

August 1, 2024

Mr. John Lubinski
Director, Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

RE: Limited-scope Rulemaking on the Regulatory Framework for Fusion Machines – Preliminary Proposed Rule Language and Preliminary Draft Guidance (Docket ID NRC-2023-0071)

Mr. Lubinski,

On behalf of Helion Energy, Inc. ("Helion"), I am writing to share our perspective on the U.S. Nuclear Regulatory Commission's ("NRC") limited-scope rulemaking to develop a regulatory framework for fusion machines. We sincerely appreciate the staff's efforts and engagement during the rulemaking process.¹ Helion remains committed to working with the staff and Agreement States moving forward toward completion of the rulemaking and during implementation, ensuring the safe deployment of commercial fusion energy in the U.S.

Thus far, the staff has proactively released and held public meetings on the preliminary proposed rule language² and the preliminary draft guidance document.³ These interactions have enhanced stakeholder engagement in the rulemaking process and led to iteration and improvement in the preliminary proposed rule language based on the feedback provided. We recognize that this has required additional effort by the staff, and we greatly appreciate their work.

Helion fully endorses the Fusion Industry Association's (FIA) letter⁴ on the preliminary proposed rule language and preliminary draft guidance and write today to add further context to several areas highlighted in that letter. In summary, Helion urges the staff to:

- Implement the provisions of the ADVANCE Act, including clearly identifying fusion machines as types of particle accelerators
- Recognize fusion's limited environmental impacts and proactively prepare for efficient review
- Enable performance-based approaches to material control and accountability

Addressing these matters, will enable Helion's continued progress toward the safe deployment of the world's first fusion power plant in 2028.⁵

¹ See [Fusion Systems | NRC.gov](#)

² [Fusion Systems Rulemaking - Preliminary Proposed Rule Language dated October 23, 2023](#) as revised by [Rulemaking: Regulatory Framework for Fusion Systems dated March 18, 2024](#)

³ [Preliminary Draft NUREG-1556 "Consolidated Guidance About Materials Licenses" Volume 22 "Program-Specific Guidance About Possession Licenses for Fusion Systems" dated November 1, 2023 \(ML24067A227\)](#)

⁴ [Letter from FIA to J. Lubinski dated May 22, 2024 - Preliminary Rulemaking Process for Fusion Systems](#)

⁵ [Announcing Helion's fusion power purchase agreement with Microsoft | Helion \(helionenergy.com\)](#)

ADVANCE Act

The bipartisan Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy (ADVANCE) Act⁶ was signed into law on July 9, 2024. The ADVANCE Act includes important provisions related to fusion that significantly bolster legal and regulatory clarity for the licensing and oversight of fusion energy. The ADVANCE Act modifies the Atomic Energy Act of 1954 (AEA), as amended,⁷ to, for the first time, include reference to fusion. It does this through modification of the definition of particle accelerator produced byproduct material in AEA Section 11(e)(3)(B) and providing a definition in Section 11(dd) of “fusion machine.” The updated text reads (new text in **plasma**):

e. The term “byproduct material” means—

(3)(B) 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 the date of enactment of this paragraph for use for a commercial, medical, or research activity;

dd. **FUSION MACHINE.** – The term “fusion machine” means a machine that is capable of—

(1) transforming atomic nuclei, through fusion processes, into different elements, isotopes, of other particles; and

(2) directly capturing and using resulting products, including particles, heat, or other electromagnetic radiation.

Helion urges the staff to adopt the language set forth in the ADVANCE Act regarding fusion machines and byproduct material into the current rulemaking.

Critically, the staff’s latest revision of the definition of “particle accelerator” should be streamlined to state directly that: “The term *particle accelerator* includes fusion machines.” The ADVANCE Act’s reference to byproduct material made radioactive by a particle accelerator, “including by use of a fusion machine,” provides legislative confirmation that fusion machines are types of particle accelerators under the AEA—a finding which aligns with the NRC’s own technical and legal conclusions as part of its earlier analyses of fusion machines.⁸

Making this clarification explicit not only conforms the NRC’s rulemaking to the ADVANCE Act, but also provides regulatory clarity that will substantially improve developer engagement with other regulatory bodies and the public. This language should also be adopted throughout the preliminary draft guidance.

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⁶ [S.870 Division B - Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy](#)

⁷ [Atomic Energy Act of 1954, as Amended](#)

⁸ See [NRC SECY-23-0001 “Options for Licensing and Regulating Fusion Energy Systems” dated January 3, 2023 \(ML22273A163\)](#), where the staff found fusion machines “operate in a manner consistent with the regulatory definition of particle accelerator.” See also [Letter from Helion to NRC “Classification of Fusion Devices as Particle Accelerators; and Supplementing Common Defense & Security Discussions” dated August 12, 2022 \(ML22243A083\)](#)

Distinct from the current rulemaking, the ADVANCE Act also requests the NRC to study and produce a report on design-specific licensing frameworks for mass-manufactured fusion machines. Helion sees this activity as critical to enabling fusion's potential as a real solution to our climate and energy needs as well as to establish U.S. energy security for the 21st century and beyond.

Helion anticipates being able to mass-manufacture our fusion generators as soon as the early 2030s. Our generators can be truly factory produced and assembled, without the need for radioactive material nor a license during manufacturing; easily transported to common, modestly sized industrial sites; and installed with limited site work.

The Part 30 framework is well suited to support at-scale deployment and does so for many different uses of byproduct material. Nonetheless, at the right time, high-throughput, low-impact deployment of mass-manufactured fusion machines will require a more efficient alternative licensing process, that can be made available in parallel with traditional site-by-site licensing approaches.

Even if scale deployment may be a few years away, critical thinking about how the Part 30 framework can evolve to be ready—such as development of a “fusion generator registry”—should start now.

Environmental Considerations

The staff's preliminary draft guidance addresses environmental considerations in Section 8.5.3 “Environmental Review” and in Appendix C “Commencement of Construction at Existing and Proposed Byproduct Material Facilities.” These sections appear to have a bias toward expecting that commercial fusion power plants will significantly affect the quality of the environment and require development of an environmental impact statement. We note this bias in statements such as:

“the applicant will need to submit their environmental report and application for a byproduct material as least 9 months prior to the commencement of construction as required by 10 CFR 30.32(f)”

Reference to Section 30.32(f) and mandating of the 9 month timeline creates a presumption that fusion power plants will have a significant impact on the environment, which does not align with Helion's expectations for our power plants.

The language used for irradiators in 10 CFR 36.15 offers a strong analogue that could be adopted in the preliminary draft guidance:

“Commencement of construction of a new irradiator may not occur prior to the submission to the NRC of both an application for a license for the irradiator and the fee required by § 170.31 of this chapter. Any activities undertaken prior to the issuance of a license are entirely at the risk of the applicant and have no bearing on the issuance of a license with respect to the requirements of the Atomic Energy Act of 1954 (Act), as amended, and rules, regulations, and orders issued under the Act.”

Helion's fusion generators are expected to have very limited environmental impacts. Our 50 MW_e generator design is anticipated to be largely factory produced and installed with limited site work in common industrial buildings (e.g., concrete tilt up). The generator building for a 50 MW_e Helion fusion power plant is currently anticipated to encompass less than 100,000 square feet and any ancillary

structures would be yet smaller. Helion's technology⁹ uses direct conversion of fusion energy to electricity, greatly reducing water needs and discharge from the facility. Water is anticipated to be provided by utility service in large part for cooling electrical systems.

Helion's primary fuel, deuterium, is extremely energy dense and it, along with operational waste, can be transported on and off-site in delivery vans. Fusion does not generate any high-level waste and site remediation is anticipated to be completed soon after shutdown of the facility with cost estimates in the 10s of millions of U.S. dollars.

These attributes give Helion confidence that our power plants will not significantly affect the quality of the environment and that NRC's National Environmental Policy Act (NEPA) responsibilities,¹⁰ for those plants subject to NEPA requirements, could be appropriately addressed through a finding of no significant impact (FONSI).

* * *

In the same vein, the ADVANCE Act includes provisions related to increasing the efficiency of environmental reviews and requests the NRC to report to Congress on efforts:

"to facilitate efficient, timely, and predictable environmental reviews... through expanded use of categorical exclusions, environmental assessments, and generic environmental impact statements."

The act further lists several considerations that the report should consider including:

- Adopting other federal agency environmental findings
- Leveraging studies or analyses performed by federal, state, and local permitting agencies
- Establishing new CATEX
- Amending 10 CFR 51.20, and others

This direction is consistent with broader federal and state environmental review process reforms initiated in recent years, including in the Fiscal Responsibility Act¹¹ and the recently introduced, bipartisan Energy Permitting Reform Act of 2024.¹²

Environmental review guidance that does not presume significant impacts for fusion machines supports the spirit of the ADVANCE Act.

Material Control and Accountability

Helion urges the staff to enable performance-based approaches to material control and accountability. The preliminary draft guidance currently states in Section 8.10.3:

"each licensee shall conduct a semiannual physical inventory to account for all licensed material received and possessed under the license"

This would place an unjustified burden on a commercial fusion power plant, requiring shutdown of the facility for several days up to several weeks twice per year. Helion's generators will have very few moving parts and are anticipated to demonstrate high capacity factors with minimal maintenance cycles. This

⁹ [Helion | Technology \(helionenergy.com\)](https://www.helionenergy.com)

¹⁰ [National Environmental Policy Act at The NRC | NRC.gov](https://www.nrc.gov/regions/atlanta/about-nrc/national-environmental-policy-act)

¹¹ [H.R.3746 - 118th Congress \(2023-2024\): Fiscal Responsibility Act of 2023](#) ; See also [NRC SECY-24-0046 "Implementation of the Fiscal Responsibility Act of 2023 National Environmental Policy Act Amendments" dated June 13, 2024 \(ML24078A013\)](#)

¹² [Manchin, Barrasso Release Bipartisan Energy Permitting Reform Legislation \(senate.gov\)](#)

prescriptive stipulation in the preliminary draft guidance would therefore cause specific shutdowns of the power plant.

Additionally, a physical inventory would likely require placing Helion team members inside generator shielding structures for potentially extended periods of time. Given that there are other, well-established methods for calculating, modelling, and assessing the amount and location of licensed material, a semiannual physical inventory does not appear to align with NRC's as low as reasonably achievable (ALARA) principle.¹³


Further, members of the Helion team recently visited the Joint European Torus (JET) facility¹⁴ at the United Kingdom Atomic Energy Agency (UKAEA) and discussed tritium accountancy with their experts. It is our understanding that the facility does not, and has not needed to, undertake a complete physical inventory of all radioactive material on site to ensure safe operation. Tritium that is not inventoried in systems that can be readily assessed or was not monitored leaving the system is reasonably assumed to be held up in the tokamak. This can be validated upon destructive examination during decommissioning of the facility.

It is our understanding that JET operated safely for 40 years using this approach without any undue impact on public health and safety or the environment.

* * *

Thank you for your consideration of these matters, which are critical to Helion's continued progress toward the safe deployment of the world's first fusion power plant. We look forward to continuing conversations with the staff on these important topics.

Sincerely,

A handwritten signature in black ink, appearing to read 'Andrew Proffitt'.

Andrew Proffitt
Regulatory Policy Lead
Helion Energy, Inc.

cc: Mike King, Special Assistant for ADVANCE Act Implementation, NRC/EDO
Rob Lewis, Deputy Office Director, NRC/NMSS
Kevin Williams, Division Director, NRC/NMSS/MSST
Adelaide Giantelli, Deputy Division Director, NRC/NMSS/MSST
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Allyce Bolger, Project Manager, NRC/NMSS/MSST
Dennis Andrukat, Project Manager, NRC/NMSS/REFS
Sachin Desai, Helion Energy, Inc.
Michael Hua, Helion Energy, Inc.

¹³ [ALARA | NRC.gov](https://www.nrc.gov/ALARA)

¹⁴ [JET: the Joint European Torus - Culham Centre for Fusion Energy \(ukaea.uk\)](https://www.ukaea.uk/en/what-we-do/our-programmes/jet-the-joint-european-torus)

From: [Andrew Proffitt](#)
To: [John Lubinski \(He/Him/His\)](#)
Cc: [Mike King](#); [Robert Lewis \(He/Him\)](#); [Kevin Williams](#); [Adelaide Giantelli](#); [Christopher Regan](#); [Melissa Ralph \(She/Her/Hers\)](#); [John Moses](#); [Duncan White](#); [Allyce Bolger \(She/Her\)](#); [Dennis Andrukat](#); [Sachin Desai](#); [Michael Hua](#)
Subject: [External_Sender] Helion Letter on NRC Fusion Rulemaking
Date: Thursday, August 1, 2024 2:55:02 PM
Attachments: [image001.png](#)
[Helion_NRC_Letter_August_2024.pdf](#)

John – Please see attached a letter on behalf of Helion regarding the ongoing limited-scope rulemaking to establish a regulatory framework for fusion machines. We truly appreciate the staff's work thus far and look forward to continued engagement.

In the letter we endorse FIA's May 22nd letter and urge NRC to:

- Implement the provisions of the ADVANCE Act, including clearly identifying fusion machines as types of particle accelerators
- Recognize fusion's limited environmental impacts and proactively prepare for efficient review
- Enable performance-based approaches to material control and accountability

The letter can be made publicly available.

Please reach out with any questions!

-Andrew

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