

Calendar No. 217116TH 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.

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*]

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.

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 Lead-
 5 ership Act”.

6 **SEC. 2. AUTHORIZATION OF LONG-TERM POWER PUR-**
 7 **CHASE AGREEMENTS.**

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

11 “(B) PUBLIC UTILITY CONTRACTS.—

12 “(i) TERM.—

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

18 “(II) OTHER PUBLIC UTILITY
 19 SERVICES.—A contract under this
 20 paragraph for a public utility service
 21 other than a service described in sub-
 22 clause (I) may be for a period of not
 23 more than 10 years.

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

1 may be paid from the appropriations for
2 that fiscal year.”.

3 **SEC. 3. LONG-TERM NUCLEAR POWER PURCHASE AGREE-**
4 **MENT PILOT PROGRAM.**

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

8 **“SEC. 640. LONG-TERM NUCLEAR POWER PURCHASE**
9 **AGREEMENT PILOT PROGRAM.**

10 “(a) ESTABLISHMENT.—The Secretary shall estab-
11 lish a pilot program for a long-term power purchase agree-
12 ment.

13 “(b) REQUIREMENTS.—In developing the pilot pro-
14 gram under this section, the Secretary shall—

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

19 “(A) the Secretary of Defense; and

20 “(B) the Secretary of Homeland Security;

21 and

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

1 from the Nuclear Regulatory Commission after Jan-
 2 uary 1, 2019.

3 “(c) FACTORS FOR CONSIDERATION.—

4 “(1) IN GENERAL.—In carrying out this sec-
 5 tion, the Secretary shall give special consideration to
 6 power purchase agreements for first-of-a-kind or
 7 early deployment nuclear technologies that can pro-
 8 vide reliable and resilient power to high-value assets
 9 for national security purposes or other purposes as
 10 the Secretary determines to be in the national inter-
 11 est, especially in remote off-grid scenarios or grid-
 12 connected scenarios that can provide capabilities
 13 commonly known as ‘islanding power capabilities’
 14 during an emergency scenario.

15 “(2) EFFECT ON RATES.—An agreement to
 16 purchase power under this section may be at a rate
 17 that is higher than the average market rate, if the
 18 agreement fulfills an applicable consideration de-
 19 scribed in paragraph (1).”.

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

“Sec. 640. Long-term nuclear power purchase agreement pilot program.”.

1 **SEC. 4. 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 an advanced nuclear

17 reactor operated—

18 “(A) as part of the power generation facili-

19 ties of an electric utility system; or

20 “(B) in any other manner for the purpose

21 of demonstrating the suitability for commercial

22 application of the advanced nuclear reactor.

23 “(b) PURPOSE.—The purpose of this section is to di-

24 rect the Secretary, as soon as practicable after the date

25 of enactment of this section, to advance the research and

1 development of domestic advanced, affordable, and clean
2 nuclear energy by—

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

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

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

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

11 “(D) backup or mission-critical power sup-
12 plies;

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

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

20 “(4) facilitating the access of the private sec-
21 tor—

22 “(A) to Federal research facilities and per-
23 sonnel; and

1 “(B) to the results of research relating to
2 civil nuclear technology funded by the Federal
3 Government.

4 “(e) DEMONSTRATION PROJECTS.—

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

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

10 “(B) establish a program to demonstrate
11 not fewer than 2, and not more than 5, addi-
12 tional operational advanced reactor designs by
13 not later than December 31, 2035.

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

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

20 “(i) primary coolants;

21 “(ii) fuel types and compositions; and

22 “(iii) neutron spectra;

23 “(B) seek to ensure that—

24 “(i) the long-term cost of electricity or
25 heat for each design to be demonstrated

1 under this subsection is cost-competitive in
2 the applicable market;

3 “(ii) the selected projects can meet
4 the deadline established in paragraph (1)
5 to demonstrate first-of-a-kind advanced
6 nuclear reactor technologies; for which ad-
7 ditional information shall be considered; in-
8 cluding—

9 “(I) the technology readiness
10 level of a proposed advanced nuclear
11 reactor technology;

12 “(II) the technical abilities and
13 qualifications of teams desiring to
14 partner with the Department to dem-
15 onstrate a proposed advanced nuclear
16 reactor technology; and

17 “(III) the capacity to meet cost-
18 share requirements of the Depart-
19 ment;

20 “(C) ensure that each evaluation of can-
21 didate technologies for the demonstration
22 projects is completed through an external re-
23 view of proposed designs; which review shall—

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

4 “(I) an electric utility; and

5 “(II) an entity that uses high-
6 temperature process heat for manu-
7 facturing or industrial processing;
8 such as a petrochemical company, a
9 manufacturer of metals, or a manu-
10 facturer of concrete; and

11 “(ii) include a review of cost-competi-
12 tiveness and other value streams, together
13 with the technology readiness level, of each
14 design to be demonstrated under this sub-
15 section;

16 “(D) enter into cost-sharing agreements
17 with partners in accordance with section 988
18 for the conduct of activities relating to the re-
19 search, development, and demonstration of pri-
20 vate-sector advanced nuclear reactor designs
21 under the program;

22 “(E) work with private sector partners to
23 identify potential sites, including Department-
24 owned sites, for demonstrations, as appropriate;
25 and

1 “(F) align specific activities carried out
2 under demonstration projects carried out under
3 this subsection with priorities identified through
4 direct consultations between—

5 “(i) the Department;

6 “(ii) National Laboratories;

7 “(iii) institutions of higher education;

8 “(iv) traditional end-users (such as
9 electric utilities);

10 “(v) potential end-users of new tech-
11 nologies (such as users of high-tempera-
12 ture process heat for manufacturing proc-
13 essing, including petrochemical companies,
14 manufacturers of metals, or manufacturers
15 of concrete); and

16 “(vi) developers of advanced nuclear
17 reactor technology.

18 “(3) **ADDITIONAL REQUIREMENTS.**—In ear-
19 rying out demonstration projects under paragraph
20 (1), the Secretary shall—

21 “(A) identify candidate technologies that—

22 “(i) are not developed sufficiently for
23 demonstration within the initial required
24 timeframe described in paragraph (1)(A);
25 but

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

3 “(B) identify technical challenges to the
4 candidate technologies identified in subpara-
5 graph (A);

6 “(C) support near-term research and devel-
7 opment to address the highest-risk technical
8 challenges to the successful demonstration of a
9 selected advanced reactor technology, in accord-
10 ance with—

11 “(i) subparagraph (B); and

12 “(ii) the research and development ac-
13 tivities under section 958;

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

22 “(i) private-sector advanced nuclear
23 reactor technology developers;

1 “(ii) technical experts with respect to
2 the relevant technologies at institutions of
3 higher education; and

4 “(iii) technical experts at the National
5 Laboratories.

6 “(d) GOALS.—

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

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

17 “(3) REQUIREMENTS.—In developing the goals
18 under paragraph (1), the Secretary shall ensure
19 that—

20 “(A) research activities facilitated by the
21 Department to meet the goals developed under
22 this subsection are focused on key areas of nu-
23 clear research and deployment ranging from
24 basic science to full-design development, safety
25 evaluation, and licensing;

1 “(B) research programs designed to meet
2 the goals emphasize—

3 “(i) resolving materials challenges re-
4 lating to extreme environments, including
5 extremely high levels of—

6 “(I) radiation fluence;

7 “(II) temperature;

8 “(III) pressure; and

9 “(IV) corrosion; and

10 “(ii) qualification of advanced fuels;

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

14 “(D) related technologies, such as tech-
15 nologies to manage, reduce, or reuse nuclear
16 waste, are developed;

17 “(E) nuclear research infrastructure is
18 maintained or constructed, such as—

19 “(i) currently operational research re-
20 actors at the National Laboratories and in-
21 stitutions of higher education;

22 “(ii) hot cell research facilities;

23 “(iii) a versatile fast neutron source;

24 and

25 “(iv) a molten salt testing facility;

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

3 “(G) advanced sensors and control systems
4 are developed; and

5 “(H) advanced manufacturing and ad-
6 vanced construction techniques and materials
7 are investigated to reduce the cost of advanced
8 nuclear reactors.”.

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

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

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

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

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

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

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

1 **“SEC. 959B. NUCLEAR ENERGY STRATEGIC PLAN.**

2 “(a) IN GENERAL.—Not later than 180 days after
3 the date of enactment of this section, the Secretary shall
4 submit to the Committee on Energy and Natural Re-
5 sources of the Senate and the Committees on Energy and
6 Commerce and Science, Space, and Technology of the
7 House of Representatives a 10-year strategic plan for the
8 Office of Nuclear Energy of the Department, in accord-
9 ance with this section.

10 “(b) REQUIREMENTS.—

11 “(1) COMPONENTS.—The strategic plan under
12 this section shall designate—

13 “(A) programs that support the planned
14 accomplishment of—

15 “(i) the goals established under sec-
16 tion 959A; and

17 “(ii) the demonstration programs
18 identified under subsection (c) of that sec-
19 tion; and

20 “(B) programs that—

21 “(i) do not support the planned ac-
22 complishment of demonstration programs;
23 or the goals, referred to in subparagraph
24 (A); but

1 “(ii) are important to the mission of
2 the Office of Nuclear Energy, as deter-
3 mined by the Secretary.

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

7 “(A) the accomplishment of relevant objec-
8 tives under current programs of the Depart-
9 ment; or

10 “(B) the commencement of new programs
11 to accomplish those objectives.

12 “(e) UPDATES.—Not less frequently than once every
13 2 years, the Secretary shall submit to the Committee on
14 Energy and Natural Resources of the Senate and the
15 Committees on Energy and Commerce and Science, Space,
16 and Technology of the House of Representatives an up-
17 dated 10-year strategic plan in accordance with subsection
18 (b), which shall identify, and provide a justification for,
19 any major deviation from a previous strategic plan sub-
20 mitted under this section.”.

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

“Sec. 959B. Nuclear energy strategic plan.”.

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

3 Section 955(c)(1) of the Energy Policy Act of 2005
4 (42 U.S.C. 16275(e)(1)) is amended—

5 (1) in the paragraph heading, by striking “MIS-
6 SION NEED” and inserting “AUTHORIZATION”; and

7 (2) in subparagraph (A), by striking “determine
8 the mission need” and inserting “provide”.

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

10 (a) FINDINGS.—Congress finds that—

11 (1) the national security nuclear enterprise,
12 which supports the nuclear weapons stockpile stew-
13 ardship and naval reactors functions of the National
14 Nuclear Security Administration, requires a domes-
15 tic source of low- and high-enriched uranium in ac-
16 cordance with legal restrictions regarding foreign ob-
17 ligations relating to the beginning stage of the nu-
18 clear fuel cycle;

19 (2) many domestic advanced nuclear power in-
20 dustry participants require access to high-assay, low-
21 enriched uranium fuel for—

22 (A) initial fuel testing;

23 (B) operation of demonstration reactors;

24 and

25 (C) commercial operation of advanced nu-
26 clear reactors;

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

5 ~~(4) a healthy commercial nuclear fuel cycle ca-~~
6 ~~pable of providing higher levels of enriched uranium~~
7 ~~would benefit—~~

8 ~~(A) the relevant national security functions~~
9 ~~of the National Nuclear Security Administra-~~
10 ~~tion; and~~

11 ~~(B) the domestic advanced nuclear indus-~~
12 ~~try of the United States; and~~

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

18 ~~(A) the path to market of those concepts;~~

19 ~~and~~

20 ~~(B) the development of—~~

21 ~~(i) a market for advanced nuclear re-~~
22 ~~actors; and~~

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

25 ~~(b) AMENDMENT.—~~

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

5 **“SEC. 960. ADVANCED NUCLEAR FUEL SECURITY PRO-**
6 **GRAM.**

7 “(a) DEFINITIONS.—In this section:

8 “(1) HALEU TRANSPORTATION PACKAGE.—
9 The term ‘HALEU transportation package’ means a
10 transportation package that is suitable for trans-
11 porting high-assay, low-enriched uranium.

12 “(2) HIGH-ASSAY, LOW-ENRICHED URANIUM.—
13 The term ‘high-assay, low-enriched uranium’ means
14 uranium with an assay greater than 5 weight per-
15 cent, but less than 20 weight percent, of the ura-
16 nium-235 isotope.

17 “(3) HIGH-ENRICHED URANIUM.—The term
18 ‘high-enriched uranium’ means uranium with an
19 assay of 20 weight percent or more of the uranium-
20 235 isotope.

21 “(b) HIGH-ASSAY, LOW-ENRICHED URANIUM PRO-
22 GRAM FOR ADVANCED REACTORS.—

23 “(1) ESTABLISHMENT.—Not later than 1 year
24 after the date of enactment of this section, the Sec-
25 retary shall establish a program to make available

1 high-assay, low-enriched uranium, through contracts
2 for sale, resale, transfer, or lease, for use in com-
3 mercial or noncommercial advanced nuclear reactors.

4 “(2) NUCLEAR FUEL OWNERSHIP.—Each lease
5 under this subsection shall include a provision estab-
6 lishing that the nuclear fuel that is the subject of
7 the lease shall remain the property of the Depart-
8 ment, including with respect to responsibility for the
9 final disposition of all radioactive waste created by
10 the irradiation, processing, or purification of any
11 leased uranium.

12 “(3) QUANTITY.—In carrying out the program
13 under this subsection, the Secretary shall make
14 available—

15 “(A) by December 31, 2022, high-assay,
16 low-enriched uranium containing not less than
17 2 metric tons of the uranium-235 isotope; and

18 “(B) by December 31, 2025, high-assay,
19 low-enriched uranium containing not less than
20 10 metric tons of the uranium-235 isotope (as
21 determined including the quantities of the ura-
22 nium-235 isotope made available before Decem-
23 ber 31, 2022).

24 “(4) FACTORS FOR CONSIDERATION.—In ear-
25 rying out the program under this subsection, the

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

6 “(A) fuel that—

7 “(i) directly meets the needs of an
8 end-user; but

9 “(ii) has been previously used or fab-
10 ricated for another purpose;

11 “(B) fuel that can meet the needs of an
12 end-user after removing radioactive or other
13 contaminants that resulted from a previous use
14 or fabrication of the fuel for research, develop-
15 ment, demonstration, or deployment activities
16 of the Department (including activities of the
17 National Nuclear Security Administration); and

18 “(C) fuel from a high-enriched uranium
19 stockpile, which can be blended with lower-
20 assay uranium to become high-assay, low-en-
21 riched uranium to meet the needs of an end-
22 user.

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

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

3 ~~“(6) SUNSET.—The program under this sub-~~
4 ~~section shall terminate on the earlier of—~~

5 ~~“(A) January 1, 2035; and~~

6 ~~“(B) the date on which uranium enriched~~
7 ~~up to, but not equal to, 20 weight percent can~~
8 ~~be obtained in the commercial market from do-~~
9 ~~mestic suppliers.~~

10 ~~“(c) REPORT.—~~

11 ~~“(1) IN GENERAL.—Not later than 180 days~~
12 ~~after the date of enactment of this section, the Sec-~~
13 ~~retary shall submit to the appropriate committees of~~
14 ~~Congress a report that describes actions proposed to~~
15 ~~be carried out by the Secretary—~~

16 ~~“(A) under the program under subsection~~

17 ~~(b); or~~

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

20 ~~“(2) COORDINATION AND STAKEHOLDER~~
21 ~~INPUT.—In developing the report under this sub-~~
22 ~~section, the Secretary shall seek input from—~~

23 ~~“(A) the Nuclear Regulatory Commission;~~

24 ~~“(B) the National Laboratories;~~

25 ~~“(C) institutions of higher education;~~

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

3 “(E) a diverse group of technology devel-
4 opers.

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

9 “(4) REQUIRED EVALUATIONS.—The report
10 under this subsection shall evaluate—

11 “(A) the costs and actions required to es-
12 tablish and carry out the program under sub-
13 section (b); including with respect to—

14 “(i) proposed preliminary terms for
15 the sale, resale, transfer, and leasing of
16 high-assay, low-enriched uranium (includ-
17 ing guidelines defining the roles and re-
18 sponsibilities between the Department and
19 the purchaser, transfer recipient, or les-
20 see); and

21 “(ii) the potential to coordinate with
22 purchasers, transfer recipients, and lessees
23 regarding—

24 “(I) fuel fabrication; and

25 “(II) fuel transport;

1 “(B) the potential sources and fuel forms
2 available to provide uranium for the program
3 under subsection (b);

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

8 “(D) the ability of the domestic uranium
9 market to provide materials for advanced nu-
10 clear reactor fuel; and

11 “(E) any associated legal, regulatory, and
12 policy issues that should be addressed to en-
13 able—

14 “(i) the program under subsection (b);

15 and

16 “(ii) the establishment of a domestic
17 industry capable of providing high-assay,
18 low-enriched uranium for commercial and
19 noncommercial purposes, including with re-
20 spect to the needs of—

21 “(I) the Department;

22 “(II) the Department of Defense;

23 and

24 “(III) the National Nuclear Se-
25 curity Administration.

1 “(d) HALEU TRANSPORTATION PACKAGE RE-
2 SEARCH PROGRAM.—

3 “(1) IN GENERAL.—As soon as practicable
4 after the date of enactment of this section, the Sec-
5 retary shall establish a research, development, and
6 demonstration program under which the Secretary
7 shall provide grants, on a competitive basis, to es-
8 tablish the capability to transport high-assay, low-
9 enriched uranium.

10 “(2) REQUIREMENT.—The focus of the pro-
11 gram under this subsection shall be to establish 1 or
12 more HALEU transportation packages that can be
13 certified by the Nuclear Regulatory Commission to
14 transport high-assay, low-enriched uranium to the
15 various facilities involved in producing or using nu-
16 clear fuel containing high-assay, low-enriched ura-
17 nium, such as—

18 “(A) enrichment facilities;

19 “(B) fuel processing facilities;

20 “(C) fuel fabrication facilities; and

21 “(D) nuclear reactors.”.

22 “(2) TABLE OF CONTENTS.—The table of con-
23 tents of the Energy Policy Act of 2005 (Public Law
24 109–58; 119 Stat. 594) (as amended by section

1 5(b)) is amended by inserting after the item relating
2 to section 959B the following:

“Sec. 960. Advanced nuclear fuel security program.”.

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

4 (a) FINDINGS.—Congress finds that—

5 (1) nuclear power plants—

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

9 (B) provide tens of thousands of people in
10 the United States with high-paying jobs; con-
11 tributing substantially to the local economies of
12 the communities in which the plants operate;

13 (2) the world market for the growth of commer-
14 cial nuclear power was estimated by the Department
15 of Commerce to be valued at up to
16 \$740,000,000,000 during the period of calendar
17 years 2018 through 2028;

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

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

1 (ii) preserve and enhance the ability of the
2 United States to positively influence inter-
3 national nuclear safety, security, and non-
4 proliferation standards through commercial en-
5 gagement with other nations; but

6 (B) require significant investment in
7 United States-origin advanced nuclear tech-
8 nologies;

9 (4) in order to lead the world in the next gen-
10 eration of commercial nuclear power, the advanced
11 nuclear industry in the United States should be posi-
12 tioned for accelerated growth, which requires public-
13 private partnerships between industry entities and
14 the Federal Government;

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

19 (A) the Department of Energy;

20 (B) the National Nuclear Security Admin-
21 istration; and

22 (C) the Nuclear Regulatory Commission;

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

1 (7) the challenges referred to in paragraph
2 (6)—

3 (A) are directly relevant to the missions
4 of—

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

7 (ii) the National Nuclear Security Ad-
8 ministration; and

9 (iii) the Nuclear Regulatory Commis-
10 sion; and

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

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

16 (A) annually award degrees in nuclear en-
17 gineering and related fields to more than 600
18 undergraduate students; and 500 graduate stu-
19 dents; who are critical to maintaining United
20 States leadership in the development of ad-
21 vanced nuclear systems;

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

1 (C) support workforce development critical
2 to maintaining United States leadership in nu-
3 clear detection, nonproliferation, nuclear medi-
4 eine, advanced manufacturing, and other non-
5 energy areas.

6 (b) ~~AMENDMENT.~~—Section 313 of the Energy and
7 Water Development and Related Agencies Appropriations
8 Act, 2009 (42 U.S.C. 16274a), is amended to read as fol-
9 lows:

10 **“SEC. 313. UNIVERSITY NUCLEAR LEADERSHIP PROGRAM.**

11 “~~(a) DEFINITIONS.~~—In this section:

12 “~~(1) ADVANCED NUCLEAR REACTOR.~~—The
13 term ‘advanced nuclear reactor’ means—

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

21 “~~(i)~~ additional inherent safety fea-
22 tures;

23 “~~(ii)~~ lower waste yields;

24 “~~(iii)~~ improved fuel performance;

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

3 “(v) enhanced reliability;

4 “(vi) increased proliferation resist-
5 ance;

6 “(vii) increased thermal efficiency;

7 “(viii) reduced consumption of cooling
8 water;

9 “(ix) the ability to integrate into elec-
10 tric applications and nonelectric applica-
11 tions;

12 “(x) modular sizes to allow for deploy-
13 ment that corresponds with the demand
14 for electricity; or

15 “(xi) operational flexibility to respond
16 to changes in demand for electricity and to
17 complement integration with intermittent
18 renewable energy; and

19 “(B) a fusion reactor.

20 “(2) INSTITUTION OF HIGHER EDUCATION.—

21 The term ‘institution of higher education’ has the
22 meaning given the term in section 101(a) of the
23 Higher Education Act of 1965 (20 U.S.C. 1001(a)).

1 “(3) PROGRAM.—The term ‘Program’ means
2 the University Nuclear Leadership Program estab-
3 lished under subsection (b).

4 “(b) ESTABLISHMENT.—The Secretary of Energy,
5 the Administrator of the National Nuclear Security Ad-
6 ministration, and the Chairman of the Nuclear Regulatory
7 Commission shall jointly establish a program, to be known
8 as the ‘University Nuclear Leadership Program’.

9 “(c) USE OF FUNDS.—

10 “(1) IN GENERAL.—Except as provided in para-
11 graph (2), amounts made available to carry out the
12 Program shall be used to provide financial assistance
13 for scholarships, fellowships, and research and devel-
14 opment projects at institutions of higher education
15 in areas relevant to the programmatic mission of the
16 applicable Federal agency providing the financial as-
17 sistance with respect to research, development, dem-
18 onstration, and deployment activities for technologies
19 relevant to advanced nuclear reactors, including rel-
20 evant fuel cycle technologies.

21 “(2) EXCEPTION.—Notwithstanding paragraph
22 (1), amounts made available to carry out the Pro-
23 gram may be used to provide financial assistance for
24 a scholarship, fellowship, or multiyear research and
25 development project that does not align directly with

1 a programmatic mission of the applicable Federal
 2 agency providing the financial assistance, if the ac-
 3 tivity for which assistance is provided would facili-
 4 tate the maintenance of the discipline of nuclear
 5 science or nuclear engineering.

6 “(d) ~~AUTHORIZATION OF APPROPRIATIONS.~~—There
 7 are authorized to be appropriated such sums as are nec-
 8 essary to carry out the Program.”.

9 **SECTION 1. SHORT TITLE.**

10 *This Act may be cited as the “Nuclear Energy Leader-*
 11 *ship Act”.*

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

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

17 “(B) *PUBLIC UTILITY CONTRACTS.*—

18 “(i) *TERM.*—

19 “(I) *IN GENERAL.*—A contract
 20 *under this paragraph to purchase elec-*
 21 *tricity from a public utility may be for*
 22 *a period of not more than 40 years.*

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

1 *other than a service described in sub-*
 2 *clause (I) may be for a period of not*
 3 *more than 10 years.*

4 *“(ii) COSTS.—The cost of a contract*
 5 *under this paragraph for any fiscal year*
 6 *may be paid from the appropriations for*
 7 *that fiscal year.”.*

8 **SEC. 3. LONG-TERM NUCLEAR POWER PURCHASE AGREE-**
 9 **MENT PILOT PROGRAM.**

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

13 **“SEC. 640. LONG-TERM NUCLEAR POWER PURCHASE AGREE-**
 14 **MENT PILOT PROGRAM.**

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

18 *“(b) REQUIREMENTS.—In developing the pilot pro-*
 19 *gram under this section, the Secretary shall—*

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

24 *“(A) the Secretary of Defense; and*

1 “(B) *the Secretary of Homeland Security;*
2 *and*

3 “(2) *not later than December 31, 2023, enter*
4 *into at least 1 agreement to purchase power from a*
5 *commercial nuclear reactor that receives the first li-*
6 *cence for that reactor from the Nuclear Regulatory*
7 *Commission after January 1, 2019.*

8 “(c) *FACTORS FOR CONSIDERATION.—*

9 “(1) *IN GENERAL.—In carrying out this section,*
10 *the Secretary shall give special consideration to power*
11 *purchase agreements for first-of-a-kind or early de-*
12 *ployment nuclear technologies that can provide reli-*
13 *able and resilient power to high-value assets for na-*
14 *tional security purposes or other purposes as the Sec-*
15 *retary determines to be in the national interest, espe-*
16 *cially in remote off-grid scenarios or grid-connected*
17 *scenarios that can provide capabilities commonly*
18 *known as ‘islanding power capabilities’ during an*
19 *emergency scenario.*

20 “(2) *EFFECT ON RATES.—An agreement to pur-*
21 *chase power under this section may be at a rate that*
22 *is higher than the average market rate, if the agree-*
23 *ment fulfills an applicable consideration described in*
24 *paragraph (1).”.*

1 (b) *TABLE OF CONTENTS.*—*The table of contents of the*
 2 *Energy Policy Act of 2005 (Public Law 109–58; 119 Stat.*
 3 *594) is amended by inserting after the item relating to sec-*
 4 *tion 639 the following:*

“*Sec. 640. Long-term nuclear power purchase agreement pilot program.*”.

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

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

10 **“SEC. 959A. ADVANCED NUCLEAR REACTOR RESEARCH AND**
 11 **DEVELOPMENT GOALS.**

12 “(a) *DEFINITIONS.*—*In this section:*

13 “(1) *ADVANCED NUCLEAR REACTOR.*—*The term*
 14 *‘advanced nuclear reactor’ means—*

15 “(A) *a nuclear fission reactor, including a*
 16 *prototype plant (as defined in sections 50.2 and*
 17 *52.1 of title 10, Code of Federal Regulations (or*
 18 *successor regulations)), with significant improve-*
 19 *ments compared to the most recent generation of*
 20 *fission reactors, including improvements such*
 21 *as—*

22 “(i) *additional inherent safety features;*

23 “(ii) *lower waste yields;*

24 “(iii) *improved fuel performance;*

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

3 “(v) enhanced reliability;

4 “(vi) increased proliferation resistance;

5 “(vii) increased thermal efficiency;

6 “(viii) reduced consumption of cooling
7 water;

8 “(ix) the ability to integrate into elec-
9 tric applications and nonelectric applica-
10 tions;

11 “(x) modular sizes to allow for deploy-
12 ment that corresponds with the demand for
13 electricity; or

14 “(xi) operational flexibility to respond
15 to changes in demand for electricity and to
16 complement integration with intermittent
17 renewable energy; and

18 “(B) a fusion reactor.

19 “(2) DEMONSTRATION PROJECT.—The term
20 ‘demonstration project’ means—

21 “(A) an advanced nuclear reactor oper-
22 ated—

23 “(i) as part of the power generation fa-
24 cilities of an electric utility system; or

1 “(ii) in any other manner for the pur-
2 pose of demonstrating the suitability for
3 commercial application of the advanced nu-
4 clear reactor;

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

10 “(C) an advanced nuclear reactor dem-
11 onstrated by the Secretary of Defense in coopera-
12 tion with the Secretary of Energy.

13 “(b) PURPOSE.—The purpose of this section is to direct
14 the Secretary, as soon as practicable after the date of enact-
15 ment of this section, to advance the research and develop-
16 ment of domestic advanced, affordable, and clean nuclear
17 energy by—

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

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

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

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

1 “(D) backup or mission-critical power sup-
2 plies;

3 “(2) developing subgoals for nuclear energy re-
4 search programs that would accomplish the goals of
5 the demonstration projects carried out under sub-
6 section (c);

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

10 “(4) facilitating the access of the private sector—

11 “(A) to Federal research facilities and per-
12 sonnel; and

13 “(B) to the results of research relating to
14 civil nuclear technology funded by the Federal
15 Government.

16 “(c) DEMONSTRATION PROJECTS.—

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

19 “(A) enter into agreements to complete not
20 fewer than 2 demonstration projects by not later
21 than December 31, 2025; and

22 “(B) establish a program to enter into
23 agreements to demonstrate not fewer than 2, and
24 not more than 5, additional operational ad-

1 *vanced reactor designs by not later than Decem-*
2 *ber 31, 2035.*

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

6 “(A) *include diversity in designs for the ad-*
7 *vanced nuclear reactors demonstrated under this*
8 *section, including designs using various—*

9 “(i) *primary coolants;*

10 “(ii) *fuel types and compositions; and*

11 “(iii) *neutron spectra;*

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;*

17 “(ii) *the selected projects can meet the*
18 *deadline established in paragraph (1) to*
19 *demonstrate first-of-a-kind advanced nu-*
20 *clear reactor technologies, for which addi-*
21 *tional information shall be considered, in-*
22 *cluding—*

23 “(I) *the technology readiness level*
24 *of a proposed advanced nuclear reactor*
25 *technology;*

1 “(II) the technical abilities and
2 qualifications of teams desiring to
3 demonstrate a proposed advanced nu-
4 clear reactor technology; and

5 “(III) the capacity to meet cost-
6 share requirements of the Department;

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

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

14 “(I) an electric utility; and

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

21 “(ii) include a review of cost-competi-
22 tiveness and other value streams, together
23 with the technology readiness level, of each
24 design to be demonstrated under this sub-
25 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 with
5 private sector partners in accordance with sec-
6 tion 988 for the conduct of activities relating to
7 the research, development, and demonstration of
8 private-sector advanced nuclear reactor designs
9 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) National Laboratories;

19 “(iii) institutions of higher education;

20 “(iv) traditional end-users (such as
21 electric utilities);

22 “(v) potential end-users of new tech-
23 nologies (such as users of high-temperature
24 process heat for manufacturing processing,
25 including petrochemical companies, manu-

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

3 “(vi) *developers of advanced nuclear*
4 *reactor technology; and*

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

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

14 “(A) *identify candidate technologies that—*

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

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

21 “(B) *identify technical challenges to the*
22 *candidate technologies identified in subpara-*
23 *graph (A);*

24 “(C) *support near-term research and devel-*
25 *opment to address the highest-risk technical chal-*

1 *lenges to the successful demonstration of a se-*
2 *lected advanced reactor technology, in accordance*
3 *with—*

4 “(i) subparagraph (B); and

5 “(ii) the research and development ac-
6 tivities under section 958;

7 “(D) establish such technology advisory
8 *working groups as the Secretary determines to be*
9 *appropriate to advise the Secretary regarding*
10 *the technical challenges identified under sub-*
11 *paragraph (B) and the scope of research and de-*
12 *velopment programs to address the challenges, in*
13 *accordance with subparagraph (C), to be com-*
14 *prised of—*

15 “(i) private-sector advanced nuclear
16 reactor technology developers;

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

20 “(iii) technical experts at the National
21 Laboratories.

22 “(d) GOALS.—

23 “(1) IN GENERAL.—The Secretary shall establish
24 *goals for research relating to advanced nuclear reac-*
25 *tors facilitated by the Department that support the*

1 *objectives of the program for demonstration projects*
2 *established under subsection (c).*

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

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

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

17 “(B) *research programs designed to meet the*
18 *goals emphasize—*

19 “(i) *resolving materials challenges re-*
20 *lating to extreme environments, including*
21 *extremely high levels of—*

22 “(I) *radiation fluence;*

23 “(II) *temperature;*

24 “(III) *pressure; and*

25 “(IV) *corrosion; and*

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

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

4 (1) *in the item relating to section 917, by strik-*
 5 *ing “Efficiency”;*

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

9 (3) *by inserting after the item relating to section*
 10 *959 the following:*

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

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

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

16 ***“SEC. 959B. NUCLEAR ENERGY STRATEGIC PLAN.***

17 “*(a) IN GENERAL.*—*Not later than 180 days after the*
 18 *date of enactment of this section, the Secretary shall submit*
 19 *to the Committee on Energy and Natural Resources of the*
 20 *Senate and the Committees on Energy and Commerce and*
 21 *Science, Space, and Technology of the House of Representa-*
 22 *tives a 10-year strategic plan for the Office of Nuclear En-*
 23 *ergy of the Department, in accordance with this section.*

24 “*(b) REQUIREMENTS.*—

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

3 “(A) *programs that support the planned ac-*
4 *complishment of—*

5 “(i) *the goals established under section*
6 *959A; and*

7 “(ii) *the demonstration programs iden-*
8 *tified under subsection (c) of that section;*
9 *and*

10 “(B) *programs that—*

11 “(i) *do not support the planned accom-*
12 *plishment of demonstration programs, or*
13 *the goals, referred to in subparagraph (A);*
14 *but*

15 “(ii) *are important to the mission of*
16 *the Office of Nuclear Energy, as determined*
17 *by the Secretary.*

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

21 “(A) *the accomplishment of relevant objec-*
22 *tives under current programs of the Department;*
23 *or*

24 “(B) *the commencement of new programs to*
25 *accomplish those objectives.*

1 “(c) *UPDATES.*—Not less frequently than once every 2
 2 years, the Secretary shall submit to the Committee on En-
 3 ergy and Natural Resources of the Senate and the Commit-
 4 tees on Energy and Commerce and Science, Space, and
 5 Technology of the House of Representatives an updated 10-
 6 year strategic plan in accordance with subsection (b), which
 7 shall identify, and provide a justification for, any major
 8 deviation from a previous strategic plan submitted under
 9 this section.”.

10 (b) *TABLE OF CONTENTS.*—The table of contents of the
 11 Energy Policy Act of 2005 (Public Law 109–58; 119 Stat.
 12 594) (as amended by section 4(b)(3)) is amended by insert-
 13 ing after the item relating to section 959A the following:
 “Sec. 959B. Nuclear energy strategic plan.”.

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

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

18 (1) in the paragraph heading, by striking “*MIS-*
 19 *SION NEED*” and inserting “*AUTHORIZATION*”; and

20 (2) in subparagraph (A), by striking “*determine*
 21 *the mission need*” and inserting “*provide*”.

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

23 (a) *FINDINGS.*—Congress finds that—

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

1 *ardship and naval reactors functions of the National*
2 *Nuclear Security Administration, requires a domestic*
3 *source of low- and high-enriched uranium in accord-*
4 *ance with legal restrictions regarding foreign obliga-*
5 *tions relating to the beginning stage of the nuclear*
6 *fuel cycle;*

7 *(2) many domestic advanced nuclear power in-*
8 *dustry participants require access to high-assay, low-*
9 *enriched uranium fuel for—*

10 *(A) initial fuel testing;*

11 *(B) operation of demonstration reactors;*

12 *and*

13 *(C) commercial operation of advanced nu-*
14 *clear reactors;*

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

18 *(4) as of the date of enactment of this Act, no do-*
19 *mestic uranium enrichment or fuel fabrication capa-*
20 *bility is licensed for uranium fuel enriched to greater*
21 *than 5 weight percent of the uranium-235 isotope;*

22 *(5) a healthy commercial nuclear fuel cycle capa-*
23 *ble of providing higher levels of enriched uranium*
24 *would benefit—*

1 (A) the relevant national security functions
2 of the National Nuclear Security Administra-
3 tion; and

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

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

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

13 (B) the development of—

14 (i) a market for advanced nuclear re-
15 actors; and

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

18 (b) AMENDMENT.—

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

23 **“SEC. 960. ADVANCED NUCLEAR FUEL SECURITY PROGRAM.**

24 “(a) DEFINITIONS.—In this section:

1 “(1) *HALEU TRANSPORTATION PACKAGE.*—The
2 term ‘*HALEU transportation package*’ means a
3 transportation package that is suitable for trans-
4 porting high-assay, low-enriched uranium.

5 “(2) *HIGH-ASSAY, LOW-ENRICHED URANIUM.*—
6 The term ‘*high-assay, low-enriched uranium*’ means
7 uranium with an assay greater than 5 weight per-
8 cent, but less than 20 weight percent, of the uranium-
9 ²³⁵ isotope.

10 “(3) *HIGH-ENRICHED URANIUM.*—The term
11 ‘*high-enriched uranium*’ means uranium with an
12 assay of 20 weight percent or more of the uranium-
13 ²³⁵ isotope.

14 “(b) *HIGH-ASSAY, LOW-ENRICHED URANIUM PRO-*
15 *GRAM FOR ADVANCED REACTORS.*—

16 “(1) *ESTABLISHMENT.*—Not later than 1 year
17 after the date of enactment of this section, the Sec-
18 retary shall establish a program to make available
19 high-assay, low-enriched uranium, through contracts
20 for sale, resale, transfer, or lease, for use in commer-
21 cial or noncommercial advanced nuclear reactors.

22 “(2) *NUCLEAR FUEL OWNERSHIP.*—Each lease
23 under this subsection shall include a provision estab-
24 lishing that the nuclear fuel that is the subject of the
25 lease shall remain the property of the Department, in-

1 *cluding with respect to responsibility for the final dis-*
2 *position of all radioactive waste created by the irra-*
3 *diation, processing, or purification of any leased ura-*
4 *anium.*

5 “(3) *QUANTITY.—In carrying out the program*
6 *under this subsection, the Secretary shall make avail-*
7 *able—*

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

11 “(B) *by December 31, 2025, high-assay,*
12 *low-enriched uranium containing not less than*
13 *10 metric tons of the uranium-235 isotope (as*
14 *determined including the quantities of the ura-*
15 *anium-235 isotope made available before Decem-*
16 *ber 31, 2022).*

17 “(4) *FACTORS FOR CONSIDERATION.—In car-*
18 *rying out the program under this subsection, the Sec-*
19 *retary shall take into consideration—*

20 “(A) *options for providing the high-assay,*
21 *low-enriched uranium under this subsection from*
22 *a stockpile of uranium owned by the Department*
23 *(including the National Nuclear Security Ad-*
24 *ministration), including—*

25 “(i) *fuel that—*

1 “(I) directly meets the needs of an
2 end-user; but

3 “(II) has been previously used or
4 fabricated for another purpose;

5 “(ii) fuel that can meet the needs of an
6 end-user after removing radioactive or other
7 contaminants that resulted from a previous
8 use or fabrication of the fuel for research,
9 development, demonstration, or deployment
10 activities of the Department (including ac-
11 tivities of the National Nuclear Security
12 Administration); and

13 “(iii) fuel from a high-enriched ura-
14 nium stockpile, which can be blended with
15 lower-assay uranium to become high-assay,
16 low-enriched uranium to meet the needs of
17 an end-user; and

18 “(B) requirements to support molybdenum-
19 99 production under the American Medical Iso-
20 topes Production Act of 2012 (Public Law 112–
21 239; 126 Stat. 2211).

22 “(5) LIMITATION.—The Secretary shall not bar-
23 ter or otherwise sell or transfer uranium in any form
24 in exchange for services relating to the final disposi-

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

3 *“(6) SUNSET.—The program under this sub-*
4 *section shall terminate on the earlier of—*

5 *“(A) January 1, 2035; and*

6 *“(B) the date on which uranium enriched*
7 *up to, but not equal to, 20 weight percent can*
8 *be obtained in the commercial market from do-*
9 *mestic suppliers.*

10 *“(c) REPORT.—*

11 *“(1) IN GENERAL.—Not later than 180 days*
12 *after the date of enactment of this section, the Sec-*
13 *retary shall submit to the appropriate committees of*
14 *Congress a report that describes actions proposed to*
15 *be carried out by the Secretary—*

16 *“(A) under the program under subsection*
17 *(b); or*

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

20 *“(2) COORDINATION AND STAKEHOLDER*
21 *INPUT.—In developing the report under this sub-*
22 *section, the Secretary shall seek input from—*

23 *“(A) the Nuclear Regulatory Commission;*

24 *“(B) the National Laboratories;*

25 *“(C) institutions of higher education;*

1 “(D) producers of medical isotopes;

2 “(E) a diverse group of entities operating
3 in the nuclear energy industry; and

4 “(F) a diverse group of technology devel-
5 opers.

6 “(3) *COST AND SCHEDULE ESTIMATES.*—The re-
7 port under this subsection shall include estimated
8 costs, budgets, and timeframes for enabling the use of
9 high-assay, low-enriched uranium.

10 “(4) *REQUIRED EVALUATIONS.*—The report
11 under this subsection shall evaluate—

12 “(A) the costs and actions required to estab-
13 lish and carry out the program under subsection
14 (b), including with respect to—

15 “(i) proposed preliminary terms for
16 the sale, resale, transfer, and leasing of
17 high-assay, low-enriched uranium (includ-
18 ing guidelines defining the roles and respon-
19 sibilities between the Department and the
20 purchaser, transfer recipient, or lessee); and

21 “(ii) the potential to coordinate with
22 purchasers, transfer recipients, and lessees
23 regarding—

24 “(I) fuel fabrication; and

25 “(II) fuel transport;

1 “(B) the potential sources and fuel forms
2 available to provide uranium for the program
3 under subsection (b);

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

8 “(D) the ability of the domestic uranium
9 market to provide materials for advanced nu-
10 clear reactor fuel; and

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

13 “(i) the program under subsection (b);

14 and

15 “(ii) the establishment of a domestic
16 industry capable of providing high-assay,
17 low-enriched uranium for commercial and
18 noncommercial purposes, including with re-
19 spect to the needs of—

20 “(I) the Department;

21 “(II) the Department of Defense;

22 and

23 “(III) the National Nuclear Secu-
24 rity Administration.

1 “(d) *HALEU TRANSPORTATION PACKAGE RESEARCH*
2 *PROGRAM.*—

3 “(1) *IN GENERAL.*—*As soon as practicable after*
4 *the date of enactment of this section, the Secretary*
5 *shall establish a research, development, and dem-*
6 *onstration program under which the Secretary shall*
7 *provide grants, on a competitive basis, to establish the*
8 *capability to transport high-assay, low-enriched ura-*
9 *nium.*

10 “(2) *REQUIREMENT.*—*The focus of the program*
11 *under this subsection shall be to establish 1 or more*
12 *HALEU transportation packages that can be certified*
13 *by the Nuclear Regulatory Commission to transport*
14 *high-assay, low-enriched uranium to the various fa-*
15 *cilities involved in producing or using nuclear fuel*
16 *containing high-assay, low-enriched uranium, such*
17 *as—*

18 “(A) *enrichment facilities;*

19 “(B) *fuel processing facilities;*

20 “(C) *fuel fabrication facilities; and*

21 “(D) *nuclear reactors.*”.

22 “(2) *TABLE OF CONTENTS.*—*The table of contents*
23 *of the Energy Policy Act of 2005 (Public Law 109–*
24 *58; 119 Stat. 594) (as amended by section 5(b)) is*

1 *amended by inserting after the item relating to sec-*
2 *tion 959B the following:*

 “Sec. 960. *Advanced nuclear fuel security program.*”.

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

4 *(a) FINDINGS.—Congress finds that—*

5 *(1) nuclear power plants—*

6 *(A) generate billions of dollars in national*
7 *economic activity through procurements through-*
8 *out the United States; and*

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

13 *(2) the world market for the growth of commer-*
14 *cial nuclear power was estimated by the Department*
15 *of Commerce to be valued at up to \$740,000,000,000*
16 *during the period of calendar years 2018 through*
17 *2028;*

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

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

1 (ii) preserve and enhance the ability of the
2 United States to positively influence inter-
3 national nuclear safety, security, and non-
4 proliferation standards through commercial en-
5 gagement with other nations; but

6 (B) require significant investment in
7 United States-origin advanced nuclear tech-
8 nologies;

9 (4) in order to lead the world in the next genera-
10 tion of commercial nuclear power, the advanced nu-
11 clear industry in the United States should be posi-
12 tioned for accelerated growth, which requires public-
13 private partnerships between industry entities and
14 the Federal Government;

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

19 (A) the Department of Energy;

20 (B) the National Nuclear Security Adminis-
21 tration; and

22 (C) the Nuclear Regulatory Commission;

23 (6) advanced reactors present new challenges and
24 opportunities in reactor design, safeguards, and regu-
25 lation;

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

2 *(A) are directly relevant to the missions*

3 *of—*

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

6 *(ii) the National Nuclear Security Ad-*
7 *ministration; and*

8 *(iii) the Nuclear Regulatory Commis-*
9 *sion; and*

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

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

15 *(A) annually award degrees in nuclear en-*
16 *gineering and related fields to more than 600*
17 *undergraduate students, and 500 graduate stu-*
18 *dents, who are critical to maintaining United*
19 *States leadership in the development of advanced*
20 *nuclear systems;*

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

1 (C) support workforce development critical
2 to maintaining United States leadership in nu-
3 clear detection, nonproliferation, nuclear medi-
4 cine, advanced manufacturing, and other non-
5 energy areas.

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

10 **“SEC. 313. UNIVERSITY NUCLEAR LEADERSHIP PROGRAM.**

11 “(a) *DEFINITIONS.*—In this section:

12 “(1) *ADVANCED NUCLEAR REACTOR.*—The term
13 ‘advanced nuclear reactor’ means—

14 “(A) a nuclear fission reactor, including a
15 prototype plant (as defined in sections 50.2 and
16 52.1 of title 10, Code of Federal Regulations (or
17 successor regulations)), with significant improve-
18 ments compared to the most recent generation of
19 fission reactors, including improvements such
20 as—

21 “(i) additional inherent safety features;

22 “(ii) lower waste yields;

23 “(iii) improved fuel performance;

24 “(iv) increased tolerance to loss of fuel
25 cooling;

1 “(v) enhanced reliability;

2 “(vi) increased proliferation resistance;

3 “(vii) increased thermal efficiency;

4 “(viii) reduced consumption of cooling
5 water;

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

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

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

16 “(B) a fusion reactor.

17 “(2) *INSTITUTION OF HIGHER EDUCATION.*—The
18 term ‘institution of higher education’ has the meaning
19 given the term in section 101(a) of the Higher Edu-
20 cation Act of 1965 (20 U.S.C. 1001(a)).

21 “(3) *PROGRAM.*—The term ‘Program’ means the
22 University Nuclear Leadership Program established
23 under subsection (b).

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

1 *tration, and the Chairman of the Nuclear Regulatory Com-*
2 *mission shall jointly establish a program, to be known as*
3 *the ‘University Nuclear Leadership Program’.*

4 “(c) *USE OF FUNDS.—*

5 “(1) *IN GENERAL.—Except as provided in para-*
6 *graph (2), amounts made available to carry out the*
7 *Program shall be used to provide financial assistance*
8 *for scholarships, fellowships, and research and devel-*
9 *opment projects at institutions of higher education in*
10 *areas relevant to the programmatic mission of the ap-*
11 *licable Federal agency providing the financial as-*
12 *sistance with respect to research, development, dem-*
13 *onstration, and deployment activities for technologies*
14 *relevant to advanced nuclear reactors, including rel-*
15 *evant fuel cycle technologies.*

16 “(2) *EXCEPTION.—Notwithstanding paragraph*
17 *(1), amounts made available to carry out the Pro-*
18 *gram may be used to provide financial assistance for*
19 *a scholarship, fellowship, or multiyear research and*
20 *development project that does not align directly with*
21 *a programmatic mission of the applicable Federal*
22 *agency providing the financial assistance, if the activ-*
23 *ity for which assistance is provided would facilitate*
24 *the maintenance of the discipline of nuclear science or*
25 *nuclear engineering.*

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

4 “(1) *\$30,000,000 to the Secretary of Energy, of*
5 *which \$15,000,000 shall be for use by the Adminis-*
6 *trator of the National Nuclear Security Administra-*
7 *tion; and*

8 “(2) *\$15,000,000 to the Nuclear Regulatory Com-*
9 *mission.”.*

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