

ARPA-E REAUTHORIZATION ACT OF 2019

JUNE 18, 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. 4091]

[Including cost estimate of the Congressional Budget Office]

The Committee on Science, Space, and Technology, to whom was referred the bill (H.R. 4091) to amend the America COMPETES Act to reauthorize the ARPA-E program, and for other purposes, having considered the same, reports favorably thereon with an amendment and recommends that the bill as amended do pass.

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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 “ARPA–E Reauthorization Act of 2019”.

SEC. 2. ARPA–E AMENDMENTS.

(a) **ESTABLISHMENT.**—Section 5012(b) of the America COMPETES Act (42 U.S.C. 16538(b)) is amended by striking “development of energy technologies” and inserting “development of transformative science and technology solutions to address the energy and environmental missions of the Department”.

(b) **GOALS.**—Section 5012(c) of the America COMPETES Act (42 U.S.C. 16538(c)) is amended—

(1) by striking paragraph (1)(A) and inserting the following:

“(A) to enhance the economic and energy security of the United States through the development of energy technologies that—

“(i) reduce imports of energy from foreign sources;

“(ii) reduce energy-related emissions, including greenhouse gases;

“(iii) improve the energy efficiency of all economic sectors;

“(iv) provide transformative solutions to improve the management, clean-up, and disposal of radioactive waste and spent nuclear fuel; and

“(v) improve the resilience, reliability, and security of infrastructure to produce, deliver, and store energy; and”;

(2) in paragraph (2), in the matter preceding subparagraph (A), by striking “energy technology projects” and inserting “advanced technology projects”.

(c) **RESPONSIBILITIES.**—Section 5012(e)(3)(A) of the America COMPETES Act (42 U.S.C. 16538(e)(3)(A)) is amended by striking “energy”.

(d) **REPORTS AND ROADMAPS.**—Section 5012(h) of the America COMPETES Act (42 U.S.C. 16538(h)) is amended to read as follows:

“(h) **REPORTS AND ROADMAPS.**—

“(1) **ANNUAL REPORT.**—As part of the annual budget request submitted for each fiscal year, the Director shall provide to the relevant authorizing and appropriations committees of Congress a report that—

“(A) describes projects supported by ARPA–E during the previous fiscal year;

“(B) describes projects supported by ARPA–E during the previous fiscal year that examine topics and technologies closely related to other activities funded by the Department, and includes an analysis of whether in supporting such projects, the Director is in compliance with subsection (i)(1)(A); and

“(C) describes current, proposed, and planned projects to be carried out pursuant to subsection (e)(3)(D).

“(2) **STRATEGIC VISION ROADMAP.**—Not later than October 1, 2021, and every four years thereafter, the Director shall provide to the relevant authorizing and appropriations committees of Congress a roadmap describing the strategic vision that ARPA–E will use to guide the choices of ARPA–E for future technology investments over the following 4 fiscal years.”

(e) **COORDINATION AND NONDUPLICATION.**—Section 5012(i)(1) of the America COMPETES Act (42 U.S.C. 16538(i)(1)) is amended to read as follows:

“(1) **IN GENERAL.**—To the maximum extent practicable, the Director shall ensure that—

“(A) the activities of ARPA–E are coordinated with, and do not duplicate the efforts of, programs and laboratories within the Department and other relevant research agencies; and

“(B) ARPA–E does not provide funding for a project unless the prospective grantee demonstrates sufficient attempts to secure private financing or indicates that the project is not independently commercially viable.”

(f) **EVALUATION.**—Section 5012(l) of the America COMPETES Act (42 U.S.C. 16538(l)) is amended—

(1) by striking paragraph (1) and inserting the following:

“(1) **IN GENERAL.**—Not later than 3 years after the date of enactment of the ARPA–E Reauthorization Act of 2019, the Secretary is authorized to enter into a contract with the National Academy of Sciences under which the National Academy shall conduct an evaluation of how well ARPA–E is achieving the goals and mission of ARPA–E.”; and

(2) in paragraph (2)—

(A) in the matter preceding subparagraph (A), by striking “shall” and inserting “may”; and

(B) in subparagraph (A), by striking “the recommendation of the National Academy of Sciences” and inserting “a recommendation”.

(g) AUTHORIZATION OF APPROPRIATIONS.—Paragraph (2) of section 5012(o) of the America COMPETES Act (42 U.S.C. 16538(o)) is amended to read as follows:

“(2) AUTHORIZATION OF APPROPRIATIONS.—Subject to paragraph (4), there are authorized to be appropriated to the Director for deposit in the Fund, without fiscal year limitation—

“(A) \$428,000,000 for fiscal year 2020;

“(B) \$497,000,000 for fiscal year 2021;

“(C) \$567,000,000 for fiscal year 2022;

“(D) \$651,000,000 for fiscal year 2023; and

“(E) \$750,000,000 for fiscal year 2024.”

(h) TECHNICAL AMENDMENTS.—Section 5012 of the America COMPETES Act (42 U.S.C. 16538) is amended—

(1) in subsection (g)(3)(A)(iii), by striking “subpart” each place it appears and inserting “subparagraph”; and

(2) in subsection (o)(4)(B), by striking “(c)(2)(D)” and inserting “(c)(2)(C)”.

II. PURPOSE OF THE BILL

The purpose of H.R. 4091, the *ARPA–E Reauthorization Act of 2019* is to provide the Department of Energy (DOE) with effective guidance, capabilities, and resources to support and expand the mission of the Advanced Research Program Agency–Energy (ARPA–E), which is to overcome long-term and high-risk technology barriers in the development of energy and energy-relevant technologies. H.R. 4091 is sponsored by Chairwoman Johnson and cosponsored by Ranking Member Lucas, Energy Subcommittee Chairwoman Fletcher, Mr. Graves, Ms. Castor, Mr. Baird, Mr. Beyer, Mr. Mast, Mr. Tonko, Mr. Riggleman, Mr. Foster, Mr. Fortenberry, Mr. Swalwell, Mr. Katko, Ms. Watson Coleman, Mr. Crenshaw, Ms. Jackson Lee, Mr. Bacon, Mr. Lipinski, Mr. Marshall, Mr. Deutch, Mr. Fitzpatrick, Mr. Connolly, Mr. Hurd, Mr. Cohen, Ms. Stefanik, Mr. Schiff, Mr. Gonzalez, Mr. Casten, Ms. González-Colon, Mr. McNerney, Mr. Rooney, Mr. Rouda, Mr. Waltz, Mr. Lamb, Ms. Herrera-Beutler, Ms. Bonamici, Mr. Balderson, Ms. Luria, Mr. Woodall, Mr. Case, Mr. Fleischmann, Ms. Stevens, Ms. Brooks, Ms. Horn, Mr. Gallagher, Mr. Perlmutter, Mr. Pappas, Ms. Slotkin, Ms. Brownley, Mr. Lynch, Mr. Crow, Mr. Allred, Ms. Sherrill, Mr. Neguse, Mr. Schneider, Mr. Luján, Mr. Huffman, Mr. Peters, Mr. Himes, Mr. Welch, Mr. Moulton, Ms. Houlihan, Ms. Axne, Mr. Keating, Ms. Wild, Ms. Eshoo, Ms. Porter, Ms. Spanberger, Mr. Doyle, Mr. Scott (VA), and Mr. Desaulnier.

III. BACKGROUND AND NEED FOR THE LEGISLATION

In 2005, Congress requested a report from the National Academies to identify what federal actions could “enhance the science and technology enterprise so that the United States can successfully compete, prosper, and be secure in the global community of the 21st century”.¹ The subsequent report, *Rising Above the Gathering Storm*, made a series of recommendations to enhance the Nation’s technological competitiveness, including the creation of a new energy agency within DOE modeled after the Defense Advanced Research Program Agency (DARPA) within the Department of De-

¹National Academies of Sciences, Engineering, and Medicine 2007. *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/11463>.

fense.² In 2007, the U.S. Congress authorized such a program, now known as ARPA-E, as a part of the America COMPETES Act. In accordance with its statute, ARPA-E’s objectives are:

“(A) to enhance the economic and energy security of the United States through the development of energy technologies that result in—

- (i) reductions of imports of energy from foreign sources;
- (ii) reductions of energy-related emissions, including greenhouse gases; and
- (iii) improvement in the energy efficiency of all economic sectors; and

“(B) to ensure that the United States maintains a technological lead in developing and deploying advanced energy technologies”.³

While ARPA-E was authorized in 2007, it did not receive funding until the passage of the *American Recovery and Reinvestment Act of 2009*, which included \$400 million to build and support the agency over a two-year period.⁴

Since 2009, 82 projects supported by ARPA-E have led to the formation of new companies, 219 have partnered with non-DOE government agencies, and 161 have attracted over \$3.2 billion in private sector follow-on funding. ARPA-E projects have also produced 385 U.S. patents and 3,658 peer reviewed journal articles.⁵

Included in ARPA-E’s initial authorization was a requirement that it receive an independent evaluation from the National Academies of Science after its first four years.⁶ The National Academies of Science conducted this review beginning in 2015 and published its results in *An Assessment of ARPA-E*, in 2017. In summary, the report concluded that ARPA-E was making significant, unique contributions to the U.S.’s energy research and development enterprise.⁷ This review also found that a substantial increase in funding would be necessary for ARPA-E to be able to sufficiently support the scale-up of particularly promising technologies, such as advanced technologies for energy storage and power electronics, that were previously supported by the agency but (1) are still too risky to be supported by the private sector alone; and (2) other DOE programs are ill-suited to steward.

Substantial growth in funding for ARPA-E is consistent with the original recommendations of the National Academies for establishing and supporting ARPA-E in its *Rising Above the Gathering Storm* report,⁸ as well as more recent recommendations from the Bipartisan Policy Center’s American Energy Innovation Council

²“ARPA-E History.” Department of Energy. Accessed 7 Feb 2019. <https://arpa-e.energy.gov/?q=arpa-e-site-page/arpa-e-history>.

³America COMPETES Act. Pub. L. 110–69. 121 Stat. 621. 9 Aug 2007.

⁴“ARPA-E History.” Department of Energy. Accessed 7 Feb 2019. <https://arpa-e.energy.gov/?q=arpa-e-site-page/arpa-e-history>.

⁵“ARPA-E Impact.” Department of Energy. Accessed 14 Feb 2019. <https://arpa-e.energy.gov/?q=site-page/arpa-e-impact>.

⁶America COMPETES Act. Pub. L. 110–69. 121 Stat. 624. 9 Aug 2007.

⁷National Academies of Sciences, Engineering, and Medicine 2017. *An Assessment of ARPA-E*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/24778>.

⁸National Academies of Sciences, Engineering, and Medicine 2007. *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/11463>.

(AEIC),⁹ the Information Technology and Innovation Foundation (ITIF),¹⁰ and the Energy Futures Initiative.¹¹

Further, according to data provided by the agency, ARPA-E has only been able to support 1% of the proposals submitted for its Open Funding Opportunity Announcements, and has only been able to support 12% of the proposals submitted for its Focused Funding Opportunity Announcements.

Taking into account the above issues and recommendations regarding funding levels for ARPA-E, H.R. 4091 would authorize substantial growth in federal support for the agency through FY 2024. It would also require the Department to prevent unnecessary duplication between ARPA-E's initiatives and other research across DOE programs. And the bill codifies a rigorous approval process that ensures that each applicant has either first sought private investment before applying for ARPA-E grants or determined that their proposed project is not independently commercially viable.

Other provisions in this bill include explicit authorization for ARPA-E to provide assistance in addressing DOE's significant nuclear waste clean-up and management issues, consistent with the recommendations of a National Academies report¹² released earlier this year. And it includes authorization for ARPA-E to support projects to improve the resilience, reliability, and security of the U.S.'s energy infrastructure.

Authorizing language from the America COMPETES Reauthorization Act of 2010 (P.L. 111-58), including expired funding authorization levels through 2013, provides the most recent comprehensive legislative direction for ARPA-E, with an additional specific provision protecting sensitive private business information from disclosure provided in the *Department of Energy Research and Innovation Act* (P.L. 115-246) in 2018. H.R. 4091 would build upon this prior authorization, taking into consideration the program's record thus far as well as recent recommendations from independent reviews and stakeholders.

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:

The Subcommittee on Energy held a legislative hearing on February 26, 2019 to assess the role that ARPA-E plays in accelerating the development of innovative energy technologies, and to examine ways that Congress and the Administration may be able to improve ARPA-E's capabilities to spur transformational techno-

⁹"Energy Innovation: Fueling American's Economic Engine." American Energy Innovation Council. Published Nov 2018. <http://americanenergyinnovation.org/wp-content/uploads/2018/11/Energy-Innovation-Fueling-Americas-Economic-Engine.pdf>.

¹⁰Hart, David. Kearney, Michael. "ARPA-E: Versatile Catalyst for U.S. Energy Innovation." Information Technology & Innovation Foundation. Published Nov 2017. <http://www2.itif.org/2017-arpae-energy-innovation.pdf>.

¹¹Moniz, Ernest. Yergin, Daniel. "Advancing the Landscape of Clean Energy Innovation." Breakthrough Energy. Published February 2019. <https://energyfuturesinitiative.org/news/2019/2/6/clean-energy-innovation-report>.

¹²National Academies of Sciences, Engineering, and Medicine 2019. "Independent Assessment of Science and Technology for the Department of Energy's Defense Environmental Cleanup Program." Washington, DC: The National Academies Press. <https://doi.org/10.17226/25338>.

logical advances in pursuit of the agency’s energy and environmental missions.

WITNESSES

Dr. Arun Majumdar, Jay Precourt Provostial Chair Professor at Stanford University. Dr. Majumdar was the founding Director of ARPA–E from 2009 to 2012.

Dr. Ellen D. Williams, Distinguished University Professor in the Department of Physics at the University of Maryland. Dr. Williams was the Director of ARPA–E from 2014 through the end of the Obama Administration.

Dr. John Wall, Retired Chief Technology Officer for Cummins Inc., Member of the Committee on Evaluation for the 2017 National Academies review of ARPA–E.

Dr. Saul Griffith, Founder and CEO of Otherlab.

Mr. Mark P. Mills, Senior Fellow, Manhattan Institute.

V. COMMITTEE CONSIDERATION AND VOTES

The Subcommittee on Energy met to consider H.R. 4091 on September 11, 2019.

Mr. Foster offered an amendment to establish a Chief Evaluation Officer position at ARPA–E. *The amendment was withdrawn.*

Mr. Baird offered an amendment to reduce the amounts authorized to be appropriated to carry out the Act. *The amendment was rejected by voice vote.*

H.R. 4091 was forwarded by the Subcommittee to the full Committee by voice vote.

The Full Committee met to consider H.R. 4091 on October 17, 2019.

Chairwoman Johnson offered a Manager’s amendment to ensure that ARPA–E coordinates its activities with other programs at DOE to avoid duplicative RD&D projects. The amendment also reduces the amounts authorized to be appropriated to carry out the Act during fiscal years 2021–2024, lowering the authorization to \$750,000,000 in 2024. *The amendment was agreed to by voice vote.*

Mr. Foster offered an amendment to establish a Chief Evaluation Officer position at ARPA–E. *The amendment was withdrawn.*

H.R. 4091 was forwarded by the full Committee to the full House (as amended) by voice vote.

VI. SUMMARY OF MAJOR PROVISIONS OF THE BILL

H.R. 4091 would authorize substantial growth in federal support for ARPA–E through FY 2024 and includes policy direction to ensure coordination and nonduplication of ARPA–E programs across the Department. It also includes explicit authorization for ARPA–E to provide assistance in addressing DOE’s significant nuclear waste clean-up and management issues, and it authorizes the agency to support projects to improve the resilience, reliability, and security of the U.S.’s energy infrastructure.

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

Section 1. Short title

ARPA–E Reauthorization Act of 2019.

Section 2. ARPA-E amendments

Amends the America COMPETES Act (42 U.S.C. 16538(b)) to authorize ARPA-E to support projects addressing nuclear waste clean-up and management, and to improve the resilience, reliability, and security of our energy infrastructure, in addition to its existing missions.

Adds an annual reporting requirement on ARPA-E's scale-up, demonstration, and coordination activities.

Requires the Director of ARPA-E to produce and provide to Congress a strategic vision roadmap every four years.

Ensures that ARPA-E coordinates with other DOE programs to avoid unintentional duplication of RD&D activities across programs.

Ensures that ARPA-E does not provide funding for a project unless it demonstrates sufficient attempts to secure private financing or indicates lack of independent commercial viability.

Authorizes the Secretary to enter into a contract with the National Academies to conduct an evaluation of the program no later than three years after the date of enactment.

Authorizes annual funding increases over five years for ARPA-E, beginning with \$497 million in 2021 and rising to \$750 million in 2024, to carry out the Act.

VIII. COMMITTEE VIEWS

While H.R. 4091 authorizes ARPA-E to identify and support high-risk, high-reward research activities that have the potential to achieve breakthroughs in addressing DOE's significant nuclear waste clean-up and management issues, it is not the intent of the Committee for these activities to be a replacement for a robust, ongoing research program stewarded by the Department's Office of Environmental Management to make further progress in addressing these issues. If the Director of ARPA-E chooses to utilize this new authority, then the Committee expects that the Director would initially establish one research program on this topic of approximately the average scale and duration of ARPA-E's other targeted research programs.

While the Committee recognizes ARPA-E's important role in supporting DOE research over a wide range of groundbreaking technology areas and acknowledges the value of complementary and coordinated research, the Committee would appreciate greater clarity regarding the differences between ARPA-E supported projects and those in closely related areas supported by other DOE programs. The Committee would also like more information on the extent or nature of any collaborative research efforts such as data or results sharing between ARPA-E and DOE's other applied programs. Understanding this data is critical to avoiding potential unintended duplication at the Department and evaluating the overall performance of the ARPA-E portfolio.

In October 2019, the Committee submitted a request to the Government Accountability Office to further explore potential crossover between ARPA-E and other programs funded by the DOE, and provide potential recommendations to limit unnecessary or unintended duplication of ARPA-E funded research programs.

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, November 5, 2019.

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. 4091, the ARPA-E Reauthorization Act of 2019.

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. 4091, ARPA-E Reauthorization Act of 2019			
As ordered reported by the House Committee on Science, Space, and Technology on October 17, 2019			
By Fiscal Year, Millions of Dollars	2020	2020-2024	2020-2029
Direct Spending (Outlays)	0	0	0
Revenues	0	0	0
Increase in the Deficit	0	0	0
Spending Subject to Appropriation (Outlays)	2	690	2,510
Statutory pay-as-you-go procedures apply?	No	Mandate Effects	
Increases on-budget deficits in any of the four consecutive 10-year periods beginning in 2030?	No	Contains intergovernmental mandate?	No
		Contains private-sector mandate?	No

H.R. 4091 would reauthorize activities of the Advanced Research Projects Agency–Energy (ARPA–E), an agency tasked with researching and developing transformative energy technologies, through fiscal year 2024. The bill also would amend ARPA–E’s requirements for submitting annual reports and strategic vision roadmaps to the Congress.

H.R. 4091 would authorize appropriations totaling \$2.9 billion over the 2020–2024 period. In 2019, the Congress appropriated \$366 million for ARPA–E. Because CBO scores continuing resolutions on an annualized basis, in 2020 CBO assumes that the same amount of funds will be available under the current continuing resolution (Public Law 116–59). As a result, CBO estimates that H.R.

4091 would authorize an increase in spending subject to appropriation in 2020 of \$62 million, the difference between the authorized amount and the annualized amount under the continuing resolution. Based on historical spending patterns, and assuming appropriation of the authorized and necessary amounts, CBO estimates that implementing H.R. 4091 would cost \$690 million over the 2020–2024 period and \$1.8 billion after 2024.

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

TABLE 1—ESTIMATED INCREASES IN SPENDING SUBJECT TO APPROPRIATION UNDER H.R. 4091

	By fiscal year, millions of dollars—												
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2020– 2024	2020– 2029	
Authorization ^a	62	497	567	651	750	0	0	0	0	0	2,527	2,527	
Estimated Outlays	2	21	79	197	391	536	550	463	230	41	690	2,510	

^a H.R. 4091 would authorize the appropriation of \$428 million in 2020 for ARPA-E activities. However, CBO estimates that \$366 million has been allocated on an annualized basis from funds made available under the continuing resolution (Public Law 116-59), which provided appropriations through November 21, 2019. Thus, the estimated authorization for 2020 (\$62 million) is equal to the specified amount (\$428 million) minus the annualized amount from the continuing resolution (\$366 million).

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

XI. FEDERAL MANDATES STATEMENT

H.R. 4091 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

The goal of H.R. 4091 is to support and expand the mission of the Advanced Research Program Agency–Energy (ARPA–E)—overcoming long-term and high-risk technology barriers in the development of energy and energy-relevant technologies.

XIV. FEDERAL ADVISORY COMMITTEE STATEMENT

H.R. 4091 does not create any 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. 4091 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. 4091 contains no earmarks, limited tax benefits, or limited tariff benefits.

XVII. APPLICABILITY TO THE LEGISLATIVE BRANCH

The Committee finds that H.R. 4091 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):

AMERICA COMPETES ACT

* * * * *

TITLE V—DEPARTMENT OF ENERGY

* * * * *

SEC. 5012. ADVANCED RESEARCH PROJECTS AGENCY—ENERGY.

(a) DEFINITIONS.—In this section:

(1) ARPA-E.—The term “ARPA-E” means the Advanced Research Projects Agency–Energy established by subsection (b).

(2) DIRECTOR.—The term “Director” means the Director of ARPA-E appointed under subsection (d).

(3) FUND.—The term “Fund” means the Energy Transformation Acceleration Fund established under subsection (o)(1).

(b) ESTABLISHMENT.—There is established the Advanced Research Projects Agency–Energy within the Department to overcome the long-term and high-risk technological barriers in the **development of energy technologies** *development of transformative science and technology solutions to address the energy and environmental missions of the Department.*

(c) GOALS.—

(1) IN GENERAL.—The goals of ARPA-E shall be—

[(A) to enhance the economic and energy security of the United States through the development of energy technologies that result in—

[(i) reductions of imports of energy from foreign sources;

[(ii) reductions of energy-related emissions, including greenhouse gases; and

[(iii) improvement in the energy efficiency of all economic sectors; and]

(A) *to enhance the economic and energy security of the United States through the development of energy technologies that—*

(i) reduce imports of energy from foreign sources;

(ii) reduce energy-related emissions, including greenhouse gases;

(iii) improve the energy efficiency of all economic sectors;

(iv) provide transformative solutions to improve the management, clean-up, and disposal of radioactive waste and spent nuclear fuel; and

(v) improve the resilience, reliability, and security of infrastructure to produce, deliver, and store energy; and

(B) *to ensure that the United States maintains a technological lead in developing and deploying advanced energy technologies.*

(2) MEANS.—ARPA-E shall achieve the goals established under paragraph (1) through [energy technology projects] *advanced technology projects* by—

(A) *identifying and promoting revolutionary advances in fundamental and applied sciences;*

(B) *translating scientific discoveries and cutting-edge inventions into technological innovations; and*

(C) *accelerating transformational technological advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty.*

(d) DIRECTOR.—

(1) APPOINTMENT.—There shall be in the Department of Energy a Director of ARPA-E, who shall be appointed by the President, by and with the advice and consent of the Senate.

(2) QUALIFICATIONS.—The Director shall be an individual who, by reason of professional background and experience, is especially qualified to advise the Secretary on, and manage research programs addressing, matters pertaining to long-term and high-risk technological barriers to the development of energy technologies.

(3) RELATIONSHIP TO SECRETARY.—The Director shall report to the Secretary.

(4) RELATIONSHIP TO OTHER PROGRAMS.—No other programs within the Department shall report to the Director.

(e) RESPONSIBILITIES.—The responsibilities of the Director shall include—

(1) *approving all new programs within ARPA-E;*

(2) *developing funding criteria and assessing the success of programs through the establishment of technical milestones;*

(3) *administering the Fund through awards to institutions of higher education, companies, research foundations, trade and industry research collaborations, or consortia of such entities, which may include federally-funded research and development*

centers, to achieve the goals described in subsection (c) through targeted acceleration of—

- (A) novel early-stage [energy] research with possible technology applications;
 - (B) development of techniques, processes, and technologies, and related testing and evaluation;
 - (C) research and development of advanced manufacturing process and technologies for the domestic manufacturing of novel energy technologies; and
 - (D) coordination with nongovernmental entities for demonstration of technologies and research applications to facilitate technology transfer;
- (4) terminating programs carried out under this section that are not achieving the goals of the programs; and
- (5) pursuant to subsection (c)(2)(C)—
- (A) ensuring that applications for funding disclose the extent of current and prior efforts, including monetary investments as appropriate, in pursuit of the technology area for which funding is being requested;
 - (B) adopting measures to ensure that, in making awards, program managers adhere to the purposes of subsection (c)(2)(C); and
 - (C) providing as part of the annual report required by subsection (h)(1) a summary of the instances of and reasons for ARPA-E funding projects in technology areas already being undertaken by industry.

(f) AWARDS.—In carrying out this section, the Director may provide awards in the form of grants, contracts, cooperative agreements, cash prizes, and other transactions.

(g) PERSONNEL.—

(1) IN GENERAL.—The Director shall establish and maintain within ARPA-E a staff with sufficient qualifications and expertise to enable ARPA-E to carry out the responsibilities of ARPA-E under this section in conjunction with other operations of the Department.

(2) PROGRAM DIRECTORS.—

(A) IN GENERAL.—The Director shall designate employees to serve as program directors for the programs established pursuant to the responsibilities established for ARPA-E under subsection (e).

(B) RESPONSIBILITIES.—A program director of a program shall be responsible for—

(i) establishing research and development goals for the program, including through the convening of workshops and conferring with outside experts, and publicizing the goals of the program to the public and private sectors;

(ii) soliciting applications for specific areas of particular promise, especially areas that the private sector or the Federal Government are not likely to undertake alone;

(iii) building research collaborations for carrying out the program;

(iv) selecting on the basis of merit each of the projects to be supported under the program after considering—

(I) the novelty and scientific and technical merit of the proposed projects;

(II) the demonstrated capabilities of the applicants to successfully carry out the proposed project;

(III) the consideration by the applicant of future commercial applications of the project, including the feasibility of partnering with 1 or more commercial entities; and

(IV) such other criteria as are established by the Director;

(v) identifying innovative cost-sharing arrangements for ARPA-E projects, including through use of the authority provided under section 988(b)(3) of the Energy Policy Act of 2005 (42 U.S.C. 16352(b)(3));

(vi) monitoring the progress of projects supported under the program;

(vii) identifying mechanisms for commercial application of successful energy technology development projects, including through establishment of partnerships between awardees and commercial entities; and

(viii) recommending program restructure or termination of research partnerships or whole projects.

(C) TERM.—The term of a program manager shall be not more than 3 years and may be renewed.

(3) HIRING AND MANAGEMENT.—

(A) IN GENERAL.—The Director shall have the authority to—

(i) make appointments of scientific, engineering, and professional personnel without regard to the civil service laws;

(ii) fix the basic pay of such personnel at a rate to be determined by the Director at rates not in excess of Level II of the Executive Schedule (EX-II) without regard to the civil service laws; and

(iii) pay any employee appointed under this [subpart] *subparagraph* payments in addition to basic pay, except that the total amount of additional payments paid to an employee under this [subpart] *subparagraph* for any 12-month period shall not exceed the least of the following amounts:

(I) \$25,000.

(II) The amount equal to 25 percent of the annual rate of basic pay of the employee.

(III) The amount of the limitation that is applicable for a calendar year under section 5307(a)(1) of title 5, United States Code.

(B) NUMBER.—The Director shall appoint not more than 120 personnel under this section.

(C) PRIVATE RECRUITING FIRMS.—The Secretary, or the Director serving as an agent of the Secretary, may contract

with private recruiting firms for the hiring of qualified technical staff to carry out this section.

(D) ADDITIONAL STAFF.—The Director may use all authorities in existence on the date of enactment of this Act that are provided to the Secretary to hire administrative, financial, and clerical staff as necessary to carry out this section.

[(h) REPORTS AND ROADMAPS.—

[(1) ANNUAL REPORT.—As part of the annual budget request submitted for each fiscal year, the Director shall provide to the relevant authorizing and appropriations committees of Congress a report describing projects supported by ARPA-E during the previous fiscal year.

[(2) STRATEGIC VISION ROADMAP.—Not later than October 1, 2010, and October 1, 2013, the Director shall provide to the relevant authorizing and appropriations committees of Congress a roadmap describing the strategic vision that ARPA-E will use to guide the choices of ARPA-E for future technology investments over the following 3 fiscal years.]

(h) REPORTS AND ROADMAPS.—

(1) ANNUAL REPORT.—As part of the annual budget request submitted for each fiscal year, the Director shall provide to the relevant authorizing and appropriations committees of Congress a report that—

(A) describes projects supported by ARPA-E during the previous fiscal year;

(B) describes projects supported by ARPA-E during the previous fiscal year that examine topics and technologies closely related to other activities funded by the Department, and includes an analysis of whether in supporting such projects, the Director is in compliance with subsection (i)(1)(A); and

(C) describes current, proposed, and planned projects to be carried out pursuant to subsection (e)(3)(D).

(2) STRATEGIC VISION ROADMAP.—Not later than October 1, 2021, and every four years thereafter, the Director shall provide to the relevant authorizing and appropriations committees of Congress a roadmap describing the strategic vision that ARPA-E will use to guide the choices of ARPA-E for future technology investments over the following 4 fiscal years.

(i) COORDINATION AND NONDUPLICATION.—

[(1) IN GENERAL.—To the maximum extent practicable, the Director shall ensure that the activities of ARPA-E are coordinated with, and do not duplicate the efforts of, programs and laboratories within the Department and other relevant research agencies.]

(1) IN GENERAL.—To the maximum extent practicable, the Director shall ensure that—

(A) the activities of ARPA-E are coordinated with, and do not duplicate the efforts of, programs and laboratories within the Department and other relevant research agencies; and

(B) ARPA-E does not provide funding for a project unless the prospective grantee demonstrates sufficient attempts to

secure private financing or indicates that the project is not independently commercially viable.

(2) TECHNOLOGY TRANSFER COORDINATOR.—To the extent appropriate, the Director may coordinate technology transfer efforts with the Technology Transfer Coordinator appointed under section 1001 of the Energy Policy Act of 2005 (42 U.S.C. 16391).

(j) FEDERAL DEMONSTRATION OF TECHNOLOGIES.—The Director shall seek opportunities to partner with purchasing and procurement programs of Federal agencies to demonstrate energy technologies resulting from activities funded through ARPA-E.

(k) ADVICE.—

(1) ADVISORY COMMITTEES.—The Director may seek advice on any aspect of ARPA-E from—

(A) an existing Department of Energy advisory committee; and

(B) a new advisory committee organized to support the programs of ARPA-E and to provide advice and assistance on—

(i) specific program tasks; or

(ii) overall direction of ARPA-E.

(2) ADDITIONAL SOURCES OF ADVICE.—In carrying out this section, the Director may seek advice and review from—

(A) the President's Committee of Advisors on Science and Technology; and

(B) any professional or scientific organization with expertise in specific processes or technologies under development by ARPA-E.

(l) ARPA-E EVALUATION.—

[(1) IN GENERAL.—After ARPA-E has been in operation for 6 years, the Secretary shall offer to enter into a contract with the National Academy of Sciences under which the National Academy shall conduct an evaluation of how well ARPA-E is achieving the goals and mission of ARPA-E.]

(1) IN GENERAL.—Not later than 3 years after the date of enactment of the ARPA-E Reauthorization Act of 2019, the Secretary is authorized to enter into a contract with the National Academy of Sciences under which the National Academy shall conduct an evaluation of how well ARPA-E is achieving the goals and mission of ARPA-E.

(2) INCLUSIONS.—The evaluation [shall] *may* include—

(A) [the recommendation of the National Academy of Sciences] *a recommendation* on whether ARPA-E should be continued or terminated; and

(B) a description of lessons learned from operation of ARPA-E, and the manner in which those lessons may apply to the operation of other programs of the Department.

(3) AVAILABILITY.—On completion of the evaluation, the evaluation shall be made available to Congress and the public.

(m) EXISTING AUTHORITIES.—The authorities granted by this section are—

(1) in addition to existing authorities granted to the Secretary; and

(2) are not intended to supersede or modify any existing authorities.

(n) PROTECTION OF INFORMATION.—The following types of information collected by ARPA-E from recipients of financial assistance awards shall be considered commercial and financial information obtained from a person and privileged or confidential and not subject to disclosure under section 552(b)(4) of title 5, United States Code:

(1) Plans for commercialization of technologies developed under the award, including business plans, technology-to-market plans, market studies, and cost and performance models.

(2) Investments provided to an awardee from third parties (such as venture capital firms, hedge funds, and private equity firms), including amounts and the percentage of ownership of the awardee provided in return for the investments.

(3) Additional financial support that the awardee—

(A) plans to or has invested into the technology developed under the award; or

(B) is seeking from third parties.

(4) Revenue from the licensing or sale of new products or services resulting from research conducted under the award.

(o) FUNDING.—

(1) FUND.—There is established in the Treasury of the United States a fund, to be known as the “Energy Transformation Acceleration Fund”, which shall be administered by the Director for the purposes of carrying out this section.

[(2) AUTHORIZATION OF APPROPRIATIONS.—Subject to paragraphs (4) and (5), there are authorized to be appropriated to the Director for deposit in the Fund, without fiscal year limitation—

[(A) \$300,000,000 for fiscal year 2008;

[(B) such sums as are necessary for each of fiscal years 2009 and 2010;

[(C) \$300,000,000 for fiscal year 2011;

[(D) \$306,000,000 for fiscal year 2012; and

[(E) \$312,000,000 for fiscal year 2013.]

(2) AUTHORIZATION OF APPROPRIATIONS.—*Subject to paragraph (4), there are authorized to be appropriated to the Director for deposit in the Fund, without fiscal year limitation—*

(A) \$428,000,000 for fiscal year 2020;

(B) \$497,000,000 for fiscal year 2021;

(C) \$567,000,000 for fiscal year 2022;

(D) \$651,000,000 for fiscal year 2023; and

(E) \$750,000,000 for fiscal year 2024.

(3) SEPARATE BUDGET AND APPROPRIATION.—

(A) BUDGET REQUEST.—The budget request for ARPA-E shall be separate from the rest of the budget of the Department.

(B) APPROPRIATIONS.—Appropriations to the Fund shall be separate and distinct from the rest of the budget for the Department.

(4) ALLOCATION.—Of the amounts appropriated for a fiscal year under paragraph (2)—

(A) not more than 50 percent of the amount shall be used to carry out subsection (e)(3)(D);

(B) at least 5 percent of the amount shall be used for technology transfer and outreach activities, consistent with the goal described in subsection ~~[(c)(2)(D)]~~ (c)(2)(C) and within the responsibilities of program directors described in subsection (g)(2)(B)(vii); and

(C) no funds may be used for construction of new buildings or facilities during the 5-year period beginning on the date of enactment of this Act.

* * * * *

XX. PROCEEDINGS OF THE SUBCOMMITTEE MARKUP

**MARKUPS:
H.R. 4901, ARPA-E
REAUTHORIZATION ACT OF 2019; AND
H.R. 4230, CLEAN INDUSTRIAL
TECHNOLOGY ACT OF 2019**

MARKUP
BEFORE THE
SUBCOMMITTEE ON ENERGY
OF THE
COMMITTEE ON SCIENCE, SPACE, AND
TECHNOLOGY
HOUSE OF REPRESENTATIVES
ONE HUNDRED SIXTEENTH CONGRESS
FIRST SESSION

SEPTMBER 11, 2019

Serial No. CP 116-7

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C O N T E N T S

September 11, 2019

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H.R. 4230— <i>Clean Industrial Technology Act of 2019</i>	00

**MARKUPS:
H.R. 4091, ARPA-E
REAUTHORIZATION ACT OF 2019; AND
H.R. 4230, CLEAN INDUSTRIAL
TECHNOLOGY ACT OF 2019**

WEDNESDAY, SEPTEMBER 11, 2019

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

The Subcommittee met, pursuant to notice, at 10:07 a.m., in room 2318, 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 recess at any time. Pursuant to Committee rule 2(e) and House rule XI, 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. 4091, the *ARPA-E Reauthorization Act of 2019*, and H.R. 4230, the *Clean Industrial Technology Act of 2019*.

I'm pleased to consider these two bipartisan bills today. I think they are absolutely essential to our Nation's clean energy future. They were considered at three hearings earlier this Congress where we brought together experts from industry, academia, and the Department of Energy (DOE). We talked about ARPA-E and also R&D (research and development) to reduce emissions from the manufacturing sector.

I'm an original cosponsor of H.R. 4091, the bipartisan *ARPA-E Reauthorization Act*, which Chairwoman Johnson took the lead on and we introduced in July. ARPA-E (Advanced Research Projects Agency-Energy) was first authorized by this Committee back in 2007. I think it has tremendous promise to help us solve one of our longest-term challenges, which is the future of low-carbon energy production in this country. Congress recognized this back then, and we have maintained our leadership in this research overall, creating jobs benefiting the energy sector and of course the environment, but we think there's a lot more we can do.

Groundbreaking research involves a high level of risk, some of which the private sector is able to take, but a lot of it, it can't bear alone, so we have our part to play. The first appropriation for ARPA-E was \$400 million, and it was made exactly 10 years ago. In that time, ARPA-E and the people it's given grants to have done incredible work, but the budget has had stagnant, if any, growth.

I don't believe in that. I think that when the government is doing something right and doing it well, especially in cooperation with other segments of our society, that's an occasion to double down, especially on a challenge this important.

So this bill answers the call of the National Academies and the leading energy think tanks, who have all called for significantly increasing ARPA-E's budget to allow them to do even more of the great work they're already doing. This will ensure that ARPA-E actually has the impact we want it to have, not just individual excellent projects but an overall sector-wide impact that can help us change the future of energy in this country.

Many people have recognized this, and that's why the ARPA-E reauthorization bill is now endorsed by those ranging from the U.S. Chamber of Commerce to the Natural Resources Defense Council (NRDC), the American Gas Association, and the American Council for Renewable Energy. You don't always see those groups on the same side of an individual piece of legislation, but in this case we have all their support, and I thank them for that.

The second bill we're looking at today is H.R. 4230, the *Clean Industrial Technology Act*, which is introduced by my colleague Representative Casten, and it is also a bipartisan bill. We've made a lot of strides in the past couple of decades in reducing greenhouse gas emissions from the power sector, but we still have a real uphill climb when it comes to manufacturing in heavy industry. That's about 25 percent of our Nation's emissions, yet only about 6 percent of the Department of Energy's research budget has been dedicated to this. And we have no national plan devoted to solving this problem.

So this bill will help address those issues by authorizing a cross-agency DOE-led R&D and demonstration program to advance these technologies from industrial sources of emissions including steel, cement, chemical production, and industrial heat. Importantly, this program will operate in collaboration with stakeholders from industry and labor groups to make sure that people who are essentially the boots on the ground in the sectors have a say in the investment we're going to make as a Nation.

DOE has succeeded with large demonstration projects before, so after the basic science and the basic research is done actually showing it can be done on a large commercial scale. We've done that most recently and prominently with the nearly \$200 million investment in a commercial-scale, post-combustion, carbon-capture coal-fired power plant in Thompsons, Texas, known as Petra Nova.

This bill, like the others, has support from a wide array of stakeholders and groups, including the National Association of Manufacturers, the American Chemistry Council, the United Steelworkers, the BlueGreen Alliance, the Union of Concerned Scientists, the Clean Air Task Force, again, not players that you usually see on the same side of the field, but in this case we have them.

So we think it's essential to ensure that American manufacturers can access these new technologies and the technologies that are still to come so that they will remain competitive throughout the 21st century and the fact that they will have a competitive edge in the 21st century because of the demand that you're going to have for some of this clean energy.

My Republican colleagues who have signed on to support these important bills have recognized that innovation must play a key role in doing our work here. And I just urge my colleagues on both sides of the aisle again to consider supporting these bills. I look forward to advancing them out of the Subcommittee today.

[The prepared statement of Chairman Lamb follows:]

I am pleased to consider two bipartisan bills today that are essential to securing our nation's clean energy future. These bills were considered at three hearings earlier this Congress that brought together expert witnesses from industry, academia, and the Department of Energy to discuss two important topics: the Advanced Research Projects Agency–Energy, or ARPA–E, and research and development to reduce emissions from the manufacturing sector.

I am very proud to be an original cosponsor of H.R. 4091, the bipartisan *ARPA–E Reauthorization Act of 2019*, which Chairwoman Johnson and I introduced in July. First authorized by this Committee in 2007, ARPA–E was designed to address some of the unique challenges of advancing new clean energy technologies.

In its creation of ARPA–E Congress recognized the necessity of developing transformational technologies in the energy sector. By maintaining our leadership in research, we're creating jobs here in America, benefiting the energy sector and mitigating climate change. We're making our power safer and more sustainable, and improving our economy.

Groundbreaking research involves a high level of risk. The private sector is understandably unable to take on these risks alone and make all of the investments we so badly need to transition our energy infrastructure into the twenty-first century.

ARPA–E received its first appropriation of \$400 million exactly ten years ago, and in that time has made significant strides in supporting the development of groundbreaking energy projects. However, to this day, the budget of this transformational agency has seen only marginal growth. This bill answers the call of the National Academies and leading energy think tanks and analysts to significantly increase ARPA–E's budget to allow the agency to scale up the excellent work that it is already doing. The authorizations in this bill will ensure that ARPA–E has the resources it needs to make a truly transformational impact on our nation's energy sector.

This bill is now endorsed by those ranging from the U.S. Chamber of Commerce to the Natural Resources Defense Council, the American Gas Association, and the American Council for Renewable Energy. It's pretty rare to receive support from this broad array of groups for the same piece of legislation, and I certainly appreciate the range of stakeholders who have weighed in on the legislation.

The second bill we are considering today is H.R. 4230, the bipartisan *Clean Industrial Technology Act* introduced by my colleague Rep. Casten. Over the past several decades, we have made significant strides to reduce greenhouse gas emissions from the power sector. But it is critical we recognize the role that other sectors of the economy play in contributing emissions to the atmosphere.

In particular, the manufacturing sector contributes nearly 25% of our nation's emissions, and yet only 6% of the Department of Energy's research budget is dedicated to developing technologies to help reduce emissions from manufacturing. Furthermore, we currently have no national plan devoted to solving this problem.

H.R. 4230 will help address these important issues by authorizing a cross-agency, DOE-led research, development, and demonstration program to advance technologies that will help reduce emissions from industrial sources of emissions including: steel and cement production, chemical production, and industrial heat. The research program will operate in collaboration with stakeholders from industry and labor groups to ensure that those who will work most closely with these technologies have a say in our nation's investment in their development. The Department of Energy has succeeded with large demonstration projects, like when they provided nearly \$200M to demonstrate the addition of a commercial-scale post-combustion carbon capture technology to a coal-fired power plant in Thompsons, Texas, commonly known as Petra Nova.

This bill has significant support from a wide array of stakeholders, such as the National Association of Manufacturers and the American Chemistry Council, the Steelworkers and the Blue Green Alliance, the Union of Concerned Scientists and the Clean Air Task Force.

Ensuring American manufacturers can access technologies to make them increasingly sustainable will ensure the domestic manufacturing industry remains competitive through the 21st Century. We need to give these companies, firms, factories and workers the assets and resources they need to compete and succeed in the inter-

national market—and sustainability, I believe, is one of the key components in doing so.

My Republican colleagues who have signed on to support these important pieces of legislation have recognized the essential role that innovation must play in achieving this goal. 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. And with that I now recognize the Ranking Member Mr. Weber for his opening remarks.

Mr. WEBER. Good morning. And thank you, Chairman Lamb, for the opportunity to speak on H.R. 4091, the *ARPA-E Reauthorization Act of 2019* and H.R. 4230, the *Clean Industrial Technology Act of 2019*.

During my tenure on the Science Committee, we've had an incredible track record for passing bipartisan legislation. Just last Congress, 32 of the 34 bills from this Committee, an outstanding 94 percent, received bipartisan support. In fact, this Energy Subcommittee only worked in a bipartisan fashion, with all nine energy-related bills passing the House with bipartisan support from Science Committee Members.

Now, we certainly had different opinions on a whole range of policy issues, but at the end of the day, when it came to legislating, we focused on the areas where we indeed had common ground. Unfortunately, that is not the case this Congress, and today, we are holding yet another partisan markup in my opinion.

The two bills we will consider today may be characterized as bipartisan because of a single cosponsor, which, by the way, is not a Member of this Committee because once again both bills propose reckless budget increases without including any offsets in spending, something I simply cannot and will not support.

The first, H.R. 4091, the *ARPA-E Reauthorization Act of 2019*, would actually increase ARPA-E's authorization by, listen to this, 173 percent to \$1 billion with a B in Fiscal Year 2024. This funding level is both unrealistic and unproductive. Such a high rate of increase would be challenging for any program to effectively manage, but ARPA-E is particularly unsuited for the task. And with the small staff it has, this will be extremely difficult.

Now, I want to acknowledge that this bill does make important policy reforms to DOE's ARPA-E program, building off those, I might add, in Ranking Member Lucas' bipartisan ARPA-E legislation that passed the House last Congress. While I support these reforms, we don't need to drastically increase ARPA-E's funding to implement them.

It is unfortunate that we are unable to meet in the middle and reach a compromise on funding for this program. I'll be the first to admit I, and many of my conservative colleagues on this Committee, have been skeptical of ARPA-E, and I have voted many times to cut spending for the program. But I believe that Ranking Member Lucas' most recent ARPA-E bill, which has nearly identical policy reforms paired with authorization levels that were supported by both Chairwoman Johnson last Congress and this Committee, is a responsible compromise approach. I encourage the Chairman and the Committee to consider that legislation.

The second bill we will consider today, H.R. 4230, the *Clean Industrial Technology Act of 2019*, seeks to develop technologies to reduce emissions in industrial sectors. And while I agree that there

is a need for collaboration in developing new technologies to reduce emissions, I'm concerned that we're rushing to move to a major authorization without doing our homework.

For example, I support the establishment of the Federal Advisory Committee in section 4 of the bill, but before we authorize a new program, shouldn't we first make sure this advisory committee has developed an effective research roadmap and goals for that program? Don't we want the experts from industry, academia, and the agencies to be able to weigh in before blindly committing taxpayer dollars?

This legislation also includes language that delegates authority for setting spending levels through the appropriators. If we don't know how much a program should cost, we have no business authorizing that program. Why don't we take the time to hear from stakeholders on what is needed and let's do our job?

We all support basic research. We all want to see the United States remain a leader in energy technology. And we can and should work together to send bipartisan legislation to the House floor.

So, in closing, I want to emphasize that I support the intent behind both of these bills, but unfortunately, I cannot and will not support a bill where we haven't done our due diligence on where we're making promises that we simply cannot keep. So let's stop wasting time. Let's get back to work on the areas that we can all agree and get our job done. Mr. Chairman, I yield back.

[The prepared statement of Mr. Weber follows:]

Good morning. Thank you, Chairman Lamb, for the opportunity to speak on H.R. 4091, the *ARPA-E Reauthorization Act of 2019*, and H.R. 4230, the *Clean Industrial Technology Act of 2019*.

During my tenure on the Science Committee, we've had an incredible track record for passing bipartisan legislation. Just last Congress, 32 of the 34 bills from this Committee, an outstanding 94%, received bipartisan support. In fact, the Energy Subcommittee only worked in bipartisan fashion, with all nine energy related bills passing the House with bipartisan support from Science Committee Members.

Now, we certainly had different opinions on a whole range of policy issues. But at the end of the day, when it came to legislating, we focused on the areas where we had common ground. Unfortunately, that is not the case this Congress—and today we are holding yet another partisan markup.

The two bills we will consider today may be characterized as bipartisan because of a single cosponsor, but that support does not come from Members of this Committee. Because once again, both bills propose reckless budget increases without including any offsets in spending—something I simply cannot support.

The first, H.R. 4091, the *ARPA-E Reauthorization Act of 2019*, would increase ARPA-E's authorization by 173%, to \$1 billion in fiscal year (FY) 2024.

This funding level is both unrealistic and unproductive. Such a high rate of increase would be challenging for any program to effectively manage—but ARPA-E is particularly unsuited for the task, and its small staff will make this even more difficult.

Now I want to acknowledge that this bill does make important policy reforms to DOE's ARPA-E program, building off those in Ranking Member Lucas's bipartisan ARPA-E legislation that passed the House last Congress. While I support these reforms, we don't need to drastically increase ARPA-E's funding to implement them.

It is unfortunate that we are unable to meet in the middle and reach a compromise on funding for this program.

And I'll be the first to admit—I and many of my conservative colleagues on this Committee have been skeptical of ARPA-E, and I have voted many times to cut spending for this program.

But I believe that Ranking Member Lucas's most recent ARPA-E bill, which has nearly identical policy reforms paired with authorization levels that were supported by Chairwoman Johnson last Congress, is a responsible compromise approach. I encourage the Chairman and this Committee to consider that legislation.

The second bill we will consider today, H.R. 4230, the *Clean Industrial Technology Act of 2019*, seeks to develop technologies to reduce emissions in industrial sectors. While I agree there is a need for collaboration in developing new technologies to reduce emissions, I'm concerned that we're rushing to move a major authorization without doing our homework.

For example, I support the establishment of the federal advisory committee in section four of this bill.

But before we authorize a new program, shouldn't we first make sure this advisory committee has developed an effective research roadmap and goals for that program? Don't we want the experts from industry, academia, and the agencies to be able to weigh in before blindly committing taxpayer dollars?

This legislation also includes language that delegates authority for setting spending levels to the appropriators.

If we don't know how much a program should cost, we have no business authorizing that program. Let's take the time to hear from stakeholders on what is needed, and do our job.

We all support basic research. We all want to see the United States remain a leader in energy technology. And we can and should work together to send bipartisan legislation to the House floor.

In closing, I want to emphasize that I support the intent behind both of these bills. But unfortunately, I can't support a bill where we haven't done our due diligence, or where we are making promises we can't keep.

Let's stop wasting time, and get back to work on the areas where we can all agree.

Chairman LAMB. We will now consider H.R. 4091, the *ARPA-E Reauthorization Act of 2019*. The clerk will report the bill.

The CLERK. H.R. 4091, a bill.

[The bill follows:]



116TH CONGRESS
1ST SESSION

H. R. 4091

To amend the America COMPETES Act to reauthorize the ARPA-E program, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

JULY 30, 2019

Ms. JOHNSON of Texas (for herself and Mr. LAMB) introduced the following bill; which was referred to the Committee on Science, Space, and Technology

A BILL

To amend the America COMPETES Act to reauthorize the ARPA-E program, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “ARPA-E Reauthoriza-
5 tion Act of 2019”.

6 **SEC. 2. ARPA-E AMENDMENTS.**

7 (a) **ESTABLISHMENT.**—Section 5012(b) of the Amer-
8 ica COMPETES Act (42 U.S.C. 16538(b)) is amended
9 by striking “development of energy technologies” and in-
10 sserting “development of transformative science and tech-

8

8

2

1 nology solutions to address the energy and environmental
2 missions of the Department”.

3 (b) GOALS.—Section 5012(c) of the America COM-
4 PETES Act (42 U.S.C. 16538(c)) is amended—

5 (1) by striking paragraph (1)(A) and inserting
6 the following:

7 “(A) to enhance the economic and energy
8 security of the United States through the devel-
9 opment of energy technologies that—

10 “(i) reduce imports of energy from
11 foreign sources;

12 “(ii) reduce energy-related emissions,
13 including greenhouse gases;

14 “(iii) improve the energy efficiency of
15 all economic sectors;

16 “(iv) provide transformative solutions
17 to improve the management, clean-up, and
18 disposal of radioactive waste and spent nu-
19 clear fuel; and

20 “(v) improve the resilience, reliability,
21 and security of infrastructure to produce,
22 deliver, and store energy; and”;

23 (2) in paragraph (2), in the matter preceding
24 subparagraph (A), by striking “energy technology

9

9

3

1 projects” and inserting “advanced technology
2 projects”.

3 (c) RESPONSIBILITIES.—Section 5012(e)(3)(A) of
4 the America COMPETES Act (42 U.S.C.
5 16538(e)(3)(A)) is amended by striking “energy”.

6 (d) REPORTS AND ROADMAPS.—Section 5012(h) of
7 the America COMPETES Act (42 U.S.C. 16538(h)) is
8 amended to read as follows:

9 “(h) REPORTS AND ROADMAPS.—

10 “(1) ANNUAL REPORT.—As part of the annual
11 budget request submitted for each fiscal year, the
12 Director shall provide to the relevant authorizing
13 and appropriations committees of Congress a report
14 describing—

15 “(A) projects supported by ARPA-E dur-
16 ing the previous fiscal year; and

17 “(B) current, proposed, and planned
18 projects to be carried out pursuant to sub-
19 section (e)(3)(D).

20 “(2) STRATEGIC VISION ROADMAP.—Not later
21 than October 1, 2021, and every four years there-
22 after, the Director shall provide to the relevant au-
23 thorizing and appropriations committees of Congress
24 a roadmap describing the strategic vision that
25 ARPA-E will use to guide the choices of ARPA-E

10

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4

1 for future technology investments over the following
2 4 fiscal years.”.

3 (e) EVALUATION.—Section 5012(l) of the America
4 COMPETES Act (42 U.S.C. 16538(l)) is amended—

5 (1) by striking paragraph (1) and inserting the
6 following:

7 “(1) IN GENERAL.—Not later than 3 years
8 after the date of enactment of the ARPA–E Reau-
9 thorization Act of 2019, the Secretary is authorized
10 to enter into a contract with the National Academy
11 of Sciences under which the National Academy shall
12 conduct an evaluation of how well ARPA–E is
13 achieving the goals and mission of ARPA–E.”; and

14 (2) in paragraph (2)—

15 (A) in the matter preceding subparagraph
16 (A), by striking “shall” and inserting “may”;
17 and

18 (B) in subparagraph (A), by striking “the
19 recommendation of the National Academy of
20 Sciences” and inserting “a recommendation”.

21 (f) AUTHORIZATION OF APPROPRIATIONS.—Para-
22 graph (2) of section 5012(o) of the America COMPETES
23 Act (42 U.S.C. 16538(o)) is amended to read as follows:

24 “(2) AUTHORIZATION OF APPROPRIATIONS.—
25 Subject to paragraph (4), there are authorized to be

11

11

5

1 appropriated to the Director for deposit in the
2 Fund, without fiscal year limitation—

3 “(A) \$428,000,000 for fiscal year 2020;

4 “(B) \$550,000,000 for fiscal year 2021;

5 “(C) \$675,000,000 for fiscal year 2022;

6 “(D) \$825,000,000 for fiscal year 2023;

7 and

8 “(E) \$1,000,000,000 for fiscal year
9 2024.”.

10 (g) TECHNICAL AMENDMENTS.—Section 5012 of the
11 America COMPETES Act (42 U.S.C. 16538) is amend-
12 ed—

13 (1) in subsection (g)(3)(A)(iii), by striking
14 “subpart” each place it appears and inserting “sub-
15 paragraph”; and

16 (2) in subsection (o)(4)(B), by striking
17 “(c)(2)(D)” and inserting “(c)(2)(C)”.

○

Chairman LAMB. Without objection, the bill is considered as read and open to amendment at any point.

I now recognize Chairwoman Johnson to present her remarks on the bill.

Chairwoman JOHNSON. Thank you very much, Mr. Chairman. I'm pleased that we are now considering H.R. 4091, the bipartisan *ARPA-E Reauthorization Act of 2019* led by myself and Chairman LAMB.

Even though the agency is still relatively young, ARPA-E has already demonstrated incredible success in advancing high-risk, high-reward energy technology solutions that neither the public sector nor the private sector have been willing or able to support in the past. Industry leaders like Bill Gates and Chad Holliday and Norm Augustine have repeatedly called for significantly increasing this agency's budget given the unique role it is now playing in our energy innovation pipeline.

ARPA-E's impressive track record now includes over \$2.9 billion in private-sector follow-on funding for a group of 145 ARPA-E projects since the agency's founding in 2009. Equally notable, 76 projects have formed new companies, 131 projects have shown enough promise to result in partnerships with other government agencies, and ARPA-E projects have led to 2,489 peer-reviewed journal articles and 346 U.S. patents.

Unfortunately, ARPA-E has only been able to support about 1 percent of the proposals submitted for its open funding opportunities, and 12 percent of the proposals submitted for its focused programs, even though the number of promising high-quality proposals that the agency has received is many times higher.

That is why I am proud to sponsor H.R. 4091, the *ARPA-E Reauthorization Act of 2019*, which authorizes substantial growth in support for the agency over the next 5 years. This growth is consistent with the National Academies' original recommendations for establishing and supporting ARPA-E, as well as more recent recommendations from well-respected bipartisan and nonpartisan institutions such as the Bipartisan Policy Center's American Energy Innovation Council, the Energy Futures Initiative, and the Information Technology and Innovation Foundation.

I'd also note that in its review of the program released in 2017, the National Academies found that a significant increase in funding would be necessary for ARPA-E to be able to support the scale-up of several particularly promising technologies that were previously supported by the agency. But many of these new approaches are still too risky to be supported by the private sector alone, and too often other DOE programs remain ill-suited to steward them.

By authorizing these resources, this bill ensures that ARPA-E is able to fully pursue the development and demonstration of truly transformational clean energy technologies, just as DARPA (Defense Advanced Research Projects Agency), the agency on which ARPA-E is modeled, has been able to do time and again for defense applications.

This bill also authorizes ARPA-E to better address DOE's significant nuclear waste clean-up and management issues, something which the Department currently spends billions of dollars every

year trying to manage with current technologies. And it allows ARPA-E to pursue projects that improve the resilience, reliability, and security of our energy infrastructure.

The *ARPA-E Reauthorization Act of 2019* incorporates extensive feedback from stakeholders, including input from a hearing on ARPA-E this Subcommittee held in February, as a matter of fact, February 26. It also incorporates constructive language from a bill that I cosponsored with my friend, Ranking Member Lucas, last year.

Just to name a few of the bill's many supporters, it is endorsed by the U.S. Chamber of Commerce, the National Association of Manufacturers, the Council on Competitiveness, the Bipartisan Policy Center, the Association of American Universities, the Association of Public Land-Grant Universities, the Nuclear Energy Institute, the American Petroleum Institute, the American Gas Association, the Energy Storage Association, the Carbon Utilization Research Council, the American Council on Renewable Energy, the Natural Resources Defense Council, and the Energy Sciences Coalition. I'll submit the full list of supporters for the record.

ARPA-E's unique work is one of the best tools we have to produce the innovation needed to maintain our international competitiveness, and transition ourselves to a clean energy future. If we are truly serious about using innovation to address the increasing dangers of climate change, then we must provide ARPA-E the resources to reach its immense potential.

Given this bill's crucial mission, along with the deep support from industry, academia, and scientific and environmental organizations, I hope that each of my colleagues on both sides of the aisle will strongly support advancing H.R. 4091 this morning.

With that, I yield back. Thank you.

[The prepared statement of Chairwoman Johnson follows:]

I am pleased that we are now considering H.R. 4091, the bipartisan *ARPA-E Reauthorization Act of 2019*, led by myself and Chairman Lamb.

Even though the agency is still relatively young, ARPA-E has already demonstrated incredible success in advancing high-risk, high-reward energy technology solutions that neither the public nor the private sector had been willing or able to support in the past. Industry leaders like Bill Gates, Chad Holliday, and Norm Augustine have repeatedly called for significantly increasing this agency's budget given the unique role that it is now playing in our energy innovation pipeline.

ARPA-E's impressive track record now includes over \$2.9 billion in private-sector follow-on funding for a group of 145 ARPA-E projects since the agency's founding in 2009. Equally notable, 76 projects have formed new companies, 131 projects have shown enough promise to result in partnerships with other government agencies, and ARPA-E projects have led to 2,489 peer-reviewed journal articles and 346 U.S. patents.

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I'd also note that in its review of the program released in 2017, the National Academies found that a significant increase in funding would be necessary for ARPA-E to be able to support the scale-up of several particularly promising tech-

nologies that were previously supported by the agency. But many of these new approaches are still too risky to be supported by the private sector alone, and too often other DOE programs remain ill-suited to steward them.

By authorizing these resources, this bill ensures that ARPA-E is able to fully pursue the development and demonstration of truly transformational clean energy technologies, just as DARPA, the agency upon which ARPA-E is modeled, has been able to demonstrate time and again for defense applications.

This bill also authorizes ARPA-E to better address DOE's significant nuclear waste clean-up and management issues, for which the Department currently spends billions of dollars every year trying to manage with current technologies. And it allows ARPA-E to pursue projects that improve the resilience, reliability, and security of our energy infrastructure.

The *ARPA-E Reauthorization Act of 2019* incorporates extensive feedback from stakeholders, including input from a hearing on ARPA-E this Subcommittee held on February 26th. It also incorporates constructive language from a bill that I co-sponsored with my friend, Ranking Member Lucas, last year.

Just to name a few of the bill's many supporters, it is endorsed by the U.S. Chamber of Commerce, the National Association of Manufacturers, the Council on Competitiveness, the Bipartisan Policy Center, the Association of American Universities, the Association of Public & Land-grant Universities, the Nuclear Energy Institute, the American Gas Association, the Energy Storage Association, the Carbon Utilization Research Council, the American Council on Renewable Energy, the Natural Resources Defense Council, and the Energy Sciences Coalition. I'll submit the full list of supporters for the record.

ARPA-E's unique work is one of the best tools we have to produce the innovation needed to maintain our international competitiveness and transition ourselves to a clean energy future. If we are truly serious about using innovation to address the increasing dangers of climate change, then we must provide ARPA-E the resources to reach its immense potential. Given this bill's crucial mission, along with its deep support from industrial, academic, scientific, and environmental organizations, I hope that each of my colleagues on both sides of the aisle will strongly support advancing H.R. 4091 this morning.

With that, I yield back.

Chairman LAMB. Thank you, Madam Chairwoman. Does anyone else wish to be recognized?

Mr. LUCAS. Mr. Chairman?

Chairman LAMB. So recognized.

Mr. LUCAS. Thank you, Chairman Lamb.

We all know this Committee has one of the best track records in Congress of passing productive, bipartisan legislation, so I have to say I'm a little surprised and disappointed that we've been unable to reach a consensus on reauthorizing ARPA-E in a truly bipartisan way, especially given that Republicans have proposed a bill that not only includes similar program reforms but also authorizes a responsible spending increase.

Now, I'm optimistic that there are many opportunities for bipartisanship in the future, but as stewards of the taxpayers' resources, we, in Congress, must do our job to set realistic priorities and focus our limited Federal funds where we can maximize the return on that investment.

Unfortunately, the bills we're considering today don't meet that standard. H.R. 4091, the *ARPA-E Reauthorization Act of 2019*, includes substantial increases in funding for the program, reaching \$1 billion in funding by 2024. If enacted, this bill would authorize, I won't use the word shocking; I'll just say an amazing 173 percent increase in spending.

This legislation does include policy reforms that were first proposed in my bipartisan bill last Congress like expanding ARPA-E's mission to include a wider range of innovative technologies and requiring the Department to provide annual reports on ARPA-E

projects. I support these reforms, and I know we can achieve them without irresponsibly raising spending.

Now, I have spent a number of years working with Chairwoman Johnson and my friends across the aisle to support ARPA-E, and I have worked hard in this Congress to bring my Republican colleagues to the table. And I am proud of how far we have all come on this issue. I believe there is a real opportunity to find common ground. So I'm disappointed I will acknowledge, to see my friends in the majority on the Science Committee apparently unwilling to have a realistic and productive conversation about ARPA-E funding in this Congress.

However, we still have an opportunity to pass a truly bipartisan ARPA-E bill out of this Committee. My bill, H.R. 3915, the *ARPA-E Reauthorization and Reform Act of 2019*, includes the key policy reforms included in this legislation and includes a realistic funding profile for the program, authorizing an over \$130 million increase in funding over 5 years, reaching \$500 million by 2024.

And I want to remind my colleagues that we are proposing an amount that is \$100 million more than what was included in Chairwoman Johnson's ARPA-E authorization bill from the last Congress. We're making an effort to find consensus.

I can't support the bill we're considering today, but as someone who is committed to reauthorizing ARPA-E, I hope that before we consider legislation in the full Committee, we can agree on a compromise approach that will actually have a chance of becoming law.

With that, I would remind all my colleagues I've been a Member of the legislative process long enough. I understand and respect the fact that the majority has the right and the responsibility to govern. But the minority also has the right and the responsibility to be heard, and today we're using this opportunity to stress these points that we think are critical to a successful reauthorization of ARPA-E.

And with that, Mr. Chairman, I yield back.

[The prepared statement of Mr. Lucas follows:]

We all know this Committee has one of the best track records in Congress for passing productive, bipartisan legislation. So I have to say, I am surprised and disappointed that we have been unable to reach a consensus on reauthorizing ARPA-E in a truly bipartisan way, especially given that Republicans have proposed a bill that not only includes similar program reforms but also authorizes a responsible spending increase.

Now, I am optimistic that there are many opportunities for bipartisanship in the future. But as stewards of taxpayer resources, we in Congress must do our job to set realistic priorities and focus our limited federal funds where we can maximize the return on investment.

Unfortunately, the bills we will consider today don't meet this standard.

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This legislation does include policy reforms that were first proposed in my bipartisan bill last Congress, like expanding ARPA-E's mission to include a wider range of innovative technologies and requiring the Department to provide annual reports on ARPA-E projects. I support these reforms, and I know we can achieve them without irresponsibly raising spending.

I have spent a number of years working with Chairwoman Johnson and my friends across the aisle to support ARPA-E, and I have worked hard this Congress to bring my Republican colleagues to the table. I am proud of how far we all have come on this issue, and I believe there is a real opportunity here to find common ground.

So I am disappointed to see Science Committee Democrats unwilling to have a realistic and productive conversation on ARPA-E funding this Congress.

However, we still have an opportunity to pass a truly bipartisan ARPA-E bill out of this Committee. My bill, H.R. 3915, the *ARPA-E Reauthorization and Reform Act of 2019*, includes the same key policy reforms included in this legislation. And it includes a realistic funding profile for the program, authorizing an over \$130 million increase in funding over five years, reaching \$500 million by 2024.

I want to remind my colleagues that we are proposing an amount that is over \$100 million more than was included in Chairwoman Johnson's ARPA-E authorization bill from last Congress. We are making an effort to find consensus.

I can't support the bill we are considering today. But as someone who is committed to re-authorizing ARPA-E, I hope that before we consider legislation in the full Committee, we can agree on a compromise approach that actually has a chance of becoming law.

Chairman LAMB. Thank you to the Ranking Member.

Does anyone else wish to be heard? OK.

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

Mr. FOSTER. Thank you, Mr. Chairman. I have an amendment at the desk.

Chairman LAMB. The clerk will report the amendment.

The CLERK. Amendment No. 1, amendment to H.R. 4091 offered by Mr. Foster.

[The amendment of Mr. Foster follows:]

AMENDMENT TO H.R. 4091
OFFERED BY M. _____

Page 4, line 20, insert the following (and make such conforming changes as may be necessary):

- 1 (3) by adding at the end the following:
- 2 “(4) CHIEF EVALUATION OFFICER.—
- 3 “(A) IN GENERAL.—The Director shall ap-
- 4 point within ARPA-E a Chief Evaluation Offi-
- 5 cer, who shall report to the Director and shall
- 6 be provided sufficient support staff to carry out
- 7 the duties described in subparagraph (B).
- 8 “(B) DUTIES.—The Chief Evaluation Offi-
- 9 cer appointed under subparagraph (A) shall—
- 10 “(i) conduct systematic and com-
- 11 prehensive impact assessments of ARPA-E
- 12 projects and programs;
- 13 “(ii) assist with the preparation of the
- 14 Reports and Roadmaps in section (h); and
- 15 “(iii) carry out such other activities as
- 16 determined by the Director.

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1 “(C) LIMITATION.—The appointment
2 under subparagraph (A) shall be subject to sub-
3 section (g)(3)(A).”.

Chairman LAMB. I ask unanimous consent to dispense with the reading. Without objection, so ordered.

I now recognize the gentleman from Illinois for 5 minutes to explain the amendment.

Mr. FOSTER. Thank you, Mr. Chairman, and I hope I don't use the 5 minutes here. I'm introducing this amendment to establish a Chief Evaluation Officer position at ARPA-E.

The National Academies recently issued an assessment of ARPA-E in 2017, and while the report was generally positive in terms of ARPA-E's technological advancements and its effective program and project management, the authors noted a few areas of attentional improvement.

Now, one area that was in need of attention was ARPA-E's evaluation and assessment program. These are findings 4-9 and recommendations 4-8 in their report. The Academy found that the agency is not yet able to fully assess the full extent of its impact and achievement on its statutory missions and goals. They also found that ARPA-E is not doing a good job of creating awareness of its successes in enhancing the economic and energy security of the United States. The report recommended that, quote, "The ARPA-E Director and Program Director should develop and implement a framework for measuring and assessing the agency's impact in achieving its missions and goals."

Now, I don't believe that Congress should be overly prescriptive in telling ARPA-E how to best measure and assess its impact or better communicate its success to lawmakers and the general public, so my amendment simply creates a position of Chief Evaluation Officer in ARPA-E.

The Chief Evaluation Officer coordinates, promotes, sponsors, and builds capacity within a Federal department to help that agency understand and conduct evaluations. The results of these evaluations can be used to improve policies and programs, as well as communicate the success of the agency to the public. Other Federal agencies have such a position and benefit greatly from having this position filled.

Under my amendment, it would be left to ARPA-E and the Chief Evaluation Officer to determine how to best measure impact and communicate its successes. The position would also provide some institutional memory in ARPA-E. Where the Director comes in as a political appointee and initiates a number of—by design—fairly short-term projects to provide the agility and flexibility that we all hope will continue to make ARPA-E a productive research and development enterprise.

I think it's a tremendous idea and I was very pleased to find that since introducing my amendment, we have learned that ARPA-E now plans to hire an evaluation and impact assessment expert to help them respond to the National Academies' recommendations. So this is a tremendous example of, I think, first off, the real value that Congress gets from the National Academies and other sources of technical advice, and also the way we benefit from having a collaborative relationship between Congress and the agencies that it oversees.

So, Mr. Chairman, I hereby withdraw my amendment and look forward to working with the agency to ensure that this critically important role is effectively filled using existing authorities.

Thank you, and I yield back.

Chairman LAMB. Thank you. The next amendment on the roster is an amendment offered by the gentleman from Indiana. He is recognized to offer an amendment.

Mr. BAIRD. Mr. Chair, I have an amendment at the desk.

Chairman LAMB. The clerk will report the amendment.

The CLERK. Amendment No. 2, amendment to H.R. 4091 offered by Mr. Baird.

[The amendment of Mr. Baird follows:]

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AMENDMENT TO H.R. 4091

OFFERED BY M. . _____

Page 5, strike lines 3 through 9 and insert the following:

- 1 “(A) \$354,233,250 for fiscal year 2020;
- 2 “(B) \$371,944,913 for fiscal year 2021;
- 3 and
- 4 “(C) \$390,542,158 for fiscal year 2022.”.



Chairman LAMB. I ask unanimous consent to dispense with the reading. Without objection, so ordered.

I recognize the gentlemen for 5 minutes to explain the amendment.

Mr. BAIRD. Thank you, Chairman Lamb. My amendment to H.R. 4091, the *ARPA-E Reauthorization Act of 2019*, would replace the authorized funding levels with more reasonable numbers that have received bipartisan support in the past.

In the 115th Congress, Chairwoman Johnson introduced H.R. 3681, an ARPA-E reauthorization bill that was cosponsored by 39 Members, including five Democratic Members currently sitting on this Committee. My amendment simply takes the exact funding profile proposed in the bill and adds it here. This funding level would be a modest, reasonable increase in spending with funding, reaching \$390 million in Fiscal Year 2022.

After supporting it last year, I see no reason why Chairwoman Johnson and my Science Committee colleagues cannot support this funding level again. Good policy doesn't change as the result of an election or based on who controls the House of Representatives, and successfully reauthorizing ARPA-E will take a collaborative bipartisan approach.

The funding levels I propose in this amendment are also reflected in Ranking Member Lucas' bill, H.R. 3915. Mr. Lucas' bill, of which I am a cosponsor, proposes a manageable \$130 million increase to operate ARPA-E over the next 5 years. That bill proposes an increase to \$500 million by the year 2024, which I will note is significantly higher than Chairwoman Johnson's bill from last Congress.

I believe my amendment is a good starting point and Mr. Lucas' bill is an excellent compromise. I urge all of my colleagues to support this amendment, and I yield back the balance of my time.

Chairman LAMB. Thank you. Are there any other comments or discussion on the amendment?

Chairwoman JOHNSON. Mr. Chairman?

Chairman LAMB. Madam Chairwoman, you are recognized.

Chairwoman JOHNSON. I move to strike the last word.

Chairman LAMB. You're recognized.

Chairwoman JOHNSON. I am sure that my friends in the minority think that they've caught me in a tough spot this time. That's because the funding levels in this amendment simply match the funding levels included in the bipartisan *ARPA-E Reauthorization Act* that I introduced in 2017.

However, a lot has happened since 2017, but one thing, at that time, the Trump Administration was attempting to shut down ARPA-E in defiance of the law. That bill, which had 39 cosponsors, including 11 Republicans, served to send a strong bipartisan message to the Administration to change course and support this agency in accordance with its statutory mission.

In 2017, ARPA-E's appropriated funding level was also lower than it is today, and I think we can all remember that at the time I was serving as Ranking Member of the Committee rather than Chairwoman. That bill was my attempt to write a proposal that the previous Republican-controlled Congress could pass.

Now, it's 2019, and things are little different. For one, we now have a series of recommendations from well-respected bipartisan and nonpartisan institutions that call for supporting ARPA-E at the levels in this bill. ARPA-E's funding levels have increased to the point where the 2020 level authorized in this amendment would make a significant cut to the agency's budget. In fact, even the out-year funding in this amendment would cut ARPA-E to well below the bipartisan, House-passed appropriation level for next year.

The climate crisis has only grown more urgent, and we have a new congressional majority in the House that is ready and willing to make the investments we need to address it. For all of these reasons, I strongly urge my colleagues to oppose this amendment. I yield back.

Chairman LAMB. Thank you, Madam Chairwoman. Any other discussion on the amendment?

Mr. CASTEN. Move to strike the last word.

Chairman LAMB. You're recognized.

Mr. CASTEN. So I'm a freshman. I'm pleased to serve with my friend Mr. Baird. Neither of us were here in the last session, but as a newly elected Member, I think any discussion of fiscal responsibility with respect to the last Congress deserves one five-word response: \$1.5 trillion.

Thank you, and I yield back.

Mr. LUCAS. Mr. Chairman, I move to strike the last word.

Chairman LAMB. You are recognized, sir.

Mr. LUCAS. Mr. Chairman, I realize that we have a lot of new Members in Congress and a lot of new Members on the Committee, and Chairwoman Johnson and I are kind of the senior Members from experience and time. So I will just offer a little thought to my colleagues from my perspective. And I say this respectfully.

But as I mentioned earlier, it is the right and the responsibility of the majority to govern. It's the right and the responsibility of the minority to be heard. What we are trying to do is simply say to our friends you don't control the entire congressional process. You don't control the Administration. We are trying to work with you to craft a piece of legislation that gives us a chance to leave this Committee, and across the floor in a bipartisan way, so that we can persuade that other body that might not be quite as enlightened always, as we are to join us in this effort to get something signed at the other end of Pennsylvania Avenue.

If this is an aspirational bill, I respect that fully. Going from \$500 million to \$1 billion is an aspirational increase in 2024. But we, in the minority, are trying in good faith to work with you to craft something we can get all the way through. We can't control our brethren at the other end of Pennsylvania Avenue or the other side of this building, but we can promise you, based on how hard it has been to maintain ARPA-E in recent years, that if we don't work together, we'll wind up doing great damage.

So with that, in the greatest of respect for my colleagues, I encourage my friends to vote for Dr. Baird's amendment and to urge us all to consider those factors today and understand the majority will have its way. That's the way it's supposed to work. But we'll revisit this in full Committee, and we'll revisit this on the floor and

it'll make it more difficult ultimately. I want to accomplish something.

I understand the joys of being in the conscience of the body, as some of my other friends on the other side have experienced, too.

And with that, Mr. Chairman, I respectfully yield back.

Chairman LAMB. Thank you, Mr. Ranking Member. Any further discussion on the amendment?

Mr. WEBER. I move to strike the last word.

Chairman LAMB. You are recognized.

Mr. WEBER. I appreciate that. What he said, the gentleman from Oklahoma. I yield back.

Chairman LAMB. Thank you. And I would just recognize myself for a moment to say that I very much appreciate the spirit of bipartisanship that survives even in moments where we disagree. I think that our disagreement in this particular case is really a disagreement of degree rather than kind. I think most of us believe in the ARPA-E program and think that it has been successful and is promising, and so it's a debate about how large of a bet that you're willing to place on that progress.

I think that our hope is that with the support already of four Republicans, not one, every one of which we value—much like the good Lord counts every hair on your head—we count every Republican who is willing to support our bills. We hope that on the other side of Capitol Hill and at the other end of Pennsylvania Avenue supporters like the Chamber of Commerce and American Gas Association will also carry a lot of weight.

So with that, we will vote on the amendment.

All in favor, say aye.

All opposed, say no.

The noes have it. The amendment is not agreed to.

Are there any more amendments?

Mr. NORMAN. Mr. Chair?

Chairman LAMB. You're recognized. False alarm, OK.

A reporting quorum being present, I move that the Energy Subcommittee of the Science, Space, and Technology Committee report H.R. 4091 to the full Committee and with the recommendation that the bill be approved.

Those in favor of the motion will signify by saying aye.

Those 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. 4230

Chairman LAMB. We will now consider H.R. 4230, the *Clean Industrial Technology Act of 2019*, and the clerk will please report the bill.

The CLERK. H.R. 4230, a bill.

[The bill follows:]

XXI. PROCEEDINGS OF THE FULL COMMITTEE MARKUP

MARKUPS:
**H.R. 4901, ARPA-E REAUTHORIZATION
ACT OF 2019; H.R. 2051,
SUSTAINABLE CHEMISTRY RESEARCH
AND DEVELOPMENT ACT OF 2019; AND
H.R. 1709, SCIENTIFIC INTEGRITY ACT**

MARKUP
BEFORE THE
**COMMITTEE ON SCIENCE, SPACE, AND
TECHNOLOGY**
HOUSE OF REPRESENTATIVES
ONE HUNDRED SIXTEENTH CONGRESS
FIRST SESSION

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OCTOBER 17, 2019
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Serial No. CP 116-10
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October 17, 2019

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**MARKUPS:
H.R. 4091, ARPA-E REAUTHORIZATION
ACT OF 2019; H.R. 2051,
SUSTAINABLE CHEMISTRY RESEARCH
AND DEVELOPMENT ACT OF 2019; AND
H.R. 1709, SCIENTIFIC INTEGRITY ACT**

THURSDAY, OCTOBER 17, 2019

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

The Committee met, pursuant to notice, at 10:02 a.m., in room 2318 of the Rayburn House Office Building, Hon. Eddie Bernice Johnson [Chairwoman of the Committee] presiding.

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

Pursuant to notice, the Committee meets to consider the following measures: H.R. 4091, *ARPA-E Reauthorization Act of 2019*; H.R. 2051, *Sustainable Chemistry Research and Development Act of 2019*; and H.R. 1709, Scientific Integrity Act.

Good morning, and welcome to today's markup of three bills. I'm very pleased that we are considering the bipartisan *ARPA-E Reauthorization Act of 2019* this morning. ARPA-E (Advanced Research Projects Agency-Energy) stewards the development of high-risk, high-reward energy technologies that neither the private sector nor other DOE (Department of Energy) programs had previously been willing to support.

After demonstrating a strong record of success over its first 10 years in operation and successfully passing numerous independent, bipartisan, and nonpartisan assessments over the last several years, it is clear that ARPA-E has been a successful program. This bill will enable ARPA-E to truly fulfill its potential to help transform our Nation's energy infrastructure for a far cleaner and more prosperous future.

The next bill we will consider is H.R. 2051, the *Sustainable Chemistry Research and Development Act of 2019*, which is sponsored by the gentleman from Illinois, Mr. Lipinski. The Research and Technology Subcommittee held a hearing in July to explore the challenges and opportunities in sustainable chemistry. The Committee heard from an expert panel of witnesses about the need for more research and technology development, improved chemistry

education, and enhanced Federal agency coordination to encourage the use of sustainable chemicals and processes throughout the chemical science and engineering enterprise. All of the witnesses spoke in support of H.R. 2051.

This bipartisan bill is a good step to advancing the chemical innovations we need to reduce our reliance on substances that are hazardous to human health and the environment. I want to thank Mr. Lipinski for his leadership on this important issue. I'll also take a moment to mention that this bill has a companion in the Senate which is sponsored by Senator Coons, and I know he is committed to moving this legislation forward. Hopefully, he can help us to get this important legislation enacted this Congress.

Last, we will consider H.R. 1709, the *Scientific Integrity Act*. I want to thank Mr. Tonko for his leadership on this legislation, which began in 2016 when he sought to codify the scientific integrity policies put in place under the Obama Administration for all agencies that fund, conduct, and oversee scientific research. These policies were developed in response to a 2010 memorandum from the Office of Science and Technology Policy, which in turn was in response to a requirement in the 2007 *America COMPETES Act*.

This legislation brings our 2007 effort full circle by spelling out in law the core principles of a Federal agency's scientific integrity policy. There are many specific principles addressing openness, transparency, and due process. At their essence, they are about protecting Federal science and scientists from undue political influence and ensuring that the public can trust the science and scientific process informing public policy decisions.

H.R. 1709 has 218 cosponsors and has earned the endorsements of 60 organizations. This is important legislation, regardless of which party is in the White House, and I urge my colleagues to support it.

I'd like to also take a moment to observe that we will be considering extensive amendments to each of these bills, offered by all three bill sponsors. All of these amendments were formed with input from outside stakeholders and also extensive negotiations with Ranking Member Lucas and his staff. I greatly appreciate his efforts to reach bipartisan agreements, and the efforts of both of our staffs to work together.

It sometimes seems like "compromise" has become a dirty word in this town. I will be the first to acknowledge that compromise can be less than satisfying. But I do not believe that our constituents sent us here to posture. There are real problems that need to be solved, and those problems won't be addressed if Democrats and Republicans always go their separate ways. I hope that the Science Committee will continue to be a place where people from both sides of the aisle can come together to pass good legislation, and I look forward to doing that today.

[The prepared statement of Chairwoman Johnson follows:]

Good morning and welcome to today's markup of three good bills.

I am very pleased that we are considering the bipartisan *ARPA-E Reauthorization Act of 2019* this morning. ARPA-E stewards the development of high-risk, high-reward energy technologies that neither the private sector nor other DOE programs had previously been willing or able to support. After demonstrating a strong record of success over its first ten years in operation, and successfully passing numerous independent, bipartisan, and nonpartisan assessments over the last several years,

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There are real problems that need to be solved, and those problems won't be addressed if Democrats and Republicans always go their separate ways. I hope that the Science Committee will continue to be a place where people from both sides of the aisle can come together to pass good legislation, and I look forward to doing that today.

Chairwoman JOHNSON. I now recognize our Ranking Member, Mr. Lucas, for his remarks.

Mr. LUCAS. Thank you, Madam Chairwoman.

And today, we will consider three bills. The first is H.R. 4091, the *ARPA-E Reauthorization Act of 2019*. After a lot of negotiation, I'm pleased to say we've reached a bipartisan consensus on this legislation, and I look forward to supporting the bill, as amended. I want to thank the Chairwoman for being willing to come to the table and find a more measured approach we can all agree on.

I believe the additional changes in the manager's amendments that we'll consider today will further strengthen this legislation. With this amendment, we'll double our investment in ARPA-E's high-risk, high-reward research over 5 years, but we'll also establish important guardrails to ensure that we're using our limited research dollars wisely and efficiently.

To be sure, we're not using taxpayer dollars on initiatives that industry can conduct, the bill requires grant applicants to demonstrate they made sufficient attempts to fund projects without Federal dollars. Importantly, this bill will address the problem of duplication within ARPA-E. Like all Federal programs, ARPA-E isn't perfect, and in the past, some initiatives have appeared to duplicate the efforts of other DOE programs. ARPA-E is meant to focus on cutting-edge research to enable transformative technologies. It can't do that if its resources are being drained by duplicative work conducted elsewhere in the Department. This bill will require the Department to prevent duplication between ARPA-E's initiatives and other research across DOE.

I'm also pleased that Chairwoman Johnson has agreed to join me in a GAO (Government Accountability Office) request seeking to add transparency to the program. With this report, I hope we can shed more light on unintended duplication and develop policies to prevent that from occurring in the future. Taken together, these initiatives will strengthen ARPA-E and refocus the program on its intended mission: Serving as the bridge between basic research and industry-led innovation.

The second bill on our agenda today is H.R. 2051, the *Sustainable Chemistry Act of 2019*. H.R. 2051 provides for Federal coordination of research and development for new innovations in chemistry, manufacturing, and materials. This bill continues our Committee's bipartisan commitment to prioritizing fundamental research for new technologies and the ideas that will drive the American economy into the future.

Chemistry is essential to our economy and plays a vital role in helping to solve the greatest challenges facing the Nation and our world. From farming to medicine to the applications we use, chemical manufacturing touches our lives every day. There is market demand for chemical products that use resources more efficiently and are safer for both humans and the environment. Consumers want these products to be just as effective or more effective than traditional chemical products. This bill will help support the research, training, and standards needed to meet these demands.

It's rare that a bill has the endorsement of both the chemical companies and the environmental advocates. I thank the bill's sponsors, Representative Dan Lipinski and Representative John Moolenaar, for their leadership on this issue and for developing a good consensus bill. I encourage my colleagues to support it.

The final bill on our agenda today is the *Scientific Integrity Act*. I will speak more about that when we consider the bill and I'll offer an amendment. But in the meantime, I appreciate Chairwoman Johnson and the bill's sponsor Mr. Tonko for working with us on a compromise that will be able to move that bill forward with my support.

In the meantime, I look forward to considering our bipartisan bills on ARPA-E and sustainable chemistry. Thank you, Madam Chair, and I yield back.

[The prepared statement of Mr. Lucas follows:]

Thank you, Madam Chairwoman.
Today we will consider three bills.

The first is H.R. 4091, the *ARPA-E Reauthorization Act of 2019*. After a lot of negotiation, I'm pleased to say we've reached a bipartisan consensus on this legislation, and I look forward to supporting the bill as amended.

I want to thank the Chairwoman for being willing to come to the table and find a more measured approach we can all agree on.

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In the meantime, I look forward to considering our bipartisan bills on ARPA-E and sustainable chemistry. Thank you and I yield back.

H.R. 4091

Chairwoman JOHNSON. Thank you very much.

We will now consider H.R. 4091, the *ARPA-E Reauthorization Act of 2019*. The clerk will report the bill.

The CLERK. H.R. 4091, a bill to amend the *America COMPETES Act* to reauthorize the ARPA-E program and for other purposes.

[The bill follows:]

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Committee Print116TH CONGRESS
1ST SESSION**H. R. 4091**

To amend the America COMPETES Act to reauthorize the ARPA-E program, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

introduced the following bill; which was referred to the Committee on Science, Space, and Technology

A BILL

To amend the America COMPETES Act to reauthorize the ARPA-E program, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “ARPA-E Reauthoriza-
5 tion Act of 2019”.

6 **SEC. 2. ARPA-E AMENDMENTS.**

7 (a) **ESTABLISHMENT.**—Section 5012(b) of the Amer-
8 ica COMPETES Act (42 U.S.C. 16538(b)) is amended
9 by striking “development of energy technologies” and in-

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1 sserting “development of transformative science and tech-
2 nology solutions to address the energy and environmental
3 missions of the Department”.

4 (b) GOALS.—Section 5012(e) of the America COM-
5 PETES Act (42 U.S.C. 16538(e)) is amended—

6 (1) by striking paragraph (1)(A) and inserting
7 the following:

8 “(A) to enhance the economic and energy
9 security of the United States through the devel-
10 opment of energy technologies that—

11 “(i) reduce imports of energy from
12 foreign sources;

13 “(ii) reduce energy-related emissions,
14 including greenhouse gases;

15 “(iii) improve the energy efficiency of
16 all economic sectors;

17 “(iv) provide transformative solutions
18 to improve the management, clean-up, and
19 disposal of radioactive waste and spent nu-
20 clear fuel; and

21 “(v) improve the resilience, reliability,
22 and security of infrastructure to produce,
23 deliver, and store energy; and”; and

24 (2) in paragraph (2), in the matter preceding
25 subparagraph (A), by striking “energy technology

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1 projects” and inserting “advanced technology
2 projects”.

3 (e) RESPONSIBILITIES.—Section 5012(e)(3)(A) of
4 the America COMPETES Act (42 U.S.C.
5 16538(c)(3)(A)) is amended by striking “energy”.

6 (d) REPORTS AND ROADMAPS.—Section 5012(h) of
7 the America COMPETES Act (42 U.S.C. 16538(h)) is
8 amended to read as follows:

9 “(h) REPORTS AND ROADMAPS.—

10 “(1) ANNUAL REPORT.—As part of the annual
11 budget request submitted for each fiscal year, the
12 Director shall provide to the relevant authorizing
13 and appropriations committees of Congress a report
14 describing—

15 “(A) projects supported by ARPA-E dur-
16 ing the previous fiscal year; and

17 “(B) current, proposed, and planned
18 projects to be carried out pursuant to sub-
19 section (e)(3)(D).

20 “(2) STRATEGIC VISION ROADMAP.—Not later
21 than October 1, 2021, and every four years there-
22 after, the Director shall provide to the relevant au-
23 thORIZING and appropriations committees of Congress
24 a roadmap describing the strategic vision that
25 ARPA-E will use to guide the choices of ARPA-E

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1 for future technology investments over the following
2 4 fiscal years.”.

3 (c) EVALUATION.—Section 5012(l) of the America
4 COMPETES Act (42 U.S.C. 16538(l)) is amended—

5 (1) by striking paragraph (1) and inserting the
6 following:

7 “(1) IN GENERAL.—Not later than 3 years
8 after the date of enactment of the ARPA-E Reau-
9 thorization Act of 2019, the Secretary is authorized
10 to enter into a contract with the National Academy
11 of Sciences under which the National Academy shall
12 conduct an evaluation of how well ARPA-E is
13 achieving the goals and mission of ARPA-E.”; and

14 (2) in paragraph (2)—

15 (A) in the matter preceding subparagraph
16 (A), by striking “shall” and inserting “may”;
17 and

18 (B) in subparagraph (A), by striking “the
19 recommendation of the National Academy of
20 Sciences” and inserting “a recommendation”.

21 (f) AUTHORIZATION OF APPROPRIATIONS.—Para-
22 graph (2) of section 5012(o) of the America COMPETES
23 Act (42 U.S.C. 16538(o)) is amended to read as follows:

24 “(2) AUTHORIZATION OF APPROPRIATIONS.—
25 Subject to paragraph (4), there are authorized to be

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1 appropriated to the Director for deposit in the
2 Fund, without fiscal year limitation—

3 “(A) \$428,000,000 for fiscal year 2020;

4 “(B) \$550,000,000 for fiscal year 2021;

5 “(C) \$675,000,000 for fiscal year 2022;

6 “(D) \$825,000,000 for fiscal year 2023;

7 and

8 “(E) \$1,000,000,000 for fiscal year
9 2024.”.

10 (g) TECHNICAL AMENDMENTS.—Section 5012 of the
11 America COMPETES Act (42 U.S.C. 16538) is amend-
12 ed—

13 (1) in subsection (g)(3)(A)(iii), by striking
14 “subpart” each place it appears and inserting “sub-
15 paragraph”; and

16 (2) in subsection (o)(4)(B), by striking
17 “(c)(2)(D)” and inserting “(c)(2)(C)”.

Chairwoman JOHNSON. Without objection, the bill is considered as read and open to amendment at any point. I recognize myself to speak on this bill.

I'm pleased that we are now considering H.R. 4091. Before going into any further detail, I want to thank my friend Ranking Member Lucas for working with me to come to an agreement on the bill.

After discussions between ourselves and our staff, I am proud to say that we have achieved a genuine compromise that will allow us to support this bill together this morning. As I noted during the Energy Subcommittee markup of 4091 last month, ARPA-E has already demonstrated incredible success in advancing high-risk, high-reward energy technology solutions that neither the public sector nor the private sector have been willing or able to support in the past.

Industry leaders like Bill Gates, Chad Holliday, and Norman Augustine have repeatedly called for significantly increasing this Agency's budget given the unique role that it is now playing in our energy innovation pipeline. ARPA-E's impressive track record now includes over \$2.9 billion in private-sector follow-on funding for a group of 145 ARPA-E projects since the Agency's founding in 2009. Equally notable, 76 projects have formed new companies, and that's one of the main goals here. We want American science investments to result in American innovation and high-tech jobs. ARPA-E projects have also had significant impacts on science, leading to thousands of peer-reviewed journal articles and 346 U.S. patents.

Unfortunately, ARPA-E has only been able to support about 1 percent of the proposals submitted for its open funding opportunities and 12 percent of the proposals submitted to the FOCUS (Full-Spectrum Optimized Conversion and Utilization of Sunlight) programs. Too many good ideas are falling by the wayside, and that ends up shifting the enormous potential of this program—stifling the enormous potential of the program.

H.R. 4091 addresses this problem by authorizing substantial growth and support for the Agency over the next 5 years. The growth is consistent with the National Academies' original recommendations for establishing and supporting ARPA-E, as well as more recent recommendations from well-respected bipartisan and nonpartisan institutions such as the Bipartisan Policy Center of America's Energy Innovation Council, the Energy Futures Initiative, and the Information Technology and Innovation Foundation.

H.R. 4091 incorporates extensive feedback from stakeholders, including constructive language from a bill that I cosponsored with Ranking Member Lucas last year. The bill would incorporate additional provisions proposed by the Ranking Member upon the passage of the manager's amendment today. I value the perspectives that the Ranking Member and my colleagues across the aisle bring to this Committee and will continue to consider good ideas to improve our legislation wherever they come from.

This bill is now endorsed by a broad coalition of organizations, including the U.S. Chamber of Commerce, the National Association of Manufacturers, the Bipartisan Policy Center, the Association of American Universities, the Nuclear Energy Institute, the American Petroleum Institute, the Natural Resources Defense Council and

Energy Storage Association, the Carbon Utilization Research Council, the American Council for Renewable Energy, the Environmental Defense Fund, and the Energy Sciences Coalition, just to name a few.

ARPA-E's unique work is one of the best tools we have to produce the innovation needed to maintain our international competitiveness and transition ourselves to a clean energy future. Given this bill's crucial mission, along with this deep support from our Nation's leading industrial, academic, scientific, and environmental organizations, I am hopeful that all of my colleagues will strongly support advancing 4091 this morning.

Does anyone else need to be recognized or desire to be recognized?

The Chair recognizes Mr. Lipinski.

Mr. LIPINSKI. Thank you, Chairwoman Johnson. I just want to very briefly say ARPA-E I think is one of the most important programs that we have making a difference with the potential to do even greater things for our country. And when it comes to our position on science and technology and innovation and addressing a lot of the big problems that we face, including climate issues and other very critical issues, I just want to say this is very important. I'm glad we've been able to come to agreement on this. I yield back.

Chairwoman JOHNSON. Thank you very much. Ms. Bonamici.

Ms. BONAMICI. Thank you, Chairwoman Johnson. I move to strike the last word.

Chairwoman JOHNSON. The Chair recognizes you for 5 minutes.

Ms. BONAMICI. Thank you, Chairwoman. In addition to the Science Committee, I serve on the Select Committee on the Climate Crisis, and I just came from a hearing in that Committee. And, you know, in northwest Oregon climate change is a reality. We have acidic oceans that are threatening our shellfish industry on the Pacific Coast. We have smoke from raging wildfires that's made air unhealthy to breathe. We have decreased snowpack that's limiting access to skiing and snowboarding, and that affects our outdoor recreation industry. We have droughts and extreme weather patterns that are jeopardizing the livelihoods of our farmers and our prestigious wineries; warmer water temperatures in the Columbia River that are endangering salmon, which are a fundamental part of the identity and culture of the Northwest tribes; and, of course, rising sea levels that are threatening homeowners and small businesses in our coastal communities.

If you look at the findings from the Intergovernmental Panel on Climate Change in the Fourth National Climate Assessment, it's more than a wake-up call; it's really an alarm. Greenhouse gas emissions from human activities are the most substantial factor that account for observed warming over the past 6 decades, and carbon dioxide concentrations in the atmosphere are higher than any time in the last 3 million years.

We know the climate crisis is a national emergency and an existential threat, and we have the imperative to act on climate and to transition to a clean energy economy no later than midcentury. And that transition can start by strengthening investments in research and development for clean energy, which is one of the reasons why I'm so proud to cosponsor the bipartisan *ARPA-E Reau-*

thorization Act. The bill would more than double authorization for the Agency to \$1 billion by 2024. These funds will help support the high-risk but high-reward energy research that's not being addressed by the private sector. At current funding levels ARPA-E continues to identify more projects than can be funded. And it's worth noting that the increase in funding is consistent with the recommendations from the National Academies in their assessment "Rising Above the Gathering Storm" report. By authorizing \$1 billion for ARPA-E, we can show leadership and also help accelerate the development of clean energy technologies.

And, importantly, we must complement Federal high-risk, high-reward programs like ARPA-E with regional partnerships that can spur the development of early stage innovations and help also move new technologies beyond laboratory research to market deployment.

I'm working on a bill to help support the creation and expansion of regional private-public partnerships to foster an environment of innovation and job creation at the local level and to accelerate smart market deployment of clean energy technologies. And that is something that, you know, since the creation of ARPA-E, we have seen so much growth in the private sector, as well as the groundbreaking research, so it takes vision and persistence to pursue areas of research when the benefits are unknown at the outset. The Federal Government has a role as an active participant in this important work, and one part of that is providing robust funding for ARPA-E.

So I thank Chairwoman Johnson for her leadership on this bipartisan bill. I also thank the Ranking Member for his collaboration, and I urge all of my colleagues to support this bill, and I yield back the balance of my time.

Chairwoman JOHNSON. Thank you very much. Any other requests for time?

We will now proceed with the amendments in the order of the roster. The Chair's amendment, the first amendment on the roster is an amendment offered by the Chair. The clerk will report the amendment.

The CLERK. Amendment No. 1, amendment to Committee print of H.R. 4091 offered by Ms. Johnson.

[The amendment of Chairwoman Johnson follows:]

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AMENDMENT TO COMMITTEE PRINT OF H.R. 4091
OFFERED BY Ms. Johnson

[Page and line numbers refer to CP_4091 with timestamp of
September 12, 2019 at 4:15 a.m.]

Page 3, after line 16, insert the following (and make such conforming changes as may be necessary):

1 “(B) projects supported by ARPA-E dur-
2 ing the previous fiscal year that examine topics
3 and technologies closely related to other activi-
4 ties funded by the Department, and includes an
5 analysis of whether in supporting such projects,
6 the Director is in compliance with subsection
7 (i)(1)(A); and”.

Page 4, after line 2, insert the following (and make such conforming changes as may be necessary):

8 (e) COORDINATION AND NONDUPLICATION.—Section
9 5012(i)(1) of the America COMPETES Act (42 U.S.C.
10 16538(i)(1)) is amended to read as follows:

11 “(1) IN GENERAL.—To the maximum extent
12 practicable, the Director shall ensure that—
13 “(A) the activities of ARPA-E are coordi-
14 nated with, and do not duplicate the efforts of,

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1 programs and laboratories within the Depart-
2 ment and other relevant research agencies; and
3 “(B) ARPA-E does not provide funding
4 for a project unless the prospective grantee
5 demonstrates sufficient attempts to secure pri-
6 vate financing or indicates that the project is
7 not independently commercially viable.”.

Page 5, strike lines 4 through 9 and insert the fol-
lowing:

8 “(B) \$497,000,000 for fiscal year 2021;
9 “(C) \$567,000,000 for fiscal year 2022;
10 “(D) \$651,000,000 for fiscal year 2023;
11 and
12 “(E) \$750,000,000 for fiscal year 2024.”.

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Chairwoman JOHNSON. I ask unanimous consent to dispense from further reading, and without objection, so ordered. I recognize myself for 5 minutes to briefly explain the amendment.

The manager's amendment represents an agreement between me and my friend Mr. Lucas to pass a major reauthorization of ARPA-E out of this Committee with strong bipartisan support. I greatly appreciate the hard work that he and his staff put into achieving this compromise, and I truly hope that this bodes well for all of our mutual efforts to advance the authorization of other important clean energy R&D (research and development) programs going forward. I urge all my colleagues on both sides of the aisle to support the amendment, and I yield back.

Is there further discussion?

Mr. LUCAS. Madam Chair?

Chairwoman JOHNSON. Mr. Lucas.

Mr. LUCAS. Thank you, Madam Chairwoman. When we marked up H.R. 4091 in the Energy Subcommittee, I said that I believed there was an opportunity to find common ground and to reauthorize ARPA-E in a bipartisan way. I want to thank you, Chairwoman Johnson, for working with me to achieve that common ground through this manager's amendment. We both had to make compromises, but I believe we achieved consensus. And I believe this amendment is a responsible approach and will give us the best chance to see a robust reauthorization bill signed into law.

I introduced a bill in July to reauthorize and reform ARPA-E, and the manager's amendment we are considering today includes elements of that bill that were essential for reaching bipartisan consensus. ARPA-E is meant to advance cutting-edge technologies that are too high-risk for industry but have the potential to revolutionize energy production, development, and use in America. This is vitally important work, and ARPA-E is unique in its ability to do this. So it's critical that even as we grow the program's resources, we make sure that we're going to fund work within ARPA-E's mission, not duplicative research, a development that can be better funded by other DOE programs or the private industry.

This manager's amendment goes a long way toward eliminating the duplication between ARPA-E and other Department of Energy research. It also creates a more rigorous approval process that ensures applicants have first sought private investment before applying for ARPA-E grants.

These reforms, in addition to the reforms included in the original legislation, have given us the opportunity to pass a bipartisan bill that benefits taxpayers while strengthening the transformational energy research.

I want to thank the Chairwoman for working with me on this bill, and I yield back.

Chairwoman JOHNSON. Thank you very much.

Any further discussion on the amendment?

Seeing none, the vote will occur on the amendment.

All those in favor, say aye.

Those opposed, no.

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

We now will hear the Foster amendment. The next amendment on the roster is offered by the gentleman from Illinois. He is recognized to offer the amendment.

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

Chairwoman JOHNSON. The clerk will report the amendment.

The CLERK. Amendment No. 2, amendment to H.R. 4091 offered by Mr. Foster.

[The amendment of Mr. Foster follows:]

AMENDMENT TO H.R. 4091
OFFERED BY Mr. Foster

Page 4, line 20, insert the following (and make such conforming changes as may be necessary):

- 1 (3) by adding at the end the following:
- 2 “(4) CHIEF EVALUATION OFFICER.—
- 3 “(A) IN GENERAL.—The Director shall ap-
- 4 point within ARPA-E a Chief Evaluation Offi-
- 5 cer, who shall report to the Director and shall
- 6 be provided sufficient support staff to carry out
- 7 the duties described in subparagraph (B).
- 8 “(B) DUTIES.—The Chief Evaluation Offi-
- 9 cer appointed under subparagraph (A) shall—
- 10 “(i) conduct systematic and com-
- 11 prehensive impact assessments of ARPA-E
- 12 projects and programs;
- 13 “(ii) assist with the preparation of the
- 14 Reports and Roadmaps in section (h); and
- 15 “(iii) carry out such other activities as
- 16 determined by the Director.

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1 “(C) LIMITATION.—The appointment
2 under subparagraph (A) shall be subject to sub-
3 section (g)(3)(A).”

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

I recognize the gentleman for 5 minutes to explain his amendment.

Mr. FOSTER. Thank you, Ms. Chairwoman. I'm introducing this amendment to establish a Chief Evaluation Officer position at ARPA-E. In 2017 the National Academies issued a comprehensive assessment of ARPA-E. While the report was generally positive in terms of ARPA-E's technological advancements and effective program and project management, the authors noted a few areas in need of improvement.

One area in need of attention was ARPA-E's evaluation and assessment program. The Academy found that the Agency is not yet able to fully assess the full extent of its impact and achievement of its statutory mission and goals. They also found that ARPA-E is doing a poor job of creating awareness of its success in enhancing the economic and energy security of the United States. The report recommended that, quote, "The ARPA-E Director and Program Director should develop and implement a framework for measuring and assessing the Agency's impact in achieving its mission and goals," unquote.

I do not want to be overly prescriptive in telling ARPA-E how to better measure and assess its impact or better communicate its success to lawmakers and the general public. My amendment simply creates a position of Chief Evaluation Officer, a position which is successfully used in other agencies. A Chief Evaluation Officer coordinates, promotes, sponsors, and builds capacity within a Federal department to help the Agency understand and conduct evaluations. The results of these evaluations can be used to improve policies and programs, as well as to communicate the success of the Agency to the public. It will be left up to ARPA-E and the Chief Evaluation Officer to determine how best to measure impact and communicate its success.

Now, since introducing my amendment, I have recently learned that ARPA-E now plans to hire an evaluation impact assessment expert to help them respond to the National Academies' recommendations.

So, Ms. Chairwoman, I withdraw my amendment and look forward to working with the Agency to ensure that this critically important role is filled using existing authorities. And I yield back.

Chairwoman JOHNSON. Thank you very much.

Are there any other amendments? Are there any requests for time?

If not, a reporting quorum being present, I move that the Committee on Science, Space, and Technology report H.R. 4091, as amended, to the House with the recommendation that the bill be approved.

Those in favor of the motion can signify by saying aye.

Those opposed, no.

Hearing none, the motion is carried.

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 2 subsequent calendar days in which to submit supplementary minority and additional views on this measure.

H.R. 2051

Chairwoman JOHNSON. We will now consider H.R. 2051, the *Sustainable Chemistry Research and Development Act of 2019*. The clerk will report the bill.

The CLERK. H.R. 2051, a bill to provide for Federal coordination of activities supporting sustainable chemistry and for other purposes.

[The bill follows:]

