Richard P. Feynman Center for Innovation

Capability Snapshot

Technology Licensing Opportunity

Los Alamos NATIONAL LABORATORY

Accelerator-Driven Sub-Critical Molten-Salt Assembly (ADS+MSA Facility)

Unlocking commercial fusion energy through reliable, centralized tritium supply

Value Proposition

An accelerator-driven, sub-critical molten-salt nuclear system that centrally produces large quantities of tritium for fusion energy while safely consuming nuclear waste and excess plutonium. By pairing accelerator-driven subcritical operation with molten-salt chemistry, the system offers a controllable, safety-forward pathway to produce fusion fuel, recover useful energy and convert legacy nuclear liabilities into strategic energy assets.

Technology Readiness Level 3-4

IP Information for S-195186

U.S. Patent pending

Contact Information

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Overview

The Accelerator-Driven Sub-Critical Molten-Salt Assembly (ADS+MSA) is a centralized nuclear facility that uses a high-power particle accelerator coupled to a liquid molten-salt system to reliably produce kilogram-scale quantities of tritium while simultaneously consuming long-lived nuclear materials such as plutonium and used nuclear fuel. Because the system is sub-critical, nuclear reactions only occur when driven by the accelerator, providing inherent safety and operational control. By combining proven accelerator technology with modern molten-salt chemistry, the ADS+MSA removes a major bottleneck to commercial fusion energy, reduces nuclear waste liabilities, recovers useful energy, and strengthens U.S. energy security and national security missions under existing Department of Energy safety frameworks rather than commercial reactor licensing.

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Advantages

- Enables large-scale commercial fusion energy by providing a reliable, centralized source of tritium, eliminating the need for fusion plants to breed their own fuel and significantly reducing cost, complexity, and deployment risk.
- Operates in an inherently safe, sub-critical configuration in which nuclear reactions stop when the accelerator is turned off, avoiding runaway scenarios and allowing operation under DOE accelerator safety orders rather than NRC power-reactor licensing.
- Converts excess plutonium and used nuclear fuel into value by consuming government-owned nuclear materials, reducing long-term radiotoxicity and waste volumes while recovering useful thermal energy.
- Achieves extremely high tritium production efficiency, with tritium breeding ratios far exceeding those achievable in fusion reactor blankets, enabling kilogram-scale production with substantially lower accelerator power than earlier accelerator-only concepts.
- Builds on decades of proven accelerator development and growing industrial experience with molten-salt systems, reducing technical risk and enabling modular, scalable deployment as demand increases.

Market Applications

- **Fusion Energy**
- **Nuclear Waste Management**
- **Advanced Nuclear Energy**
- **Government Nuclear Asset Management**
- **Industrial Energy and Infrastructure**
- **Clean Energy and Decarbonization**

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NNSA National Nuclear Security Administration