



Michael Ruddell

Idaho National Laboratory

**Senior Manager – Advanced
Reactor Demonstration**

9/24/2026

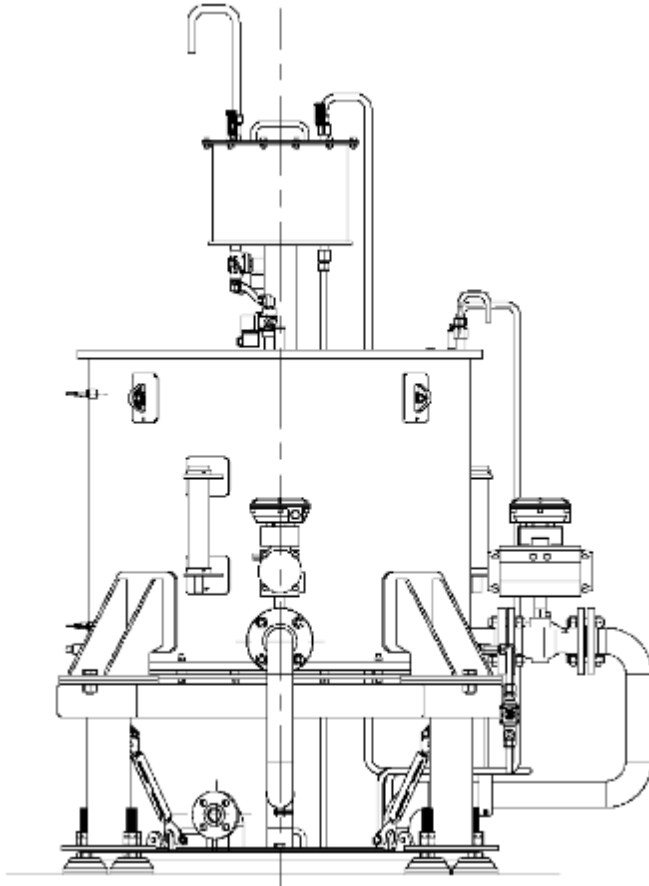
Authorization for Startup of the Deployable Energy UNITY Reactor through DOE-STD-1271 and NE Order 425.1

Battelle Energy Alliance manages INL for the
U.S. Department of Energy's Office of Nuclear Energy



Idaho National Laboratory

Deployable Energy UNITY Criticality Test



<1 Watt thermal power output

LEU (~5% enriched)

Uranium Dioxide fuel pellets

Light water moderator controlled

DOE-STD-1271-2025 VS DOE-STD-1189-2016

- DOE-STD-1271

1. PURPOSE: Streamlined authorization pathway for NE nuclear facilities
2. APPLICABILITY: Onsite/offsite NE-authorized nuclear facilities incl. test reactors
3. PROCESS: NSDA → PDSA → DSA → Startup (authorization focus)
4. DESIGN: Efficient regulatory alignment, flexibility, negotiation of requirements
5. PRODUCTS: NSDA, PDSA, DSA, autonomous ops guidance, test reactor guidance

- DOE-STD-1189

1. PURPOSE: Safety-in-design integration for HC-1/2/3 facilities under DOE O 413.3B
2. APPLICABILITY: Design & construction of DOE hazard category facilities
3. PROCESS: Pre-conceptual → CD phases → design maturity → hazard analysis
4. DESIGN: Conservative safety margins, structured hazard integration, SMP alignment
5. PRODUCTS: SDS, CSDR, PDSA, DSA/TSRs, SMP interfaces, major modification guidance

DOE-STD-1271 for UNITY



- Establishes **early negotiation of requirements** through a Nuclear Safety Design Agreement (NSDA)
- Provides **sequential development** of Preliminary and Final Documented Safety Analyses
- Integrates **design maturation with hazard evaluation** throughout the authorization process
- Supports **expedited review** under recent Executive Orders
- Anticipates leveraging **DOE-authorized designs** as a pathway toward **future NRC licensing**

NE O 425.1 VS DOE O 425.1E

- NE O 425.1
 1. PURPOSE: NE-specific readiness review process for HC-1 and HC-2 facilities
 2. APPLICABILITY: Applies only to NE-authorized HC-1 and HC-2 facilities
 3. PROCESS: Uses Intent-to-Startup notification; segmented RRs allowed
 4. AUTHORIZATION: Secretary of Energy, SBAA, or Senior Contractor Official for many on-site HC-1/2 startups, per table
 5. MODIFICATIONS: Major modifications determined via DOE-STD-1189
- DOE O 425.1E
 1. PURPOSE: Department-wide readiness review requirements for HC-1/2/3 facilities
 2. APPLICABILITY: Applies broadly to all DOE/NNSA HC-1/2/3 nuclear facilities
 3. PROCESS: Uses Startup Notification Report (SNR); formal POA/IP; parallel reviews allowed in specific cases
 4. AUTHORIZATION: PSO/CSO or Secretary of Energy for high-significance cases; broader hierarchy
 5. MODIFICATIONS: Uses substantial modification criteria in Attachment 5; more detailed triggers

NE O 425.1 Timelines



90-day Notification of Intent to Startup (before RR begins)

30-day SBAA approval window for Review Plan (RP)

1-week document review, 1-week onsite review, 1-week final report

Segmented readiness reviews allowed (timeline adjusted in RP)

NE O 425.1 for UNITY

- Establishes a formal **readiness review process** for Hazard Category 1 and 2 facilities
- Requires verification of **system operability, safety management program implementation, and documented safety basis adequacy** before startup authorization
- Places the **Startup Approval Authority (SAA)** as the official who must validate readiness prior to reactor startup
- Implements a structured workflow:
 - **Intent-to-startup notification**
 - **Graded readiness plans**
 - **On-site demonstrations and evaluations**
 - **Final readiness reporting**
- Ensures UNITY's deployment meets DOE's expectations for **adequate protection of workers, the public, and the environment**





Joint Test Group

Advanced Reactor Joint Test Group (JTG) – Local Agreement INL and DOE-ID

- **Purpose:** Provides oversight of startup, commissioning, and initial testing to ensure safe transition to operations.
- **Scope:** Reviews/approves test plans, oversees test execution, controls changes, and operates from post-Readiness Review through unrestricted operations.

Core Roles

- **JTG Chair:** Establishes JTG, manages meetings, documents decisions, escalates issues.
- **JTG Team:** Multidisciplinary group ensuring tests meet safety basis, approving test documents/hold points, assessing deviations, and escalating unresolved issues.
- **Senior Oversight Committee:** Approves issues beyond JTG authority, especially those outside safety analysis bounds.

Key Processes

- Validate test plans against safety basis; review revisions and acceptance criteria.
- Document all decisions and required controls in facility logbook.
- Use USQ process for deviations; escalate when necessary.

Outcomes!

- Project contract signed to critical reactor: 155 days
- NSDA submittal to approval: 39 days
- PDSA submittal to approval: 46 days
- DSA submittal to approval: 27 days
- DSA implementation: 0.5 days
- DOE Readiness Review: 10 days
 - 2 Pre-Start findings (corrected before the end of the RR), 0 Post-Start findings



Alignment with 10 CFR Part 57

- DOE's new framework aligns with the NRC's emerging **risk-informed, performance-based** licensing approach under proposed **10 CFR Part 57**
- Part 57 emphasizes:
 - **Flexibility** for diverse reactor technologies
 - **Fleet-wide licensing** strategies
 - **Manufacturing approvals** for standardized designs
 - **Streamlined applications** to reduce duplication and shorten review timelines
- UNITY's DOE authorization pathway reflects this same **design-centric, standardized, and integrated** regulatory philosophy
- The approach—negotiated requirements, integrated safety analysis, and formal readiness verification—mirrors the structure Part 57 intends to adopt
- Result: UNITY is positioned for **efficient transition to NRC oversight**, leveraging DOE-vetted safety bases and operational programs as **foundational inputs** once Part 57 is finalized, reducing regulatory burden and accelerating licensing





Battelle Energy Alliance manages INL for the U.S. Department of Energy's Office of Nuclear Energy. INL is the nation's center for nuclear energy research and development, and also performs research in each of DOE's strategic goal areas: energy, national security, science and the environment.

WWW.INL.GOV