

ADVANCED MICROREACTORS ARCTIC DEPLOYMENT WORKSHOP

Workshop Executive Summary for Participants • 9-11 September 2026 • Fairbanks, Alaska

Principle Outcomes

The Advanced Microreactors Arctic Deployment (AMAD) Workshop and Tabletop Exercise (TTX) assessed applied research and development needs for defense-related microreactor deployment, while considering potential commercial applications following military deployments. Participants identified nine priority research areas and emphasized the need to evaluate the full deployed system and lifecycle, including environmental site assessment, geohazard analysis, site work and foundations, transportation, construction, supporting equipment, microgrid integration, sustainment, emergency response, and eventual removal. The need to evaluate technologies specifically for the Arctic environment was discussed and permafrost foundations emerged as high-priority opportunities for near-term testing.

Participation

Participants brought expertise in nuclear technology, Arctic engineering, military operations, energy resilience, logistics, and infrastructure. Organizations represented included DoW and Army nuclear energy and research leadership, U.S. Army Engineer Research and Development Center, U.S. Arctic Research Commission, West Point, 11th Airborne Division, Army Prime Power School, Alaskan Command, Naval Facilities Engineering Systems Command, the Ted Stevens Center, DOE and five national laboratories, the State of Alaska, University of Alaska Fairbanks, and Defence Research and Development Canada. West Point faculty and cadets supported the exercise through a multidisciplinary senior capstone effort. Janus partners Radiant and Antares were on-site to engage participants on reactor designs and deployment approaches.

Alaska Governor Mike Dunleavy, UAF Chancellor Dr. Russ Vander Lugt, DOE Deputy Under Secretary Mike Kopp, and USARC Commissioner Mark Myers provided opening remarks. Dr. Gwen Holdmann, Chief Scientist of UAF's Alaska Center for Energy and Power, delivered the keynote address.

TTX and Operational Context Site Visits

The TTX considered deployment lifecycles for two scenarios: an austere inland site in the far north, and a rugged tectonically active coastal installation with some established infrastructure. Participants considered site selection and characterization, transportation, civil works, construction and commissioning, integration with local infrastructure, operations and maintenance, security, emergency response, decommissioning, and site restoration. Challenges and a recommended course of action were recorded for each step in the lifecycle.

To better understand the operational context and ground the discussion in Arctic conditions, participants visited the CRREL Permafrost Tunnel, Arctic Infrastructure Research Center, and Trans-Alaska Pipeline viewing point. The workshop concluded with a case study from Fort Wainwright DPW on the installation power requirements and a tour of the Fort Wainwright combined heat and power plant by Doyon Utilities.

Distribution A. Approved for public release: distribution is unlimited.

1



Priority Research Areas

Participants reviewed and agreed to nine priority research areas during the final workshop discussion:

- 1. Permafrost foundations and thermal interactions.** Understand heat transfer, thaw settlement, frost heave, and foundation performance across the reactor lifecycle; develop structural health monitoring, materials, and foundation approaches to manage these interactions.
- 2. Local soil and aggregate analysis for irradiation effects.** Determine whether local soils and aggregates can support construction, shielding, and long-term nuclear operations, and develop site restoration strategies for Arctic and permafrost environments.
- 3. Arctic transportation of reactor systems, nuclear fuel, and sensors.** Develop multimodal approaches using airlift, ice roads, overland vehicles, and sealift, addressing packaging, instrumentation / monitoring, and regulatory requirements; explore autonomous transport, handling, and assembly in extreme weather.
- 4. Remote Arctic fueling, defueling and reactor break-down methods.** Develop Arctic ready field fueling and defueling methods, transport containers, cooling-time criteria, and safe approaches for removing and disposing of irradiated fuel and reactor components from remote sites.
- 5. Cold-region construction, operations and sustainment.** Qualify equipment, local and imported materials, construction methods, and maintenance approaches for extreme cold and extreme geohazards; define workforce, training, skills, and education requirements.
- 6. High Technical Level of Readiness research and engineering of complete deployed microreactor power plant system.** Validate the reliability of the complete deployment package in Arctic conditions, including system health monitoring, safety sensors, microgrid controls, and other supporting components.
- 7. Paired equipment to support remote operations, maintenance, and other mission tasks.** Evaluate Arctic-capable equipment that uses reactor heat and electricity to reduce logistics demands, including additive manufacturing of spare parts, synthetic fuel production, and desalination; explore demonstration testbeds.
- 8. Arctic emergency and radiological response.** Develop procedures and equipment for low or no-water decontamination, cold-weather chemical, biological, radiological, and nuclear response, casualty evacuation, remote assessment, and robotics; assess non-radiological and potential radiological test infrastructure needs.
- 9. Arctic system integration.** Evaluate integrated energy architectures and combined heat and power approaches; develop microreactor site planning tools that support operational formations and 11th Airborne Division missions.

Near Term Testing and Follow-on

Participants identified non-radiological Arctic testing as an opportunity to uncover unknowns, reduce risk, and accelerate deployment, and discussed developing a non-radiological Arctic testbed facility. Long-duration permafrost foundation testing under representative weight and heat loads was a high priority.

Sustained community engagement on nuclear technology's benefits and risks was discussed as essential to public support of defense, industry, and community deployments. Participants emphasized the need for coordinated, planned, and resourced outreach efforts.

A detailed workshop report is in preparation. A follow-on FY27 tabletop exercise focused on North Warning System applications remains under consideration.



Figure 1: Alaska Governor Mike Dunleavy provides opening remarks, frames energy challenges faced in remote parts of the state, and thanks USMA cadets for their participation in the workshop.



Figure 2: Workshop participants discuss courses of action in breakout groups during a turn of the tabletop exercise.



Figure 3: Dr. Annie Kammerer, Army Nuclear Energy Office Lead for Policy, Fuel, and Interagency Coordination, provides background to participants on Janus program awardees and technology considerations.



Figure 4: Dr Tom Douglas, Senior Scientific Technical Manager with ERDC, leads workshop attendees through the permafrost tunnel in Fox, Alaska for discussion on the tunnel's history and unique challenges of Arctic structural, geological, and thermal management design and operational considerations for microreactor deployment.



Figure 5: Ms. Isabelle Jacobson(far right), ERDC Cold Regions Research and Engineering Lab Physical Scientist working out of Fairbanks area, demonstrates sustainment and operational systems being evaluated at the ERDC Arctic Infrastructure Research Center to Mr. Jim P. Allen (far left), ERDC Technical Director for Operational Science and Engineering, COL Clay Bagwell (center-left), Operational Energy Prototype Fund Program Military Deputy, and Mr. James Kocsis (center-right), Operational Energy Requirements and Acquisitions Lead.



Figure 6: Workshop participant observes the feed mechanism and combustion chamber of a coal boiler during a tour of the Fort Wainwright Combined Heat and Power Plant.



Figure 7: Dr. Russ Vander Lugt (center-left), University of Alaska-Fairbanks chancellor and former US Military Academy (USMA) assistant professor, welcomed participants to the workshop. Dr. Orian Welling (center-right), ERDC Senior Researcher facilitated workshop discussions, and Dr. Todd Davidson (right), USMA Director Center for Applied Engineering, and LTC Karoline Hood (2nd from right), USMA Assistant Professor, brought eight USMA Cadets to assist with the workshop and for future capstone project integration.