

NUCLEAR ENERGY INNOVATION CAPABILITIES ACT

FEBRUARY 29, 2016.—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. 4084]

[Including cost estimate of the Congressional Budget Office]

The Committee on Science, Space, and Technology, to whom was referred the bill (H.R. 4084) to enable civilian research and development of advanced nuclear energy technologies by private and public institutions and to expand theoretical and practical knowledge of nuclear physics, chemistry, and materials science, having considered the same, report favorably thereon with an amendment and recommend that the bill as amended do pass.

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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 “Nuclear Energy Innovation Capabilities Act”.

SEC. 2. NUCLEAR ENERGY.

Section 951 of the Energy Policy Act of 2005 (42 U.S.C. 16271) is amended to read as follows:

“SEC. 951. NUCLEAR ENERGY.

“(a) MISSION.—The Secretary shall conduct programs of civilian nuclear research, development, demonstration, and commercial application, including activities in this subtitle. Such programs shall take into consideration the following objectives:

“(1) Providing research infrastructure to promote scientific progress and enable users from academia, the National Laboratories, and the private sector to make scientific discoveries relevant for nuclear, chemical, and materials science engineering.

“(2) Maintaining National Laboratory and university nuclear energy research and development programs, including their infrastructure.

“(3) Providing the technical means to reduce the likelihood of nuclear weapons proliferation and increasing confidence margins for public safety of nuclear energy systems.

“(4) Reducing the environmental impact of nuclear energy related activities.

“(5) Supporting technology transfer from the National Laboratories to the private sector.

“(6) Enabling the private sector to partner with the National Laboratories to demonstrate novel reactor concepts for the purpose of resolving technical uncertainty associated with the aforementioned objectives in this subsection.

“(b) DEFINITIONS.—In this subtitle:

“(1) ADVANCED FISSION REACTOR.—The term ‘advanced fission reactor’ means a nuclear fission reactor with significant improvements over the most recent generation of nuclear reactors, which may include inherent safety features, lower waste yields, greater fuel utilization, superior reliability, resistance to proliferation, and increased thermal efficiency.

“(2) FAST NEUTRON.—The term ‘fast neutron’ means a neutron with kinetic energy above 100 kiloelectron volts.

“(3) NATIONAL LABORATORY.—The term ‘National Laboratory’ has the meaning given that term in paragraph (3) of section 2, except that with respect to subparagraphs (G), (H), and (N) of such paragraph, for purposes of this subtitle the term includes only the civilian activities thereof.

“(4) NEUTRON FLUX.—The term ‘neutron flux’ means the intensity of neutron radiation measured as a rate of flow of neutrons applied over an area.

“(5) NEUTRON SOURCE.—The term ‘neutron source’ means a research machine that provides neutron irradiation services for research on materials sciences and nuclear physics as well as testing of advanced materials, nuclear fuels, and other related components for reactor systems.

“(c) SENSE OF CONGRESS.—It is the sense of the Congress that nuclear energy, through fission or fusion, represents the highest energy density of any known attainable source and yields zero air emissions. This energy source is of national importance to scientific progress, national security, electricity generation, heat generation for industrial applications, and space exploration. Considering the inherent complexity and regulatory burden associated with this area of science, the Department should focus its civilian nuclear research and development activities towards programs that enable the private sector, National Laboratories, and universities to carry out such experiments as are necessary to promote scientific progress and enhance practical knowledge of nuclear engineering.”.

SEC. 3. NUCLEAR ENERGY RESEARCH PROGRAMS.

Section 952 of the Energy Policy Act of 2005 (42 U.S.C. 16272) is amended—

(1) by striking subsection (c); and

(2) by redesignating subsections (d) and (e) as subsections (c) and (d), respectively.

SEC. 4. ADVANCED FUEL CYCLE INITIATIVE.

Section 953(a) of the Energy Policy Act of 2005 (42 U.S.C. 16273(a)) is amended by striking “, acting through the Director of the Office of Nuclear Energy, Science and Technology,”.

SEC. 5. UNIVERSITY NUCLEAR SCIENCE AND ENGINEERING SUPPORT.

Section 954(d)(4) of the Energy Policy Act of 2005 (42 U.S.C. 16274(d)(4)) is amended by striking “as part of a taking into consideration effort that emphasizes” and inserting “that emphasize”.

SEC. 6. DEPARTMENT OF ENERGY CIVILIAN NUCLEAR INFRASTRUCTURE AND FACILITIES.

Section 955 of the Energy Policy Act of 2005 (42 U.S.C. 16275) is amended—

(1) by striking subsections (c) and (d); and

(2) by adding at the end the following:

“(c) VERSATILE NEUTRON SOURCE.—

“(1) MISSION NEED.—Not later than December 31, 2016, the Secretary shall determine the mission need for a versatile reactor-based fast neutron source, which shall operate as a national user facility. During this process, the Secretary shall consult with the private sector, universities, National Laboratories, and relevant Federal agencies to ensure that this user facility will meet the research needs of the largest possible majority of prospective users.

“(2) ESTABLISHMENT.—Upon the determination of mission need made under paragraph (1), the Secretary shall, as expeditiously as possible, provide to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate a detailed plan for the establishment of the user facility.

“(3) FACILITY REQUIREMENTS.—

“(A) CAPABILITIES.—The Secretary shall ensure that this user facility will provide, at a minimum, the following capabilities:

“(i) Fast neutron spectrum irradiation capability.

“(ii) Capacity for upgrades to accommodate new or expanded research needs.

“(B) CONSIDERATIONS.—In carrying out the plan provided under paragraph (2), the Secretary shall consider the following:

“(i) Capabilities that support experimental high-temperature testing.

“(ii) Providing a source of fast neutrons at a neutron flux, higher than that at which current research facilities operate, sufficient to enable research for an optimal base of prospective users.

“(iii) Maximizing irradiation flexibility and irradiation volume to accommodate as many concurrent users as possible.

“(iv) Capabilities for irradiation with neutrons of a lower energy spectrum.

“(v) Multiple loops for fuels and materials testing in different coolants.

“(vi) Additional pre-irradiation and post-irradiation examination capabilities.

“(vii) Lifetime operating costs and lifecycle costs.

“(4) REPORTING PROGRESS.—The Department shall, in its annual budget requests, provide an explanation for any delay in its progress and otherwise make every effort to complete construction and approve the start of operations for this facility by December 31, 2025.

“(5) COORDINATION.—The Secretary shall leverage the best practices for management, construction, and operation of national user facilities from the Office of Science.”.

SEC. 7. SECURITY OF NUCLEAR FACILITIES.

Section 956 of the Energy Policy Act of 2005 (42 U.S.C. 16276) is amended by striking “, acting through the Director of the Office of Nuclear Energy, Science and Technology,”.

SEC. 8. HIGH-PERFORMANCE COMPUTATION AND SUPPORTIVE RESEARCH.

Section 957 of the Energy Policy Act of 2005 (42 U.S.C. 16277) is amended to read as follows:

“SEC. 957. HIGH-PERFORMANCE COMPUTATION AND SUPPORTIVE RESEARCH.

“(a) MODELING AND SIMULATION.—The Secretary shall carry out a program to enhance the Nation’s capabilities to develop new reactor technologies through high-performance computation modeling and simulation techniques. This program shall coordinate with relevant Federal agencies through the National Strategic Computing Initiative created under Executive Order 13702 (July 29, 2015) while taking into account the following objectives:

“(1) Utilizing expertise from the private sector, universities, and National Laboratories to develop computational software and capabilities that prospective users may access to accelerate research and development of advanced fission reactor systems, nuclear fusion systems, and reactor systems for space exploration.

“(2) Developing computational tools to simulate and predict nuclear phenomena that may be validated through physical experimentation.

“(3) Increasing the utility of the Department’s research infrastructure by coordinating with the Advanced Scientific Computing Research program within the Office of Science.

“(4) Leveraging experience from the Energy Innovation Hub for Modeling and Simulation.

“(5) Ensuring that new experimental and computational tools are accessible to relevant research communities.

“(b) SUPPORTIVE RESEARCH ACTIVITIES.—The Secretary shall consider support for additional research activities to maximize the utility of its research facilities, including physical processes to simulate degradation of materials and behavior of fuel forms and for validation of computational tools.”.

SEC. 9. ENABLING NUCLEAR ENERGY INNOVATION.

Subtitle E of title IX of the Energy Policy Act of 2005 (42 U.S.C. 16271 et seq.) is amended by adding at the end the following:

“SEC. 958. ENABLING NUCLEAR ENERGY INNOVATION.

“(a) NATIONAL REACTOR INNOVATION CENTER.—The Secretary shall carry out a program to enable the testing and demonstration of reactor concepts to be proposed and funded by the private sector. The Secretary shall leverage the technical expertise of relevant Federal agencies and National Laboratories in order to minimize the time required to enable construction and operation of privately funded experimental reactors at National Laboratories or other Department-owned sites while ensuring reasonable safety for persons working within these sites. Such reactors shall operate to meet the following objectives:

“(1) Enabling physical validation of novel reactor concepts.

“(2) Resolving technical uncertainty and increasing practical knowledge relevant to safety, resilience, security, and functionality of first-of-a-kind reactor concepts.

“(3) General research and development to improve nascent technologies.

“(b) REPORTING REQUIREMENT.—Not later than 180 days after the date of enactment of the Nuclear Energy Innovation Capabilities Act, the Secretary, in consultation with the National Laboratories, relevant Federal agencies, and other stakeholders, shall transmit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate a report assessing the Department’s capabilities to authorize, host, and oversee privately funded fusion and advanced fission experimental reactors as described under subsection (a). The report shall address the following:

“(1) The Department’s safety review and oversight capabilities, including options to leverage expertise from the Nuclear Regulatory Commission and National Laboratories.

“(2) Potential sites capable of hosting activities described under subsection (a).

“(3) The efficacy of the Department’s available contractual mechanisms to partner with the private sector and Federal agencies, including cooperative research and development agreements, strategic partnership projects, and agreements for commercializing technology.

“(4) Potential cost structures related to physical security, decommissioning, liability, and other long-term project costs.

“(5) Other challenges or considerations identified by the Secretary.”.

SEC. 10. BUDGET PLAN.

(a) IN GENERAL.—Subtitle E of title IX of the Energy Policy Act of 2005 (42 U.S.C. 16271 et seq.) is further amended by adding at the end the following:

“SEC. 959. BUDGET PLAN.

“Not later than 12 months after the date of enactment of the Nuclear Energy Innovation Capabilities Act, the Department shall transmit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate 3 alternative 10-year budget plans for civilian nuclear energy research and development by the Department. The first shall assume constant annual funding for 10 years at the appropriated level for the Department’s civilian nuclear energy research and development for fiscal year 2016. The second shall assume 2 percent annual increases to the appropriated level for the Department’s nuclear energy research and development for fiscal year 2016. The third shall be an unconstrained budget. The 3 plans shall include—

“(1) a prioritized list of the Department’s programs, projects, and activities to best support the development of next generation nuclear energy technology;

“(2) realistic budget requirements for the Department to implement sections 955(c), 957, and 958 of this Act; and

“(3) the Department’s justification for continuing or terminating existing civilian nuclear energy research and development programs.”.

(b) REPORT ON FUSION INNOVATION.—Not later than six months after the date of enactment of this Act, the Secretary of the Department of Energy shall transmit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate a report that will identify engineering designs for innovative fusion energy systems that have the

potential to demonstrate net energy production not later than 15 years after the start of construction. In this report, the Secretary will identify budgetary requirements that would be necessary for the Department to carry out a fusion innovation initiative to accelerate research and development of these designs.

SEC. 11. CONFORMING AMENDMENTS.

The table of contents for the Energy Policy Act of 2005 is amended by striking the item relating to section 957 and inserting the following:

“957. High-performance computation and supportive research.
 “958. Enabling nuclear energy innovation.
 “959. Budget plan.”

COMMITTEE STATEMENT AND VIEWS

PURPOSE AND SUMMARY

This legislation modifies Subtitle E (Nuclear Energy) of Title IX (Research and Development) of the Energy Policy Act of 2005 (42 U.S.C. 16271–16277) by updating policy direction and existing authority for civilian nuclear research and development (R&D) by the Department of Energy (DOE or the Department). This legislation directs DOE to prioritize R&D infrastructure that will enable academic and proprietary nuclear energy research that cannot occur without its capabilities. These R&D capabilities will enable the private sector to invest in the development of advanced reactor technologies in the United States while providing a clear path for experimental reactor development and related experiments at DOE labs.

BACKGROUND AND NEED FOR LEGISLATION

The DOE’s national laboratory complex originated from the Manhattan project and since then has provided the facilities and expertise necessary to conduct R&D for military and civilian applications of nuclear energy. The DOE funds civilian nuclear energy R&D through the DOE labs, universities, and the private sector all of which employ highly trained scientists to maintain the nation’s critical R&D capabilities. The DOE manages long-term research and development programs and is capable of constructing and operating research infrastructure in the national interest that the private sector cannot undertake.

The Department has unique authority under the Atomic Energy Act of 1954, as amended, to construct and operate nuclear reactors for R&D purposes that would otherwise require a license from the Nuclear Regulatory Commission (NRC or the Commission). Yet the Department has not brought online a civilian research reactor in almost four decades. As the NRC draws the majority of its funding from the currently operating reactor fleet (of light-water reactors using the thermal neutron spectrum), 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. Moreover, the United States 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.

The Nuclear Energy Innovation Capabilities Act provides the DOE with statutory direction to prioritize R&D infrastructure that will enable scientists and engineers to conduct the necessary experiments to develop new technologies and advance scientific knowledge through publication of technical papers. This statutory

direction will provide the DOE with the long-term certainty it requires for more effective R&D planning and send a positive signal for the private sector to invest in the development of advanced reactor technologies in the United States.

COMMITTEE VIEWS

Under H.R. 4084, the DOE will develop computational tools to model and simulate nuclear phenomena and construct a versatile neutron source to enable rare experiments and validate computational models. The Department will also provide a clear pathway for private development of experimental reactors and related experiments at DOE-owned sites. The Department will also maintain its current R&D infrastructure, including facilities housed within the DOE labs and universities. The Committee encourages the Department to continue to leverage talent from universities through the nuclear energy university program (NEUP) as a mechanism to implement specific activities prioritized in the legislation as well as other research programs already in operation.

The Committee recognizes the accomplished safety record of the commercial fleet of reactors under the jurisdiction of NRC. The Committee also recognizes that the NRC lacks sufficient resources to timely consider and license non-light water fission technology due to its 90 percent fee recover basis from licensees. As a result, the Commission's current regulatory framework, focused solely on light-water technology, creates a barrier for private developers to physically demonstrate the increased safety and efficiency features of advanced designs.

This legislation sets forth a timeline for the Department to complete a versatile neutron research source capable of providing fast neutron irradiation services by the close of 2025. 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 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). Consistent with testimony of the Chairman of the Nuclear Regulatory Commission during the Energy Subcommittee hearing titled "A Review of the Nuclear Regulatory Commission's Licensing Process," the DOE may elect to use technical assistance from the NRC for analysis relevant to the design, construction, and operation of a facility such as the versatile neutron research source described in the bill. The Committee expects the Department to pursue every available option to adhere to the timeline described in the legislation.

The bill authorizes a national reactor innovation center to accommodate the needs of private developers by providing the capability to expeditiously carry out criticality experiments up to the engineering prototype level. The Committee envisions that the DOE will carry out the national reactor innovation center consistent with the Department's mandate to advance the status of civilian nuclear R&D.

The Committee is concerned about the lack of progress in developing advanced nuclear fission technology in the United States, especially while comparative growth has increased for such technologies overseas. While other countries continue to develop proto-

types and commercial advanced reactors, the United States appears to be at least a decade away from beginning construction of a commercial advanced reactor. If the United States fails to regain leadership in advanced nuclear technology, it will lose the opportunity to compete in the global market and weaken its position to influence global nuclear safety and nonproliferation standards. The Committee also looks forward to further private investment in fusion technology in the United States and encourages the Department and the national laboratories to engage with the fusion community in the event that a private developer may require use of the national reactor innovation center.

LEGISLATIVE HISTORY

On January 12, 2016, the Committee on Science, Space, and Technology passed H.R. 4084 (as amended) by voice vote. The Committee passed by voice vote an amendment in the nature of a substitute and an amendment to require the Department of Energy to deliver a report on fusion innovation to the Committee on Science, Space, and Technology and to the Committee on Energy and Natural Resources of the Senate.

On December 3, 2015, the Energy Subcommittee of the Committee on Science, Space, and Technology held a hearing titled “H.R. 4084, the Nuclear Energy Innovation Capabilities Act,” which included testimony on H.R. 4084 from witnesses representing the private sector, academia, and the DOE.

On November 19, 2015, Rep. Randy Weber, Rep. Eddie Bernice Johnson, and Rep. Lamar Smith along with 18 original cosponsors introduced H.R. 4084, the Nuclear Energy Innovation Capabilities Act. On January 21, 2015, Sen. Mike Crapo, Sen. Sheldon Whitehouse, Sen. Jim Risch, and Sen. Cory Booker introduced companion legislation in the Senate, S. 2461, the Nuclear Energy Innovation Capabilities Act. 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 November 18, 2015, the Energy Subcommittee of the Committee on Science, Space, and Technology held a hearing titled “Recommendations of the Commission to Review the Effectiveness of the National Energy Laboratories.”

On July 29, 2015, the Energy Subcommittee of the Committee on Science, Space, and Technology held a hearing titled “A Review of the Nuclear Regulatory Commission’s Licensing Process,” which addressed the capability of the Nuclear Regulatory Commission to provide technical assistance to the DOE for assessing safety risk associated with nuclear research and development activities.

On June 17, 2015, the Energy Subcommittee of the Committee on Science, Space, and Technology held a hearing titled “Department of Energy Oversight: Energy Innovation Hubs,” which scrutinized on the effectiveness of the DOE’s model for energy innovation by leveraging expertise from the DOE laboratories, universities, and the private sector.

On May 13, 2015, the Energy Subcommittee of the Committee on Science, Space, and Technology held a hearing titled “Nuclear Energy Innovation and the National Labs,” which explored the capabilities of the DOE laboratories to provide unique research infra-

structure to enable academic and proprietary research and development.

On January 28, 2015, the Energy Subcommittee of the Committee on Science, Space, and Technology held a hearing titled “Super computing and American Technology Leadership,” which addressed the impact of accelerating research and development through high performance computational modeling and simulation.

On December 11, 2014, the Energy Subcommittee of the Committee on Science, Space, and Technology held a hearing titled “The Future of Nuclear Energy,” which addressed the need for the Department of Energy to use its authority to expeditiously support engineering prototype research and development, and related experiments at DOE labs.

SECTION-BY-SECTION

Sec. 1. Short title

The short title of this legislation is “Nuclear Energy Innovation Capabilities Act.”

Sec. 2. Nuclear energy

This section amends DOE’s civilian nuclear energy R&D mission to ensure that the DOE enables the private sector to partner with national labs for the purpose of developing novel reactor concepts. This section also provides a sense of congress that nuclear fission and fusion represent an opportunity for high energy density, zero air-emissions technology development of national importance to scientific progress, national security, energy R&D, and space exploration.

Sec. 3. Nuclear energy research programs

This section makes technical changes to current law.

Sec. 4. Advanced fuel cycle initiative

This section makes technical changes to statutory language.

Sec. 5. University nuclear science and engineering support

This section makes technical changes to statutory language.

Sec. 6. Department of Energy civilian nuclear infrastructure and facilities

This section provides the DOE with statutory direction for a reactor-based fast neutron research source that will operate as an open-access user facility to enable academic and proprietary research in the United States.

Sec. 7. Security of nuclear facilities

This section makes technical changes to statutory language.

Sec. 8. High-performance computation and supportive research

This section provides programmatic authority for DOE to leverage its supercomputing infrastructure to accelerate nuclear energy R&D capabilities for advanced fission and fusion reactor technologies.

Sec. 9. Enabling nuclear energy innovation

This section authorizes a program to enable the private sector to partner with DOE laboratories to construct and operate privately-funded experimental reactors and related experiments at DOE sites.

Sec. 10. Budget plan

This section requires DOE to produce a transparent, strategic, 10-year plan for prioritizing nuclear R&D programs while considering budget constraints.

Sec. 11. Conforming amendments

This section makes conforming changes to the table of contents of Subtitle E of Title IX of the Energy Policy Act of 2005 (42 U.S.C. 16271).

EXPLANATION OF AMENDMENTS

The Committee agreed by voice vote to an amendment in the nature of a substitute, offered by Chairman Smith. The amendment in the nature of a substitute codifies language from H.R. 4084, as introduced, into Subtitle E of Title IX of the Energy Policy Act of 2005 and makes technical updates to the United States Code.

The Committee also agreed by voice vote to an amendment, offered by Mr. Grayson, to require the Secretary to deliver a report on fusion innovation to the Committee on Science, Space, and Technology of the House and to the Committee on Energy and Natural Resources of the Senate.

COMMITTEE CONSIDERATION

On January 12, 2016, the Committee met in open session and ordered reported favorably the bill, H.R. 4084, as amended, 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 directs the Department of Energy to prioritize research and development infrastructure that will enable academic and proprietary research that would otherwise not be possible. 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

The goal of H.R. 4084 is to direct the Department of Energy to prioritize research and development infrastructure that will enable

academic and proprietary research that would otherwise not be possible.

DUPLICATION OF FEDERAL PROGRAMS

No provision of H.R. 4084 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. 4084 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. 4084 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. 4084. 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. 4084 from the Director of Congressional Budget Office:

U.S. CONGRESS,
CONGRESSIONAL BUDGET OFFICE,
Washington, DC, February 18, 2016.

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. 4084, the Nuclear Energy Innovation Capabilities Act.

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.

Enclosure.

H.R. 4084—Nuclear Energy Innovation Capabilities Act

H.R. 4084 would amend current law to restate the objectives of Department of Energy (DOE) programs related to the research, development, demonstration, and commercial application of technologies involving nuclear energy. The bill would authorize DOE to study the need for a new reactor to support research and development of advanced reactor systems, expand capabilities in the area of high-performance computation modeling and simulation techniques, and implement a program to enable the private sector to test and demonstrate reactor concepts. In carrying out such activities, H.R. 4084 would require DOE to continue to collaborate with the national laboratories, other federal agencies, universities, and private firms.

DOE is already pursuing activities similar to those envisioned under the bill, so CBO estimates that implementing H.R. 4084 would not significantly affect the agency's costs to carry out its nuclear programs, which are subject to appropriation. (Funding for nuclear energy programs in 2016 totals \$986 million.)

Because enacting H.R. 4084 would not affect direct spending or revenues, pay-as-you-go procedures do not apply. CBO estimates that enacting H.R. 4084 would not increase net direct spending or on-budget deficits in any of the four consecutive 10-year periods beginning in 2027.

H.R. 4084 contains no intergovernmental or private-sector mandates as defined in the Unfunded Mandates Reform Act and would impose no costs on state, local, or tribal governments.

The CBO staff contact for this estimate is Megan Carroll. The estimate was approved by H. Samuel Papenfuss, Deputy Administrative Director for Budget Analysis.

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):

ENERGY POLICY ACT OF 2005

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) **SHORT TITLE.**—This Act may be cited as the “Energy Policy Act of 2005”.

(b) **TABLE OF CONTENTS.**—The table of contents for this Act is as follows:

* * * * *

TITLE IX—RESEARCH AND DEVELOPMENT

* * * * *

Subtitle E—Nuclear Energy

* * * * *

[Sec. 957. Alternatives to industrial radioactive sources.]
957. High-performance computation and supportive research.
958. Enabling nuclear energy innovation.
959. Budget plan.

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TITLE IX—RESEARCH AND DEVELOPMENT

* * * * *

Subtitle E—Nuclear Energy

[SEC. 951. NUCLEAR ENERGY.

[(a) IN GENERAL.—The Secretary shall conduct programs of civilian nuclear energy research, development, demonstration, and commercial application, including activities described in this subtitle. Programs under this subtitle shall take into consideration the following objectives:

[(1) Enhancing nuclear power’s viability as part of the United States energy portfolio.

[(2) Providing the technical means to reduce the likelihood of nuclear proliferation.

[(3) Maintaining a cadre of nuclear scientists and engineers.

[(4) Maintaining National Laboratory and university nuclear programs, including their infrastructure.

[(5) Supporting both individual researchers and multidisciplinary teams of researchers to pioneer new approaches in nuclear energy, science, and technology.

[(6) Developing, planning, constructing, acquiring, and operating special equipment and facilities for the use of researchers.

[(7) Supporting technology transfer and other appropriate activities to assist the nuclear energy industry, and other users of nuclear science and engineering, including activities addressing reliability, availability, productivity, component aging, safety, and security of nuclear power plants.

[(8) Reducing the environmental impact of nuclear energy-related activities.]

[(b) AUTHORIZATION OF APPROPRIATIONS FOR CORE PROGRAMS.—There are authorized to be appropriated to the Secretary to carry out nuclear energy research, development, demonstration, and commercial application activities, including activities authorized under this subtitle, other than those described in subsection (c)—

- [(1) \$330,000,000 for fiscal year 2007;
- [(2) \$355,000,000 for fiscal year 2008; and
- [(3) \$495,000,000 for fiscal year 2009.]

[(c) NUCLEAR INFRASTRUCTURE AND FACILITIES.—There are authorized to be appropriated to the Secretary to carry out activities under section 955—

- [(1) \$135,000,000 for fiscal year 2007;
- [(2) \$140,000,000 for fiscal year 2008; and
- [(3) \$145,000,000 for fiscal year 2009.]

[(d) ALLOCATIONS.—From amounts authorized under subsection (a), the following sums are authorized:

- [(1) For activities under section 953—
 - [(A) \$150,000,000 for fiscal year 2007;
 - [(B) \$155,000,000 for fiscal year 2008; and
 - [(C) \$275,000,000 for fiscal year 2009.]
- [(2) For activities under section 954—
 - [(A) \$43,600,000 for fiscal year 2007;
 - [(B) \$50,100,000 for fiscal year 2008; and
 - [(C) \$56,000,000 for fiscal year 2009.]
- [(3) For activities under section 957, \$6,000,000 for each of fiscal years 2007 through 2009.]

[(e) LIMITATION.—None of the funds authorized under this section may be used to decommission the Fast Flux Test Facility.]

SEC. 951. NUCLEAR ENERGY.

(a) *MISSION.—The Secretary shall conduct programs of civilian nuclear research, development, demonstration, and commercial application, including activities in this subtitle. Such programs shall take into consideration the following objectives:*

- (1) *Providing research infrastructure to promote scientific progress and enable users from academia, the National Laboratories, and the private sector to make scientific discoveries relevant for nuclear, chemical, and materials science engineering.*
- (2) *Maintaining National Laboratory and university nuclear energy research and development programs, including their infrastructure.*
- (3) *Providing the technical means to reduce the likelihood of nuclear weapons proliferation and increasing confidence margins for public safety of nuclear energy systems.*
- (4) *Reducing the environmental impact of nuclear energy related activities.*
- (5) *Supporting technology transfer from the National Laboratories to the private sector.*
- (6) *Enabling the private sector to partner with the National Laboratories to demonstrate novel reactor concepts for the purpose of resolving technical uncertainty associated with the aforementioned objectives in this subsection.*

(b) *DEFINITIONS.—In this subtitle:*

(1) *ADVANCED FISSION REACTOR.*—The term “advanced fission reactor” means a nuclear fission reactor with significant improvements over the most recent generation of nuclear reactors, which may include inherent safety features, lower waste yields, greater fuel utilization, superior reliability, resistance to proliferation, and increased thermal efficiency.

(2) *FAST NEUTRON.*—The term “fast neutron” means a neutron with kinetic energy above 100 kiloelectron volts.

(3) *NATIONAL LABORATORY.*—The term “National Laboratory” has the meaning given that term in paragraph (3) of section 2, except that with respect to subparagraphs (G), (H), and (N) of such paragraph, for purposes of this subtitle the term includes only the civilian activities thereof.

(4) *NEUTRON FLUX.*—The term “neutron flux” means the intensity of neutron radiation measured as a rate of flow of neutrons applied over an area.

(5) *NEUTRON SOURCE.*—The term “neutron source” means a research machine that provides neutron irradiation services for research on materials sciences and nuclear physics as well as testing of advanced materials, nuclear fuels, and other related components for reactor systems.

(c) *SENSE OF CONGRESS.*—It is the sense of the Congress that nuclear energy, through fission or fusion, represents the highest energy density of any known attainable source and yields zero air emissions. This energy source is of national importance to scientific progress, national security, electricity generation, heat generation for industrial applications, and space exploration. Considering the inherent complexity and regulatory burden associated with this area of science, the Department should focus its civilian nuclear research and development activities towards programs that enable the private sector, National Laboratories, and universities to carry out such experiments as are necessary to promote scientific progress and enhance practical knowledge of nuclear engineering.

SEC. 952. NUCLEAR ENERGY RESEARCH PROGRAMS.

(a) *NUCLEAR ENERGY RESEARCH INITIATIVE.*—The Secretary shall carry out a Nuclear Energy Research Initiative for research and development related to nuclear energy.

(b) *NUCLEAR ENERGY SYSTEMS SUPPORT PROGRAM.*—The Secretary shall carry out a Nuclear Energy Systems Support Program to support research and development activities addressing reliability, availability, productivity, component aging, safety, and security of existing nuclear power plants.

[(c) *NUCLEAR POWER 2010 PROGRAM.*—

[(1) *IN GENERAL.*—The Secretary shall carry out a Nuclear Power 2010 Program, consistent with recommendations of the Nuclear Energy Research Advisory Committee of the Department in the report entitled “A Roadmap to Deploy New Nuclear Power Plants in the United States by 2010” and dated October 2001.

[(2) *ADMINISTRATION.*—The Program shall include—

[(A) use of the expertise and capabilities of industry, institutions of higher education, and National Laboratories in evaluation of advanced nuclear fuel cycles and fuels testing;

[(B) consideration of a variety of reactor designs suitable for both developed and developing nations;

[(C) participation of international collaborators in research, development, and design efforts, as appropriate; and

[(D) encouragement for participation by institutions of higher education and industry.]

[(d)] (c) GENERATION IV NUCLEAR ENERGY SYSTEMS INITIATIVE.—

(1) IN GENERAL.—The Secretary shall carry out a Generation IV Nuclear Energy Systems Initiative to develop an overall technology plan for and to support research and development necessary to make an informed technical decision about the most promising candidates for eventual commercial application.

(2) ADMINISTRATION.—In conducting the Initiative, the Secretary shall examine advanced proliferation-resistant and passively safe reactor designs, including designs that—

(A) are economically competitive with other electric power generation plants;

(B) have higher efficiency, lower cost, and improved safety compared to reactors in operation on the date of enactment of this Act;

(C) use fuels that are proliferation resistant and have substantially reduced production of high-level waste per unit of output; and

(D) use improved instrumentation.

[(e)] (d) REACTOR PRODUCTION OF HYDROGEN.—The Secretary shall carry out research to examine designs for high-temperature reactors capable of producing large-scale quantities of hydrogen.

SEC. 953. ADVANCED FUEL CYCLE INITIATIVE.

(a) IN GENERAL.—The Secretary[, acting through the Director of the Office of Nuclear Energy, Science and Technology,] shall conduct an advanced fuel recycling technology research, development, and demonstration program (referred to in this section as the “program”) to evaluate proliferation-resistant fuel recycling and transmutation technologies that minimize environmental and public health and safety impacts as an alternative to aqueous reprocessing technologies deployed as of the date of enactment of this Act in support of evaluation of alternative national strategies for spent nuclear fuel and the Generation IV advanced reactor concepts.

(b) ANNUAL REVIEW.—The program shall be subject to annual review by the Nuclear Energy Research Advisory Committee of the Department or other independent entity, as appropriate.

(c) INTERNATIONAL COOPERATION.—In carrying out the program, the Secretary is encouraged to seek opportunities to enhance the progress of the program through international cooperation.

(d) REPORTS.—The Secretary shall submit, as part of the annual budget submission of the Department, a report on the activities of the program.

SEC. 954. UNIVERSITY NUCLEAR SCIENCE AND ENGINEERING SUPPORT.

(a) IN GENERAL.—The Secretary shall conduct a program to invest in human resources and infrastructure in the nuclear sciences

and related fields, including health physics, nuclear engineering, and radiochemistry, consistent with missions of the Department related to civilian nuclear research, development, demonstration, and commercial application.

(b) REQUIREMENTS.—In carrying out the program under this section, the Secretary shall—

(1) conduct a graduate and undergraduate fellowship program to attract new and talented students, which may include fellowships for students to spend time at National Laboratories in the areas of nuclear science, engineering, and health physics with a member of the National Laboratory staff acting as a mentor;

(2) conduct a junior faculty research initiation grant program to assist universities in recruiting and retaining new faculty in the nuclear sciences and engineering by awarding grants to junior faculty for research on issues related to nuclear energy engineering and science;

(3) support fundamental nuclear sciences, engineering, and health physics research through a nuclear engineering education and research program;

(4) encourage collaborative nuclear research among industry, National Laboratories, and universities; and

(5) support communication and outreach related to nuclear science, engineering, and health physics.

(c) UNIVERSITY-NATIONAL LABORATORY INTERACTIONS.—The Secretary shall conduct—

(1) a fellowship program for professors at universities to spend sabbaticals at National Laboratories in the areas of nuclear science and technology; and

(2) a visiting scientist program in which National Laboratory staff can spend time in academic nuclear science and engineering departments.

(d) STRENGTHENING UNIVERSITY RESEARCH AND TRAINING REACTORS AND ASSOCIATED INFRASTRUCTURE.—In carrying out the program under this section, the Secretary may support—

(1) converting research reactors from high-enrichment fuels to low-enrichment fuels and upgrading operational instrumentation;

(2) consortia of universities to broaden access to university research reactors;

(3) student training programs, in collaboration with the United States nuclear industry, in relicensing and upgrading reactors, including through the provision of technical assistance; and

(4) reactor improvements [as part of a taking into consideration effort that emphasizes] *that emphasize* research, training, and education, including through the Innovations in Nuclear Infrastructure and Education Program or any similar program.

(e) OPERATIONS AND MAINTENANCE.—Funding for a project provided under this section may be used for a portion of the operating and maintenance costs of a research reactor at a university used in the project.

(f) DEFINITION.—In this section, the term “junior faculty” means a faculty member who was awarded a doctorate less than 10 years

before receipt of an award from the grant program described in subsection (b)(2).

SEC. 955. DEPARTMENT OF ENERGY CIVILIAN NUCLEAR INFRASTRUCTURE AND FACILITIES.

(a) **IN GENERAL.**—The Secretary shall operate and maintain infrastructure and facilities to support the nuclear energy research, development, demonstration, and commercial application programs, including radiological facilities management, isotope production, and facilities management.

(b) **DUTIES.**—In carrying out this section, the Secretary shall—

(1) develop an inventory of nuclear science and engineering facilities, equipment, expertise, and other assets at all of the National Laboratories;

(2) develop a prioritized list of nuclear science and engineering plant and equipment improvements needed at each of the National Laboratories;

(3) consider the available facilities and expertise at all National Laboratories and emphasize investments which complement rather than duplicate capabilities; and

(4) develop a timeline and a proposed budget for the completion of deferred maintenance on plant and equipment, with the goal of ensuring that Department programs under this subtitle will be generally recognized to be among the best in the world.

[(c) **PLAN.**—The Secretary shall develop a comprehensive plan for the facilities at the Idaho National Laboratory, especially taking into account the resources available at other National Laboratories. In developing the plan, the Secretary shall—

[(1) evaluate the facilities planning processes utilized by other physical science and engineering research and development institutions, both in the United States and abroad, that are generally recognized as being among the best in the world, and consider how those processes might be adapted toward developing such facilities plan;

[(2) avoid duplicating, moving, or transferring nuclear science and engineering facilities, equipment, expertise, and other assets that currently exist at other National Laboratories;

[(3) consider the establishment of a national transuranic analytic chemistry laboratory as a user facility at the Idaho National Laboratory;

[(4) include a plan to develop, if feasible, the Advanced Test Reactor and Test Reactor Area into a user facility that is more readily accessible to academic and industrial researchers;

[(5) consider the establishment of a fast neutron source as a user facility;

[(6) consider the establishment of new hot cells and the configuration of hot cells most likely to advance research, development, demonstration, and commercial application in nuclear science and engineering, especially in the context of the condition and availability of these facilities elsewhere in the National Laboratories; and

[(7) include a timeline and a proposed budget for the completion of deferred maintenance on plant and equipment.

[(d) TRANSMITTAL TO CONGRESS.—Not later than 1 year after the date of enactment of this Act, the Secretary shall transmit the plan under subsection (c) to Congress.]

(c) *VERSATILE NEUTRON SOURCE*.—

(1) *MISSION NEED*.—Not later than December 31, 2016, the Secretary shall determine the mission need for a versatile reactor-based fast neutron source, which shall operate as a national user facility. During this process, the Secretary shall consult with the private sector, universities, National Laboratories, and relevant Federal agencies to ensure that this user facility will meet the research needs of the largest possible majority of prospective users.

(2) *ESTABLISHMENT*.—Upon the determination of mission need made under paragraph (1), the Secretary shall, as expeditiously as possible, provide to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate a detailed plan for the establishment of the user facility.

(3) *FACILITY REQUIREMENTS*.—

(A) *CAPABILITIES*.—The Secretary shall ensure that this user facility will provide, at a minimum, the following capabilities:

(i) *Fast neutron spectrum irradiation capability.*

(ii) *Capacity for upgrades to accommodate new or expanded research needs.*

(B) *CONSIDERATIONS*.—In carrying out the plan provided under paragraph (2), the Secretary shall consider the following:

(i) *Capabilities that support experimental high-temperature testing.*

(ii) *Providing a source of fast neutrons at a neutron flux, higher than that at which current research facilities operate, sufficient to enable research for an optimal base of prospective users.*

(iii) *Maximizing irradiation flexibility and irradiation volume to accommodate as many concurrent users as possible.*

(iv) *Capabilities for irradiation with neutrons of a lower energy spectrum.*

(v) *Multiple loops for fuels and materials testing in different coolants.*

(vi) *Additional pre-irradiation and post-irradiation examination capabilities.*

(vii) *Lifetime operating costs and lifecycle costs.*

(4) *REPORTING PROGRESS*.—The Department shall, in its annual budget requests, provide an explanation for any delay in its progress and otherwise make every effort to complete construction and approve the start of operations for this facility by December 31, 2025.

(5) *COORDINATION*.—The Secretary shall leverage the best practices for management, construction, and operation of national user facilities from the Office of Science.

SEC. 956. SECURITY OF NUCLEAR FACILITIES.

The Secretary[, acting through the Director of the Office of Nuclear Energy, Science and Technology,] shall conduct a research

and development program on cost-effective technologies for increasing—

- (1) the safety of nuclear facilities from natural phenomena; and
- (2) the security of nuclear facilities from deliberate attacks.

SEC. 957. ALTERNATIVES TO INDUSTRIAL RADIOACTIVE SOURCES.

[(a) SURVEY.—

[(1) IN GENERAL.—Not later than August 1, 2006, the Secretary shall submit to Congress the results of a survey of industrial applications of large radioactive sources.

[(2) ADMINISTRATION.—The survey shall—

[(A) consider well-logging sources as one class of industrial sources;

[(B) include information on current domestic and international Department, Department of Defense, State Department, and commercial programs to manage and dispose of radioactive sources; and

[(C) analyze available disposal options for currently deployed or future sources and, if deficiencies are noted for either deployed or future sources, recommend legislative options that Congress may consider to remedy identified deficiencies.

[(b) PLAN.—

[(1) IN GENERAL.—In conjunction with the survey conducted under subsection (a), the Secretary shall establish a research and development program to develop alternatives to sources described in subsection (a) that reduce safety, environmental, or proliferation risks to either workers using the sources or the public.

[(2) ACCELERATORS.—Miniaturized particle accelerators for well-logging or other industrial applications and portable accelerators for production of short-lived radioactive materials at an industrial site shall be considered as part of the research and development efforts.

[(3) REPORT.—Not later than August 1, 2006, the Secretary shall submit to Congress a report describing the details of the program plan.]

SEC. 957. HIGH-PERFORMANCE COMPUTATION AND SUPPORTIVE RESEARCH.

(a) MODELING AND SIMULATION.—The Secretary shall carry out a program to enhance the Nation’s capabilities to develop new reactor technologies through high-performance computation modeling and simulation techniques. This program shall coordinate with relevant Federal agencies through the National Strategic Computing Initiative created under Executive Order 13702 (July 29, 2015) while taking into account the following objectives:

- (1) Utilizing expertise from the private sector, universities, and National Laboratories to develop computational software and capabilities that prospective users may access to accelerate research and development of advanced fission reactor systems, nuclear fusion systems, and reactor systems for space exploration.*

(2) *Developing computational tools to simulate and predict nuclear phenomena that may be validated through physical experimentation.*

(3) *Increasing the utility of the Department's research infrastructure by coordinating with the Advanced Scientific Computing Research program within the Office of Science.*

(4) *Leveraging experience from the Energy Innovation Hub for Modeling and Simulation.*

(5) *Ensuring that new experimental and computational tools are accessible to relevant research communities.*

(b) *SUPPORTIVE RESEARCH ACTIVITIES.—The Secretary shall consider support for additional research activities to maximize the utility of its research facilities, including physical processes to simulate degradation of materials and behavior of fuel forms and for validation of computational tools.*

SEC. 958. ENABLING NUCLEAR ENERGY INNOVATION.

(a) *NATIONAL REACTOR INNOVATION CENTER.—The Secretary shall carry out a program to enable the testing and demonstration of reactor concepts to be proposed and funded by the private sector. The Secretary shall leverage the technical expertise of relevant Federal agencies and National Laboratories in order to minimize the time required to enable construction and operation of privately funded experimental reactors at National Laboratories or other Department-owned sites while ensuring reasonable safety for persons working within these sites. Such reactors shall operate to meet the following objectives:*

(1) *Enabling physical validation of novel reactor concepts.*

(2) *Resolving technical uncertainty and increasing practical knowledge relevant to safety, resilience, security, and functionality of first-of-a-kind reactor concepts.*

(3) *General research and development to improve nascent technologies.*

(b) *REPORTING REQUIREMENT.—Not later than 180 days after the date of enactment of the Nuclear Energy Innovation Capabilities Act, the Secretary, in consultation with the National Laboratories, relevant Federal agencies, and other stakeholders, shall transmit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate a report assessing the Department's capabilities to authorize, host, and oversee privately funded fusion and advanced fission experimental reactors as described under subsection (a). The report shall address the following:*

(1) *The Department's safety review and oversight capabilities, including options to leverage expertise from the Nuclear Regulatory Commission and National Laboratories.*

(2) *Potential sites capable of hosting activities described under subsection (a).*

(3) *The efficacy of the Department's available contractual mechanisms to partner with the private sector and Federal agencies, including cooperative research and development agreements, strategic partnership projects, and agreements for commercializing technology.*

(4) *Potential cost structures related to physical security, de-commissioning, liability, and other long-term project costs.*

(5) *Other challenges or considerations identified by the Secretary.*

SEC. 959. BUDGET PLAN.

Not later than 12 months after the date of enactment of the Nuclear Energy Innovation Capabilities Act, the Department shall transmit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate 3 alternative 10-year budget plans for civilian nuclear energy research and development by the Department. The first shall assume constant annual funding for 10 years at the appropriated level for the Department's civilian nuclear energy research and development for fiscal year 2016. The second shall assume 2 percent annual increases to the appropriated level for the Department's nuclear energy research and development for fiscal year 2016. The third shall be an unconstrained budget. The 3 plans shall include—

(1) a prioritized list of the Department's programs, projects, and activities to best support the development of next generation nuclear energy technology;

(2) realistic budget requirements for the Department to implement sections 955(c), 957, and 958 of this Act; and

(3) the Department's justification for continuing or terminating existing civilian nuclear energy research and development programs.

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