118TH CONGRESS
2D SESSION

S. 5157

To require the Secretary of Energy to study new technologies and opportunities for recycling spent nuclear fuel, and for other purposes.

IN THE SENATE OF THE UNITED STATES

SEPTEMBER 24, 2024

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

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A BILL

To require the Secretary of Energy to study new technologies and opportunities for recycling spent nuclear fuel, and for other purposes.

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

SECTION 1. SHORT TITLE.

This Act may be cited as the ''Advancing Research in Nuclear Fuel Recycling Act of 2024''.

SEC. 2. STUDY ON NEW TECHNOLOGIES TO RECYCLE SPENT NUCLEAR FUEL.

(a) DEFINITIONS.—In this section:

(1) NATIONAL LABORATORY.—The term ''National Laboratory'' has the meaning given the term in section 2 of the Energy Policy Act of 2005 (42 U.S.C. 15801).

(2) NUCLEAR WASTE.—The term ''nuclear waste'' means spent nuclear fuel and high-level radioactive waste, as defined in section 2 of the Nuclear Waste Policy Act of 1982 (42 U.S.C. 10101).

(3) RECYCLING.—The term ''recycling'' means the recovery of valuable radionuclides, including fissile materials, from nuclear waste, and any subsequent processes, such as enrichment and fuel fabrication, necessary for reuse in nuclear reactors or other commercial applications.

(4) SPENT NUCLEAR FUEL.—The term ''spent nuclear fuel'' has the meaning given in section 2 of the Nuclear Waste Policy Act of 1982 (42 U.S.C. 10101).

(b) STUDY.—

(1) IN GENERAL.—Not later than 90 days after the date of enactment of this Act, the Secretary of Energy shall seek to enter into an agreement with the National Academies of Sciences, Engineering, and Medicine to assemble an independent committee

of experts to author the study described in this subsection.

(2) INDIVIDUALS NOT TO BE INCLUDED.—The independent committee of experts shall not include any of the same individuals who authored the report, ''Merits and Viability of Different Nuclear Fuel Cycles and Technology Options and the Waste Aspects of Advanced Nuclear Reactors (2023)'', but those same individuals may advise the independent committee of experts.

(3) INDEPENDENT COMMITTEE OF EXPERTS.—The independent committee of experts shall consist of subject matter experts from stakeholders, such as the Office of Nuclear Energy of the Department of Energy, the National Laboratories, academia, industry, and other relevant stakeholder groups, as determined by the Secretary—

(A) to analyze the practicability, potential benefits, costs, and risks, including proliferation, of using dedicated recycling facilities to convert spent nuclear fuel, including spent high-assay low-enriched uranium fuel, into useable nuclear fuels, such as those for—

(i) commercial light water reactors;

(ii) advanced nuclear reactors; and

(iii) medical, space-based, advanced-battery, and other non-reactor applications, as determined by the Secretary;

(B) to—

(i) analyze the practicability, potential benefits, costs, and risks of recycling spent nuclear fuel, which is taken from temporary storage sites throughout the United States, and using it as fuel or input for advanced reactors, existing reactors, or commercial applications;

(ii) compare such practicability, potential benefits, costs, and risks of recycling spent nuclear fuel with the practicability, potential benefits, costs, and risks of the once-through fuel cycle, including temporary and permanent storage requirements; and

(iii) analyze the practicability, potential benefits, costs, and risks of aqueous (such as PUREX and its derivatives) recycling processes with the practicability, potential benefits, costs, and risk of non-aqueous (such as pyro-electrochemistry) recycling processes;

(C) to analyze the technical and economic feasibility of utilizing nuclear waste processing to extract certain isotopes needed for domestic and international use, including medical, industrial, space-based power source, and advanced-battery applications;

(D) to analyze the practicability, potential benefits, costs, risks, and potential approaches for coupling or collocating recycling facilities with other pertinent facilities, such as advanced reactors (that can use the recycled fuel), interim storage, and fuel-fabrication facilities, including—

(i) relevant analyses, such as capital and operating cost estimates, public-private partnerships to encourage investment, infrastructure requirements, timeline to full-scale commercial deployment, and distinguishing characteristics or requirements of such facilities;

(ii) input from interested private technology developers and relevant assumptions regarding cost; and

(iii) comparison with the practicability, potential benefits, costs, and risks of

the once-through fuel cycle, including temporary and permanent storage requirements;

(E) to identify parties, including individuals, communities, businesses, and local and Tribal governments, that are impacted economically, or through health, safety, or environmental risks, by the current practice of indefinite temporary storage of spent nuclear fuel, and assess potential risks and benefits for these parties should spent nuclear fuel be removed from their sites for the purposes of nuclear waste recycling;

(F) to assess different approaches for siting and sizing nuclear waste recycling facilities, including a centralized national facility, regional facilities, on-site facilities where spent nuclear fuel is currently stored, and on-site facilities where newly recycled fuel can be used by an on-site reactor, and recommend one or more approaches that consider environmental, transportation, infrastructure, capital, and other risks;

(G) to identify tracking and accountability methods for new recycled fuel and radioactive

waste streams for byproducts of the recycling process;

(H) to—

(i) identify any regulatory gaps related to nuclear waste management and recycling, including accuracy and consistency of relevant definitions for radioactive waste (including ''high-level radioactive waste'', ''spent nuclear fuel'', ''low-level radioactive waste'', ''reprocessing'', ''recycling'', and ''vitrification'') and classifications of radioactive waste that exist in Federal law on the date of enactment of this Act;

(ii) compare such definitions to those used by other nations that manage radioactive waste; and

(iii) make recommendations for modernizing such definitions; and

(I) to evaluate—

(i) potential Federal and State-level policy changes to support development and deployment of recycling and waste-utilizing reactor technologies; and

(ii) impacts of spent nuclear fuel recycling on requirements for domestic nuclear waste storage.

(c) REPORT.—Not later than 12 months after the date on which the agreement described under subsection (b) is entered, the Secretary of Energy shall submit to the Committee on Commerce, Science, and Transportation of the Senate, the Committee on Energy and Natural Resources of the Senate, the Committee on Energy and Commerce of the House of Representatives, the Committee on Science, Space, and Technology of the House of Representatives, and the Committee on Natural Resources of the House of Representatives, a report that complies with each of the following:

(1) Describes the results of the study.

(2) Is released to the public.

(3) Totals not more than 120 pages (excluding Front Matter, References, and Appendices) written and formatted to facilitate review by a nonspecialist readership, including the following sections:

(A) A Front Matter section that includes a cover page with identifying information, tables of contents, figures, and tables.

(B) An Executive Summary section.

(C) An Introductory section that includes a historical overview that also explains why recycling is not performed in the United States today, such as economic, political, or technological obstacles.

(D) Results and Findings sections that summarize the results and findings of the study described in subsection (b).

(E) A Key Remaining Challenges and Barriers section that identifies key technical and nontechnical (such as economic) challenges and barriers that need to be addressed to enable scale-up and commercial adoption of spent nuclear fuel recycling, with preference given to secure, proliferation resistant, environmentally safe, and economical recycling methods.

(F) A Policy Recommendations section that—

(i) lists policy recommendations to address remaining technical and nontechnical (such as economic) challenges and barriers to enable scale-up and commercial adoption of spent nuclear fuel recycling, including with government support;

(ii) contrasts the potential benefits and risks of each policy; and

(iii) compares benefits to current or past policies.

(G) An Other section in which other relevant information may be added.

(H) A References section.

(I) An Appendices section.

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