

114TH CONGRESS  
1ST SESSION

# 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.

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## IN THE HOUSE OF REPRESENTATIVES

NOVEMBER 19, 2015

Mr. WEBER of Texas (for himself, Ms. EDDIE BERNICE JOHNSON of Texas, Mr. SMITH of Texas, Mr. LIPINSKI, Mr. LOUDERMILK, Mr. PERLMUTTER, Mrs. COMSTOCK, Mr. TONKO, Mr. BRIDENSTINE, Mr. ROHRBACHER, Mr. HULTGREN, Mr. WESTERMAN, Mr. SCHWEIKERT, Mr. BABIN, Mr. CULBERSON, Mr. BRADY of Texas, Mr. SESSIONS, Mr. CARTER of Texas, Mr. CONAWAY, Mr. MARCHANT, and Mr. FARENTHOLD) introduced the following bill; which was referred to the Committee on Science, Space, and Technology

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## A BILL

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.

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 “Nuclear Energy Inno-  
5 vation Capabilities Act”.

1 **SEC. 2. DEFINITIONS.**

2 In this Act:

3 (1) **ADVANCED FISSION REACTOR.**—The term  
4 “advanced fission reactor” means a nuclear fission  
5 reactor with significant improvements over the most  
6 recent generation of nuclear reactors, which may in-  
7 clude inherent safety features, lower waste yields,  
8 greater fuel utilization, superior reliability, resist-  
9 ance to proliferation, and increased thermal effi-  
10 ciency.

11 (2) **DEPARTMENT.**—The term “Department”  
12 means the Department of Energy.

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

16 (4) **NATIONAL LABORATORY.**—The term “Na-  
17 tional Laboratory” has the meaning given that term  
18 in paragraph (3) of section 2 of the Energy Policy  
19 Act of 2005 (42 U.S.C. 15801(3)), except that with  
20 respect to subparagraphs (G), (H), and (N) of such  
21 paragraph, for purposes of this Act the term in-  
22 cludes only the civilian activities thereof.

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

1           (6) NEUTRON SOURCE.—The term “neutron  
2 source” means a research machine that provides  
3 neutron irradiation services for research on mate-  
4 rials sciences and nuclear physics as well as testing  
5 of advanced materials, nuclear fuels, and other re-  
6 lated components for reactor systems.

7           (7) SECRETARY.—The term “Secretary” means  
8 the Secretary of Energy.

9 **SEC. 3. MISSION.**

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

12         “(a) IN GENERAL.—The Secretary shall conduct pro-  
13 grams of civilian nuclear research, development, dem-  
14 onstration, and commercial application, including activi-  
15 ties in this subtitle. Such programs shall take into consid-  
16 eration the following objectives:

17           “(1) Providing research infrastructure to pro-  
18 mote scientific progress and enable users from aca-  
19 demia, the National Laboratories, and the private  
20 sector to make scientific discoveries relevant for nu-  
21 clear, chemical, and materials science engineering.

22           “(2) Maintaining National Laboratory and uni-  
23 versity nuclear energy research and development  
24 programs, including their infrastructure.

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

5           “(4) Reducing the environmental impact of nu-  
6           clear energy related activities.

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

9           “(6) Enabling the private sector to partner with  
10          the National Laboratories to demonstrate novel reac-  
11          tor concepts for the purpose of resolving technical  
12          uncertainty associated with the aforementioned ob-  
13          jectives in this section.”.

14 **SEC. 4. SENSE OF CONGRESS.**

15          It is the sense of the Congress that nuclear energy,  
16          through fission or fusion, represents the highest energy  
17          density of any known attainable source and yields zero air  
18          emissions. This energy source is of national importance  
19          to scientific progress, national security, electricity genera-  
20          tion, heat generation for industrial applications, and space  
21          exploration. Considering the inherent complexity and reg-  
22          ulatory burden associated with this area of science, the  
23          Department should focus its civilian nuclear research and  
24          development activities towards programs that enable the  
25          private sector, National Laboratories, and universities to

1 carry out such experiments as are necessary to promote  
2 scientific progress and enhance practical knowledge of nu-  
3 clear engineering.

4 **SEC. 5. HIGH-PERFORMANCE COMPUTATION AND SUP-**  
5 **PORTIVE RESEARCH.**

6 (a) MODELING AND SIMULATION.—The Secretary  
7 shall carry out a program to enhance the Nation’s capa-  
8 bilities to develop new reactor technologies through high-  
9 performance computation modeling and simulation tech-  
10 niques. This program shall coordinate with relevant Fed-  
11 eral agencies through the National Strategic Computing  
12 Initiative created under Executive Order 13702 (July 29,  
13 2015) while taking into account the following objectives:

14 (1) Utilizing expertise from the private sector,  
15 universities, and National Laboratories to develop  
16 computational software and capabilities that pro-  
17 spective users may access to accelerate research and  
18 development of advanced fission reactor systems, nu-  
19 clear fusion systems, and reactor systems for space  
20 exploration.

21 (2) Developing computational tools to simulate  
22 and predict nuclear phenomena that may be vali-  
23 dated through physical experimentation.

24 (3) Increasing the utility of the Department’s  
25 research infrastructure by coordinating with the Ad-

1 vanced Scientific Computing Research program  
2 within the Office of Science.

3 (4) Leveraging experience from the Energy In-  
4 novation Hub for Modeling and Simulation.

5 (5) Ensuring that new experimental and com-  
6 putational tools are accessible to relevant research  
7 communities.

8 (b) SUPPORTIVE RESEARCH ACTIVITIES.—The Sec-  
9 retary shall consider support for additional research activi-  
10 ties to maximize the utility of its research facilities, includ-  
11 ing physical processes to simulate degradation of materials  
12 and behavior of fuel forms and for validation of computa-  
13 tional tools.

14 **SEC. 6. VERSATILE NEUTRON SOURCE.**

15 (a) MISSION NEED.—Not later than December 31,  
16 2016, the Secretary shall determine the mission need for  
17 a versatile reactor-based fast neutron source, which shall  
18 operate as a national user facility. During this process,  
19 the Secretary shall consult with the private sector, univer-  
20 sities, National Laboratories, and relevant Federal agen-  
21 cies to ensure that this user facility will meet the research  
22 needs of the largest possible majority of prospective users.

23 (b) ESTABLISHMENT.—Upon the determination of  
24 mission need made under subsection (a), the Secretary  
25 shall, as expeditiously as possible, provide to the Com-

1 mittee on Science, Space, and Technology of the House  
2 of Representatives and the Committee on Energy and  
3 Natural Resources of the Senate a detailed plan for the  
4 establishment of the user facility.

5 (c) FACILITY REQUIREMENTS.—

6 (1) CAPABILITIES.—The Secretary shall ensure  
7 that this user facility will provide, at a minimum,  
8 the following capabilities:

9 (A) Fast neutron spectrum irradiation ca-  
10 pability.

11 (B) Capacity for upgrades to accommodate  
12 new or expanded research needs.

13 (2) CONSIDERATIONS.—In carrying out the  
14 plan provided under subsection (b), the Secretary  
15 shall consider the following:

16 (A) Capabilities that support experimental  
17 high-temperature testing.

18 (B) Providing a source of fast neutrons at  
19 a neutron flux, higher than that at which cur-  
20 rent research facilities operate, sufficient to en-  
21 able research for an optimal base of prospective  
22 users.

23 (C) Maximizing irradiation flexibility and  
24 irradiation volume to accommodate as many  
25 concurrent users as possible.

1 (D) Capabilities for irradiation with neu-  
2 trons of a lower energy spectrum.

3 (E) Multiple loops for fuels and materials  
4 testing in different coolants.

5 (F) Additional pre-irradiation and post-ir-  
6 radiation examination capabilities.

7 (d) REPORTING PROGRESS.—The Department shall,  
8 in its annual budget requests, provide an explanation for  
9 any delay in its progress and otherwise make every effort  
10 to complete construction and approve the start of oper-  
11 ations for this facility by December 31, 2025.

12 (e) COORDINATION.—The Secretary shall leverage  
13 the best practices for management, construction, and op-  
14 eration of national user facilities from the Office of  
15 Science.

16 **SEC. 7. ENABLING NUCLEAR ENERGY INNOVATION.**

17 (a) NATIONAL REACTOR INNOVATION CENTER.—The  
18 Secretary shall carry out a program to enable the testing  
19 and demonstration of reactor concepts to be proposed and  
20 funded by the private sector. The Secretary shall leverage  
21 the technical expertise of relevant Federal agencies and  
22 National Laboratories in order to minimize the time re-  
23 quired to enable construction and operation of privately  
24 funded experimental reactors at National Laboratories or  
25 other Department-owned sites while ensuring reasonable



1 safety for persons working within these sites. Such reac-  
2 tors shall operate to meet the following objectives:

3 (1) Enabling physical validation of novel reactor  
4 concepts.

5 (2) Resolving technical uncertainty and increas-  
6 ing practical knowledge relevant to safety, resilience,  
7 security, and functionality of first-of-a-kind reactor  
8 concepts.

9 (3) General research and development to im-  
10 prove nascent technologies.

11 (b) REPORTING REQUIREMENT.—Not later than 180  
12 days after the date of enactment of this Act, the Sec-  
13 retary, in consultation with the National Laboratories, rel-  
14 evant Federal agencies, and other stakeholders, shall  
15 transmit to the Committee on Science, Space, and Tech-  
16 nology of the House of Representatives and the Committee  
17 on Energy and Natural Resources of the Senate a report  
18 assessing the Department’s capabilities to authorize, host,  
19 and oversee privately funded fusion and advanced fission  
20 experimental reactors as described under subsection (a).  
21 The report shall address the following:

22 (1) The Department’s safety review and over-  
23 sight capabilities, including options to leverage ex-  
24 pertise from the Nuclear Regulatory Commission  
25 and National Laboratories.

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

3           (3) The efficacy of the Department's available  
4 contractual mechanisms to partner with the private  
5 sector and Federal agencies, including cooperative  
6 research and development agreements, strategic  
7 partnership projects, and agreements for commer-  
8 cializing technology.

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

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

14 **SEC. 8. BUDGET PLAN.**

15       Not later than 12 months after the date of enactment  
16 of this Act, the Department shall transmit to the Com-  
17 mittee on Science, Space, and Technology of the House  
18 of Representatives and the Committee on Energy and  
19 Natural Resources of the Senate 3 alternative 10-year  
20 budget plans for civilian nuclear energy research and de-  
21 velopment by the Department. The first shall assume con-  
22 stant annual funding for 10 years at the appropriated level  
23 for the Department's civilian nuclear energy research and  
24 development for fiscal year 2016. The second shall assume  
25 2 percent annual increases to the appropriated level for

1 the Department's nuclear energy research and develop-  
2 ment for fiscal year 2016. The third shall be an uncon-  
3 strained budget. The 3 plans shall include—

4           (1) a prioritized list of the Department's pro-  
5 grams, projects, and activities to best support the  
6 development of next generation nuclear energy tech-  
7 nology;

8           (2) realistic budget requirements for the De-  
9 partment to implement sections 5, 6, and 7 of this  
10 Act; and

11           (3) the Department's justification for con-  
12 tinuing or terminating existing civilian nuclear en-  
13 ergy research and development programs.

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