Executive Summary

Department of Defense Enterprise Assessment in the Continental United States and U.S. Territories for Advanced Nuclear Reactors [1]

Energy resilience is an essential capability of Department of Defense (DoD) installation mission execution. It is vital that the Department explore all options to strengthen energy resilience, including emerging technologies like advanced nuclear power. The Office of the Deputy Assistant Secretary for Energy Resilience and Optimization (ODASD(ER&O)) recently completed a siting assessment that considered the feasibility and potential siting and operation of one or more advanced nuclear microreactors on a military installation.

Renewed interest in nuclear energy is leading designers, developers, and federal stakeholders to advance solutions on long-term technical and regulatory barriers to new advanced nuclear development. The Department's consideration of advanced nuclear microreactors as a potential installation energy resilience measure supports several key objectives. These include the delivery of highly resilient, reliable power; identifying and addressing critical regulatory and implementation gaps impacting developers, end-users, regulators, and industry; and stimulation of innovative new-to-market energy technologies and solutions that when implemented, can serve to address these barriers.

Currently, nuclear technology developers are advancing designs with distinguishing characteristics related to operational output, fuel, reactor coolant, power generation cycles, and extension of refueling intervals. Additional attributes of advanced nuclear microreactor technologies seek to ensure compliance with safety, technical, and performance-based requirements designated by the following:

- Engineered safe-by-design and targeted defense-in-depth principles for management and control of reactor criticality, shielding, containment, thermal management, and sustainment throughout the reactor lifecycle.
- Direct contribution to installation resilience and energy requirements, capable of both grid-connected and independent generation and dispatch.
- Scalable design-for-purpose technologies that can range in capacity from hundreds of kilowatts to tens of megawatts (MW) of electrical power and thermal energy supporting installation needs.
- Factory manufacturing capability that can reduce production timelines, improve quality control and assurance, and potentially reduce capital- and procurement-related costs.
- Transportability of the reactor and fuel through conventional, regulated pathways across the microreactor lifecycle.

The Department conducted the assessment to systematically identify, prioritize, and evaluate a range of candidate installations in the continental United States (CONUS) and U.S. territories that may benefit from the implementation and operation of one or more advanced nuclear microreactor(s). The siting assessment characterized installations based on criteria that incorporates both DoD energy policy and conventional nuclear siting objectives. As applied, the assessment resulted in a range of potential installation energy demand profiles across the Military Departments (MILDEPs) so that modular, scalable design(s) at known capacities could be considered for the highest number of installations.

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[1] Excerpted from the full report *Enterprise Installation Assessment for Advanced Nuclear Reactors,* PNNL- 34741, (Issued as Final, APR 2025).

Consistent with DoD and other Federal energy siting objectives, the assessment used data, criteria, and threshold requirements supported by estimating methodologies and siting characteristics consistent with established nuclear siting and regulatory objectives. As a reconnaissance-level siting assessment, it is expected that subsequent analyses will require verification by the MILDEPs and validation at each respective site with emphasis on the advanced nuclear microreactors technology(s) being considered for that location.

Methodology

The siting assessment used a progressive, criteria-driven, down-selection process to evaluate DoD installations in the CONUS and U.S. territories under the jurisdiction of U.S. nuclear policy and regulations. The consolidated list of installations was screened and rank-ordered based on criteria which accounted for an installation's demand for electricity (purchased and/or produced). Each installation was then categorized and grouped based on estimated capacity (in megawatts electric (MWe)) required to meet the average demand for purchased and/or produced electricity. This allowed for a fair comparison among equivalently sized installations from a capacity perspective, with the highest-ranking installations in each capacity range moving forward for further evaluation through the application of site-suitability criteria.

Reflective of critical mission, nuclear siting, regulatory, stakeholders, and economic attributes, detailed site-suitability criteria were applied and modeled across multiple scenarios to evaluate the impacts associated with varying attributes. The full list of site-suitability criteria is detailed in Table 1.1.

Category	Criteria	
Demand for Power	Capacity/Energy	• Electricity consumption, load, and capacity • Energy consumption
Critical Mission	Assurance	• Priority designation(s)
	Resilience	• Loss of service (outside the fence) • Critical peak load service (inside the fence)
Nuclear Siting	Siting Hazard and Risk	• Natural hazard phenomenon (6 criteria)
Regulatory	Siting	• State-level policies, posture, and statutes
Stakeholders	Host/Defense Community	• Accrued project benefits
Resource Economics	Cost and Value	• Unit cost of electricity and energy • Resilience value at risk

Table 1.1. ODASD (ER&O) nuclear site assessment site-suitability criteria

Through a series of model scenarios which varied by category and criteria weighting, the top-ranking installations were identified; those installations that consistently ranked the highest among their peers in each modeled scenario were carried forward for additional geospatial analysis. While numerous installations ranked highest among their peers in every scenario, other installations ranked highest in one or two modeled scenarios. Depending on the priorities of the Department and the MILDEPs, their inclusion in further site or criteria specific assessments may be warranted.

The application of geospatial criteria provided estimates for known or probable constraints on the availability of land for the siting of an advanced nuclear microreactor on an installation within the authoritative boundary. The geospatial criteria were largely avoidance or exclusionary in nature such that any available land on an installation would have to meet requirements ensuring the safety of the public and installation personnel (radiological buffers and controlled zones); compliance with environmental laws (wetlands, listed species, critical habitat); and avoidance of hard-to-mitigate hazards such as excessive slope, storm surge in coastal and riverine locations with limited topographical relief, and readily identifiable clear zones (e.g., airstrips, munitions storage).

Once all geospatial criteria were applied, available land on the installation was then assessed against conservatively estimated radiologic and physically controlled land requirements for operation of an advanced nuclear microreactor. For a plant up to 10 MWe, this was estimated to nominally require 3 acres; for a plant larger than 10MWe, this was estimated to require 11 acres. As a final consideration, a radiologic buffer was imposed at the installation boundary such that public and civilian populations outside of the installation boundary could expect to remain safe under all normal and off-normal conditions. Those installations that appeared to have available land inside the authoritative boundary which could support the development of one or more advanced nuclear microreactors were prioritized.

Results

When evaluated and assessed against site-screening, suitability, and geospatial criteria, twenty-four (24) installations demonstrated no assessed limitations at the reconnaissance level.[2] Each of the twenty-four (24) installations scored highly in all modeled scenarios and appear to have available land to potentially support the development and operation of one or more advanced nuclear microreactors (of appropriate capacity) within the installations authoritative boundaries after applying relevant geospatial criteria. Table 1.2 provides a numeric summary of the installation siting assessment characterized by the number of priority installations and the respective targeted capacity range.

Capacity (MW)	Number of Installations
5-10	6
10-20	6
20-40	7
40+	5

Table 1.2. ODASD(ER&O) nuclear site assessment results summary

To further delineate priority installations, MILDEP-specific criteria and constraints will require additional assessment and validation from both a temporal and site-specific level. Installations exposed to changing energy supply mix, demand, or ownership (utilities); siting constraints or changes in land availability or changing mission profiles may affect the future feasibility of an installation's ability to host an advanced nuclear microreactor.

In prioritizing installations that consistently rank highest among their peers across multiple scenarios, the assessment preferably serves to focus resources on locations that appear to be optimal for initial siting of a microreactor but recognizes that future planning objectives specific to the MILDEPs and their respective installations are not reflected in this assessment. As a

[2] A reconnaissance-level analysis is a necessary first step to identifying installations that can be prioritized from a siting perspective based on accessible information and historic data. Additional site-specific analysis and site-specific characterization should be conducted for final site decision-making purposes.

result, it is appropriate to review and update findings on a consistent basis as MILDEP-specific goals and objectives are identified in complement with the specified siting criteria considered herein.

The detailed analysis and site-specific criteria have been provided to the MILDEPs and will remain with the Department to support future MILDEP planning activities. The information in this executive summary is being shared publicly to invite our industry and regulatory partners to join with DoD to support development and deployment of new technologies that may be uniquely positioned to advance the energy resilience objectives of the Department.

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