

Calendar No. 418115TH CONGRESS
2^D SESSION**S. 1457****[Report No. 115–251]**

To amend the Energy Policy Act of 2005 to direct the Secretary of Energy to carry out demonstration projects relating to advanced nuclear reactor technologies to support domestic energy needs.

IN THE SENATE OF THE UNITED STATES

JUNE 28, 2017

Mr. FLAKE (for himself, Mr. BOOKER, Mr. RISCH, and Mr. CRAPO) introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

MAY 21, 2018

Reported by Ms. MURKOWSKI, with an amendment

[Omit the part struck through and insert the part printed in *italic*]

A BILL

To amend the Energy Policy Act of 2005 to direct the Secretary of Energy to carry out demonstration projects relating to advanced nuclear reactor technologies to support domestic energy needs.

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

1 **SECTION 1. SHORT TITLE.**

2 This Act may be cited as the “Advanced Nuclear En-
3 ergy Technologies Act”.

4 **SEC. 2. ADVANCED NUCLEAR REACTOR RESEARCH AND DE-**
5 **VELOPMENT GOALS.**

6 (a) IN GENERAL.—Subtitle B of title VI of the En-
7 ergy Policy Act of 2005 (Public Law 109–58; 119 Stat.
8 782) is amended by adding at the end the following:

9 **“SEC. 640. ADVANCED NUCLEAR REACTOR RESEARCH AND**
10 **DEVELOPMENT GOALS.**

11 “(a) DEFINITIONS.—In this section:

12 “(1) **ADVANCED NUCLEAR REACTOR.**—The
13 term ‘advanced nuclear reactor’ means a nuclear fis-
14 sion or fusion reactor, including a prototype plant
15 (as defined in sections 50.2 and 52.1 of title 10,
16 Code of Federal Regulations (or successor regula-
17 tions)); with significant improvements compared to
18 commercial nuclear reactors under construction as of
19 the date of enactment of this section, including im-
20 provements such as—

21 “(A) additional inherent safety features;

22 “(B) a significantly lower levelized cost of
23 electricity;

24 “(C) lower waste yields;

25 “(D) improved fuel performance;

1 “(E) increased tolerance to loss of fuel
2 cooling;

3 “(F) enhanced reliability;

4 “(G) increased proliferation resistance;

5 “(H) increased thermal efficiency;

6 “(I) reduced consumption of cooling water;

7 “(J) the ability to integrate into electric
8 applications and nonelectric applications;

9 “(K) modular sizes to allow for deployment
10 that corresponds with the demand for elec-
11 tricity; or

12 “(L) operational flexibility to respond to
13 changes in demand for electricity and to com-
14 plement integration with intermittent renewable
15 energy.

16 “(2) DEMONSTRATION PROJECT.—The term
17 ‘demonstration project’ means an advanced nuclear
18 reactor operated—

19 “(A) as part of the power generation facili-
20 ties of an electric utility system; or

21 “(B) in any other manner for the purpose
22 of demonstrating the suitability for commercial
23 application of the advanced nuclear reactor.

24 “(b) PURPOSE.—The purpose of this section is to di-
25 rect the Secretary, as soon as practicable after the date

1 of enactment of this section, to advance the research and
 2 development of domestic advanced, affordable, and clean
 3 nuclear energy by—

4 “(1) demonstrating different advanced nuclear
 5 reactor technologies that could be used by the pri-
 6 vate sector to produce—

7 “(A) emission-free power at a cost of \$65–
 8 \$70 per mWh or less;

9 “(1) *ADVANCED NUCLEAR REACTOR.*—*The term*
 10 *‘advanced nuclear reactor’ means a nuclear fission or*
 11 *fusion reactor, including a prototype plant (as de-*
 12 *defined in sections 50.2 and 52.1 of title 10, Code of*
 13 *Federal Regulations (or successor regulations)), with*
 14 *significant improvements compared to the most recent*
 15 *generation of fission reactors, including improvements*
 16 *such as—*

17 “(A) *additional inherent safety features;*

18 “(B) *a significantly lower levelized cost of*
 19 *electricity;*

20 “(C) *lower waste yields;*

21 “(D) *improved fuel performance;*

22 “(E) *increased tolerance to loss of fuel cool-*
 23 *ing;*

24 “(F) *enhanced reliability;*

25 “(G) *increased proliferation resistance;*

1 “(H) increased thermal efficiency;

2 “(I) reduced consumption of cooling water;

3 “(J) the ability to integrate into electric ap-
4 plications and nonelectric applications;

5 “(K) modular sizes to allow for deployment
6 that corresponds with the demand for electricity;

7 or

8 “(L) operational flexibility to respond to
9 changes in demand for electricity and to com-
10 plement integration with intermittent renewable
11 energy.

12 “(2) *DEMONSTRATION PROJECT.*—The term
13 ‘demonstration project’ means an advanced nuclear
14 reactor operated—

15 “(A) as part of the power generation facili-
16 ties of an electric utility system; or

17 “(B) in any other manner for the purpose
18 of demonstrating the suitability for commercial
19 application of the advanced nuclear reactor.

20 “(b) *PURPOSE.*—The purpose of this section is to direct
21 the Secretary, as soon as practicable after the date of enact-
22 ment of this section, to advance the research and develop-
23 ment of domestic advanced, affordable, and clean nuclear
24 energy by—

1 “(1) *demonstrating different advanced nuclear*
2 *reactor technologies that could be used by the private*
3 *sector to produce—*

4 “(A) *emission-free power at a levelized cost*
5 *of electricity of \$60 per mWh or less;*

6 “(B) *heat for industrial purposes or syn-*
7 *thetic fuel production;*

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

9 “(D) *backup or mission-critical power sup-*
10 *plies;*

11 “(2) *developing goals for nuclear energy re-*
12 *search programs that would accomplish the goals of*
13 *the demonstration projects carried out under sub-*
14 *section (c);*

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

18 “(4) *facilitating the access of the private sec-*
19 *tor—*

20 “(A) *to Federal research facilities; and*

21 “(B) *to the results of research funded by*
22 *the Federal Government.*

23 “(c) **DEMONSTRATION PROJECTS.—**

24 “(1) **IN GENERAL.—**During the period begin-
25 ning on the date of enactment of this section and

1 ending on September 30, 2028, the Secretary shall,
2 to the maximum extent practicable, enter into one or
3 more agreements to carry out not fewer than 4 ad-
4 vanced nuclear reactor demonstration projects.

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

8 “(A) seek to include diversity in designs
9 for the advanced nuclear reactors demonstrated
10 under this section, including designs using var-
11 ious primary coolants;

12 “(B) seek to ensure that—

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

17 “(ii) the cost-competitiveness of each
18 design to be demonstrated under this sub-
19 section is verified by an external review of
20 the proposed design;

21 “(C) enter into cost-sharing agreements
22 with partners in accordance with section 988
23 for the conduct of activities relating to the re-
24 search, development, and demonstration of pri-

1 vate-sector advanced nuclear reactor designs
2 under the program;

3 “(D) work with private sector partners to
4 identify potential sites, including Department-
5 owned sites, for demonstrations, as appropriate;
6 and

7 “(E) align specific activities carried out
8 under demonstration projects carried out under
9 this subsection with priorities identified through
10 direct consultations between—

11 “(i) the Department;

12 “(ii) National Laboratories;

13 “(iii) traditional end-users (such as
14 electric utilities);

15 “(iv) potential end-users of new tech-
16 nologies (such as petrochemical compa-
17 nies); and

18 “(v) developers of advanced nuclear
19 reactor technology.

20 “(d) GOALS.—

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

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

6 “(3) REQUIREMENTS.—In developing the goals
7 under paragraph (1), the Secretary shall ensure
8 that—

9 “(A) research activities facilitated by the
10 Department to meet the goals developed under
11 this subsection are focused on key areas of nu-
12 clear research and deployment ranging from
13 basic energy to full-design development, safety
14 evaluation, and licensing;

15 “(B) research programs designed to meet
16 the goals emphasize—

17 “(i) resolving materials challenges re-
18 lating to radiation damage or corrosive
19 coolants; and

20 “(ii) qualification of advanced fuels;

21 “(C) activities are carried out that address
22 near-term challenges in modeling and simula-
23 tion to enable accelerated design and licensing;

24 “(D) related technologies, such as electro-
25 chemical processing or fuel recycling that could

1 reduce nuclear waste volumes or half lives, are
2 developed;

3 “(E) infrastructure, such as a versatile
4 fast neutron source or molten salt testing facil-
5 ity, to aid in research are constructed;

6 “(F) basic knowledge of non-light water
7 coolant physics and chemistry is improved; and

8 “(G) advanced manufacturing and con-
9 struction techniques and materials are inves-
10 tigated to reduce the commercialization cost of
11 advanced nuclear reactors.”.

12 (b) TABLE OF CONTENTS AMENDMENT.—The table
13 of contents of the Energy Policy Act of 2005 (Public Law
14 109–58; 119 Stat. 594) is amended by inserting after the
15 item relating to section 639 the following:

“Sec. 640. Advanced nuclear reactor research and development goals.”.

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