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(Original Signature of Member)

116TH CONGRESS
2D SESSION

H. R.

To establish and support advanced nuclear energy research and development programs at the Department of Energy, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

Mr. GALLAGHER introduced the following bill; which was referred to the Committee on _____

A BILL

To establish and support advanced nuclear energy research and development programs at the Department of Energy, and for other purposes.

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

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Nuclear Energy Reac-
5 tor Demonstration Act”.

6 **SEC. 2. TABLE OF CONTENTS.**

- Sec. 1. Short title.
- Sec. 2. Table of contents.
- Sec. 3. Advanced nuclear reactor research and development goals.
- Sec. 4. Advanced fuels development.

1 **SEC. 3. ADVANCED NUCLEAR REACTOR RESEARCH AND DE-**
2 **VELOPMENT GOALS.**

3 (a) IN GENERAL.—Subtitle E of title IX of the En-
4 ergy Policy Act of 2005 (42 U.S.C. 16271 et seq.) is
5 amended by adding at the end the following:

6 **“SEC. 959A. ADVANCED NUCLEAR REACTOR RESEARCH**
7 **AND DEVELOPMENT GOALS.**

8 “(a) DEFINITIONS.—In this section:

9 “(1) ADVANCED NUCLEAR REACTOR.—The
10 term ‘advanced nuclear reactor’ means—

11 “(A) a nuclear fission reactor, including a
12 prototype plant (as defined in sections 50.2 and
13 52.1 of title 10, Code of Federal Regulations
14 (or successor regulations)), with significant im-
15 provements compared to the most recent gen-
16 eration of fission reactors, including improve-
17 ments such as—

18 “(i) additional inherent safety fea-
19 tures;

20 “(ii) lower waste yields;

21 “(iii) improved fuel performance;

22 “(iv) increased tolerance to loss of
23 fuel cooling;

24 “(v) enhanced reliability;

25 “(vi) increased proliferation resist-
26 ance;

1 “(vii) increased thermal efficiency;

2 “(viii) reduced consumption of cooling
3 water;

4 “(ix) the ability to integrate into elec-
5 tric applications and nonelectric applica-
6 tions;

7 “(x) modular sizes to allow for deploy-
8 ment that corresponds with the demand
9 for electricity; or

10 “(xi) operational flexibility to respond
11 to changes in demand for electricity and to
12 complement integration with intermittent
13 renewable energy; and

14 “(B) a fusion reactor.

15 “(2) DEMONSTRATION PROJECT.—The term
16 ‘demonstration project’ means—

17 “(A) an advanced nuclear reactor oper-
18 ated—

19 “(i) as part of the power generation
20 facilities of an electric utility system; or

21 “(ii) in any other manner for the pur-
22 pose of demonstrating the suitability for
23 commercial application of the advanced nu-
24 clear reactor;

1 “(B) the demonstration of privately funded
2 experimental advanced nuclear reactors, funded
3 in whole or in part by the private sector, at Na-
4 tional Laboratories or other sites owned by the
5 Department of Energy; and

6 “(C) an advanced nuclear reactor dem-
7 onstrated by the Secretary of Defense in co-
8 operation with the Secretary of Energy.

9 “(b) PURPOSE.—The purpose of this section is to di-
10 rect the Secretary, as soon as practicable after the date
11 of enactment of this section, to advance the research and
12 development of domestic advanced, affordable, and clean
13 nuclear energy by—

14 “(1) demonstrating different advanced nuclear
15 reactor technologies that could be used by the pri-
16 vate sector to produce—

17 “(A) emission-free power at a levelized cost
18 of electricity of \$60 per megawatt- hour or less;

19 “(B) heat for community heating, indus-
20 trial purposes, or synthetic fuel production;

21 “(C) remote or off-grid energy supply; or

22 “(D) backup or mission-critical power sup-
23 plies;

24 “(2) developing subgoals for nuclear energy re-
25 search programs that would accomplish the goals of

1 the demonstration projects carried out under sub-
2 section (c);

3 “(3) identifying research areas that the private
4 sector is unable or unwilling to undertake due to the
5 cost of, or risks associated with, the research; and

6 “(4) facilitating the access of the private sec-
7 tor—

8 “(A) to Federal research facilities and per-
9 sonnel; and

10 “(B) to the results of research relating to
11 civil nuclear technology funded by the Federal
12 Government.

13 “(c) DEMONSTRATION PROJECTS.—

14 “(1) IN GENERAL.—The Secretary shall, to the
15 maximum extent practicable—

16 “(A) enter into agreements to complete not
17 fewer than 2 demonstration projects by not
18 later than December 31, 2025; and

19 “(B) establish a program to enter into
20 agreements to demonstrate not fewer than 2,
21 and not more than 5, additional operational ad-
22 vanced reactor designs by not later than De-
23 cember 31, 2035.

1 “(2) REQUIREMENTS.—In carrying out dem-
2 onstration projects under paragraph (1), the Sec-
3 retary shall—

4 “(A) include diversity in designs for the
5 advanced nuclear reactors demonstrated under
6 this section, including designs using various—

7 “(i) primary coolants;

8 “(ii) fuel types and compositions; and

9 “(iii) neutron spectra;

10 “(B) seek to ensure that—

11 “(i) the long-term cost of electricity or
12 heat for each design to be demonstrated
13 under this subsection is cost-competitive in
14 the applicable market;

15 “(ii) the selected projects can meet
16 the deadline established in paragraph (1)
17 to demonstrate first-of-a-kind advanced
18 nuclear reactor technologies, for which ad-
19 ditional information shall be considered, in-
20 cluding—

21 “(I) the technology readiness
22 level of a proposed advanced nuclear
23 reactor technology;

24 “(II) the technical abilities and
25 qualifications of teams desiring to

1 demonstrate a proposed advanced nu-
2 clear reactor technology; and

3 “(III) the capacity to meet cost-
4 share requirements of the Depart-
5 ment;

6 “(C) ensure that each evaluation of can-
7 didate technologies for the demonstration
8 projects is completed through an external re-
9 view of proposed designs, which review shall—

10 “(i) be conducted by a panel that in-
11 cludes not fewer than 1 representative of
12 each of—

13 “(I) an electric utility; and

14 “(II) an entity that uses high-
15 temperature process heat for manu-
16 facturing or industrial processing,
17 such as a petrochemical company, a
18 manufacturer of metals, or a manu-
19 facturer of concrete;

20 “(ii) include a review of cost-competi-
21 tiveness and other value streams, together
22 with the technology readiness level, of each
23 design to be demonstrated under this sub-
24 section; and

1 “(iii) not be required for a demonstra-
2 tion project that is not federally funded;

3 “(D) for federally funded demonstration
4 projects, enter into cost-sharing agreements
5 with private sector partners in accordance with
6 section 988 for the conduct of activities relating
7 to the research, development, and demonstra-
8 tion of private-sector advanced nuclear reactor
9 designs under the program;

10 “(E) work with private sector partners to
11 identify potential sites, including Department-
12 owned sites, for demonstrations, as appropriate;

13 “(F) align specific activities carried out
14 under demonstration projects carried out under
15 this subsection with priorities identified through
16 direct consultations between—

17 “(i) the Department;

18 “(ii) relevant Federal agencies as de-
19 termined by the Secretary;

20 “(iii) National Laboratories;

21 “(iv) institutions of higher education;

22 “(v) traditional end-users (such as
23 electric utilities);

24 “(vi) potential end-users of new tech-
25 nologies (such as users of high- tempera-

1 ture process heat for manufacturing pro-
2 cessing, including petrochemical companies,
3 manufacturers of metals, or manufacturers
4 of concrete); and

5 “(vii) developers of advanced nuclear
6 reactor technology; and

7 “(G) seek to ensure that the demonstration
8 projects carried out under paragraph (1) do not
9 cause any delay in a deployment of an advanced
10 reactor by private industry and the Department
11 of Energy that is underway as of the date of
12 enactment of this section.

13 “(3) *ADDITIONAL REQUIREMENTS.*—In car-
14 rying out demonstration projects under paragraph
15 (1), the Secretary shall—

16 “(A) identify candidate technologies that—

17 “(i) are not developed sufficiently for
18 demonstration within the initial required
19 timeframe described in paragraph (1)(A);
20 but

21 “(ii) could be demonstrated within the
22 timeframe described in paragraph (1)(B);

23 “(B) identify technical challenges to the
24 candidate technologies identified in subpara-
25 graph (A);

1 “(C) support near-term research and devel-
2 opment to address the highest-risk technical
3 challenges to the successful demonstration of a
4 selected advanced reactor technology, in accord-
5 ance with—

6 “(i) subparagraph (B); and

7 “(ii) the research and development ac-
8 tivities under section 958; and

9 “(D) establish such technology advisory
10 working groups as the Secretary determines to
11 be appropriate to advise the Secretary regard-
12 ing the technical challenges identified under
13 subparagraph (B) and the scope of research
14 and development programs to address the chal-
15 lenges, in accordance with subparagraph (C), to
16 be comprised of—

17 “(i) private-sector advanced nuclear
18 reactor technology developers;

19 “(ii) technical experts with respect to
20 the relevant technologies at institutions of
21 higher education; and

22 “(iii) technical experts at the National
23 Laboratories.

24 “(d) GOALS.—

1 “(1) IN GENERAL.—The Secretary shall estab-
2 lish goals for research relating to advanced nuclear
3 reactors facilitated by the Department that support
4 the objectives of the program for demonstration
5 projects established under subsection (c).

6 “(2) COORDINATION.—In developing the goals
7 under paragraph (1), the Secretary shall coordinate,
8 on an ongoing basis, with members of private indus-
9 try to advance the demonstration of various designs
10 of advanced nuclear reactors.

11 “(3) REQUIREMENTS.—In developing the goals
12 under paragraph (1), the Secretary shall ensure
13 that—

14 “(A) research activities facilitated by the
15 Department to meet the goals developed under
16 this subsection are focused on key areas of nu-
17 clear research and deployment ranging from
18 basic science to full-design development, safety
19 evaluation, and licensing;

20 “(B) research programs designed to meet
21 the goals emphasize—

22 “(i) resolving materials challenges re-
23 lating to extreme environments, including
24 extremely high levels of—

25 “(I) radiation fluence;

- 1 “(II) temperature;
- 2 “(III) pressure; and
- 3 “(IV) corrosion; and
- 4 “(ii) qualification of advanced fuels;
- 5 “(C) activities are carried out that address
- 6 near-term challenges in modeling and simula-
- 7 tion to enable accelerated design and licensing;
- 8 “(D) related technologies, such as tech-
- 9 nologies to manage, reduce, or reuse nuclear
- 10 waste, are developed;
- 11 “(E) nuclear research infrastructure is
- 12 maintained or constructed, such as—
- 13 “(i) currently operational research re-
- 14 actors at the National Laboratories and in-
- 15 stitutions of higher education;
- 16 “(ii) hot cell research facilities;
- 17 “(iii) a versatile fast neutron source;
- 18 and
- 19 “(iv) a molten salt testing facility;
- 20 “(F) basic knowledge of non-light water
- 21 coolant physics and chemistry is improved;
- 22 “(G) advanced sensors and control systems
- 23 are developed; and
- 24 “(H) advanced manufacturing and ad-
- 25 vanced construction techniques and materials

1 are investigated to reduce the cost of advanced
2 nuclear reactors.”.

3 (b) TABLE OF CONTENTS.—The table of contents of
4 the Energy Policy Act of 2005 (Public Law 109–58; 119
5 Stat. 594) is amended—

6 (1) in the item relating to section 917, by strik-
7 ing “Efficiency”;

8 (2) in the items relating to sections 957, 958,
9 and 959, by inserting “Sec.” before “9” each place
10 it appears; and

11 (3) by inserting after the item relating to sec-
12 tion 959 the following:

“Sec. 959A. Advanced nuclear reactor research and development goals.”.

13 **SEC. 4. ADVANCED FUELS DEVELOPMENT.**

14 Section 953 of the Energy Policy Act of 2005 (42
15 U.S.C. 16273) is amended—

16 (1) by redesignating subsections (a) through (d)
17 as paragraphs (1), (3), (4), and (5), respectively,
18 and indenting appropriately;

19 (2) in paragraph (1) (as so redesignated)—

20 (A) by striking “this section” and inserting
21 “this subsection”;

22 (B) by striking “minimize environmental”
23 and inserting “improve fuel cycle performance
24 while minimizing the cost and complexity of
25 processing, environmental impacts,”; and

1 (C) by striking “the Generation IV”;

2 (3) by inserting after paragraph (1) (as so re-
3 designated) the following:

4 “(2) CONSIDERATIONS.—In carrying out activi-
5 ties under the program, the Secretary shall consider
6 the potential benefits of those activities for civilian
7 nuclear applications, environmental remediation, and
8 national security.”;

9 (4) by inserting after paragraph (5) (as so re-
10 designated) the following:

11 “(6) AUTHORIZATION OF APPROPRIATIONS.—
12 From within funds authorized to be appropriated to
13 the Department of Energy’s Office of Nuclear En-
14 ergy, the Secretary may use to carry out the pro-
15 gram under this subsection, \$40,000,000 for each of
16 fiscal years 2021 through 2025.”;

17 (5) by inserting before paragraph (1) (as so re-
18 designated) the following:

19 “(a) MATERIAL RECOVERY AND WASTE FORM DE-
20 VELOPMENT.—”; and

21 (6) by adding at the end the following:

22 “(b) ADVANCED FUELS.—

23 “(1) IN GENERAL.—The Secretary shall carry
24 out a program to conduct research relating to—

1 “(A) next-generation light water reactor
2 fuels that demonstrate improved—

3 “(i) performance; and

4 “(ii) accident tolerance; and

5 “(B) innovative advanced reactor fuels that
6 demonstrate improved—

7 “(i) proliferation resistance; and

8 “(ii) use of resources.

9 “(2) REQUIREMENTS.—In carrying out the pro-
10 gram under this subsection, the Secretary shall—

11 “(A) focus on the development of accident-
12 tolerant fuel and cladding concepts that are ca-
13 pable of achieving initial commercialization by
14 December 31, 2025;

15 “(B) conduct studies regarding the means
16 by which those concepts would impact reactor
17 economics, the fuel cycle, operations, safety,
18 and the environment;

19 “(C) support a healthy nuclear fuel cycle
20 capable of providing higher levels of enriched
21 uranium for domestic advanced nuclear develop-
22 ment and for national security applications;

23 “(D) subject to paragraph (3), publish the
24 results of the studies conducted under subpara-
25 graph (B); and

1 “(E) cooperate with institutions of higher
2 education through the Nuclear Energy Univer-
3 sity and Integrated Research Projects programs
4 of the Department.

5 “(3) SENSITIVE INFORMATION.—The Secretary
6 shall not publish any information under paragraph
7 (2)(C) that is detrimental to national security, as de-
8 termined by the Secretary.

9 “(4) AUTHORIZATION OF APPROPRIATIONS.—
10 From within funds authorized to be appropriated to
11 the Department of Energy’s Office of Nuclear En-
12 ergy, the Secretary may use to carry out the pro-
13 gram under this subsection \$120,000,000 for each
14 of fiscal years 2021 through 2025.”.