Draft Environmental Assessment for the Proposed Rule—Regulatory Framework for Fusion Machines

Docket No. NRC-2023-0071

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards

February 2026

ML25168A335

This page intentionally left blank.

TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMS iv
1 INTRODUCTION 1
1.1 Background 1
1.2 Proposed Action 2
1.3 Purpose of and Need for Proposed Action 2
1.4 Structure of 10 CFR Part 30 4
2 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION 5
2.1 Changes in Regulations 5
2.1.1 New Regulations 5
2.1.2 Amended Sections 6
2.2 Environmental Impacts of the Proposed Action 8
3 ENVIRONMENTAL IMPACTS OF THE ALTERNATIVE TO THE PROPOSED ACTION 9
4 AGENCIES AND PERSONS CONSULTED 10
5 PRELIMINARY CONCLUSION AND FINDING OF NO SIGNIFICANT IMPACT 11
6 STAKEHOLDER INTERACTIONS 12
REFERENCES 15

ABBREVIATIONS AND ACRONYMS

10 CFR	Title 10 of the *Code of Federal Regulations*
ADAMS	Agencywide Documents Access and Management System
ADVANCE Act	Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy Act of 2024
AEA	Atomic Energy Act
ARPA-E	Advanced Research Projects Agency—Energy
DHHS	U.S. Department of Health and Human Services
DHS	U.S. Department of Homeland Security
DNFSB	Defense Nuclear Facilities Safety Board
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EA	environmental assessment
EPA	U.S. Environmental Protection Agency
FR	*Federal Register*
HPS	Health Physics Society
IAEA	International Atomic Energy Agency
IRPA	International Radiation Protection Association
ISCORS	Interagency Steering Committee on Radiation Standards
LWR	light-water reactor
mSv	millisievert
NEIMA	Nuclear Energy Innovation and Modernization Act
NETWG	Nuclear Energy Tribal Working Group
NRC	U.S. Nuclear Regulatory Commission
OMB	Office of Management and Budget
OSHA	Occupational Safety and Health Administration
OSTP	Office of Science and Technology Policy
PDR	Public Document Room
rem	Roentgen equivalent man
RIC	Regulatory Information Conference
SECY	Commission paper
SRM	staff requirements memorandum
STC	State and Tribal Communication
TRMTC	Tribal Radioactive Materials Transportation Committee

1 INTRODUCTION

The U.S. Nuclear Regulatory Commission (NRC) is proposing to amend its regulations to augment the existing byproduct material framework to be inclusive of fusion machines. This proposed rule is required by the Nuclear Energy Innovation and Modernization Act (NEIMA), which directs the NRC to "complete a rulemaking to establish a technology-inclusive, regulatory framework for optional use by commercial advanced nuclear reactor applicants"[1] by December 31, 2027. The NRC is proposing requirements that are technology-inclusive to accommodate the wide variety of anticipated fusion machine designs and sizes across the National Materials Program. The proposed rule includes consolidated regulatory requirements for the possession, use, and production of byproduct material associated with fusion machines that are consistent with existing Title 10 of the *Code of Federal Regulations* (10 CFR) Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," requirements, to the extent practicable. These requirements are technology-inclusive and performance-based to address the hazards of the byproduct material associated with fusion machines. It includes proposed changes to 10 CFR Parts 20, 30, 37, 50, 51, 72, 110, 150, 170, and 171, including changes to definitions, content -of- application requirements, recordkeeping and inspection requirements, intruder assessment requirements for waste disposal sites, and environmental report submission requirements. The proposed changes would also revise the NRC's regulatory definitions of byproduct material to reflect fusion machine-related changes to the Atomic Energy Act of 1954 (AEA) made by the Accelerating Deployment of Versatile, Advance Nuclear for Clean Energy Act of 2024, Public Law 118-67 (ADVANCE Act).

This proposed rulemaking responds to Commission direction in staff requirements memorandum (SRM) SRM-SECY-23-0001 to proceed with a rulemaking on near-term fusion machines through a byproduct material approach using the existing 10 CFR Part 30 framework.

The NRC has prepared this draft environmental assessment (EA) in compliance with the agency's environmental review requirements in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," which implement the National Environmental Policy Act of 1969, as amended. This EA evaluates and documents the potential environmental impacts resulting from the proposed rulemaking related to amending the regulations for the licensing of fusion machines under the NRC's byproduct material framework.

1.1 Background

In 10 CFR Part 30 and associated regulations, including, but not limited to, those in 10 CFR Part 20, "Standards for Protection Against Radiation," and 10 CFR Part 31, "General Domestic Licenses for Byproduct Material," through 10 CFR Part 37, "Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material," and 10 CFR Part 39, "Licenses

[1] The definition of advanced nuclear reactor in NEIMA includes "fusion reactor." Based on the fundamental differences in generating the fusion reaction compared to the fission reaction and the fact that special nuclear material is not being used, the staff used the term "fusion energy system" to describe fusion devices during the development of options for a fusion regulatory framework. Based on the Commission's decision in, "Staff Requirements SECY-23-0001," dated April 13, 2023 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML23103A449), to regulate fusion devices under the byproduct materials framework in 10 CFR Part 30, the staff then used the term "fusion system" without "energy,". Furthermore, commensurate with the signing of the ADVANCE Act of 2024 on July 9, 2024, the staff now uses the term "fusion machine." Subsection 205(a) of the ADVANCE Act added a definition of "fusion machine" generated radioactive material to the AEA. Subsection 205(b) amended NEIMA to incorporate the new term "fusion machine" and amended section 3 to update the definition of advance nuclear reactor to refer to a "fusion machine" instead of a "fusion reactor."

and Radiation Safety Requirements for Well Logging," the NRC provides an existing framework for licensing a wide variety of uses for byproduct material. The byproduct material regulations, along with the guidance in NUREG-1556, "Consolidated Guidance About Materials Licenses," are scalable, provide a comprehensive list of technical and regulatory areas required for licensing, and have been used to regulate the potential hazards and risks from an extensive spectrum of uses of byproduct material, from low risk (e.g., portable gauges) to higher risk (e.g., panoramic irradiators). The regulations include specific programmatic requirements, such as those related to financial assurance and emergency planning, that are applicable for licensing larger quantities of byproduct material, which fusion machines are expected to produce. The NRC's proposed byproduct material framework would provide a technology-inclusive basis for the licensing and oversight of the broad array of fusion machines currently under development.

1.2 Proposed Action

The proposed action is a rulemaking to develop a limited-scope rule for licensing the possession, use, and production of byproduct material associated with a fusion machine under the NRC's byproduct material framework contained in 10 CFR Part 30 and associated regulations, including 10 CFR Part 20 byproduct disposal requirements. As part of the rulemaking effort, the NRC remains engaged with the industry, Federal agencies, Agreement States, and stakeholders to identify and develop the necessary technical bases and regulatory guidance to support the rulemaking.

1.3 Purpose of and Need for Proposed Action

In anticipation of future license applications to possess, use, and produce byproduct material associated with fusion machines[2], the Commission stated in 2009 that "the NRC has regulatory jurisdiction over commercial fusion energy devices whenever such devices are of significance to the common defense and security, or could affect the health and safety of the public."[3] However, the Commission directed the staff to wait until the commercial deployment of fusion technology became more predictable before expending significant resources to develop a regulatory framework. Since 2009, commercial companies worldwide have continued development of fusion technologies using a variety of designs and fuel cycles.[4] Design proof of concept, including exceeding scientific break-even (i.e., Q>1)[5] and net power production, is now targeted for some commercial fusion machine concepts as soon as the mid-to-late 2020s, with commercial deployment projected to follow in the late 2020s and early 2030s.

---

[2] With the passage of the ADVANCE Act of 2024, Section 11 of the Atomic Energy Act of 1954 (AEA) was amended to add "fusion machine" to describe the fusion process and its resultant products. Fusion machine generated radioactive material was also added to the definition of byproduct material in the AEA. With the amendment of the AEA, NRC will now use the term fusion machine instead of previous terms used to describe the fusion process and its resultant products such as fusion reactor, fusion energy systems, or fusion systems. Those previous terms will be used if quoted from other documents.

[3] See Staff Requirements Memorandum (SRM)-SECY-09-0064, "Staff Requirements—SECY-09-0064—Regulation of Fusion-Based Power Generation Devices," dated July 16, 2009 (ADAMS Accession No. ML092230198).

[4] See the Fusion Industry Association's report "The Global Fusion Industry in 2023," https://www.fusionindustryassociation.org/fusion-industry-report-archive/.

[5] Q denotes the ratio of the energy of the fusion products to the energy used to heat the plasma. Q=1 would denote the fusion breakeven point where equal amounts of energy were used and produced by the fusion machine. Q > 1 denotes the fusion machine generated more energy than it used to heat the plasma, while Q < 1 denotes the fusion machine generated less energy than it used to heat the plasma.

In 2019, NEIMA required the NRC to develop the regulatory infrastructure to support the development and commercialization of advanced nuclear reactors, including both nuclear fission reactors and fusion machines.[6] Section 103 of NEIMA requires the NRC to "complete a rulemaking to establish a technology-inclusive, regulatory framework for optional use by commercial advanced nuclear reactor applicants" by December 31, 2027.

In response to NEIMA, and due to the continued development of fusion technologies, the Commission in 2020 directed the staff to "consider the appropriate treatment of fusion reactor designs in our regulatory structure by developing options for Commission consideration on licensing and regulating fusion energy systems."[7] In its November 2, 2020, response to this Commission direction, the staff stated that it would assess the potential risks posed by fusion technologies and possible regulatory approaches separate from the ongoing rulemaking for 10 CFR Part 53, "Risk-Informed, Technology-Inclusive Regulatory Frameworks for Commercial Nuclear Plants."

In 2023, the staff submitted to the Commission for approval SECY-23-0001, "Options for Licensing and Regulating Fusion Energy Systems," containing three proposed options for regulating fusion systems (ML22273A163). On April 13, 2023, the Commission issued SRM-SECY-23-0001, approving the staff's Option 2 to license and regulate fusion machines under the NRC's byproduct material framework contained in 10 CFR Part 30 and associated regulations. The limited-scope rulemaking takes into account the existence of fusion machines that already have been licensed and are being regulated by the Agreement States, as well as those that may be licensed before the completion of the rulemaking. Agreement States are currently using requirements compatible with those in 10 CFR Part 30 and have safely regulated research and development fusion machines for over 25 years. These requirements cover but are not limited to waste management, emergency preparedness, security, and radiation protection for workers and the public.

On July 9, 2024, the ADVANCE Act of 2024 was signed into law. Section 205 of the Act amended section 11 of the AEA to add the definition of "fusion machine" and section 11e.(3)(B) of the AEA to amend the definition of "byproduct material" to include fusion machine generated radioactive material. The new definition of fusion machine is as follows:

> Fusion machine means a machine that is capable of—(1) transforming atomic nuclei, through fusion processes, into different elements, isotopes, or other particles; and (2) directly capturing and using the resultant products, including particles, heat, or other electromagnetic radiation.

The ADVANCE Act codifies inclusion of material made radioactive by a fusion machine as section 11e.(3)(B) byproduct material. Section 11e.(3)(B) of the AEA was amended to read:

> any material that—(i) has been made radioactive by use of a particle accelerator, including by use of a fusion machine; and (ii) if made radioactive by use of a particle accelerator that is not a fusion machine, is produced, extracted, or converted after extraction, before, on, or after August 8, 2005, for use for a commercial, medical, or research activity;

[6] The ADVANCE Act of 2024 amended NEIMA to replace "fusion reactor" with "fusion machine."

[7] SRM-SECY-20-0032, "Staff Requirements—SECY-20-0032—Rulemaking Plan on 'Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors (RIN-3150-AK31; NRC-2019-0062),'" dated October 2, 2020 (ADAMS Accession No. ML20276A293).

The proposed rulemaking would revise 10 CFR Part 30 to include technology-inclusive fusion machine licensing requirements that address the statutory provisions in NEIMA section 103(a)(4). This rulemaking would also make conforming changes in other parts of 10 CFR as necessary by adding text clarifications and references to the proposed regulations under 10 CFR Part 30, where necessary.

1.4 Structure of 10 CFR Part 30

The NRC byproduct material framework is contained in 10 CFR Part 30 and associated regulations, including, but not limited to, 10 CFR Part 20 and 10 CFR Parts 31 through 37 and 10 CFR Part 39. In 10 CFR Part 30, the NRC gives the basic requirements for licensing byproduct materials for use under a general license or specific license, as well as exemptions from these requirements. Under the byproduct material framework, a fusion machine would require a specific license under 10 CFR Part 30.

Specific licenses for the use of byproduct material are issued pursuant to 10 CFR Part 30. Certain uses of byproduct material have additional regulations found in 10 CFR Part 31; 10 CFR Part 32, "Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material"; 10 CFR Part 33, "Specific Domestic Licenses of Broad Scope for Byproduct Material"; 10 CFR Part 34, "Licenses for Industrial Radiography and Radiation Safety Requirements for Industrial Radiographic Operations"; 10 CFR Part 35, "Medical Use of Byproduct Material"; 10 CFR Part 36, "Licenses and Radiation Safety Requirements for Irradiators"; 10 CFR Part 37; and 10 CFR Part 39. All specific licensees are required to follow the regulations in 10 CFR Part 19, "Notices, Instructions and Reports to Workers: Inspections and Investigations," and 10 CFR Part 20. The licensee is bound by the regulations and the license conditions. Inspection of specific licensees occurs at a prescribed frequency, according to NRC policies and the type of activities authorized by the license.

A specific license has three main elements to ensure the adequate protection of public health and safety: (1) the application process, which requires the NRC review and approval of the licensee's experience, training, facilities, and safety programs (e.g., quality assurance, security, monitoring) before authorization to possess and use byproduct material, (2) the requirement to operate the program so that the licensee is in compliance with the applicable regulations, and (3) periodic unannounced inspections of the licensee's program by the NRC.

2 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

This EA evaluates the potential environmental impacts of developing a new regulatory framework for licensing the possession, use, and production of byproduct material associated with a fusion machine. The majority of the provisions in the proposed rule requirements are administrative, procedural in nature, or add clarity such as definitions and general and technical information to be submitted as part of a license application to construct and operate a fusion machine and would have no significant environmental impacts. Further, the NRC has evaluated requirements of interest to stakeholders, based on interactions described in section 6 of this EA, that have the potential to affect the human environment, including an approach for determining reasonable assurance of adequate protection of public health and safety, and determined that the proposed action does not have a significant environmental impact, as discussed below.

This proposed rulemaking addresses NEIMA and the ADVANCE Act, and amends various parts of the NRC's regulations, including 10 CFR Part 30, 10 CFR Part 20, and 10 CFR Part 51 to provide a regulatory framework for fusion machines under the existing byproduct material framework. Additional conforming changes are being proposed to 10 CFR Parts 37, 50, 72, 110, 150, 170, and 171.

This EA focuses on those aspects of the rulemaking for licensing the possession, use, and production of byproduct material associated with a fusion machine by which a licensee, following the proposed requirements, could affect the environment. Most environmental issues such as land use, aquatic impacts, or air quality would be the same for a fusion machine as they would for a larger byproduct material facility licensed under the current byproduct material framework. However, 10 CFR Part 20 and 10 CFR Part 30 would contain some proposed safety requirements for fusion machine licensees that would differ from those under the existing framework. Therefore, the following analysis focuses on whether these different safety requirements would cause a license to possess, use, and produce byproduct material associated with a fusion machine under 10 CFR Part 30 to have any different environmental impacts than one licensed under the current regulations.

2.1 Changes in Regulations

The proposed rule for licensing the possession, use, and production of byproduct material associated with a fusion machine would add new requirements under 10 CFR 30.32(k), 10 CFR 30.33(a)(6), and 10 CFR 51.60(b)(1)(viii) that are specific to the application requirements for a fusion machine license. The proposed rule would also provide conforming changes to existing byproduct material requirements to address specific attributes of fusion machines under 10 CFR 20.2008, "Disposal of certain byproduct material"; 10 CFR 30.51, "Records," paragraphs (a) and (a)(1); and 10 CFR 30.52, "Inspections," paragraph (a).

2.1.1 New Regulations

The proposed rule for licensing the possession, use, and production of byproduct material associated with a fusion machine would provide for technology-inclusive content-of-application requirements supportive of a performance-based approach to regulating fusion machines. Specifically, the rulemaking would provide the requirements for the licensing of a fusion machine, as supplemented by the current general regulatory requirements and terms and conditions of licenses contained in 10 CFR 30.32, "Application for specific licenses"; 10 CFR 30.33, "General requirements for issuance of specific licenses"; and 10 CFR 30.34, "Terms and conditions of licenses"; along with other conforming changes specific to fusion machines.

The proposed new content of 10 CFR 30.32(k) would require that an applicant for a license to possess, use, and produce byproduct material associated with a fusion machine provide a general description of the fusion machine, a summary of the applicant's operating and emergency procedures related to radiation safety, a description of the applicant's radiation safety organizational structure, a description of the applicant's training program for fusions machines and radiation protection, a description of the inspection and maintenance program, and a description of the applicant's methodology for maintaining a radioactive material inventory. The summary of the procedures important to radiation protection must also include descriptions of (1) the radiation protection measures to be employed for byproduct material, including all interlocks, access control systems, shielding, and radiation monitors, (2) the byproduct material handling systems procedures and inventory control procedures, and (3) a description of any other components or systems used to control radiation and radioactive material.

The rulemaking would offer an applicant for a license to possess, use, and produce byproduct material associated with a fusion machine an alternative licensing approach to recognize the diversity of fusion machine designs currently being considered and possible in the future. This alternative pathway applicable to radiation safety, as proposed in 10 CFR 30.32(k)(2)(i)–(iii), would require the applicant to describe the fusion machine relevant to radiation safety and explain how the applicant can ensure that the fusion machine would be operated safely. The proposed alternative approach in 10 CFR 30.32(k)(2)(iv) would also require an applicant to provide any information requested by the NRC during preapplication communications to enable the agency to evaluate whether the fusion machine can be operated and decommissioned safely.

A new proposed paragraph would be added to 10 CFR 30.33(a)(6) that would specifically provide the general requirements for approving an application for a license to possess, use, and produce byproduct material associated with a fusion machine once the applicant provides sufficient information to demonstrate the safety of the fusion machine.

A new proposed paragraph would be added to 10 CFR 51.60(b)(1)(viii) that would require preparation of an environmental report for the construction and operation of a fusion machine unless a categorical exclusion in 10 CFR 51.22 applies. The NRC expects that the scope of the environmental report would be discussed during any preapplication communications.

2.1.2 Amended Sections

As presented in proposed 10 CFR 20.2008(a), licensed material as defined in paragraphs (3) and (4) of the definition of "byproduct material" set forth in 10 CFR 20.1003, "Definitions," is not defined as low-level radioactive waste but may be disposed of in accordance with 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste." Given the similarities between accelerators and fusion devices, 10 CFR 20.2008(a) allows disposal of fusion machine waste with low-level radioactive waste under 10 CFR Part 61. To address waste that is beyond the scope of the waste characteristics the NRC considered during the development of 10 CFR Part 61, the NRC is proposing to amend 10 CFR 20.2008 to allow certain licensed waste from a fusion machine to be disposed at low-level waste disposal sites that have performed site-specific analyses demonstrating waste acceptability. This would allow the disposal of radioactive waste generated from fusion machines to be consistent with the disposal of accelerator-generated radioactive waste under 10 CFR Part 61.

Under 10 CFR Part 61, protection of individuals from inadvertent intrusion is ensured, in part, by the waste classification system. While the waste classification tables in 10 CFR 61.55, "Waste

classification," include tritium, one example of a component of a type of fusion fuel, a fusion machine could create significant inventories of activation products that are not included in these waste classification tables. Furthermore, the activation products formed by fusion machines will depend on materials used in and around the fusion machine, as well as their impurities. Many of those materials have not yet been selected or developed; therefore, the identity, quantities, and concentrations of the potential activation products in those materials are not yet known.

Instead of updating the waste classification tables in 10 CFR Part 61 to include all radionuclides in fusion-related radioactive waste as they become known, the NRC proposes to require that byproduct material waste associated with a fusion machine that differs significantly from the characteristics and radionuclide concentrations considered during the development of 10 CFR Part 61 can only be disposed of at a disposal site that completes a site-specific inadvertent intrusion assessment. The objective of this proposed requirement is to demonstrate the protection of individuals from inadvertent intrusion, based on the waste acceptance criteria (i.e., the concentrations of various radionuclides a disposal site licensee allows in waste) as well as characteristics of the disposal facility and site. To establish that requirement, the NRC is proposing to amend 10 CFR 20.2008 paragraph (a) to add:

> In addition, waste resulting from fusion machines must either be accompanied by an analysis showing the waste is manifested and labeled for disposal consistent with the description of the applicable waste class in [10 CFR] 61.7 of this chapter, based on the physical, chemical, and radiological characteristics of the waste, or be disposed of in a disposal facility that has completed a site-specific intrusion assessment that demonstrates the projected dose to an individual who inadvertently intrudes into the waste at the facility will be less than 0.5 rem (5 (mSv)) per year.

Because this rulemaking action is not modifying 10 CFR Part 61 itself, any assessment of a disposal pathway for byproduct wastes associated with a fusion machine, including waste volume, would occur under the above amended 10 CFR 20.2008 regulation during a specific licensing action for approving an application for a license to possess, use, and produce byproduct material associated with a fusion machine.[8]

The NRC is proposing to amend the record-keeping requirements in 10 CFR 30.51(a) and 10 CFR 30.51(a)(1) and the inspection requirements in 10 CFR 30.52(a) to include the production of byproduct material by a fusion machine. For example, some fusion machine designs include the production of tritium as a source of fuel by the capture of neutrons in lithium adjacent to the vacuum vessel where the fusion reaction takes place. Thus, the proposed 10 CFR 30.51, "Records," would require that for the production of tritium, a fusion machine licensee would keep the necessary records showing the receipt, transfer, and disposal of this byproduct material to ensure the proper controls are in place for adequate protection of public health and safety.

[8] Concurrent with the development of this rulemaking, the staff proposed a revision of 10 CFR Part 61 in a separate rulemaking activity to the Commission "Proposed Rule: Integrated Low-Level Radioactive Waste Disposal" (SECY-24-0045). The draft proposed Part 61 rule, if approved by the Commission, would not conflict with the fusion machine rule's proposed changes to § 20.2008. Similarly, the draft proposed changes to 10 CFR Part 61 would not change the requirements for disposal of fusion machine waste.

2.2 Environmental Impacts of the Proposed Action

Regarding potential environmental impacts, implementation of the proposed regulations for licensing the possession, use, and production of byproduct material associated with a fusion machine under 10 CFR 30.32, 10 CFR 30.33, and 10 CFR 51.60, “Environmental report—materials licenses,” is similar to, and consistent with, the application of existing NRC regulations for a byproduct material facility using significant quantities of byproduct material. This is because the proposed requirements would be administrative in application, would be matters of procedure, or provide clarity on licensing and regulating fusion machines, but would not materially change any requirements, and would not result in any new or different environmental impacts.

The amendments to the section on the disposal of fusion machine byproduct material waste are intended to provide clarity and consistency with the existing regulations governing accelerator and other byproduct material waste Providing a mechanism for fusion machine waste to be disposed of with low-level radioactive waste under 10 CFR Part 61 would not materially change any requirements for the disposal of fusion machine waste as for traditional sources of radioactive wastes from byproduct material facilities such as irradiators and accelerators.

Amending the record-keeping requirements in 10 CFR 30.51 and the inspection requirements in 10 CFR 30.52, “Inspections,” would make those requirements for fusion machines consistent with existing byproduct regulations. Therefore, because this is an administrative change, there would be no new or different environmental impacts when implementing the proposed change to the regulations than with the current regulations.

In addition, the requirements under the proposed rule for licensing the possession, use, and production of byproduct material associated with a fusion machine would not affect endangered or threatened species or any historic sites since no physical actions with environmental impacts are associated with this proposed rule.

Based on the above evaluation, the NRC concludes that the proposed regulatory requirements for licensing the possession, use, and production of byproduct material associated with a fusion machine would not have a significant impact on the environment.

3 ENVIRONMENTAL IMPACTS OF THE ALTERNATIVE TO THE PROPOSED ACTION

Under the no-action alternative (i.e., the status quo), the regulations would not change. Licensees would continue to be required to meet current regulations (namely, 10 CFR Part 30, 10 CFR Part 20, and 10 CFR Part 51) or seek relief using the existing regulatory framework. As stated in section 2 of this EA, the proposed rule would not result in a significant impact on the environment because licenses to possess, use, and produce byproduct material associated with a fusion machine under 10 CFR Part 30 are expected to have a similar impact on the affected environment as facilities with a specific license to manufacture byproduct material under the current regulations, and the proposed rule would not materially change any requirements as provided by the current regulations. Therefore, there would be no difference in environmental impacts between the no-action alternative and the proposed rule. The NRC would analyze the environmental impacts of a license application under the existing regulations and guidance for the no-action alternative and would continue to analyze the environmental impacts of applications, exemptions, and license amendment requests on a case-by-case basis. The NRC describes the costs and benefits of the no-action alternative and the proposed action in the regulatory analysis for the proposed rule (ML25168A335).

4 AGENCIES AND PERSONS CONSULTED

The NRC developed the proposed rule and is requesting public comment on this draft EA. The NRC intends to conduct at least one public meeting during the proposed rule comment period to describe the proposed rule to the public and allow stakeholders to ask questions about the proposed rule and this EA. The agency will consider comments received on the docket as it develops the final rule and the final EA. The NRC will issue the final EA when it publishes the final rule.

During the development of this proposed rule, the NRC conducted numerous public meetings and other interactions with stakeholders related to the development of the fusion machine regulations. Section 6 of this EA provides details about stakeholder interactions.

The proposed rulemaking for licensing the possession, use, and production of byproduct material associated with a fusion machine would not materially change any requirements in current regulations in 10 CFR Parts 20,[9] 30, 37, 50, 51, 72, 110, 150, 170, and 171 and would result in no significant impact on the environment. As such, the rulemaking would not result in impacts to endangered and threatened species or critical habitat; therefore, the NRC has determined that a Section 7 consultation under the Endangered Species Act is not necessary. Likewise, the NRC has determined that the proposed rule could not cause effects on or to historic properties. Therefore, the NRC has determined that no further consultation is required under Section 106 of the National Historic Preservation Act.

[9] This proposed rule would not amend existing regulations under 10 CFR Part 61; however, it does propose a change to 10 CFR Part 20 to include a dose requirement that would provide an equivalent level of safety to that of 10 CFR Part 61.

5 PRELIMINARY CONCLUSION AND FINDING OF NO SIGNIFICANT IMPACT

Based on this EA, the staff finds that the proposed action would not have a significant effect on the quality of the human environment and therefore, pursuant to 10 CFR 51.32, a Finding of No Significant Impact is appropriate. Accordingly, the NRC is not required to prepare an environmental impact statement for the proposed action. Documents may be examined, and copied for a fee, at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland, 20852. Publicly available records will be accessible electronically from the ADAMS Public Electronic Reading Room on the NRC website at https://www.nrc.gov/reading-rm/adams.html. Persons who do not have access to ADAMS or who encounter problems in accessing the documents in ADAMS should contact the NRC PDR reference staff at (800) 397-4209 or (301) 415-4737 or send an email to pdr.resource@nrc.gov. This EA and finding of no significant impact can be tracked with identification number NEPA ID EAXX-429-00-000-1770960385.

6 STAKEHOLDER INTERACTIONS

The NRC has undertaken extensive stakeholder interactions for this rulemaking for licensing the possession, use, and production of byproduct material associated with a fusion machine. Table 6-1 lists interactions between the NRC and stakeholders during meetings and communications on issues related to the fusion machine rulemaking. In addition, the NRC held multiple Government-to-Government meetings with Agreement States to discuss the rulemaking. Meetings and communications that occurred before the initiation of this rulemaking action in April 2023 are also shown below for completeness and transparency. The NRC has received feedback from various stakeholders on 10 CFR Part 20, 10 CFR Part 30, and 10 CFR Part 51 during or as a result of these interactions.

Table 6-1 NRC and Stakeholder Interactions

Description	Date	ADAMS Accession No.
DOE, NRC, and Fusion Industry Association Public Forum	10/6/2020	-
Virtual Public Meeting on Developing Options for a Regulatory Framework for Fusion Energy Systems	1/26/2021	ML21026A315
Virtual Public Meeting on Developing Options for a Regulatory Framework for Fusion Energy Systems	3/30/2021	ML21104A425
Meeting with Advisory Committee on Reactor Safeguards Future Plants Subcommittee	5/6/2021	ML21088A256
Virtual Public Meeting on Developing Options for a Regulatory Framework for Fusion Energy Systems	9/16/2021	ML21306A336
Virtual Public Meeting on Developing Options for a Regulatory Framework for Fusion Energy Systems	10/27/2021	ML21307A103
Virtual Public Meeting on Developing Options for a Regulatory Framework for Fusion Energy System	3/23/2022	ML22089A192
Virtual Public Meeting on Developing Options for a Regulatory Framework for Fusion Energy System	6/7/2022	ML22210A313
Letter from Helion to the NRC	8/12/2022	ML22243A083
NRC White Paper—Licensing and Regulating Fusion Energy Systems	9/13/2022	ML22252A192
Advisory Committee on Reactor Safeguards—Regulatory Policies and Practices Subcommittee Meeting	9/23/2022	ML22277A810
Advisory Committee on Reactor Safeguards—Full Committee Meeting	10/5/2022	ML22293B779
Response Letter from NRC to General Fusion	10/14/2022	ML22284A044
Advisory Committee on Reactor Safeguards Letter	10/21/2022	ML22290A177

Description	Date	ADAMS Accession No.
NRC Staff Response to Advisory Committee on Reactor Safeguards Letter	11/7/2022	ML22306A260
Commission Meeting: Briefing on Regulatory Approaches for Fusion Energy Devices	11/8/2022	ML22307A042
Government-to-Government Meeting with the Agreement States	11/30/2022	-
Conference of Radiation Control Program Directors 55th National Conference on Radiation Control—Panel Discussion: Strategies for Regulating Fusion Devices Across the National Materials Program & Plans for a Regulatory Framework for Fusion Energy Systems	5/10/2023	-
Commission Public Meeting with the Organization of Agreement States and the Conference of Radiation Control Program Directors	5/18/2023	ML23132A260
ISCORS Meeting (included representatives from DOE, DoD, EPA, DHS, DOT, OSHA, DHHS, OMB, OSTP, and DNFSB)	5/24/2023	-
State Liaison Officer Conference on Fusion	6/7/2023	-
ARPA-E Fusion Programs Annual Meeting	6/15/2023	-
Government-to-Government Meeting with specific Agreement States	6/27/2023	-
Virtual Public Meeting on Proposed Rule: Regulatory Framework for Fusion Energy Systems	7/12/2023	ML23191A156
STC Letter—Notification of Proposed Rulemaking: Regulatory Framework for Fusion Energy Systems (STC-23-053)	7/17/2023	ML23180A231
2023 Annual Meeting—Organization of Agreement States	8/6-10/2023	-
Email from Fusion Industry Association to the NRC	8/22/2023	ML23234A223
STC Letter—Tribal Notification of Public Meetings (STC-23-069)	9/29/2023	ML23270B446
Federal Register: Notice of Availability of Preliminary Proposed Rule Language	10/4/2023	88 FR 68506
Preliminary Proposed Rule Language	10/4/2023	ML23258A145
STC Letter—State Notification of Public Meetings (STC-23-070)	10/6/2023	ML23276A991
Government-to-Government Meeting with Agreement States	10/10/2023	-
Virtual Public Meeting on Proposed Rule: Regulatory Framework for Fusion Systems	10/11/2023	ML23258A146
Virtual Public Meeting on Proposed Rule: Regulatory Framework for Fusion Systems	11/1/2023	ML23258A169
Virtual Public Meeting on Proposed Rule: Regulatory Framework for Fusion Systems	11/9/2023	ML23258A182

Description	Date	ADAMS Accession No.
Letter from Fusion Industry Association to the NRC	12/15/2023	ML23354A236
Virtual Public Meeting on Proposed Rule: Regulatory Framework for Fusion Systems	1/17/2024	ML23355A142
Helion Paper: Preparing for At-Scale Deployment of Fusion Energy via a Design-Specific License	1/19/2024	ML24023A302
DOE's NETWG Meeting	2/29/2024	-
Letter from Commonwealth Fusion Systems to the NRC	3/6/2024	ML24068A081
Regulatory Information Conference 2024—Technical Session Panel: TH24 - Navigating the Future of Fusion: Designing a Flexible, Resilient Regulatory Framework for Emerging Fusion Technologies	3/14/2024	ML24086A544 ML24086A550
Virtual Public Meeting on Proposed Rule: Regulatory Framework for Fusion Systems	3/18/2024	ML24067A237
Letter from Commonwealth Fusion Systems to the NRC	5/21/2024	ML24157A322
Letter from TAE Technologies to the NRC	5/22/2024	ML24157A328
Letter from Fusion Industry Association to the NRC	5/22/2024	ML24157A326
Letter from Helion to the NRC	8/1/2024	ML24218A159
Virtual Public Meeting on Proposed Rule: Regulatory Framework for Fusion Machines	8/14/2024	ML24207A028
Government-to-Government Meeting with Agreement States	8/28/2024	-
Letter from Fusion Industry Association to the NRC	9/13/2024	ML24262A058

REFERENCES

10 CFR Part 19. *Code of Federal Regulations*, Title 10, *Energy*, Part 19, "Notices, Instructions and Reports to Workers: Inspections and Investigations." Washington, DC.

10 CFR Part 20. *Code of Federal Regulations*, Title 10, *Energy*, Part 20, "Standards for Protection Against Radiation." Washington, DC.

10 CFR Part 30. *Code of Federal Regulations*, Title 10, *Energy*, Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material." Washington, DC.

10 CFR Part 31. *Code of Federal Regulations*, Title 10, *Energy*, Part 31, "General Domestic Licenses for Byproduct Material." Washington, DC.

10 CFR Part 32. *Code of Federal Regulations*, Title 10, *Energy*, Part 32, "Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material." Washington, DC.

10 CFR Part 33. *Code of Federal Regulations*, Title 10, *Energy*, Part 33, "Specific Domestic Licenses of Broad Scope for Byproduct Material." Washington, DC.

10 CFR Part 34. *Code of Federal Regulations*, Title 10, *Energy*, Part 34, "Licenses for Industrial Radiography and Radiation Safety Requirements for Industrial Radiographic Operations." Washington, DC.

10 CFR Part 35. *Code of Federal Regulations*, Title 10, *Energy*, Part 35, "Medical Use of Byproduct Material." Washington, DC.

10 CFR Part 36. *Code of Federal Regulations*, Title 10, *Energy*, Part 36, "Licenses and Radiation Safety Requirements for Irradiators." Washington, DC.

10 CFR Part 37. *Code of Federal Regulations*, Title 10, *Energy*, Part 37, "Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material." Washington, DC.

10 CFR Part 39. *Code of Federal Regulations*, Title 10, *Energy*, Part 39, "Licenses and Radiation Safety Requirements for Well Logging." Washington, DC.

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." Washington, DC.

10 CFR Part 61. *Code of Federal Regulations*, Title 10, *Energy*, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste." Washington, DC.

10 CFR Part 110. *Code of Federal Regulations*, Title 10, *Energy*, Part 110, "Export and Import of Nuclear Equipment and Material." Washington, DC.

Memo to Commission from M. Doane, EDO Re: Response to Staff Requirements—SECY-20-0032—"Rulemaking Plan on Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors." U.S. Nuclear Regulatory Commission. Washington, DC. November 2, 2020. ML20288A251.

National Environmental Policy Act of 1969, as amended. (NEPA) 42 U.S.C. 4321 et seq.

Nuclear Energy Innovation and Modernization Act. (NEIMA) 42 U.S.C. 2011 et seq.

NUREG-1556, “Consolidated Guidance About Materials Licenses.” U.S. Nuclear Regulatory Commission. Washington, DC.

SECY-24-0045, “Proposed Rule—Integrated Low-Level Radioactive Waste Disposal (RIN 3150-AI92; NRC -2011-0012).” U.S. Nuclear Regulatory Commission. Washington, DC. May 29, 2024. ML23242A261.

SRM-SECY-09-0064, “Staff Requirements—SECY-09-0064—Regulation of Fusion-Based Power Generation Devices.” U.S. Nuclear Regulatory Commission. Washington, DC. July 16, 2009. ML092230198.

SRM-SECY-20-0032, “Staff Requirements—SECY-20-0032—Rulemaking Plan on ‘Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors (RIN-3150-AK31; NRC-2019-0062).’” U.S. Nuclear Regulatory Commission. Washington, DC. October 2, 2020. ML20276A293.

SRM-SECY-23-0001, “Staff Requirements—SECY--23--0001—Options for Licensing and Regulating Fusion Energy Systems.” U.S. Nuclear Regulatory Commission. Washington, DC. April 13, 2023. ML23103A449.

SRM-SECY-23-0021, “Staff Requirements—SECY-23-0021—Proposed Rule: Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors (RIN 3150-AK31).” U.S. Nuclear Regulatory Commission. Washington, DC. March 4, 2024. ML24064A047.