IDAHO NATIONAL LABORATORY

FY 2026
NUCLEAR SCIENCE & TECHNOLOGY
RESEARCH IMPACTS













A MESSAGE FROM ASSOCIATE LABORATORY DIRECTOR JESS GEHIN

This past year has been one of extraordinary momentum for Nuclear Science and Technology (NS&T), and I could not be prouder of what this team has delivered. Nothing captured that momentum more visibly than this summer's criticality milestones.

Under the U.S. Department of Energy (DOE) Reactor Pilot Program, established by Executive Order (EO) 14301, "Reforming Nuclear Reactor Testing at the Department of Energy," to accelerate advanced reactor testing, four industry-led reactors achieved criticality just weeks apart—one more than the EO called for, and all ahead of the July 4, 2026 deadline. Three of those reactors (Antares Nuclear's Mark-0, Aalo Atomics' Critical Test Reactor [CTR], and Deployable Energy's Unity) reached criticality here at the Idaho National Laboratory (INL), and a fourth (Valar Atomics) achieved criticality at its Utah facility with fuel that INL received, stored, and coordinated for shipment on extraordinarily short notice. A fifth reactor (Oklo's Groves Isotope Test Reactor) followed in August with direct INL support in Texas. This is the most consequential stretch of reactor testing this country has seen in half a century, and it happened because teams from across the laboratory integrated the full breadth of INL's capabilities to achieve this historic outcome.

That same drive to move faster and deliver more showed up across every part of our mission this year. In advanced reactor development, we completed construction of the National Reactor Innovation Center (NRIC) Demonstration of Microreactor Experiments (DOME) test bed nearly 1 year ahead of schedule, stood up the Molten Salt Thermophysical Experiment Capability (MSTEC), and established the NRIC Nuclear Energy Launch Pad — a long-term partnership framework giving developers streamlined pathways to build and test at INL or other sites nationwide.

> *"This is the most consequential stretch of reactor testing this country has seen in half a century, and it happened because teams from across the laboratory integrated the full breadth of INL's capabilities to achieve this historic outcome."*
>
> **— Jess Gehin, Associate Lab Director, INL**

Key reactor projects are advancing with completion of the fabrication for the primary coolant system and fuel element production for Microreactor Application Research Validation and Evaluation (MARVEL). On the Molten Chloride Reactor Experiment (MCRE), we worked with project partners on a design pivot to a static core that cut several years and more than $100M from the project's cost. And the Versatile Autonomous Lightweight Kilowatt-class Reactor Experiment (VALKRE) reactor development is progressing well. These will be new reactors that will achieve criticality next year.

In space and defense, we received the tristructural isotropic (TRISO) particle fuel for Project Pele and secured DOE approval of the project's Preliminary Documented Safety Analysis, clearing the way toward a mobile nuclear power plant for the Department of War. INL supported technical assessments that helped inform the Army's selection of five vendors for the new Janus Program, which will deploy microreactors at military installations across the country. On the space side, work is well underway on SR-1 Freedom, the reactor that will power the nation's first nuclear electric propulsion mission to Mars, with the National Aeronautics and Space Administration (NASA) Administrator and delegation visiting INL this summer to review the progress.

In computing and super intelligence (SI), commonly referred to as artificial intelligence, we secured the Genesis Mission Phase II Prometheus award—a first-of-its-kind recognition for the nuclear sector, delivering $60M in DOE funding, $30M in private-sector funding, and substantial in-kind support across 32 partners. This project will change how reactors are designed, developed, and operated. We launched Arco, an NVIDIA H200 GPU-accelerated supercomputing system, alongside the Teton supercomputer that came online earlier this year, and the INL Computing Facility was officially designated a DOE user facility—the nation's largest computing resources dedicated to nuclear energy. Our teams also demonstrated the first remote, limited autonomous operation of an active nuclear reactor on Purdue's PUR-1, a full year ahead of schedule.

In fuel development and testing, our teams executed a remarkable slate of first-of-a-kind achievements: the HERA-HBU-2 and -3 tests on high-burnup accident-tolerant fuel in Transient Reactor Test Facility (TREAT); the first new flowing-sodium loop for use in TREAT in more than 30 years, in support of TerraPower's Natrium license application; the first irradiation of X-energy's pebble fuel in the Advanced Test Reactor; the IMPACT experiment, the first anywhere to irradiate instrumented metallic fuel pins with sensors embedded inside; and the launch of AMIX to answer critical safety questions about TRISO fuel behavior. In the molten salt reactor area, we streamlined the fuel-salt production process for MCRE, compressing a 2-week synthesis into a single day.

In fusion, we brought the Tritium Extraction eXperiment (TEX) online—the first U.S. system to demonstrate tritium extraction from a flowing liquid breeder loop—completed the first irradiation test of six candidate tritium-breeding materials, and were selected by General Atomics as a partner to design the nation's first full-scale fusion blanket test facility. INL's TMAP8 tritium modeling platform earned an R&D 100 Award, one of two won by NS&T this year.

On the operating fleet, we supported the first-ever approved upgrade of an operating U.S. nuclear plant's control systems from analog to digital, at Limerick Generating Station in Pennsylvania, and launched work in direct support of DOE's Utility Power Reactor Incremental Scaling Effort (UPRISE) initiative—an effort to add the equivalent of five large power plants' worth of electricity to the grid without building anything new.

These are not incremental gains—they are proof the U.S. nuclear enterprise is accelerating, and that INL is leading the way. Every accomplishment here reflects disciplined collaboration across the laboratory and with partners in industry, academia, and government, in direct support of the four nuclear executive orders that have redefined this moment. What follows is a snapshot of that progress, organized by mission area, for anyone who wants to understand what INL is building and why it matters.

Watch key highlights in this short documentary:
https://www.youtube.com/watch?v=7Ev0reeahHY&t=608s

Jess C. Gehin, Ph.D.
Associate Laboratory Director,
Nuclear Science and Technology



SECTION 1

ADVANCED REACTOR DEVELOPMENT AND TESTING

Supporting National Priorities Through Executive Orders

A series of EOs issued this year called on the Idaho National Laboratory (INL) to move faster, open our doors wider to industry, and strengthen United States (U.S.) nuclear leadership. INL delivered on all fronts.

"Criticality" is the moment a reactor's nuclear chain reaction becomes self-sustaining. Essentially, the reactor is turning on for the first time. The EO called for at least three industry-led test reactors to hit this milestone by July 4, 2026. INL's support helped four companies get there:



From left to right: Kyle Haustveit, DOE under secretary of energy; Bob Boston, manager of DOE Idaho Operations Office; John Wagner, INL director; Chris Wright, energy secretary; Ted Garrish, DOE-NE assistant secretary; Rian Bahran, then deputy assistant secretary of DOE for nuclear reactors; and Mike Goff, principal deputy assistant secretary of DOE Office of Nuclear Energy.

FOUR REACTORS REACHED CRITICALITY—ONE MORE THAN REQUIRED BEFORE JULY 4 AND THEN ANOTHER IN AUGUST 2026.



Antares CEO Jordan Bramble and team celebrating criticality.

ENERGY.GOV

June 4, 2026

Department of Energy Celebrates First Advanced Reactor Criticality

Today, as part of the DOE Reactor Pilot Program, Antares Nuclear's advanced reactor design, the Mark-0, successfully completed a zero-power fueled criticality demonstration at DOE's INL.

https://www.energy.gov/articles/department-energy-celebrates-first-advanced-reactor-criticality

Antares Nuclear

Antares Nuclear reached criticality on June 18, 2026. It was the first reactor to do so under this Department of Energy (DOE) program. INL compressed what would normally take years into about 12 months by repurposing an existing test facility, reusing fuel infrastructure already onsite, and helping prepare the extensive safety paperwork required for federal authorization.

> *Through its work with Antares, INL has demonstrated the responsive, partnership-oriented approach envisioned by DOE when establishing this notable outcome. These efforts assist the private sector and DOE in fulfilling the requirements of Executive Order 14301 and advancing the nation's nuclear energy objectives."* **— Jason Andrus, Head of Nuclear Operations and Regulatory Affairs, Antares Nuclear Inc.**



Valar Atomics criticality of the Ward 250 reactor. (Photo: Isaiah Taylor/LinkedIn)

Valar Atomics

Valar Atomics reached criticality and began generating usable power on June 18, 2026. When the location for receiving the reactor's nuclear fuel changed with less than 1 day's notice, INL mobilized to accept and store the fuel, then coordinated with federal transportation officials to resolve a shipping issue within 2 days—getting the fuel to Valar's Utah facility the same day it was authorized to arrive.

> *Our schedule demanded delivery the same day DOE authorized our Utah facility to store and handle the fuel. INL coordinated with Valar and DOE, and the shipment moved the moment approval came through.* **— Mark Mitchell, CNO, Valar Atomics Inc.**

NUCLEARNEWSWIRE

Jun 22, 2026

Valar's Ward 250 reaches criticality in Utah

The DOE celebrated the achievement in a June 18 announcement, describing it as a "zero-power fueled criticality demonstration"

https://www.ans.org/news/2026-06-22/article-8136/valars-ward-250-reaches-criticality-in-utah/



Deployable Energy team with their reactor vessel.

POWER

July 1, 2026

Deployable Energy's Unity Nuclear Reactor Achieves Criticality at INL, Third Under DOE Nuclear Push

Deployable Energy's Unity demonstration reactor has achieved criticality at INL, making it the third DOE–authorized advanced reactor to reach the milestone ahead of the July 4 deadline set under President Trump's May 2025 nuclear executive order.

https://www.powermag.com/deployable-energys-unity-nuclear-reactor-achieves-criticality-at-inl-third-under-doe-nuclear-push/

Deployable Energy

Deployable Energy reached criticality on June 30, 2026—just 156 days after the project began. INL housed the compact reactor in the Hot Fuel Examination Facility and led the safety planning, engineering, and installation from start to finish.

> *(INL's) integrated technical expertise, disciplined safety and engineering processes, and ability to solve issues in real time were essential to achieving criticality on this schedule."* **— Bobby Gallagher, CEO & CTO, Deployable Energy**



Aalo Atomics prepares for criticality at INL.

Aalo Atomics

Aalo Atomics reached criticality just after midnight on July 4, 2026. When last-minute readiness issues threatened to delay the milestone, INL sent reactor operations and safety experts to work side-by-side with Aalo's team, and modified contracts in just 3 days to make that support possible.

> *(INL's) personnel supplied expertise, responsiveness, and problem-solving needed to achieve CTR criticality, a significant milestone in Aalo's reactor development program that advances our path toward deployment."* — **JR Biggs, Senior VP Nuclear Operations, Aalo Atomics**

BUSINESSWIRE

July 6, 2026

Aalo Atomics Achieves Criticality Milestone; Meets Executive Order Goal

From Founding to Fission in Less than Three Years, Aalo on Track to Become the Preeminent Nuclear Power Source for Modern AI Data Centers

https://www.businesswire.com/news/home/20260706396342/en/Aalo-Atomics-Achieves-Criticality-Milestone-Meets-Executive-Order-Goal



EO 14302 — Strengthening the Operating Fleet

One of the most cost-effective ways to produce more energy is to get more power out of the nuclear plants we already have, without building anything new. INL is helping make that possible on three fronts.

First, INL conducted a critical safety test on nuclear fuel that has been used longer and at higher intensity than standard fuel. The test simulates the kind of sudden power surge a reactor might experience during emergency operations, and the results confirm how that fuel responds under stress. That data is now helping Westinghouse—one of the world's leading nuclear companies—move through the federal licensing process needed to use this fuel more broadly, which means more efficient, longer-running reactors across the country.

Second, INL launched a national working group focused on increasing the output of existing U.S. reactors through the Utility Power Reactor Incremental Scaling Effort (UPRISE) initiative. The goal: add the equivalent of five large power plants' worth of electricity to the grid, not by building new plants, but by safely increasing the capacity of reactors already operating. That is a significant contribution to U.S. energy security, achieved at a fraction of the cost of new construction. See Section 2 for more information.

Third, INL is helping modernize the outdated controls that keep these plants running safely. The Nuclear Regulatory Commission recently approved Constellation's plan to replace the analog safety systems at its Limerick plant with a modern digital protection system, which is the first large-scale digital safety upgrade ever approved for an operating U.S. nuclear plant. INL's Human Systems Simulation Laboratory, supported by DOE's Light Water Reactor Sustainability Program, provided the human-factors research behind the control room redesign, testing how operators would work with the new systems before the plan went to regulators. The result is a more reliable, more secure plant, and a proven path for the rest of the U.S. fleet to make the same upgrade.



Nuclear News April 2026

A new pathway for industry: the NRIC Nuclear Energy Launch Pad

In February 2026, NRIC launched the Nuclear Energy Launch Pad, which is the next chapter of DOE's pilot programs that offers a structured on-ramp for companies wanting to pilot nuclear energy and fuel-cycle technologies. The initiative gives developers two ways to move forward: Launch Pad INL, a 2,000-acre site on federal land at INL offering direct access to the laboratory's facilities, decades of nuclear expertise, and streamlined regulatory support; and Launch Pad USA, which extends that same framework to federal and non-federal sites elsewhere in the country. Together, the two pathways let companies choose the location and setup that best fits their project while still drawing on the same authorization framework and hands-on national laboratory support.

After NRIC opened applications in April, the program drew strong interest from developers, and 13 projects were announced in August. This effort draws on the same NRIC Nuclear Energy Launch Pad people and funding mechanisms at INL that enabled the DOME test bed, mentioned earlier, to finish construction 1 year ahead of schedule.

NRIC also completed and commissioned the Molten Salt Thermophysical Experiment Capability (MSTEC), a first-of-its-kind shielded facility that advances the nation's ability to develop molten salt reactor technologies.

LOCAL NEWS 8

August 25, 2026

INL building up 2,000-acre Nuclear Energy Launch Pad in Idaho Desert

Twelve companies and 13 projects have been selected to participate in the Nuclear Energy Launch Pad program, which is hosted by the National Reactor Innovation Center (NRIC) and will be located at the Central Facilities Area.

bit.ly/3V5uFRy



INL's reach extended to all five reactors that achieved criticality under the pilot program; NRIC held contracts to support each one. The fifth, Oklo's Groves Isotope Test Reactor, reached criticality on August 5, 2026 with direct support from an INL team dispatched to Texas to help ensure the facility's readiness.

DOME: LEGACY BUILT, FUTURE READY

A NUCLEAR NEWS PHOTO FEATURE

In 2019, a familiar landmark at Idaho National Laboratory was scheduled for demolition. Though striking for both its physical presence and its significance to nuclear history, the containment dome that once housed Experimental Breeder Reactor-II sat unused—that is, until INL realized its potential as a reactor testing facility.

EBR-II's distinctive dome was spared, and that same year, the National Reactor Innovation Center was formed with the mission of partnering with industry to develop and deploy advanced reactor technologies.

Plans for the DOME—Demonstration of Microreactor Experiments—test bed began to coalesce, and refurbishment and construction kicked off in October 2023.

In May 2025, INL received priority rating authorization from the federal government to expedite construction under the Defense Production Act, and with the help of industry leaders like construction contractor Estech and crane and rigging contractor Barnhart, NRIC's DOME officially celebrated its grand opening on April 8, 2026.

At the opening, INL Director John Wagner said, "DOME represents the kind of bold and creative infrastructure investment that America's nuclear resurgence demands."

NRIC Director Brad Tomer agreed, saying, "With the information gathered from their testing at DOME, reactor developers will turn pioneering ideas into validated technologies to advance nuclear energy. We are extremely proud to offer this capability and cannot wait to see the impact it has on the nuclear industry."

Whether it's the three layers of aluminum paint gleaming in the Idaho sun, its astonishing modification from containment structure to high-tech test bed, or the industry-changing advances that will be made in this facility, it will be hard for the world to turn its eyes away from DOME.

Continued



Unless otherwise noted, all photos are courtesy of Idaho National Laboratory.

THE WALL STREET JOURNAL

August 18, 2026

Inside the Race to Build America's First Nuclear Reactor in a Generation

Renewed interest in atomic energy and AI mania are colliding at the Idaho National Lab

https://www.wsj.com/finance/investing/inside-the-race-to-build-americas-first-nuclear-reactor-in-a-generation-b17ea0c2?st=9eXWMN&reflink=desktopwebshare_permalink

POWER

August 25, 2026

NRIC Adds 13 Projects to Nuclear Energy Launch Pad, Expanding Advanced Reactor and Fuel-Cycle Pipeline

The selections—spanning microreactor developers, enrichment startups, fuel fabrication firms, and isotope producers—add the first major round since NRIC opened the program to broader industry applications in late April and set a July 8 deadline for its initial competitive round.

https://www.powermag.com/nric-adds-13-projects-to-nuclear-energy-launch-pad-expanding-advanced-reactor-and-fuel-cycle-pipeline/

FORBES

July 2, 2026

Trump Meets Own July 4 Deadline To Go 'Critical' With Three New Mini Nuclear Reactors

With help from the government and national labs, these new nuke startups have achieved successful testing or 'criticality' to satisfy a presidential challenge.

https://www.forbes.com/sites/christopherhelman/2026/07/02/new-atomic-age-underway-as-three-mini-reactors-go-critical-by-trumps-july-4-deadline/

A CLOSER LOOK AT WHAT "SUPPORTING INDUSTRY" MEANT THIS YEAR:

Turning a presidential directive into real, working reactors required INL to become something like an air-traffic controller for an entire industry, including coordinating dozens of moving parts across multiple companies, all racing toward the same deadline. The details are as follows.

NRIC completed construction of the Demonstration of Microreactor Experiments (DOME) test bed nearly 1 year ahead of schedule. That milestone let the team begin the installation of the first DOME microreactor test in spring 2026. INL also supported eight of the ten DOE Reactor Pilot Program selectees and worked with seven developers to build credible paths to reactor criticality by July 4, 2026.

Building the fast lane

INL pulled together senior staff from 12 different specialty areas across the laboratory to create a streamlined system for approving industry projects. Using ready-made agreement templates instead of starting from scratch each time, this team supported 46 new industry agreements over the course of the year. When problems arose, the team moved fast, including turning around the Preliminary Documented Safety Analysis (PDSA), for Aalo Atomics in just 24 hours, and helping Oklo shave 6 months off its schedule by speeding up the release of technical data the company needed.

> *Over the past year, INL and NRIC have provided substantial hands-on support that has directly accelerated the KDU program… This level of collaboration underscores the unique value NRIC provides: dedicated responsive infrastructure and labor support that would be difficult or impossible for Radiant to secure independently."* **— Rita Baranwal, Chief Nuclear Officer, Radiant**

NPR

June 29, 2026

Red, white and glowing blue: Trump's push for new reactors reaches the finish line

A lot of the action is happening at the Department of Energy's Idaho National Laboratory, where several of the companies have set up shop. One of them is Radiant, which hopes to build small reactors for everything from disaster relief to data centers.

https://www.npr.org/2026/06/29/nx-s1-5847944/new-nuclear-reactors-america-250-safety-concerns

EAST IDAHO NEWS

September 12, 2025

America built nuclear power in Idaho first. Now it's doing it again.

Idaho was the cradle for the first atomic age. Now, decades later, it is again the birthplace of accelerated nuclear innovation that ushers in the next nuclear golden age.

https://www.eastidahonews.com/2026/09/america-built-nuclear-power-in-idaho-first-now-its-doing-it-again/

USING READY-MADE AGREEMENT TEMPLATES INSTEAD OF STARTING FROM SCRATCH EACH TIME, THIS TEAM SUPPORTED 46 NEW INDUSTRY AGREEMENTS OVER THE COURSE OF THE YEAR.



MARVEL team at Carolina Fabricators Inc. who fabricated and assembled the primary coolant system.

MARVEL Microreactor Progressing to Initial Criticality

MARVEL is INL's compact, experimental microreactor—small enough to fit in a large room, yet capable of producing heat and electricity to support reactor research and development. This year, the team completed the analyses and hardware needed to lay the groundwork for a major milestone: dry criticality, targeted for fiscal year (FY) 2027.

Dry criticality occurs when a reactor sustains a controlled nuclear chain reaction for the first time, without yet running coolant through the system. It is a carefully managed, heavily monitored test that confirms the core is working as designed before full operations begin. Reaching this milestone is one of the most significant steps in bringing any new reactor to life. Earlier this year, the project shifted to a new management structure directed by DOE, which gave the team a clear schedule.

The team completed structural and safety analyses by finalizing the safety basis for dry criticality and submitting the final Documented Safety Analysis to DOE in May 2026, which was approved by DOE's Idaho Office in September 2026. The team also finished building key reactor components, validated the system that controls the reactor's power level, and produced the first MARVEL fuel elements. INL worked closely with TRIGA International to work through fuel fabrication challenges; 14 fuel elements are complete, with 23 on track for November delivery, supporting MARVEL's December 2026 dry criticality date. Another milestone was the delivery of the reactor guard vessel in September. Fabrication of the reactor's remaining major components is on track for completion in FY 2026.

Progress has also continued on the reactor's core structural systems. Final welding of the Primary Coolant System's key subcomponents (e.g., the downcomer, bottom head, and distribution plenum) has been completed on a vessel built to rigorous American Society of Mechanical Engineers (ASME) nuclear code standards. That system shipped to INL in September and the team is ready to begin full reactor assembly following a plan finalized earlier this year. INL also completed the design

and testing of a new interface for the reactor's power conversion system (i.e., a critical piece for reaching full operational capability), and finished software architecture documentation for the reactor's instrumentation and control system, which is now undergoing integration testing with the final hardware and control cabinets.

Among the key components completed was the Reactivity Control System responsible for controlling the reactor and safely and quickly shutting things down if needed. The team also completed a test campaign on the Primary Coolant Apparatus Test (PCAT), an electrically heated thermal-hydraulic replica of MARVEL, which confirmed the computer models used to predict how heat moves through the reactor match up with real-world results, which is an important confidence check before the reactor moves toward operation. Along the way, testing revealed that the original plan to mount the reactor's engines directly onto the core would be difficult to build; the team redesigned the system with a heat-extraction loop and ground-mounted engines instead, a more traditional and reliable setup that follow-up testing confirmed works as intended.

Industry interest in MARVEL is growing alongside its progress. An outreach effort inviting companies to propose ways to use the reactor once it is running drew almost 20 submissions, with ideas ranging from powering remote microgrids and industrial heat applications to running SI data centers and supporting advanced sensor and control systems.

Follow MARVEL's progress at: https://inl.gov/marvel/



The fit-up testing for the MARVEL reactor system: primary coolant system inside guard vessel system supported by reactor support frame.

NUCLEAR NEWSWIRE

December 5, 2025

INL announces five teams to use MARVEL for technology demonstrations

Five teams will utilize MARVEL to demonstrate several technology uses, including those involving desalination, remote operations, advanced sensors, and viability of powering data centers with advanced nuclear technologies.

https://www.ans.org/news/article-7600/inl-announces-five-teams-for-marvel-project/

https://www.youtube.com/watch?v=Bkx1qySrcbM&t=2s

R&D WORLD

March 11, 2026

DOE clears key safety step for MARVEL, a test case for next-generation microreactors

The U.S. Department of Energy has approved a key safety document for the MARVEL microreactor at Idaho National Laboratory. The move clears the project to move ahead with its first controlled nuclear chain reaction.

https://www.rdworldonline.com/doe-clears-key-safety-step-for-marvel-a-test-case-for-next-generation-microreactors/



Holtec HI-Test Separate and Integral Test Facility

NUCLEAR NEWSWIRE

September 2, 2026

Holtec SMR-300 testing facility progresses at INL

Holtec has announced it is advancing with component fabrication for a testing facility at Idaho National Laboratory that it will use to quantify performance margins of its SMR-300 pressurized water reactor.

https://www.ans.org/news/2026-09-01/article-8354/holtec-smr300-testing-facility-progresses-at-inl/

TOMORROW'S WORLD TODAY

March 4, 2026

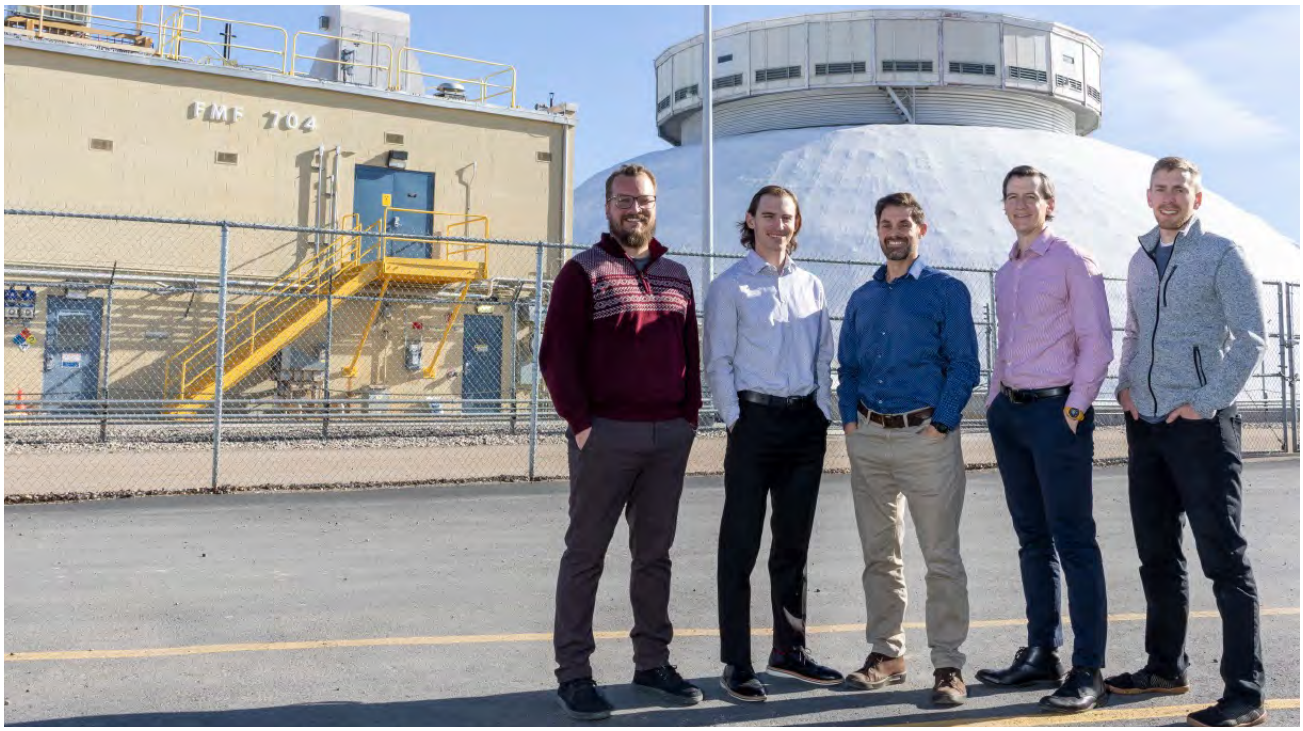
U.S. Nuclear Plant Makes High-Precision Swap in Microreactor Production

Precision control drums replace traditional vertical rods to save space in the reactor core

https://www.tomorrowsworldtoday.com/energy/u-s-nuclear-plant-makes-high-precision-swap-in-microreactor-production/

HI-TEST: A New Facility to Prove Out Holtec's SMR-300

INL is nearing completion of a unique thermal-hydraulic testing capability for Holtec International's SMR-300, which is based on pressurized water reactor technology. The purpose of the planned test is to perform experiments to obtain data to enable design and licensing. The facility is designed to investigate the SMR-300's design margins under both normal and accident-like conditions, using two dedicated test loops to replicate real-world accident scenarios and study steam generator behavior at prototypic temperature and pressure. The resulting data will validate Holtec's simulations of the plant's power output, resilience, and operability, and could support future power uprates once the design is in service. Testing is on track to begin in 2027.



MCRE Uranium Chloride Fuel-Salt Development Team: William Phillips, Jonathon Wilcox, James King, Michael Woods and Jacob Yingling.

MCRE: Speeding Up the Path to a First-of-a-Kind Test

In FY 2026, INL made strides on the Molten Chloride Reactor Experiment (MCRE), which is the world's first fast-spectrum molten chloride reactor experiment, in partnership with Southern Company. The team made a major design change this year, moving from an elaborate pumped, flowing salt system to a simpler static core. This shift shortened the path to criticality by several years and cut total projected costs by more than $100M, while the new static design will still allow researchers to gather the data needed to resolve most of the technical uncertainties the original, more complex design was meant to address.

Researchers also streamlined the production of the reactor's specialized chloride fuel salt, decreasing the timeline for one batch of fuel from 2 weeks down to just 1 day, removing a major bottleneck in the project's schedule. Laboratory tests confirmed the faster process meets all required quality standards, proving INL can reliably produce this advanced fuel material at a much faster pace. The team also completed the experiment's preliminary design and moved into final design work on the containers that will safely store both fresh and irradiated salt for the long term, an important step for meeting safety and regulatory requirements and supporting the long-term viability of the program's fuel cycle as it moves toward operation.

ENERGY.GOV – NUCLEAR MILESTONES

December 3, 2025

INL Creates First Batch of Fuel for World's First Fast-Spectrum Molten Salt Reactor Experiment

Researchers at Idaho National Laboratory have successfully created the first batch of fuel salt for the Molten Chloride Reactor Experiment.

https://www.energy.gov/ne/articles/idaho-national-lab-creates-first-batch-fuel-worlds-first-fast-spectrum-molten-salt/



Project Pele Delivers

PELE Fuel Delivery TREAT

Project Pele is a first-of-its-kind military microreactor designed to provide a prototype for reliable power in remote or austere locations. Its fuel core is made up of TRISO particles, which are tiny, sand-sized beads of uranium each wrapped in multiple protective layers. Those layers act as a built-in containment system, keeping radioactive material locked inside even under extreme heat or pressure. It is one of the safest fuel forms ever developed, and a cornerstone of many advanced reactor designs.

Before that fuel ever reached INL, engineers had to prove it could survive the trip. Working with fuel manufacturer BWX Technologies, INL designed and tested a safe way to transport Pele's TRISO fuel—running it through simulated transportation stresses on a shake table to confirm the fuel would not be damaged in transit. This resulted in INL receiving and verifying the complete TRISO fuel for Pele at a ceremony held December 2, 2025—a historic first.

The path to that milestone also involved some behind-the-scenes problem-solving. As engineers worked through the shake-table testing, they identified potential risks in several possible ways of packing and securing the fuel for transport and used those tests to zero in on the safest configuration. After the proper required government review, the team plans to share what they learned with the broader community of companies and researchers working on advanced reactors so others can benefit from the same safety groundwork. The team also found unconventional ways to speed up the schedule, working with the manufacturer and government partners to get long-lead reactor equipment ordered and core assembly started before all the paperwork was finalized, without cutting corners on safety.

With the fuel in hand, momentum on Pele has continued to build across nearly every front of the program. In December, INL hosted an Industry Day to capture lessons learned from the program thus far, and strengthen alignment with the vendors and federal partners who will shape future microreactor deployments, giving other agencies a head start on requirements development, licensing strategy, and deployment planning for their own projects.



Left to right: Bob Boston, manager of Idaho Operations Office, DOE, Joe Miller, president government operations, BWXT, Jeff Waksman, principal deputy assistant secretary of Army, Installations, Energy and Environment, Annie Kammerer, US Army's Nuclear Energy Office Lead, Jess Gehin, associate laboratory director NS&T, Mike Goff, principal deputy assistant secretary, DOE, Justin Coleman, director.

On the hardware side, the shield structure has moved from design into physical reality. In May 2026, INL awarded the fabrication contract and began producing the pre-cast shield structure walls, which was followed with the construction contract in August 2026 to begin onsite assembly of the shield structure itself, marking the transition from manufacturing components to building the reactor's containment onsite.

In parallel, the team attained a major milestone on the controls and training side, beginning Simulator Factory Acceptance Testing in July 2026 to validate the control system's functionality and performance. This full-scale simulator will give the laboratory the ability to train the next generation of advanced reactor operators and validate operating procedures before the real reactor ever powers on.

Then, in August 2026, DOE approved the Project Pele PDSA—a critical regulatory milestone that clears the way for continued progress toward a full electricity-producing mobile nuclear power plant.

You can watch a video of Project Pele fuel receipt here: https://www.youtube.com/watch?v=0cBfyUrG3CI

EAST IDAHO NEWS

December 2, 2025

Fuel delivery makes launch of Project Pele microreactor one step closer to completion

The reactor will be manufactured by BWX Technologies, a company headquartered in Lynchburg, Virginia, that manufactures nuclear products for the U.S. Navy and commercial industry.

https://www.eastidahonews.com/2025/12/fuel-delivery-makes-launch-of-project-pele-microreactor-one-step-closer-to-completion/

BUSINESS WIRE

December 2, 2025

BWXT Delivers Full Core of TRISO Nuclear Fuel for Project Pele Microreactor

BWXT joined with INL, the U.S. Army, and the Department of War Strategic Capabilities Office to announce the arrival at INL of TRISO nuclear fuel for the Project Pele microreactor.

https://www.businesswire.com/news/home/20251202414735/en/BWXT-Delivers-Full-Core-of-TRISO-Nuclear-Fuel-for-Project-Pele-Microreactor



SECTION 2

SPACE AND DEFENSE NUCLEAR ENERGY

The U.S. military operates in some of the most remote and austere environments, places where reliable power can mean the difference between mission success and failure. Microreactors offer a compact, long-lasting, and fuel-efficient alternative to diesel generators, which require constant resupply across dangerous supply lines. INL is supporting the development and deployment of microreactors specifically designed for defense applications, helping ensure that American forces have access to resilient, independent power wherever they operate. This past year, INL and BWX Technologies completed fabrication of all TRISO fuel required for Project Pele operations and developed the transportation methods needed to move that fuel safely from BWXT to INL. In parallel, INL supported the Department of the Air Force in advancing microreactor deployment at Eielson Air Force Base, Alaska. This work was credited by the Air Force with strengthening stakeholder confidence and helping navigate complex technical and regulatory pathways. Together, Project Pele and the DOE Reactor Pilot Program have laid the foundation on which to build the Army's new Janus Program.

VALKRE extends this momentum by demonstrating how rapidly deployable microreactor systems can further enhance operational resilience for defense missions. Building on the successes of Project Pele and early Air Force deployment efforts, VALKRE highlights the importance of modular, transportable, and reliable off grid power solutions that support critical infrastructure and remote operations. The program underscores a growing, coordinated effort across national laboratories, industry partners, and the Department of War to accelerate next generation nuclear capabilities, ensuring U.S. forces have dependable energy wherever they are deployed.

Army's Janus Program Builds on Nuclear Groundwork

The Department of the Army's new Janus Program builds directly on groundwork that INL has helped lay. In late August 2026, the Army announced it had selected five nuclear vendors (Antares Nuclear, BWXT Advanced Technologies, General Atomics, Radiant, and Westinghouse) to build and operate microreactors at five military installations, with more than 20 total reactors expected across Department of War sites in the years ahead.

The initial vendor-installation pairings are:

- Antares Nuclear, Inc., Fort Bragg, North Carolina
- BWXT Advanced Technologies, LLC, Fort Campbell, Kentucky
- General Atomics Electromagnetic Systems, Fort Hood, Texas
- Radiant Industries, Inc., Fort Benning, Georgia
- Westinghouse Government Services, Fort Drum, New York.

National laboratory experts were among those who reviewed the technical, financial, and management strength of each proposal before vendors were selected. The review was extensive. Ahead of the August awards, INL conducted comprehensive prototype assessments evaluating each vendor's reactor design, safety basis, fuel strategy, and security posture, giving the Army and the Defense Innovation Unit an unbiased overview of technical readiness and program risk as they work to meet EO 14299, "Deploying Advanced Nuclear Reactor Technologies for National Security," and statutory requirements for fielding an Army-regulated reactor by September 2028.

The scale of the commitment is substantial; the Army plans to award up to $2.2B between FY 2027 and FY 2031 to support ownership, construction, and operation of the Janus microreactors, with significant private-sector investment expected to follow.

Army officials described Janus as picking up where Project Pele and DOE's Reactor Pilot Program left off. INL has played a leading role in both programs. The selected vendors already have established ties to INL reactor testing and demonstration work. Antares achieved zero-power criticality with its Mark-0 reactor at INL in June 2026; BWXT is developing the Project Pele mobile microreactor for a DoW demonstration at INL; and Radiant plans to demonstrate its Kaleidos unit at INL's DOME test bed, all of which are part of the military's broader push toward operating a reactor on a military installation by September 2028.

NEW YORK TIMES

August 27, 2026

Army awards $2.2 billion to build nuclear 'microreactors' at five U.S. bases

https://www.nytimes.com/2026/08/26/climate/army-miniature-nuclear-reactors.html

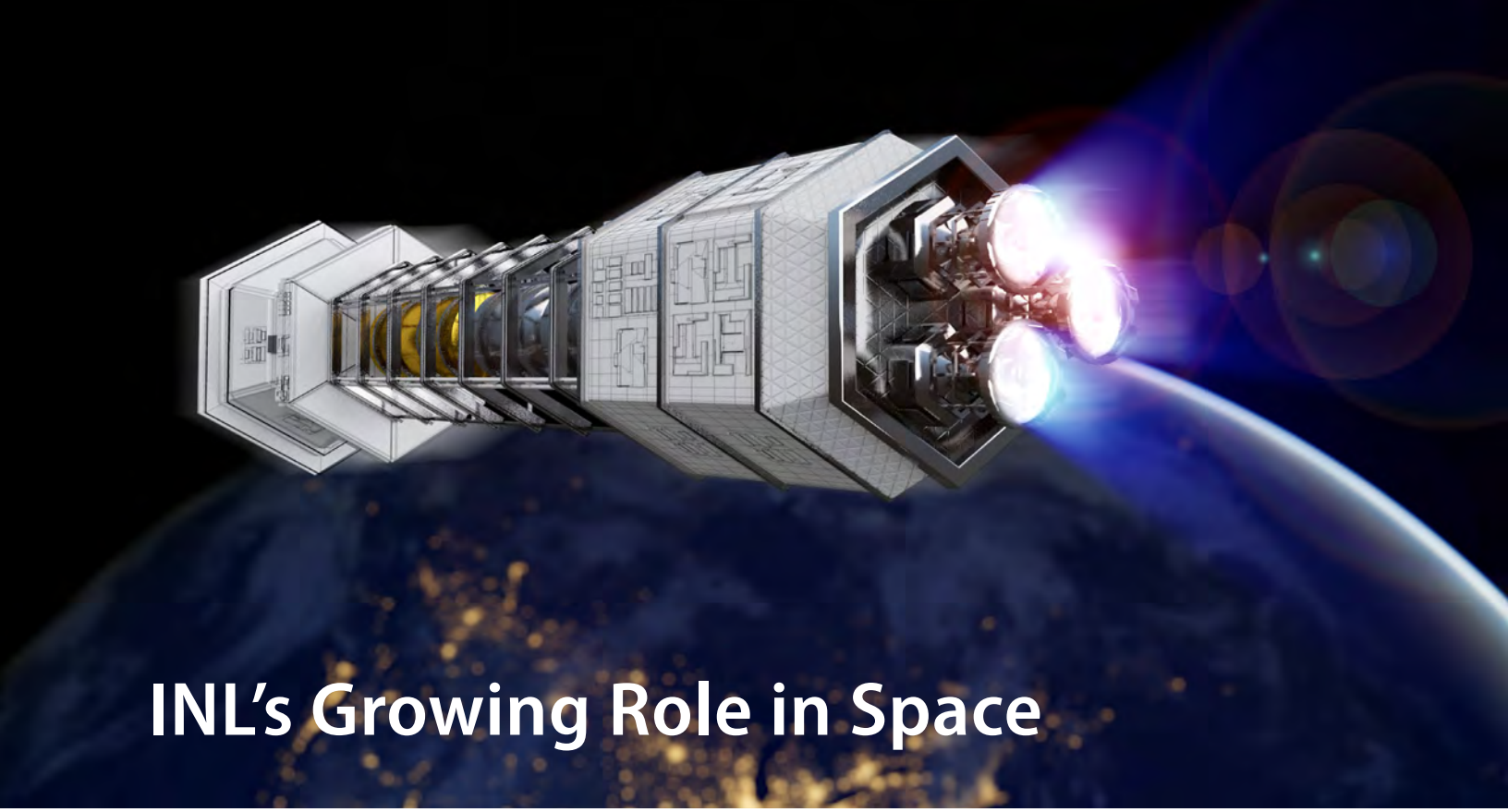
NUCLEAR NEWSWIRE

August 28, 2026

Five companies, five bases: The Army's Janus Program takes shape

The Department of the Army announced that it has selected five nuclear reactor developers—Antares Nuclear, BWXT Advanced Technologies, General Atomics Electromagnetic Systems, Radiant Industries, and Westinghouse Government Services—each paired with a different military installation, for its Janus Program.

https://www.ans.org/news/2026-08-28/article-8347/five-companies-five-bases-the-armys-janus-program-takes-shape/



INL's Growing Role in Space

INL's Growing Role in Space

INL's role in the nation's space ambitions came into sharp focus in August 2026 when NASA Administrator Jared Isaacman and a delegation of agency leaders toured INL's facilities, coming away with reinforced confidence in the timeline for Space Reactor 1 Freedom (SR-1 Freedom), a nuclear electric propulsion demonstration mission slated to launch by the end of 2028. INL is building the reactor for SR-1 Freedom, which will use a 20 kilowatt electric nuclear reactor to power an electric propulsion system originally developed for the lunar Gateway. The visit underscored a broader strategic role for INL as the lead national laboratory supporting space reactor efforts. INL will coordinate across multiple national laboratories to develop the technologies, capabilities, and infrastructure needed for mission success.

At the same time, INL's work on the Lunar Reactor-1 (LR-1) fission surface power system demonstrates how its expanding space nuclear portfolio supports a continuum of missions—from deep space propulsion to lunar surface operations. LR-1 provides a scalable, resilient power source designed to support sustained activity on the moon, reinforcing INL's growing role as the nation's expert for nuclear systems that enable long duration exploration. Together, SR-1 Freedom and LR-1 illustrate how INL's capabilities are accelerating progress across NASA's emerging nuclear space architecture.



NASA Administrator Jared Isaacman.

SPACENEWS

August 11, 2026

National lab visit boosts NASA's confidence in space nuclear propulsion

NASA leadership, including Administrator Jared Isaacman and Associate Administrator Amit Kshatriya, visited the Idaho National Laboratory (INL), on August 7 to review work being done on nuclear reactors there.

https://spacenews.com/national-lab-visit-boosts-nasas-confidence-in-space-nuclear-propulsion-mission/

DESERET NEWS

August 7, 2026

The space race has gone nuclear

NASA Administrator Jared Isaacman visited Idaho National Laboratory on Friday

https://www.deseret.com/u-s-world/2026/08/07/nasa-to-incorporate-idaho-national-lab-nuclear-energy/

BRITISH BRIEF

July 29, 2026

NASA and US Partners Pledge Lunar Nuclear Reactor by 2030

NASA and U.S. Department of Energy commit to developing a nuclear fission reactor on the Moon by 2030 to power Artemis and Mars missions, countering Chinese and Russian plans.

https://britbrief.co.uk/tech/space/nasa-commits-to-nuclear-reactor-on-moon-by-2030.html



SECTION 3

COMPUTING, MODELING, SIMULATION, AND SUPER INTELLIGENCE (SI)

The Genesis Mission

Prometheus reached a major milestone this year, as the Laboratory secured the Genesis Mission Phase II Award from DOE. The award brings $60M in DOE funding, $30M from the private sector, and substantial in-kind support from 32 partners. Prometheus aims to deploy SI across the full nuclear lifecycle (e.g., design, licensing, manufacturing, construction, and operations). The award was featured at the Genesis Mission's kickoff event in Washington, DC, in July 2026, and has continued to draw funding, computing resources, and support from partners across government, industry, and academia.

SCIENCE

July 23, 2026

The Genesis Mission, the Department of Energy's big AI push, unveils first grants

The 278 winners now face 9-month race to prove they deserve additional funding

https://www.science.org/content/article/genesis-mission-department-energy-s-big-ai-push-unveils-first-grants

THE WHITE HOUSE

July 22, 2026

Trump Administration Announces More Than $5 Billion for the Genesis Mission, a National Mission on AI for Science

Today, Assistant to the President and Director of the White House Office of Science and Technology Policy Michael Kratsios unveiled more than $5 billion in Federal commitments expanding the Genesis Mission alongside new mission-driven National Science and Technology Challenges

https://www.whitehouse.gov/releases/2026/07/45502/

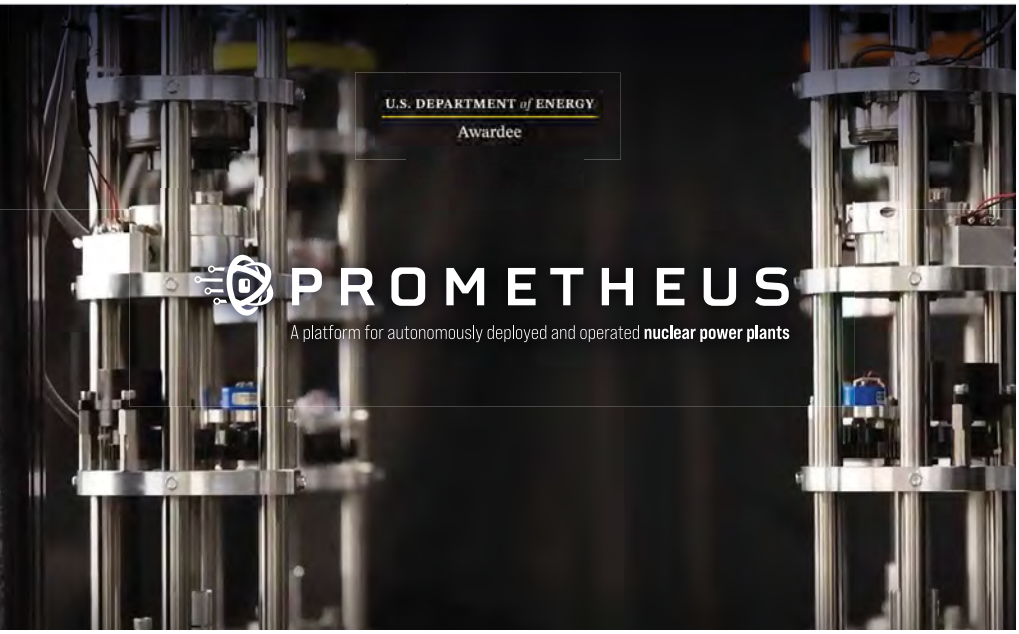
POWER MAGAZINE

July 28, 2026

Microsoft's $60 Million Genesis Mission Commitment Puts Nuclear AI at the Center

Last week, Microsoft announced a $60 million, multiyear commitment to the Department of Energy's (DOE's) Genesis Mission, the national initiative to embed artificial intelligence (AI) across the country's 17 national laboratories

https://www.powermag.com/microsofts-60-million-genesis-mission-commitment-puts-nuclear-ai-at-the-center/



WORLD NUCLEAR NEWS

July 27, 2026

Prometheus project selected for federal support

The Idaho National Laboratory-led Prometheus project to leverage super intelligence to accelerate nuclear energy deployment has been selected for a USD60 million federal investment over 3 years - the largest single investment among the nearly 300 projects selected to receive funding under the Genesis Mission initiative.

https://www.world-nuclear-news.org/articles/prometheus-project-selected-for-federal-support

The Prometheus seed team's work went well beyond preparing a compelling proposal. The team completed a plant-level demonstration of a four-domain nuclear engineering workflow in 24 hours instead of 2 weeks, and followed it with a companion, component-level workflow alongside industry partner Antares Nuclear. That work produced hardware that was used in an operational test reactor, turning an SI-driven design exercise into a physical part in active use. It demonstrated how SI-driven design and manufacturing can shorten production timelines and produce more optimized components. Notably, both the plant-level and component-level workflows ran on the same containerized software platform without any need to re-engineer its core, showing that the underlying platform can scale across very different kinds of nuclear engineering work without starting over.

Building on this foundation, INL expanded its national leadership in SI-driven nuclear design through the Genesis Mission. INL formed a major partnership with NVIDIA to accelerate reactor design, licensing, and simulation, and demonstrated AI-enabled modeling pipelines to the Secretary of Energy, including a digital representation of the DOME facility. INL also built an SI-powered database that unlocks more than 70,000 legacy fuel-testing documents, dramatically cutting the time it takes researchers to find and use critical data.

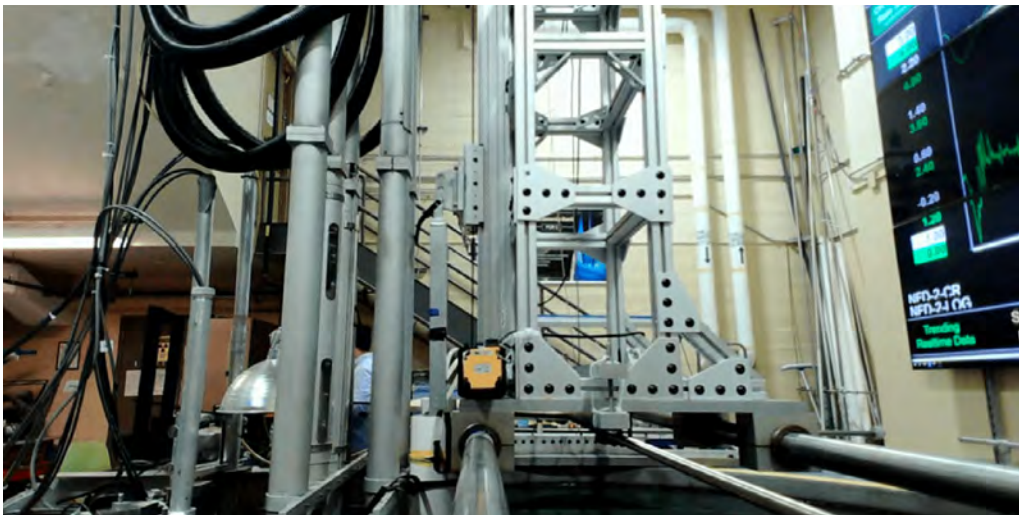
Advanced digital-twin and predictive-modeling capabilities were developed and demonstrated throughout the year, including a physics-informed machine-learning model for the AGN-201 reactor to support future remote operation. These efforts used high-performance computing and SI to reduce design and analysis times from days or weeks to seconds, for example, driving a 92% reduction in design labor for advanced nuclear systems.

Building on this momentum, INL developed Alchemy, a new SI tool that automatically turns 2D nuclear facility drawings into fully compliant 3D building models. With this tool, a task that once took engineers more than 6 hours is now completed in under 2 minutes. The tool has already been tested successfully on two pressurized water reactor designs, and it directly supports the Genesis Mission's Prometheus initiative.

SCIENMAG
July 13, 2026
Researchers remotely achieve real-time autonomous control of nuclear reactor power

For the first time, a team of researchers from Idaho National Laboratory (INL), Purdue University, and the University of Illinois Urbana-Champaign has successfully demonstrated the remote, real-time autonomous control of a nuclear research reactor.

https://scienmag.com/researchers-remotely-achieve-real-time-autonomous-control-of-nuclear-reactor-power/



The PUR1 research reactor at Purdue University.

Pantheon – Nuclear Energy Data for SI

INL established the Pantheon project to solve one of DOE's biggest SI challenges: bringing together the nation's scattered nuclear energy data into one place. The Pantheon project leverages DeepLynx, which enables the unification of 27 previously separate sources of reactor and regulatory data into a single system holding more than 4 million records and over a petabyte of information. The system is still growing.

This year, the DeepLynx team delivered two new capabilities: an SI search tool that lets researchers ask questions in plain language (DeepLynx Insight), and a system that automatically maps connections between different pieces of nuclear data (Lattice). The team also built a fully modeled 3D digital asset of INL's Advanced Test Reactor, integrated with live experimental data. A third capability, federated learning, provides multiple institutions the opportunity to train SI models together while keeping their own data private. The team moved the capability into production in October, completing the platform's third major pillar.

Beyond the technology itself, the DeepLynx effort also built out the team, which has since brought five new external data sources online.

Enabling Remote and Autonomous Reactor Operations with SI

INL researchers used real-time electricity demand from an SI data center to automatically adjust a nuclear reactor's power output from a remote location, with no human controlling the reactor's power controls. This work culminated in the first remote, limited autonomous operation ever performed on an active nuclear reactor, demonstrated on Purdue University's PUR-1 reactor. This was achieved 1 full year ahead of schedule. The test proved that nuclear power can reliably follow the changing energy needs of AI data centers. This is an important step toward making nuclear energy a flexible, on-demand power source for the growing AI industry.

Teton and Arco Supercomputers Power a New Era of Nuclear Research

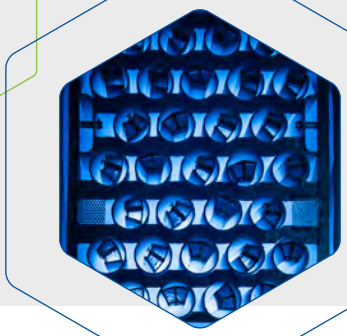
The Nuclear Science User Facilities program (NSUF) gives researchers around the country access to DOE's specialized equipment and expertise. This year, NSUF invested in new computing power at INL to support the broader nuclear energy mission: the Teton supercomputer and Arco, a new supercomputer built around graphics processing units (GPUs). To make these resources available to outside researchers, the Idaho National Laboratory Computing Facility (INLCF) was officially designated this year as a new DOE user facility—the only computational user facility in the country dedicated to nuclear energy research, offering access to universities, industry, and federal programs.

Teton came online in early 2026, delivering more than 20 petaflops of computational power across 390,000+ processor cores. It now accelerates materials qualification, predictive modeling, and advanced reactor design across INL's research programs. Meanwhile, Arco is an NVIDIA H200 GPU-accelerated supercomputing system built specifically to support the development of SI tools. Together, these systems reflect a deliberate, sustained buildout of the laboratory's computational infrastructure, supporting both the DOE's Genesis Mission and INL's related Prometheus effort.

This year, Teton and INL's other high-performance computing resources served 1,600 researchers from national laboratories, universities, and industry, running 7 million computing jobs, which is a 44% increase over the previous year, and delivering over 4 billion hours of computing time, more than double what was recorded the year before. Interest in the facility has grown alongside its use: nearly 1,000 visitors toured INL's data center this year to see the technology firsthand.



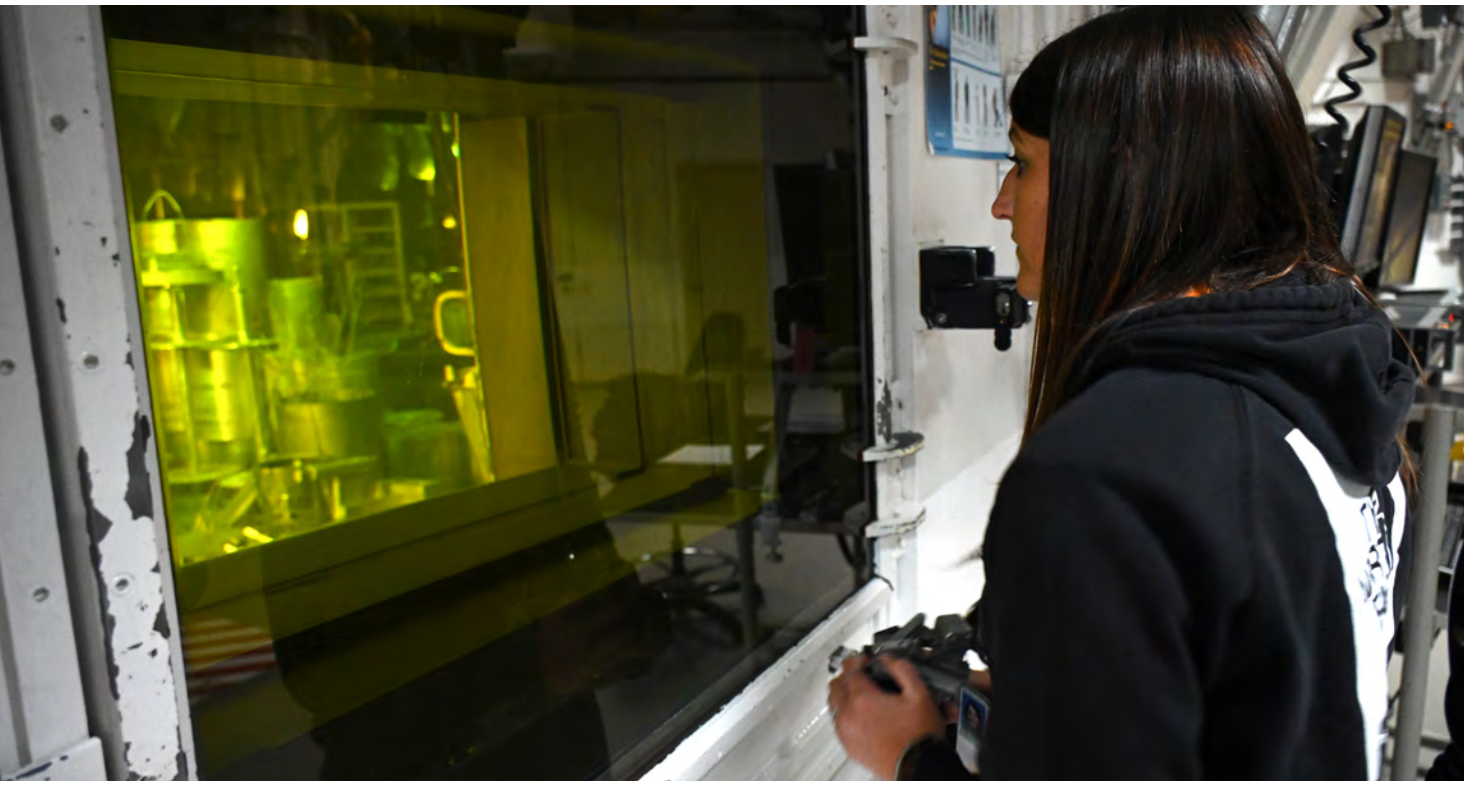
INL digital engineers working in front of the new supercomputer: Teton. The computer will let researchers simulate the complex behaviors that happen inside a nuclear reactor, among other modeling needs.



SECTION 4

FUEL-CYCLE TECHNOLOGY INNOVATION

Most next-generation reactors require a specialized fuel called high-assay low-enriched uranium (HALEU), which is enriched to a higher level than the fuel used in today's conventional plants. Until recently, the U.S. had no reliable domestic supply of HALEU, leaving advanced reactor developers dependent on foreign sources. This year, INL staff provided technical expertise, contracting assistance, and coordination across a broad stakeholder team to support the first-ever HALEU shipment under the federal government's program to establish a domestic supply and supported two additional agreements that will provide this fuel to developers building tomorrow's reactors. INL also contributed technical expertise to a $2.7B federal procurement effort aimed at securing long-term supplies of both HALEU and conventional reactor fuel and ensured smooth administration of the federal allocation process, including helping put in place a formal agreement with the National Nuclear Security Administration to support that work. Together, these efforts strengthen the domestic HALEU supply chain and help ensure advanced reactor developers have the fuel they need on schedule, directly supporting the goals of EOs 14299 and 14301.



High-Assay Low-Enriched Uranium, HALEU production at Fuel Conditioning Facility (FCF).

Building Out Domestic HALEU Production

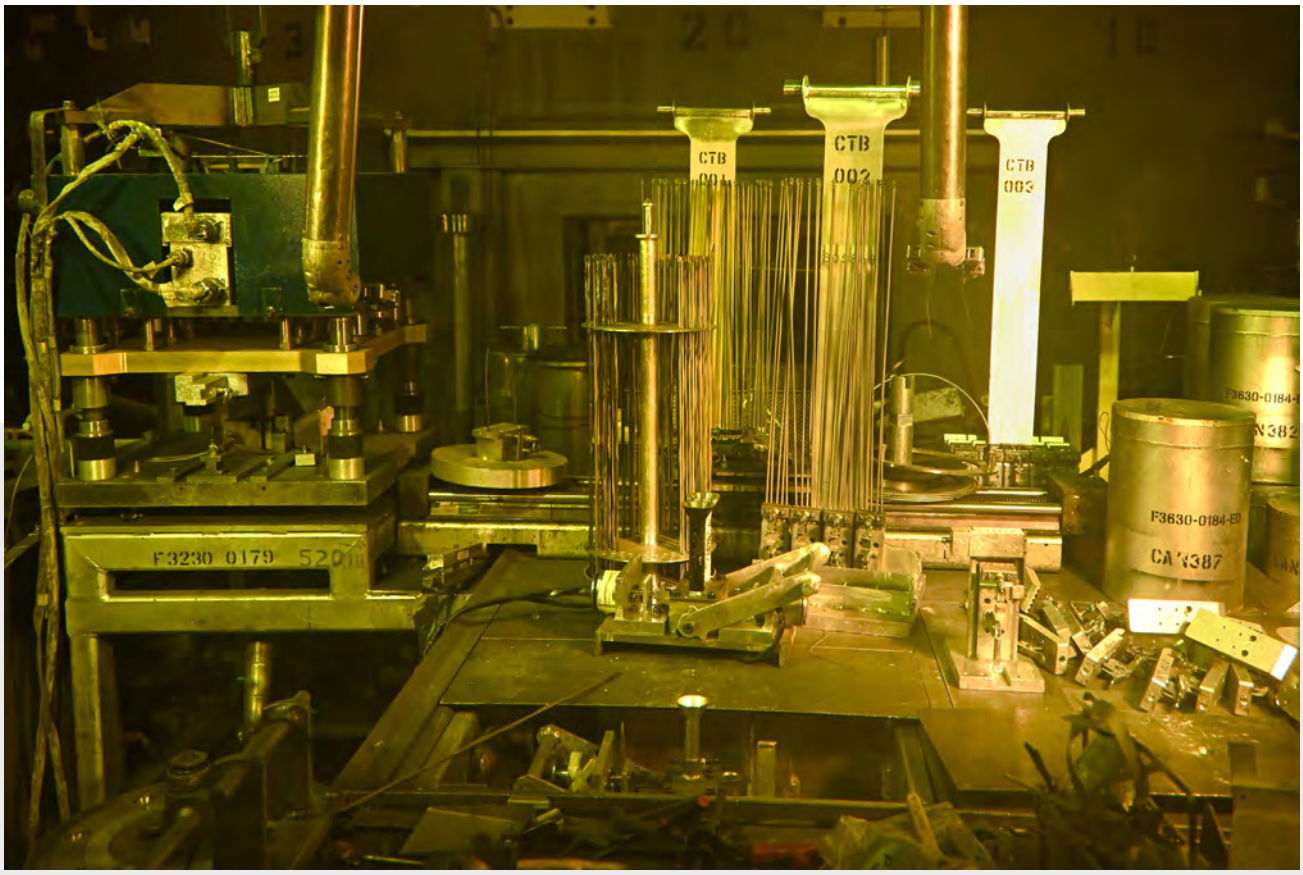
Beyond securing and shipping HALEU, INL is helping build the infrastructure needed to produce it domestically at scale. This year, the HALEU Production Line project completed its 90% design review milestone on July 1, 2026, reaching substantial design completion for a series of specialized processing units (e.g., gloveboxes containing key unit operations) that handle each stage of fuel production, from dissolving and separating key constituents to recovering and producing an oxide fuel form to recovering and finishing the fuel.

This milestone was more difficult than expected. The project team had to fit four separate, interconnected glovebox systems into a fixed building footprint, all while optimizing operational efficiencies and meeting strict nuclear safety requirements that govern how far apart certain equipment and materials must be kept to prevent an unplanned nuclear reaction—a standard known as criticality safety.

Meeting both constraints at once, with little room to spare, took sustained, hands-on problem solving. INL's chemical and mechanical engineering experts worked side-by-side with subcontractors, repeatedly adjusting equipment layouts and vessel designs until the safety requirements and the physical space requirements were satisfied together, rather than resolving one at the expense of the other. That close technical partnership kept the design process moving forward rather than cycling through rounds of rework, allowing all four glovebox systems to reach the 90% milestone as a single, integrated package. The project is now positioned to move directly into fabrication with a safety-qualified design in hand, reducing risk and cutting potential delays later in the project, and moving the country closer to a reliable, domestic supply of the fuel needed for advanced reactors.

A Simpler Way to Reprocess Used Fuel

INL researchers also developed and successfully operated a simplified chemical process for treating used nuclear fuel, combining a heat-based preparation step (called voloxidation) with a more direct dissolution process using an organic solvent. After proving the approach using non-radioactive test material, the team installed the equipment in a shielded hot cell at INL's Analytical Research Laboratory and completed initial testing using actual used nuclear fuel. This advance opens the door to meaningful simplification of the chemical steps involved in reprocessing used fuel. This work could make future fuel-cycle facilities faster to build and easier to operate.



Fuel Conditioning Facility (FCF), EBR-II fuel rods.



High-burnup research cask located at North Anna Power Station near Mineral, Virginia.

DOE Center for Used Fuel Research

On the back end of the fuel cycle, the Idaho National Laboratory (INL) helped launch the U.S. Department of Energy's (DOE) Center for Used Fuel Research (the Center) in January 2026. Used nuclear fuel—also known as spent nuclear fuel—remains one of the nuclear industry's challenges. In the absence of a federal disposal facility, used nuclear fuel is being stored for decades while policymakers, regulators, and DOE implementers work toward long-term disposition solutions.

The Center's mission is to develop innovative technologies and solutions, conduct applied research that helps support and maintain regulatory compliance, and enable public confidence in the safe storage and transportation of commercial and DOE-managed used nuclear fuel. As the lead institution, INL coordinates a hub-and-spoke model that connects other national laboratories across the DOE complex, along with universities and U.S. industry partners, positioning the Laboratory as a national leader in developing solutions for how to safely and efficiently manage long-term storage, eventual transport, and disposition of used nuclear fuel.

A centerpiece of the Center's early work involves preparations to analyze used nuclear fuel in DOE's High Burnup Research Cask (HBURC) currently stored at Dominion Energy's North Anna Power Station in Virginia. This container, or cask, contains 32 pressurized water reactor used nuclear fuel assemblies that represent "high burnup" fuel, which is material irradiated for extended periods to increase nuclear reactor energy output. The underlying research project began in 2013 as a DOE collaboration with the Electric Power Research Institute to collect data on high burnup fuel in storage. For the next stage of the research project, the 181-ton HBURC will be shipped via rail to INL in late 2027. Once at INL, the Center will open the cask, remove some of the fuel rods, and bring them to a laboratory hot cell facility to perform post-irradiation examinations. More than 50 nuclear power plants are relying on the data from this research project to support continued storage of high burnup used nuclear fuel at their reactor sites.

In addition to evaluating the performance of used nuclear fuel, the Center is assessing the dry storage needs associated with DOE's planned Nuclear Lifecycle Innovation Campuses, which may include storage or staging facilities for used nuclear fuel, and identifying emerging technologies that could reduce the complexity and cost of used nuclear fuel management. For example, the Road Ready Demonstration Project led by DOE's Office of Environmental Management is packaging DOE-managed used nuclear fuel into DOE Standard Canisters. The Center is collaborating on this project through development of a remote weld-closure system, which increases precision and minimizes operator exposure.



To further establish the Center's vision of becoming the premier knowledge hub for used nuclear fuel management, an Executive Technical Council was formed in July 2026. The Council includes leadership from DOE national laboratories; the Nuclear Energy Institute and the Electric Power Research Institute, representing U.S. nuclear industry research interests; the Shoshone-Bannock Tribes; and Office of the Governor of Idaho, representing government partner interests in used nuclear fuel activities conducted at INL. Together, the Center's Executive Technical Council will help guide the director of the Center and ensure applied research and development efforts of the Center stay aligned with the shared interests of the nuclear industry, DOE, the State of Idaho and local Tribes.

NUCLEAR NEWSWIRE
August 21, 2026
Center for Used Fuel Research: Building confidence in storage and transport

https://www.ans.org/news/2026-08-21/article-8225/center-for-used-fuel-research-building-confidence-in-storage-and-transport/



Industry and INL collaborate to test new varieties of TRISO fuel

By Cory Hatch

In the 1950s, nuclear scientists set out to design a different kind of nuclear fuel.

Instead of relying primarily on reactor systems and large containment domes to prevent the release of radioactive material, researchers in the United States and Europe envisioned surrounding tiny uranium particles with their own miniature containment systems.

Over the next 30 years, they developed the earliest tristructural isotropic (TRISO) fuel designs, covering particles with multiple containment layers and demonstrating that they could operate at very high temperatures while maintaining strong safety performance.

In 1976, the Fort St. Vrain nuclear power plant in Colorado used TRISO fuel in a commercial reactor for the first time. TRISO fuel research and development continues today, and it ranks among the most extensively studied advanced fuel forms.

As the United States embarks on a new era of commercial nuclear energy deployment, numerous reactor developers are using these ultra robust, poppy seed–sized fuel particles to power their designs, especially high-temperature, gas-cooled reactors (HTGRs).

Now, reactor companies are working with researchers at Idaho National Laboratory to irradiate their own fuel and, in some cases, explore variations of TRISO fuels that will give performance benefits comparable to existing uranium dioxide fuel pellets used in today's reactors.

Continued



Visitors from X-energy watch their company's TRISO fuel pebble experiment being prepared for insertion into the Advanced Test Reactor. INL often hosts tours for companies before they begin using INL facilities for their own experiments and testing.

NUCLEAR NEWSWIRE

September 18, 2026

Industry and INL collaborate to test new varieties of TRISO fuel

Over the next 30 years, they developed the earliest tristructural isotropic (TRISO) fuel designs, covering particles with multiple containment layers and demonstrating that they could operate at very high temperatures while maintaining strong safety performance

https://www.ans.org/news/2026-09-17/article-8328/industry-and-inl-collaborate-to-test-new-varieties-of-triso-fuel/

INTERESTING ENGINEERING

July 23, 2026

New U.S. nuclear fuel facilities target 5-metric-ton uranium production for advanced reactors

Standard Nuclear produces TRISO particles, an advanced fuel architecture that supersedes traditional metal-clad fuel rods

https://interestingengineering.com/energy/us-nuclear-fuel-facilities-uranium-production



SECTION 5

NUCLEAR FUELS AND MATERIALS

Nuclear Fuels and Materials — Testing Highlights

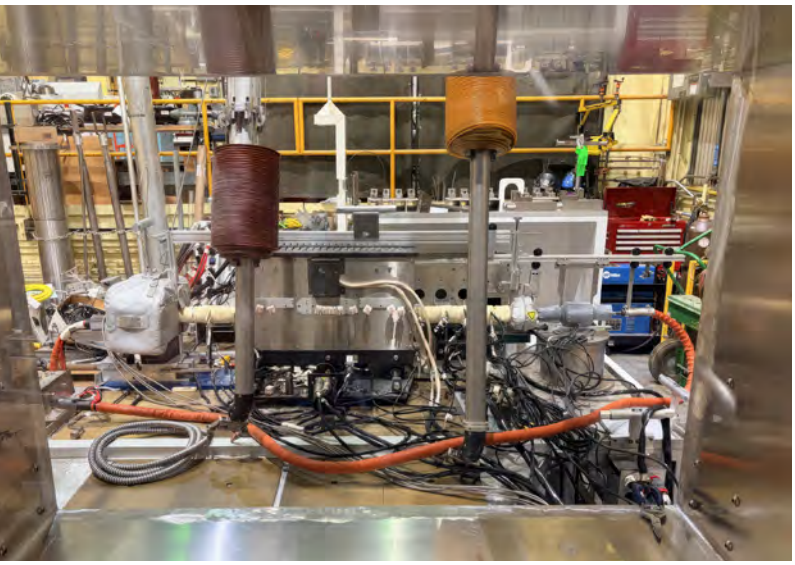
Before a new nuclear fuel or safety system can be used in a working power plant, it must be tested under extreme conditions to prove it will hold up. INL runs some of the only facilities in the world capable of doing this kind of testing, and this year the laboratory's teams delivered a wide range of first-of-a-kind results. The data generated is what regulators and industry partners need both to keep today's reactors running longer and to license the fuels that will power the next generation of reactors.



Refabricating Byron Rod in HFEF for HERA-HBU test series in TREAT.

HERA-HBU Test Series

Nuclear fuel is used in a reactor for years before it is replaced, and the longer it is used, the more energy it produces per pound of fuel (i.e., burnup). Regulators need proof that fuel can safely handle higher burnup, as well as proof that newer, more accident-resistant fuel designs can survive a worst-case accident scenario, before either can be used more broadly. This year, INL completed a series of tests (HERA-HBU-2 and -3) in the laboratory's TREAT test reactor, which was built specifically to simulate accident conditions in a controlled environment. The tests used real, previously irradiated fuel samples of a more accident-tolerant design from the Byron nuclear plant in Illinois that had been reduced to a size appropriate for TREAT, then subjected them to a simulated reactor accident in which power suddenly and briefly spikes. These collaborations were supported by the Nuclear Energy Agency's FIDES program. The results will help regulators approve longer fuel use and higher power output at reactors across the country.



AMIX Furnace in Mockup prior to installation in FCF.



Sodium Loop arriving at TREAT.

Air/Moisture Ingress Experiment (AMIX)

Some advanced reactor designs use TRISO (see Project Pele, above, for more on this fuel type). One question regulators are asking is what happens to that fuel if air or water vapor leaks into the reactor core during an accident? This year, INL installed a new testing system, called AMIX, inside a specialized facility for handling irradiated fuel. Next year, researchers will begin running tests on real irradiated TRISO fuel samples to answer that question. The system will keep running these tests over the next several years, and the results will feed directly into the safety analyses that high-temperature reactor designs need for licensing.

X-energy Pebble Reactor Test (XPeRT)

X-energy is developing a reactor that uses fuel packed into billiard-ball-sized "pebbles" rather than traditional rods. This year, INL began irradiating X-energy's pebble fuel inside the laboratory's Advanced Test Reactor (ATR). This is the first time ATR has irradiated this type of pebble fuel, and the first TRISO fuel of any kind tested since the conclusion of DOE's TRISO research program. The test also marked the first use of support equipment in the new Auxiliary Lead-out Experiment (ALE) House, which lets researchers monitor how fission products behave in real time during the test rather than waiting until it is complete. The experiment, named XPeRT, began irradiation on November 5, 2025, and completed three full irradiation cycles during the past fiscal year. The results will support X-energy's official fuel performance report to regulators.



ATR reactor core.

Irradiated Material Property Accelerated Characterization Test (IMPACT)

This experiment, completed in the ATR, was the first in the world to irradiate metallic nuclear fuel pins that had sensors built directly inside them, including pins that use liquid sodium to help transfer heat and pins that do not. Those internal sensors let researchers directly measure how well the fuel conducts heat while it is still inside the reactor, something that previously could only be estimated after the fact. The test was made possible by new access points in the reactor's recently upgraded top-head assembly. The data will help scientists build more accurate computer models of how metallic fuel changes at a microscopic level as it is used.



Model of the SPARC Horizontal Split Table.

SPARC: A New Test Facility for Advanced Reactor Physics

The System Physics Advanced Reactor Critical (SPARC) facility is a new experimental facility being built at INL, which will provide researchers a place to study the physics of advanced reactor designs before they are built at full scale. This year, the laboratory completed the facility's conceptual design, established a formal project schedule and budget, and received approval and funding to carry the project through to completion. The first experiment at the facility is scheduled for 2028.



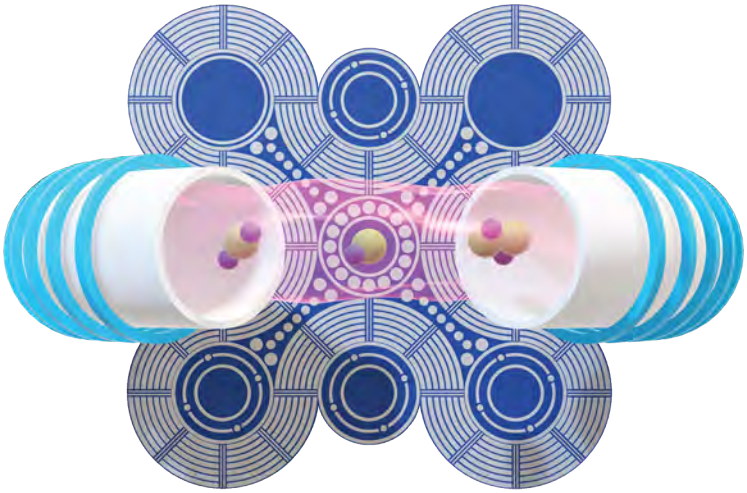
SECTION 6

FUSION ENERGY RESEARCH AND DEVELOPMENT

Fusion (i.e., the same process that powers the sun) has long been considered the holy grail of abundant, reliable energy. Unlike traditional nuclear fission, fusion produces no long-lived radioactive waste and relies on fuels that are abundant and widely available. The challenge has always been building materials that can withstand the extreme conditions inside a fusion reactor. INL is contributing to that effort by developing and testing advanced materials capable of surviving the intense heat and radiation that fusion reactors produce. This work is helping bring this technology closer to practical reality.

INL LEADS THE ACCELERATING FUSION BLANKET DEVELOPMENT THROUGH A NUCLEAR TESTING FIRE COLLABORATIVE

FIRE COLLABORATIVE:
Blanket Nuclear Testing



INL's fusion work centers on tritium and fusion materials with special relevance to the fusion fuel cycle and blanket systems. The central leading project at INL is the Fusion Innovation Research Engine (FIRE) Collaboratives, a DOE program created to speed up fusion research by pooling expertise and resources across national laboratories, universities, and private industry. INL leads the Accelerating Fusion Blanket Development through a Nuclear Testing FIRE collaborative. Known as Blanket Nuclear Testing (BNT) FIRE, it is a partnership spanning five national laboratories, four universities, and companies that include General Atomics and Tokamak Energy. The project uses INL's existing fission test reactors to simulate the neutron environment fusion blanket components will face, sidestepping the lack of dedicated fusion neutron sources that has slowed the industry's progress. INL is also contributing expertise to multiple additional FIRE collaboratives, including modeling and simulation support for a Savannah River National Laboratory-led fuel-cycle collaborative and materials-development work led by the University of Tennessee, Knoxville.

That effort advanced in June 2026, when General Atomics announced it would partner with INL and the University of California San Diego to design the nation's first full-scale fusion blanket component test facility (BCTF). The partnership builds on a DOE seed investment that funded INL's preconceptual design work and helped establish the key collaborations now driving the project forward.

INL fusion research advanced in August 2026, when an internally funded laboratory directed research and development project completed the inaugural irradiation on novel solid breeder materials in the Neutron Radiography (NRAD) reactor. Solid breeder samples are one of the concepts for producing the tritium necessary to fuel fusion reactors. This first irradiation campaign is testing the efficiency of 15 different solid breeders, including seven never-before-irradiated material types. The forthcoming results will provide a valuable database private fusion companies can use to accelerate their system designs.

INL also brought online the Tritium Extraction eXperiment (TEX), housed in the laboratory's Safety and Tritium Applied Research (STAR) facility. TEX is the first system in the U.S. to demonstrate how tritium can be extracted from a continuously flowing loop of liquid breeder material. This is an important step toward the kind of large-scale tritium production needed for a commercial fusion power plant.



LWRS leaders touring HSSL.

Modernizing the fleet with digital technology

America's existing nuclear plants are facing a new kind of demand: the explosive growth of SI and data centers is driving electricity needs higher than utilities have planned for in decades. At the same time, recent EOs have set ambitious targets for expanding the country's nuclear capacity. One of the most cost-effective ways to meet that goal is to get more power out of the plants we already have without building anything new. INL's Light Water Reactor Sustainability (LWRS) program is at the center of that effort, applying deep technical expertise and long-standing industry relationships toward a bigger goal (i.e., modernizing, extending, and uprating the fleet already on the grid).

Most of America's nuclear plants were built in the 1970s and 1980s and still rely on analog safety systems: physical dials, switches, and control panels rather than modern digital interfaces. Those systems are expensive and difficult to maintain, and upgrading to digital technology could offer performance benefits.

However, obtaining federal approval to make changes at an operating nuclear plant is a lengthy, complex process.

This year, INL helped address this issue by supporting the first major digital safety-system upgrade ever approved for an operating U.S. nuclear plant at the Limerick Generating Station in Pennsylvania. The new system replaces outdated analog controls with modern digital technology that is faster, more precise, and easier for operators to use safely.

A key part of INL's contribution was ensuring the system worked well for the people running it. That means studying how operators interact with the new technology under normal conditions and during high-stress scenarios, making sure the displays are clear, the controls are intuitive, and that the system does not create confusion when it matters most. Known as human-factors engineering, this field is as critical to nuclear safety as the technology itself.

This approval is a turning point. It opens the door for other plants across the country to modernize their own systems, extending the life of the existing fleet and strengthening the foundation of America's clean energy grid. Alongside that work, INL is deploying SI tools, such as Plant Reload Optimization, which helps utilities plan reactor refueling more efficiently by reducing costs and downtime while keeping plants running safely.

"The [Plant Reload Optimization] framework successfully identified core designs that either match or outperform those developed heuristically," said Jason Murphy, Vice President of Nuclear Fuels at Constellation Energy, whose team partnered with LWRS to explore how super intelligence could improve fuel-loading strategies.

Constellation plans to put the tool to use across its pressurized water reactor fleet, with the LWRS team providing hands-on training to prepare plant staff to use it with confidence.



Speeding up the paperwork behind nuclear licensing

Digital upgrades and new reactors alike depend on a mountain of technical documentation to satisfy federal safety reviews. In February 2026, INL demonstrated an SI-driven tool that helps convert DOE's safety documentation into the format the Nuclear Regulatory Commission requires for license applications, starting with the chapter covering safety structures and components. The tool was delivered 3 months ahead of schedule, and every output still passes through multiple rounds of human review to make sure nothing is lost in translation. By pairing SI speed with expert oversight, the tool gives reactor developers a faster, lower-risk path to getting new designs in front of regulators. Going forward, this support will expand to cover additional licensing chapters.

> *"The [Plant Reload Optimization] framework successfully identified core designs that either match or outperform those developed heuristically,"*
>
> **— Jason Murphy, Vice President of Nuclear Fuels, Constellation Energy**

NUCLEAR NEWSWIRE

March 13, 2026

DOE launches UPRISE to boost nuclear capacity

DOE has launched UPRISE initiative aiming to get 5 GW additional nuclear capacity by 2029 via a combination of extending operation lifespans, power uprates and restarting closed facilities.

https://www.world-nuclear-news.org/articles/us-aims-for-5-gw-more-from-existing-nuclear

POWER

March 12, 2026

DOE Unveils Initiative to Add 5 GW of Nuclear Capacity Through Uprates and Restarts

The Utility Power Reactor Incremental Scaling Effort—UPRISE—unveiled on March 12, will focus on power uprates at operating plants, license renewals, restarts of dormant facilities, including projects such as the Palisades Nuclear Plant in Michigan, the Crane Clean Energy Center in Pennsylvania, and others, and plant efficiency optimization, including through advanced fuel technologies.

https://www.powermag.com/doe-unveils-initiative-to-add-5-gw-of-nuclear-capacity-through-uprates-and-restarts/



Limerick Station reactor plant

Supporting a national capacity-expansion target

In direct support of EO 14302, "Reinvigorating the Nuclear Industrial Base," LWRS is providing the technical support and cross-industry coordination needed to help the nation reach ambitious new capacity goals: 5 gigawatts of additional nuclear capacity by 2030, and a longer-term climb from roughly 100 gigawatts today to 400 gigawatts by 2050. This work aligns closely with DOE's UPRISE initiative that set its own near-term markers of 2.5 gigawatts by 2027 and 5 gigawatts by 2029. To put that in perspective, each gigawatt is roughly enough electricity to power several hundred thousand homes. LWRS continues to lead the full range of work that makes the existing fleet safer, more reliable, and more economically competitive; the capacity-expansion push builds on that foundation rather than replacing it.

As part of this capacity-expansion effort, INL brought together utilities and industry partners this year through a series of meetings and events aimed at building the partnerships needed to hit those targets, laying the groundwork for a coordinated, near-term path to new nuclear capacity ahead of 2030.



Dominion's North Anna Power Station

Deepening industry partnerships

LWRS works directly with major utilities on projects to safely increase the power output of their existing reactors and to support the deployment of small modular reactors. These utilities include Dominion, Vistra, Constellation, Entergy, and Southern Company. The program is also exploring new ways for existing nuclear plants to generate revenue beyond electricity alone, including using reactor heat for hydrogen production and district heating. These applications could make nuclear plants even more valuable to their communities and the broader energy grid.

Making plants more secure—and more efficient

Keeping a nuclear plant secure takes constant vigilance, but it does not have to be costly. Earlier this year, INL completed a security review at Diablo Canyon Power Plant in California, examining the site's security procedures and confirming that they could be streamlined without any reduction in protection. The plant put those changes into practice quickly, resulting in significant efficiencies, showing how the right technical review can strengthen both safety and a plant's bottom line simultaneously.

NUCLEAR NEWSWIRE

May 1, 2026

National labs drive nuclear innovations and uprates for the U.S. fleet

As the United States faces surging electricity demand driven by artificial intelligence, data centers, and a push to bring manufacturing back home, Idaho National Laboratory is leading an effort to modernize and expand the nation's nuclear power capabilities by revamping the Department of Energy's Light Water Reactor Sustainability (LWRS) Program.

https://www.ans.org/news/2026-05-01/article-7954/national-labs-drive-nuclear-innovations-and-uprates-for-the-us-fleet/

NUCLEAR NEWSWIRE

May 8, 2026

U.S. nuclear capacity factors: More power on order

End users—from homeowners to hyperscalers—want affordable, reliable energy. President Trump has ordered nuclear capacity additions through uprates, restarts, and new builds.

https://www.ans.org/news/2026-05-08/article-7959/us-nuclear-capacity-factors-more-power-on-order/



SECTION 7

PARTNERSHIPS AND OUTREACH

Advancing nuclear energy takes a team. INL has spent this year building and deepening the collaborations that move the whole field forward. Our partnerships with industry, government, regulators, and academia are what turn research into reality. INL is increasingly recognized—nationally and internationally—as the leading institution for accelerating advanced nuclear technologies from concept to demonstration.

Academic partnerships have been a particular focus. INL now maintains Strategic University Partnership for Education and Research (SUPER) agreements with 14 institutions: Arizona State University, Boise State University, Brigham Young University, Colorado School of Mines, Idaho State University, Oregon State University, Texas A&M, University of Idaho, University of Michigan, Missouri S&T, University of Tennessee, University of Texas at San Antonio, University of Utah, and Utah State University.



Alaska visitors outside the DETAIL facility and talking about microgrids.

Advanced Reactor Developer Partnerships

INL holds active or pending agreements with 15 advanced reactor developers, spanning everything from microreactor demonstrations to fuel-cycle readiness and digital licensing. We engaged utilities, regulators, policymakers, and state leaders throughout the year, building the relationships needed to move new technologies from the laboratory to the grid.

The surge in SI-driven electricity demand has made data centers a growing focus of this work. In October 2025, INL convened more than 100 invited industry professionals (e.g., data center developers and operators, utilities and grid operators, nuclear technology providers, and engineering and technology vendors) for a workshop on powering data centers with advanced nuclear energy. That engagement is already translating into demonstration projects: Aalo Atomics and Crusoe Energy have partnered to pair Aalo's advanced reactor development program at INL with a Crusoe modular SI data center, aiming for a 2027 demonstration at the Site. INL's reactor testbed activity has accelerated in step. Aalo-X became the 55th reactor built in Idaho on July 4, 2026, following the Unity microreactor's criticality on June 30 and Mark-0's criticality on June 4, 2026.

INL teamed with Datacloud, one of the world's largest data center conference producers, to conduct a Nuclear-for-SI workshop at both the Datacloud Global Congress and at Datacloud USA. These workshops created forums for data center developers to engage with advanced nuclear developers, and ensured attendees were fully informed on recent developments in advanced nuclear demonstrations and ready to address near-term hurdles to becoming early adopters of small modular reactors and microreactors.

DOE also nominated INL to present at the International Atomic Energy Agency's "Workshop to Develop Case Studies on Long-Term Nuclear Operations and Small Modular Reactor Deployment for Hyperscalers and Artificial Intelligence." The workshop brought together an international panel of experts from hyperscalers, SI developers, cloud service providers, utilities, the nuclear sector, and the finance community to examine how long-term operation of existing reactors and the deployment of SMRs can support the rapidly growing electricity needs associated with digitalization and SI.



IAEA-DOE Latin America and Caribbean Region SMR Workshop (attendees touring HFEF).

POWER

March 12, 2026

DOE Unveils Initiative to Add 5 GW of Nuclear Capacity Through Uprates and Restarts

The Utility Power Reactor Incremental Scaling Effort—UPRISE—unveiled on March 12, will focus on power uprates at operating plants, license renewals, restarts of dormant facilities, including projects such as the Palisades Nuclear Plant in Michigan, the Crane Clean Energy Center in Pennsylvania, and others, and plant efficiency optimization, including through advanced fuel technologies.

https://www.powermag.com/doe-unveils-initiative-to-add-5-gw-of-nuclear-capacity-through-uprates-and-restarts/

NUCLEAR NEWSWIRE

March 13, 2026

DOE launches UPRISE to boost nuclear capacity

The Department of Energy's Office of Nuclear Energy has launched a new initiative to meet the government's goal of increasing U.S. nuclear energy capacity by boosting the power output of existing nuclear reactors through uprates and restarts and by completing stalled reactor projects.

https://www.ans.org/news/article-7841/doe-launches-uprise-to-boost-nuclear-capacity/



International Framework for Nuclear Energy Cooperation (IFNEC) where different countries were working on a case study together.

NUCLEAR ENGINEERING INTERNATIONAL
April 14, 2026

The rewarded projects will be given access to specialized capabilities at ORNL and ANL to accelerate advanced reactor development.

https://www.neimagazine.com/news/gain-awards-advanced-reactor-vouchers/

INL Expands Global Nuclear Leadership, Reaching 47 Countries in FY 2026

This year, INL's NS&T program significantly grew its international reach. The team connected with 47 countries through nearly 70 major events, including workshops, webinars, bilateral meetings, keynote speeches, and appearances at key international forums.

These efforts strengthened INL's relationships with U.S. government agencies, international organizations, top nuclear research labs, and countries developing new nuclear energy programs. NS&T also helped INL experts secure leadership and advisory positions on the world stage. This visibility boosted the lab's influence, showcased its expertise to global decisionmakers, and opened doors for future partnerships.

INL organized several major workshops with countries that matter most to DOE's nuclear energy goals. These events let INL demonstrate U.S. nuclear and AI technologies while advancing America's international nuclear priorities.

Through the State Department's FIRST program (which supports responsible small modular reactor deployment), NS&T trained international partners in nuclear financing, economics, and workforce development. This training helps countries build the skills and institutions needed to deploy nuclear energy safely and responsibly.

NS&T also turned these relationships into concrete results. The team signed a research and development agreement with Singapore and completed its first project focused on TRIGA fuel.

Together, these achievements cement INL's role as a trusted nuclear energy partner—both in the U.S. and around the world—while opening new doors for collaboration and reinforcing the lab's leadership in civilian nuclear energy.

NUCLEAR NEWSWIRE

June 26, 2026

GAIN makes diverse selections for its third round of awards this year

Two of the companies receiving awards are working on optimization, reliability, and verification of their reactor designs; one company is developing its uranium conversion process; and one company is developing its neutron detector design.

https://www.ans.org/news/article-8154/gain-makes-diverse-selections-for-its-third-round-of-awards-this-year/



GAIN's Michelle Zietlow-Miller recently joined a Nuclear 101 panel in Lake Placid, New York, helping attendees learn more about nuclear technologies, energy systems, and the role nuclear energy can play in meeting future energy needs.

GAIN Outreach and Engagement

Beyond direct industry support, Gateway for Accelerated Innovation in Nuclear (GAIN) continued expanding its role as a trusted national voice on nuclear energy. In FY 2026, GAIN participated in over 78 outreach events, sharing research and connecting stakeholders with technical resources. To meet growing demand for unbiased information, GAIN developed a community engagement toolkit to help states and communities build their own accurate outreach materials and continued sharing brownfield site data and site-screening information with communities, state leaders, academia, and utilities.

GAIN also expanded into new areas this year. Beyond its ongoing work on state feasibility studies, GAIN began supporting utility regulators in Kentucky and Arizona on nuclear technology discussions, which is a new focus expected to grow in FY 2027 as more states plan for new nuclear generation. GAIN also began compiling and sharing a list of open DOE funding opportunities on its website to help states and developers track available funding.

GAIN deepened its work with Tribal communities through a growing partnership with DOE's Office of Indian Energy, supporting its Technical Assistance team on Tribal nuclear energy requests. This included joint outreach at the Reservation Economic Summit, the Advancing Indigenous Science and Engineering Society's National Conference, and the Tribal Energy Summit. GAIN also joined the Midwest Tribal Energy Resources Association and built new relationships with Tribal nonprofits focused on energy, connecting multiple Tribes with resources and experts.

Through its continued partnership with the National Association of State Energy Officials (NASEO) on the Advanced Nuclear First Mover Initiative—a coalition of 11 states building the advanced nuclear ecosystem—GAIN helped issue a Request for Information toward a coordinated orderbook for advanced nuclear projects. The results identified three priorities: adopting generic siting information for permitting, streamlining permitting approval processes, and piloting a cost-share program for early site permitting. GAIN is now advancing these priorities through discussions with DOE, a review of national laboratory capabilities, and the use of SI tools to help streamline permitting.



Data Center Workshop, October 2025.

Voucher Awards

The U.S. Department of Energy's Gateway for Accelerated Innovation in Nuclear (GAIN) program issued 14 voucher awards over FY 2026 to help innovative nuclear companies tap the expertise and facilities of national laboratories. Rather than cash grants, these vouchers fund laboratory support, from advanced modeling to materials testing, so industry teams can solve key technical challenges faster and more affordably.

This year's selections span established utilities and emerging reactor developers, with examples like BWXT Advanced Technologies, NuScale Power, and Constellation Energy working on fuel performance and plant operations, while startups such as Aalo Atomics, OrganiCore Nuclear, Raven-Flint Nuclear, and Srijan LLC pursued operational risk tools, new materials data for reactor design, sensor development, and fuel-cycle innovations. Together, the FY 2026 vouchers illustrate how targeted laboratory collaboration is accelerating cleaner, reliable nuclear energy solutions for the public.

These investments in industry partnerships are how the U.S. ensures that promising nuclear technologies do not stall on the path from innovation to commercial deployment.



SECTION 8

ORGANIZATIONAL EXCELLENCE AND RECOGNITION

NS&T staff continue to be recognized nationally and internationally for their leadership, innovation, and contributions to the nuclear field.

NS&T continues to grow in response to the historic amount of work coming to the directorate. In FY 2026, the directorate added 125 new staff members (a 26% increase over last year). In addition, the directorate welcomed 188 interns.



125

NEW STAFF MEMBERS INCLUDING POSTDOCS

188

INTERNS JOINED THE DIRECTORATE



Laboratory Director Awards Ceremony.

American Nuclear Society (ANS) Awards and Recognitions:

Jess Gehin
Seaborg Medal, for pioneering leadership in reactor physics and advanced reactor development

John Wagner
Alvin M. Weinberg Medal, for decades of leadership shaping nuclear science, policy, and innovation

John Jackson
Untermeyer & Cisler Award

Vivek Agarwal
H.M. Hashemian Mid-Career Award

Abdalla Abou-Jaoude
Early Career Reactor Physicist Award
ANS Landis Young Member Engineering Achievement Award

Drew Thomas
ANS Landis Public Communication and Education Award

INL Risk Assessment Training Program Team
Robert L. Long Training Excellence Award

Ishita Trivedi
Young Members Advancement Award, for advancing mentorship and inclusion in the nuclear workforce

Stephanie H. Bruffey
FCWMD Significant Contribution Award

Ken Marsden
FCWMD Significant Contribution Award

GAIN Team (Christine King, Michelle Zietlow-Miller, Emily Nichols)
Social Responsibility in the Nuclear Community Award

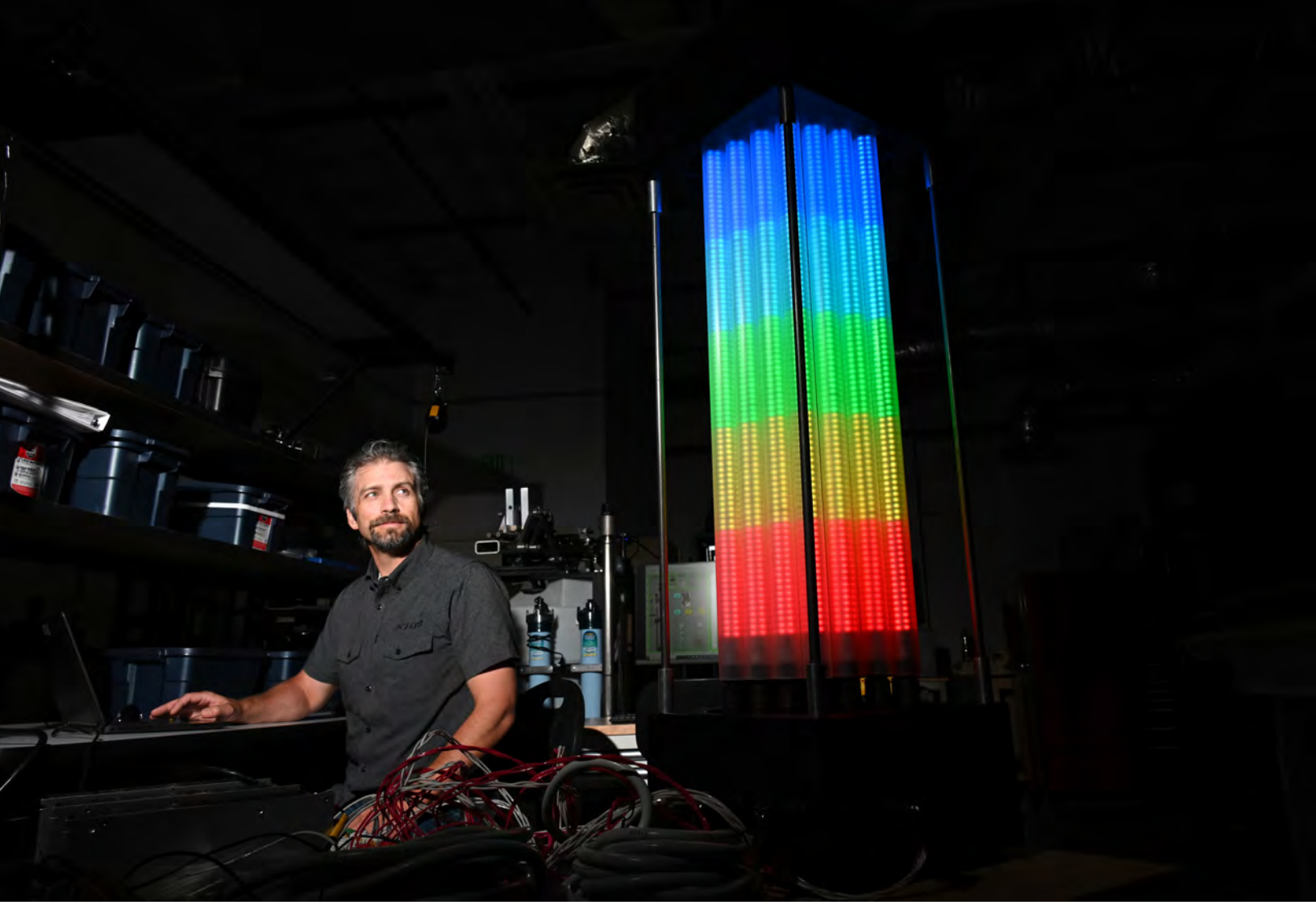
Other Recognitions:

Jacy Conrad
2026 IAPWS Helmholtz Award, for research in high-temperature water chemistry and radiolysis relevant to nuclear systems

Nuclear Science User Facilities (NSUF)
Pioneering UK-U.S. Breakthroughs Award, U.S./UK Global Research and Innovation Impact Showcase — recognizing over a decade of collaborative nuclear materials research, including SiC-SiC composite irradiation campaigns at ATR and joint U.S.-UK student training initiatives

U.S. Department of Energy Secretary's Honor Awards

Reactor and Fuel Line Pilot Program Implementation Team: Ron Crone, Jess Gehin, Brad Tomer, Brady Orchard, Justin Coleman, Stuart Jensen and Sam Reiss



ViBRANT - (principal investigator, Anthony "Tony" Crawford) uses a photon-based surrogate reactor to advance reactor instrumentation and controls.

ViBRANT and TMAP8 Win R&D 100 Awards

Idaho National Laboratory earned two of its five 2026 R&D 100 Awards for technologies tied to NS&T's mission. Visual Benign Reactor as Analog for Nuclear Testing **(ViBRANT)**, led by **Anthony Crawford**, is a surrogate nuclear reactor that replaces neutrons with photons, allowing researchers to accelerate advanced reactor development and testing without the cost and complexity of working with an actual nuclear core.

Tritium Migration Analysis Program, Version 8 **(TMAP8)**, led by **Pierre-Clément Simon**, tackles one of fusion energy's biggest hidden challenges: tritium management. Built on INL's Multiphysics Object-Oriented Simulation Environment (MOOSE) simulation platform, TMAP8 is the first open-source tritium modeling tool to meet the Nuclear Quality Assurance Level 1 (NQA-1) industry standard, giving fusion developers a validated, publicly available way to model tritium transport and fuel-cycle behavior.



TMAP8 - (principal investigator Pierre-Clément "PC" Simon) is the first open-source Nuclear Quality Assurance-1-compliant tritium modeling platform supporting safe fusion energy.

Publications and Intellectual Property

In FY 2026, BEA produced 478 publications (323 peer-reviewed journal articles, 148 conference papers, four books / chapters, three editorials), translating to 97 technology licenses (including 16 open-source software licenses), 7 patents granted, and 42 invention disclosures. Licenses included Plant Reload Optimization (PRLO) to Constellation Energy Generation, where it matched or outperformed heuristic core-reload designs, and Bison to NANO Nuclear Energy's KRONOS reactor and Subcritical Systems' Energy Amplifier.

323
PEER-REVIEWED JOURNAL ARTICLES

42
INVENTION DISCLOSURES

148
CONFERENCE PAPERS

7
PATENTS GRANTED

Access a digital copy of this report.

For more information, contact donna.kempspangler@inl.gov

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

26-50840







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