



Natrium™ Plant Design and Project Overview

A TerraPower and GE-Hitachi technology

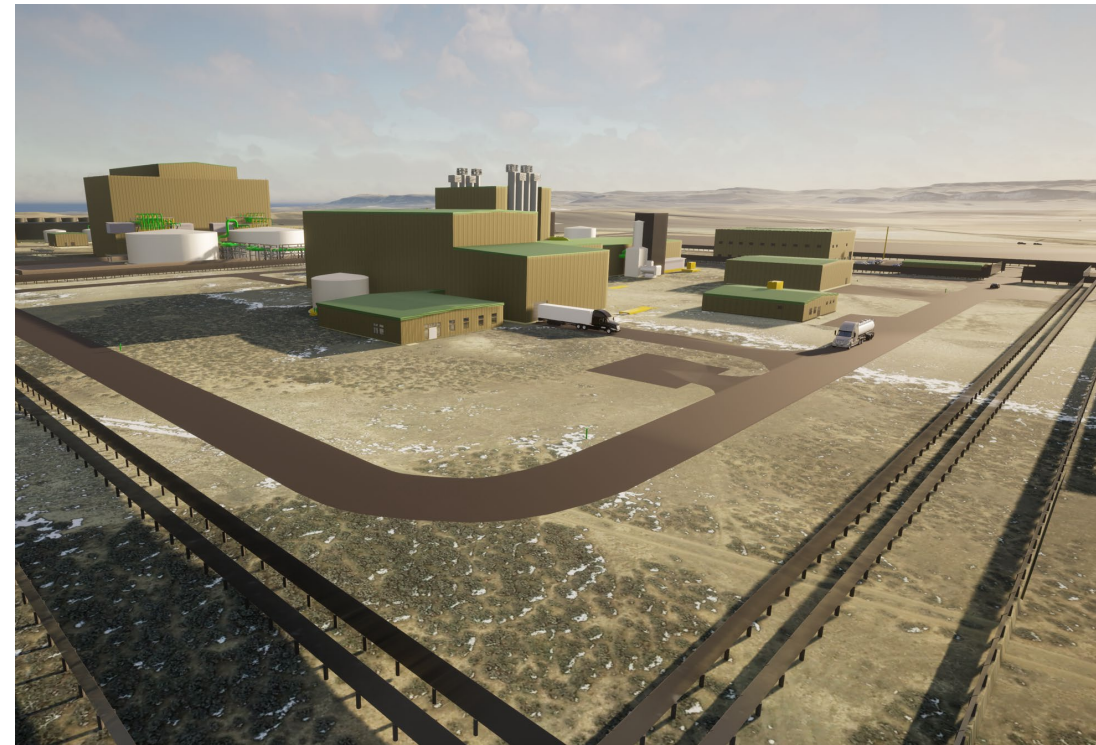
June 29, 2023

NCSL Nuclear Legislative Working Group (NLWG) Meeting

Natrium™ Program Mission

COST-COMPETITIVE, FLEXIBLE TECHNOLOGY FOR THE CLEAN ENERGY FUTURE

- Natrium Reactor and Integrated Energy System
 - **safer**, *simpler*, easier and **less costly** to construct,
 - **less expensive** to operate, and
 - able to provide energy that is competitive with fossil fuels and *complementary to renewables*.
- Natrium Program's focus is to enable the commercialization and widespread deployment that are crucial to the health of the nuclear industry and long-term U.S. energy leadership.



Redefining what nuclear can be...

What is the Sodium Reactor and IES?

- Integral Sodium Fast Reactor
- Distributed Nuclear Facility Layout
- Advanced once-through fuel system
- GW-hr scale Thermal Energy Storage
- Decoupled Energy Island leveraged from Concentrated Solar Plant industry

Nuclear redefined

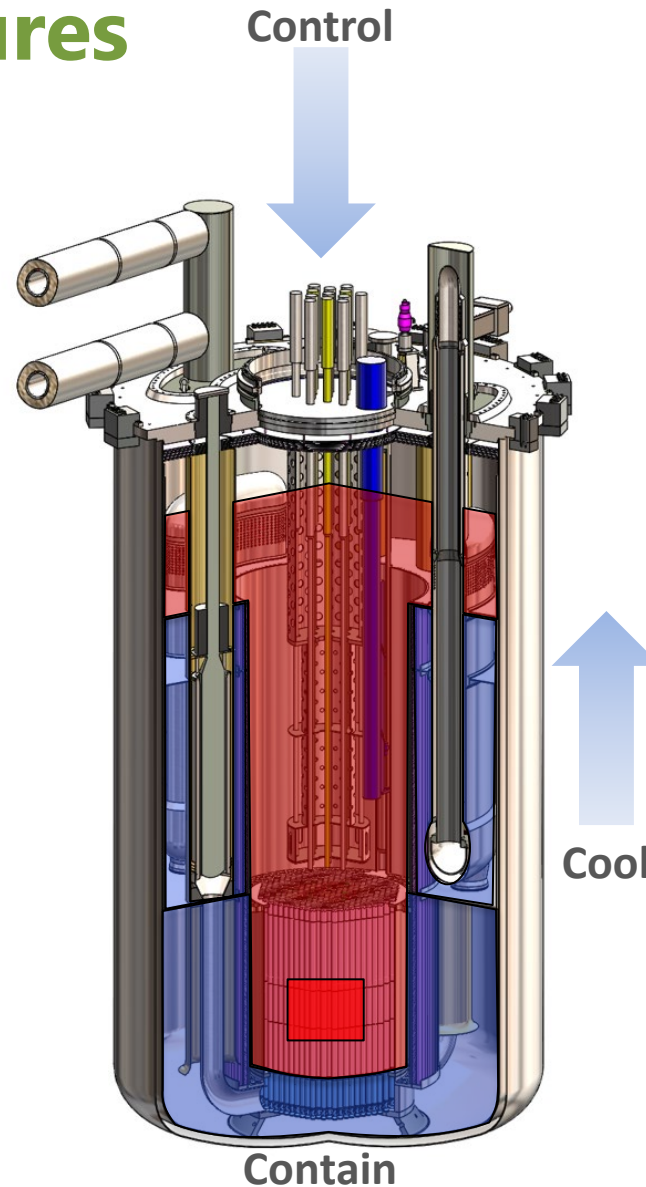
- Eliminates nuclear “sprawl”
 - ✓ Design to cost
 - ✓ Simplicity
 - ✓ Rapid construction
 - ✓ Design specific staffing
- ~41% net thermal efficiency

Integrating with renewables

- Zero emission dispatchable resource
- Price follower... w/ reactor at 100% power 24/7
- 345 MWe nominal
- Flex to 500 MWe for 5.5 hours through energy storage

Natrium™ Safety Features

- Pool-type Metal Fuel SFR with Molten Salt Energy Island
 - Metallic fuel and sodium have high compatibility
 - No sodium-water reaction in steam generator
 - Large thermal inertia enables simplified response to abnormal events
- Simplified Response to Abnormal Events
 - Reliable reactor shutdown
 - Transition to coolant natural circulation
 - Indefinite passive emergency decay heat removal
 - Low pressure functional containment
 - No reliance on Energy Island for safety functions
- No Safety-Related Control Systems, Operator Actions, or AC power
- Technology Based on U.S. SFR Experience
 - EBR-I, EBR-II, FFTF, TREAT
 - SFR inherent safety characteristics demonstrated through testing in EBR-II and FFTF



Control

- Motor-driven control rod runback
- Gravity-driven control rod scram
- Inherently stable with increased power or temperature

Cool

- In-vessel primary sodium heat transport (limited penetrations)
- Intermediate air-cooling natural draft flow
- Reactor air cooling natural draft flow – always on

Contain

- Low primary and secondary pressure
- Sodium affinity for radionuclides
- Multiple radionuclides retention boundaries

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Single Unit Site



Steam Generation

Turbine Building

Energy Storage Tanks

Fuel Handling Building

Rx Building

Standby Diesels

Switchyard

Rx/Aux. Building

Salt Piping

Control Building

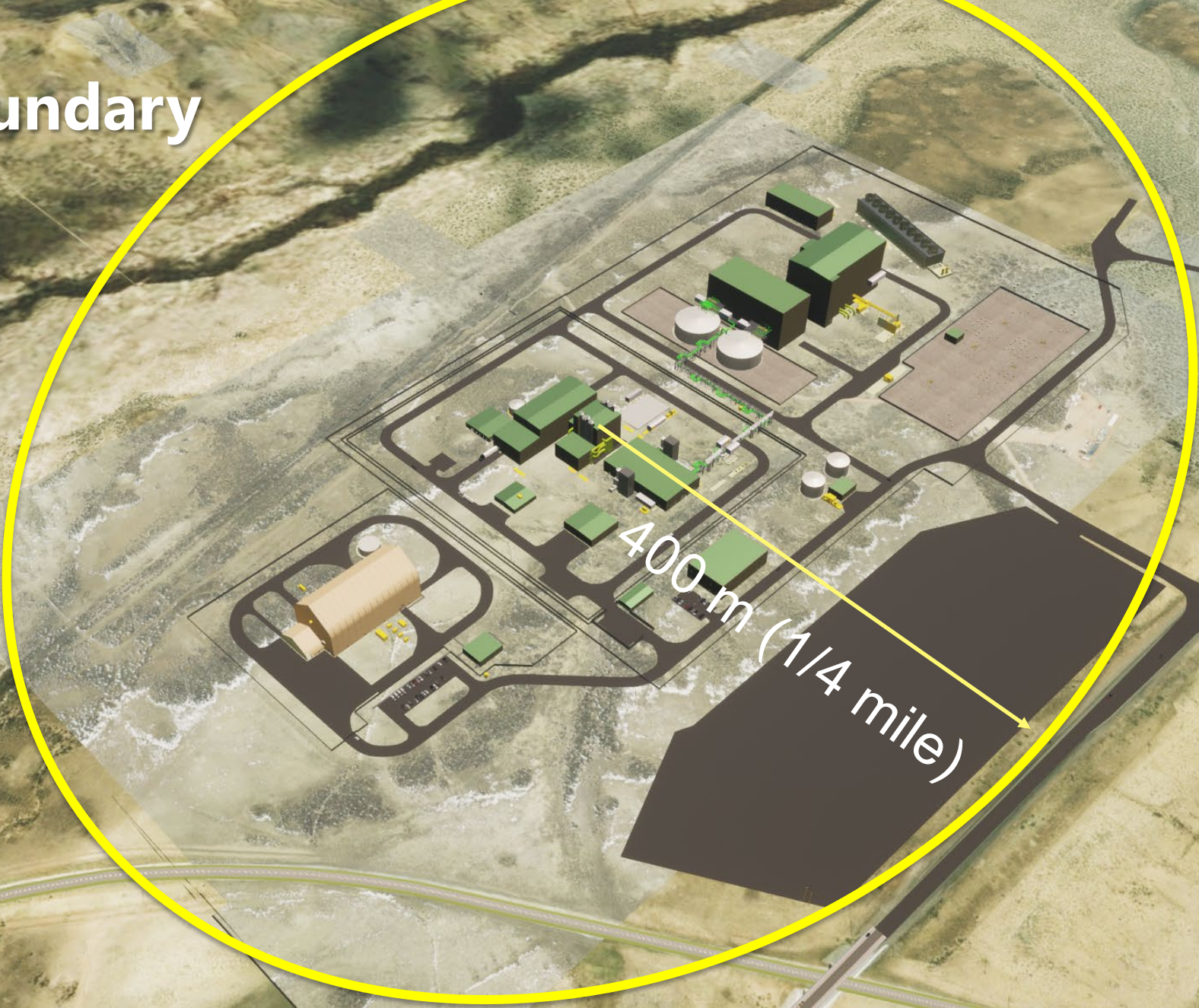
Nuclear Island

Energy Island

Warehouse & Admin

Firewater

Site Boundary



Efficient Layout for Construction

Nuclear Island

Energy Island

Ease of Crane Access,
Construction
Sequencing, Multiple
Work fronts

Open Areas for Laydown

Reactor Assembly
and Installation

NI to EI Spacing
Parallel Construction

Open Areas for Laydown and Construction

Preparing for a new nuclear site is challenging

- Need to start from scratch to fully characterize the site
- Easements; Transmission and Distribution Lines
- Potentially new safety or environmental impacts
- **Community Engagement**
- **Ensuring the community can accommodate the large influx of construction workers**
- **Engagement with Tribal Nations**
- Historical and Cultural Artifacts;
- Endangered Species

Local Community and State Government Support is extremely important



Project Status

- Completed Design Reference 1
 - 2-year design cycle
 - Establishes baseline design configuration for Construction Permit Application
 - Executed extensive Design Review to evaluate design
 - Independent Reviewers for Industry, Utilities, National Labs
- Key Equipment Procurements initiated
 - Supply Chain engaged on key equipment
 - Sodium pumps, Sodium heat exchangers, Reactor protection system, Fuel handling equipment and more
- Frequent NRC Engagements
 - Topicals, Whitepapers, many pre-engagement meetings, trainings etc
- Construction Execution Plan
- Detailed Cost Estimate Completed and In Review
- Site Evaluation Work Completed, Undergoing DOE Environmental Review
- Begin construction of Test Facility in Late 2023
- Submit Construction Permit Application early 2024.

Project Status

- Focus moving forward
 - Key methods validation
 - Key testing to develop critical technology elements
 - Completing Safety Analysis for PSAR/CPA
 - Progressing design maturation through Preliminary Design
 - Integrating and developing nuclear equipment supply chain
 - CPA authoring & NRC Engagements
 - Construction planning & integration with total project plan/schedule
 - Various permits and reviews
 - Test Facility design and construction

Natrium™ Utility Advisory Committee

- Committee Charter:
 - This committee represents the utilities and their needs; members serve in an advisory capacity to the Natrium™ Program
 - Provide industry perspective feedback
 - Influence design and provide and/or vet strategies for licensing, construction and operations

Meeting targets: Updates, Working Group Development, Feedback on Design Considerations





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