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(Original Signature of Member)

116TH CONGRESS  
2D SESSION

**H. R.** \_\_\_\_\_

To provide for a program of nuclear energy research, development,  
demonstration, and commercialization, and for other purposes.

\_\_\_\_\_

M\_\_\_\_ introduced the following bill; which was referred to the  
Committee on \_\_\_\_\_

\_\_\_\_\_

## **A BILL**

To provide for a program of nuclear energy research, devel-  
opment, demonstration, and commercialization, 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 Re-  
5 search and Development Act”.

1 **SEC. 2. DEFINITIONS.**

2 Section 951(b) of the Energy Policy Act of 2005 (42  
3 U.S.C. 16271(b)) is amended—

4 (1) by amending paragraph (1) to read as fol-  
5 lows:

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

8 “(A) a nuclear fission reactor, including a  
9 prototype plant (as defined in sections 50.2 and  
10 52.1 of title 10, Code of Federal Regulations  
11 (or successor regulations)), with significant im-  
12 provements compared to reactors operating on  
13 the date of enactment of the Nuclear Energy  
14 Research and Development Act, including im-  
15 provements such as—

16 “(i) additional inherent safety fea-  
17 tures;

18 “(ii) lower waste yields;

19 “(iii) improved fuel performance;

20 “(iv) increased tolerance to loss of  
21 fuel cooling;

22 “(v) enhanced reliability;

23 “(vi) increased proliferation resist-  
24 ance;

25 “(vii) increased thermal efficiency;

1 “(viii) reduced consumption of cooling  
2 water and other environmental impacts;

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

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

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

13 “(xii) improved resilience; and

14 “(B) a fusion reactor.”;

15 (2) by adding at the end the following:

16 “(7) INSTITUTION OF HIGHER EDUCATION.—

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

21 **SEC. 3. NUCLEAR ENERGY RESEARCH, DEVELOPMENT,**  
22 **DEMONSTRATION, AND COMMERCIAL APPLI-**  
23 **CATION PROGRAMS.**

24 (a) REACTOR CONCEPTS RESEARCH, DEVELOPMENT,  
25 AND DEMONSTRATION.—Section 952 of the Energy Policy

1 Act of 2005 (42 U.S.C. 16272) is amended to read as  
2 follows:

3 **“SEC. 952. REACTOR CONCEPTS RESEARCH, DEVELOP-**  
4 **MENT, DEMONSTRATION, AND COMMERCIAL**  
5 **APPLICATION.**

6 “(a) SUSTAINABILITY PROGRAM FOR LIGHT WATER  
7 REACTORS.—

8 “(1) IN GENERAL.—The Secretary shall carry  
9 out a program of research, development, demonstra-  
10 tion, and commercial application to support existing  
11 operating nuclear power plants which shall address  
12 technologies to modernize and improve, with respect  
13 to such plants—

14 “(A) reliability;

15 “(B) capacity;

16 “(C) component aging;

17 “(D) safety;

18 “(E) physical security and security costs;

19 “(F) plant lifetime;

20 “(G) operations and maintenance costs, in-  
21 cluding by utilizing risk-informed systems anal-  
22 ysis;

23 “(H) the ability for plants to operate flexi-  
24 bly;

1           “(I) nuclear hybrid energy system applica-  
2           tions described in subsection (c);

3           “(J) efficiency;

4           “(K) environmental impacts; and

5           “(L) resilience.

6           “(2) AUTHORIZATION OF APPROPRIATIONS.—

7           There are authorized to be appropriated to the Sec-  
8           retary to carry out the program under this sub-  
9           section—

10           “(A) \$55,000,000 for fiscal year 2021;

11           “(B) \$57,750,000 for fiscal year 2022;

12           “(C) \$60,637,500 for fiscal year 2023;

13           “(D) \$63,669,375 for fiscal year 2024;

14           and

15           “(E) \$66,852,844 for fiscal year 2025.

16           “(b) ADVANCED REACTOR TECHNOLOGIES.—

17           “(1) IN GENERAL.—The Secretary shall carry  
18           out a program of research, development, demonstra-  
19           tion, and commercial application to support ad-  
20           vanced reactor technologies.

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

23           “(A) prioritize designs for advanced nu-  
24           clear reactors that are proliferation resistant  
25           and passively safe, including designs that, com-

1           pared to reactors operating on the date of en-  
2           actment of the Nuclear Energy Research and  
3           Development Act—

4                   “(i) are economically competitive with  
5                   other electric power generation plants;

6                   “(ii) have higher efficiency, lower cost,  
7                   less environmental impacts, increased resil-  
8                   ience, and improved safety;

9                   “(iii) use fuels that are proliferation-  
10                  resistant and have reduced production of  
11                  high-level waste per unit of output; and

12                  “(iv) use advanced instrumentation  
13                  and monitoring systems;

14                  “(B) consult with the Nuclear Regulatory  
15                  Commission on appropriate metrics to consider  
16                  for the criteria specified in subparagraph (A);

17                  “(C) support research and development to  
18                  resolve materials challenges relating to extreme  
19                  environments, including environments that con-  
20                  tain high levels of—

21                          “(i) radiation fluence;

22                          “(ii) temperature;

23                          “(iii) pressure; and

24                          “(iv) corrosion;

1           “(D) support research and development to  
2           aid in the qualification of advanced fuels, in-  
3           cluding fabrication techniques;

4           “(E) support activities that address near-  
5           term challenges in modeling and simulation to  
6           enable accelerated design of and licensing of ad-  
7           vanced nuclear reactors, including the identi-  
8           fication of tools and methodologies for vali-  
9           dating such modeling and simulation efforts;

10          “(F) develop technologies, including tech-  
11          nologies to manage, reduce, or reuse nuclear  
12          waste;

13          “(G) ensure that nuclear research infra-  
14          structure is maintained or constructed, includ-  
15          ing—

16               “(i) currently operational research re-  
17               actors at the National Laboratories and in-  
18               stitutions of higher education;

19               “(ii) hot cell research facilities;

20               “(iii) a versatile fast neutron source;

21               and

22               “(iv) advanced coolant testing facili-  
23               ties, including coolants such as lead, so-  
24               dium, gas, and molten salt;

1           “(H) improve scientific understanding of  
2 nonlight water coolant physics and chemistry;

3           “(I) develop advanced sensors and control  
4 systems, including the identification of tools  
5 and methodologies for validating such sensors  
6 and systems;

7           “(J) investigate advanced manufacturing  
8 and advanced construction techniques and ma-  
9 terials to reduce the cost of advanced nuclear  
10 reactors, including the use of digital twins and  
11 of strategies to implement project and construc-  
12 tion management best practices, and study the  
13 effects of radiation on materials created with  
14 these techniques;

15           “(K) consult with the Administrator of the  
16 National Nuclear Security Administration to in-  
17 tegrate reactor safeguards and security into de-  
18 sign;

19           “(L) support efforts to reduce any tech-  
20 nical barriers that would prevent commercial  
21 application of advanced nuclear energy systems;  
22 and

23           “(M) develop various safety analyses and  
24 emergency preparedness and response meth-  
25 odologies.



1           “(3) COORDINATION.—The Secretary shall co-  
2           ordinate with individuals engaged in the private sec-  
3           tor and individuals who are experts in nuclear non-  
4           proliferation, environmental and public health and  
5           safety, and economics to advance the development of  
6           various designs of advanced nuclear reactors.

7           “(4) AUTHORIZATION OF APPROPRIATIONS.—  
8           There are authorized to be appropriated to the Sec-  
9           retary to carry out the program under this sub-  
10          section \$55,000,000 for each of fiscal years 2021  
11          through 2025.

12          “(c) NUCLEAR HYBRID ENERGY SYSTEMS RE-  
13          SEARCH, DEVELOPMENT, DEMONSTRATION, AND COM-  
14          MERCIAL APPLICATION PROGRAM.—

15                 “(1) IN GENERAL.—The Secretary shall carry  
16                 out a program of research, development, demonstra-  
17                 tion, and commercial application to develop nuclear  
18                 hybrid energy systems, composed of 2 or more co-  
19                 located or jointly operated subsystems of energy gen-  
20                 eration, energy storage, or other technologies and in  
21                 which not in which not less than 1 such subsystem  
22                 is a nuclear energy system, to reduce greenhouse gas  
23                 emissions in both the power and nonpower sectors.

24                 “(2) COORDINATION.—In carrying out the pro-  
25                 gram under paragraph (1), the Secretary shall co-

1       ordinate with relevant program offices within the  
2       Department of Energy.

3               “(3) FOCUS AREAS.—The program under para-  
4       graph (1) may include research, development, dem-  
5       onstration, or commercial application of nuclear hy-  
6       brid energy systems with respect to—

7               “(A) desalination of water;

8               “(B) hydrogen or other fuel production;

9               “(C) heat for industrial processes;

10              “(D) district heating;

11              “(E) heat storage;

12              “(F) carbon capture, use, utilization, and  
13       storage;

14              “(G) microgrid or island applications;

15              “(H) integrated systems modeling, anal-  
16       ysis, and optimization, inclusive of different  
17       configurations of hybrid energy systems; and

18              “(I) integrated design, planning, and oper-  
19       ation of systems with existing infrastructure,  
20       including interconnection requirements with the  
21       electric grid, as appropriate.

22              “(4) AUTHORIZATION OF APPROPRIATIONS.—  
23       There are authorized to be appropriated to the Sec-  
24       retary to carry out the program under this sub-  
25       section—

- 1           “(A) \$52,500,000 for fiscal year 2021;  
2           “(B) \$55,125,000 for fiscal year 2022;  
3           “(C) \$57,881,250 for fiscal year 2023;  
4           “(D) \$60,775,313 for fiscal year 2024;  
5           and  
6           “(E) \$63,814,078 for fiscal year 2025.”.

7           (b) FUEL CYCLE RESEARCH AND DEVELOPMENT.—  
8 Section 953 of the Energy Policy Act of 2005 (42 U.S.C.  
9 16273) is amended to read as follows:

10 **“SEC. 953. FUEL CYCLE RESEARCH, DEVELOPMENT, DEM-**  
11 **ONSTRATION, AND COMMERCIAL APPLICA-**  
12 **TION.**

13           “(a) HIGH-ASSAY, LOW-ENRICHED URANIUM RE-  
14 SEARCH, DEVELOPMENT, DEMONSTRATION, AND COM-  
15 MERCIAL APPLICATION FOR ADVANCED NUCLEAR REAC-  
16 TORS.—

17           “(1) DEFINITIONS.—In this section:

18           “(A) HIGH-ASSAY, LOW-ENRICHED URA-  
19 NIUM.—The term ‘high-assay, low-enriched ura-  
20 nium’ means uranium with an assay greater  
21 than 5 weight percent, but less than 20 weight  
22 percent, of the uranium-235 isotope.

23           “(B) HIGH-ENRICHED URANIUM.—The  
24 term ‘high-enriched uranium’ means uranium

1 with an assay of 20 weight percent or more of  
2 the uranium-235 isotope.

3 “(2) PROGRAM.—

4 “(A) ESTABLISHMENT.—Not later than 1  
5 year after the date of enactment of this section,  
6 the Secretary shall establish a program of re-  
7 search, development, demonstration, and com-  
8 mercial application to make available high-  
9 assay, low-enriched uranium for use in civilian  
10 advanced nuclear reactors.

11 “(B) NUCLEAR FUEL OWNERSHIP.—Ura-  
12 nium made available under this subsection shall  
13 remain the property of the Department, which  
14 shall be responsible for the storage, use, and  
15 disposition of all radioactive waste created by  
16 the irradiation, processing, or purification of  
17 such uranium, and shall not be deemed to be a  
18 sale or transfer of uranium subject to sections  
19 3112 and 3113 of the USEC Privatization Act  
20 (42 U.S.C. 2297h– 10 and 42 USC 2297h–  
21 11).

22 “(C) GOAL.—In carrying out the program  
23 under this subsection, the Secretary shall dem-  
24 onstrate the capability to produce high-assay,  
25 low-enriched uranium, with the goal of having

1 the capability of producing amounts needed to  
2 provide a reliable and available supply for ad-  
3 vanced nuclear reactors by December 31, 2025.

4 “(D) FACTORS FOR CONSIDERATION.—In  
5 carrying out the program under this subsection,  
6 the Secretary shall take into consideration op-  
7 tions for providing high-assay, low-enriched  
8 uranium for use in civilian advanced nuclear re-  
9 actors under this subsection from a stockpile of  
10 uranium owned by the Department or using en-  
11 richment technology, prioritizing methods that  
12 would produce useable material the quickest, in-  
13 cluding—

14 “(i) fuel that—

15 “(I) directly meets the needs of  
16 an end user; and

17 “(II) has been previously used or  
18 fabricated for another purpose;

19 “(ii) fuel that can meet the needs of  
20 an end user after removing radioactive or  
21 other contaminants that resulted from a  
22 previous use or fabrication of the fuel for  
23 research, development, demonstration, or  
24 deployment activities of the Department;  
25 and

1           “(iii) fuel from a high-enriched ura-  
2           nium stockpile, which can be blended with  
3           lower assay uranium to become high-assay,  
4           low-enriched uranium to meet the needs of  
5           an end user.

6           “(E) SELECTION.—The Secretary shall de-  
7           termine awardees of uranium under this section  
8           through a merit-based, competitive selection  
9           process for use in advanced reactor demonstra-  
10          tion projects.

11          “(F) LIMITATION.—The Secretary shall  
12          not barter or otherwise sell or transfer uranium  
13          in any form in exchange for services relating to  
14          the final disposition of radioactive waste from  
15          uranium that is made available under this sub-  
16          section.

17          “(G) SUNSET.—The program under this  
18          subsection shall terminate on the earlier of—

19                 “(i) January 1, 2035; or

20                 “(ii) 90 days after the date on which  
21                 uranium enriched up to, but not equal to,  
22                 20 weight percent is available to provide a  
23                 reliable and adequate supply for domestic  
24                 advanced nuclear reactors in the commer-  
25                 cial market.

1 “(3) REPORT.—

2 “(A) IN GENERAL.—Not later than 180  
3 days after the date of enactment of this section,  
4 the Secretary shall submit to the Committee on  
5 Science, Space, and Technology of the House of  
6 Representatives and the Committee on Energy  
7 and Natural Resources of the Senate a report  
8 that describes actions proposed to be carried  
9 out by the Secretary to enable the availability  
10 of high-assay, low-enriched uranium for re-  
11 search, development, demonstration or commer-  
12 cial application under the program under para-  
13 graph (2).

14 “(B) COORDINATION AND STAKEHOLDER  
15 INPUT.—In developing the report under this  
16 subsection, the Secretary shall consult with—

17 “(i) the Nuclear Regulatory Commis-  
18 sion;

19 “(ii) the National Nuclear Security  
20 Administration;

21 “(iii) the National Laboratories;

22 “(iv) institutions of higher education;

23 “(v) a diverse group of entities from  
24 the nuclear energy industry;

1                   “(vi) a diverse group of technology de-  
2                   velopers; and

3                   “(vii) experts in nuclear non-prolifera-  
4                   tion, environmental and public health and  
5                   safety, and economics.

6                   “(C) COST AND SCHEDULE ESTIMATES.—  
7                   The report under this subsection shall include  
8                   estimated costs, budgets, and timeframes for  
9                   enabling the availability of high-assay, low-en-  
10                  riched uranium for research, development, dem-  
11                  onstration, or commercial application.

12                  “(D) REQUIRED EVALUATIONS.—The re-  
13                  port under this subsection shall evaluate—

14                         “(i) the actions required to establish  
15                         and carry out the program under para-  
16                         graph (2) and the cost of such actions, in-  
17                         cluding with respect to—

18                                 “(I) proposed preliminary terms  
19                                 for contracting between the Depart-  
20                                 ment and awardees (including guide-  
21                                 lines defining the roles and respon-  
22                                 sibilities between the Department and  
23                                 the awardee); and

24                                 “(II) the potential to coordinate  
25                                 with awardees regarding—



- 1 “(aa) fuel fabrication; and
- 2 “(bb) fuel transport;
- 3 “(ii) the potential sources and fuel
- 4 forms available to provide uranium for the
- 5 program under paragraph (2);
- 6 “(iii) options to coordinate the pro-
- 7 gram under paragraph (2) with the oper-
- 8 ation of the versatile, reactor-based fast
- 9 neutron source under section 959A;
- 10 “(iv) the ability of uranium producers
- 11 to provide materials for advanced nuclear
- 12 reactor fuel;
- 13 “(v) any associated legal, regulatory,
- 14 and policy issues that should be addressed
- 15 to enable—
- 16 “(I) the program under para-
- 17 graph (2); and
- 18 “(II) the establishment of an in-
- 19 dustry capable of providing high-
- 20 assay, low-enriched uranium;
- 21 “(vi) industry needs for high-assay,
- 22 low-enriched uranium predicted over a 10-
- 23 year period, as determined by surveying in-
- 24 dustry stakeholders; and

1                   “(vii) research and development plans  
2                   to develop testing to provide criticality  
3                   benchmark data for the validation of fuel  
4                   use, transportation, and storage.

5                   “(4) HIGH-ASSAY, LOW-ENRICHED URANIUM  
6                   TRANSPORTATION PACKAGE RESEARCH PROGRAM.—

7                   “(A) IN GENERAL.—The Secretary shall  
8                   establish a program of research, development,  
9                   demonstration, and commercial application  
10                  under which the Secretary shall provide finan-  
11                  cial assistance to entities that the Secretary de-  
12                  termines appropriate, on a competitive basis, to  
13                  establish the capability to safely and securely  
14                  transport gaseous or solid high-assay, low-en-  
15                  riched uranium.

16                  “(B) REQUIREMENT.—The focus of the  
17                  program under this subsection shall be to estab-  
18                  lish 1 or more high-assay, low-enriched uranium  
19                  transportation packages for commercial applica-  
20                  tion to transport high-assay, low-enriched ura-  
21                  nium to the various facilities involved in pro-  
22                  ducing or using nuclear fuel containing high-  
23                  assay, low-enriched uranium, such as—

24                               “(i) fuel processing facilities;

25                               “(ii) fuel fabrication facilities; and

1 “(iii) nuclear reactors.

2 “(5) AUTHORIZATION OF APPROPRIATIONS.—

3 There are authorized to be appropriated to the Sec-  
4 retary to carry out the program under this sub-  
5 section—

6 “(A) \$31,500,000 for fiscal year 2021;

7 “(B) \$33,075,000 for fiscal year 2022;

8 “(C) \$34,728,750 for fiscal year 2023;

9 “(D) \$36,465,188 for fiscal year 2024;

10 and

11 “(E) \$38,288,447 for fiscal year 2025.

12 “(b) ALTERNATE FUELS REPORT.—Not later than  
13 180 days after the date of enactment of this section, the  
14 Secretary shall, after consulting with relevant entities, in-  
15 cluding National Laboratories, institutions of higher edu-  
16 cation, and technology developers, submit to the Com-  
17 mittee on Science, Space, and Technology of the House  
18 of Representatives and the Committee on Energy and  
19 Natural Resources of the Senate a report identifying any  
20 and all options for providing nuclear material, containing  
21 isotopes other than the uranium-235 isotope, such as ura-  
22 nium-233 and thorium-232 to be used as fuel for advanced  
23 nuclear reactor research, development, demonstration, or  
24 commercial application purposes.

1       “(c) USED NUCLEAR FUEL RESEARCH, DEVELOP-  
2 MENT, DEMONSTRATION, AND COMMERCIAL APPLICA-  
3 TION.—

4           “(1) IN GENERAL.—The Secretary shall con-  
5 duct an advanced fuel cycle research, development,  
6 demonstration, and commercial application program  
7 that improves fuel cycle performance and supports a  
8 variety of options for used nuclear fuel storage, use,  
9 and disposal, including advanced nuclear reactor  
10 concepts, while minimizing environmental and public  
11 health and safety impacts, including—

12                   “(A) dry cask storage;

13                   “(B) consolidated interim storage;

14                   “(C) deep geological storage and disposal,  
15 including mined repository, and other tech-  
16 nologies;

17                   “(D) used nuclear fuel transportation;

18                   “(E) integrated waste management sys-  
19 tems;

20                   “(F) vitrification;

21                   “(G) fuel recycling and transmutation  
22 technologies, including advanced reprocessing  
23 technologies and plutonium uranium redox ex-  
24 traction technologies;

1           “(H) advanced materials to be used in sub-  
2 paragraphs (A) through (G); and

3           “(I) other areas as determined by the Sec-  
4 retary.

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

7           “(A) ensure all activities and designs in-  
8 corporate state of the art safeguards tech-  
9 nologies and techniques to reduce risk of pro-  
10 liferation;

11           “(B) consult with the Administrator of the  
12 National Nuclear Security Administration to in-  
13 tegrate safeguards and security by design;

14           “(C) consider the potential benefits and  
15 other impacts of those activities for civilian nu-  
16 clear applications, environmental health and  
17 safety, and national security, including consid-  
18 eration of public consent; and

19           “(D) consider the economic viability of all  
20 activities and designs.

21           “(3) AUTHORIZATION OF APPROPRIATIONS.—  
22 There are authorized to be appropriated to the Sec-  
23 retary to carry out the program under this section—

24           “(A) \$91,875,000 for fiscal year 2021;

25           “(B) \$96,468,750 for fiscal year 2022;

1 “(C) \$101,292,188 for fiscal year 2023;

2 “(D) \$106,356,797 for fiscal year 2024;

3 and

4 “(E) \$111,674,637 for fiscal year 2025.

5 “(d) ADVANCED FUELS.—

6 “(1) IN GENERAL.—The Secretary shall con-  
7 duct an advanced fuels research, development, dem-  
8 onstration, and commercial application program on  
9 next-generation light water reactor and advanced re-  
10 actor fuels that demonstrate the potential for im-  
11 proved—

12 “(A) performance;

13 “(B) accident tolerance;

14 “(C) proliferation resistance;

15 “(D) use of resources;

16 “(E) environmental impact; and

17 “(F) economics.

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

20 “(A) focus on the development of advanced  
21 technology fuels that offer improved accident-  
22 tolerance and economic performance with the  
23 goal of initial commercial application by Decem-  
24 ber 31, 2025; and

1           “(B) cooperate with private industry and  
2           with institutions of higher education through  
3           the Nuclear Energy University and Integrated  
4           Research Projects programs of the Department.

5           “(3) REPORT.—Not later than 180 days after  
6           the date of enactment of this section, the Secretary  
7           shall submit to the Committee on Science, Space,  
8           and Technology of the House of Representatives and  
9           the Committee on Energy and Natural Resources of  
10          the Senate a report that describes how the tech-  
11          nologies and concepts studied under this program  
12          would impact reactor economics, the fuel cycle, oper-  
13          ations, safety, proliferation, and the environment.

14          “(4) AUTHORIZATION OF APPROPRIATIONS.—  
15          There are authorized to be appropriated to the Sec-  
16          retary to carry out the program under this section—

17                  “(A) \$131,880,000 for fiscal year 2021;

18                  “(B) \$138,474,000 for fiscal year 2022;

19                  “(C) \$145,397,700 for fiscal year 2023;

20                  “(D) \$152,667,585 for fiscal year 2024;

21                  and

22                  “(E) \$160,330,964 for fiscal year 2025.”.

23          (c) NUCLEAR SCIENCE AND ENGINEERING SUP-  
24          PORT.—

1           (1) IN GENERAL.—Section 954 of the Energy  
2 Policy Act of 2005 (42 U.S.C. 16274) is amended—

3           (A) in the section heading, by striking  
4           “**UNIVERSITY NUCLEAR**” and inserting “**NU-**  
5           **CLEAR**”;

6           (B) in subsection (b)—

7                 (i) in the matter preceding paragraph  
8                 (1), by striking “this section” and insert-  
9                 ing “this subsection”; and

10                (ii) by redesignating paragraphs (1)  
11                through (5) as subparagraphs (A) through  
12                (E), respectively, and indenting appro-  
13                priately;

14           (C) in subsection (c), by redesignating  
15           paragraphs (1) and (2) as subparagraphs (A)  
16           and (B), respectively, and indenting appro-  
17           priately;

18           (D) in subsection (d)—

19                 (i) in the matter preceding paragraph  
20                 (1), by striking “this section” and insert-  
21                 ing “this subsection”; and

22                (ii) by redesignating paragraphs (1)  
23                through (4) as subparagraphs (A) through  
24                (D), respectively, and indenting appro-  
25                priately;



1 (E) in subsection (e), by striking “this sec-  
2 tion” and inserting “this subsection”;

3 (F) in subsection (f)—

4 (i) by striking “this section” and in-  
5 serting “this subsection”; and

6 (ii) by striking “subsection (b)(2)”  
7 and inserting “paragraph (2)(B)”;

8 (G) by redesignating subsections (a)  
9 through (d) as paragraphs (1) through (4), re-  
10 spectively, and indenting appropriately;

11 (H) by redesignating subsections (e) and  
12 (f) as paragraphs (7) and (8), respectively;

13 (I) by inserting after paragraph (4) (as so  
14 redesignated) the following:

15 “(5) RADIOLOGICAL FACILITIES MANAGE-  
16 MENT.—

17 “(A) IN GENERAL.—The Secretary shall  
18 carry out a program under which the Secretary  
19 shall provide project management, technical  
20 support, quality engineering and inspection, and  
21 nuclear material handling support to research  
22 reactors located at universities.

23 “(B) AUTHORIZATION OF APPROPRIA-  
24 TIONS.—Of any amounts appropriated to carry  
25 out the program under this subsection, there

1 are authorized to be appropriated to the Sec-  
2 retary to carry out the program under this  
3 paragraph \$20,000,000 for each of fiscal years  
4 2021 through 2030.

5 “(6) NUCLEAR ENERGY UNIVERSITY PRO-  
6 GRAM.—In carrying out the programs under this  
7 section, the Department shall allocate 20 percent of  
8 funds appropriated to nuclear energy research and  
9 development programs annually to fund university-  
10 led research and university infrastructure projects  
11 through an open, competitive solicitation process.”;

12 (J) by inserting before paragraph (1) (as  
13 so redesignated) the following:

14 “(a) UNIVERSITY NUCLEAR SCIENCE AND ENGI-  
15 NEERING SUPPORT.—”; and

16 (K) by adding at the end the following:

17 “(b) NUCLEAR ENERGY APPRENTICESHIP SUBPRO-  
18 GRAM.—

19 “(1) ESTABLISHMENT.—In carrying out the  
20 program under subsection (a), the Secretary shall  
21 establish a nuclear energy apprenticeship subpro-  
22 gram under which the Secretary shall competitively  
23 award traineeships and apprenticeships in coordina-  
24 tion with universities to provide focused, advanced  
25 training to meet critical mission needs of the De-

1       partment, including in industries that are rep-  
2       resented by skilled labor unions.

3               “(2) REQUIREMENTS.—In carrying out the sub-  
4       program under this subsection, the Secretary shall—

5                       “(A) encourage appropriate partnerships  
6       among National Laboratories, affected univer-  
7       sities, and industry; and

8                       “(B) on an annual basis, evaluate the  
9       needs of the nuclear energy community to im-  
10      plement traineeships for focused topical areas  
11      addressing mission-specific workforce needs.

12               “(3) AUTHORIZATION OF APPROPRIATIONS.—  
13      There are authorized to be appropriated to the Sec-  
14      retary to carry out the subprogram under this sub-  
15      section \$5,000,000 for each of fiscal years 2021  
16      through 2030.”.

17      (d) CONFORMING AMENDMENT.—The table of con-  
18      tents of the Energy Policy Act of 2005 (Public Law 109–  
19      58; 119 Stat. 600) is amended by striking the item relat-  
20      ing to sections 952 through 954 and inserting the fol-  
21      lowing:

“Sec. 952. Reactor concepts research, development, demonstration, and com-  
    mercial application.

“Sec. 953. Fuel cycle research, development, demonstration, and commercial  
    application

“Sec. 954. Nuclear science and engineering support.”.

1 (e) UNIVERSITY NUCLEAR LEADERSHIP PRO-  
2 GRAM.—Section 313 of the Omnibus Appropriations Act,  
3 2009 (42 U.S.C. 16274a), is amended to read as follows:

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

5 “(a) IN GENERAL.—In carrying out section 954 of  
6 the Energy Policy Act of 2005 (42 U.S.C. 16274), the  
7 Secretary of Energy shall support a program to be known  
8 as the University Nuclear Leadership Program (in this  
9 section referred to as the ‘Program’).

10 “(b) USE OF FUNDS.—

11 “(1) IN GENERAL.—Except as provided in para-  
12 graph (2), amounts made available to carry out the  
13 Program shall be used to provide financial assistance  
14 for scholarships, fellowships, and research and devel-  
15 opment projects at institutions of higher education  
16 with respect to research, development, demonstra-  
17 tion, and commercial application activities relevant  
18 to civilian advanced nuclear reactors including, but  
19 not limited to—

20 “(A) relevant fuel cycle technologies;

21 “(B) project management; and

22 “(C) advanced construction, manufac-  
23 turing, and fabrication methods.

24 “(2) EXCEPTION.—Notwithstanding paragraph  
25 (1), amounts made available to carry out the Pro-

1       gram may be used to provide financial assistance for  
2       a scholarship, fellowship, or multiyear research and  
3       development project that does not align directly with  
4       a programmatic mission of the Department of En-  
5       ergy, if the activity for which assistance is provided  
6       would facilitate the maintenance of the discipline of  
7       nuclear science or nuclear engineering.

8       “(c) AUTHORIZATION OF APPROPRIATIONS.—There  
9       are authorized to be appropriated \$15,000,000 to the Sec-  
10       retary of Energy to carry out the Program for fiscal year  
11       2021 and each fiscal year thereafter.”.

12       (f) VERSATILE NEUTRON SOURCE.—Section 955(c)  
13       of the Energy Policy Act of 2005 (42 U.S.C. 16275(c))  
14       is amended—

15               (1) in paragraph (1)—

16                       (A) in the paragraph heading, by striking  
17                       “MISSION NEED” and inserting “AUTHOR-  
18                       IZATION”; and

19                       (B) in subparagraph (A), by striking “de-  
20                       termine the mission need” and inserting “pro-  
21                       vide”; and

22               (2) by adding at the end the following:

23                       “(7) AUTHORIZATION OF APPROPRIATIONS.—  
24       There are authorized to be appropriated to the Sec-

1       retary to carry out to completion the construction of  
2       the facility under this section—

3               “(A) \$300,000,000 for fiscal year 2021;

4               “(B) \$550,000,000 for fiscal year 2022;

5               “(C) \$638,000,000 for fiscal year 2023;

6               “(D) \$765,000,000 for fiscal year 2024;

7               and

8               “(E) \$763,000,000 for fiscal year 2025.”.

9       (g) **ADVANCED NUCLEAR REACTOR RESEARCH, DE-**  
10 **VELOPMENT, AND DEMONSTRATION PROGRAM.—**

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

14       **“SEC. 959A. ADVANCED NUCLEAR REACTOR RESEARCH, DE-**  
15               **VELOPMENT, DEMONSTRATION, AND COM-**  
16               **MERCIAL APPLICATION PROGRAM.**

17       “(a) **DEMONSTRATION PROJECT DEFINED.**—For the  
18       purposes of this section, the term ‘demonstration project’  
19       means—

20               “(1) an advanced nuclear reactor operated for  
21       the purpose of demonstrating the suitability for com-  
22       mercial application of the advanced nuclear reac-  
23       tor—

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

1 “(B) in any other manner; or

2 “(2) the operation of one or more experimental  
3 advanced nuclear reactors, for the purpose of dem-  
4 onstrating the suitability for commercial application  
5 of such advanced nuclear reactors, funded in whole  
6 or in part by the private sector, at National Labora-  
7 tories or other sites owned by the Department of  
8 Energy.

9 “(b) ESTABLISHMENT.—The Secretary shall estab-  
10 lish a program to advance the research, development, dem-  
11 onstration, and commercial application of domestic ad-  
12 vanced, affordable, nuclear energy technologies by—

13 “(1) demonstrating a variety of advanced nu-  
14 clear reactor technologies that could be used to  
15 produce—

16 “(A) safer, emissions-free power at a lower  
17 cost compared to reactors operating on the date  
18 of enactment of the Nuclear Energy Research  
19 and Development Act;

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

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

24 “(D) backup or mission-critical power sup-  
25 plies;

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

4           “(3) facilitating the access of the private sec-  
5           tor—

6                   “(A) to Federal research facilities and per-  
7                   sonnel; and

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

11          “(c) DEMONSTRATION PROJECTS.—

12                  “(1) IN GENERAL.—In carrying out the pro-  
13                  gram established under subsection (b), the Secretary  
14                  shall, to the maximum extent practicable—

15                          “(A) enter into agreements to build not  
16                          fewer than 2 advanced nuclear reactors as dem-  
17                          onstration projects to be completed not later  
18                          than December 31, 2027; and

19                          “(B) not later than December 31, 2035, to  
20                          enter into not fewer than 2, and not more than  
21                          5, agreements, to build advanced nuclear reac-  
22                          tors as additional operational demonstration  
23                          projects.



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

4                   “(A) include, as an evaluation criterion, di-  
5                   versity in designs for the advanced nuclear re-  
6                   actors demonstrated under this section, includ-  
7                   ing designs using various—

8                           “(i) primary coolants;

9                           “(ii) fuel types and compositions; and

10                           “(iii) neutron spectra;

11                   “(B) consider, as an evaluation criterion,  
12                   the likelihood that the operating cost for future  
13                   commercial units for each design implemented  
14                   through a demonstration project under this  
15                   subsection is cost-competitive in the applicable  
16                   market, including those designs configured as  
17                   hybrid energy systems as described in section  
18                   952(c);

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

23                           “(i) be conducted by a panel that in-  
24                           cludes not fewer than 1 representative that

1 does not have a conflict of interest of each  
2 of—

3 “(I) an electric utility;

4 “(II) an entity that uses high-  
5 temperature process heat for manu-  
6 facturing or industrial processing,  
7 such as a petrochemical or synthetic  
8 fuel company, a manufacturer of met-  
9 als or chemicals, or a manufacturer of  
10 concrete;

11 “(III) an expert from the invest-  
12 ment community;

13 “(IV) a project management  
14 practitioner; and

15 “(V) an environmental health  
16 and safety expert; and

17 “(ii) include a review of each dem-  
18 onstration project under this subsection  
19 which shall include consideration of cost-  
20 competitiveness and other value streams,  
21 together with the technology readiness  
22 level, the technical abilities and qualifica-  
23 tions of teams desiring to demonstrate a  
24 proposed advanced nuclear reactor tech-  
25 nology, the capacity to meet cost-share re-

1                    requirements of the Department, if Federal  
2                    funding is provided, and environmental im-  
3                    pacts;

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

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

14                    “(F) consult with—

15                    “(i) National Laboratories;

16                    “(ii) institutions of higher education;

17                    “(iii) traditional end users (such as  
18                    electric utilities);

19                    “(iv) potential end users of new tech-  
20                    nologies (such as users of high-tempera-  
21                    ture process heat for manufacturing proc-  
22                    essing, including petrochemical or synthetic  
23                    fuel companies, manufacturers of metals or  
24                    chemicals, or manufacturers of concrete);

1                   “(v) developers of advanced nuclear  
2 reactor technology;

3                   “(vi) environmental and public health  
4 and safety experts; and

5                   “(vii) non-proliferation experts;

6                   “(G) seek to ensure that the demonstration  
7 projects carried out under paragraph (1) do not  
8 cause any delay in the progress of an advanced  
9 reactor project by private industry and the De-  
10 partment of Energy that is underway as of the  
11 date of enactment of this section;

12                   “(H) establish a streamlined approval  
13 process for expedited contracting between  
14 awardees and the Department;

15                   “(I) identify technical challenges to can-  
16 didate technologies;

17                   “(J) support near-term research and devel-  
18 opment to address the highest risk technical  
19 challenges to the successful demonstration of a  
20 selected advanced reactor technology, in accord-  
21 ance with—

22                   “(i) subparagraph (A);

23                   “(ii) the research and development ac-  
24 tivities under section 952(b); and

1                   “(iii) the research and development  
2                   activities under section 958; and

3                   “(K) establish such technology advisory  
4                   working groups as the Secretary determines to  
5                   be appropriate to advise the Secretary regard-  
6                   ing the technical challenges identified under  
7                   subparagraph (A) and the scope of research  
8                   and development programs to address the chal-  
9                   lenges, in accordance with subparagraph (B), to  
10                  be comprised of—

11                  “(i) private sector advanced nuclear  
12                  reactor technology developers;

13                  “(ii) technical experts with respect to  
14                  the relevant technologies at institutions of  
15                  higher education;

16                  “(iii) technical experts at the National  
17                  Laboratories;

18                  “(iv) environmental and public health  
19                  and safety experts;

20                  “(v) non-proliferation experts; and

21                  “(vi) any other entities the Secretary  
22                  determines appropriate.

23                  “(d)        MILESTONE-BASED        DEMONSTRATION  
24        PROJECTS.—

1           “(1) IN GENERAL.—Using the authority of the  
2           Secretary under section 646(g) of the Department of  
3           Energy Organization Act (42 U.S.C. 7256(g)), not-  
4           withstanding paragraph (10) of such section, the  
5           Secretary may carry out not more than 3 dem-  
6           onstration projects under subsection (c) as a mile-  
7           stone-based demonstration project that requires par-  
8           ticular technical and financial milestones to be met  
9           before a participant is awarded funds by the Depart-  
10          ment.

11          “(2) REQUIREMENTS.—In carrying out mile-  
12          stone-based demonstration projects under the au-  
13          thority in paragraph (1), the Secretary shall, for  
14          each relevant project,—

15                 “(A) request proposals from eligible enti-  
16                 ties, as determined by the Secretary, that in-  
17                 clude—

18                         “(i) a business plan;

19                         “(ii) a plan for raising private sector  
20                         investment; and

21                         “(iii) proposed technical and financial  
22                         milestones, including estimated project  
23                         timelines and total costs, that are in ac-  
24                         cordance to the requirements specified in  
25                         subsection (c); and

1           “(B) award funding of a predetermined  
2           amount to projects that successfully meet pro-  
3           posed milestones under subparagraph (A)(iii);  
4           and

5           “(C) require cost-sharing in accordance  
6           with Section 988 of the Energy Policy Act of  
7           2005.

8           “(3) CONSULTATION.—In carrying out dem-  
9           onstration projects under this authority, the Sec-  
10          retary shall consult with experts from the investment  
11          community to assess project proposals and deter-  
12          mine the commercial viability of project proposals.

13          “(4) FAILURE TO MEET MILESTONES.—Should  
14          an awardee not meet the milestones described in  
15          paragraph (2)(A)(iii), the Secretary may end the  
16          partnership with the awardee and use the remaining  
17          funds in the ended agreement for new or existing  
18          demonstration projects under this section.

19          “(e) NONDUPLICATION.—Entities may not receive  
20          funds under this program if receiving funds from another  
21          reactor demonstration program at the Department in the  
22          same fiscal year.

23          “(f) AUTHORIZATION OF APPROPRIATIONS.—There  
24          are authorized to be appropriated to the Secretary to carry  
25          out the program under this subsection—

1 “(1) \$520,000,000 for fiscal year 2021;  
2 “(2) \$670,000,000 for fiscal year 2022;  
3 “(3) \$670,000,000 for fiscal year 2023;  
4 “(4) \$670,000,000 for fiscal year 2024; and  
5 “(5) \$670,000,000 for fiscal year 2025.”.

6 (2) TABLE OF CONTENTS.—The table of con-  
7 tents of the Energy Policy Act of 2005 (Public Law  
8 109–58; 119 Stat. 594) is amended—

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

12 (B) by inserting after the item relating to  
13 section 959 the following:

“Sec. 959A. Advanced nuclear reactor research, development, demonstration,  
and commercial application program.”.

14 (h) INTERNATIONAL NUCLEAR ENERGY COOPERA-  
15 TION.—

16 (1) IN GENERAL.—Subtitle E of title IX of the  
17 Energy Policy Act of 2005 (42 U.S.C. 16271 et  
18 seq.), as amended by subsection (g), is further  
19 amended by adding at the end the following:

20 **“SEC. 959B. INTERNATIONAL NUCLEAR ENERGY COOPERA-**  
21 **TION.**

22 “(a) IN GENERAL.—The Secretary, in consultation  
23 with international regulators, shall carry out a program—



1           “(1) to coordinate international efforts with re-  
2           spect to research, development, demonstration, and  
3           commercial application of nuclear technology that  
4           supports diplomatic, nonproliferation, climate, and  
5           international economic objectives for the safe, se-  
6           cure, and peaceful use of such technology; and

7           “(2) to develop collaboration initiatives with re-  
8           spect to such efforts with a variety of countries  
9           through—

10           “(A) research and development agree-  
11           ments;

12           “(B) the development of coordinated action  
13           plans; and

14           “(C) new or existing multilateral coopera-  
15           tion commitments including—

16           “(i) the International Framework for  
17           Nuclear Energy Cooperation;

18           “(ii) the Generation IV International  
19           Forum;

20           “(iii) the International Atomic Energy  
21           Agency;

22           “(iv) the Organization for Economic  
23           Co-operation and Development Nuclear  
24           Energy Agency; and

1                   “(v) any other international collabo-  
2                   rative effort with respect to advanced nu-  
3                   clear reactor operations and safety.

4           “(b) REQUIREMENTS.—The program under sub-  
5 section (a) shall be carried out to facilitate, to the max-  
6 imum extent practicable, workshops and expert-based ex-  
7 changes to engage industry, stakeholders, and foreign gov-  
8 ernments regarding international civil nuclear issues, such  
9 as training, financing, safety, and options for multi-  
10 national cooperation on used nuclear fuel disposal.”.

11           (2) TABLE OF CONTENTS.—The table of con-  
12 tents of the Energy Policy Act of 2005 (Public Law  
13 109–58; 119 Stat. 594), as amended by subsection  
14 (g), is further amended by inserting after the item  
15 relating to section 959A the following:

“Sec. 959B. International Nuclear Energy Cooperation.”.

16 **SEC. 4. NUCLEAR ENERGY BUDGET PLAN.**

17       Section 959 of the Energy Policy Act of 2005 (42  
18 U.S.C. 16279) is amended—

19           (1) by amending subsection (b) to read as fol-  
20 lows:

21       “(b) BUDGET PLAN ALTERNATIVE 1.—One of the  
22 budget plans submitted under subsection (a) shall assume  
23 constant annual funding for 10 years at the appropriated  
24 level for the current fiscal year for the civilian nuclear en-  
25 ergy research and development of the Department.”; and

1           (2) by inserting after subsection (d) the fol-  
2           lowing:

3           “(e) UPDATES.—Not less frequently than once every  
4           2 years, the Secretary shall submit to the Committee on  
5           Science, Space, and Technology of the House of Rep-  
6           resentatives and the Committee on Energy and Natural  
7           Resources of the Senate updated 10-year budget plans  
8           which shall identify, and provide a justification for, any  
9           major deviation from a previous budget plan submitted  
10          under this section.”.

11       **SEC. 5. ORGANIZATION AND ADMINISTRATION OF PRO-**  
12                               **GRAMS.**

13          (a) IN GENERAL.—Subtitle E of title IX of the En-  
14          ergy Policy Act of 2005 (42 U.S.C. 16271 et seq.), as  
15          amended by section 3(h), is further amended by adding  
16          at the end of the following:

17       **“SEC. 959C. ORGANIZATION AND ADMINISTRATION OF PRO-**  
18                               **GRAMS.**

19          “(a) COORDINATION.—In carrying out this subtitle,  
20          the Secretary shall coordinate activities, and effectively  
21          manage crosscutting research priorities across programs  
22          of the Department and other relevant Federal agencies,  
23          including the National Laboratories.

24          “(b) COLLABORATION.—

1           “(1) IN GENERAL.—In carrying out this sub-  
2           title, the Secretary shall collaborate with industry,  
3           National Laboratories, other relevant Federal agen-  
4           cies, institutions of higher education, including mi-  
5           nority-serving institutions and research reactors,  
6           Tribal entities, including Alaska Native Corpora-  
7           tions, and international bodies with relevant sci-  
8           entific and technical expertise.

9           “(2) PARTICIPATION.—To the extent prac-  
10          ticable, the Secretary shall encourage research  
11          projects that promote collaboration between entities  
12          specified in paragraph (1).

13          “(c) DISSEMINATION OF RESULTS AND PUBLIC  
14          AVAILABILITY.—The Secretary shall, except to the extent  
15          protected from disclosure under section 552(b) of title 5,  
16          United States Code, publish the results of projects sup-  
17          ported under this subtitle through Department websites,  
18          reports, databases, training materials, and industry con-  
19          ferences, including information discovered after the com-  
20          pletion of such projects.

21          “(d) EDUCATION AND OUTREACH.—In carrying out  
22          the activities described in this subtitle, the Secretary shall  
23          support education and outreach activities to disseminate  
24          information and promote public understanding of nuclear  
25          energy.

1           “(e) TECHNICAL ASSISTANCE.—In carrying out this  
2 subtitle, for the purposes of supporting technical, non-  
3 hardware, and information-based advances in nuclear en-  
4 ergy development and operations, the Secretary shall also  
5 conduct technical assistance and analysis activities, includ-  
6 ing activities that support commercial application of nu-  
7 clear energy in rural, Tribal, and low-income communities.

8           “(f) PROGRAM REVIEW.—At least annually, all pro-  
9 grams in this subtitle shall be subject to an annual review  
10 by the Nuclear Energy Advisory Committee of the Depart-  
11 ment or other independent entity, as appropriate.

12           “(g) SENSITIVE INFORMATION.—The Secretary shall  
13 not publish any information generated under this subtitle  
14 that is detrimental to national security, as determined by  
15 the Secretary.”.

16           (b) TABLE OF CONTENTS.—The table of contents of  
17 the Energy Policy Act of 2005 (Public Law 109–58; 119  
18 Stat. 594), as amended by section 3(h), is further amend-  
19 ed by inserting after the item relating to section 959B  
20 the following:

“Sec. 959C. Organization and administration of programs.”.