118TH CONGRESS
2D SESSION

S. _____

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

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

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) DEFINITION OF SPENT NUCLEAR FUEL.—In this section, the term ''spent nuclear fuel'' has the meaning

given the term in section 2 of the Nuclear Waste Policy Act of 1982 (42 U.S.C. 10101).

(b) STUDY.—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 Academy of Sciences, Engineering, and Medicine to assemble an independent committee of experts, including subject matter experts from the Office of Nuclear Energy of the Department of Energy, academia, industry, and other relevant stakeholder groups—

(1) to analyze the practicability, potential benefits, costs, and risks, including proliferation, of dedicated recycling facilities to convert spent nuclear fuel into usable nuclear fuel, including fluorination of spent nuclear fuel to extract uranium hexafluoride for recycled commercial light water reactor nuclear fuel, and extraction of other fissionable actinides and fission products for recycled advanced nuclear fuels to be used in molten-salt and other advanced nuclear reactors, as well as other non-reactor fuel applications such as medical, space-based, and advanced battery applications among other societal uses;

(2) to—

(A) analyze the practicability, potential benefits, costs, and risks of recycling spent nu-

clear fuel, which is taken from temporary storage sites throughout the United States, and using it as fuel for advanced reactors or existing reactors; and

(B) compare such practicability, potential benefits, costs, and risks with the practicability, potential benefits, costs, and risks of permanent and interim storage options for spent nuclear fuel;

(3) to analyze the potential to utilize nuclear waste processing to extract certain isotopes needed for domestic and international use, including medical, industrial, space-based power source, and advanced battery applications;

(4) to overview several recycling-with-reactor waste management approaches, especially those of interest to private technology developers, including technologies and processes that could potentially minimize current and future high-level radioactive spent nuclear fuel to the maximum degree possible, and contrasted with continued storage of spent nuclear fuel in a non-recycled manner;

(5) to evaluate waste-utilizing advanced reactor concepts that include—

(A) contrasting information that explains unique aspects of each technological approach and other relevant information;

(B) input from interested private technology developers and a list of their contact information; and

(C) a list of any developers who were not able to be contacted during the study;

(6) to evaluate potential strategies for coupling recycling and waste-burning advanced reactors that include—

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

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

(7) to evaluate potential changes to Federal-level policy that enable use of the Nuclear Waste Fund for development and deployment of recycling and waste-utilizing reactor technologies, potential State-level policies that enable spent nuclear fuel re-

cycling, and impacts of spent nuclear fuel recycling on domestic nuclear waste storage;

(8) to assess the definitions of radioactive waste, such as ''high-level radioactive waste'', ''spent nuclear fuel'', ''low-level radioactive waste'', and other radioactive or nuclear waste-related definitions, that exist in Federal law on the date of the assessment, compare such definitions to those used by other nations that manage radioactive waste, and make recommendations for modernizing such definitions, as appropriate;

(9) 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 interim 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;

(10) 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, capital, and other risks;

(11) to identify tracking and accountability methods for new recycled fuel and radioactive waste streams for byproducts of the recycling process; and

(12) to identify any regulatory gaps related to nuclear waste management and recycling.

(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.