

PNNL Grid-Edge AI Resilience Node

Executive Summary

Project 30, named the PNNL Grid-Edge AI Resilience Node, introduces a flexible AI campus idea positioned at or near the Pacific Northwest National Laboratory (PNNL). This serves as a boundary-point durability and analysis hub, extending beyond a standard computing facility. All evaluations rely on surrogate simulations and strategic planning, with no involvement in managing networks, power production, or atomic resources.

The initiative offers the Department of Energy (DOE) a systematic method to assess how cutting-edge AI operations might integrate with PNNL's network expertise and varied local energy options in eastern Washington, per the March 2025 "AI Infrastructure on DOE Lands" Request for Information (RFI). It emphasizes placement ideas, design patterns, and models to guide potential future bids without favoring particular tech, suppliers, or builds.

Strategic Goals and RFI Compatibility

Strategic Goals

Project 30's aims include:

- Crafting AI campus design patterns that establish PNNL as a network-boundary AI durability hub, able to accommodate AI tasks that demand and enhance superior energy stability.
- Applying surrogate simulations to investigate conceptual interactions between an AI campus at PNNL and area hydro, traditional atomic, prospective small modular reactors (SMRs planned regionally), and wider grid systems.
- Outlining necessary additional location, network, and regulatory details before DOE might explore a bid tied to AI setups at or near PNNL.
- Spotlighting ways to utilize PNNL's strengths in network studies, digital protection, and sophisticated computing for AI-boosted network durability.

Compatibility with the March 2025 AI Infrastructure on DOE Lands RFI

This aligns by:

- Addressing PNNL's potential as a site, leveraging the PNNL supplement that notes consistent weather, mixed energy supplies, and closeness to grounds formerly allocated for regional growth.

Flatirons Nexus: AI-Renewables Integration Test Campus

Executive Summary

Project 29 outlines a renewables-focused AI experimental campus idea situated at or adjacent to the National Renewable Energy Laboratory (NREL) Flatirons site. It creates a concise array of adaptable AI campus design patterns and appraises them through solely unclassified stand-in simulations and strategic reviews. Every result consists of relative assessments aimed at aiding initial choices; no functional oversight of power sources, network elements, or computing hubs is suggested or inferred.

The goal is to equip the Department of Energy (DOE) with an organized method to grasp how sophisticated AI tasks might function in tight synergy with wind, solar, batteries, hydrogen, and additional unified energy setups available in the Flatirons setting, as outlined in the March 2025 “AI Infrastructure on DOE Lands” Request for Information (RFI). The framework aids in cultivating future possibilities without binding DOE or NREL to any definite rollout trajectory.

Strategic Goals and RFI Compatibility

Strategic Goals

Project 29 aims to:

- Position NREL Flatirons as a hub for AI-energy fusion trials, rather than just a commercial hosting location.
- Investigate how adaptable and partially adaptable AI operations could adjust to fluctuating renewable output while upholding suitable simulated performance standards.
- Contrast renewables-dominant, grid-equilibrated, and blended functional modes via surrogate simulations.
- Highlight the core location, network, and partner details DOE would require prior to contemplating any upcoming bid or collaboration approach.
- Reveal partnership potentials involving NREL initiatives, power companies, academic institutions, and sector allies.

Oak Ridge AI Supercomputing Campus (ORNL / TVA-Aligned)

Planning-Level Concept Developed to Inform DOE’s March 2025 “AI Infrastructure on DOE Lands” Request for Information [DOE RFI, Mar 2025]

Executive Summary

This document presents a planning-only concept for an Oak Ridge AI Supercomputing Campus that would colocate advanced AI infrastructure with ORNL's high-performance computing and science missions, supported by the TVA-served regional grid. It is a feasibility-oriented proposal that defines campus architecture templates, proxy modeling constructs, governance concepts, and readiness criteria to help the Department of Energy (DOE) evaluate Oak Ridge as a potential site for AI infrastructure under the March 2025 RFI [DOE RFI, Mar 2025].

All content remains in the realms of simulation, modeling, and conceptual planning. No operational control, reactor interfacing, grid actuation, deployment decision, procurement action, or vendor selection is proposed or implied. The intent is to give DOE a disciplined planning framework, not to pre-judge or commit to any future project.

Problem Statement and Opportunity

AI workloads are increasingly central to DOE's scientific, energy, and security missions, and they often operate in close partnership with high-performance computing systems. ORNL, located on the Oak Ridge Reservation in Tennessee, already hosts leading-edge computing infrastructure and supports major national research programs [DOE RFI, Mar 2025].

The RFI identifies Oak Ridge as one of several DOE sites that may be suitable for AI infrastructure but does not provide an integrated concept for how AI and HPC could be co-planned at this location [DOE RFI, Mar 2025]. The gap is:

- There is no unified, Oak Ridge-specific vision that shows how an AI campus might be structured to:
 - Complement ORNL's science and national research missions.
 - Conceptually interact with the TVA-served grid in planning models.
 - Respect Oak Ridge's environmental, security, and land-use constraints.

Savannah River Sovereign AI Campus

Planning-Level Concept Designed to Respect Nuclear, Tritium, and Environmental Missions and Informed by DOE's March 2025 "AI Infrastructure on DOE Lands" Request for Information [DOE RFI, Mar 2025]

Executive Summary

This document presents a planning-only concept for a Savannah River Sovereign AI Campus: a small, tightly governed AI enclave nested within the much larger Savannah River Site, which the

RFI describes as an approximately 310-square-mile DOE/NNSA complex supporting tritium production, nuclear material management, and environmental cleanup and stewardship [DOE RFI, Mar 2025]. The AI campus is conceived as a phased, long-horizon presence that coexists with, but does not interface with, SRS's nuclear and national security missions.

The proposal defines architecture templates, proxy modeling constructs, governance assumptions, and readiness criteria that DOE can use to consider whether SRS could host a limited, sovereign AI campus in support of long-term national objectives. All content is confined to conceptual planning and proxy simulation: no operational control, grid actuation, facility interfacing, deployment decision, or vendor selection is proposed or implied.

Problem Statement and Opportunity

The Savannah River Site is a very large, mission-critical DOE/NNSA complex with tritium, nuclear materials, and environmental missions, and it is explicitly cited in the RFI as one of 16 candidate locations for potential AI infrastructure [DOE RFI, Mar 2025]. The RFI notes that SRS includes extensive DOE-managed land and that any new land use is controlled through a Site Use Permit process that applies to all activities on any tract of land [DOE RFI, Mar 2025].

The planning problem is that there is currently no SRS-specific concept that demonstrates:

- How a small, sovereign AI enclave could be sited and phased at SRS while maintaining clear isolation from tritium, nuclear, and other mission facilities.
- How such an enclave could evolve over long time horizons under the Site Use Permit framework and environmental hard constraints.
- How SRS's scale and mission profile can be translated into a conservative, reversible AI campus concept using only planning constructs and information explicitly available in the RFI.

[6450-01-P] DEPARTMENT OF ENERGY Request for Information on Artificial Intelligence Infrastructure on DOE Lands

AGENCY: Office of Policy, Department of Energy.

ACTION: Request for information (RFI).

SUMMARY: The United States has long been at the forefront of artificial intelligence (AI) innovation. Maintaining that leadership is a key national and economic security priority. AI infrastructure including data centers is a critical component of the modern economy, enabling AI training and inference, scientific research, and a wide range of other essential services. The U.S. Department of Energy (DOE) is exploring opportunities to leverage its land assets to support the growing demand for AI infrastructure. This aligns with the policy laid out in the executive order

signed January 23, 2025, titled “Removing Barriers to American Leadership in Artificial Intelligence,” to sustain and enhance America’s global AI dominance in order to promote human flourishing, economic competitiveness, and national security.

DATES: Responses to the RFI are requested by May 7, 2025.

ADDRESSES: Responses should be submitted electronically to aiinfrastructure@hq.doe.gov and include “Data Center RFI Response” in the subject line of the email. Any information that may be business proprietary and exempt by law from public disclosure should be submitted as described in Section VI of this document.

FOR FURTHER INFORMATION CONTACT: Questions may be addressed to Neelesh Nerurkar, Director of Infrastructure Policy in the Office of Policy, through aiinfrastructure@hq.doe.gov.

SUPPLEMENTARY INFORMATION: DOE seeks to enable the construction of AI infrastructure at select DOE sites to begin by the end of 2025, with a target of commencing operation by the end of 2027. This RFI seeks to assess industry interest in developing, operating, and maintaining AI infrastructure on select DOE owned or managed lands, along with information on potential development approaches, technology solutions, operational models, and economic considerations associated with establishing AI infrastructure on DOE sites. In addition, this RFI seeks input from grid operators that serve DOE sites on opportunities and challenges associated with existing energy infrastructure and potential co-location of data centers with new energy generation.

DOE recognizes its relationships with Tribes and States and local governments as well as local communities, universities, businesses, utilities, and governments, contributing to economic development, education, and scientific advancement. As such, this RFI also seeks to gather input from potentially interested entities and individuals.

For the purposes of this RFI, AI infrastructure includes AI data centers, which contain specialized Information Technology (IT) equipment and associated cooling facilities, as well as their energy supply, including sources of generation, such as nuclear energy, and transmission and storage.

[View Implementation Link](#) (Planning) (Manual link: https://ucdpforge.com/pdfs/NLIG/PNNL_AI_Resilience_Impl_Guide.pdf)