act of

2007 (42 U.S.C. 17231) is amended, in subsection (q) (as redesignated by subsection (a)(1))—

(1) in paragraph (5), by striking "and" at the end;

(2) in paragraph (6), by striking the period at the end and inserting "; and"; and

(3) by adding at the end the following:

"(7) the research, development, and demonstration program of grid-scale energy storage systems under subsection (l) $60,000,000 for each of fiscal years 2020 through 2024.".

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Chairman LAMB. Without objection, the bill is considered as read, and open to amendment at any point. I recognize the gentleman from Illinois to present any remarks on the bill.

Mr. FOSTER. Thank you, Chairman Lamb, and Ranking Member Weber. I am proud that the Committee today is advancing H.R. 2986, the bipartisan *Better Energy Storage Act*, or so-called *BEST Act*, led by myself, Mr. Casten, Ms. Herrera Beutler, and Mr. Gonzalez. I want to thank my friends on the other side of the aisle for working with me to develop a bill that will address grid resiliency and climate change—two of the critically important issues facing our country today. Developing advanced energy storage technologies will allow us to modernize our electric grid and reduce our dependence on fossil fuels.

I'll speak more on the bill when I introduce an amendment in the nature of a substitute, but in the meantime, I urge all my colleagues to support this bill, and yield back.

Chairman LAMB. Thank you, Dr. Foster. Anyone else have anything to add on this bill? No? We will now proceed with the amendments in the order of the roster. The first amendment on the roster is an amendment in the nature of a substitute offered by the gentleman from Illinois. He is recognized to offer an amendment.

Mr. FOSTER. I have an amendment at the desk.

Chairman LAMB. The Clerk will report the amendment.

The CLERK. Amendment No. 1, amendment in the nature of a substitute to H.R. 2986, offered by Mr. Foster.

[The amendment follows:]

AMENDMENT IN THE NATURE OF A SUBSTITUTE TO H.R. 2986

OFFERED BY Mr.Foster

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. ENERGY STORAGE.

(a) IN GENERAL.—The United States Energy Storage Competitiveness Act of 2007 (42 U.S.C. 17231) is amended—

(1) by redesignating subsections (l) through (p) as subsections (n) through (r), respectively; and

(2) by inserting after subsection (k) the following:

"(l) ENERGY STORAGE RESEARCH AND DEVELOPMENT PROGRAM.—

"(1) IN GENERAL.—Not later than 180 days after the date of enactment of the Better Energy Storage Technology Act, the Secretary shall establish a research and development program for energy

storage systems, components, and materials across multiple program offices of the Department.

"(2) REQUIREMENTS.—In carrying out the program under paragraph (1), the Secretary shall—

"(A) coordinate across all relevant program offices throughout the Department, including the Office of Electricity, the Office of Energy Efficiency and Renewable Energy, the Advanced Research Projects Agency – Energy, the Office of Science, and the Office of Cybersecurity, Energy Security, and Emergency Response;

"(B) adopt long-term cost, performance, and demonstration targets for different types of energy storage systems and for use in a variety of regions, including rural areas; and

"(C) incorporate considerations of sustainability, sourcing, recycling, reuse, and disposal of materials, including critical elements, in the design of energy storage systems;

"(D) identify energy storage duration needs; and

"(E) analyze the need for various types of energy storage to improve electric grid resilience and reliability.

"(3) STRATEGIC PLAN.—

"(A) IN GENERAL.—No later than 180 days after the date of enactment of the Better Energy Storage Technology Act, the Secretary shall develop a 5-year strategic plan identifying research, development, demonstration, and commercial application goals for the program in accordance with this section. The Secretary shall submit this plan to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate.

"(B) CONTENTS.—The strategic plan submitted under subparagraph (A) shall—

"(i) identify programs at the Department related to energy storage systems that support the research and development activities described in paragraph (4), and the demonstration projects under subsection (m); and

"(ii) include timelines for the accomplishment of goals developed under the plan.

"(C) UPDATES TO PLAN.—Not less frequently than once every 3 years, the Secretary

shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate an updated version of the plan under subparagraph (A).

"(4) RESEARCH AND DEVELOPMENT.—In carrying out the program established in paragraph (1), the Secretary shall focus on developing—

"(A) energy storage systems that can store energy and generate stored energy for a minimum of 6 hours in duration to balance electricity needs over the course of a single day;

"(B) long-duration energy storage systems that can store energy and generate stored energy for 10 to 100 hours in duration; and

"(C) energy storage systems that can store energy and generate stored energy over several months and address seasonal scale variations in supply and demand.

"(5) TESTING AND VALIDATION.—The Secretary shall support the standardized testing and validation of energy storage systems under the program through collaboration with 1 or more National Laboratories, including the development of meth-

odologies to independently validate energy storage technologies by—

"(A) performance of energy storage systems on the electric grid, including—

"(i) when appropriate, testing of application-driven charge and discharge protocols;

"(ii) evaluation of power capacity and energy output;

"(iii) degradation of the energy storage systems from cycling and aging;

"(iv) safety; and

"(v) reliability testing under grid duty cycles; and

"(B) prediction of lifetime metrics.

"(6) COORDINATION.—In carrying out this subsection, the Secretary shall coordinate with—

"(A) programs and offices that aim to increase domestic manufacturing and production of energy storage systems, such as those within the Department and within the National Institute of Standards and Technology;

"(B) other Federal agencies that are carrying out initiatives to increase energy reliability through the development of energy stor-

age systems, including the Department of Defense; and

"(C) other stakeholders working to advance the development of commercially viable energy storage systems.

"(7) TECHNICAL ASSISTANCE PROGRAM.—

"(A) IN GENERAL.—The Secretary shall provide technical assistance for commercial application of energy storage technologies to eligible entities.

"(B) TECHNICAL ASSISTANCE.—Technical assistance provided under this paragraph—

"(i) may include assistance with—

"(I) assessment of relevant technical and geographic characteristics;

"(II) interconnection of electricity storage systems with the electric grid; and

"(III) engineering design; and

"(ii) may not include assistance relating to modification of Federal, State, or local regulations or policies with respect to energy storage systems.

"(C) APPLICATIONS.—

"(i) IN GENERAL.—The Secretary shall seek applications for technical assistance and grants under the program—

"(I) on a competitive basis; and

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

"(iii) PRIORITIES.—In selecting eligible entities for technical assistance for commercial applications, the Secretary shall give priority to eligible entities with projects that have the greatest potential for—

"(I) strengthening the reliability and resiliency of the electric grid to the impact of extreme weather events, power grid failures, and interruptions in supply of electricity;

"(II) reducing the cost of energy storage systems; or

"(III) facilitating the use of net zero emission energy resources.

"(8) PROGRAM DEFINED.—In this subsection, the term 'program' means the research and development program established under paragraph (1).".

(b) ENERGY STORAGE DEMONSTRATION PROGRAM.—The United States Energy Storage Competitiveness Act of 2007 (42 U.S.C. 17231), as amended, is amended by inserting after subsection (l) the following:

"(m) ENERGY STORAGE DEMONSTRATION PROGRAM.—

"(1) ESTABLISHMENT.—The Secretary shall establish a competitive grant program for the demonstration of energy storage systems, as identified by the Secretary, that use either—

"(A) a single system; or

"(B) aggregations of multiple systems.

"(2) ELIGIBILITY.—Entities eligible to receive a grant under paragraph (1) include—

"(A) a State, territory, or possession of the United States;

"(B) a State energy office;

"(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) a rural electric cooperative;

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

"(iii) an investor-owned utility; and

"(F) a private company, such as but not limited to an energy storage company.

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

"(A) ensure regional diversity among eligible entities that receive the grants, including participation by rural States and small States;

"(B) ensure that specific projects selected for grants—

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

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

"(C) give consideration to proposals from eligible entities for securing energy storage

through competitive procurement or contract for service; and

"(D) prioritize projects that leverage matching funds from non-Federal sources.

"(4) OBJECTIVES.—Each demonstration project selected for a grant under paragraph (1) shall include one or more of the following objectives:

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

"(B) To improve the reliability of the transmission and distribution system, 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 or demand.

"(E) To reduce peak loads of homes and businesses, particularly to defer or avoid investments in new electric grid capacity.

"(F) To advance power conversion systems to make the systems smarter, more efficient, able to communicate with other inverters, and able to control voltage.

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

"(H) To integrate one or more energy resources, including renewable energy resources, at the source or away from the source.

"(I) To increase the feasibility of microgrids or islanding.

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

"(5) RESTRICTION ON USE OF FUNDS.—Any eligible entity that receives a grant under paragraph (1) may only use the grant to fund programs relating to the demonstration of energy storage systems connected to the electric grid, or that provides bi-directional energy storage capable of providing back-up energy in the event of grid outages, including energy storage systems sited behind a customer revenue meter.

"(6) FEDERAL COST SHARE.—The Federal cost share of a project carried out with a grant under

paragraph (1) shall be not more than 50 percent of the total costs incurred in connection with the development, construction, acquisition of components for, or engineering of a demonstration project.

"(7) NO PROJECT OWNERSHIP INTEREST.—The United States shall hold no equity or other ownership interest in an energy storage system for which a grant is provided under paragraph (1).

"(8) RULES AND PROCEDURES; AWARDING OF GRANTS.—

"(A) RULES AND PROCEDURES.—Not later than 180 days after the date of enactment of the Better Energy Storage Technology Act, the Secretary shall adopt rules and procedures for carrying out the grant program under subsection (m).

"(B) AWARDING OF GRANTS.—Not later than 1 year after the date on which the rules and procedures under paragraph (A) are established, the Secretary shall award the initial grants provided under this section.

"(9) REPORTS.—The Secretary shall submit to Congress and make publicly available—

"(A) not less frequently than once every 2 years for the duration of the grant program

under subsection (m), a report describing the performance of the grant 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

"(B) on termination of the grant program under subsection (m), an assessment of the success of, and education provided by, the measures carried out by grant recipients under the grant program.

"(10) PROGRAM DEFINED.—In this subsection, the term 'program' means the demonstration program established under paragraph (1).".

(c) AUTHORIZATION OF APPROPRIATIONS.—The United States Energy Storage Competitiveness Act of 2007 (42 U.S.C. 17231) is amended, in subsection (r) (as redesignated by subsection (a)(1))—

(1) in paragraph (5), by striking "and" at the end;

(2) in paragraph (6), by striking the period at the end and inserting "; and"; and

(3) by adding at the end the following:

"(7) the research and development program for energy storage systems under subsection (l)—

"(A) $62,000,000 for fiscal year 2020;

"(B) $ 65,100,000 for fiscal year 2021;

"(C) $ 68,355,000 for fiscal year 2022;

"(D) $ 71,773,000 for fiscal year 2023; and

"(E) $ 75,362,000 for fiscal year 2024.

"(8) the demonstration program for energy storage systems under subsection (m), $50,000,000 for each of fiscal years 2020 through 2024.".

(d) DEFINITIONS.—In this Act:

(1) ENERGY STORAGE SYSTEM.—The term "energy storage system" means a system, equipment, facility, or technology relating to the electric grid that—

(A) is capable of absorbing energy, storing such energy for a period of time, and dispatching such energy after storage; and

(B) uses a mechanical, electrical, chemical, electrochemical, or thermal process to store such energy, or any other process that the Secretary determines relevant.

(2) ISLAND.—The term "island" means one or more distributed generators or energy storage systems that continues to power a location in the absence of electricity from the electric grid.

(3) MICROGRID.—The term "microgrid" means an integrated energy system consisting of inter-connected loads and distributed energy resources, including generators and energy storage systems, within clearly defined electrical boundaries that—

(A) acts as a single controllable entity with respect to the grid; and

(B) can connect and disconnect from the grid to operate in either grid-connected mode or island-mode; or

(C) can operate in the absence of the grid.

(4) 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).

Amend the title so as to read: "A bill to amend the United States Energy Storage Competitiveness Act of 2007 to establish certain research and development programs related to energy storage, and for other purposes".

☒

Chairman LAMB. I ask unanimous consent to dispense with the reading. Without objection, so ordered. I recognize the gentleman for 5 minutes to explain the amendment.

Mr. FOSTER. Thank you, Mr. Chairman. I'm introducing an amendment in the nature of a substitute to H.R. 2986, the bipartisan *Better Energy Storage Technology Act*, or *BEST Act*, a bill that I introduced along with Mr. Casten, Ms. Herrera Beutler, and Mr. Gonzalez. The bill currently has 44 other bipartisan co-sponsors, including Chairwoman Johnson and Ranking Member Weber of this Committee.

The fight against climate change is one of the defining issues of our time. We are working hard every day to develop solutions to help address this critical issue, and energy storage is essential for making progress toward a clean energy economy. These technologies take many forms, including battery, pumped-hydropower, and thermal energy storage. The development of cost-effective storage systems will help reduce the intermittency issues of renewable generation sources, like wind and solar energy; and will help match the base load sources of power, like nuclear and hydro, to the variable demand of our economy; and will also help provide grid services, such as frequency and voltage regulation, to ensure that electric consumers receive reliable and resilient power.

In my home district of Illinois, researchers at Argonne National Lab are leading a nationwide effort to advance the state of advanced batteries, including the development of novel cathode, anode, and electrolyte designs, as well as new material synthesis and characterization tools. In particular, Argonne National Lab is the home of the Joint Center for Energy Storage Research, also known as JCESR, which is a $24 million annual investment made by the Department of Energy to develop transformative battery storage technologies that go beyond lithium-ion batteries. And that's why I'm very pleased to see the Energy Subcommittee advance the *Better Energy Storage Technology Act* today.

This bill sets forth a cross-cutting program at the Department of Energy to advance a suite of storage technologies. It directs DOE to establish a research and development program to coordinate acts across relevant program offices to make progress toward developing cost-effective sustainable energy storage systems, including testing and validation activities. The bill also directs the Department to develop a 5-year strategic plan to continue to identify and refine research goals for the program. Finally, the bill authorizes an energy storage demonstration program, as well as a technical assistance program, to help put more energy storage systems on the electric grid.

I'd be remiss if I did not acknowledge the hard work of my colleague on the Science Committee, Mr. Casten, who introduced the *Promoting Grid Storage Act of 2019*. His bill contained many important provisions that have been included here and to strengthen the version of the *BEST Act* that we are considering in front of the Committee today. The *BEST Act* now provides technical assistance and grants, and authorizes an energy storage system demonstration program, both of which were included in the *Promoting Grid Storage Act of 2019*. So I urge my colleagues to support my amendment and final passage of the bill. And, with that, I yield back.

Chairman LAMB. Is there any further discussion on the amendment? Mr. Casten is recognized for 5 minutes.

Mr. CASTEN. Thank you, Chairman Lamb. There is a growing and bipartisan recognition that grid-scale energy storage technologies will be an essential part of tomorrow's grid, and the *BEST Act* reflects that growing consensus by providing critical research funds to help ensure that the U.S. maintains its leadership in the grid of the future. I really want to thank my colleague, Mr. Foster, for introducing this important piece of legislation. I am proud to be a co-sponsor of the *BEST Act*, and I'm happy to see it being considered here today.

There are many benefits of energy storage technologies, but perhaps the most critical will be the role they can play in helping us to decarbonize the power sector, and in so doing, to combat the climate crisis. One of the largest barriers that we have to the deployment of clean energy resources is whether we have a grid that has the requisite transmission reliability and flexibility to handle the increases in intermittent and non-traditional power sources.

While we certainly need to invest in many different upgrades to the grid to achieve our climate goals, we have to do grid energy storage, because it is so hard to permit transmission, and until we solve that permitting problem, grid-scale energy storage is going to be the way to get that through. The sun doesn't always shine, the wind does not always blow, but the loads of the grid tend to be consistent in ways that are not always consistent with where the generation comes from, so improved energy storage will allow for the utilization of more intermittent power generators more efficiently, like wind turbines and solar panels. Storage can also help increase the reliability and resiliency of the electric system during and after extreme weather events.

So if we want to both lower greenhouse gas emissions and maintain a stable grid, or, in fact, if we only want one of those things, we must invest in far greater energy storage capacity. The transition to a low carbon, clean energy economy requires a commitment to research, demonstration, and deployment of new and improved energy storage systems across the grid. That's why, in addition to being a proud supporter of the *BEST Act*, I was proud to introduce H.R. 2909, the *Promoting Grid Storage Act of 2019*, which, among other things, would authorize a new cross-cutting energy storage R&D program at the Department of Energy, while providing technical assistance and competitive demonstration grants to localities, States, Tribal governments, and private-sector actors seeking to further develop and de-risk these technologies.

The bill would create a competitive grant program for energy storage at the Department of Energy that would uniquely empower local entities to identify specific demonstration projects, and compete for funds at the Department of Energy, instead of waiting for the DOE to identify potential projects to fund. Like the *BEST Act*, this effort is bipartisan and bicameral, and builds upon the President's budget request for greater storage R&D at the Department of Energy. I believe that the *Promoting Grid Storage Act* is an important complementary effort to the *BEST Act*, and I was proud to work with Representative Foster, Chairman Lamb, and their staffs

to incorporate many of the key provisions from that bill into this amendment in the nature of a substitute.

I'm glad we were able to come together on this legislation. I'd like to sincerely thank my colleagues and their dedicated staffs for working with me and my team to incorporate these provisions into this amendment. I believe this makes an already important piece of legislation all the more impactful in accomplishing the critical goal of developing, de-risking, and deploying energy storage to the grid. I applaud the Committee for taking up this critical issue, and I urge my colleagues to vote yes on this amendment and the *BEST Act*. I yield back.

Chairman LAMB. Is there any further discussion on the amendment? The vote will occur on the amendment. All in favor say aye. Those opposed say no. The ayes have it, and the amendment is agreed to.

A reporting quorum being present, I move that the Energy Subcommittee of the Science, Space, and Technology Committee report H.R. 2986, as amended, to the full Committee, with the recommendation that the bill be approved. Those in favor of the motion will signify by saying aye. Opposed, no. The ayes have it, and the bill is favorably reported.

Without objection, the motion to reconsider is laid upon the table. I ask unanimous consent that staff be authorized to make any necessary technical and conforming changes to the bill. Without objection, so ordered. Members will have 2 subsequent calendar days in which to submit supplemental, minority, or additional views on the measure.

H.R. 5374

Chairman LAMB. We will now consider H.R. 5374, the *Advanced Geothermal Research and Development Act of 2019*. The Clerk will report the bill.

The CLERK. H.R. 5374, a bill——

[The bill follows:]

XXI. PROCEEDINGS OF THE FULL COMMITTEE MARKUP

MARKUPS:
H.R. 2986, THE BETTER ENERGY STORAGE TECHNOLOGY (BEST) ACT;
H.R. 4230, THE CLEAN INDUSTRIAL TECHNOLOGY (CIT) ACT OF 2019;
H.R. 5374, THE ADVANCED GEOTHERMAL RESEARCH AND DEVELOPMENT ACT OF 2019;
H.R. 5428, THE GRID MODERNIZATION RESEARCH AND DEVELOPMENT ACT OF 2019; AND
H.R. 5760, THE GRID SECURITY RESEARCH AND DEVELOPMENT ACT

MARKUP

BEFORE THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

ONE HUNDRED SIXTEENTH CONGRESS

SECOND SESSION

FEBRUARY 12, 2020

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C O N T E N T S

Wednesday, February 12, 2020

Markup on H.R. 2986, Better Energy Storage Technology Act or the BEST Act

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Markup on H.R. 4230, Clean Industrial Technology Act of 2019 or CIT Act of 2019

Markup on H.R. 5374, Advanced Geothermal Research and Development Act of 2019

Markup on H.R. 5428, Grid Modernization Research and Development Act of 2019

Markup on H.R. 5760, Grid Security Research and Development Act

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WEDNESDAY, FEBRUARY 12, 2020

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, DC.

The Committee met, pursuant to notice, at 10 o'clock a.m., in room 2318 of the Rayburn House Office Building, Hon. Eddie Bernice Johnson [Chairwoman of the Committee] presiding.

cently established DOE Office of Cybersecurity, Energy Security, and Emergency Response. The bill authorizes an interagency research and development program to advance electric grid cybersecurity, physical security, grid resilience, and emergency response efforts. In particular, the bill authorizes activities on the cybersecurity testbeds, education and workforce training and standards, and guidance documents for energy sector cybersecurity practices.

I'm proud that today's bills are supported by a cross-section of interested groups. One or more of today's bills has been endorsed by organizations that include the National Audubon Society, the U.S. Chamber of Commerce, the Information Technology and Innovation Foundation, the Environmental Defense Fund, the National Rural Electric Cooperatives Association, Duke Energy, the Union of Concerned Scientists, the Natural Resources Defense Fund, and the National Association of Manufacturers.

Thank you.

[The statement of Chairwoman Johnson follows:]

Good morning, and welcome to today's Science Committee markup of five good, bipartisan bills.

First, we will consider H.R. 2986, the Better Energy Storage Technology Act. The BEST Act authorizes the Department of Energy to conduct a cross-cutting research, development, and demonstration program on energy storage technologies, including batteries and pumped hydro systems. The Act requires DOE create a 5-year strategic plan to coordinate research activities among DOE's technology offices.

Renewable energy technology can be intermittent. Strong winds die down, and sunny days turn cloudy. According to the Congressional Research Service, energy storage systems may be a key technology to enabling a reliable, low greenhouse gas emitting electric grid comprised of energy generation sources like wind and solar.

Next we have H.R. 4230, the Clean Industrial Technology Act of 2019. This act authorizes a intra-agency, DOE-led research, development, and demonstration program to advance technologies that will help reduce emissions from the manufacturing sector, including steel and cement production, chemical production, and industrial heat. The research program will be carried out in collaboration with stakeholders from industry and labor groups.

Allowing American manufacturers to access technologies that make them increasingly sustainable will ensure that the domestic manufacturing industry will remain competitive through the 21st Century.

We will then move on to H.R. 5374, the Advanced Geothermal Research and Development Act of 2019. I will speak about this bill a little later.

Next is H.R. 5428, the Grid Modernization Research and Development Act of 2019, which authorizes a broad research, development, and demonstration program on a wide variety of topics pertaining to grid modernization, including smart grid modeling, planning, and controls; hybrid energy systems; and enhanced electric grid integration of technologies like vehicles and building components.

Our nation's electricity grid is undergoing a series of transformations, which include adapting to a changing electricity generation mix, an increase in "smart grid" technologies, and a growing need to improve the resilience of the electric power grid. This bill will help lead our nation in developing the technologies we need by setting forth a comprehensive research agenda led by the DOE.

Finally, we'll be considering H.R. 5760, the Grid Security Research and Development Act. This bill is an updated version of a bill that Mr. Bera and I introduced, along with many of our Science Committee colleagues, in the previous two Congresses.

H.R. 5760 will provide legislative guidance to the activities carried out by the recently established DOE Office of Cybersecurity, Energy Security, and Emergency Response. The bill authorizes an interagency research and development program to advance electric grid cybersecurity, physical security, grid resilience, and emergency response efforts. In particular, the bill authorizes activities on cybersecurity test beds, education and workforce training and standards, and guidance documents for energy sector cybersecurity practices.

I am proud that today's bills are supported by a cross-section of interested groups. One or more of today's bills has been endorsed by organizations that include: the

National Audubon Society, the U.S. Chamber of Commerce, the Information Technology & Innovation Foundation (ITIF), the Environmental Defense Fund (EDF), the National Rural Electric Cooperative Association, Duke Energy, the Union of Concerned Scientists, the Natural Resources Defense Fund, and the National Association of Manufacturers.

Chairwoman JOHNSON. I now recognize our Ranking Member for his opening remarks.

Mr. LUCAS. Thank you, Chairwoman Johnson, for holding today's full Committee markup.

The Science Committee has one of the best records in Congress for passing productive, bipartisan legislation, and I'm very pleased to see us upholding that tradition this morning. We've reached bipartisan agreement on the five energy bills being considered today.

Currently, the U.S. energy sector faces a number of critical challenges, and it can be difficult to find the best path forward in a world that increasingly demands cleaner, more reliable, and more affordable energy sources. But it is our job in Congress to set the priorities to address these challenges and focus our limited Federal resources where we can see the best return on investment.

To deliver truly effective solutions, we must take the long-term and big-picture approach. We must support research in fundamental science that drives innovation over a broad range of energy applications and strategically invest in the early stage clean-energy technologies that industry cannot support. We must also provide for R&D (research and development) to modernize and defend our critical energy infrastructure and address the complex energy needs of our Nation's industrial sectors. These are the initiatives that today's bills will address.

First, we'll consider this morning H.R. 2986, the *BEST Energy Storage Technology Act of 2019*. This legislation authorizes a cross-cutting research and development program at the Department of Energy to provide necessary direction on high-priority energy storage technology research and development activities. Advanced grid scale energy storage is an essential component of any comprehensive clean-energy strategy and a priority of the current Administration. Developing our grid scale energy storage ability will accelerate the growth in all kinds of energy production, which can make use of this technology.

Our second bill this morning is H.R. 4230, the *Clean Industrial Technology Act of 2019*. Our Nation's economic stability and national security are tied to the growth of the U.S. industrial sector, yet the demanding energy needs of industry can represent a unique challenge for our clean and secure future energy. This bill establishes a DOE program to support the development of innovative technologies and practices that will reduce industrial sector emissions while maintaining the effectiveness and competitiveness of U.S. industry. It also requires the Secretary to establish a comprehensive strategy to develop the mission and goals for this new program.

While I can't say I agree with every aspect of this legislation, I'd like to thank our friends across the aisle for meeting us at the table to come to an agreement. By having a good-faith discussion, we were able to add responsible funding levels and good governance provisions to H.R. 4230 that will make this legislation a bipartisan product.

Next, we'll consider my bill, H.R. 5374, the *Advanced Geothermal Research and Development Act of 2019,* which authorizes DOE's cutting-edge geothermal research and development activities. This bill establishes a geothermal computing program and includes funding for critical geothermal user facilities that will support the next generation of electricity generation from these vast and largely untapped renewable resources. I would like to thank Chairwoman Johnson for cosponsoring this legislation and working with me to refine it.

While many renewables like wind and solar are already seeing success in the market, early stage technologies like geothermal, which are often far too expensive and risky for industry to take to scale, require Federal support for R&D. By strategically investing in these promising technologies, we can continue to enhance our diverse domestic energy portfolio and bolster U.S. energy independence. While we support next-generation energy technologies and clean-energy strategies, we must also increase our investment in our critical energy infrastructure.

So, finally, the Committee will consider H.R. 5428, the *Grid Modernization Research and Development Act of 2019*, and H.R. 5760, the *Grid Security Research and Development Act*. Together, these two bills authorize DOE's critical work in strengthening our Nation's electric grid against rapidly changing technological challenges. The *Grid Security Research and Development Act* authorizes the Department's critical cybersecurity and emergency response R&D activities and directs DOE to work with relevant Federal agencies to develop cybersecurity best practices. The *Grid Modernization Research and Development Act* authorizes R&D into hybrid energy systems, grid integration, and smart grid modeling, modernizing the grid to improve its overall resilience and flexibility.

I'd like to take this opportunity to thank my good friends across the aisle for working with us on these bills. I appreciate that we can come together to focus on our shared interest in supporting commonsense legislation to maintain U.S. national security, environmental stewardship, economic prosperity, and energy security for years to come. And I'd like to again thank Chairwoman Johnson for holding this markup, and I yield back the balance of my time.

[The statement of Mr. Lucas follows:]

Thank you, Chairwoman Johnson, for holding today's full Committee mark-up.

The Science Committee has one of the best track records in Congress for passing productive, bipartisan legislation, and I'm very pleased to see us upholding that tradition this morning. We've reached bipartisan agreement on the five energy bills being considered today.

Currently, the U.S. energy sector faces a number of critical challenges, and it can be difficult to find the best path forward in a world that increasingly demands cleaner, more reliable, and more affordable energy sources. But it is our job in Congress to set the priorities to address these challenges and focus our limited federal funds where we can see the best return on investment.

To deliver truly effective solutions, we must take the long-term and big picture approach. We must support research in fundamental science that drives innovation over a broad range of energy applications, and strategically invest in the early-stage clean energy technologies that industry cannot support. We must also provide for R&D to modernize and defend our critical energy infrastructure and address the complex energy needs of our nation's industrial sectors. These are the initiatives that today's bills will address.

Chairwoman JOHNSON. Good morning. The Committee will come to order. Without objection, the Chair is authorized to declare recess at any time. Pursuant to Committee rule and the House rules, the Chair announces that she may postpone roll call votes.

Pursuant to notice, the Committee meets to consider the following measures: H.R. 2986, *Better Energy Storage Technology Act*; H.R. 4230, *Clean Industrial Technology Act of 2019*; H.R. 5374, *Advanced Geothermal Research and Development Act of 2019*; H.R. 5428, *Grid Modernization Research and Development Act of 2019*; H.R. 5760, *Grid Security Research and Development Act.*

We welcome all to the Science Committee markup of five good, bipartisan bills. First, we will consider the *Better Energy Storage Technology Act (BEST ACT).* The *BEST Act* authorizes the Department of Energy to conduct a crosscutting research, development, and demonstration program on energy storage technologies, including batteries and pumped hydro systems. The act requires DOE (Department of Energy) to create a 5-year strategic plan to coordinate research activities among DOE's technology offices.

Renewable energy technology can be intermittent. Strong winds die down, and sunny days turn cloudy. According to the Congressional Research Service, energy storage systems may be a key technology to enabling a reliable, low greenhouse-gas-emitting electric grid comprised of energy generation sources like wind and solar.

Next, we have H.R. 4230, the *Clean Industrial Technology Act of 2019.* The act authorizes an interagency, DOE-led research, development, and demonstration program to advance technologies that will help reduce emissions from the manufacturing sector, including steel and cement production, chemical production, and industrial heat. The research program will be carried out in collaboration with the stakeholders from industry and labor groups. Allowing American manufacturers to access technologies that make them increasingly sustainable will ensure that the domestic manufacturing industry will remain competitive throughout the 21st century.

We will then move to H.R. 5374, the *Advanced Geothermal Research and Development Act of 2019.* I will speak about this bill a little bit later.

Next is H.R. 5428, the *Grid Modernization Research and Development Act of 2019*, which authorizes a broad research, development, and demonstration program on a wide variety of topics pertaining to grid modernization, including smart grid modeling, planning, and controls; hybrid energy systems; and enhanced electric grid integration of technologies like vehicles and building components. Our Nation's electricity grid is undergoing a series of transformations, which includes adapting to a changing electricity generation mix, an increase in smart-grid technologies, and a growing need for improved resilience of the electric power grid. This bill will help lead our Nation in developing the technologies we need by setting forth a comprehensive research agenda by the DOE.

Finally, we'll be considering H.R. 5760, the *Grid Security Research and Development Act.* This bill is an updated version of a bill that Mr. Bera and I introduced, along with many of our Science Committee colleagues, in the previous two Congresses. H.R. 5760 will provide legislative guidance to activities carried out by the re-

The first bill we will consider this morning is H.R. 2986, the "Better Energy Storage Technology Act of 2019." This legislation authorizes a cross-cutting research and development program at the Department of Energy (DOE) to provide necessary direction on high-priority energy storage technology research and development activities.

Advanced grid scale energy storage is an essential component of any comprehensive clean energy strategy and a priority of the current administration. Developing our grid scale energy storage ability will accelerate growth in all kinds of energy production, which can make use of this technology.

Our second bill this morning is H.R. 4230, the "Clean Industrial Technology Act of 2019." Our nation's economic stability and national security are tied to the growth of the U.S. industrialsector.

Yet the demanding energy needs of industry can represent a unique challenge for our clean and secure energy future. This bill establishes a DOE program to support the development of innovative technologies and practices that will reduce industrial sector emissions while maintaining the effectiveness and competitiveness of U.S. industry. It also requires the Secretary to establish a comprehensive strategy to develop the mission and goals for this new program.

While I can't say I agree with every aspect of this legislation, I would like to thank our friends across the aisle for meeting us at the table to come to an agreement. By having a good-faith discussion, we were able to add responsible funding levels and good governance provisions to H.R. 4230 that will make this legislation a bipartisan product.

Next we will consider my bill, H.R. 5374, the "Advanced Geothermal Research and Development Act of 2019" which authorizes DOE's cutting-edge geothermal research and development activities. This bill establishes a geothermal computing program and includes funding for critical geothermal energy user facilities that will support the next generation of electricity generation from these vast and largely untapped renewable resources. I would like to thank Chairwoman Johnson for cosponsoring this legislation and for working with me to refine it.

While many renewables like wind and solar are already seeing success in the market, early stage technologies like geothermal, which are often far too expensive and risky for industry to take to scale, require federal support for R&D. By strategically investing in these promising technologies we can continue to enhance our diverse domestic energy portfolio and bolster U.S. energy independence.

While we support next-generation energy technologies and clean energy strategies, we must also increase our investment in our critical energy infrastructure. So finally, the Committee will consider H.R. 5428, the "Grid Modernization Research and Development Act of 2019" and H.R. 5760, the "Grid Security Research and Development Act."

Together, these two bills authorize DOE's critical work in strengthening our nation's electric grid against rapidly changing technological challenges. The Grid Security Research and Development Act authorizes the Department's crucial cybersecurity and emergency response R&D activities and directs DOE to work with relevant Federal agencies to develop cybersecurity best practices. The Grid Modernization Research and Development Act authorizes R&D into hybrid energy systems, grid integration, and smart grid modeling - modernizing the grid to improve its overall resilience and flexibility.

I'd like to take this opportunity to thank my good friends across the aisle for working with us on these bills. I appreciate that we can come together to focus on our shared interest in supporting commonsense legislation to maintain U.S. national security, environmental stewardship, economic prosperity, and energy security for years to come. I'd like to again thank Chairwoman Johnson for holding this markup and I yield back the balance of my time.

Chairwoman JOHNSON. Thank you very much.

We will now consider H.R. 2986, the *Better Energy Storage Technology Act*. The clerk will report the bill.

The CLERK. Committee print of H.R. 2986, section 1——

[The bill follows:]

COMMITTEE PRINT

[Showing the text of H.R. 2986 as forwarded by the Subcommittee on Energy on December 19, 2019]

SECTION 1. SHORT TITLE.

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

SEC. 2. ENERGY STORAGE.

(a) IN GENERAL.—The United States Energy Storage Competitiveness Act of 2007 (42 U.S.C. 17231) is amended—

(1) by redesignating subsections (l) through (p) as subsections (n) through (r), respectively; and

(2) by inserting after subsection (k) the following:

"(l) ENERGY STORAGE RESEARCH AND DEVELOPMENT PROGRAM.—

"(1) IN GENERAL.—Not later than 180 days after the date of enactment of the Better Energy Storage Technology Act, the Secretary shall establish a research and development program for energy storage systems, components, and materials across multiple program offices of the Department.

"(2) REQUIREMENTS.—In carrying out the program under paragraph (1), the Secretary shall—

"(A) coordinate across all relevant program offices throughout the Department, including the Office of Electricity, the Office of Energy Efficiency and Renewable Energy, the Advanced Research Projects Agency – Energy, the Office of Science, and the Office of Cybersecurity, Energy Security, and Emergency Response;

"(B) adopt long-term cost, performance, and demonstration targets for different types of energy storage systems and for use in a variety of regions, including rural areas; and

"(C) incorporate considerations of sustainability, sourcing, recycling, reuse, and disposal of materials, including critical elements, in the design of energy storage systems;

"(D) identify energy storage duration needs; and

"(E) analyze the need for various types of energy storage to improve electric grid resilience and reliability.

"(3) STRATEGIC PLAN.—

"(A) IN GENERAL.—No later than 180 days after the date of enactment of the Better Energy Storage Technology Act, the Secretary

shall develop a 5-year strategic plan identifying research, development, demonstration, and commercial application goals for the program in accordance with this section. The Secretary shall submit this plan to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate.

"(B) CONTENTS.—The strategic plan submitted under subparagraph (A) shall—

"(i) identify programs at the Department related to energy storage systems that support the research and development activities described in paragraph (4), and the demonstration projects under subsection (m); and

"(ii) include timelines for the accomplishment of goals developed under the plan.

"(C) UPDATES TO PLAN.—Not less frequently than once every 3 years, the Secretary shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and

Natural Resources of the Senate an updated version of the plan under subparagraph (A).

"(4) RESEARCH AND DEVELOPMENT.—In carrying out the program established in paragraph (1), the Secretary shall focus on developing—

"(A) energy storage systems that can store energy and generate stored energy for a minimum of 6 hours in duration to balance electricity needs over the course of a single day;

"(B) long-duration energy storage systems that can store energy and generate stored energy for 10 to 100 hours in duration; and

"(C) energy storage systems that can store energy and generate stored energy over several months and address seasonal scale variations in supply and demand.

"(5) TESTING AND VALIDATION.—The Secretary shall support the standardized testing and validation of energy storage systems under the program through collaboration with 1 or more National Laboratories, including the development of methodologies to independently validate energy storage technologies by—

"(A) performance of energy storage systems on the electric grid, including—

"(i) when appropriate, testing of application-driven charge and discharge protocols;

"(ii) evaluation of power capacity and energy output;

"(iii) degradation of the energy storage systems from cycling and aging;

"(iv) safety; and

"(v) reliability testing under grid duty cycles; and

"(B) prediction of lifetime metrics.

"(6) COORDINATION.—In carrying out this subsection, the Secretary shall coordinate with—

"(A) programs and offices that aim to increase domestic manufacturing and production of energy storage systems, such as those within the Department and within the National Institute of Standards and Technology;

"(B) other Federal agencies that are carrying out initiatives to increase energy reliability through the development of energy storage systems, including the Department of Defense; and

"(C) other stakeholders working to advance the development of commercially viable energy storage systems.

"(7) TECHNICAL ASSISTANCE PROGRAM.—

"(A) IN GENERAL.—The Secretary shall provide technical assistance for commercial application of energy storage technologies to eligible entities.

"(B) TECHNICAL ASSISTANCE.—Technical assistance provided under this paragraph—

"(i) may include assistance with—

"(I) assessment of relevant technical and geographic characteristics;

"(II) interconnection of electricity storage systems with the electric grid; and

"(III) engineering design; and

"(ii) may not include assistance relating to modification of Federal, State, or local regulations or policies with respect to energy storage systems.

"(C) APPLICATIONS.—

"(i) IN GENERAL.—The Secretary shall seek applications for technical assistance and grants under the program—

"(I) on a competitive basis; and

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

"(iii) PRIORITIES.—In selecting eligible entities for technical assistance for commercial applications, the Secretary shall give priority to eligible entities with projects that have the greatest potential for—

"(I) strengthening the reliability and resiliency of the electric grid to the impact of extreme weather events, power grid failures, and interruptions in supply of electricity;

"(II) reducing the cost of energy storage systems; or

"(III) facilitating the use of net zero emission energy resources.

"(8) PROGRAM DEFINED.—In this subsection, the term 'program' means the research and development program established under paragraph (1).".

(b) ENERGY STORAGE DEMONSTRATION PROGRAM.—The United States Energy Storage Competitive-

ness Act of 2007 (42 U.S.C. 17231), as amended, is amended by inserting after subsection (l) the following:

"(m) ENERGY STORAGE DEMONSTRATION PROGRAM.—

"(1) ESTABLISHMENT.—The Secretary shall establish a competitive grant program for the demonstration of energy storage systems, as identified by the Secretary, that use either—

"(A) a single system; or

"(B) aggregations of multiple systems.

"(2) ELIGIBILITY.—Entities eligible to receive a grant under paragraph (1) include—

"(A) a State, territory, or possession of the United States;

"(B) a State energy office;

"(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) a rural electric cooperative;

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

or instrumentality of one or more State political subdivisions; and

"(iii) an investor-owned utility; and

"(F) a private company, such as but not limited to an energy storage company.

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

"(A) ensure regional diversity among eligible entities that receive the grants, including participation by rural States and small States;

"(B) ensure that specific projects selected for grants—

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

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

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

"(D) prioritize projects that leverage matching funds from non-Federal sources.

"(4) OBJECTIVES.—Each demonstration project selected for a grant under paragraph (1) shall include one or more of the following objectives:

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

"(B) To improve the reliability of the transmission and distribution system, 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 or demand.

"(E) To reduce peak loads of homes and businesses, particularly to defer or avoid investments in new electric grid capacity.

"(F) To advance power conversion systems to make the systems smarter, more efficient,

able to communicate with other inverters, and able to control voltage.

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

"(H) To integrate one or more energy resources, including renewable energy resources, at the source or away from the source.

"(I) To increase the feasibility of microgrids or islanding.

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

"(5) RESTRICTION ON USE OF FUNDS.—Any eligible entity that receives a grant under paragraph (1) may only use the grant to fund programs relating to the demonstration of energy storage systems connected to the electric grid, or that provides bi-directional energy storage capable of providing back-up energy in the event of grid outages, including energy storage systems sited behind a customer revenue meter.

"(6) FEDERAL COST SHARE.—The Federal cost share of a project carried out with a grant under paragraph (1) shall be not more than 50 percent of the total costs incurred in connection with the devel-

opment, construction, acquisition of components for, or engineering of a demonstration project.

"(7) NO PROJECT OWNERSHIP INTEREST.—The United States shall hold no equity or other ownership interest in an energy storage system for which a grant is provided under paragraph (1).

"(8) RULES AND PROCEDURES; AWARDING OF GRANTS.—

"(A) RULES AND PROCEDURES.—Not later than 180 days after the date of enactment of the Better Energy Storage Technology Act, the Secretary shall adopt rules and procedures for carrying out the grant program under subsection (m).

"(B) AWARDING OF GRANTS.—Not later than 1 year after the date on which the rules and procedures under paragraph (A) are established, the Secretary shall award the initial grants provided under this section.

"(9) REPORTS.—The Secretary shall submit to Congress and make publicly available—

"(A) not less frequently than once every 2 years for the duration of the grant program under subsection (m), a report describing the performance of the grant 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

"(B) on termination of the grant program under subsection (m), an assessment of the success of, and education provided by, the measures carried out by grant recipients under the grant program.

"(10) PROGRAM DEFINED.—In this subsection, the term 'program' means the demonstration program established under paragraph (1).".

(c) AUTHORIZATION OF APPROPRIATIONS.—The United States Energy Storage Competitiveness Act of 2007 (42 U.S.C. 17231) is amended, in subsection (r) (as redesignated by subsection (a)(1))—

(1) in paragraph (5), by striking "and" at the end;

(2) in paragraph (6), by striking the period at the end and inserting "; and"; and

(3) by adding at the end the following:

"(7) the research and development program for energy storage systems under subsection (l)—

"(A) $62,000,000 for fiscal year 2020;

"(B) $ 65,100,000 for fiscal year 2021;

"(C) $ 68,355,000 for fiscal year 2022;

"(D) $ 71,773,000 for fiscal year 2023; and

"(E) $ 75,362,000 for fiscal year 2024.

"(8) the demonstration program for energy storage systems under subsection (m), $50,000,000 for each of fiscal years 2020 through 2024.".

(d) DEFINITIONS.—In this Act:

(1) ENERGY STORAGE SYSTEM.—The term "energy storage system" means a system, equipment, facility, or technology relating to the electric grid that—

(A) is capable of absorbing energy, storing such energy for a period of time, and dispatching such energy after storage; and

(B) uses a mechanical, electrical, chemical, electrochemical, or thermal process to store such energy, or any other process that the Secretary determines relevant.

(2) ISLAND.—The term "island" means one or more distributed generators or energy storage systems that continues to power a location in the absence of electricity from the electric grid.

(3) MICROGRID.—The term "microgrid" means an integrated energy system consisting of inter-con-

nected loads and distributed energy resources, including generators and energy storage systems, within clearly defined electrical boundaries that—

(A) acts as a single controllable entity with respect to the grid; and

(B) can connect and disconnect from the grid to operate in either grid-connected mode or island-mode; or

(C) can operate in the absence of the grid.

(4) 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).

☒

Chairwoman JOHNSON. Without objection, the bill is considered as read and open to amendment for any point.

I now recognize the gentleman from Illinois, Dr. Foster, to briefly speak on his bill.

Mr. FOSTER. Thank you, Chairwoman Johnson and Ranking Member Lucas.

I'm proud that the Committee today is advancing H.R. 2986, the bipartisan *Better Energy Storage Technology* or *BEST Act* led by myself, Mr. Casten, Ms. Herrera Beutler, and Mr. Gonzalez. I want to thank my friends on the other side of the aisle for working with me to develop a bill that will address climate change, one of the critically important issues facing our country and the world.

Developing advanced energy storage technologies will allow us to modernize our electric grid and reduce our dependence on fossil fuels. I will speak more on this bill when I introduce a manager's amendment, but in the meantime, I urge all of my colleagues to support this bill and yield back.

Chairwoman JOHNSON. Thank you. Any other Members wishing—Mr. Gonzalez?

Mr. GONZALEZ. Thank you, Madam Chair Johnson and Ranking Member Lucas, for holding this markup. I urge all my colleagues to support H.R. 2986, the *Better Energy Storage Technology Act*. I was proud to join Representatives Foster, Herrera Beutler, and Casten in introducing this legislation, and I thank them for their leadership to help sustain U.S. energy dominance with this bill.

The *BEST Act* directs the DOE to establish R&D and demonstration programs for grid scale energy storage. Currently, one of the biggest barriers to greater usage of grid-scale energy storage is the cost of building storage units. The purpose of this legislation is to make energy storage more affordable by directing DOE to devise and enact cost targets for demonstration projects.

Additionally, the *BEST Act* will create a joint Department of Defense-DOE storage demonstration program and establish regulatory actions to enable integration of energy storage into the grid.

With this legislation, we're aiming to tackle one of the key innovation challenges that confronts our energy sector today. As our economy places ever-increasing strains on the existing grid, we need to build better, cheaper, and more efficient grid-scale energy storage units. If we're successful in confronting these challenges and developing the requisite storage technologies here at home, then the rest of the world will look to us as we forge solutions to some of the most difficult global energy challenges facing our society. This means more American energy jobs selling transformative technology across the world.

We know onerous regulations will not decrease carbon emissions. Only innovative and smart technologies that we can export to the biggest polluters in the world such as China and India can help us achieve that. We have a terrible example in Germany of what top-down government regulations can do where you spend a lot of money, regulate your economy, and don't get much done on the carbon reduction front.

If we want to reduce carbon emissions across the world, I believe placing American innovation and our economic might front and center in the debate is the only approach that will work. The *BEST*

Act does that. It is the right approach, and I urge my colleagues from both sides of the aisle to support it. With that, Madam Chair, I yield back.

Chairwoman JOHNSON. Thank you. Anyone else wishing to be recognized?

We will now proceed with the amendments in the order of the roster. The manager's amendment, the first amendment on the roster is an amendment offered by the gentleman from Illinois. He's recognized to offer his amendment.

Mr. FOSTER. I have an amendment at the desk.

The CLERK. Amendment No. 1, amendment to H.R. 2986 offered by Mr.——

[The amendment of Mr. Foster follows:]

AMENDMENT TO H.R. 2986

OFFERED BY Mr. Foster

Page 4, line 7, strike "generate" and insert "deliver".

Page 4, line 11, strike "generate" and insert "deliver".

Page 4, line 14, strike "generate" and insert "deliver".

Page 7, line 12, strike "resiliency" and insert "resilience".

Strike page 11, line 22, through page 12, line 2, and replace with the following:

(6) COST SHARING.—In carrying out this section, the Secretary shall require cost sharing under this section in accordance with section 988 of the Energy Policy Act of 2005 (42 U.S.C. 16352).

☒

Chairwoman JOHNSON. I ask unanimous consent to dispense with the reading. Without objection, so ordered.

I recognize the gentleman from Illinois for five minutes to explain his amendment.

Mr. FOSTER. Thank you, Madam Chair. I am introducing a manager's amendment to make technical and conforming changes to H.R. 2986, the bipartisan *Better Energy Storage Technology* or *BEST Act.* I'm very pleased that we're considering this bill led by myself, Mr. Casten, Ms. Herrera Beutler, Mr.—and Mr. Gonzalez, along with 50 other bipartisan cosponsors, including Chairwoman Johnson and Ranking Member Weber.

The fight against climate change is one of the defining issues of our time. We are working hard every day to develop solutions to address this critical issue. And energy storage is essential for making progress toward clean-energy economy. These technologies take many forms, including batteries, pumped hydropower, and thermal energy storage. The development of cost-effective energy storage systems will help reduce the intermittency issues of renewable generation sources like solar and wind energy and will also provide grid services such as frequency regulation to ensure that electricity consumers receive reliable and resilient power.

Near my home in Illinois researchers at Argonne National Lab are working hard to accelerate the state of advanced batteries, including the development of novel cathode, anode, and electrolyte designs, as well as new materials synthesis and characterization tools. In particular, Argonne National Lab is the home of the Joint Center for Energy Storage Research, also known as JCESR, which is a $24 million annual investment made by DOE and executed by universities and labs around the country to develop transformative battery storage technologies that go beyond lithium-ion batteries.

That's why I'm very pleased to see the House Committee on Science, Space, and Technology consider the *Better Energy Storage Technology Act* today. The bill sets forth a crosscutting program at the Department of Energy to advance a suite of storage technologies. It directs DOE to establish a research and development program that coordinates across relevant program offices to make progress toward developing cost-effective and sustainable energy storage systems, including testing and validation activities. The bill also directs the Department to develop a 5-year strategic plan to continue to identify and refine research goals for the program.

Finally, the bill authorizes an energy storage demonstration program, as well as a technical assistance program, to help put more energy storage systems on our electric grid.

I would be remiss if I did not also acknowledge the hard work of my colleague on the Science Committee Mr. Casten, who introduced the *Promoting Grid Storage Act of 2019.* His bill contained many important provisions that have helped strengthen the version of the *BEST Act* that we're considering in front of the Committee today.

I'm also pleased that we will be considering amendments from my colleagues Mr. Tonko and Ms. Sherrill on this bill today. Mr. Tonko's amendment will—would bring attention to the need for improved recycling infrastructure of lithium-ion batteries and other energy storage systems in the United States. And Ms. Sherrill's

amendment would direct DOE to construct—conduct research on advanced manufacturing techniques for energy storage systems. These important contributions make the bill even stronger, and I'm grateful for their work.

I urge my colleagues to support my amendment and final passage of the bill. With that, I yield back.

Chairwoman JOHNSON. Thank you very much. Any further discussion or requests for time on this amendment?

If not, if there's no further discussion, a vote occurs on the amendment.

All those in favor, say aye.

Those opposed, say no.

The ayes have it, and the amendment is agreed to.

Further proceedings on this amendment will be—oh, the next amendment on the roster is the amendment offered by the gentleman from New York, Mr. Tonko, who's recognized to offer his amendment.

Mr. TONKO. Thank you, Madam Chair. I have an amendment at the desk.

The CLERK. Amendment No. 2, amendment to the Committee print of H.R. 2986 offered by Mr. Tonko.

[The amendment of Mr. Tonko follows:]

AMENDMENT

TO THE COMMITTEE PRINT TO H.R. 2986

Page 1, line 9, strike "(n) through (r)" and insert "(p) through (t)".

Page 13, line 15, strike "(r)" and insert "(t)".

Page 14, line 8, strike all that follows through page 15, line 13, and insert the following:

SEC. 3. CRITICAL MINERAL RECYCLING AND REUSE RESEARCH, DEVELOPMENT, AND DEMONSTRATION PROGRAM.

The United States Energy Storage Competitiveness Act of 2007 (42 U.S.C. 17231) is amended by inserting after subsection (m), as so designated by section 2, the following:

"(n) CRITICAL MINERAL RECYCLING AND REUSE RESEARCH, DEVELOPMENT, AND DEMONSTRATION PROGRAM.—

"(1) DEFINITIONS.—In this subsection:

"(A) CRITICAL MINERAL.—The term 'critical mineral' means any of a class of chemical elements that have a high risk of a supply disruption and are critical to one or more new, en-

ergy-related technologies such that a shortage of such element would significantly inhibit large-scale deployment of technologies that store energy.

"(B) RECYCLING.—The term 'recycling' means the separation of critical minerals embedded within an energy storage system through physical or chemical means and reuse of those separated critical minerals in other technologies.

"(2) ESTABLISHMENT.—Not later than 180 days after the date of enactment of the BEST Act, the Secretary shall establish a research, development, and demonstration program of recycling of energy storage systems containing critical minerals.

"(3) RESEARCH, DEVELOPMENT, AND DEMONSTRATION.—In carrying out the program, the Secretary may focus research, development, and demonstration activities on—

"(A) technologies, process improvements, and design optimizations that facilitate and promote recycling, including—

"(i) improvement of efficiency and rates of collection of products and scrap

containing critical minerals from consumer, industrial, and other waste streams;

"(ii) separation and sorting of component materials in energy storage systems containing critical minerals, including improving the recyclability of such energy storage systems;

"(iii) safe storage of energy storage systems, including reducing fire risk;

"(iv) safe transportation of energy storage systems and components; and

"(v) development of technologies to advance energy storage recycling facility infrastructure, including integrated recycling facilities that can process multiple materials;

"(B) research and development of technologies that mitigate emissions and environmental impacts that arise from recycling, including disposal of toxic reagents and byproducts related to recycling processes;

"(C) research and development of technologies to enable recycling of critical materials from batteries in electric vehicles;

"(D) research on and analysis of non-technical barriers to improving the transportation of energy storage systems containing critical minerals; and

"(E) research on technologies and methods to enable the safe disposal of energy storage systems containing critical minerals, including waste materials and components recovered during the recycling process.

"(4) REPORT TO CONGRESS.—Not later than 2 years after the date of enactment of the BEST Act, and every 3 years thereafter, the Secretary shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate a report summarizing the activities, findings, and progress of the program.

"(o) DEFINITIONS.—For purposes of subsections (l), (m), and (n), the following definitions apply:

"(1) ENERGY STORAGE SYSTEM.—The term 'energy storage system' means a system, equipment, facility, or technology relating to the electric grid that—

"(A) is capable of absorbing energy, storing such energy for a period of time, and dispatching such energy after storage; and

"(B) uses a mechanical, electrical, chemical, electrochemical, or thermal process to store such energy, or any other process that the Secretary determines relevant.

"(2) ISLAND.—The term 'island' means one or more distributed generators or energy storage systems that continues to power a location in the absence of electricity from the electric grid.

"(3) MICROGRID.—The term 'microgrid' means an integrated energy system consisting of inter-connected loads and distributed energy resources, including generators and energy storage systems, within clearly defined electrical boundaries that—

"(A) acts as a single controllable entity with respect to the grid; and

"(B) can connect and disconnect from the grid to operate in either grid-connected mode or island-mode; or

"(C) can operate in the absence of the grid.

"(4) 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).".

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Chairwoman JOHNSON. I ask unanimous consent to dispense with the reading. Without objection, so ordered.

I recognize Mr. Tonko for five minutes to explain his amendment.

Mr. TONKO. Thank you, Madam Chair. The *BEST Act* rightfully directs Federal dollars and expertise toward addressing a critically important issue: energy storage. However, regardless of the future innovation that would result from this investment, we know that demand for batteries and the materials needed to make them is growing. According to Bloomberg New Energy Finance, sales of electric vehicles are expected to grow 14-fold this decade and 28-fold next decade with that demand for lithium, cobalt, nickel, and other critical minerals is also expected to rise. Of course, such increased demand will create increased waste. The Department of Energy estimates that we are going to have about 11 million tons of lithium-ion batteries die between now and 2030.

So what do we do with this enormous stockpile of dead batteries? My amendment helps answer that question. It would establish an R&D program focused on critical mineral recycling from energy storage systems within DOE. Instead of dangerously and wastefully disposing of used batteries, we can recover and reuse their valuable mineral components to make new batteries and other technologies.

There are several commonsense reasons why we need to invest in critical minerals recycling. One is American energy security. Today, we rely on China, Australia, Chile, Congo, and other Nations for the minerals required for lithium-ion batteries. Foreign reliance has caused enormous volatility in their price. For example, cobalt has dropped from $90,000 to $30,000 per ton since 2017. For us to be a part of this burgeoning new market, we need a reliable domestic source of materials at a consistent price.

Recycling can provide that source. Additionally, recycling would allow us to distance ourselves from the significant environmental and human rights issues tied to the current critical minerals market. Recycling batteries and reusing critical minerals is possible today. In Europe, over 60 percent of the lithium in the economy is recovered through recycling. In China, Japan, and Korea, the percentage is even higher. We only recycle 5 percent of the lithium-ion batteries in the United States despite recycling 97 percent of traditional lead acid batteries. Additional research can help us understand and overcome the logistical, safety, technological, and nontechnical barriers that are currently inhibiting the development of a U.S. recycling market.

Collection and storage are major issues. I have heard from numerous companies that want to invest in domestic mineral recycling, that it will not be profitable until we are able to provide a sufficient waste stream to supply recyclers.

This amendment focuses DOE research on increasing and streamlining battery collection so that this waste ends up at a recycler and not a landfill where it can pose a significant health and safety risk. In 2017, 65 percent of fires in California landfills were started by lithium-ion batteries, and last March a lithium-ion battery sparked a five-alarm fire in Queens, New York, that burned for two days. The amendment also focuses DOE research on determining how to safely store, transport, and stockpile lithium-ion

batteries so that a stockpile can be maintained without a safety threat.

The clean energy future that many of us dream of is going to require the deployment of millions of batteries for the grid and transportation. Rather than ignore foreseeable issues surrounding critical minerals and battery disposal, which will be upon us by the end of the decade, let's take steps today to try to solve them. Directing DOE to establish this RD&D (research, design, and development) program will go a long way to ensure these challenges can be met and the United States can develop a new clean industrial sector that is needed nationwide.

With that, Madam Chair, I urge Members to support this amendment, and I yield back.

Chairwoman JOHNSON. Thank you very much. Any further discussion on the amendment?

If there is no further discussion, the vote occurs on the amendment.

All in favor, say aye.

Those opposed, say no.

The ayes have it, and the amendment is agreed to.

Next, we have the Sherrill amendment, the—on the roster and offered by the gentlelady from New Jersey, and she is recognized.

Ms. SHERILL. Thank you, Madam Chair. I have an amendment at the desk.

Chairwoman JOHNSON. The clerk will read the amendment.

The CLERK. Amendment No. 3, amendment to Committee print——

[The amendment of Ms. Sherrill follows:]

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AMENDMENT TO

COMMITTEE PRINT OF H.R. 2986

OFFERED BY M.S. Sherrill

Page 2, line 18, strike "and".

Page 2, line 21, strike the period and insert "; and"

Page 2, after line 21, insert the following new subparagraph:

(F) support research and development of advanced manufacturing technologies that have the potential to improve United States competitiveness in energy storage manufacturing.

☒

Chairwoman JOHNSON. I ask unanimous consent to dispense with the reading. Without objection, so ordered.

I recognize the gentlelady from New Jersey for five minutes to explain the amendment.

Ms. SHERRILL. Thank you, Chairwoman Johnson and Ranking Member Lucas, for holding this markup today. I also want to thank the gentleman from Illinois, Representative Foster, for his work on this bipartisan legislation.

My amendment requires the Secretary to support research and development of manufacturing technologies that have the potential to improve U.S. competitiveness in energy storage manufacturing. This alliance with the Department of Energy's vision for establishing a domestic supply chain for energy storage by 2030 and serves two goals that we all support: promoting our national security and promoting economic development.

Energy storage is a major focus of New Jersey's plan to create a sustainable energy future. To increase the amount of clean renewable energy on the grid, energy storage is necessary to enhance the grid's ability to manage greater variability and demand for electricity. New Jersey is pursuing targets of 600 megawatts of electricity storage by 2021 and 2,000 megawatts by 2030.

We are leading the Nation on this front, and I promise you, demand for electricity storage technologies is only going to grow. The question is will we capitalize and make the United States the global powerhouse for energy storage and manufacturing? We created groundbreaking advancements in solar energy but then ceded the manufacturing base to countries like Germany and China. We are a global leader in developing energy storage technologies. We should do everything possible to also lead the world in manufacturing them.

I thank the Committee for working on a bipartisan basis to promote energy storage. I urge support for my amendment and the underlying bill, and I yield back.

Chairwoman JOHNSON. Thank you. Any further discussion on the amendment?

Hearing none, all in favor, say aye.

Those opposed, say no.

The ayes have it, and the amendment is agreed to.

Now, if there are any other amendments, they can be presented now.

If no, a reporting quorum being present, I move that the Committee on Science, Space, and Technology report H.R. 2986, as amendment—amended to the House with the recommendation that the bill be approved.

Those in favor of the motion will signify by saying aye.

Those no—those opposed, say no.

The ayes have it, and the bill is favorably reported.

Without objection, the motion to reconsider is laid on the table, and I ask unanimous consent that the staff be authorized to make any necessary technical and conforming changes to the bill. Without objection, so ordered.

Members will have two subsequent calendar days in which to submit supplementary minority or additional views on the measure.

○