

NUCLEAR ENERGY RESEARCH INFRASTRUCTURE ACT OF  
 2017

FEBRUARY 13, 2018.—Committed to the Committee of the Whole House on the State  
 of the Union and ordered to be printed

Mr. SMITH of Texas, from the Committee on Science, Space, and  
 Technology, submitted the following

R E P O R T

[To accompany H.R. 4378]

[Including cost estimate of the Congressional Budget Office]

The Committee on Science, Space, and Technology, to whom was referred the bill (H.R. 4378) to direct the Secretary of Energy to carry out the construction of a versatile reactor-based fast neutron source, and for other purposes, having considered the same, report favorably thereon without amendment and recommend that the bill do pass.

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## COMMITTEE STATEMENT AND VIEWS

## PURPOSE AND SUMMARY

The purpose of H.R. 4378, the “Nuclear Energy Research Infrastructure Act of 2017,” is to provide for technological innovation in nuclear energy through the prioritization of a nuclear energy user facility in the Department of Energy (DOE) national laboratory system.

This legislation directs the Department to construct a Versatile Neutron Source (VNS), defined as a research reactor capable of providing fast neutron irradiation services. This facility will enable next generation nuclear energy research and facilitate private sector investment and development of advanced reactor technologies in the United States.

## BACKGROUND AND NEED FOR LEGISLATION

DOE’s national laboratory complex originated with the Manhattan project and currently provides the facilities and expertise necessary to conduct research and development (R&D) for military and civilian applications of nuclear energy. DOE funds civilian nuclear energy R&D through the national labs, universities, and the private sector. DOE manages long-term R&D programs, employs highly trained scientists, and is capable of constructing and operating research infrastructure in the national interest that the private sector cannot undertake.

The Committee recognizes that constructing and maintaining best-in-the-world user facilities enables research conducted by DOE and by industry partners, and facilitates revolutionary discoveries in nuclear energy. The next transformative breakthroughs in innovative nuclear energy technologies will likely arise from a strong foundation in early-stage research, particularly in the study of fast neutrons.

The Department has unique authority under the Atomic Energy Act of 1954, as amended, to construct and operate nuclear reactors for R&D, activities that would otherwise require a license from the Nuclear Regulatory Commission (NRC or the Commission). However, the Department has not brought a civilian research reactor online in almost four decades. As the NRC draws the majority of its funding from the currently operating reactor fleet, the Commission remains heavily focused on regulating one specific technology class and is not well suited to advance non-light water reactors in a timely manner.

The United States also lacks sufficient capability to conduct physical experiments for materials science, chemistry, and fuels R&D in the fast neutron spectrum or in a liquid fueled reactor system.

In the 114th Congress, the Committee advanced H.R. 4084, the Nuclear Energy Innovation Capabilities Act, which authorized the Department to develop high-end computational tools to model and simulate nuclear phenomena, private development of experimental reactors and related experiments at DOE-owned sites, and construction of the VNS, a research reactor capable of producing fast neutrons, in order to enable rare experiments and validate computational models.

H.R. 4378 authorizes existing Office of Nuclear Energy funding to construct the VNS, ensuring the Department will invest in research infrastructure that will enable scientists and engineers to conduct the necessary experiments to develop new nuclear energy technologies and advance scientific knowledge. This legislation also requires that to the maximum extent practicable, the Secretary of Energy shall ensure that the start of full operations of the VNS occurs before December 31, 2025.

#### LEGISLATIVE HISTORY

On December 11, 2014, the Energy Subcommittee held a hearing titled, “The Future of Nuclear Energy.” Witnesses were: The Honorable Peter Lyons, Assistant Secretary for Nuclear Energy, U.S. Department of Energy; Dr. Ashley Finan, Senior Project Manager, Energy Innovation Project, Clean Air Task Force; Mr. Mike McGough, Chief Commercial Officer, NuScale Power; Dr. Leslie Dewan, Co-founder and Chief Executive Officer, Transatomic Power; Mr. Daniel Lipman, Executive Director, Policy Development, Nuclear Energy Institute.

On January 28, 2015, the Energy Subcommittee held a hearing titled, “Supercomputing and American Technology Leadership.” Witnesses were: Mr. Norman Augustine, Board Member, Bipartisan Policy Center; Dr. Roscoe Giles, Chairman, DOE Advanced Scientific Computing Advisory Committee; Mr. Dave Turek, Vice President, Technical Computing, IBM; Dr. James Crowley, Executive Director, Society for Industrial and Applied Mathematics.

On May 13, 2015, the Energy Subcommittee held a hearing titled, “Nuclear Energy Innovation and the National Labs.” Witnesses were: Dr. Mark Peters, Associate Laboratory Director, Energy and Global Security, Argonne National Laboratory; Mr. Frank Batten, Jr., President, The Landmark Foundation; Mr. Nathan Gilliland, CEO, General Fusion; Dr. John Parmentola, Senior Vice President, Energy and Advanced Concepts, General Atomics.

On June 17, 2015, the Energy Subcommittee held a hearing titled, “Department of Energy Oversight: Energy Innovation Hubs.” Witnesses were: Dr. Harry A. Atwater, Director, Joint Center for Artificial Photosynthesis (JCAP); Dr. Jess Gehin, Director, Consortium for Advanced Simulation of Light Water Reactors (CASL); Dr. George Crabtree, Director, Joint Center for Energy Storage Research (JCESR); Dr. Alex King, Director, Critical Materials Institute (CMI).

On July 29, 2015, the Energy Subcommittee held a hearing titled, “A Review of the Nuclear Regulatory Commission’s Licensing Process.” The witness was The Honorable Stephen G. Burns, Chairman, U.S. Nuclear Regulatory Commission.

On November 18, 2015, the Energy Subcommittee held a hearing titled, “Recommendations of the Commission to Review the Effectiveness of the National Energy Laboratories.” Witnesses were: Mr. TJ Glauthier, Co-Chair, Commission to Review the Effectiveness of the National Energy Laboratories; Dr. Jared Cohon, Co-Chair, Commission to Review the Effectiveness of the National Energy Laboratories; Dr. Peter Littlewood, Director, Argonne National Laboratory.

On November 19, 2015, Energy Subcommittee Chairman Randy Weber introduced H.R. 4084, the Nuclear Energy Innovation Capabilities Act.

On December 3, 2015, the Energy Subcommittee held a hearing titled “H.R. 4084, the Nuclear Energy Innovation Capabilities Act.” Witnesses were: Mr. John Kotek, Acting Assistant Secretary, Office of Nuclear Energy, U.S. Department of Energy; Dr. Dale Klein, Associate Vice Chancellor for Research, University of Texas; Mr. Ray Rothrock, Partner Emeritus, Venrock.

On January 21, 2016, Sen. Mike Crapo introduced S. 2461, companion legislation to H.R. 4084, in the Senate. This legislation was adopted as an amendment to S. 2012, the Energy Policy Modernization Act, by a vote of 87–4 on January 28, 2016.

On February 26, 2016, H.R. 4084 passed the House by voice vote.

On March 22, 2016, the Committee held a hearing titled, “An Overview of the Budget Proposal for the Department of Energy for Fiscal Year 2017.” The witness was The Honorable Ernest Moniz, Secretary of Energy, U.S. Department of Energy.

On May 18, 2016, H.R.4909, the National Defense Authorization Act for Fiscal Year 2017, which included the text of H.R. 4084 as an amendment, passed the House by recorded vote, 277–147.

On June 28, 2017, the Energy Subcommittee and the Research and Technology Subcommittee held a hearing titled, “Material Science: Building the Future.” Witnesses were: Dr. Matthew Tirrell, Deputy Laboratory Director for Science and Chief Research Officer, Argonne National Laboratory; Dr. Laurie Locascio, Acting Associate Director for Laboratory Programs and Director, Material Measurement Laboratory, National Institute of Standards and Technology; Dr. Adam Schwartz, Director, Ames Laboratory; Dr. Fred Higgs, John and Ann Doerr Professor of Mechanical Engineering, Rice University.

On January 11, 2017, Energy Subcommittee Chairman Weber introduced H.R. 431, the Nuclear Energy Innovation Capabilities Act of 2017.

On January 24, 2017, H.R. 589, the Department of Energy Research and Innovation Act introduced by Chairman Lamar Smith, which included the text of H.R. 431 as Title IV, passed the House by voice vote.

On July 19, 2017, the Committee held a hearing titled, “Energy Innovation: Letting Technology Lead.” Witnesses were: Dr. Jacob DeWitte, President and CEO, Oklo; Dr. Gaurav N. Sant, Associate Professor and Henry Samueli Fellow, Department of Civil and Environmental Engineering, Henry Samueli School of Engineering and Applied Science, University of California, Los Angeles; Dr. Venky Narayanamurti, Benjamin Peirce Research Professor of Technology and Public Policy, John A. Paulson School of Engineering and Applied Science, Harvard University; Mr. Kiran Kumaraswamy, Market Development Director, AES Energy Storage.

On November 13, 2017, H.R. 4378, the Nuclear Energy Research Infrastructure Act of 2017, was introduced by Energy Subcommittee Chairman Weber and referred to the Committee on Science, Space, and Technology.

On November 15, 2017, the Committee approved and ordered reported H.R. 4378 by voice vote.

## COMMITTEE VIEWS

*Versatile Neutron Source*

H.R. 4378 authorizes the construction of the VNS to provide the necessary infrastructure to enable experiments to advance scientific knowledge, validate computational models, and develop new nuclear energy technologies. This includes the capability to provide fast neutron spectrum irradiation and the capacity for upgrades to accommodate new or expanded research needs to maximize the user base for this research facility.

In order to ensure the on-schedule, on-budget construction of this project, the Committee included a timeline and sufficient annual authorizations in this legislation requiring the Department to complete the VNS by the close of 2025. However, the Committee encourages the Department to design this facility in such a way that it may accommodate expansions and upgrades to enable new testing scenarios that may not be available in 2025 timeframe. The Committee expects the Department to pursue every available option to adhere to the timeline described in the legislation.

The Committee also encourages the Department to fully consider options to construct this facility under its existing authority pursuant to Sec. 110 of the Atomic Energy Act of 1954 (42 U.S.C. 2140), and to explore opportunities to incorporate technical assistance from the NRC for analysis relevant to the design, construction, and operation of the VNS.

The Committee finds that this authorization will provide the DOE Office of Nuclear Energy with a long-term funding priority that clearly communicates a U.S. commitment to developing advanced nuclear technologies, and will encourage the private sector to invest in the development of advanced reactor technologies in the United States.

## SECTION-BY-SECTION

*Sec. 1. Short title*

Nuclear Energy Research Infrastructure Act of 2017.

*Sec. 2. Versatile Neutron Source*

This section would authorize the construction of the VNS over eight years. This facility will provide a reactor-based source of fast neutrons for nuclear energy research, and enable scientists in academia and the private sector to advance scientific knowledge, validate computational models, and conduct experiments that would otherwise not be possible in order to develop next generation materials, fuels, and nuclear energy technologies.

## EXPLANATION OF AMENDMENTS

There were no amendments to this bill.

## COMMITTEE CONSIDERATION

On November 15, 2017, the Committee met in open session and ordered reported favorably the bill, H.R. 4378, by voice vote, a quorum being present.

## APPLICATION OF LAW TO THE LEGISLATIVE BRANCH

Section 102(b)(3) of Public Law 104–1 requires a description of the application of this bill to the legislative branch where the bill relates to the terms and conditions of employment or access to public services and accommodations. This bill provides for technological innovation in nuclear energy through the construction of a nuclear energy user facility in the DOE national laboratory system. As such, this bill does not relate to employment or access to public services and accommodations.

## STATEMENT OF OVERSIGHT FINDINGS AND RECOMMENDATIONS OF THE COMMITTEE

In compliance with clause 3(c)(1) of rule XIII and clause (2)(b)(1) of rule X of the Rules of the House of Representatives, the Committee's oversight findings and recommendations are reflected in the descriptive portions of this report.

## STATEMENT OF GENERAL PERFORMANCE GOALS AND OBJECTIVES

H.R. 4378 provides for technological innovation in nuclear energy through the construction of a nuclear energy user facility in the DOE national laboratory system.

## DUPLICATION OF FEDERAL PROGRAMS

No provision of H.R. 4378 establishes or reauthorizes a program of the Federal Government known to be duplicative of another Federal program, a program that was included in any report from the Government Accountability Office to Congress pursuant to section 21 of Public Law 111–139, or a program related to a program identified in the most recent Catalog of Federal Domestic Assistance.

## DISCLOSURE OF DIRECTED RULE MAKINGS

The Committee estimates that enacting H.R. 4378 does not direct the completion of any specific rule makings within the meaning of 5 U.S.C. 551.

## FEDERAL ADVISORY COMMITTEE ACT

The Committee finds that the legislation does not establish or authorize the establishment of an advisory committee within the definition of 5 U.S.C. App., Section 5(b).

## UNFUNDED MANDATE STATEMENT

Section 423 of the Congressional Budget and Impoundment Control Act (as amended by Section 101(a)(2) of the Unfunded Mandate Reform Act, P.L. 104–4) requires a statement as to whether the provisions of the reported include unfunded mandates. In compliance with this requirement the Committee has received a letter from the Congressional Budget Office included herein.

## EARMARK IDENTIFICATION

H.R. 4378 does not include any congressional earmarks, limited tax benefits, or limited tariff benefits as defined in clause 9 of Rule XXI.

## COMMITTEE ESTIMATE

Clause 3(d)(2) of rule XIII of the Rules of the House of Representatives requires an estimate and a comparison by the Committee of the costs that would be incurred in carrying out H.R. 4378. However, clause 3(d)(3)(B) of that rule provides that this requirement does not apply when the Committee has included in its report a timely submitted cost estimate of the bill prepared by the Director of the Congressional Budget Office under section 402 of the Congressional Budget Act.

## BUDGET AUTHORITY AND CONGRESSIONAL BUDGET OFFICE COST ESTIMATE

With respect to the requirements of clause 3(c)(2) of rule XIII of the Rules of the House of Representatives and section 308(a) of the Congressional Budget Act of 1974 and with respect to requirements of clause (3)(c)(3) of rule XIII of the Rules of the House of Representatives and section 402 of the Congressional Budget Act of 1974, the Committee has received the following cost estimate for H.R. 4378 from the Director of Congressional Budget Office:

U.S. CONGRESS,  
CONGRESSIONAL BUDGET OFFICE,  
*Washington, DC, December 4, 2017.*

Hon. LAMAR SMITH,  
*Chairman, Committee on Science, Space, and Technology,  
House of Representatives, Washington, DC.*

DEAR MR. CHAIRMAN: The Congressional Budget Office has prepared the enclosed cost estimate for H.R. 4378, the Nuclear Energy Research Infrastructure Act of 2017.

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

Sincerely,

KEITH HALL,  
*Director.*

Enclosure.

*H.R. 4378—Nuclear Energy Research Infrastructure Act of 2017*

Summary: H.R. 4378 would authorize appropriations for the Department of Energy (DOE) to establish a test reactor to support research and development of advanced nuclear reactor technologies. Assuming appropriation of the authorized amounts, CBO estimates that implementing the bill would cost nearly \$2 billion over the 2018–2027 period.

Enacting H.R. 4378 would not affect direct spending or revenues; therefore, pay-as-you-go procedures do not apply. CBO estimates that enacting H.R. 4378 would not increase net direct spending or on-budget deficits in any of the four consecutive 10-year periods beginning in 2028.

H.R. 4378 contains no intergovernmental or private-sector mandates as defined in the Unfunded Mandates Reform Act (UMRA).

Estimated cost to the Federal Government: The estimated budgetary effect of H.R. 4378 is shown in the following table. The costs of this legislation fall within budget function 270 (energy).

|  | By fiscal year, in millions of dollars— |      |      |      |      |      |      |      |      |      |  | 2018–<br>2022 | 2018–<br>2027 |  |
|--|---|------|------|------|------|------|------|------|------|------|--|---------------|---------------|--|
|  | 2018                                    | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |  |               |               |  |
| INCREASES IN SPENDING SUBJECT TO APPROPRIATION |   |      |      |      |      |      |      |      |      |      |  |               |               |  |
| Authorization Level .....                      | 35                                      | 100  | 200  | 260  | 340  | 350  | 350  | 350  | 0    | 0    |  | 935           | 1,985         |  |
| Estimated Outlays .....                        | 11                                      | 41   | 101  | 172  | 250  | 305  | 338  | 349  | 245  | 140  |  | 575           | 1,952         |  |

Basis of estimate: H.R. 4378 would authorize appropriations totaling nearly \$2 billion for DOE to establish, before calendar year 2026, a nuclear test reactor to support the research and development of advanced nuclear technologies. The bill also would specify technical capabilities that the proposed reactor must provide and would direct DOE to operate it as a national user facility that would be available for external use by nonfederal entities. Finally, the bill would direct DOE to consult the private sector, universities, national laboratories, and other federal agencies when it developed such a facility.

According to DOE, the agency is currently assessing the need for a test reactor similar to the one envisioned under H.R. 4378, the costs of which are uncertain. Assuming appropriation of the specified amounts, CBO estimates that federal spending to support the development of such a facility would total nearly \$2 billion over the 2018–2027 period. That estimate is based on historical spending patterns for similar activities administered by DOE.

Pay-As-You-Go considerations: None.

Increase in long-term direct spending and deficits: CBO estimates that enacting the legislation would not increase net direct spending or on-budget deficits in any of the four consecutive 10-year periods beginning in 2028.

Mandates: H.R. 4378 contains no intergovernmental or private-sector mandates as defined in UMRA.

Estimate prepared by: Federal costs: Megan Carroll; Mandates: Jon Sperl.

Estimate approved by: H. Samuel Papenfuss, Deputy Assistant Director for Budget Analysis.