# Calendar No. 217

116TH CONGRESS
1ST SESSION

# S. 903

**[Report No. 116–114]**

To direct the Secretary of Energy to establish advanced nuclear goals, provide for a versatile, reactor-based fast neutron source, make available high-assay, low-enriched uranium for research, development, and demonstration of advanced nuclear reactor concepts, and for other purposes.

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IN THE SENATE OF THE UNITED STATES

MARCH 27, 2019

Ms. MURKOWSKI (for herself, Mr. BOOKER, Mr. ALEXANDER, Mr. MANCHIN, Mr. RISCH, Mr. WHITEHOUSE, Mr. CRAPO, Mr. COONS, Mrs. CAPITO, Ms. DUCKWORTH, Mr. SULLIVAN, Mr. BENNET, Mr. GRAHAM, Mr. PORTMAN, Mr. GARDNER, Mr. JONES, Mr. CRAMER, Mr. CARDIN, Mr. BRAUN, and Ms. MCSALLY) introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

SEPTEMBER 24, 2019

Reported by Ms. MURKOWSKI, with an amendment

[Strike out all after the enacting clause and insert the part printed in italic]

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# A BILL

To direct the Secretary of Energy to establish advanced nuclear goals, provide for a versatile, reactor-based fast neutron source, make available high-assay, low-enriched uranium for research, development, and demonstration of advanced nuclear reactor concepts, and for other purposes.

*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 ''Nuclear Energy Leadership Act''.

**SEC. 2. AUTHORIZATION OF LONG-TERM POWER PURCHASE AGREEMENTS.**

Section 501(b)(1) of title 40, United States Code, is amended by striking subparagraph (B) and inserting the following:

''(B) PUBLIC UTILITY CONTRACTS.—

''(i) TERM.—

''(I) IN GENERAL.—A contract under this paragraph to purchase electricity from a public utility may be for a period of not more than 40 years.

''(II) OTHER PUBLIC UTILITY SERVICES.—A contract under this paragraph for a public utility service other than a service described in subclause (I) may be for a period of not more than 10 years.

''(ii) COSTS.—The cost of a contract under this paragraph for any fiscal year

may be paid from the appropriations for that fiscal year.''.

**SEC. 3. LONG-TERM NUCLEAR POWER PURCHASE AGREEMENT PILOT PROGRAM.**

(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. LONG-TERM NUCLEAR POWER PURCHASE AGREEMENT PILOT PROGRAM.**

''(a) ESTABLISHMENT.—The Secretary shall establish a pilot program for a long-term power purchase agreement.

''(b) REQUIREMENTS.—In developing the pilot program under this section, the Secretary shall—

''(1) consult and coordinate with the heads of other Federal departments and agencies that may benefit from purchasing nuclear power for a period of longer than 10 years, including—

''(A) the Secretary of Defense; and

''(B) the Secretary of Homeland Security; and

''(2) not later than December 31, 2023, enter into at least 1 agreement to purchase power from a commercial nuclear reactor that receives a license

from the Nuclear Regulatory Commission after January 1, 2019.

''(c) FACTORS FOR CONSIDERATION.—

''(1) IN GENERAL.—In carrying out this section, the Secretary shall give special consideration to power purchase agreements for first-of-a-kind or early deployment nuclear technologies that can provide reliable and resilient power to high-value assets for national security purposes or other purposes as the Secretary determines to be in the national interest, especially in remote off-grid scenarios or grid-connected scenarios that can provide capabilities commonly known as 'islanding power capabilities' during an emergency scenario.

''(2) EFFECT ON RATES.—An agreement to purchase power under this section may be at a rate that is higher than the average market rate, if the agreement fulfills an applicable consideration described in paragraph (1).''.

(b) TABLE OF CONTENTS.—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. Long-term nuclear power purchase agreement pilot program.''.

**SEC. 4. ADVANCED NUCLEAR REACTOR RESEARCH AND DEVELOPMENT GOALS.**

(a) IN GENERAL.—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. 959A. ADVANCED NUCLEAR REACTOR RESEARCH AND DEVELOPMENT GOALS.**

"(a) DEFINITIONS.—In this section:

"(1) ADVANCED NUCLEAR REACTOR.—The term 'advanced nuclear reactor' means—

"(A) a nuclear fission 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—

"(i) additional inherent safety features;

"(ii) lower waste yields;

"(iii) improved fuel performance;

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

"(v) enhanced reliability;

"(vi) increased proliferation resistance;

''(vii) increased thermal efficiency;

''(viii) reduced consumption of cooling water;

''(ix) the ability to integrate into electric applications and nonelectric applications;

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

''(xi) operational flexibility to respond to changes in demand for electricity and to complement integration with intermittent renewable energy; and

''(B) a fusion reactor.

''(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 megawatt-hour or less;

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

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

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

"(2) developing subgoals 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 personnel; and

‘‘(B) to the results of research relating to civil nuclear technology funded by the Federal Government.

‘‘(c) DEMONSTRATION PROJECTS.—

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

‘‘(A) complete not fewer than 2 advanced nuclear reactor demonstration projects by not later than December 31, 2025; and

‘‘(B) establish a program to demonstrate not fewer than 2, and not more than 5, additional operational advanced reactor designs by not later than December 31, 2035.

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

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

‘‘(i) primary coolants;

‘‘(ii) fuel types and compositions; and

‘‘(iii) neutron spectra;

‘‘(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;

"(ii) the selected projects can meet the deadline established in paragraph (1) to demonstrate first-of-a-kind advanced nuclear reactor technologies, for which additional information shall be considered, including—

"(I) the technology readiness level of a proposed advanced nuclear reactor technology;

"(II) the technical abilities and qualifications of teams desiring to partner with the Department to demonstrate a proposed advanced nuclear reactor technology; and

"(III) the capacity to meet cost-share requirements of the Department;

"(C) ensure that each evaluation of candidate technologies for the demonstration projects is completed through an external review of proposed designs, which review shall—

‘‘(i) be conducted by a panel that includes not fewer than 1 representative of each of—

‘‘(I) an electric utility; and

‘‘(II) an entity that uses high-temperature process heat for manufacturing or industrial processing, such as a petrochemical company, a manufacturer of metals, or a manufacturer of concrete; and

‘‘(ii) include a review of cost-competitiveness and other value streams, together with the technology readiness level, of each design to be demonstrated under this subsection;

‘‘(D) 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 private-sector advanced nuclear reactor designs under the program;

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

‘‘(F) 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) institutions of higher education;

‘‘(iv) traditional end-users (such as electric utilities);

‘‘(v) potential end-users of new technologies (such as users of high-temperature process heat for manufacturing processing, including petrochemical companies, manufacturers of metals, or manufacturers of concrete); and

‘‘(vi) developers of advanced nuclear reactor technology.

‘‘(3) ADDITIONAL REQUIREMENTS.—In carrying out demonstration projects under paragraph (1), the Secretary shall—

‘‘(A) identify candidate technologies that—

‘‘(i) are not developed sufficiently for demonstration within the initial required timeframe described in paragraph (1)(A); but

‘‘(ii) could be demonstrated within the timeframe described in paragraph (1)(B);

‘‘(B) identify technical challenges to the candidate technologies identified in subparagraph (A);

‘‘(C) support near-term research and development to address the highest-risk technical challenges to the successful demonstration of a selected advanced reactor technology, in accordance with—

‘‘(i) subparagraph (B); and

‘‘(ii) the research and development activities under section 958;

‘‘(D) establish such technology advisory working groups as the Secretary determines to be appropriate to advise the Secretary regarding the technical challenges identified under subparagraph (B) and the scope of research and development programs to address the challenges, in accordance with subparagraph (C), to be comprised of—

‘‘(i) private-sector advanced nuclear reactor technology developers;

"(ii) technical experts with respect to the relevant technologies at institutions of higher education; and

"(iii) technical experts at the National Laboratories.

"(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 science to full-design development, safety evaluation, and licensing;

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

~~"(i) resolving materials challenges relating to extreme environments, including extremely high levels of—~~

~~"(I) radiation fluence;~~

~~"(II) temperature;~~

~~"(III) pressure; and~~

~~"(IV) corrosion; 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 technologies to manage, reduce, or reuse nuclear waste, are developed;~~

~~"(E) nuclear research infrastructure is maintained or constructed, such as—~~

~~"(i) currently operational research reactors at the National Laboratories and institutions of higher education;~~

~~"(ii) hot cell research facilities;~~

~~"(iii) a versatile fast neutron source; and~~

~~"(iv) a molten salt testing facility;~~

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

"(G) advanced sensors and control systems are developed; and

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

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

(1) in the item relating to section 917, by striking "Efficiency";

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

(3) by inserting after the item relating to section 959 the following:

"Sec. 959A. Advanced nuclear reactor research and development goals.".

**SEC. 5. NUCLEAR ENERGY STRATEGIC PLAN.**

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

**"SEC. 959B. NUCLEAR ENERGY STRATEGIC PLAN.**

"(a) IN GENERAL.—Not later than 180 days after the date of enactment of this section, the Secretary shall submit to the Committee on Energy and Natural Resources of the Senate and the Committees on Energy and Commerce and Science, Space, and Technology of the House of Representatives a 10-year strategic plan for the Office of Nuclear Energy of the Department, in accordance with this section.

"(b) REQUIREMENTS.—

"(1) COMPONENTS.—The strategic plan under this section shall designate—

"(A) programs that support the planned accomplishment of—

"(i) the goals established under section 959A; and

"(ii) the demonstration programs identified under subsection (c) of that section; and

"(B) programs that—

"(i) do not support the planned accomplishment of demonstration programs, or the goals, referred to in subparagraph (A); but

"(ii) are important to the mission of the Office of Nuclear Energy, as determined by the Secretary.

"(2) PROGRAM PLANNING.—In developing the strategic plan under this section, the Secretary shall specify expected timelines for, as applicable—

"(A) the accomplishment of relevant objectives under current programs of the Department; or

"(B) the commencement of new programs to accomplish those objectives.

"(c) UPDATES.—Not less frequently than once every 2 years, the Secretary shall submit to the Committee on Energy and Natural Resources of the Senate and the Committees on Energy and Commerce and Science, Space, and Technology of the House of Representatives an updated 10-year strategic plan in accordance with subsection (b), which shall identify, and provide a justification for, any major deviation from a previous strategic plan submitted under this section.".

(b) TABLE OF CONTENTS.—The table of contents of the Energy Policy Act of 2005 (Public Law 109–58; 119 Stat. 594) (as amended by section 4(b)(3)) is amended by inserting after the item relating to section 959A the following:

"Sec. 959B. Nuclear energy strategic plan.".

**SEC. 6. VERSATILE, REACTOR-BASED FAST NEUTRON SOURCE.**

Section 955(c)(1) of the Energy Policy Act of 2005 (42 U.S.C. 16275(c)(1)) is amended—

(1) in the paragraph heading, by striking ''MISSION NEED'' and inserting ''AUTHORIZATION''; and

(2) in subparagraph (A), by striking ''determine the mission need'' and inserting ''provide''.

**SEC. 7. ADVANCED NUCLEAR FUEL SECURITY PROGRAM.**

(a) FINDINGS.—Congress finds that—

(1) the national security nuclear enterprise, which supports the nuclear weapons stockpile stewardship and naval reactors functions of the National Nuclear Security Administration, requires a domestic source of low- and high-enriched uranium in accordance with legal restrictions regarding foreign obligations relating to the beginning stage of the nuclear fuel cycle;

(2) many domestic advanced nuclear power industry participants require access to high-assay, low-enriched uranium fuel for—

(A) initial fuel testing;

(B) operation of demonstration reactors; and

(C) commercial operation of advanced nuclear reactors;

(3) as of the date of enactment of this Act, no domestic uranium enrichment or fuel fabrication capability exists for uranium fuel enriched to greater than 5 weight percent of the uranium-235 isotope;

(4) a healthy commercial nuclear fuel cycle capable of providing higher levels of enriched uranium would benefit—

(A) the relevant national security functions of the National Nuclear Security Administration; and

(B) the domestic advanced nuclear industry of the United States; and

(5) making limited quantities of high-assay, low-enriched uranium available from Department of Energy stockpiles of uranium would allow for initial fuel testing and demonstration of advanced nuclear reactor concepts, accelerating—

(A) the path to market of those concepts; and

(B) the development of—

(i) a market for advanced nuclear reactors; and

(ii) a resulting growing commercial nuclear fuel cycle capability.

(b) AMENDMENT.—

(1) IN GENERAL.—Subtitle E of title IX of the Energy Policy Act of 2005 (42 U.S.C. 16271 et seq.) (as amended by section 5(a)) is amended by adding at the end the following:

**"SEC. 960. ADVANCED NUCLEAR FUEL SECURITY PROGRAM.**

"(a) DEFINITIONS.—In this section:

"(1) HALEU TRANSPORTATION PACKAGE.—The term 'HALEU transportation package' means a transportation package that is suitable for transporting high-assay, low-enriched uranium.

"(2) HIGH-ASSAY, LOW-ENRICHED URANIUM.—The term 'high-assay, low-enriched uranium' means uranium with an assay greater than 5 weight percent, but less than 20 weight percent, of the uranium-235 isotope.

"(3) HIGH-ENRICHED URANIUM.—The term 'high-enriched uranium' means uranium with an assay of 20 weight percent or more of the uranium-235 isotope.

"(b) HIGH-ASSAY, LOW-ENRICHED URANIUM PROGRAM FOR ADVANCED REACTORS.—

"(1) ESTABLISHMENT.—Not later than 1 year after the date of enactment of this section, the Secretary shall establish a program to make available

high-assay, low-enriched uranium, through contracts for sale, resale, transfer, or lease, for use in commercial or noncommercial advanced nuclear reactors.

"(2) NUCLEAR FUEL OWNERSHIP.—Each lease under this subsection shall include a provision establishing that the nuclear fuel that is the subject of the lease shall remain the property of the Department, including with respect to responsibility for the final disposition of all radioactive waste created by the irradiation, processing, or purification of any leased uranium.

"(3) QUANTITY.—In carrying out the program under this subsection, the Secretary shall make available—

"(A) by December 31, 2022, high-assay, low-enriched uranium containing not less than 2 metric tons of the uranium-235 isotope; and

"(B) by December 31, 2025, high-assay, low-enriched uranium containing not less than 10 metric tons of the uranium-235 isotope (as determined including the quantities of the uranium-235 isotope made available before December 31, 2022).

"(4) FACTORS FOR CONSIDERATION.—In carrying out the program under this subsection, the

Secretary shall take into consideration options for providing the high-assay, low-enriched uranium under this subsection from a stockpile of uranium owned by the Department (including the National Nuclear Security Administration), including—

"(A) fuel that—

"(i) directly meets the needs of an end-user; but

"(ii) has been previously used or fabricated for another purpose;

"(B) fuel that can meet the needs of an end-user after removing radioactive or other contaminants that resulted from a previous use or fabrication of the fuel for research, development, demonstration, or deployment activities of the Department (including activities of the National Nuclear Security Administration); and

"(C) fuel from a high-enriched uranium stockpile, which can be blended with lower-assay uranium to become high-assay, low-enriched uranium to meet the needs of an end-user.

"(5) LIMITATION.—The Secretary shall not barter or otherwise sell or transfer uranium in any form in exchange for services relating to the final

~~disposition of radioactive waste from uranium that is the subject of a lease under this subsection.~~

~~"(6) SUNSET.—The program under this subsection shall terminate on the earlier of—~~

~~"(A) January 1, 2035; and~~

~~"(B) the date on which uranium enriched up to, but not equal to, 20 weight percent can be obtained in the commercial market from domestic suppliers.~~

~~"(c) REPORT.—~~

~~"(1) IN GENERAL.—Not later than 180 days after the date of enactment of this section, the Secretary shall submit to the appropriate committees of Congress a report that describes actions proposed to be carried out by the Secretary—~~

~~"(A) under the program under subsection (b); or~~

~~"(B) otherwise to enable the commercial use of high-assay, low-enriched uranium.~~

~~"(2) COORDINATION AND STAKEHOLDER INPUT.—In developing the report under this subsection, the Secretary shall seek input from—~~

~~"(A) the Nuclear Regulatory Commission;~~

~~"(B) the National Laboratories;~~

~~"(C) institutions of higher education;~~

‘‘(D) a diverse group of entities operating in the nuclear energy industry; and

‘‘(E) a diverse group of technology developers.

‘‘(3) COST AND SCHEDULE ESTIMATES.—The report under this subsection shall include estimated costs, budgets, and timeframes for enabling the use of high-assay, low-enriched uranium.

‘‘(4) REQUIRED EVALUATIONS.—The report under this subsection shall evaluate—

‘‘(A) the costs and actions required to establish and carry out the program under subsection (b), including with respect to—

‘‘(i) proposed preliminary terms for the sale, resale, transfer, and leasing of high-assay, low-enriched uranium (including guidelines defining the roles and responsibilities between the Department and the purchaser, transfer recipient, or lessee); and

‘‘(ii) the potential to coordinate with purchasers, transfer recipients, and lessees regarding—

‘‘(I) fuel fabrication; and

‘‘(II) fuel transport;

"(B) the potential sources and fuel forms available to provide uranium for the program under subsection (b);

"(C) options to coordinate the program under subsection (b) with the operation of the versatile, reactor-based fast neutron source under section 959A;

"(D) the ability of the domestic uranium market to provide materials for advanced nuclear reactor fuel; and

"(E) any associated legal, regulatory, and policy issues that should be addressed to enable—

"(i) the program under subsection (b); and

"(ii) the establishment of a domestic industry capable of providing high-assay, low-enriched uranium for commercial and noncommercial purposes, including with respect to the needs of—

"(I) the Department;

"(II) the Department of Defense; and

"(III) the National Nuclear Security Administration.

''(d) HALEU TRANSPORTATION PACKAGE RESEARCH PROGRAM.—

''(1) IN GENERAL.—As soon as practicable after the date of enactment of this section, the Secretary shall establish a research, development, and demonstration program under which the Secretary shall provide grants, on a competitive basis, to establish the capability to transport high-assay, low-enriched uranium.

''(2) REQUIREMENT.—The focus of the program under this subsection shall be to establish 1 or more HALEU transportation packages that can be certified by the Nuclear Regulatory Commission to transport high-assay, low-enriched uranium to the various facilities involved in producing or using nuclear fuel containing high-assay, low-enriched uranium, such as—

''(A) enrichment facilities;

''(B) fuel processing facilities;

''(C) fuel fabrication facilities; and

''(D) nuclear reactors.''.

(2) TABLE OF CONTENTS.—The table of contents of the Energy Policy Act of 2005 (Public Law 109–58; 119 Stat. 594) (as amended by section

5(b)) is amended by inserting after the item relating to section 959B the following:

"Sec. 960. Advanced nuclear fuel security program.".

**SEC. 8. UNIVERSITY NUCLEAR LEADERSHIP PROGRAM.**

(a) FINDINGS.—Congress finds that—

(1) nuclear power plants—

(A) generate billions of dollars in national economic activity through procurements throughout the United States; and

(B) provide tens of thousands of people in the United States with high-paying jobs, contributing substantially to the local economies of the communities in which the plants operate;

(2) the world market for the growth of commercial nuclear power was estimated by the Department of Commerce to be valued at up to $740,000,000,000 during the period of calendar years 2018 through 2028;

(3) the participation and leadership of the United States in the market described in paragraph (2) will—

(A)(i) increase economic activity in the United States through robust nuclear exports, leading to the enhanced economic security of the United States; and

(ii) preserve and enhance the ability of the United States to positively influence international nuclear safety, security, and nonproliferation standards through commercial engagement with other nations; but

(B) require significant investment in United States-origin advanced nuclear technologies;

(4) in order to lead the world in the next generation of commercial nuclear power, the advanced nuclear industry in the United States should be positioned for accelerated growth, which requires public-private partnerships between industry entities and the Federal Government;

(5) success in achieving the goals described in this subsection will require a whole-government Federal approach that focuses on the shared needs and individual mission requirements of, at a minimum—

(A) the Department of Energy;

(B) the National Nuclear Security Administration; and

(C) the Nuclear Regulatory Commission;

(6) advanced reactors present new challenges and opportunities in reactor design, safeguards, and regulation;

(7) the challenges referred to in paragraph (6)—

(A) are directly relevant to the missions of—

(i) the Office of Nuclear Energy of the Department of Energy;

(ii) the National Nuclear Security Administration; and

(iii) the Nuclear Regulatory Commission; and

(B) require a highly skilled workforce in order to be met; and

(8) nuclear science and engineering programs at institutions of higher education in the United States—

(A) annually award degrees in nuclear engineering and related fields to more than 600 undergraduate students, and 500 graduate students, who are critical to maintaining United States leadership in the development of advanced nuclear systems;

(B) perform cutting-edge research and technology development activities that have made fundamental contributions to advancing United States nuclear technology; and

(C) support workforce development critical to maintaining United States leadership in nuclear detection, nonproliferation, nuclear medicine, advanced manufacturing, and other non-energy areas.

(b) AMENDMENT.—Section 313 of the Energy and Water Development and Related Agencies Appropriations Act, 2009 (42 U.S.C. 16274a), is amended to read as follows:

**"SEC. 313. UNIVERSITY NUCLEAR LEADERSHIP PROGRAM.**

"(a) DEFINITIONS.—In this section:

"(1) ADVANCED NUCLEAR REACTOR.—The term 'advanced nuclear reactor' means—

"(A) a nuclear fission 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—

"(i) additional inherent safety features;

"(ii) lower waste yields;

"(iii) improved fuel performance;

‘‘(iv) increased tolerance to loss of fuel cooling;

‘‘(v) enhanced reliability;

‘‘(vi) increased proliferation resistance;

‘‘(vii) increased thermal efficiency;

‘‘(viii) reduced consumption of cooling water;

‘‘(ix) the ability to integrate into electric applications and nonelectric applications;

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

‘‘(xi) operational flexibility to respond to changes in demand for electricity and to complement integration with intermittent renewable energy; and

‘‘(B) a fusion reactor.

‘‘(2) INSTITUTION OF HIGHER EDUCATION.—The term ‘institution of higher education’ has the meaning given the term in section 101(a) of the Higher Education Act of 1965 (20 U.S.C. 1001(a)).

~~"(3) PROGRAM.—The term 'Program' means the University Nuclear Leadership Program established under subsection (b).~~

~~"(b) ESTABLISHMENT.—The Secretary of Energy, the Administrator of the National Nuclear Security Administration, and the Chairman of the Nuclear Regulatory Commission shall jointly establish a program, to be known as the 'University Nuclear Leadership Program'.~~

~~"(c) USE OF FUNDS.—~~

~~"(1) IN GENERAL.—Except as provided in paragraph (2), amounts made available to carry out the Program shall be used to provide financial assistance for scholarships, fellowships, and research and development projects at institutions of higher education in areas relevant to the programmatic mission of the applicable Federal agency providing the financial assistance with respect to research, development, demonstration, and deployment activities for technologies relevant to advanced nuclear reactors, including relevant fuel cycle technologies.~~

~~"(2) EXCEPTION.—Notwithstanding paragraph (1), amounts made available to carry out the Program may be used to provide financial assistance for a scholarship, fellowship, or multiyear research and development project that does not align directly with~~

~~a programmatic mission of the applicable Federal agency providing the financial assistance, if the activity for which assistance is provided would facilitate the maintenance of the discipline of nuclear science or nuclear engineering.~~

~~"(d) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated such sums as are necessary to carry out the Program.".~~

***SECTION 1. SHORT TITLE.***

*This Act may be cited as the "Nuclear Energy Leadership Act".*

***SEC. 2. AUTHORIZATION OF LONG-TERM POWER PURCHASE AGREEMENTS.***

*Section 501(b)(1) of title 40, United States Code, is amended by striking subparagraph (B) and inserting the following:*

*"(B) PUBLIC UTILITY CONTRACTS.—*

*"(i) TERM.—*

*"(I) IN GENERAL.—A contract under this paragraph to purchase electricity from a public utility may be for a period of not more than 40 years.*

*"(II) OTHER PUBLIC UTILITY SERVICES.—A contract under this paragraph for a public utility service*

*other than a service described in subclause (I) may be for a period of not more than 10 years.*

*"(ii) COSTS.—The cost of a contract under this paragraph for any fiscal year may be paid from the appropriations for that fiscal year.".*

***SEC. 3. LONG-TERM NUCLEAR POWER PURCHASE AGREEMENT PILOT PROGRAM.***

*(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. LONG-TERM NUCLEAR POWER PURCHASE AGREEMENT PILOT PROGRAM.***

*"(a) ESTABLISHMENT.—The Secretary shall establish a pilot program for a long-term nuclear power purchase agreement.*

*"(b) REQUIREMENTS.—In developing the pilot program under this section, the Secretary shall—*

*"(1) consult and coordinate with the heads of other Federal departments and agencies that may benefit from purchasing nuclear power for a period of longer than 10 years, including—*

*"(A) the Secretary of Defense; and*

*"(B) the Secretary of Homeland Security; and*

*"(2) not later than December 31, 2023, enter into at least 1 agreement to purchase power from a commercial nuclear reactor that receives the first license for that reactor from the Nuclear Regulatory Commission after January 1, 2019.*

*"(c) FACTORS FOR CONSIDERATION.—*

*"(1) IN GENERAL.—In carrying out this section, the Secretary shall give special consideration to power purchase agreements for first-of-a-kind or early deployment nuclear technologies that can provide reliable and resilient power to high-value assets for national security purposes or other purposes as the Secretary determines to be in the national interest, especially in remote off-grid scenarios or grid-connected scenarios that can provide capabilities commonly known as 'islanding power capabilities' during an emergency scenario.*

*"(2) EFFECT ON RATES.—An agreement to purchase power under this section may be at a rate that is higher than the average market rate, if the agreement fulfills an applicable consideration described in paragraph (1).".*

*(b) TABLE OF CONTENTS.—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. Long-term nuclear power purchase agreement pilot program.".*

***SEC. 4. ADVANCED NUCLEAR REACTOR RESEARCH AND DEVELOPMENT GOALS.***

*(a) IN GENERAL.—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. 959A. ADVANCED NUCLEAR REACTOR RESEARCH AND DEVELOPMENT GOALS.***

*"(a) DEFINITIONS.—In this section:*

*"(1) ADVANCED NUCLEAR REACTOR.—The term 'advanced nuclear reactor' means—*

*"(A) a nuclear fission 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—*

*"(i) additional inherent safety features;*

*"(ii) lower waste yields;*

*"(iii) improved fuel performance;*

*"(iv) increased tolerance to loss of fuel cooling;*

*"(v) enhanced reliability;*

*"(vi) increased proliferation resistance;*

*"(vii) increased thermal efficiency;*

*"(viii) reduced consumption of cooling water;*

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

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

*"(xi) operational flexibility to respond to changes in demand for electricity and to complement integration with intermittent renewable energy; and*

*"(B) a fusion reactor.*

*"(2) DEMONSTRATION PROJECT.—The term 'demonstration project' means—*

*"(A) an advanced nuclear reactor operated—*

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

*"(ii) in any other manner for the purpose of demonstrating the suitability for commercial application of the advanced nuclear reactor;*

*"(B) the demonstration of privately funded experimental advanced nuclear reactors, funded in whole or in part by the private sector, at National Laboratories or other sites owned by the Department of Energy; and*

*"(C) an advanced nuclear reactor demonstrated by the Secretary of Defense in cooperation with the Secretary of Energy.*

*"(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 megawatt-hour or less;*

*"(B) heat for community heating, industrial purposes, or synthetic fuel production;*

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

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

*"(2) developing subgoals 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 personnel; and*

*"(B) to the results of research relating to civil nuclear technology funded by the Federal Government.*

*"(c) DEMONSTRATION PROJECTS.—*

*"(1) IN GENERAL.—The Secretary shall, to the maximum extent practicable—*

*"(A) enter into agreements to complete not fewer than 2 demonstration projects by not later than December 31, 2025; and*

*"(B) establish a program to enter into agreements to demonstrate not fewer than 2, and not more than 5, additional operational ad-*

*vanced reactor designs by not later than December 31, 2035.*

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

*"(A) include diversity in designs for the advanced nuclear reactors demonstrated under this section, including designs using various—*

*"(i) primary coolants;*

*"(ii) fuel types and compositions; and*

*"(iii) neutron spectra;*

*"(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;*

*"(ii) the selected projects can meet the deadline established in paragraph (1) to demonstrate first-of-a-kind advanced nuclear reactor technologies, for which additional information shall be considered, including—*

*"(I) the technology readiness level of a proposed advanced nuclear reactor technology;*

*"(II) the technical abilities and qualifications of teams desiring to demonstrate a proposed advanced nuclear reactor technology; and*

*"(III) the capacity to meet cost-share requirements of the Department;*

*"(C) ensure that each evaluation of candidate technologies for the demonstration projects is completed through an external review of proposed designs, which review shall—*

*"(i) be conducted by a panel that includes not fewer than 1 representative of each of—*

*"(I) an electric utility; and*

*"(II) an entity that uses high-temperature process heat for manufacturing or industrial processing, such as a petrochemical company, a manufacturer of metals, or a manufacturer of concrete;*

*"(ii) include a review of cost-competitiveness and other value streams, together with the technology readiness level, of each design to be demonstrated under this subsection; and*

*"(iii) not be required for a demonstration project that is not federally funded;*

*"(D) for federally funded demonstration projects, enter into cost-sharing agreements with private sector partners in accordance with section 988 for the conduct of activities relating to the research, development, and demonstration of private-sector advanced nuclear reactor designs under the program;*

*"(E) work with private sector partners to identify potential sites, including Department-owned sites, for demonstrations, as appropriate;*

*"(F) 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) institutions of higher education;*

*"(iv) traditional end-users (such as electric utilities);*

*"(v) potential end-users of new technologies (such as users of high-temperature process heat for manufacturing processing, including petrochemical companies, manu-*

*facturers of metals, or manufacturers of concrete); and*

*"(vi) developers of advanced nuclear reactor technology; and*

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

*"(3) ADDITIONAL REQUIREMENTS.—In carrying out demonstration projects under paragraph (1), the Secretary shall—*

*"(A) identify candidate technologies that—*

*"(i) are not developed sufficiently for demonstration within the initial required timeframe described in paragraph (1)(A); but*

*"(ii) could be demonstrated within the timeframe described in paragraph (1)(B);*

*"(B) identify technical challenges to the candidate technologies identified in subparagraph (A);*

*"(C) support near-term research and development to address the highest-risk technical chal-*

*lenges to the successful demonstration of a selected advanced reactor technology, in accordance with—*

*"(i) subparagraph (B); and*

*"(ii) the research and development activities under section 958;*

*"(D) establish such technology advisory working groups as the Secretary determines to be appropriate to advise the Secretary regarding the technical challenges identified under subparagraph (B) and the scope of research and development programs to address the challenges, in accordance with subparagraph (C), to be comprised of—*

*"(i) private-sector advanced nuclear reactor technology developers;*

*"(ii) technical experts with respect to the relevant technologies at institutions of higher education; and*

*"(iii) technical experts at the National Laboratories.*

*"(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 science to full-design development, safety evaluation, and licensing;*

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

*"(i) resolving materials challenges relating to extreme environments, including extremely high levels of—*

*"(I) radiation fluence;*

*"(II) temperature;*

*"(III) pressure; and*

*"(IV) corrosion; 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 technologies to manage, reduce, or reuse nuclear waste, are developed;*

*"(E) nuclear research infrastructure is maintained or constructed, such as—*

*"(i) currently operational research reactors at the National Laboratories and institutions of higher education;*

*"(ii) hot cell research facilities;*

*"(iii) a versatile fast neutron source; and*

*"(iv) a molten salt testing facility;*

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

*"(G) advanced sensors and control systems are developed; and*

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

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

*(1) in the item relating to section 917, by striking "Efficiency";*

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

*(3) by inserting after the item relating to section 959 the following:*

*"Sec. 959A. Advanced nuclear reactor research and development goals.".*

***SEC. 5. NUCLEAR ENERGY STRATEGIC PLAN.***

*(a) IN GENERAL.—Subtitle E of title IX of the Energy Policy Act of 2005 (42 U.S.C. 16271 et seq.) (as amended by section 4(a)) is amended by adding at the end the following:*

***"SEC. 959B. NUCLEAR ENERGY STRATEGIC PLAN.***

*"(a) IN GENERAL.—Not later than 180 days after the date of enactment of this section, the Secretary shall submit to the Committee on Energy and Natural Resources of the Senate and the Committees on Energy and Commerce and Science, Space, and Technology of the House of Representatives a 10-year strategic plan for the Office of Nuclear Energy of the Department, in accordance with this section.*

*"(b) REQUIREMENTS.—*

*"(1) COMPONENTS.—The strategic plan under this section shall designate—*

*"(A) programs that support the planned accomplishment of—*

*"(i) the goals established under section 959A; and*

*"(ii) the demonstration programs identified under subsection (c) of that section; and*

*"(B) programs that—*

*"(i) do not support the planned accomplishment of demonstration programs, or the goals, referred to in subparagraph (A); but*

*"(ii) are important to the mission of the Office of Nuclear Energy, as determined by the Secretary.*

*"(2) PROGRAM PLANNING.—In developing the strategic plan under this section, the Secretary shall specify expected timelines for, as applicable—*

*"(A) the accomplishment of relevant objectives under current programs of the Department; or*

*"(B) the commencement of new programs to accomplish those objectives.*

*"(c) UPDATES.—Not less frequently than once every 2 years, the Secretary shall submit to the Committee on Energy and Natural Resources of the Senate and the Committees on Energy and Commerce and Science, Space, and Technology of the House of Representatives an updated 10-year strategic plan in accordance with subsection (b), which shall identify, and provide a justification for, any major deviation from a previous strategic plan submitted under this section.".*

*(b) TABLE OF CONTENTS.—The table of contents of the Energy Policy Act of 2005 (Public Law 109–58; 119 Stat. 594) (as amended by section 4(b)(3)) is amended by inserting after the item relating to section 959A the following:*

*"Sec. 959B. Nuclear energy strategic plan.".*

***SEC. 6. VERSATILE, REACTOR-BASED FAST NEUTRON SOURCE.***

*Section 955(c)(1) of the Energy Policy Act of 2005 (42 U.S.C. 16275(c)(1)) is amended—*

*(1) in the paragraph heading, by striking "MISSION NEED" and inserting "AUTHORIZATION"; and*

*(2) in subparagraph (A), by striking "determine the mission need" and inserting "provide".*

***SEC. 7. ADVANCED NUCLEAR FUEL SECURITY PROGRAM.***

*(a) FINDINGS.—Congress finds that—*

*(1) the national security nuclear enterprise, which supports the nuclear weapons stockpile stew-*

*ardship and naval reactors functions of the National Nuclear Security Administration, requires a domestic source of low- and high-enriched uranium in accordance with legal restrictions regarding foreign obligations relating to the beginning stage of the nuclear fuel cycle;*

*(2) many domestic advanced nuclear power industry participants require access to high-assay, low-enriched uranium fuel for—*

*(A) initial fuel testing;*

*(B) operation of demonstration reactors; and*

*(C) commercial operation of advanced nuclear reactors;*

*(3) nuclear fuel supply technology originating in the United States is not required for use in civilian advanced reactor applications;*

*(4) as of the date of enactment of this Act, no domestic uranium enrichment or fuel fabrication capability is licensed for uranium fuel enriched to greater than 5 weight percent of the uranium-235 isotope;*

*(5) a healthy commercial nuclear fuel cycle capable of providing higher levels of enriched uranium would benefit—*

*(A) the relevant national security functions of the National Nuclear Security Administration; and*

*(B) the domestic advanced nuclear industry of the United States; and*

*(6) making limited quantities of high-assay, low-enriched uranium available from Department of Energy stockpiles of uranium would allow for initial fuel testing and demonstration of advanced nuclear reactor concepts, accelerating—*

*(A) the path to market of those concepts; and*

*(B) the development of—*

*(i) a market for advanced nuclear reactors; and*

*(ii) a resulting growing commercial nuclear fuel cycle capability.*

*(b) AMENDMENT.—*

*(1) IN GENERAL.—Subtitle E of title IX of the Energy Policy Act of 2005 (42 U.S.C. 16271 et seq.) (as amended by section 5(a)) is amended by adding at the end the following:*

***"SEC. 960. ADVANCED NUCLEAR FUEL SECURITY PROGRAM.***

*"(a) DEFINITIONS.—In this section:*

*"(1) HALEU TRANSPORTATION PACKAGE.—The term 'HALEU transportation package' means a transportation package that is suitable for transporting high-assay, low-enriched uranium.*

*"(2) HIGH-ASSAY, LOW-ENRICHED URANIUM.—The term 'high-assay, low-enriched uranium' means uranium with an assay greater than 5 weight percent, but less than 20 weight percent, of the uranium-235 isotope.*

*"(3) HIGH-ENRICHED URANIUM.—The term 'high-enriched uranium' means uranium with an assay of 20 weight percent or more of the uranium-235 isotope.*

*"(b) HIGH-ASSAY, LOW-ENRICHED URANIUM PROGRAM FOR ADVANCED REACTORS.—*

*"(1) ESTABLISHMENT.—Not later than 1 year after the date of enactment of this section, the Secretary shall establish a program to make available high-assay, low-enriched uranium, through contracts for sale, resale, transfer, or lease, for use in commercial or noncommercial advanced nuclear reactors.*

*"(2) NUCLEAR FUEL OWNERSHIP.—Each lease under this subsection shall include a provision establishing that the nuclear fuel that is the subject of the lease shall remain the property of the Department, in-*

*cluding with respect to responsibility for the final disposition of all radioactive waste created by the irradiation, processing, or purification of any leased uranium.*

*"(3) QUANTITY.—In carrying out the program under this subsection, the Secretary shall make available—*

*"(A) by December 31, 2022, high-assay, low-enriched uranium containing not less than 2 metric tons of the uranium-235 isotope; and*

*"(B) by December 31, 2025, high-assay, low-enriched uranium containing not less than 10 metric tons of the uranium-235 isotope (as determined including the quantities of the uranium-235 isotope made available before December 31, 2022).*

*"(4) FACTORS FOR CONSIDERATION.—In carrying out the program under this subsection, the Secretary shall take into consideration—*

*"(A) options for providing the high-assay, low-enriched uranium under this subsection from a stockpile of uranium owned by the Department (including the National Nuclear Security Administration), including—*

*"(i) fuel that—*

*"(I) directly meets the needs of an end-user; but*

*"(II) has been previously used or fabricated for another purpose;*

*"(ii) fuel that can meet the needs of an end-user after removing radioactive or other contaminants that resulted from a previous use or fabrication of the fuel for research, development, demonstration, or deployment activities of the Department (including activities of the National Nuclear Security Administration); and*

*"(iii) fuel from a high-enriched uranium stockpile, which can be blended with lower-assay uranium to become high-assay, low-enriched uranium to meet the needs of an end-user; and*

*"(B) requirements to support molybdenum-99 production under the American Medical Isotopes Production Act of 2012 (Public Law 112–239; 126 Stat. 2211).*

*"(5) LIMITATION.—The Secretary shall not barter or otherwise sell or transfer uranium in any form in exchange for services relating to the final disposi-*

*tion of radioactive waste from uranium that is the subject of a lease under this subsection.*

*"(6) SUNSET.—The program under this subsection shall terminate on the earlier of—*

*"(A) January 1, 2035; and*

*"(B) the date on which uranium enriched up to, but not equal to, 20 weight percent can be obtained in the commercial market from domestic suppliers.*

*"(c) REPORT.—*

*"(1) IN GENERAL.—Not later than 180 days after the date of enactment of this section, the Secretary shall submit to the appropriate committees of Congress a report that describes actions proposed to be carried out by the Secretary—*

*"(A) under the program under subsection (b); or*

*"(B) otherwise to enable the commercial use of high-assay, low-enriched uranium.*

*"(2) COORDINATION AND STAKEHOLDER INPUT.—In developing the report under this subsection, the Secretary shall seek input from—*

*"(A) the Nuclear Regulatory Commission;*

*"(B) the National Laboratories;*

*"(C) institutions of higher education;*

*"(D) producers of medical isotopes;*

*"(E) a diverse group of entities operating in the nuclear energy industry; and*

*"(F) a diverse group of technology developers.*

*"(3) COST AND SCHEDULE ESTIMATES.—The report under this subsection shall include estimated costs, budgets, and timeframes for enabling the use of high-assay, low-enriched uranium.*

*"(4) REQUIRED EVALUATIONS.—The report under this subsection shall evaluate—*

*"(A) the costs and actions required to establish and carry out the program under subsection (b), including with respect to—*

*"(i) proposed preliminary terms for the sale, resale, transfer, and leasing of high-assay, low-enriched uranium (including guidelines defining the roles and responsibilities between the Department and the purchaser, transfer recipient, or lessee); and*

*"(ii) the potential to coordinate with purchasers, transfer recipients, and lessees regarding—*

*"(I) fuel fabrication; and*

*"(II) fuel transport;*

*"(B) the potential sources and fuel forms available to provide uranium for the program under subsection (b);*

*"(C) options to coordinate the program under subsection (b) with the operation of the versatile, reactor-based fast neutron source under section 959A;*

*"(D) the ability of the domestic uranium market to provide materials for advanced nuclear reactor fuel; and*

*"(E) any associated legal, regulatory, and policy issues that should be addressed to enable—*

*"(i) the program under subsection (b); and*

*"(ii) the establishment of a domestic industry capable of providing high-assay, low-enriched uranium for commercial and noncommercial purposes, including with respect to the needs of—*

*"(I) the Department;*

*"(II) the Department of Defense; and*

*"(III) the National Nuclear Security Administration.*

*"(d) HALEU TRANSPORTATION PACKAGE RESEARCH PROGRAM.—*

*"(1) IN GENERAL.—As soon as practicable after the date of enactment of this section, the Secretary shall establish a research, development, and demonstration program under which the Secretary shall provide grants, on a competitive basis, to establish the capability to transport high-assay, low-enriched uranium.*

*"(2) REQUIREMENT.—The focus of the program under this subsection shall be to establish 1 or more HALEU transportation packages that can be certified by the Nuclear Regulatory Commission to transport high-assay, low-enriched uranium to the various facilities involved in producing or using nuclear fuel containing high-assay, low-enriched uranium, such as—*

*"(A) enrichment facilities;*

*"(B) fuel processing facilities;*

*"(C) fuel fabrication facilities; and*

*"(D) nuclear reactors.".*

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

*amended by inserting after the item relating to section 959B the following:*

*"Sec. 960. Advanced nuclear fuel security program.".*

***SEC. 8. UNIVERSITY NUCLEAR LEADERSHIP PROGRAM.***

*(a) FINDINGS.—Congress finds that—*

*(1) nuclear power plants—*

*(A) generate billions of dollars in national economic activity through procurements throughout the United States; and*

*(B) provide tens of thousands of people in the United States with high-paying jobs, contributing substantially to the local economies of the communities in which the plants operate;*

*(2) the world market for the growth of commercial nuclear power was estimated by the Department of Commerce to be valued at up to $740,000,000,000 during the period of calendar years 2018 through 2028;*

*(3) the participation and leadership of the United States in the market described in paragraph (2) will—*

*(A)(i) increase economic activity in the United States through robust nuclear exports, leading to the enhanced economic security of the United States; and*

*(ii) preserve and enhance the ability of the United States to positively influence international nuclear safety, security, and nonproliferation standards through commercial engagement with other nations; but*

*(B) require significant investment in United States-origin advanced nuclear technologies;*

*(4) in order to lead the world in the next generation of commercial nuclear power, the advanced nuclear industry in the United States should be positioned for accelerated growth, which requires public-private partnerships between industry entities and the Federal Government;*

*(5) success in achieving the goals described in this subsection will require a whole-government Federal approach that focuses on the shared needs and individual mission requirements of, at a minimum—*

*(A) the Department of Energy;*

*(B) the National Nuclear Security Administration; and*

*(C) the Nuclear Regulatory Commission;*

*(6) advanced reactors present new challenges and opportunities in reactor design, safeguards, and regulation;*

*(7) the challenges referred to in paragraph (6)—*

*(A) are directly relevant to the missions of—*

*(i) the Office of Nuclear Energy of the Department of Energy;*

*(ii) the National Nuclear Security Administration; and*

*(iii) the Nuclear Regulatory Commission; and*

*(B) require a highly skilled workforce in order to be met; and*

*(8) nuclear science and engineering programs at institutions of higher education in the United States—*

*(A) annually award degrees in nuclear engineering and related fields to more than 600 undergraduate students, and 500 graduate students, who are critical to maintaining United States leadership in the development of advanced nuclear systems;*

*(B) perform cutting-edge research and technology development activities that have made fundamental contributions to advancing United States nuclear technology; and*

*(C) support workforce development critical to maintaining United States leadership in nuclear detection, nonproliferation, nuclear medicine, advanced manufacturing, and other non-energy areas.*

*(b) AMENDMENT.—Section 313 of the Energy and Water Development and Related Agencies Appropriations Act, 2009 (42 U.S.C. 16274a), is amended to read as follows:*

***"SEC. 313. UNIVERSITY NUCLEAR LEADERSHIP PROGRAM.***

*"(a) DEFINITIONS.—In this section:*

*"(1) ADVANCED NUCLEAR REACTOR.—The term 'advanced nuclear reactor' means—*

*"(A) a nuclear fission 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—*

*"(i) additional inherent safety features;*

*"(ii) lower waste yields;*

*"(iii) improved fuel performance;*

*"(iv) increased tolerance to loss of fuel cooling;*

*"(v) enhanced reliability;*

*"(vi) increased proliferation resistance;*

*"(vii) increased thermal efficiency;*

*"(viii) reduced consumption of cooling water;*

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

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

*"(xi) operational flexibility to respond to changes in demand for electricity and to complement integration with intermittent renewable energy; and*

*"(B) a fusion reactor.*

*"(2) INSTITUTION OF HIGHER EDUCATION.—The term 'institution of higher education' has the meaning given the term in section 101(a) of the Higher Education Act of 1965 (20 U.S.C. 1001(a)).*

*"(3) PROGRAM.—The term 'Program' means the University Nuclear Leadership Program established under subsection (b).*

*"(b) ESTABLISHMENT.—The Secretary of Energy, the Administrator of the National Nuclear Security Adminis-*

*tration, and the Chairman of the Nuclear Regulatory Commission shall jointly establish a program, to be known as the 'University Nuclear Leadership Program'.*

*"(c) USE OF FUNDS.—*

*"(1) IN GENERAL.—Except as provided in paragraph (2), amounts made available to carry out the Program shall be used to provide financial assistance for scholarships, fellowships, and research and development projects at institutions of higher education in areas relevant to the programmatic mission of the applicable Federal agency providing the financial assistance with respect to research, development, demonstration, and deployment activities for technologies relevant to advanced nuclear reactors, including relevant fuel cycle technologies.*

*"(2) EXCEPTION.—Notwithstanding paragraph (1), amounts made available to carry out the Program may be used to provide financial assistance for a scholarship, fellowship, or multiyear research and development project that does not align directly with a programmatic mission of the applicable Federal agency providing the financial assistance, if the activity for which assistance is provided would facilitate the maintenance of the discipline of nuclear science or nuclear engineering.*

*"(d) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to carry out the Program for fiscal year 2020 and each fiscal year thereafter—*

*"(1) $30,000,000 to the Secretary of Energy, of which $15,000,000 shall be for use by the Administrator of the National Nuclear Security Administration; and*

*"(2) $15,000,000 to the Nuclear Regulatory Commission.".*

**Calendar No. 217**

116TH CONGRESS
1ST SESSION

# S. 903

**[Report No. 116–114]**

# A BILL

To direct the Secretary of Energy to establish advanced nuclear goals, provide for a versatile, reactor-based fast neutron source, make available high-assay, low-enriched uranium for research, development, and demonstration of advanced nuclear reactor concepts, and for other purposes.

SEPTEMBER 24, 2019

Reported with an amendment