Calendar No. 418

115TH CONGRESS
2D 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.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the ''Advanced Nuclear Energy Technologies Act''.

SEC. 2. ADVANCED NUCLEAR REACTOR RESEARCH AND DEVELOPMENT GOALS.

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

''SEC. 640. ADVANCED NUCLEAR REACTOR RESEARCH AND DEVELOPMENT GOALS.

''(a) DEFINITIONS.—In this section:

~~''(1) ADVANCED NUCLEAR REACTOR.—The term 'advanced nuclear reactor' means a nuclear fission or fusion reactor, including a prototype plant (as defined in sections 50.2 and 52.1 of title 10, Code of Federal Regulations (or successor regulations)), with significant improvements compared to commercial nuclear reactors under construction as of the date of enactment of this section, including improvements such as—~~

~~''(A) additional inherent safety features;~~

~~''(B) a significantly lower levelized cost of electricity;~~

~~''(C) lower waste yields;~~

~~''(D) improved fuel performance;~~

"(E) increased tolerance to loss of fuel cooling;

"(F) enhanced reliability;

"(G) increased proliferation resistance;

"(H) increased thermal efficiency;

"(I) reduced consumption of cooling water;

"(J) the ability to integrate into electric applications and nonelectric applications;

"(K) modular sizes to allow for deployment that corresponds with the demand for electricity; or

"(L) operational flexibility to respond to changes in demand for electricity and to complement integration with intermittent renewable energy.

"(2) DEMONSTRATION PROJECT.—The term 'demonstration project' means an advanced nuclear reactor operated—

"(A) as part of the power generation facilities of an electric utility system; or

"(B) in any other manner for the purpose of demonstrating the suitability for commercial application of the advanced nuclear reactor.

"(b) PURPOSE.—The purpose of this section is to direct the Secretary, as soon as practicable after the date

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

~~"(1) demonstrating different advanced nuclear reactor technologies that could be used by the private sector to produce—~~

~~"(A) emission-free power at a cost of $65–$70 per mWh or less;~~

"(1) ADVANCED NUCLEAR REACTOR.—The term 'advanced nuclear reactor' means a nuclear fission or fusion reactor, including a prototype plant (as defined in sections 50.2 and 52.1 of title 10, Code of Federal Regulations (or successor regulations)), with significant improvements compared to the most recent generation of fission reactors, including improvements such as—

"(A) additional inherent safety features;

"(B) a significantly lower levelized cost of electricity;

"(C) lower waste yields;

"(D) improved fuel performance;

"(E) increased tolerance to loss of fuel cooling;

"(F) enhanced reliability;

"(G) increased proliferation resistance;

"(H) increased thermal efficiency;

"(I) reduced consumption of cooling water;

"(J) the ability to integrate into electric applications and nonelectric applications;

"(K) modular sizes to allow for deployment that corresponds with the demand for electricity; or

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"(2) DEMONSTRATION PROJECT.—The term 'demonstration project' means an advanced nuclear reactor operated—

"(A) as part of the power generation facilities of an electric utility system; or

"(B) in any other manner for the purpose of demonstrating the suitability for commercial application of the advanced nuclear reactor.

"(b) PURPOSE.—The purpose of this section is to direct the Secretary, as soon as practicable after the date of enactment of this section, to advance the research and development of domestic advanced, affordable, and clean nuclear energy by—

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

"(A) emission-free power at a levelized cost of electricity of $60 per mWh or less;

"(B) heat for industrial purposes or synthetic fuel production;

"(C) remote or off-grid energy supply; or

"(D) backup or mission-critical power supplies;

"(2) developing goals for nuclear energy research programs that would accomplish the goals of the demonstration projects carried out under subsection (c);

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

"(4) facilitating the access of the private sector—

"(A) to Federal research facilities; and

"(B) to the results of research funded by the Federal Government.

"(c) DEMONSTRATION PROJECTS.—

"(1) IN GENERAL.—During the period beginning on the date of enactment of this section and

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

''(2) REQUIREMENTS.—In carrying out demonstration projects under paragraph (1), the Secretary shall—

''(A) seek to include diversity in designs for the advanced nuclear reactors demonstrated under this section, including designs using various primary coolants;

''(B) seek to ensure that—

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

''(ii) the cost-competitiveness of each design to be demonstrated under this subsection is verified by an external review of the proposed design;

''(C) enter into cost-sharing agreements with partners in accordance with section 988 for the conduct of activities relating to the research, development, and demonstration of pri-

vate-sector advanced nuclear reactor designs under the program;

''(D) work with private sector partners to identify potential sites, including Department-owned sites, for demonstrations, as appropriate; and

''(E) align specific activities carried out under demonstration projects carried out under this subsection with priorities identified through direct consultations between—

''(i) the Department;

''(ii) National Laboratories;

''(iii) traditional end-users (such as electric utilities);

''(iv) potential end-users of new technologies (such as petrochemical companies); and

''(v) developers of advanced nuclear reactor technology.

''(d) GOALS.—

''(1) IN GENERAL.—The Secretary shall establish goals for research relating to advanced nuclear reactors facilitated by the Department that support the objectives of the program for demonstration projects established under subsection (c).

''(2) COORDINATION.—In developing the goals under paragraph (1), the Secretary shall coordinate, on an ongoing basis, with members of private industry to advance the demonstration of various designs of advanced nuclear reactors.

''(3) REQUIREMENTS.—In developing the goals under paragraph (1), the Secretary shall ensure that—

''(A) research activities facilitated by the Department to meet the goals developed under this subsection are focused on key areas of nuclear research and deployment ranging from basic energy to full-design development, safety evaluation, and licensing;

''(B) research programs designed to meet the goals emphasize—

''(i) resolving materials challenges relating to radiation damage or corrosive coolants; and

''(ii) qualification of advanced fuels;

''(C) activities are carried out that address near-term challenges in modeling and simulation to enable accelerated design and licensing;

''(D) related technologies, such as electrochemical processing or fuel recycling that could

reduce nuclear waste volumes or half lives, are developed;

"(E) infrastructure, such as a versatile fast neutron source or molten salt testing facility, to aid in research are constructed;

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

"(G) advanced manufacturing and construction techniques and materials are investigated to reduce the commercialization cost of advanced nuclear reactors.".

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

"Sec. 640. Advanced nuclear reactor research and development goals.".

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