U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Vision and Strategy: Regulating Fusion Machines Across the National Materials Program

REVISION 1

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Contents

1. Vision

The U.S. fusion regulatory framework enables clear, efficient, independent, and reliable licensing and oversight through open processes.

The Principles of Good Regulation shape the approach to regulating the emerging fusion industry. Implementing this vision will yield a focused approach suitable for commercial-scale fusion technologies.

- **Clear** – The NRC's decision on how to regulate near-term fusion technologies provides important clarity to the emerging fusion industry. Agreement States have safely regulated fusion research and development systems under this framework for over 25 years, and the NRC's revised regulations and guidance will enable widespread implementation.
- **Efficient** – The byproduct materials framework enables a level of regulation that is commensurate with the hazards of a given application, while ensuring a high degree of technical competence to regulate fusion technologies. It is used to license technologies that range from portable gauges that measure the uniformity of highway pavement to major industrial facilities like irradiators for food and medical equipment. The National Materials Program (NMP), composed of the NRC and Agreement States, has demonstrated the flexibility to regulate emerging technologies such as cancer treatments and can do the same for diverse fusion technologies.
- **Independent** – In making independent decisions on fusion—both the development of regulations and guidance and when reviewing specific licensing applications—the U.S. regulatory community will openly seek all available facts and views. This includes coordination with other U.S. government agencies, Tribal governments, international regulators, academia, fusion companies, non-government organizations and the public.
- **Reliable** – Fusion must be regulated in a way that maintains risks at an acceptably low level while considering uncertainties in technology development for components and a diversity of fusion designs. The regulatory framework will be designed in a way that lends stability to the planning process for commercialization of fusion and provides consistent decision-making on key safety and security questions. The NMP has extensive experience applying compatible requirements and guidance nationwide and will apply those principles to the regulation of fusion.
- **Open** – Extensive outreach is planned, consistent with NRC's rulemaking process, as the NRC and Agreement States develop the regulatory framework. This outreach will help other interested parties understand the approach, solicit feedback, and encourage consistent implementation across the NMP.

2. Strategic Focus Areas

Three strategic focus areas are needed to achieve the vision for the fusion regulatory framework: (1) **regulatory optimization**, (2) **technical readiness**, and (3) **partnership and coordination**.

2.1. Regulatory Optimization

Fusion regulation must optimize competing priorities of flexibility and consistency.

The byproduct materials framework is designed to provide a flexible and scalable approach—high-level performance-based regulations with tailored guidance to address specific technologies. The NRC's decision to apply the byproduct materials framework to fusion

machines was based on its understanding of the designs and hazards of the equipment most likely to be represented in near-term license applications. The changes to the regulations and proposed guidance will be structured to account for the known features of these designs. If new designs are developed that introduce new hazards, materials, or other safety and security concerns, the regulator can require additional information during licensing or impose licensing conditions to ensure adequate protection of public health and safety. If news designs are created that contain hazards that go sufficiently beyond the near-term technologies, then appropriate regulatory action would be recommended to the Commission.

The NRC's proposed requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 30 and guidance in the current draft Volume 22 of NUREG-1556 will address scalability in situations when large quantities of tritium or activation products warrant additional actions in areas such as environmental reviews, emergency preparedness, and waste disposal.

Further, with the exception of those compatibility areas where programs should be essentially identical, through the Commission's Agreement State Program Policy Statement and NRC's compatibility model, Agreement State radiation control programs have flexibility in program implementation and administration to accommodate individual State preferences, State legislative direction, and local needs and conditions. The NRC will assess the compatibility of its fusion requirements and guidance as part of the rulemaking process.

Consistency is also important. In addition to Agreement State compatibility, current byproduct material approaches that provide consistency include safety evaluations that are shared across jurisdictions and nationwide registration of approved sealed sources and devices. The NRC will be exploring ways to provide consistent, predictable decision-making for fusion designs across the various NMP jurisdictions to share design approvals of fusion machines designs for commercial distribution. This becomes especially important during the broader adoption as the NMP fusion regulatory program matures. This approach also supports jurisdictions whose regulators have not achieved their desired level of technical readiness.

2.2. Technical Readiness

Regulators need to strengthen fusion expertise as technology develops.

Currently, the wide variety of designs being considered in the marketplace and the lack of available design details at this early stage make it difficult for regulators to develop a deep understanding of all designs. This challenge will be alleviated to some extent as specific designs are proven and become more widely adopted. The NRC and Agreement States will hire and train staff to ensure they have the needed expertise to continue to license and inspect fusion technologies as they evolve. The NRC will partner with the Department of Energy (DOE), industry, academia, and international regulatory agencies to provide training to NRC and Agreement State staff on fusion confinement methods, fusion reactions, operation types, and design-specific safety considerations. Additional training by vendors will help provide a general baseline of understanding. The NRC anticipates taking the lead in offering licensing and inspection training, as is currently done for a variety of byproduct materials technologies, which will alleviate resource constraints on States and promote consistency. In addition, the NRC is evaluating the need for research on novel issues, especially those for materials effects, waste disposal and recycling, and computer codes for shielding calculations and offsite dose evaluations.

2.3. Partnership and Coordination

New designs cannot be regulated in a vacuum.

The NRC will continue close coordination with Agreement State partners to develop regulations, licensing guidance, inspection guidance, implementation strategies, and training. This includes State regulators' participation in working groups, discussions in government-to-government meetings, and formal comments on draft documents. To support continued engagement on fusion with the States, the staff chartered a standing committee on fusion oversight that is made up of NRC and Agreement State staff (ML25183A025). This committee will serve an advisory role in the NRC's fusion program by developing and sharing lessons learned and best practices, providing technical assistance on licensing and inspection issues, tracking the status of commercial fusion technology development, and providing input on qualification and refresher training for licensing reviewers, inspectors, and standard device designs reviewers.

In addition to providing training and regulatory infrastructure to enable States to review fusion applications, the NRC has established processes to directly support States in technical reviews through information sharing, user group, and technical assistance requests. The Integrated Materials Performance Evaluation Program enables the NRC and Agreement States to evaluate each other's technical readiness and implementation of fusion, as well as to offer best practices and insights for improvement.

The NRC will continue coordination with other Federal agencies with interests in fusion, including:

- **DOE** – DOE's Offices of Fusion and Fusion Energy Sciences supports significant research activities related to fusion, and the NRC can leverage these research activities to inform its regulatory approach. DOE, as it already does on advanced reactor issues, can partner with the NRC on outreach to interested parties, including environmental justice communities and Tribes, on the technology and regulatory approach.
- **National Nuclear Security Administration (NNSA)** – NNSA has interests in fusion associated with its nuclear nonproliferation mission. The NRC will continue to partner on appropriate regulatory requirements as well as design techniques and industry initiatives to address nonproliferation.
- **Department of Commerce** – The NRC is not proposing any changes to the current framework for export controls on tritium or other fusion associated isotopes. Under the current framework, the NRC coordinates with the Department of Commerce for export of materials under its jurisdiction.

The NRC is also committed to bilateral and multilateral cooperation with international regulatory counterparts. All programs benefit when regulators who are taking a similar byproduct materials approach to fusion share design and hazard insights, guidance documents, and operating experience. These efforts are already underway with the United Kingdom and Canada and are likely to expand. The G7[1] has created a fusion energy working group to promote international collaborations to accelerate the demonstration of fusion potential, encourage private investment and public engagement, promote harmonization of fusion regulations, and share best practices. The International Atomic Energy Agency is also supporting the development of fusion technical reports and safety reports, as well as key elements for an overall fusion regulatory framework.

[1] The Group of Seven (G7) is an intergovernmental political and economic forum consisting of Canada, France, Germany, Italy, Japan, the United Kingdom and the United States.

The NRC is engaged in these workshops and conferences at both the staff and management levels.

Regulators also coordinate with designers and applicants to understand designs, hazards, schedules, and other aspects critical to informing both strategy and actions. In addition, industry groups and standards organization are likely to provide valuable guidance to designers, as is already done in other byproduct materials areas (e.g., industry standards for irradiator design). Adherence to these third-party certifications may streamline the regulatory review process. As the NRC increases its resources applied to fusion regulation, it expects to increase this coordination.

3. ADVANCE Act Implementation

The Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy Act of 2024 (ADVANCE Act) was passed with bipartisan support and signed into law in July 2024. Section 205 of the ADVANCE Act addresses the regulation of fusion machines.

3.1. Statutory Changes

Section 205 of the ADVANCE Act codified the definition of “fusion machine” to the Atomic Energy Act of 1954, as amended, and incorporated “fusion machine” into the definition of byproduct material. In response, NRC staff incorporated the new and amended definitions into the draft proposed fusion rule submitted to the Commission on December 11, 2024. Once final, these conforming changes will codify these definitions into NRC regulations to provide regulatory clarity for the fusion industry and other external stakeholders.

3.2. Regulatory Framework Study

Section 205 also tasked the NRC with performing a study on risk-informed, performance-based, regulatory frameworks to support mass-production of fusion machines and to submit a report to Congress summarizing the results. The NRC established a project team with Agreement State members that reviewed several existing design certification and licensing processes that may be leveraged in developing a licensing framework for fusion machine designs intended for mass-production. Consistent with the Act, NRC staff conducted this study in consultation with the Agreement States, the private fusion sector, the public, and other Federal agencies, including the Federal Aviation Administration. The NRC issued a report to Congress summarizing the results of this study on July 10, 2025 (ML25120A080). As noted in the report and outlined in Section 4 of this document, staff will continue to pursue several NRC program actions in response to the Act to enable scaled deployment of commercial fusion machines within the United States.

3.3. Path to Commercialization

In addition to studying existing regulatory processes for applicability to fusion machines, the ADVANCE Act tasked the NRC with the development of a timeline for issuance of guidance or regulations that would establish an efficient licensing framework for mass-manufactured fusion machines. As referenced in the Section 205 report, the NRC, in consultation with external stakeholders, developed a set of milestone indicators of industry readiness for establishing such a framework. These milestones have been integrated into an action matrix that includes each milestone’s measurement indicator, measurement method, and associated follow-up actions once the milestone is achieved. This action matrix is documented in Appendix B.

The NRC will use the lessons learned from the Section 205 study to develop a design certification framework for fusion machines that will increase the efficiency of site-specific licensing of the possession, use, and production of byproduct material associated with fusion machines. By conducting comprehensive up-front safety reviews of designs intended for

replication and large-scale deployment, the NMP can streamline the licensing process. These reviews and certifications will provide a technical basis for NRC and Agreement State staff evaluating license applications to use certified designs.

The NRC's draft proposed fusion rule and ADVANCE Act implementation efforts are vital activities to secure regulatory certainty for fusion machines. Looking forward, the path to successful scaled deployment of commercial fusion machines will require both technical achievements from the industry and the development of efficient, technology-neutral regulatory processes to certify and license designs intended for mass production. The NRC developed and released a Fusion Program Roadmap (ML25301A006) to visualize this path to commercial fusion machine deployment.

4. Actions and Schedules

To achieve this vision, specific actions are needed related to each of the focus areas. These actions depend on the stage of maturity of the designs and associated regulatory needs. In each stage, actions are grouped into four objectives that drive NMP activities. These include:

- Objective 1: Establish regulations and guidance to ensure that fusion machines operate in a safe and secure manner;
- Objective 2: Develop a framework to license standard fusion machine designs for commercial deployment across the NMP;
- Objective 3: Prepare NRC and Agreement State staff for efficient and effective fusion machine oversight and develop public trust in regulatory oversight of fusion machines; and
- Objective 4: Harmonize international efforts to embrace a risk-informed, scalable approach for fusion regulatory oversight.

The tables below show the schedule and sequence for actions in each stage, including overlaps driven by industry. Completed actions are listed in Appendix C of this document. Publicly available documentation can be found at https://www.nrc.gov/materials/fusion.

4.1. Stage 1: Early Regulatory Preparedness

Objective	Action	Schedule / Sequence	Lead Organization
1/3	Publish proposed rule and draft guidance for public comment and host public meetings	2026	NRC/NMSS
3	Develop and implement a web-based fusion fundamentals training course for NRC and Agreement State technical staff	2026	NRC/NMSS NRC/TTC
3	Evaluate existing suite of NRC health physics computer codes to identify necessary updates or new tools to support independent analyses of fusion machine designs	2026	NRC/NMSS NRC/RES
1	Develop a technical and policy white paper to address key considerations for the regulation of fusion machines, including environmental review pathways, applicability of general licensing concepts, backfitting, and options for licensing mass-manufactured fusion machines	2026	NRC/NMSS

1/3	Incorporate internal and public comments and issue final fusion rule and licensing guidance	2027 (12/31/2027 legislative deadline – see background section)	NRC/NMSS
3	Develop fee structure for fusion machines and incorporate into the NRC Fee Rule	2027	NRC/NMSS NRC/OCFO
1/2	Participate in information-exchange meetings between RES and DOE, ARPA-E, EPRI, and standards development organizations	2023 - ongoing	NRC/RES NRC/NMSS
1	Develop inspection program for fusion machines	2027	NRC/NMSS
3	Deliver training to NRC and Agreement State staff to support implementation of final fusion regulations and guidance	2027	NRC/NMSS
3	Complete skill gap assessment for licensing reviewer and inspector qualifications	2028	NRC/OCHCO
3	Develop and implement an instructor-led advanced fusion technology training course for NRC and Agreement State staff	2028	NRC/TTC
4	Participate in IAEA working groups to harmonize international fusion regulatory development	Ongoing	IAEA (NRC participation coordinated through OIP; DOE also participating)

4.2. Stage 2: Prototypes, Demonstrations, and Other Single-Site Projects

Objective	Action	Schedule / Sequence	Lead Organization
1/3	Incorporate fusion program support in budget requests for NRC	Ongoing	NRC/NMSS
1	Review pre-licensing guidance to address any security concerns for fusion designs	2026	NRC/NMSS NRC/NSIR
1	Determine any adjustments to licensing processes needed for complex fusion facilities and update guidance in NUREG-1556 if needed	Following the licensing and initial operation of the first commercial fusion power plant (see Appendix B)	NRC/NMSS
1	Determine if any additional guidance or reviews are needed to license offsite storage of tritium-containing fluids (e.g., for decay to helium-3)	2027	NRC/NMSS
3	Communicate process for NRC assistance with reviews of applications submitted to Agreement States through the Standing Committee for Fusion Machine Oversight	2025 - ongoing	NRC/NMSS
3	Conduct local outreach activities in areas where fusion designs will be built and public meetings to receive facilitate comments on fusion regulation development	2025 - ongoing	DOE NRC Industry
3	Review of additional commercial R&D/proof of concept facilities	2025 - ongoing	NRC/Regions Agreement State programs
3	Create implementation toolkit and databank of safety evaluations for shared use on NRC website	2026	NRC/NMSS Agreement State programs
3	Ensure appropriate level of staff to address fusion licensing support budget and conduct training as needed	Ongoing, as needed	NRC/NMSS NRC/Regions Agreement State programs
3	Complete review of Helion's first fusion power plant application	2026 - 2027	Washington Agreement State program
3	Complete review of Type One Energy's prototype facility application	2026 - 2027	Tennessee Agreement State program
3	Complete review of TAE Technologies' next generation fusion machines	TBD	California Agreement State program
3	Complete review of Commonwealth Fusion Systems' ARC application	TBD	Virginia Agreement State program
3	Update health physics computer codes as needed to enable confirmatory calculations of emerging commercial designs	Ongoing	NRC/RES
3	Conduct safety and environmental reviews for applications made to the NRC	TBD	NRC/NMSS

3	Capture lessons learned from the continued oversight of prototype and commercial demonstration fusion machines	Ongoing	NRC/NMSS Agreement State Programs
1	Determine any necessary fusion machine-related updates to the NRC's Enforcement Policy and initiate a revision, if needed.	2028	NRC/NMSS NRC/OE

4.3. Stage 3: Broader Commercial Adoption

Objective	Action	Schedule / Sequence	Lead Organization
2	Evaluate industry standards, including ASME Division IV, on fusion machines	2027 - 2029	ASME
2	Evaluate the need to update guidance to endorse industry standards, as appropriate, and/or to credit third-party reviews of fusion designs, building on irradiator model	1 year after industry standards, if this approach emerges	NRC/NMSS
3	Communicate to the Commission if any designs trigger thresholds in SRM direction; consider whether staff guidance or additional criteria are needed to facilitate this communication	As needed – not envisioned before the late 2030s based on industry discussions	NRC/NMSS
4	Issue international guidance on regulatory frameworks for fusion	2025 - 2026	IAEA
3/4	Externally communicate the NRC's fusion efforts to external stakeholders and the public through periodic updates to the NRC's fusion website	2023 - ongoing	NRC/NMSS
4	Trilateral workshops with the United Kingdom and Canda to discuss industry status and regulatory developments for fusion machines	2024 - ongoing	NRC/NMSS Canadian Nuclear Safety Commission United Kingdom Office of Nuclear Regulation
3	Develop regulations or guidance to support licensing of mass-manufactured fusion machines	See Appendix B	NRC/NMSS Agreement State Programs
3	Develop and implement a training program to support commercial fusion machine design certification reviews (will coincide with development of regulatory framework in line item above)	See Appendix B	NRC/NMSS NRC/TTC

Appendix A: Background

Fusion has been licensed at the research scale for decades, but updated tools and prepared regulators are needed to oversee this emerging industry effectively and efficiently.

Fusion machines harness the energy released in a controlled thermonuclear fusion reaction in which two nuclei combine to form a new nucleus. This process occurs in our Sun and other stars. Creating and sustaining the high temperature and pressure conditions for fusion on Earth has been a major technological challenge since the first controlled fusion in 1958. Significant progress has been made recently as technology advances and funding increases.

On January 3, 2018, the United States Congress passed the Nuclear Energy Innovation and Modernization Act (NEIMA) that requires the NRC to develop and implement the necessary regulatory frameworks for advance reactor designs by December 31, 2027. Fusion systems are included in the NEIMA's definition for advanced reactors. Therefore, the NRC is working to develop a clear and predictable regulatory framework for the near-term fusion system designs.

On January 3, 2023, the NRC staff submitted SECY-23-0001, "Options for Licensing and Regulating Fusion Energy Systems," summarizing fusion technologies, hazards, and regulatory approaches. The NRC staff provided three options for Commission consideration:

1. Categorization of fusion systems as utilization facilities with the NRC staff developing a new framework to address the associated specific hazards.
2. A byproduct material approach augmenting the framework in Title 10 of the *Code of Federal Regulations* (10 CFR), Part 30, “Rules of General Applicability to Domestic Licensing of Byproduct Material.”
3. A hybrid framework with decision criteria, based on the potential risks and hazards of a specific fusion system, to determine whether a byproduct material or a utilization facility approach is appropriate for that system.

On April 13, 2023, the Commission issued SRM-SECY-23-0001, "Staff Requirements – SECY-23-0001 – Options for Licensing and Regulating Fusion Energy Systems," approving the option for a limited-scope rulemaking to establish a regulatory framework for fusion systems that augments the NRC's byproduct material framework in 10 CFR Part 30. The Commission included additional direction for the staff:

- The staff should take into account the existence of fusion systems that already have been licensed and are being regulated by the Agreement States, as well as those that may be licensed prior to the completion of the rulemaking.
- The staff should develop a new volume of NUREG-1556, “Consolidated Guidance About Materials Licenses,” dedicated to fusion systems, so as to provide consistent guidance across the NMP.
- The staff should evaluate whether controls-by-design approaches, export controls, or other controls are necessary for near-term fusion systems.
- If in the future, the staff, in consultation with the Agreement States, determines that an anticipated fusion design presents hazards sufficiently beyond those of near-term fusion technologies, the staff should notify the Commission and make recommendations for taking appropriate action as needed.

On July 9, 2024, the ADVANCE Act of 2024 was signed into law. Section 205 of the ADVANCE Act amended section 11 of the AEA to add the definition of “fusion machine” and amended the

definition of “byproduct material” to include fusion machine generated radioactive material in section 11e.(3)(B). The ADVANCE Act also amended section 103 of NEIMA to delete “fusion reactor” and replace it with “fusion machine.” Finally, subsection 205(c) of the ADVANCE Act requires the NRC to submit a report to Congress on design-specific licensing frameworks for “mass-manufactured fusion machines”; and provide an estimated timeframe for the NRC to issue regulations or guidance for licensing mass-manufactured fusion machines. The NRC issued this report on July 10, 2025 (ML25120A080).

On December 11, 2024, the NRC staff submitted SECY-24-0085: “Proposed Rule: Regulatory Framework for Fusion Machines” (ML24019A060). This limited rulemaking includes requirements for content of application, environmental reviews, waste disposal, definitions, and other conforming changes to integrate fusion machines into the byproduct material framework. The proposed rule package also incorporated new and revised definitions from the ADVANCED Act. In addition to the proposed rule, a revised version of NUREG-1556, Volume 22, is part of this rulemaking package.

On March 12, 2025, NRC staff released the proposed draft version of NUREG-1556, Volume 22 “Consolidated Guidance About Materials Licenses Program-Specific Guidance About Possession Licenses for Fusion Systems” (ML24295A002). This licensing guide would apply to fusion machines for research and development or commercial deployment. The guide was written to be technology neutral and could be used to license any of the fusion technologies being considered for commercial deployment. Volume 22 uses existing Part 30 requirements applicable to fusion machines in a manner like other Part 30 licensees as much as possible to integrate fusion machines into the existing byproduct material framework. The byproduct material frameworks used a scalable risk-informed approach that emphasizes containing, shielding, processing, or controlling radiation and radioactive materials that is amenable to the diversity of fusion machine technologies currently under development.

The NRC continues to pursue this rulemaking and guidance development in partnership with the Agreement States. In parallel, the NRC and Agreement States are developing the vision and strategy for regulating the full life cycle of fusion machines, informed both by materials licensing approaches and the NRC’s vision and strategy for advanced reactors.

The NRC’s Principles of Good Regulation—independence, openness, efficiency, clarity, and reliability—are embodied in this vision and strategy. While the NRC does not promote any technology, its responsibilities as a regulator include working effectively with all stakeholders, clearly communicating its requirements, and providing regulatory information and feedback in a timely manner. Above all, the NRC mission remains unchanged but the means to achieve its mission must be optimized. An NMP that is strategically positioned to regulate fusion will provide necessary regulatory certainty to the fusion industry, potential applicants, and other stakeholders.

Appendix B: Fusion Industry Indicator Action Matrix

The NRC, in coordination with the Agreement States, developed the action matrix below to outline the milestones the NMP will monitor to assess industry readiness for regulations or guidance that will support licensing of mass-manufactured commercial fusion machines. This matrix was developed in response to Section 205(c) of the ADVANCE Act and will help ensure the NMP develops a risk-informed, performance-based, design-specific regulatory framework for mass-manufactured fusion machines in a timeframe that meets the needs of the industry. The actions in this table, along with the actions outlined in Section 4 of this document, will foster safe, efficient, and scalable deployment of commercial fusion technology.

Milestone	Measurement	Measurement Method	Regulatory Action
Investments or power purchase agreements	Dollars invested into fusion technology development	Press releases, FIA reports, and industry engagement (drop-ins, public meetings, etc.)	Research the fusion company to understand the technology they are developing and assess any actions needed, if any, to support regulatory preparedness.
Applications for research & development fusion machine licenses	Applications for possession and use of byproduct material for use in R&D fusion machines received by the NRC or Agreement States	Coordinate with OAS and standing committee to monitor application submissions and status	Process application or provide technical assistance to Agreement States, as needed. Coordinate with Agreement States to document any lessons learned* from processing applications.
Demonstration of sustained fusion with net positive energy output (i.e., Q>1) in proof-of-concept designs	Monitored according to design type or by company	Press releases and industry engagement (drop-ins, public meetings, etc.)	Begin research of design to understand technical characteristics and associated hazards to inform guidance for licensing reviews. Coordinate with the Office of Nuclear Regulatory Research to ensure computing and modeling readiness to support technical reviews of commercial-scale designs.
Demonstration of commercial viability (i.e., $Q_{ENG} > 1$; sustained fusion with net positive electrical output)	Sustained fusion reaction netting sufficient energy gain for commercial power distribution	Press releases and industry engagement (drop-ins, public meetings, etc.)	Engage with industry to understand any impacts to timeline for commercial fusion machine deployment.
Application for first-of-a-kind commercial fusion machine license	Applications for possession and use of byproduct material for use in commercial fusion machines	Coordinate with OAS and standing committee to monitor application submissions and status	Process application or provide technical assistance to Agreement States, as needed. Coordinate with Agreement States to document any lessons learned* from processing applications.

Demonstration of in situ tritium production capability (i.e., breeder blanket)	Proven and demonstrated methodology to produce sufficient tritium for commercial fusion machine operation	Press releases and industry engagement (drop-ins, public meetings, etc.)	Research and review the tritium production methodology to understand tritium handling and accountability implications associated with the production method.
Operation of first commercial fusion machine	Sustained operation of first fusion machine that successfully generates fusion-generated electricity	Inspections, press releases, and licensee engagement	Assess lessons learned and develop additional guidance. Commence rulemaking for fusion machine certification framework.

*Lessons learned will capture both technical and administrative information learned from processing applications to possess, use, and produce byproduct material associated with novel fusion machine designs. Some examples include the need for emergency planning, quantities of tritium requested, gaps in technical readiness, and resources required to complete application reviews.

Appendix C: Completed Actions

Action	Completion Date	Lead Organization
Incorporated lessons learned from the NRC's study performed in response to Section 205(c) and industry indicator action matrix into a revision of this Vision & Strategy document (Revision 1)	Jan-26	NRC/NMSS
Delivered proposed rule and draft guidance to Commission (ML24019A060)	Dec-25	NRC/NMSS
Published the NRC Fusion Program Roadmap (ML25301A006) to the NRC's fusion website	Nov-25	NRC/NMSS
Developed industry readiness signposts and markers for implementing framework for mass-manufactured commercial fusion machines	Jul-25	NRC/NMSS NRC/Regions Agreement State Programs
Issued ADVANCE Act Section 205 Report: Evaluation of regulatory approaches that could enable efficient licensing of fusion machine designs for commercial distribution (ML25120A080)	Jul-25	NRC/NMSS NRC/Regions Agreement State Programs
Chartered Standing Committee for Fusion Machine Oversight (ML25183A025)	Jun-25	NRC/NMSS Agreement State Programs
Completed white paper on guide for fusion licensing	Jun-25	CRCPD
Revamped the NRC's public fusion website to provide information on all NRC fusion efforts	Jun-25	NRC/NMSS
Issued revision to proposed draft NUREG-1556, Volume 22 licensing guidance (ML24295A002)	Mar-25	NRC/NMSS
Developed Fusion Key Elements and participate in IAEA World Fusion Energy Group	Nov-24	IAEA (NRC participation coordinated through OIP; DOE also participating)
Completed review of Commonwealth Fusion Systems' SPARC application	Oct-24	Massachusetts Agreement State program
Held external engagement meetings on preliminary language / approach for rule and guidance	Aug-24	NRC/NMSS
Agreement State comment on proposed rule and draft guidance	Aug-24	Organization of Agreement States
Standing Committee on Compatibility evaluate and assign compatibility designations on proposed rule and draft guidance	Jul-24	NRC/NMSS Organization of Agreement States
Provided input to any legislative proposals needed to facilitate licensing of mass-produced fusion machines (Section 205 of the ADVANCE Act)	Jul-24	NRC/OGC

Completed review of Helion's Polaris application	Jul-24	Washington Agreement State program
Held MIT-led fusion technology training seminar for NRC and Agreement State staff	Nov-23	NRC/RES
Issued preliminary NRC white paper on licensing and regulating fusion (ML22252A192)	Sep-22	NRC/RES

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