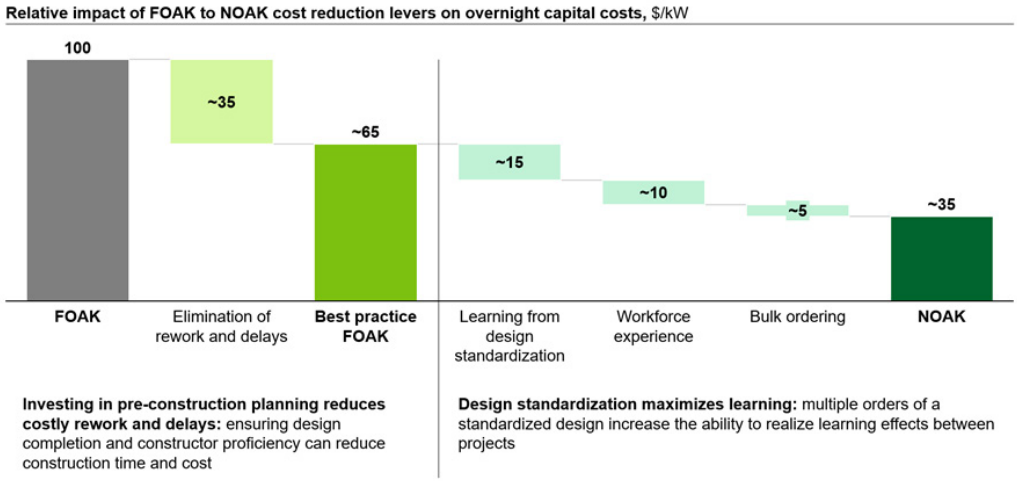
Advanced Nuclear Liftoff at the National Labs

The DOE National Lab Complex possesses numerous capabilities that support the accelerated commercialization and scale-up of advanced nuclear technologies. These capabilities include subject matter experts, user facilities, and intellectual property (IP).

Advanced Nuclear Capabilities

Following publication of the original Advanced Nuclear Liftoff report, Idaho National Lab (INL), Argonne National Lab (ANL), and Massachusetts Institute of Technology (MIT) created a framework that provides further precision on the ways to reduce the cost of new nuclear projects from First of a Kind (FOAK) to "Nth" of a Kind (or the cost associated with standard development of numerous reactors).

That framework identified seven levers where learning effects could reduce project costs: design completion, design maturity, cross-site standardization, orderbook quantity, supply chain efficiency, construction contractor proficiency, and architect/engineer contractor proficiency.



In this addendum we highlight lab capabilities that address these levers via five main sets of activities:

1. **Develop nuclear test reactors to demonstrate microreactor-related technologies.**
2. **Enable continued operation of existing nuclear reactors:** Accelerate RDD&D to reduce operating costs; demonstrate and deploy technologies that enable markets beyond electricity, including advanced energy products and industrial decarbonization; and understand socio-economic drivers and mitigate risks to enable continued operation of existing nuclear reactors both at home and abroad.
3. **Enable domestic and global deployment of advanced nuclear reactors:** Reduce risk and time needed to deploy advanced nuclear technology both domestically and abroad; develop reactors through private-public partnerships and research and development (R&D) at universities and National Laboratories that expand market opportunities for nuclear energy; and support a diversity of designs that improve resource utilization and reduce waste.
4. **Secure and sustain the global nuclear fuel cycle:** Develop and demonstrate advanced fuel cycle technologies; address gaps in the domestic nuclear fuel supply chain for both existing and advanced nuclear reactors; and encourage domestic expansion of commercial capacity in the nuclear fuel cycle.
5. **Expand International Nuclear Energy Cooperation:** Identify potential markets and create opportunities for strategic partnerships and provide international technical assistance and additional resources to countries pursuing or considering the pursuit of a new or expanding nuclear power program to support infrastructure development, regulatory frameworks, and capacity building.

Find resources at the Lab Partnering Service (labpartnering.org), with OTT available to help quarterback connections to the National Labs.

Advanced Nuclear Lab Resources

Facilities	Experts	Licensable Technologies
77	**160**	**129**

- **Facilities:** Leverage the National Laboratories' state-of-the-art facilities to innovate and tackle the world's most challenging scientific issues.
- **Experts:** Connect with top scientists, engineers, and energy experts ready to answer your questions.
- **Licensable Technologies:** Review hundreds of advanced technologies that were developed with DOE funding and are available for licensing.
- **Patents and Software:** Explore DOE's open source and proprietary software and technology to address specific business, technical, or operational challenges.

APPENDIX: FACILITIES

Argonne National Laboratory

- Activated Materials Lab
- Advanced Photon Source
- Analytical Chemistry Laboratory
- Battery Post-Test Facility
- Argonne Leadership Computing Facility
- Argonne Liquid Metal Experiment Facility
- Argonne Tandem Linac Accelerator System (ATLAS)
- ATLAS Materials Irradiation Station
- Centrifugal Contractor Testbed Facility
- Environmentally Assisted Cracking Laboratory
- Fuel Development and Qualification Facility
- High Temperature Corrosion Test Facilities and High Pressure Test Facilities for Metal Dusting
- Intermediate Voltage Electron Microscopy-Tandem
- Irradiated Materials Laboratory
- Laboratory Computing Resource Center
- Low-Energy Accelerator Facility
- Materials Corrosion Laboratory
- Materials Engineering Research Facility (MERF)
- Mechanisms Engineering Test Loop Facility (METL)Molten Salt Flow Loop and Sensor Facility
- Molten Salt Reactor Accident Analysis Facility
- National Security Facility
- Natural Convection Shutdown Heat Removal Test Facility
- Non-Destructive Evaluation and Testing Facilities
- Pressure Drop Experimental Loop for Investigations of Core Assemblies Advanced Nuclear Reactor (PELICAN)
- Pyroprocess Engineering Facilities
- Radioactive Material Handling Laboratory
- Radioanalytical Counting Laboratory
- Severe Accident Lab
- Sodium Materials Testing Loop-3 (SMT-3)
- Sodium Sensor Test Loop
- Thermal Hydraulic Experimental Test Article (THETA)
- Thermophysical Properties Laboratory

Fermi National Accelerator Laboratory

- Accelerator Applications Development and Demonstration (A2D2)

Idaho National Laboratory

- Advanced Test Reactor
- Electron Microscopy Laboratory
- Experimental Fuels Facility
- Fuel Conditioning Facility
- Fuel Manufacturing Facility
- Fuels and Applied Science Building
- EHigh Temperature Test Laboratory
- Hot Fuel Examination Facility
- Irradiated Materials Characterization Laboratory
- Materials and Fuels Complex
- Microreactor Applications Research Validation and Evaluation (MARVEL)
- Sample Preparation Laboratory
- Transient Reactor Test Facility
- Zero Power Physics Reactor

National Renewable Energy Laboratory

- 88-inch Cyclotron
- Applied Nuclear Physics Program
- Berkeley Accelerator Space Effects (BASE) Facility

Nevada National Security Site

- Joint Actinide Shock Physics Experimental Research Facility
- Nonproliferation Test and Evaluation Complex
- Radiological/Nuclear Countermeasures Test and Evaluation Complex
- JT-1 Training Center
- U1a Complex

Oak Ridge National Laboratory

- Coated Particle Fuel Laboratory
- Facility to Alleviate Salt Technology Risks
- Materials Irradiation Facility
- Remote Maintenance Laboratory
- Safeguards Laboratory
- Thermal Hydraulics Laboratory

Pacific Northwest National Laboratory

- Atmospheric Measurements Laboratory

Sandia National Laboratories

- Computer Science Research Institute
- Gamma Irradiation Facility and Low-Dose-Rate Irradiation Facility
- Geochemistry Laboratories
- Microsystems and Engineering Science Applications
- Mobile Instrumentation Data Acquisition System
- National Infrastructure Simulation and Analysis Center
- Nuclear Control System Emulation Lab
- Nuclear Energy Systems Laboratory / Brayton Lab
- Nuclear Facilities Resource Center
- Nuclear Security Technology Complex
- Thermal Test Complex
- Waste Isolation Pilot Plant

Thomas Jefferson National Accelerator Facilities

- Superconducting Radiofrequency Institute (SRF Institute)

National Reactor Innovation Center (NRIC)
The Office of Nuclear Energy (NE) launched the National Reactor Innovation Center (NRIC) to help advanced nuclear technologies move through the later stages of commercialization. Based at Idaho National Laboratory and collaborating with other National Labs like Argonne, NRIC provides developers access to cutting-edge infrastructure across multiple locations. This allows them to resolve technical challenges, validate reactor designs, and facilitate testing and demonstration, accelerating the deployment of advanced reactor technologies.

Mechanisms Engineering Test Loop Facility (METL)
Argonne's Mechanisms Engineering Test Loop Facility (METL) supports development of next-generation components and workforce for sodium fast reactors. Established in 2018, METL is an intermediate-scale liquid metal experimental facility that provides purified R-grade sodium to various experimental test vessels to test components that are required to operate in a prototypical advanced reactor environment. Experiments conducted in METL significantly assist the development of advanced reactors as it should provide invaluable performance data and reduce the risk of failures during plant operation.

Argonne NATIONAL LABORATORY · Fermilab · INL Idaho National Laboratory · BERKELEY LAB · NEVADA NATIONAL NNSS SECURITY SITE · OAK RIDGE National Laboratory · Pacific Northwest NATIONAL LABORATORY · Sandia National Laboratories · Jefferson Lab