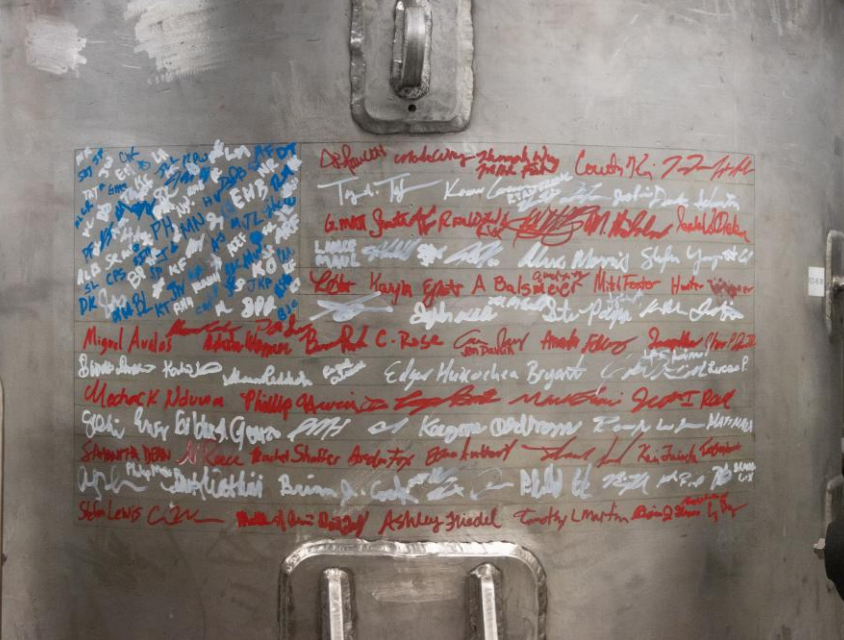




September 22, 2026

Charles P Jones III
NRAD SRO/ Shift Supervisor

Gabe Topete
NRAD Reactor Operator



Deployable Energy's UNITY Critical Assembly

NRADs North Radiography Cell

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

INL Idaho National Laboratory

Executive Order

- *Sec. 5. Establishing a Pilot Program Outside the National Laboratories.* (a) The Secretary shall create a pilot program for reactor construction and operation outside the National Laboratories, pursuant to the Atomic Energy Act's authorization of reactors under the Department's sufficient control, including reactors "under contract with and for the account of" the Department, in accordance with 42 U.S.C. 2140. The Secretary shall approve at least three reactors pursuant to this pilot program with the goal of achieving criticality in each of the three reactors by **July 4, 2026**.



Chow, Denise, et al. "Trump Signs Executive Orders Aimed at Easing Regulations on and Expanding Nuclear Energy Production." *NBCNews.Com*, NBCUniversal News Group, 23 May 2025, www.nbcnews.com/politics/trump-administration/trump-signs-executive-orders-aimed-expanding-easing-regulations-nuclear-rcna208788.

Overview

- Facility Modifications
- Safety Basis Addendum
- Equipment Checkout & Installation
- Training/ Procedures
- Reactor Design
- Fuel Assembly
- Process Flow
- Readiness
- Operations/Criticality



Patel, Shafaq. "Exclusive: Houston Startup Races to Power up Nuclear Microreactor - Axios Houston." AXIOS Huston, 29 Apr. 2026, www.axios.com/local/houston/2026/04/29/houston-nuclear-startup-deployable-energy-idaho-reactor.

Facility Modifications

- Returned North Radiography Station (NRS) high bay crane to service
- Removed NRS equipment
 - Elevator
 - Digital Imaging System
 - Radiography Foil Track
 - Ventilation
- Installed conduit & instrument air lines
- Installed UNITY console control cabinets



Safety Basis Addendum Instead of Revision

- DOE Authorization Process for Nuclear Facilities
 - Nuclear Safety Design Agreement
 - Preliminary Documented Safety Analysis
 - Safety Analysis Report & Technical Safety Requirements
- Addendum to existing nuclear facility (less overall work)
 - Implementation was completed in less than 1 business day

	NSDA	PDSA	DSA
Submittal Date	2/13/2026	3/27/26	5/15/2026
Approval Date	3/24/2026	5/12/2026	6/11/2026
Number of Days	39	46	27

Equipment Checkout & Installation

- Inspection & testing of calandria & auxiliary components
 - Ensured items met INL's quality level for use in nuclear facilities
 - Uncertainty with getting nuclear instruments & fuel in time
 - Qualification of spare NRAD fission chambers



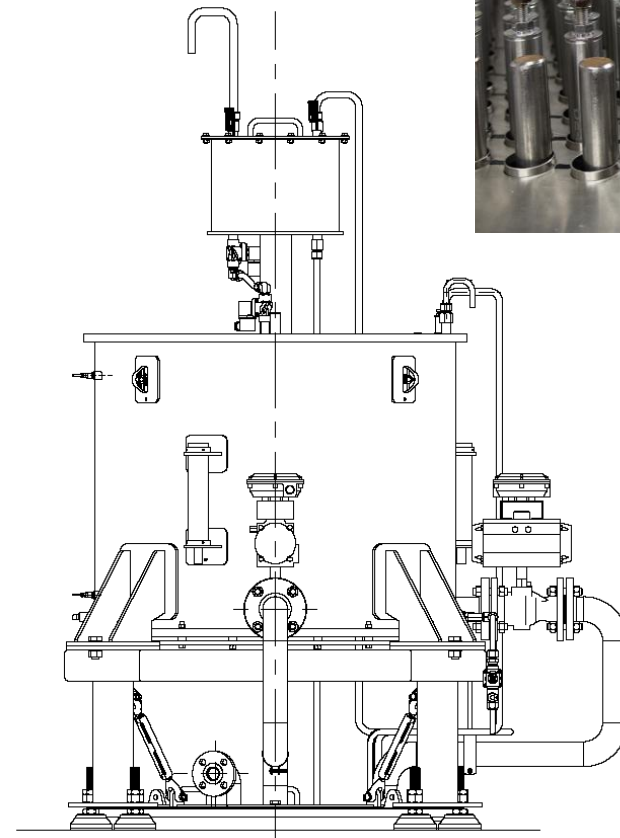
Training & Procedures

- Development of qualifications & classroom training for operations, maintenance, engineering, etc.
- Procedures written for
 - Detector/Equipment setup
 - Surveillance & pre-start checks
 - Core loading & approach to critical
 - Core unloading
 - Fuel rod assembly
 - Off normal response
 - Combustible loading program
 - 1/M Spreadsheet



Reactor Design

- CANDU inspired design
- 4.95% Enriched UO₂ fuel
- Light water moderated
- Header tank used to control light water addition
 - Limited rate & volume
 - Interlocked valves
- Calandria (fuel tank) holds several hundred fuel elements
- Drain tank
- High-capacity drain valves
- Fine control drain valve



Fuel assembly

- Amend NRC criticality controls to allow storage & assembly of fuel rods
- Training & qualifications for fuel handling & fabrication
- 5 days to fully assemble several hundred fuel rods
- Strict radiological controls & material tracking requirements



Process Flow

- Load fuel tank
 - Evacuate area and lock cell
- Add water to the header tank
- Drain from header tank to calandria
- Repeat additions until calandria is full or criticality is achieved while observing neutron population
- Generate $1/M$ plot as calandria is filled
- Drain water from calandria to drain tank by way of high-capacity drain valves
- Re-enter cell & load additional fuel



Readiness

- DOE team reviewed design, procedures, training, implementation of technical safety requirements, etc.
- Observed execution of all operational procedures
- Interviewed operations and technical staff
- Review completed in 10 days
- Readiness process covered in detail during M. Ruddell's presentation on Thursday



Fueling & Approach to Criticality - June 30th 11:55pm

- Entire process from initial loading to criticality occurred in 2 days
- Pump failure on final approach to criticality:
 - Material & Fuels Complex maintenance & engineering teams mobilized in a matter of minutes to begin troubleshoot & repair
 - Back to operations within the hour
- Validation of modeling:
 - Close match between modeled & actual number of fuel rods to achieve criticality
 - Off by approx. 2-5 rods depending on reference model



Acknowledgments

- DOE Idaho
- MFC Maintenance
- MFC Radcon
- NRAD Operations
- HFEF Operations
- FCF Operations
- ZPPR Operations
- NRIC Support
- INL Communications
- INL Document Control

Special Thanks

- Deployable Energy Staff
- Reactor Projects Engineering
- MFC Nuclear & Criticality Safety
- Reactors Engineering
- MFC Quality
- INL Radiation Measurements Team
- Reactors Division Support Staff
- MFC Operations Management
- MFC & Reactors Division Training
- MFC Safeguards & Security

and many many many more

Questions





Idaho National Laboratory

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.