

116TH CONGRESS
1ST SESSION

S. 2368

To amend the Atomic Energy Act of 1954 and the Energy Policy Act of 2005 to support licensing and relicensing of certain nuclear facilities and nuclear energy research, demonstration, and development, and for other purposes.

IN THE SENATE OF THE UNITED STATES

JULY 31, 2019

Mr. COONS (for himself and Ms. MCSALLY) introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

A BILL

To amend the Atomic Energy Act of 1954 and the Energy Policy Act of 2005 to support licensing and relicensing of certain nuclear facilities and nuclear energy research, demonstration, and development, 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 newal Act of 2019”.

1 **SEC. 2. LIGHT WATER REACTOR SUSTAINABILITY PRO-**
2 **GRAM.**

3 Section 621 of the Energy Policy Act of 2005 (Public
4 Law 109–58; 119 Stat. 782) is amended—

5 (1) by striking “Section” and inserting the fol-
6 lowing:

7 “(a) AMENDMENT TO ATOMIC ENERGY ACT OF
8 1954.—Section”; and

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

10 “(b) LIGHT WATER REACTOR SUSTAINABILITY PRO-
11 GRAM.—

12 “(1) IN GENERAL.—Notwithstanding any other
13 provision of law, the Secretary shall expand the light
14 water reactor sustainability program of the Depart-
15 ment, to the maximum extent practicable—

16 “(A) to ensure the achievement of max-
17 imum benefits from existing nuclear generation;

18 “(B) to accommodate the increase in appli-
19 cations for nuclear power plant license renewals
20 expected as of the date of enactment of this
21 subsection;

22 “(C) to enable the continued operation of
23 existing nuclear power plants through tech-
24 nology development;

1 “(D) to improve the performance and re-
 2 duce the operation and maintenance costs of
 3 nuclear power plants; and

4 “(E) to promote the use of high-perform-
 5 ance computing to simulate nuclear reactor
 6 processes.

7 “(2) AUTHORIZATION OF APPROPRIATIONS.—
 8 There is authorized to be appropriated to the Sec-
 9 retary to carry out the program under this sub-
 10 section \$60,000,000 for each of fiscal years 2020
 11 through 2029.”.

12 **SEC. 3. INCREASING SUPPORT FOR ADVANCED NUCLEAR**
 13 **TECHNOLOGIES.**

14 (a) LICENSING BY NUCLEAR REGULATORY COMMIS-
 15 SION.—Section 103 of the Atomic Energy Act of 1954 (42
 16 U.S.C. 2133) is amended—

17 (1) in subsection d., in the second sentence, by
 18 striking “any any” and inserting “any”; and

19 (2) by inserting after subsection d. the fol-
 20 lowing:

21 “e. ADVANCED NUCLEAR FACILITIES AND TECH-
 22 NOLOGIES.—

23 “(1) DEFINITION OF ADVANCED NUCLEAR.—

24 “(A) IN GENERAL.—In this subsection, the
 25 term ‘advanced nuclear’ means, with respect to

1 a production facility, utilization facility, or tech-
2 nology, the use of a nuclear fission reactor, in-
3 cluding a prototype plant (as defined in section
4 50.2 of title 10, Code of Federal Regulations
5 (or successor regulations)), that represents sig-
6 nificant improvements compared to the most re-
7 cent generation of nuclear fission reactors, in-
8 cluding improvements such as—

9 “(i) additional inherent safety fea-
10 tures;

11 “(ii) lower waste yields;

12 “(iii) improved fuel performance;

13 “(iv) increased tolerance to loss of
14 fuel cooling;

15 “(v) enhanced reliability;

16 “(vi) increased proliferation resist-
17 ance;

18 “(vii) increased thermal efficiency;

19 “(viii) reduced consumption of cooling
20 water;

21 “(ix) the ability to integrate into elec-
22 tric applications and nonelectric applica-
23 tions;

1 “(x) modular sizes to allow for deploy-
2 ment that corresponds with the demand
3 for electricity; and

4 “(xi) operational flexibility to respond
5 to changes in demand for electricity and to
6 complement integration with intermittent
7 renewable energy.

8 “(B) INCLUSION.—In this subsection, the
9 term ‘advanced nuclear’ includes, with respect
10 to a production facility, utilization facility, or
11 technology, the use of a nuclear fusion reactor.

12 “(2) ESTABLISHMENT OF PROGRAM.—The Sec-
13 retary of Energy, in coordination with the Commis-
14 sion, shall establish and carry out a program—

15 “(A) to develop certification and licensing
16 criteria with respect to advanced nuclear pro-
17 duction facilities and utilization facilities, in-
18 cluding for international licensing harmoni-
19 zation;

20 “(B) to provide assistance to eligible appli-
21 cants with respect to the certification and li-
22 censing of advanced nuclear production facili-
23 ties and utilization facilities; and

24 “(C) to establish such procedures as the
25 Secretary of Energy and the Commission deter-

1 mine to be appropriate for general public out-
 2 reach relating to advanced nuclear technologies,
 3 production facilities, and utilization facilities.

4 “(3) AUTHORIZATION OF APPROPRIATIONS.—

5 There is authorized to be appropriated to carry out
 6 the program under this subsection \$15,000,000 for
 7 the period of fiscal years 2020 through 2029.”.

8 **SEC. 4. NUCLEAR ENERGY RESEARCH, DEMONSTRATION,**
 9 **AND DEVELOPMENT.**

10 (a) IN GENERAL.—Section 952 of the Energy Policy
 11 Act of 2005 (42 U.S.C. 16272) is amended by adding at
 12 the end the following:

13 “(e) ADVANCED REACTOR TECHNOLOGIES DEVEL-
 14 OPMENT PROGRAM.—

15 “(1) IN GENERAL.—The Secretary shall carry
 16 out a program under which the Secretary shall con-
 17 duct research relating to the development of innova-
 18 tive nuclear reactor technologies that may offer im-
 19 proved safety, functionality, and affordability by en-
 20 hancing existing nuclear technologies.

21 “(2) REQUIREMENTS.—The program under this
 22 subsection shall—

23 “(A) support efforts to reduce long-term
 24 technical barriers for advanced nuclear energy
 25 systems;

1 “(B) identify potential regulatory issues
2 relating to advanced nuclear reactors;

3 “(C) be carried out in consultation with
4 the Nuclear Regulatory Commission to ensure
5 identification of any relevant concerns;

6 “(D) support international activities car-
7 ried out pursuant to—

8 “(i) the Generation IV International
9 Forum; or

10 “(ii) any other international collabo-
11 rative effort with respect to advanced nu-
12 clear reactor operations and safety;

13 “(E) support research and development re-
14 lating to enhancing the proliferation resistance
15 of nuclear technologies; and

16 “(F) support research and development
17 projects carried out by National Laboratories,
18 institutions of higher education, and other in-
19 dustry entities relating to nuclear technology,
20 including the development of—

21 “(i) codes and standards;

22 “(ii) sensors and instrumentation;

23 “(iii) probabilistic risk assessments
24 methods; and

1 “(iv) other technologies to support the
2 development of advanced nuclear reactor
3 systems.

4 “(3) AREAS OF FOCUS AND INCLUSIONS.—The
5 program under this subsection shall—

6 “(A) focus on research and development
7 activities relating to—

8 “(i) fast reactors;

9 “(ii) high-temperature, gas-cooled nu-
10 clear reactors; and

11 “(iii) molten salt reactors; and

12 “(B) with respect to the activities de-
13 scribed in clauses (ii) and (iii) of subparagraph
14 (A), include research and development relating
15 to advanced fuels.

16 “(4) SUPERCRITICAL TRANSFORMATIONAL
17 ELECTRIC POWER RESEARCH AND DEVELOPMENT.—

18 “(A) IN GENERAL.—In carrying out the
19 program under this subsection, the Secretary
20 shall develop and implement a public-private
21 cost-shared supercritical carbon dioxide (com-
22 monly known as ‘sCO₂’) Brayton cycle subpro-
23 gram, including research and development of
24 supercritical carbon dioxide technologies.

1 “(B) REQUIREMENT.—In carrying out the
2 subprogram under this paragraph, the Sec-
3 retary shall solicit and evaluate plans to encour-
4 age innovation, support technology advances,
5 and enhance the safety and performance of ad-
6 vanced nuclear reactor systems.

7 “(C) TECHNICAL REVIEW PANEL.—The
8 Secretary shall establish a technical review
9 panel for the subprogram under this paragraph,
10 which shall carry out consultation and collabo-
11 ration with appropriate industry entities—

12 “(i) to evaluate advanced nuclear re-
13 actor technologies;

14 “(ii) to identify research and develop-
15 ment opportunities; and

16 “(iii) to publish information regarding
17 cost-shared research and development in-
18 vestment decisions to facilitate commer-
19 cialization.

20 “(5) AUTHORIZATION OF APPROPRIATIONS.—

21 There is authorized to be appropriated to the Sec-
22 retary to carry out the program under this sub-
23 section \$120,000,000 for each of fiscal years 2020
24 through 2029.

1 “(f) FUEL CYCLE RESEARCH AND DEVELOPMENT
2 PROGRAM.—

3 “(1) IN GENERAL.—The Secretary shall carry
4 out a program under which the Secretary shall con-
5 duct research relating to—

6 “(A) consent-based interim storage;

7 “(B) transportation of nuclear waste;

8 “(C) potential alternative disposal options
9 for Department-managed—

10 “(i) spent nuclear fuel; and

11 “(ii) high-level radioactive waste; and

12 “(D) disposition alternatives for defense-
13 related nuclear waste.

14 “(2) AREAS OF FOCUS.—In carrying out this
15 subsection, the Secretary shall focus on activities re-
16 lating to—

17 “(A) relevant research and development;
18 and

19 “(B) integrated waste management, includ-
20 ing by conducting research and development ac-
21 tivities relating to the storage, transportation,
22 and disposal of used nuclear fuel and wastes
23 generated by existing and future fuel cycles.

24 “(3) AUTHORIZATION OF APPROPRIATIONS.—

25 There is authorized to be appropriated to the Sec-

1 retary to carry out the program under this sub-
2 section \$200,000,000 for each of fiscal years 2020
3 through 2029.

4 “(g) MATERIAL RECOVERY AND WASTE FORM DE-
5 VELOPMENT.—

6 “(1) IN GENERAL.—The Secretary shall carry
7 out a program under which the Secretary shall—

8 “(A) conduct research relating to advanced
9 nuclear material recovery and advanced nuclear
10 waste from development technologies to improve
11 fuel cycle performance with reductions in proc-
12 essing, waste generation, and potential for ma-
13 terial diversion; and

14 “(B) to the maximum extent practicable,
15 apply the technical expertise achieved through
16 that research to a broad range of programs and
17 activities, including activities relating to—

18 “(i) environmental remediation;

19 “(ii) national security; and

20 “(iii) subject to paragraph (2), civilian
21 nuclear applications.

22 “(2) CIVILIAN NUCLEAR APPLICATIONS.—Any
23 research carried out under this subsection relating
24 to civilian nuclear applications shall include research
25 relating to improving the economics and non-

1 proliferation attributes of recycling light water reac-
 2 tor fuels and advanced reactor fuels.

3 “(3) AUTHORIZATION OF APPROPRIATIONS.—
 4 There is authorized to be appropriated to the Sec-
 5 retary to carry out the program under this sub-
 6 section \$50,000,000 for each of fiscal years 2020
 7 through 2029.

8 “(h) ADVANCED FUELS.—

9 “(1) IN GENERAL.—The Secretary shall carry
 10 out a program under which the Secretary shall con-
 11 duct research relating to—

12 “(A) next-generation light water reactor
 13 fuels that demonstrate enhanced—

14 “(i) performance; and

15 “(ii) accident tolerance; and

16 “(B) fuels that demonstrate enhanced—

17 “(i) proliferation resistance; and

18 “(ii) use of resources.

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

21 “(A) focus on the development of accident-
 22 tolerant fuel and cladding concepts that are ca-
 23 pable of achieving the objective of initiating
 24 core reloads by calendar year 2025;

1 “(B)(i) develop modeling capabilities for
2 new fuel concepts;

3 “(ii) conduct studies regarding the means
4 by which those concepts would impact reactor
5 economics, the fuel cycle, operations, safety,
6 and the environment; and

7 “(iii) subject to paragraph (3), publish the
8 studies conducted under clause (ii); and

9 “(C) cooperate with institutions of higher
10 education through the Nuclear Energy Univer-
11 sity and Integrated Research Projects programs
12 of the Department.

13 “(3) SENSITIVE INFORMATION.—The Secretary
14 shall not publish any information under paragraph
15 (2)(B)(iii) that is detrimental to national security,
16 as determined by the Secretary.

17 “(4) AUTHORIZATION OF APPROPRIATIONS.—
18 There is authorized to be appropriated to the Sec-
19 retary to carry out the program under this sub-
20 section \$120,000,000 for each of fiscal years 2020
21 through 2029.

22 “(i) NUCLEAR ENERGY ENABLING TECH-
23 NOLOGIES.—

24 “(1) IN GENERAL.—The Secretary shall carry
25 out a program under which the Secretary shall—

1 “(A) conduct research relating to modeling
2 and simulation tools;

3 “(B) provide access to unique nuclear en-
4 ergy research capabilities through the Nuclear
5 Science User Facilities of the Department; and

6 “(C) address workforce needs in critical,
7 focused nuclear energy-related fields.

8 “(2) SUPPORT FOR NUCLEAR INITIATIVES.—

9 The program under this subsection shall support the
10 goals, objectives, and activities of the National Reac-
11 tor Innovation Center and the Gateway for Acceler-
12 ated Innovation in Nuclear initiative of the Depart-
13 ment to make nuclear energy research capabilities
14 accessible to industry engineers and scientists
15 through a public-private partnership.

16 “(3) CROSSCUTTING TECHNOLOGY DEVELOP-
17 MENT SUBPROGRAM.—

18 “(A) IN GENERAL.—In carrying out the
19 program under this subsection, the Secretary
20 shall establish a crosscutting technology subpro-
21 gram, under which the Secretary shall provide
22 assistance for high-priority research and devel-
23 opment activities relating to innovative solu-
24 tions to nuclear energy challenges carried out
25 by—

1 “(i) institutions of higher education;

2 “(ii) National Laboratories; and

3 “(iii) industry entities.

4 “(B) REQUIREMENTS.—In carrying out
5 the subprogram established under subparagraph
6 (A), the Secretary shall—

7 “(i) invest in competitive, nuclear en-
8 ergy-related infrastructure enhancement
9 activities carried out at National Labora-
10 tories to ensure researchers have access to
11 state-of-the-art research and development
12 resources;

13 “(ii) coordinate with other research
14 and development programs of the Office of
15 Nuclear Energy to ensure that developed
16 technologies and capabilities are part of an
17 integrated investment strategy, the overall
18 focus of which is improving safety, secu-
19 rity, reliability, and economics of operating
20 nuclear power plants; and

21 “(iii) focus on—

22 “(I) new capabilities relating to
23 nuclear energy research and develop-
24 ment;

1 “(II) enabling technologies be-
2 yond individual programs;

3 “(III) coordinating capabilities
4 among research and development pro-
5 grams of the Office of Nuclear En-
6 ergy;

7 “(IV) examining new classes of
8 materials not considered for nuclear
9 applications;

10 “(V) high-risk research, which
11 could potentially overcome techno-
12 logical limitations; and

13 “(VI) the potential for industry
14 partnerships to develop technologies
15 relating to storage, hydrogen produc-
16 tion, high-temperature process heat,
17 and other relevant areas.

18 “(4) NUCLEAR ENERGY ADVANCED MODELING
19 AND SIMULATION SUBPROGRAM.—In carrying out
20 the program under this subsection, the Secretary
21 shall establish a nuclear energy advanced modeling
22 and simulation subprogram, under which the Sec-
23 retary shall develop advanced modeling and simula-
24 tion tools to support programs carried out by the
25 Office of Nuclear Energy, including multiscale mod-

1 els of physics and chemistry that support advanced
 2 computational methods for simulations of nuclear
 3 energy systems.

4 “(5) NUCLEAR SCIENCE USER FACILITIES SUB-
 5 PROGRAM.—

6 “(A) IN GENERAL.—In carrying out the
 7 program under this subsection, the Secretary
 8 shall establish a Nuclear Science User Facilities
 9 subprogram under which the Secretary shall
 10 provide assistance—

11 “(i) to promote the use of nuclear re-
 12 search facilities; and

13 “(ii) to encourage engagement across
 14 institutions of higher education, industry
 15 entities, and National Laboratories relat-
 16 ing to relevant nuclear science research.

17 “(B) REQUIREMENTS.—

18 “(i) IN GENERAL.—The Secretary
 19 shall provide assistance under this para-
 20 graph, and solicit applications under clause
 21 (ii), on an annual basis.

22 “(ii) APPLICATIONS.—To be eligible
 23 to receive assistance under this paragraph
 24 for a fiscal year, an individual or entity
 25 conducting nuclear research shall submit

1 to the Secretary an application that de-
2 scribes—

3 “(I) the research project pro-
4 posed to be carried out at a nuclear
5 research facility;

6 “(II) timelines for the proposed
7 research; and

8 “(III) the Nuclear Science User
9 Facility at which the project is pro-
10 posed to be carried out.

11 “(iii) USE OF FUNDS.—Assistance
12 provided under this paragraph may be
13 used—

14 “(I) for experiment support and
15 laboratory services costs; and

16 “(II) only at a Nuclear Science
17 User Facility.

18 “(C) ACCESS.—In carrying out the subpro-
19 gram under this paragraph, the Secretary shall
20 provide to recipients of assistance under the
21 subprogram no-cost access to—

22 “(i) the advanced test reactor of the
23 Idaho National Laboratory;

- 1 “(ii) post-irradiation examination fa-
2 cilities at the Materials and Fuels Com-
3 plex;
4 “(iii) research reactors at—
5 “(I) Oak Ridge National Labora-
6 tory;
7 “(II) Massachusetts Institute of
8 Technology; and
9 “(III) North Carolina State Uni-
10 versity;
11 “(iv) beam line capabilities at the Ad-
12 vanced Photon Source, in coordination
13 with the Illinois Institute of Technology;
14 “(v) irradiation experiment design and
15 fabrication capabilities at Pacific North-
16 west National Laboratory;
17 “(vi) hot cells and fabrication capa-
18 bilities at Westinghouse Electric Company;
19 and
20 “(vii) examination facilities at—
21 “(I) the University of California—
22 Berkeley;
23 “(II) the University of Michigan;
24 “(III) the University of Nevada—
25 Las Vegas;

1 “(IV) Purdue University;
2 “(V) the University at Wisconsin;
3 and
4 “(VI) to the maximum extent
5 practicable, any other facilities needed
6 to support the Nuclear Science User
7 Facility.

8 “(6) NUCLEAR ENERGY TRAINEESHIPS SUBPRO-
9 GRAM.—

10 “(A) ESTABLISHMENT.—In carrying out
11 the program under this subsection, the Sec-
12 retary shall establish a nuclear energy
13 traineeships subprogram under which the Sec-
14 retary shall establish competitively awarded
15 traineeships and apprenticeships in industries
16 that are represented by skilled labor unions and
17 with institutions of higher education to provide
18 focused, graduate-level training to meet highly
19 focused needs through a tailored academic
20 graduate program that delivers a curriculum
21 with a rigorous thesis or dissertation research
22 requirement aligned with the critical needs of
23 the Department with respect to mission-driven
24 workforce.

“(B) REQUIREMENTS.—In carrying out the subprogram under this paragraph, the Secretary shall—

“(i) encourage appropriate partnerships among National Laboratories, affected institutions of higher education, and industry; and

“(ii) on an annual basis, evaluate the needs of the nuclear energy community to implement traineeships for focused topical areas addressing mission-specific workforce needs.

“(7) AUTHORIZATION OF APPROPRIATIONS.—

There is authorized to be appropriated to the Secretary to carry out the program under this subsection \$150,000,000 for each of fiscal years 2020 through 2029.

“(j) RADIOLOGICAL FACILITIES MANAGEMENT.—

“(1) IN GENERAL.—The Secretary shall carry out a program under which the Secretary shall provide project management, technical support, quality engineering and inspection, and nuclear material support to 25 research reactors located at 24 institutions of higher education.

1 “(2) ELEMENTS.—The program under this sub-
2 section shall include—

3 “(A) delivery of plate fuel elements as re-
4 quired annually by the recipient research reac-
5 tors, as determined based on—

6 “(i) need; and

7 “(ii) fuel availability;

8 “(B) delivery of Training, Research, Iso-
9 topes, General Atomics (commonly known as
10 ‘TRIGA’) reactor fuel elements from recipient
11 institutions of higher education to used fuel re-
12 ceipt facilities of the Department; and

13 “(C) funding for required safety upgrades
14 to allow resumption of research reactor fuel
15 fabrication operations at TRIGA International
16 in Romans, France.

17 “(3) AUTHORIZATION OF APPROPRIATIONS.—
18 There is authorized to be appropriated to the Sec-
19 retary to carry out the program under this sub-
20 section \$30,000,000 for each of fiscal years 2020
21 through 2029.

22 “(k) INTERNATIONAL NUCLEAR ENERGY COOPERA-
23 TION.—

24 “(1) IN GENERAL.—The Secretary shall carry
25 out a program under which the Secretary shall de-

1 velop bilateral collaboration initiatives with a variety
2 of countries through—

3 “(A) research and development agree-
4 ments;

5 “(B) other relevant arrangements and ac-
6 tion plan updates; and

7 “(C) maintaining existing multilateral co-
8 operation commitments of—

9 “(i) the International Framework for
10 Nuclear Energy Cooperation; and

11 “(ii) the International Atomic Energy
12 Agency.

13 “(2) TREATMENT.—The program under this
14 subsection shall be considered to be the lead pro-
15 gram of the Department with respect to inter-
16 national activities relating to civil nuclear energy, in-
17 cluding—

18 “(A) analysis, development, coordination,
19 and implementation of international civil nu-
20 clear energy policy; and

21 “(B) integration of international nuclear
22 technical activities.

23 “(3) SUBPROGRAM.—In carrying out the pro-
24 gram under this subsection, the Secretary shall es-
25 tablish a subprogram that shall—

1 “(A) support diplomatic, nonproliferation,
 2 climate, and international economic objectives
 3 for the safe, secure, and peaceful use of nuclear
 4 technology in countries developing nuclear en-
 5 ergy programs; and

6 “(B) shall be modeled after the Inter-
 7 national Military Education and Training pro-
 8 gram of the Department of State.

9 “(4) REQUIREMENTS.—The program under this
 10 subsection shall be carried out—

11 “(A) to facilitate, to the maximum extent
 12 practicable, workshops and expert-based ex-
 13 changes to engage industry, stakeholders, and
 14 foreign governments regarding international
 15 civil nuclear issues, such as training, financing,
 16 safety, and options for multinational coopera-
 17 tion on used nuclear fuel disposal; and

18 “(B) in coordination with—

19 “(i) the National Security Council;

20 “(ii) the Secretary of State;

21 “(iii) the Secretary of Commerce; and

22 “(iv) the Nuclear Regulatory Commis-
 23 sion.

24 “(5) AUTHORIZATION OF APPROPRIATIONS.—

25 There is authorized to be appropriated to the Sec-

1 retary to carry out the program under this sub-
 2 section \$10,000,000 for each of fiscal years 2020
 3 through 2029, of which \$5,500,000 shall be used
 4 each fiscal year to carry out the subprogram under
 5 paragraph (3).”.

6 (b) COST SHARING.—Section 988(b)(2) of the En-
 7 ergy Policy Act of 2005 (42 U.S.C. 16352(b)(2)) is
 8 amended—

9 (1) in the paragraph heading, by striking “EX-
 10 CLUSION” and inserting “EXCLUSIONS”;

11 (2) by striking “apply to” and inserting the fol-
 12 lowing: “apply—

13 “(A) to”;

14 (3) in subparagraph (A) (as so designated), by
 15 striking the period at the end and inserting “; or”;
 16 and

17 (4) by adding at the end the following:

18 “(B) to programs under subsections (e)
 19 through (k) of section 952.”.

○