

119TH CONGRESS
1ST SESSION

S. _____

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

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.

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 “Advancing Research
5 in Nuclear Fuel Recycling Act of 2025”.

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

8 (a) DEFINITIONS.—In this section:

9 (1) NATIONAL LABORATORY.—The term “Na-
10 tional Laboratory” has the meaning given the term

1 in section 2 of the Energy Policy Act of 2005 (42
2 U.S.C. 15801).

3 (2) NUCLEAR WASTE.—The term “nuclear
4 waste” means spent nuclear fuel and high-level ra-
5 dioactive waste (as defined in section 2 of the Nu-
6 clear Waste Policy Act of 1982 (42 U.S.C. 10101)).

7 (3) RECYCLING.—The term “recycling” means
8 the recovery of valuable radionuclides, including
9 fissile materials, from nuclear waste, and any subse-
10 quent processes, such as enrichment and fuel fab-
11 rication, necessary for reuse in nuclear reactors or
12 other commercial applications.

13 (4) SECRETARY.—The term “Secretary” means
14 the Secretary of Energy.

15 (5) SPENT NUCLEAR FUEL.—The term “spent
16 nuclear fuel” has the meaning given the term in sec-
17 tion 2 of the Nuclear Waste Policy Act of 1982 (42
18 U.S.C. 10101).

19 (b) STUDY.—Not later than 90 days after the date
20 of enactment of this Act, the Secretary, acting through
21 the Assistant Secretary for Nuclear Energy, shall carry
22 out a study—

23 (1) to analyze the practicability, potential bene-
24 fits, costs, and risks, including proliferation, of using
25 dedicated recycling facilities to convert spent nuclear

1 fuel, including spent high-assay low-enriched ura-
2 nium fuel, into useable nuclear fuels, such as those
3 for—

4 (A) commercial light water reactors;

5 (B) advanced nuclear reactors; and

6 (C) medical, space-based, advanced-bat-
7 tery, and other non-reactor applications, as de-
8 termined by the Secretary;

9 (2)(A) to analyze the practicability, potential
10 benefits, costs, and risks of recycling spent nuclear
11 fuel, which is taken from temporary storage sites
12 throughout the United States, and using it as fuel
13 or input for advanced nuclear reactors, existing reac-
14 tors, or commercial applications;

15 (B) to compare such practicability, potential
16 benefits, costs, and risks of recycling spent nuclear
17 fuel with the practicability, potential benefits, costs,
18 and risks of the once-through fuel cycle, including
19 temporary and permanent storage requirements; and

20 (C) to analyze the practicability, potential bene-
21 fits, costs, and risks of aqueous (such as PUREX
22 and the derivatives of PUREX) recycling processes
23 with the practicability, potential benefits, costs, and
24 risk of non-aqueous (such as pyro-electrochemistry)
25 recycling processes;

1 (3) to analyze the technical and economic feasi-
2 bility of utilizing nuclear waste processing to extract
3 certain isotopes needed for domestic and inter-
4 national use, including medical, industrial, space-
5 based power source, and advanced-battery applica-
6 tions;

7 (4) to analyze the practicability, potential bene-
8 fits, costs, risks, and potential approaches for cou-
9 pling or collocating recycling facilities with other
10 pertinent facilities, such as advanced nuclear reac-
11 tors (that can use the recycled fuel), interim storage,
12 and fuel-fabrication facilities, including through—

13 (A) relevant analyses, such as capital and
14 operating cost estimates, public-private partner-
15 ships to encourage investment, infrastructure
16 requirements, timeline to full-scale commercial
17 deployment, and distinguishing characteristics
18 or requirements of such facilities;

19 (B) input from interested private tech-
20 nology developers and relevant assumptions re-
21 garding cost; and

22 (C) comparison with the practicability, po-
23 tential benefits, costs, and risks of the once-
24 through fuel cycle, including temporary and
25 permanent storage requirements;

1 (5) to identify parties, including individuals,
2 communities, businesses, and local and Tribal gov-
3 ernments, that are impacted economically, or
4 through health, safety, or environmental risks, by
5 the current practice of indefinite temporary storage
6 of spent nuclear fuel, and assess potential risks and
7 benefits for those parties should spent nuclear fuel
8 be removed from their sites for the purposes of nu-
9 clear waste recycling;

10 (6) to assess different approaches for siting and
11 sizing nuclear waste recycling facilities, including a
12 centralized national facility, regional facilities, on-
13 site facilities where spent nuclear fuel is currently
14 stored, and on-site facilities where newly recycled
15 fuel can be used by an on-site reactor, and rec-
16 ommend one or more approaches that consider envi-
17 ronmental, transportation, infrastructure, capital,
18 and other risks;

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

22 (8)(A) to identify any regulatory gaps related to
23 nuclear waste management and recycling, including
24 accuracy and consistency of relevant definitions for
25 radioactive waste (including “high-level radioactive

1 waste”, “spent nuclear fuel”, “low-level radioactive
2 waste”, “reprocessing”, “recycling”, and “vitrifica-
3 tion”) and classifications of radioactive waste that
4 exist in Federal law on the date of enactment of this
5 Act;

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

8 (C) to make recommendations for modernizing
9 such definitions; and

10 (9) to evaluate—

11 (A) potential Federal and State-level policy
12 changes to support development and deploy-
13 ment of recycling and waste-utilizing reactor
14 technologies; and

15 (B) impacts of spent nuclear fuel recycling
16 on requirements for domestic nuclear waste
17 storage.

18 (c) REPORT.—Not later than 1 year after the date
19 of enactment of this Act, the Secretary, acting through
20 the Assistant Secretary for Nuclear Energy, shall submit
21 to the Committee on Energy and Natural Resources of
22 the Senate, the Committee on Energy and Commerce of
23 the House of Representatives, the Committee on Science,
24 Space, and Technology of the House of Representatives,
25 and the Committee on Natural Resources of the House

1 of Representatives, a report that complies with each of the
2 following:

3 (1) Describes the results of the study carried
4 out under subsection (b).

5 (2) Is released to the public.

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

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

13 (B) An Executive Summary section.

14 (C) An Introductory section that includes a
15 historical overview that also explains why recy-
16 cling is not performed in the United States
17 today, such as economic, political, or techno-
18 logical obstacles.

19 (D) Results and Findings sections that
20 summarize the results and findings of the study
21 carried out under subsection (b).

22 (E) A Key Remaining Challenges and Bar-
23 riers section that identifies key technical and
24 nontechnical (such as economic) challenges and
25 barriers that need to be addressed to enable

1 scale-up and commercial adoption of spent nu-
2 clear fuel recycling, with preference given to se-
3 cure, proliferation resistant, environmentally
4 safe, and economical recycling methods.

5 (F) A Policy Recommendations section
6 that—

7 (i) lists policy recommendations to ad-
8 dress remaining technical and nontechnical
9 (such as economic) challenges and barriers
10 to enable scale-up and commercial adop-
11 tion of spent nuclear fuel recycling, includ-
12 ing with government support;

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

15 (iii) compares benefits to current or
16 past policies.

17 (G) An Other section in which other rel-
18 evant information may be added.

19 (H) A References section.

20 (I) An Appendices section.