

# Capability Snapshot

Technology Licensing Opportunity

## Deimos

An experimental testbed for advanced nuclear reactors

### Value Proposition

Deimos enables a fundamentally new way to develop advanced nuclear reactors by providing the **only national-scale pre-certified, reconfigurable testbed** where companies can experimentally validate partial reactor cores under true operating physics—without building a full reactor or redoing the safety basis each time.

### Technology Readiness Level 7

### IP Information

S-196743

### Contact Information

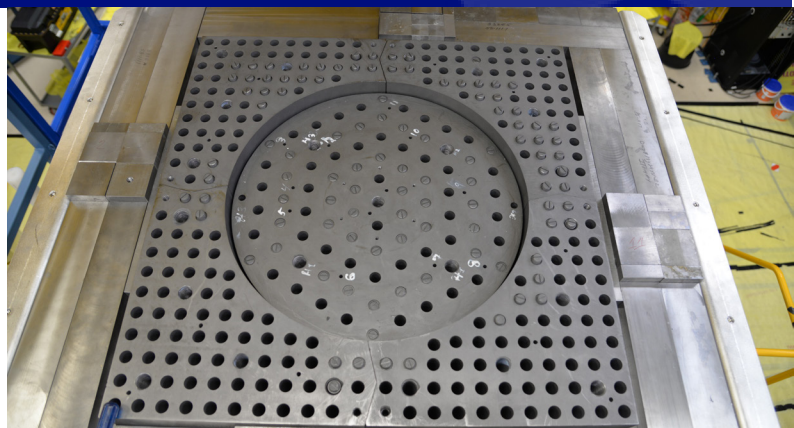
licensing@lanl.gov

### Overview

By combining a High-Assay Low-Enriched Uranium (HALEU) Tri-structural Isotropic (TRISO)-relevant neutron environment with an existing safety envelope and integrated diagnostics, Deimos enables industry to rapidly demonstrate criticality, control and safety performance with minimal fuel and cost. This capability eliminates a major bottleneck in reactor commercialization—reliance on un-validated simulations or slow, full-scale testing—reducing development timelines, lowering technical and regulatory risk, and accelerating the path from concept to licensing.

### Advantages

- **Data scarcity solved:** Data in HALEU/TRISO neutron-energy regimes have historically been limited, Deimos provides the first national-scale source of high-fidelity measurements.



Top-down view of Deimos showing the central changeable portion raised into the fixed outer portion.

- **System-level testing without a full reactor:** Validate criticality, control and safety performance using partial core assemblies.
- **Pre-approved safety basis:** Pre-approved safety envelope removes the need for a new safety basis, cutting regulatory cost and schedule.
- **Rapid, iterative experimentation:** Reconfigurable design enables fast, back-to-back testing and accelerated development cycles.
- **Relevant to modern reactor designs:** HALEU/TRISO-relevant neutron environment aligned with advanced reactor fuels.
- **Reduces risk and accelerates deployment:** Generates high-fidelity data to validate models and move designs to market faster.

### Technology Description

Deimos is a HALEU-fueled, graphite-moderated critical experiment testbed operated at the National Criticality Experiments Research Center (NCERC) at the Nevada National Security Site, designed to replicate the neutronic conditions of advanced reactor systems while enabling flexible, subsystem-scale testing. The platform is built around a two-region architecture: a fixed outer driver region containing HALEU TRISO fuel that establishes the neutron spectrum and safety basis, and a fully reconfigurable inner test region where industry-supplied fuel forms, moderators, structural components and reactor-shut-down materials can be incorporated.

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## Description continued

This configuration allows partial reactor cores to be assembled and remotely brought to criticality using a vertical lift mechanism, enabling precise measurement of key parameters such as reactivity, neutron lifetime and temperature coefficients.

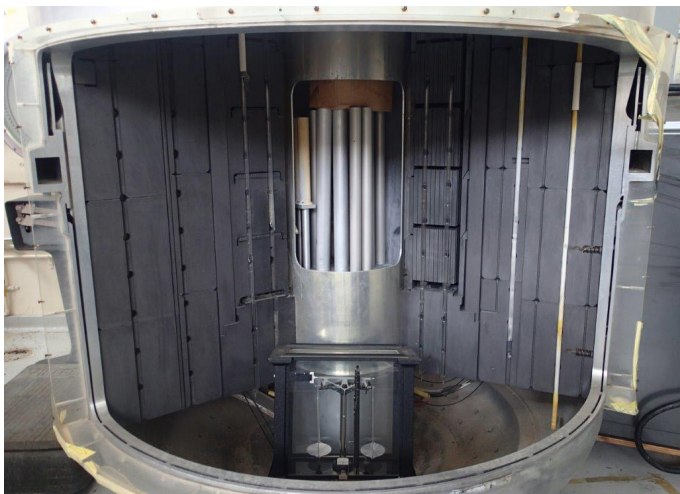
Deimos has already been used by industry partners to validate reactor physics models, fuel performance and materials to be used in shutdown systems, demonstrating its ability to support real-world reactor development programs.

A key technical innovation is the separation of safety-critical systems from the experimental core, which enables a pre-established safety envelope to remain valid across a wide range of test configurations. Because the driver region supplies the majority of the reactivity, only a fraction of the total fuel inventory is required to be supplied for the test region, significantly reducing material requirements and simplifying experiment setup.

**This architecture supports rapid reconfiguration and back-to-back testing, allowing companies to iterate on designs and generate high-fidelity validation data in neutron energy regimes relevant to HALEU-based systems—where data have historically been limited.** As a result, Deimos is not only a unique national capability, but an accessible pathway for reactor developers to reduce uncertainty, accelerate licensing, and bring advanced nuclear technologies to market.

## Market Applications

- **Advanced Nuclear Reactor Developers**
- **Nuclear Fuel Developers and Suppliers**
- **Engineering, Procurement, and Construction (EPC) & Reactor Integrators**
- **Defense and Remote Power Applications**



## Next Steps

**Deimos is available now for collaborative testing—engage early to accelerate your reactor development timeline.**

**Engage with the Feynman Center for Innovation and the Deimos team.**

Initiate a discussion to assess fit, define objectives, and identify how your reactor concept can be tested within the platform.

**Define test configuration and requirements.**

Collaborate with LANL experts to design an experiment, including fuel type, materials, geometry, and key performance metrics.

**Establish partnership mechanism.**

Execute an appropriate agreement (e.g., Cooperative Research and Development Agreement, Strategic Partnership Project).

**Prepare and deliver test articles.**

Provide required materials (e.g., fuel, moderators, components) and supporting design data for integration into the test region.

**Conduct testing and analyze results.**

Perform experiments at NCERC with integrated diagnostics, generating high-fidelity data to validate models, support licensing, and guide design iteration.



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