



NATRIUM

Purpose and Need Need for Power/Alternative Energy Analysis a TerraPower & GE-Hitachi technology

Objectives

- Natrium™ Advanced Reactor Overview
- Purpose and Need Statement
- Need for Power
- Alternative Energy Analysis

Natrium Advanced Reactor Licensing Overview

- Regulatory Engagement Plan submitted 6/8/2021
- 10 CFR 50 licensing process will be followed
 - Construction Permit Application 8/2023
 - Operating License Application 3/2026
- Numerous pre-application interactions are planned to reduce regulatory uncertainty and facilitate the NRC's understanding of Natrium technology and its safety case

Natrium Advanced Reactor Licensing Overview

- Each pre-application interaction will build upon risk insights from prior interactions to demonstrate the Natrium advanced reactor's safety case
- Future Meetings and Presentations include:
 - Risk-Informed, Performance-Based Principal Design Criteria
 - Energy Island Decoupling Strategy
 - Testing Plan and Methodology

Advanced Reactor Demonstration Program

- Demonstrate the ability to design, license, construct, startup and operate the Sodium advanced reactor within the Congressionally mandated seven-year timeframe
- Include improvements in safety, security, economics, and environmental impacts
- Utilize a simple, robust, reliable, and proven safety profile
- Lower emissions by initiating the deployment of a fleet of Sodium advanced reactors – Demonstrate that the plants can be built economically and that they will be attractive for future owner/operators

Purpose and Need Statement

- ISG-026 (Environmental Issues Associated with New Reactors):
 - The purpose and need statement is the foundation of the environmental analysis on which the rest of the EIS is built. The purpose and need statement is informed by the applicant's objectives, as stated in Chapter 1 of the applicant's ER
- The purpose and need has typically been described in terms of providing a specific quantity of baseload electricity to a defined service area within a defined time period
- RG 4.2 (Preparation of Environmental Reports for Nuclear Power Stations):
 - The purpose and need statement may address additional needs other than the production of electricity. Additional purposes or needs for the project should provide insight to the benefits of the proposed project and assist the NRC staff in defining reasonable alternatives to the proposed project
 - Additional purposes could include, but are not limited to, the following: greenhouse gas emission goals; replacing existing plants; meeting State or Federal energy policy goals; enhancing energy diversity; consideration of Federal policy not related to environmental quality (10 CFR 51.71(d))

Purpose and Need Statement

- A key aspect of the alternatives analysis is that the alternatives presented in the ER should be capable of meeting the purpose and need of the proposed project

Natrium Advanced Reactor Purpose and Need Statement:

The proposed action is to construct and operate the Natrium advanced reactor in support of participation in the ARDP.

The purpose and need of the proposed action is to demonstrate the Natrium advanced reactor while replacing electricity generation capacity in the PacifiCorp service area following planned retirement of existing coal-fired facilities, furthering the environmental goals of the U.S. Government for achieving a carbon net-zero or net-negative carbon emission goal by 2050, and providing operational flexibility through energy storage to complement a region with high penetration of renewables.

Purpose and Need Statement

- DOE implements programs, such as the ARDP, in support of its mission to maintain the Nation's technological leadership position in the global nuclear industry and ensure national energy security (MISSION)
- DOE identified that work remains to ensure continued U.S. leadership in the research, design, and development of advanced reactors and to ensure the successful deployment of these reactors in the U.S. and international marketplaces (NEED)
- In support of this mission need, DOE developed the ARDP with funding provided through the FY2020 Consolidation Appropriations Act, (H.R.1865)

Need for Power

RG 4.2:

- The goal of the need for power analysis is to provide confidence that the power generated by the proposed project will be produced and consumed in a manner consistent with the stated purpose and need of the project
- Discussion of ancillary benefits (e.g., reduced greenhouse gas emissions, fuel diversity, or grid stability) should be addressed in the benefit-cost section of the ER
- While a discussion of need for power is required, the Commission is not looking for burdensome attempts by the applicant to precisely identify future market conditions and energy demand, or to develop detailed analyses of system generating assets, costs of production, capital replacement ratios, and the like in order to establish with certainty that the construction and operation of a nuclear power plant is the most economical alternative for generation of power (see 68 FR 55905). The applicant should specify whether it intends to operate the proposed plant as a baseload generator, and, if so, include a discussion of the need for new baseload capacity

Need for Power

Natrium advanced reactor “needs”:

- Blended approach
 - ARDP - Need for U.S. leadership in design, development, and successful deployment of advanced reactors
 - Carbon Reduction/Coal Replacement - Need for carbon-free energy - Executive Order 14008
 - Energy Storage - Need for energy storage capabilities to complement renewables
- PacifiCorp IRP along with supporting analyses used for demonstration

ER Chapter 8 - Introduction

- Purpose and need discussion
- Introduction of ties to PacifiCorp 2021 IRP
 - Carbon Reduction:
 - Through strategic, customer-focused investments in a diversity of resources, PacifiCorp is on a path to reduce carbon emissions, system-wide, by 74% from 2005 levels by 2030
 - Coal Retirement:
 - Driven in part by ongoing cost pressures on existing coal-fired facilities and dropping costs for new resource alternatives, of the 22 coal units currently serving PacifiCorp customers, the preferred portfolio includes retirement of 14 units by 2030 and 19 units by the end of the planning period in 2040
 - The 2021 IRP preferred portfolio will reduce coal-fueled generation capacity by 1,300 MW by the end of 2025, over 2,200 MW by 2030, and over 4,000 MW by 2040
 - Coal unit retirements schedule under the preferred portfolio (2021 IRP, primarily taken from Table 6.2 - Wyoming units only shown):

Retirement Year	Plant/Units	Nameplate Capacity (MW)	Notes
2023/2037	Jim Bridger Units 1/2	354/359	Converted to Natural Gas Peakers in 2024; retirement 2037
2025	Naughton Units 1/2	156/201	Retirement (Naughton 3 converted to gas in 2019; retirement 2029)
2027	Dave Johnston Units 1-4	99/106/220/330	Retirement
2037	Jim Bridger Units 3-4	349/351	Retirement
2039	Wyodak	268	Retirement

ER Section 8.1 - Applicant's Power Market

- PacifiCorp services a 6-state region (California, Oregon, Washington, Idaho, Utah, and Wyoming)
- PacifiCorp is part of the CAISO
- PacifiCorp and CAISO launched the EIM in November 2014
- PacifiCorp owns and operates one of the largest privately held transmission systems in the nation, with over 16,900 line miles of high-voltage transmission spanning 10 states and a range of climate zones, uniquely abling PacifiCorp to serve its customers with the diverse and abundant natural resources the west can offer

Together with PacifiCorp's diverse energy investments, the EIM has helped cut PacifiCorp's portfolio carbon emissions by 30 million metric tons.

ER Section 8.2 - Power Demand

- Discussion based on PacifiCorp IRP to include:
 - assessment of the existing market, and how the capacity and energy of the proposed project will be used (demanded) in the PacifiCorp market once commissioned and operated

ER Section 8.3 - Power Supply

- Discussion based on PacifiCorp 2021 IRP to include:
 - the current and forecast supply of electricity (i.e., capacity), including an analysis of installed capacity, planned capacity, and known or forecast retirements
- PacifiCorp 2021 IRP preferred portfolio includes the Natrium advanced reactor coming online by summer 2028

ER Section 8.4 - Summary of the Need for Power Analysis and Conclusions

- Summary of the need for power analysis for the proposed project along with the conclusions in accordance with the purpose and need statement

Alternative Energy Analysis

- RG 4.2:
 - Discussion of energy alternatives should evaluate and identify the energy sources other than nuclear energy that have the potential to meet the purpose and need for the project and eliminate from detailed discussion energy sources that cannot meet the purpose and need
- No other source of energy, other than advanced nuclear, can meet the purpose and need statement:
 - ARDP - Advanced nuclear, Sodium technology
 - Carbon Reduction/Coal Replacement- Advanced nuclear, carbon-free with commensurate energy storage to provide energy 24/7
 - Energy storage to complement a region with high penetration of renewables

An aerial 3D architectural rendering of a power plant facility. The site is enclosed by a fence and contains several distinct areas. In the top left, there is a large array of solar panels. The central and right portions of the site feature various industrial buildings, including a large rectangular structure, a long building with many windows, and several large cylindrical storage tanks. A network of pipes and walkways connects these structures. A parking lot with several cars is visible on the left side. The surrounding landscape is green with trees and a utility tower in the distance.

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Questions?

Acronyms

ARDP – Advanced Reactor Demonstration Program

CAISO – California Independent System Operator

CFR – Code of Federal Regulations

DOE – U.S. Department of Energy

EIM – Energy Imbalance Market

EIS – Environmental Impact Statement

ER – Environmental Report

IRP – Integrated Resource Plan

ISG – Interim Staff Guidance

MW – Megawatt

NRC – U.S. Nuclear Regulatory Commission

RG – Regulatory Guide