TENNESSEE ESTABLISHES FIRST-IN-THE-NATION STATE REGULATORY FRAMEWORK FOR FUSION MACHINES

Date: 20 August 2026

US Policy and Regulatory Alert

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Tennessee became the first state in the United States to implement a fusion-specific regulatory framework that aligns with a federal regulatory template on 9 June 2026.[1] Administered by the Tennessee Department of Environment and Conservation's Division of Radiological Health (Division), the framework establishes state-level licensing and registration structure for fusion machines and fusion processes.[2] Tennessee implemented this new rule only months after the US Nuclear Regulatory Commission (NRC) published its proposed federal rule, "Regulatory Framework for Fusion Machines," which would revise NRC regulations principally in 10 C.F.R. Parts 20, 30, and 51, and make related definitional changes across several other NRC regulations to bring fusion machines within the existing byproduct-material licensing framework.[3] Tennessee's final rule is the latest example of Agreement State progress in Massachusetts, Washington, Wisconsin, and elsewhere in supporting the fusion industry in the United States. While Tennessee is the first in adopting a dedicated fusion-specific rule, other Agreement States like Massachusetts and Washington have issued approvals related to fusion machines under their existing frameworks.[4] Other states, like Wisconsin, have passed legislation requiring studies on siting and permitting requirements for fusion energy machines.[5] Tennessee's rulemaking may accelerate and clarify the licensing pathway for fusion machines in the state while the NRC works to finalize its rules that will establish the baseline for future Agreement State regulation of fusion machines.

BACKGROUND ON NRC'S AGREEMENT STATE PROGRAM

Congress established the Agreement State Program in 1959 by amending the Atomic Energy Act (AEA) to authorize the Commission to "enter into Agreements with the Governor of any State providing for discontinuance of the regulatory authority of the Commission" over byproduct, source, and "special nuclear materials in quantities not sufficient to form a critical mass."[6] States that enter into such an Agreement with the Commission, known as Agreement States, have authority to regulate the materials covered by the agreement for the protection of the public health and safety from radiation hazards.[7] Notably, the NRC retains the authority to regulate these materials for the protection of the common defense and security.[8]

Kentucky became the first Agreement State in 1962, and Tennessee became an Agreement State shortly thereafter in 1965.[9] As of August 2026, there are 40 Agreement States that maintain responsibility for about 90% of the nuclear materials licensed in the United States.[10] The Agreement State Program has evolved over the past 67 years; in its current form, this collective regulatory regime is administered through the National Materials

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Program, where the NRC and Agreement State regulators “function as regulatory partners...protecting public health and safety through compatible regulatory programs.”[11]

As the federal agency responsible for nuclear materials under the AEA, the NRC reviews each Agreement State program to ensure that it is adequate to protect public health and safety and compatible with the national program in an effort to maintain consistent regulation of nuclear materials licensees across the country.[12] The NRC determines whether Agreement State programs are adequate through an initial review of the state program prior to signing an Agreement, and conducts ongoing periodic reviews of state programs through the Integrated Materials Performance Evaluation Program (IMPEP).[13] Compatibility is maintained through the NRC's rulemaking process, where the agency uses “compatibility categories” to designate which regulations the Agreement States must adopt as drafted and where states have additional flexibility once “the requirements for adequate protection of public health and safety are met and compatibility is maintained.”[14] When the NRC implements new regulations on issues that Agreement States are required to adopt, Agreement States are allowed three years to issue compatible state regulations to provide the state program with the flexibility to develop the necessary procedures, allow the licensees to update any necessary programs, and ensure adequate time for training on the new requirements.[15]

TENNESSEE'S FIRST-IN-THE-NATION FUSION RULES

Agreement States, including Tennessee, have “safely regulated laboratory-scale fusion research and development systems for over 25 years.”[16] Tennessee's new fusion rules extend that experience to commercial activity by updating the state's regulations to establish requirements for the commercial “registration and/or licensing of fusion machines, fusion processes, and fusion-related activities.”[17] Unless otherwise provided, the rules apply to “persons or entities in possession or operation of a fusion machine.”[18] The rules define “fusion” as “a reaction in which at least one heavier, more stable nucleus is produced from two lighter, less stable nuclei,” and define a “fusion machine” as a machine capable of transforming atomic nuclei through fusion processes into different elements, isotopes, or other particles and directly capturing and using the resulting products, including particles, heat, or electromagnetic radiation.[19] This definition closely tracks the definition of fusion machine used in the 2024 ADVANCE Act and the NRC proposed rule, which, if adopted, would designate this definition as compatibility category “B,” meaning that the NRC requires Agreement States to adopt essentially identical regulatory language.[20]

The Tennessee framework requires a certified fusion machine registration or license from the Division of Radiological Health before a fusion machine may be activated.[21] To obtain certification, the applicant must demonstrate that it has the personnel, equipment, and facilities capable of using the fusion machine and handling associated radioactive material in a manner protective of public health, public safety, and property and that it satisfies all applicable regulatory requirements.[22]

Under the Tennessee rules, an application must include: a general description of the fusion machine; a summary of radiation-safety aspects of written operating and emergency procedures; a description of relevant radiation protection measures such as interlocks, access controls, shielding, radiation monitors, radioactive-material handling procedures, inventory control procedures, and other systems used to control radiation and radioactive material; as well as descriptions of organizational structure, radiation-safety responsibilities, training, inspection and maintenance, radioactive-material inventory methodology, and any other information requested by the

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Division.[23] Tennessee also imposes an initial nonrefundable application filing fee of US$50,000 and an annual fee equal to the greater of US$5,000 or the Division's actual expenses arising from licensing, inspection, emergency planning and implementation, and environmental surveillance activities.[24]

This structure reflects Tennessee's decision to move quickly to provide a predictable state-level licensing process for fusion projects located in Tennessee. In announcing the rule, Tennessee described itself as the first state to roll out a “technology-neutral approach to fusion regulation” and highlighted its more than 60 years of experience as an Agreement State.[25] Tennessee also tied the timing of the rules to expected commercial development near the Oak Ridge National Laboratory, specifically noting that the Type One Energy stellarator fusion power plant site is anticipated to be among the first licensees under the framework and that the site is expected to function as a fusion development campus with Oak Ridge, the Tennessee Valley Authority (TVA), and the University of Tennessee.[26]

NRC'S PROPOSED FUSION RULES

On 26 February 2026, the NRC published its limited-scope proposed rule that would amend the NRC's regulations to “augment the existing byproduct material framework to be inclusive of fusion machines.”[27] Rather than regulate fusion machines as production or utilization facilities under the traditional fission reactor licensing provisions in 10 C.F.R. Parts 50, 52, or 53, the NRC's proposed rule would keep fusion machines within the byproduct-material framework in 10 C.F.R. Part 30.[28] The proposed rule is rooted in the ADVANCE Act's statutory treatment of fusion machines. Section 205 of the ADVANCE Act amended the AEA to add a definition of “fusion machine” and to include radioactive material generated by fusion machines within the definition of byproduct material.[29] The NRC explained that the ADVANCE Act makes fusion machines a subset of particle accelerators for purposes of byproduct-material regulation, while also creating distinct regulatory treatment for fusion machines and other particle accelerators.[30] The NRC's proposed rule would require states to adopt essentially identical versions of the definition of “fusion machine” and an updated definition of byproduct material, which would now include “any material that—has been made radioactive by use of a particle accelerator, including by use of a fusion machine.”[31]

HOW TENNESSEE'S NEW RULE ALIGNS WITH THE NRC'S PROPOSED RULE

The Tennessee rules and NRC proposed rule share the same basic regulatory premise: fusion machines should be regulated under the byproduct material licensing regime rather than through the production and utilization facility regime. Tennessee's fusion rule closely follows the goals and principal elements of the NRC's proposed rule. It adopts the key compatibility “B” definitions of “fusion machine” and “byproduct material,” and it incorporates the conforming change related to waste disposal in 10 C.F.R. Part 20.[32] Although atypical for a state to promulgate its own regulations before an NRC final rule, Tennessee's first-of-a-kind rule is consistent with NRC's limited-scope proposed rulemaking, and it appears to have been designed to accommodate the core elements of the anticipated federal framework.

Both frameworks also reflect a similar technology-inclusive approach. Tennessee requires an applicant to provide specific radiation-safety information but allows the applicant to describe aspects of the fusion machine relevant to radiation safety that differ from the listed items and explain how those aspects ensure safe operation.[33] Similarly, the NRC's proposed rule would add technology-inclusive content-of-application requirements, including a general

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description of the fusion machine, operating and emergency procedures related to radiation safety, radiation-safety organizational structure, training, inspection and maintenance programs, and radioactive-material inventory methodology, while also allowing the applicant to explain how the machine's relevant safety requirements would be different from the prescribed procedures yet still would ensure safe operation.[34] Because the NRC would designate this provision as compatibility “D,” Agreement States like Tennessee would retain discretion to establish their own application requirements. With respect to waste, both the NRC and Tennessee would allow for the disposal of radioactive waste from fusion machines at existing low-level waste sites.[35]

However, the scope of environmental review requirements varies between the Tennessee state rule and the NRC's proposed federal framework. Tennessee's fusion chapter focuses on state registration, licensing, radiation-safety, inspection, training, and health-and-safety requirements, while the NRC proposed rule would also require a fusion machine applicant to submit an environmental report unless a categorical exclusion applies.[36] Because Tennessee is not bound by the same federal National Environmental Policy Act (NEPA) regulations, its state procedures and requirements need not mirror the environmental review process that would apply to an applicant under the NRC framework.

EARLY IMPLEMENTATION AND INDUSTRY ACTIVITY IN TENNESSEE

Tennessee's proactive development of its fusion rules was timely, as one fusion company, Type One Energy, has already submitted an initial application.[37] While speaking at East Tennessee Economic Council's August 2026 Nuclear Opportunities Workshop, a Type One Energy spokesperson announced that they plan to break ground in November for their commercial operations located at a former coal plant site, Bull Run Fossil Plant in Claxton, Tennessee. Type One Energy has partnered with the Tennessee Valley Authority on the development of the site. At the same workshop, the director of the Division indicated that she expects Tennessee to issue its first fusion license to Type One Energy this fall. There are more than 50 fusion companies operating in the United States, and at least four of those have a presence in Tennessee.[38] Other companies may move forward with applications for their fusion machines in Tennessee, perhaps before the NRC's rule becomes effective.

LOOKING AHEAD

Tennessee's first-in-the-nation fusion rule and the NRC's proposed federal rule are important steps toward a more predictable US fusion regulatory regime. Although the practice of Agreement States issuing regulations before the NRC finalizes its rules is uncommon, Tennessee's regulation aligns closely with the fundamental principles of the NRC proposed rule. Tennessee's efforts, prompted by the rapid growth and support for fusion energy within the state, should provide confidence for developers in the state to move forward with their plans.

The rules reduce the complexity of fusion licensing and signal that regulators are moving toward a right-sized framework that separates fusion from traditional fission-reactor licensing while still requiring substantial safety, radiation protection, waste management, and emergency-preparedness. As private fusion developers move from research machines toward pilot plants and commercial-scale energy production, regulators will continue refining regulations, application expectations, and waste pathways. Companies developing, financing, siting, or supplying fusion projects should begin aligning technical design, safety analysis, environmental strategy, waste planning, and state-federal licensing engagement early in the project lifecycle.

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The firm's Nuclear Energy practice group and Public Policy and Law practice group are closely monitoring state and federal fusion regulatory developments and are available to assist companies, investors, suppliers, and project sponsors evaluating licensing pathways, state siting opportunities, federal regulatory strategy, and the policy implications of the emerging US fusion energy market.

FOOTNOTES

[1] Tenn. Comp. R. & Regs. 0400-20-14-.01, -.02, available at https://publications.tnsosfiles.com/rules/0400/0400-20/0400-20-14.20260609.pdf.

[2] *Id*.

[3] Regulatory Framework for Fusion Machines, 91 Fed. Reg. 9476 (Feb. 26, 2026).

[4] Press Release, Commonwealth Fusion Systems Granted Radioactive Materials License for SPARC Fusion Machine (Oct. 24, 2024), https://cfs.energy/news-and-media/commonwealth-fusion-systems-granted-radioactive-materials-license-for-sparc-fusion-machine/; Press Release, Helion Granted Fusion Energy Safety License from Washington State Department of Health (July 30, 2024), https://www.helionenergy.com/newsroom/helion-granted-fusion-energy-safety-license-from-washington-state-department-of-health; Press Release, Helion clears key regulatory milestone on the path to building and operating the world's first fusion power plant (June 16, 2026), https://www.helionenergy.com/newsroom/helion-clears-key-regulatory-milestone-on-the-path-to-building-and-operating-the-worlds-first-fusion-power-plant.

[5] Press Release, University of Wisconsin-Madison College of Engineering, Wisconsin Governor, Public Service Commission, Announce Partnership with UW-Madison to Study the Future of Nuclear Energy in Wisconsin (Feb. 18, 2026), https://engineering.wisc.edu/news/wisconsin-governor-public-service-commission-announce-partnership-with-uw-madison-to-study-the-future-of-nuclear-energy-in-wisconsin/.

[6] Atomic Energy Act of 1954, 42 U.S.C. § 2021; *see also* Agreement State Program Policy Statement; Correction, 82 Fed. Reg. 48535, 48536 (Oct. 18, 2017) (Policy Statement). (The revision to the AEA originally authorized the NRC's predecessor agency, the Atomic Energy Commission, to enter into such agreements).

[7] *Id*.

[8] *See* 42 U.S.C. § 2021(m).

[9] *See* Agreement between the United States Atomic Energy Commission and the Commonwealth of Kentucky for Discontinuance of Certain Commission Regulatory Authority and Responsibility within the Commonwealth (Feb. 8, 1962), https://www.nrc.gov/sites/default/files/documents/kyagreements.pdf; Agreement Between Atomic Energy Commission and State of Tennessee Discontinuance of Certain Commission Regulatory Authority and Responsibility within the State (Aug. 20, 1965), https://www.nrc.gov/sites/default/files/documents/tnagreements.pdf.

[10] Two additional states have submitted letters of intent to become Agreement States.

[11] Policy Statement at 48535. (Notably, Agreement States are not required to prepare an environmental review of state-issued licensing actions under the National Environmental Policy Act. Many states, although not Tennessee, have equivalent or similar state-level requirements that would apply to state-issued licensing actions).

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[12] 42 U.S.C. § 2021(d); see Policy Statement at 48536–48539.

[13] *See* Policy Statement at 48536–48537.

[14] *Id*. at 48537.

[15] Physical Protection of Byproduct Material, 78 C.F.R. § 16922, 16927 (Mar. 19, 2013).

[16] 91 Fed. Reg. 9481.

[17] Tenn. Comp. R. & Regs. 0400-20-14-.01, -.02.

[18] *Id*.

[19] Tenn. Comp. R. & Regs. 0400-20-14-.03; 42 U.S.C. § 2014(dd), (e)(3)(B).

[20] 91 Fed. Reg. 9491.

[21] Tenn. Comp. R. & Regs. 0400-20-14-.06.

[22] Tenn. Comp. R. & Regs. 0400-20-14-.07.

[23] Tenn. Comp. R. & Regs. 0400-20-14-.08(2).

[24] Tenn. Comp. R. & Regs. 0400-20-14-.04.

[25] Press Release, Tennessee Department of Environment and Conservation, Tennessee Powers Up With First-In-The-Nation Fusion Regulations Starting June 9 (June 1, 2026), https://www.tn.gov/environment/news/2026/6/1/tn-powers-up-first-in-the-nation-fusion-regulations-june-9.html.

[26] *Id*.

[27] 91 Fed. Reg. 9476. The proposed rule is limited to "near term" fusion machines because the hazards of these devices "are more aligned with those of a byproduct material license." *Id*. at 9479–80. The Commission has directed the NRC staff, in consultation with the Agreement States, to continue to monitor fusion machine designs and to notify the Commission if "an anticipated fusion design presents hazards sufficiently beyond those of near-term fusion technologies." Staff Requirements — SECY-23-0001 — Options for Licensing and Regulating Fusion Energy Systems (ML23103A449).

[28] 91 Fed. Reg. 9476.

[29] Pub. L. No. 118-67 (July 9, 2024); 42 U.S.C. § 2014(dd), (e)(3)(B).

[30] 91 Fed. Reg. 9476.

[31] *See* 91 Fed. Reg. 9490–9491, 9494.

[32] Tenn. Comp. R. & Regs. 0400-20-05.32 (14), 0400-20-05.127, 0400-20-14-03(2).

[33] Tenn. Comp. R. & Regs. 0400-20-14-.08(2).

[34] Proposed 10 C.F.R. § 30.32(k).

[35] *See* 91 Fed. Reg. 9494 (proposing an update to 10 C.F.R. § 20.2008); Tenn. Comp. R. & Reg. 0400-20-11.

[36] *See* 91 Fed. Reg. 9484.

[37] *Type One Energy Submits Initial Licensing Application for Tennessee's First Commercial Fusion Project at Bull*

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Run Site, TYPE ONE ENERGY, (Jan. 29, 2026), https://typeoneenergy.com/insights-announcements/type-one-energy-initial-licensing-application-bull-run/.

[38] *Fusion Industry Association*, Global Fusion Industry Report (July 13, 2026), https://www.fusionindustryassociation.org/fusion-industry-reports/.

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