Industrial – Nuclear: U.S.DOE Advanced Reactor Demonstration Program (ARDP)

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X-energy at a Glance

Founded in 2009

16 years of investment and development

Rockville, MD Headquarters

Rooted in the nuclear community with proximity to the DOE and Nuclear Regulatory Commission (NRC)

50+ Years of R&D

Built upon years of R&D in high temperature gas reactors

~500 Employees

Leading Generation IV nuclear reactor development

$1.2B Federal Funding

Selected for DOE's Advanced Reactor Demonstration Program (ARDP)

$1.3B Private Investment

Multiple private investment; recently completed C-series

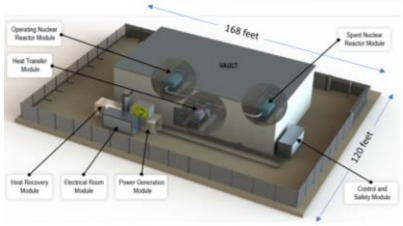
X-energy Designs & Builds Nuclear Reactors and the Fuel That Powers Them

TRISO-X Fuel Fabrication

- Our reactors use the tri-structural isotropic (TRISO) coated particle fuel approved for use by NRC
- TRISO-X developed a proprietary version with improved supply and quality control processes

Xe-100 Small Modular Reactor (SMR)

- High-Temperature Gas-cooled Reactors (HTGR) rely on inherent safety features to produce high efficiency electricity and industrial steam production
- Four 80 MWe Xe-100 units are bundled (320 MWe total) to maximize performance and economics



XENITH Microreactor

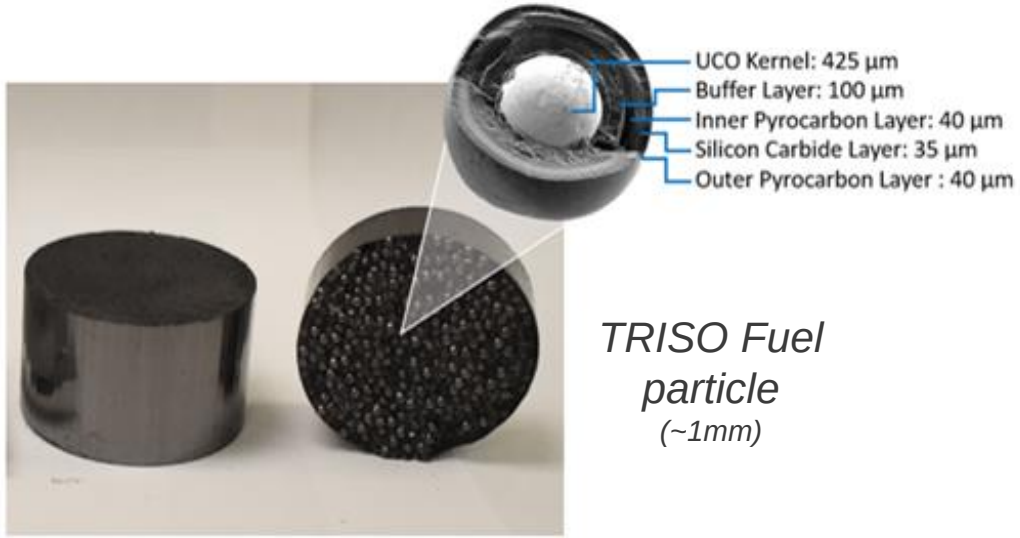
- Microreactor to generate electricity for military, maritime, and commercial applications
- Legacy Pele program redesigned and transitioned into a commercially viable reactor

Tri-Structural Isotropic (TRISO) Particle Fuel

- Wholly-owned subsidiary of X-energy based in Oak Ridge, TN
- Fabricating TRISO coated particles since 2017 in our pilot facility on the ORNL campus
- Multiple process improvements including kernel quality, consistent coating thicknesses, and uniform particle sphericity
- NRC license application submitted in April 2022

Xe-100 Fuel Element

XENITH Fuel Element



TRISO Fuel particle
(~1mm)

Commercial Fuel Fabrication Facility Development

X-energy TRISO-X Fuel Fabrication Pilot Facility
at Oak Ridge National Laboratory

North America's First Commercial Advanced Nuclear Fuel Fabrication Facility

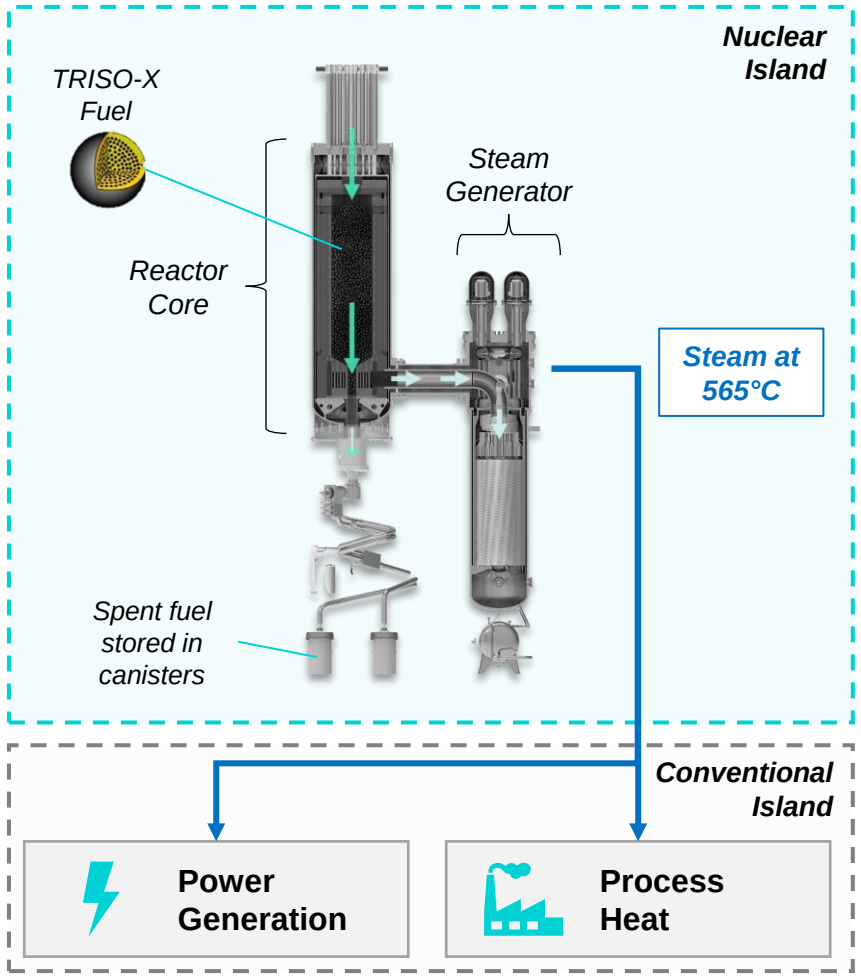
- TRISO-X pilot plant operational since 2017
- Improved fuel manufacturing processes scaled for commercial production
- Currently producing kilogram batch quantities

- TX-1 facility
- Initial output (TX-1) supports 11 Xe-100 reactors steady state operations; anticipate fabrication start in Dec 2027
- TX-2 planning well underway

Plant	Throughput	Pebbles	Reactors
TX-1	5 MTU/yr	714,286	11
TX-2	20 MTU/yr	2,857,143	44

Xe-100 – A Pioneering Gen IV SMR Reactor

Xe-100 Schematic



Modular & Standardized

- Each reactor module may be connected to its own steam turbine generator or process heat offtake, so **modules can be constructed / operated independently and even added as demand grows**
- Onsite work is reduced and a significant portion of quality control is shifted to centralized fabrication & integration facilities

Manufacturable, Road-Shippable Components

- Simpler, standardized design allows for **mass production of road-shippable components**
- In contrast, the complex design of traditional nuclear construction has significant on-site construction

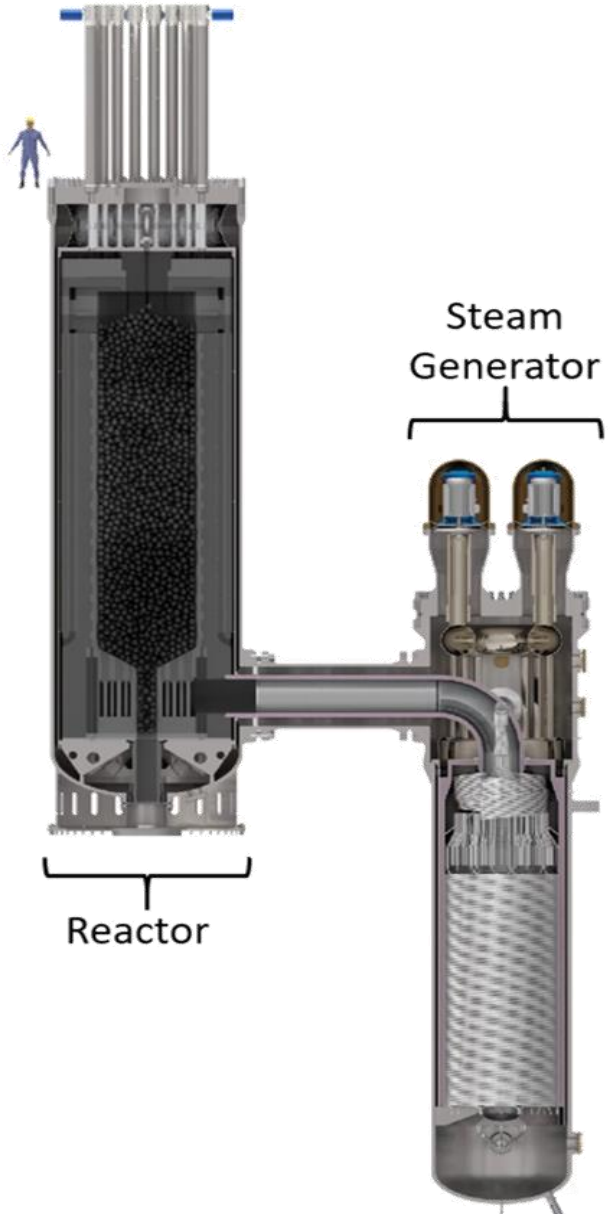
Intrinsically Safe

- **Xe-100 is designed to avoid the need for additional safety systems**
- Intrinsically safe design means **fewer safety systems of a traditional reactor** and less materials
- Simple control system to allow for more automated operations & fewer personnel

200 MWt or 80 MWe output (per unit) designed to drive scalability, accelerated timelines and cost controls

The Xe-100 Design Solution

- High Temperature Pebble Bed Reactor (~565 degree C steam output)
- Online refueling through automated continuous fuel handling system
- 60-year plant life with conservative design that does not require new material development and or code cases
- Designed for 4-unit deployments
- Steam pressure and temperature designed to provide steam to multiple Commercially Off The Shelf (COTS) Steam Turbine / Generator sets (typically those used in Combined Cycle Power Plants)



X-energy and Dow Partner to Decarbonize Industrial Processes

On March 1, 2023, Dow and X-energy announced their entry into an agreement to build the Xe-100 under the DOE's Advanced Reactor Demonstration Project (ARDP)

Pictured: Digital rendering of Dow's planned advanced nuclear facility in Seadrift, Texas

Pictured: Dow Chairman and CEO, Jim Fitterling. Click image for link to full CNBC interview

- Dow joined X-energy and DOE on ARDP in March 2023 with the intent to locate 4 Xe-100 reactors in Sea Drift, TX by 2030
- The Dow site manufactures specialty chemicals and requires a combination of electricity and high-temperature steam
- X-energy and Dow entered into a Joint Development Agreement to support engineering efforts and preparation and submission of a Construction Permit Application to the NRC

The collaboration with X-energy and the DOE will serve as a leading example of how the industrial sector can safely, effectively and affordably decarbonize." **– Jim Fitterling,** ***Dow Chairman and CEO***

Recent Private Investment: $700M

- **October 2024:** $500M investment anchored by Amazon and includes Citadel Founder Ken Griffin, Ares Management, NGP, and University of Michigan
- Amazon agrees to purchase 5GWe by 2039
- Initial support for a 4-unit plant for Energy Northwest with options for 12 units
- Major validation of X-energy technology

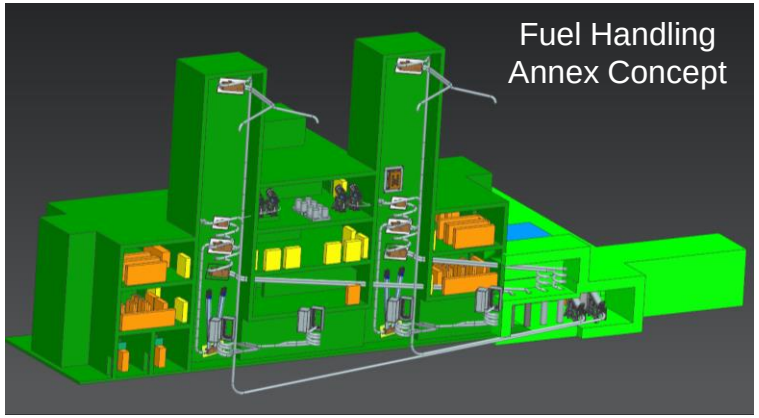
- **February 2025:** $200M upsize from Segra Capital Management, Jane Street, Ares Management Funds, Emerson Collective
- Provides additional runway and adds to corporate pipeline for reactor development and TRISO-X construction

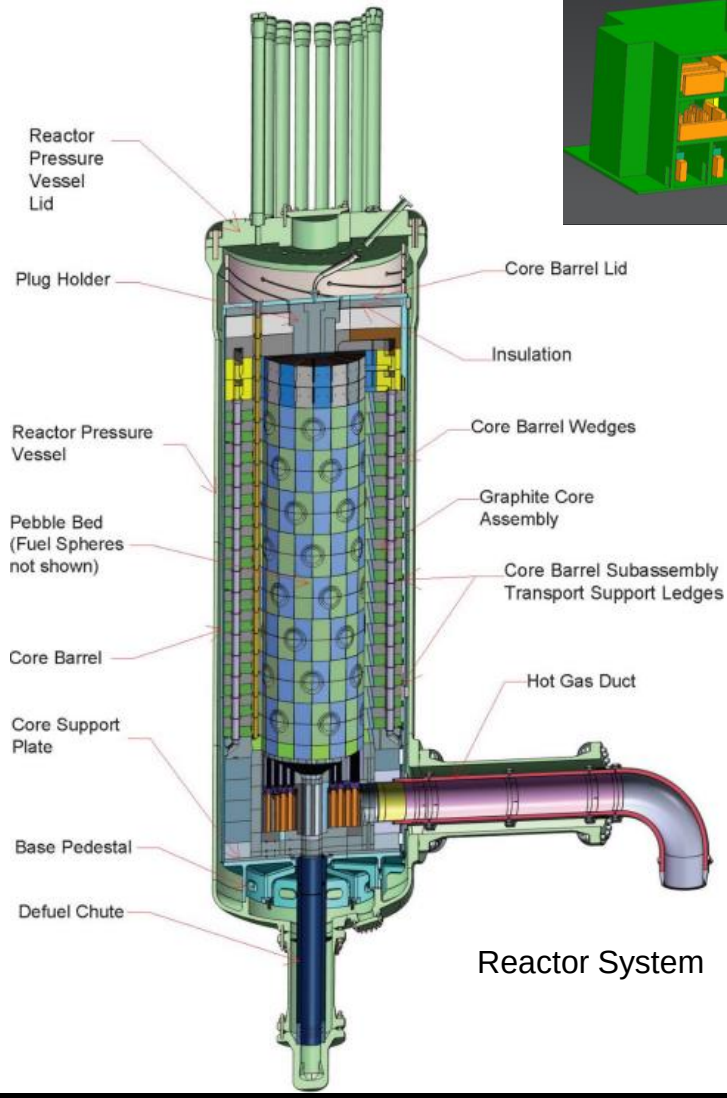
Private investment de-risks reactor development programs and TRISO fuel fabrication as well as initiating supply chain manufacturing

ARDP Update

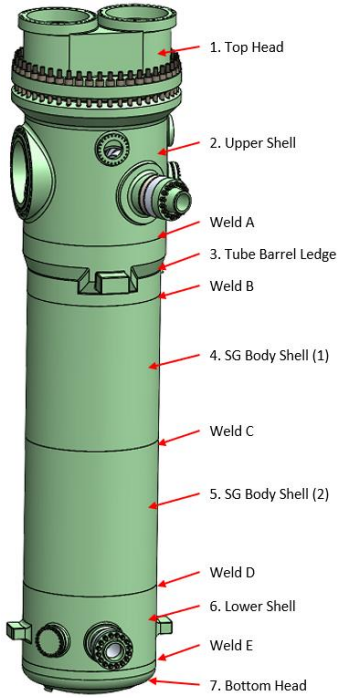
Overall Status – Xe-100 Development

- While overall plant architecture was reconfigured to reduce bulk material volumes, most SSC's were unaltered.
- Goal is to minimize the number of safety-related systems and maintain clear separation between Nuclear Island systems and operations versus the Conventional Island systems and ops
- Focus has been on major FOAK systems and long-lead equipment (Steam Generator, Reactor Pressure Vessel, Structural Graphite Blocks, Hot Gas Duct)
- Identified primary and back-up manufacturers for each system; primaries are supporting preliminary design engineering efforts
- Engaged with orgs such as ASME, INPO, etc. to ensure industry policy and use cases are consistent with Xe-100 goals



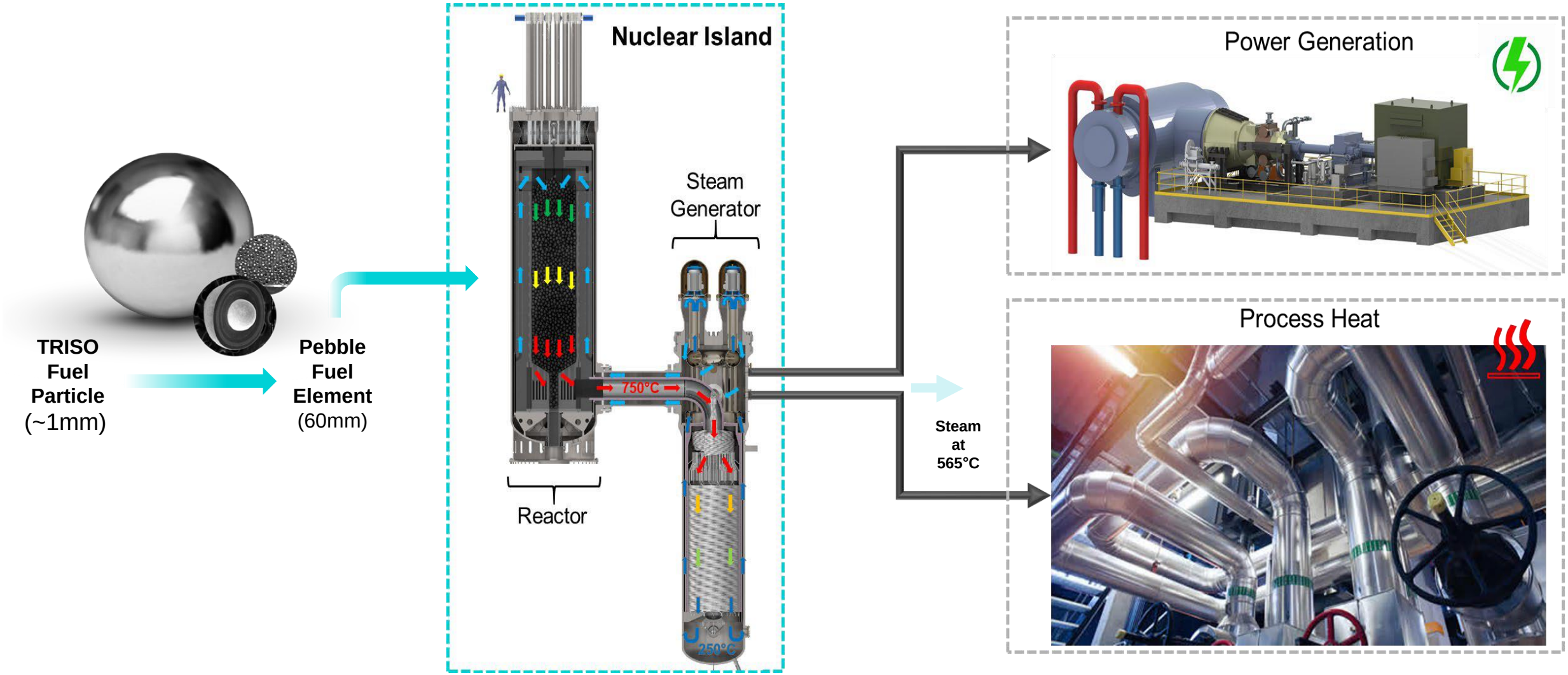


Reactor System



Steam Generator Vessel

Long Mott: Providing Electricity and Steam from an Xe-100 HTGR

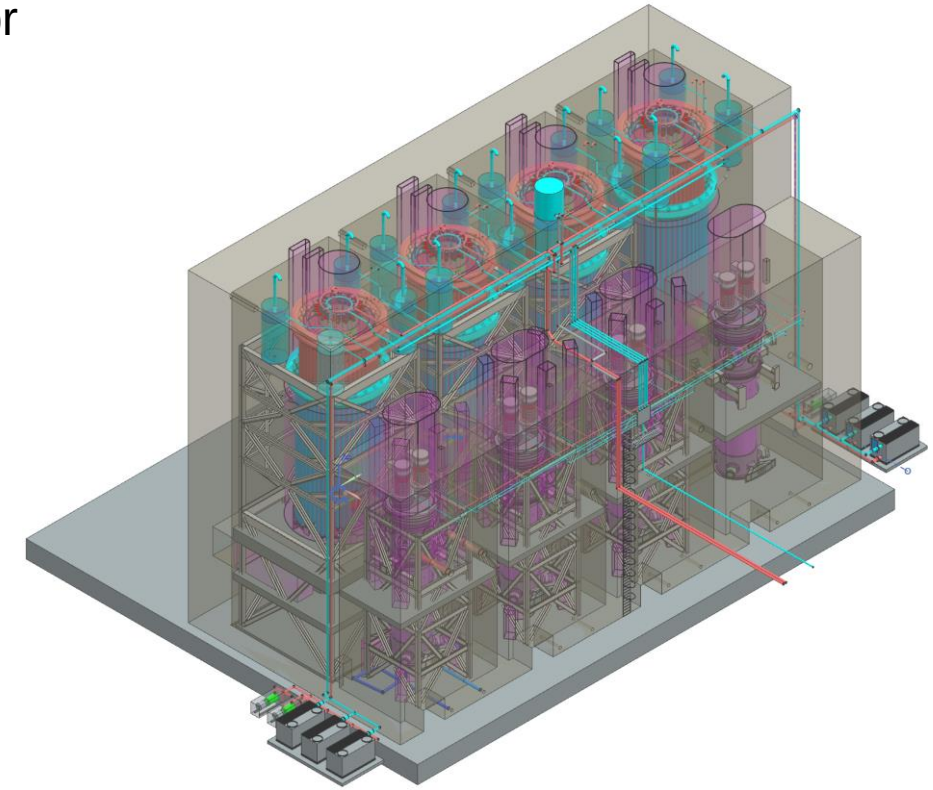


ARDP Update | Project Long Mott

PDRR | CPA | Looking Ahead

- The Preliminary Design Readiness Review (PDRR) is a major milestone for X-energy.
- PDRR signifies completion of the conceptual design phase, allowing the XE-100 to advance into preliminary design.
- PDRR confirms that all systems integrate effectively to meet Dow's performance parameters and objectives.

- PDRR held in March 2025
- FDRR planned for mid-2026
- EPCm RFP's are out and expected an award July 2025
- Integration and Test Facility being planned



ARDP Update | Project Long Mott

Dow and X-energy Submitted Construction Permit Application to the Nuclear Regulatory Commission, following the successful completion of Dow's Gate 6

Dow, X-energy, and DOE Teams at NRC
March 31, 2025

Project Long Mott Rendering

ARDP Update | Project Long Mott

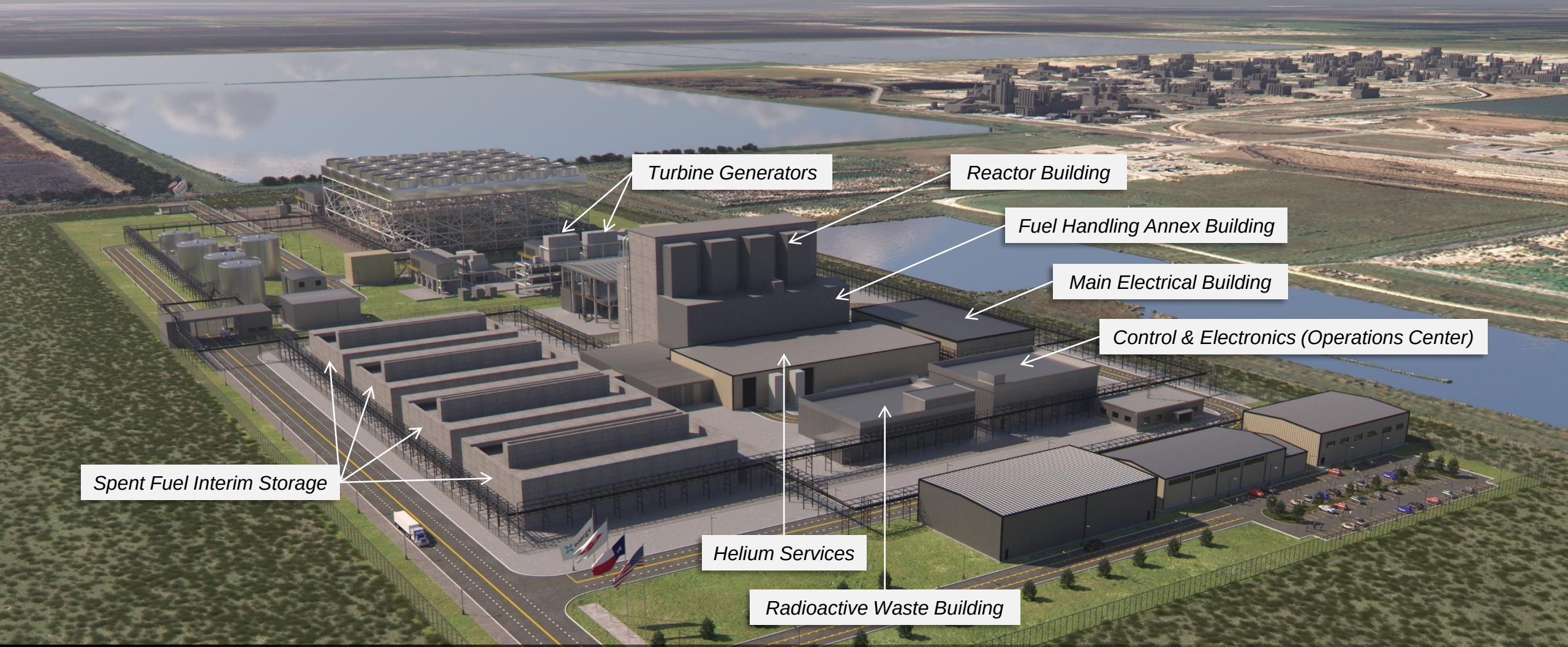
CPA Submission | PDRR | **Looking Ahead**

- Begin selection process for a nuclear-qualified EPCm partner for FEL-2 design.
- Initiate Purchase Orders for long leads and vendor design efforts: graphite, steam generator tubes, Instrumentation & Control, nuclear island hardware design, etc.
- Define and execute on the Operating License Application development plan.
- Ramp up Xe-100 Simulator development and training program preparation.
- Finalize location for X-energy Test Facility, and place contracts for Facility modifications and test equipment design and fabrication.

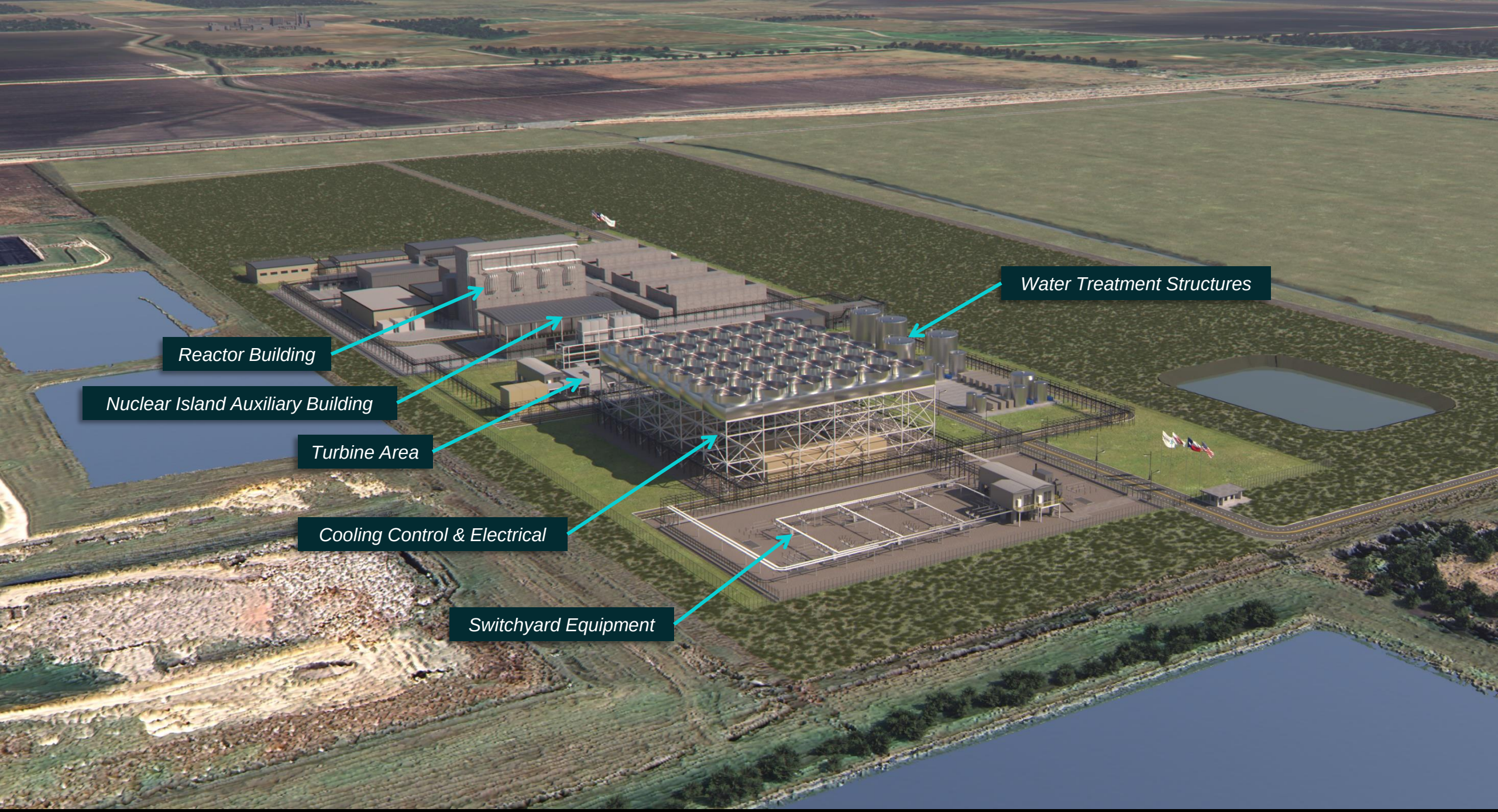
Coastal Texas Region and the Dow Seadrift Operations

San Antonio
140 miles

Houston
150 miles



- 200MW$_{thermal}$/80 MW$_{electric}$ pebble-bed helium gas-cooled Reactor/Steam Generator Module
- Low water requirement option with dry cooling (secondary side) ~60,000 m^3/yr
- Plant architecture employs an “above grade” configuration
- Four modules at the Long Mott site is the “Standard Plant”, sited on less than 26 acres
  - This configuration provides high-reliability steam to 24/7 manufacturing operations



ARDP Update | TRISO-X

TX-1 Site Preparation | Fuel Qualification | TX-1 Regulatory Pathway

TX-1 site preparation is ~48% complete and remains on track for vertical construction to begin in September 2025.

November 2024

April 2025

Division Update | TRISO-X

TX-1 Site Preparation | Fuel Qualification | TX-1 Regulatory Pathway

TX-1 site preparation is ~47% complete and remains on track for vertical construction to begin in September 2025.

- Pebbles sent to INL on April 14th for two-years worth of testing
- Actually half pebbles; the INL machinery can't handle the full pebble
- Kernals are well understood but the pebbles are not
- NRC approval slipped due to liquid U form
- New date is May 2026
- 3700 pilings!

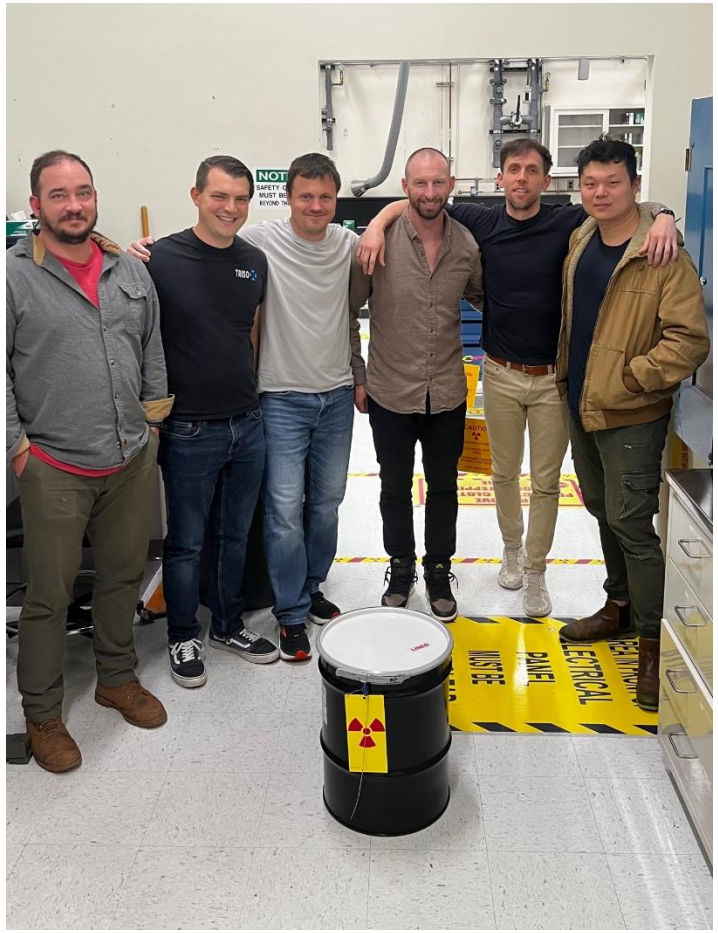
TX-1 Building Pad at Design Elevation

Installing Rigid Inclusions for Foundation

Division Update | TRISO-X

TX-1 Site Preparation | **Fuel Qualification** | TX-1 Regulatory Pathway

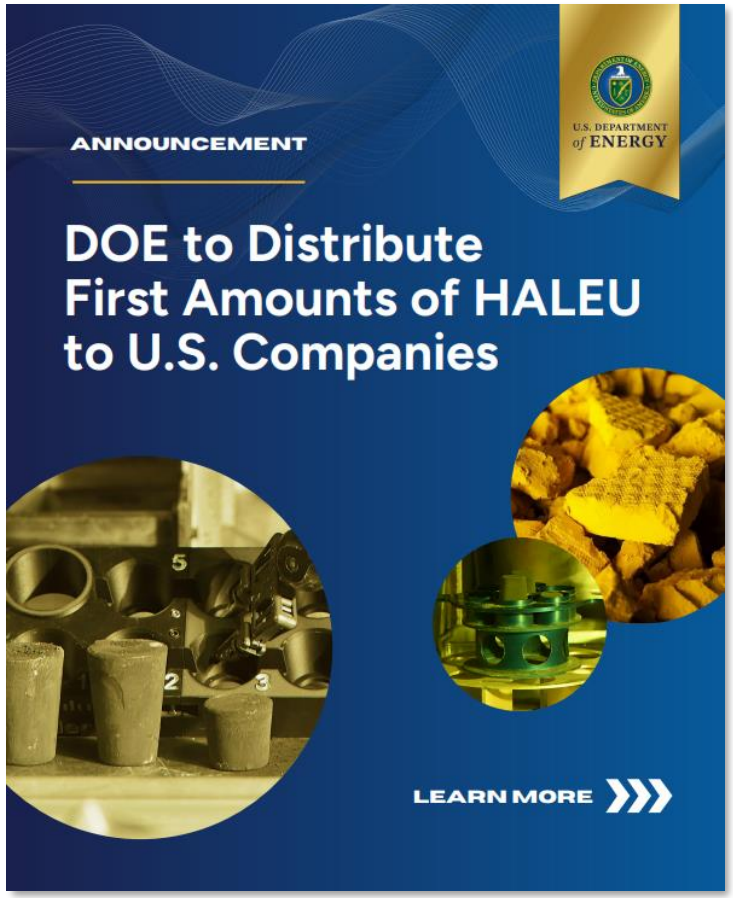
- Test articles for TRISO-X fuel qualification have been delivered to Idaho National Lab!
- This confirmatory testing will demonstrate the performance of TRISO-X under specific conditions, a necessary step for final regulatory approval.
- Fuel fabrication tailored to the unique specifications of INL's Advanced Test Reactor presented technical and schedule challenges that have been addressed and will inform process improvements going forward.



Division Update | TRISO-X

TX-1 Site Preparation | Fuel Qualification | **TX-1 Regulatory Pathway**

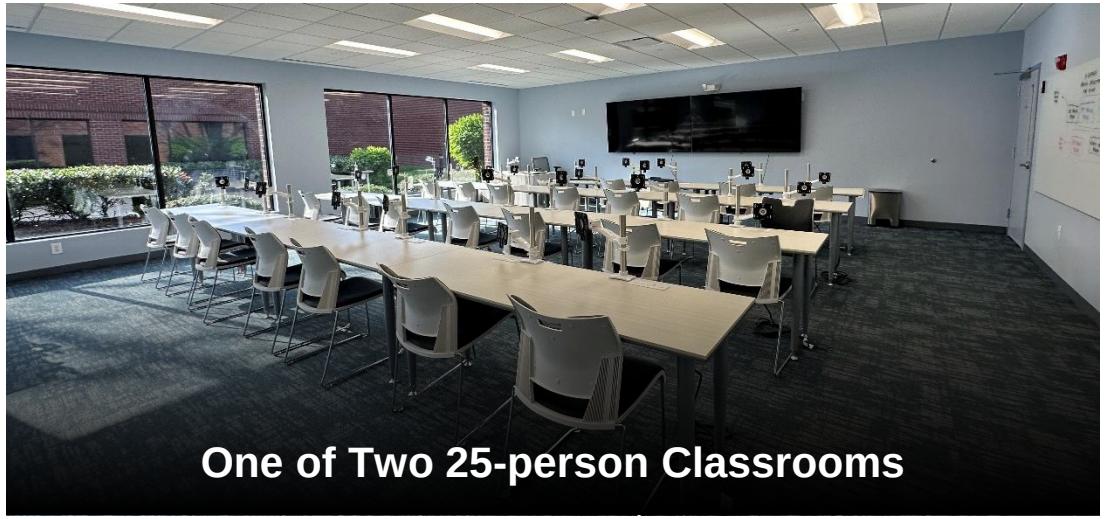
- The NRC's review of TRISO-X's application to possess and use special nuclear material to manufacture fuel is 48% complete.
- TRISO-X amended its NRC application to reflect the installation of equipment to receive a DOE allocation of HALEU announced last week.
- The NRC's projected review completion is now May 2026, but does not impact the critical path.
- But we've got HALEU!



Frederick OTC Update – Grand Opening held March 2024


Reactor Protection System Cabinets


Main Control Room Simulator


One of Two 25-person Classrooms


Simulation Computers

Operational Readiness - Xe-100 Plant Operations Training Assets

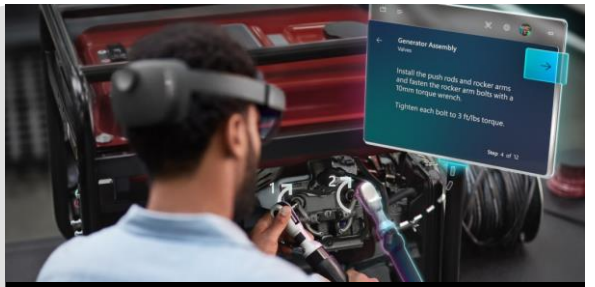
3D Models with VR

Original Mockup Control Room (Phase 2) with RPS cabinets, DCS work bench (2019)

XE-100 TRAINING ASSETS

- **ANSI 3.5 Control Room Simulator**
- **Xe-100 Operator Training Facility (Frederick, MD)**
- **Mockup Control Room (801 Thompson)**
- **Plant Support Center Simulator**
- **DCS workbench & RPS cabinets**
- **Nuclear Experience Immersion Simulator (NeXis)**
  - XR arena for training and qualification
- **Planned future assets:**
  - Flowloop simulator
  - Maintenance workshop
  - Chemistry lab
  - RP lab

ANSI 3.5 Operator Training Simulator



Augmented Reality

PSC Digital Twin, Plant Historian

Program Breakdown

ARDP/Project Long Mott is organized around 6 distinct, interrelated Programs

Xe-100 System Development

including site specific engineering and licensing to create “Issue for Manufacturing” and Issue for Construction” design packages

Xe-100 Licensing

includes Topical Report development, Construction Permit and Operating License application development, and NRC engagement

TRISO-X Fuel Fabrication Facility Development

includes fabrication facility design, licensing, construction, commissioning

Operational Readiness

includes development of the operator and maintenance training programs, maintenance tool development, and simulator development/maintenance

Xe-100 plant construction

addresses the site-specific engineering, operator/maintenance training, site specific regulatory work (site characterization), construction, commissioning, start-up and transition to operations

Uranium Delivery

ensures that low enriched and high-assay low enriched uranium (LEU & HALEU, respectively) are available to the TRISO Fuel Fab Facility when needed to support production and Plant start-up

Status of ARDP Project – April 2025

Recent Accomplishments

- **Plant and Nuclear Island conceptual design** completed – Preliminary Design Readiness Review (PDRR) conducted in March 2025
- **Seadrift site characterization** completed to support the Construction Permit Environmental Report (ER); continuing to take measurements
- **Construction Permit Application (CPA)** completed – including Preliminary Safety Analysis Report and Environmental Report – submitted to the NRC on 3/31
- Comprehensive **Level 2+ schedule** through commissioning developed with activity durations and dependencies; greater detail is in process
- Working with **long-lead vendors** to identify manufacturing timeline reductions – focusing on graphite and Steam Generator systems (SGS)
- TRISO-X Fuel Fabrication Facility **(TX-1) site preparation** started, 90% facility Design Review completed; RFP for vertical construction released to industry

Near-term Milestones

Xe-100 Design

- Initiate Xe-100/Nuclear Island preliminary design phase
- Issue a competitive Request for Proposal (RFP) for a nuclear-qualified Engineering, Procurement, and Construction Management (EPCm) partner to perform FEL-2/plant preliminary design
- Complete proposal evaluations and place bidder under contract by July
- Place orders for fine grain graphite, medium grain graphite, plant automation design & Nuclear Island systems hardware designs

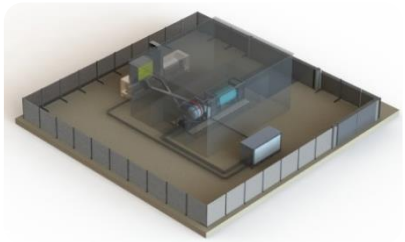
Licensing

- Implement the tools, processes & facility to support NRC's CPA review
- Define Operating License Application (OLA) development plan; execute

Operational Readiness

- Continue Xe-100 Simulator development
- Select location for X-energy owned/operated test facility and place contracts for test equipment design/fabrication

Versatility Creates Opportunity for New Nuclear Applications



Conventional Power Generation

Replace Legacy Coal Sites

High-Temperature Steam for Industrial Use

Data Center Power

Microgrid Applications

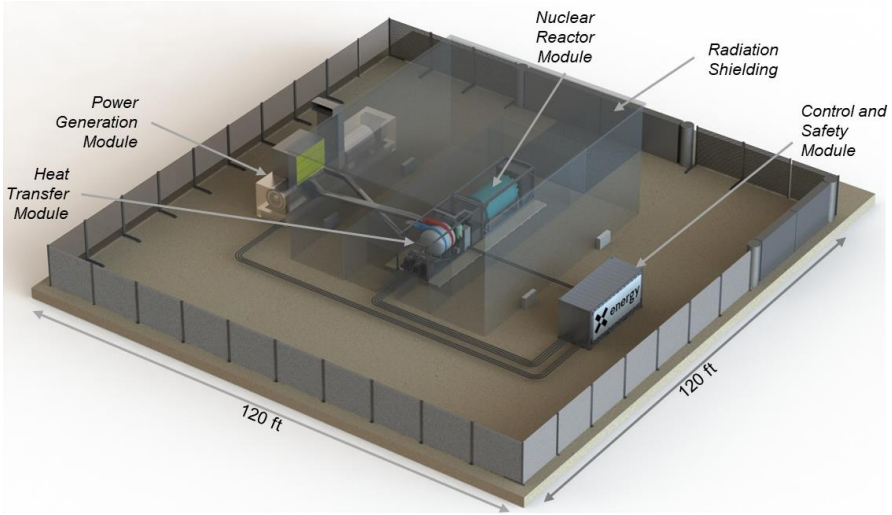
Remote and Austere Applications

X-energy is targeting end-markets and use cases beyond conventional power generation to meet future demand with safe, carbon-free, economic and high availability power

X-energy and DOD Project Pele

- Strategic Capabilities Office Project Pele
  - DOD invested $45M in X-energy and our partners to develop the final design and establish a supply chain capable of deploying our solution on a 2-year schedule
- X-energy contributed another $25M as internal investment
- Final design was evaluated by military personnel as well as dozens of globally recognized subject matter experts across a broad range of disciplines
- Design data for Pele is still controlled unclassified information (CUI)
- Pivot to Commercial: Pele Second Source
  - Relaxation of numerous strict requirements
  - Explicit focus on commercial viability

X-energy Next-generation Integrated Transportable High-temperature (XENITH) Microreactor Plant - Overview



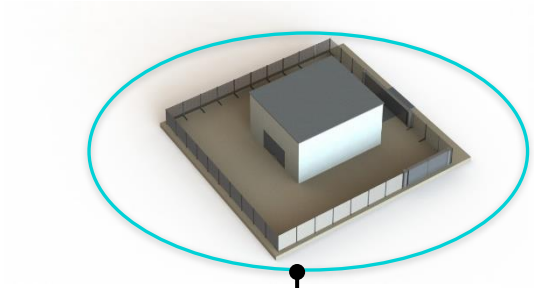
Attributes:

- 3-10 MWe Output
- Total plant footprint of ~1 acre
- Approaching 20-year lifetime with no refueling
- Fuel compacts manufactured by TRISO-X
- Modular components built in a factory
- Road, rail, and sea shippable
- Fast decommissioning due to high burnout and fuel type
- High TRL of most ancillary modules
- Supply chain development well underway
- Docketed with NRC
- Highly effective regulatory engagement plan

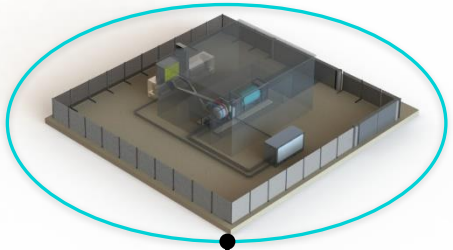
Ideally sized for remote and austere locations, supporting critical infrastructure and microgrids, and maritime applications

Lifetime of a XENITH Plant

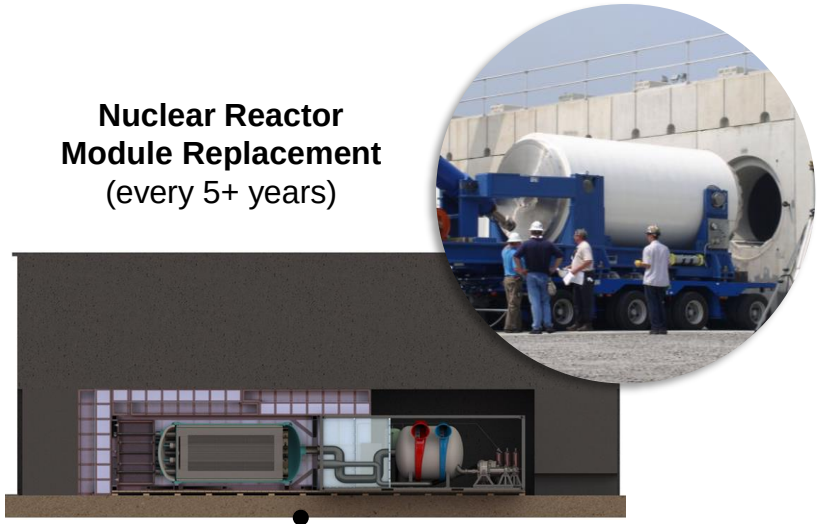
Site Preparation & Construction (site-dependent)



Modular Installation at Site (<TBD weeks)

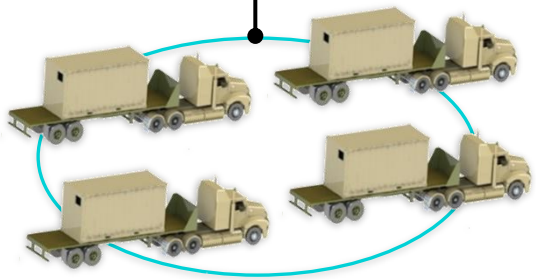


Nuclear Reactor Module Replacement (every 5+ years)

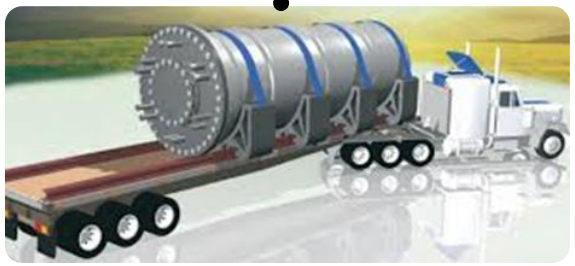


Procurement, manufacturing, & factory acceptance testing

Module integration & testing, including pre-loading nuclear fuel



Transport to Site



Previously Used Reactor Transport Overpack – Possibly to Refurbishment/Refueling Facility

Plant Removal & Return of Site for Future Uses (20+ years after initial startup)

Functional Modularity

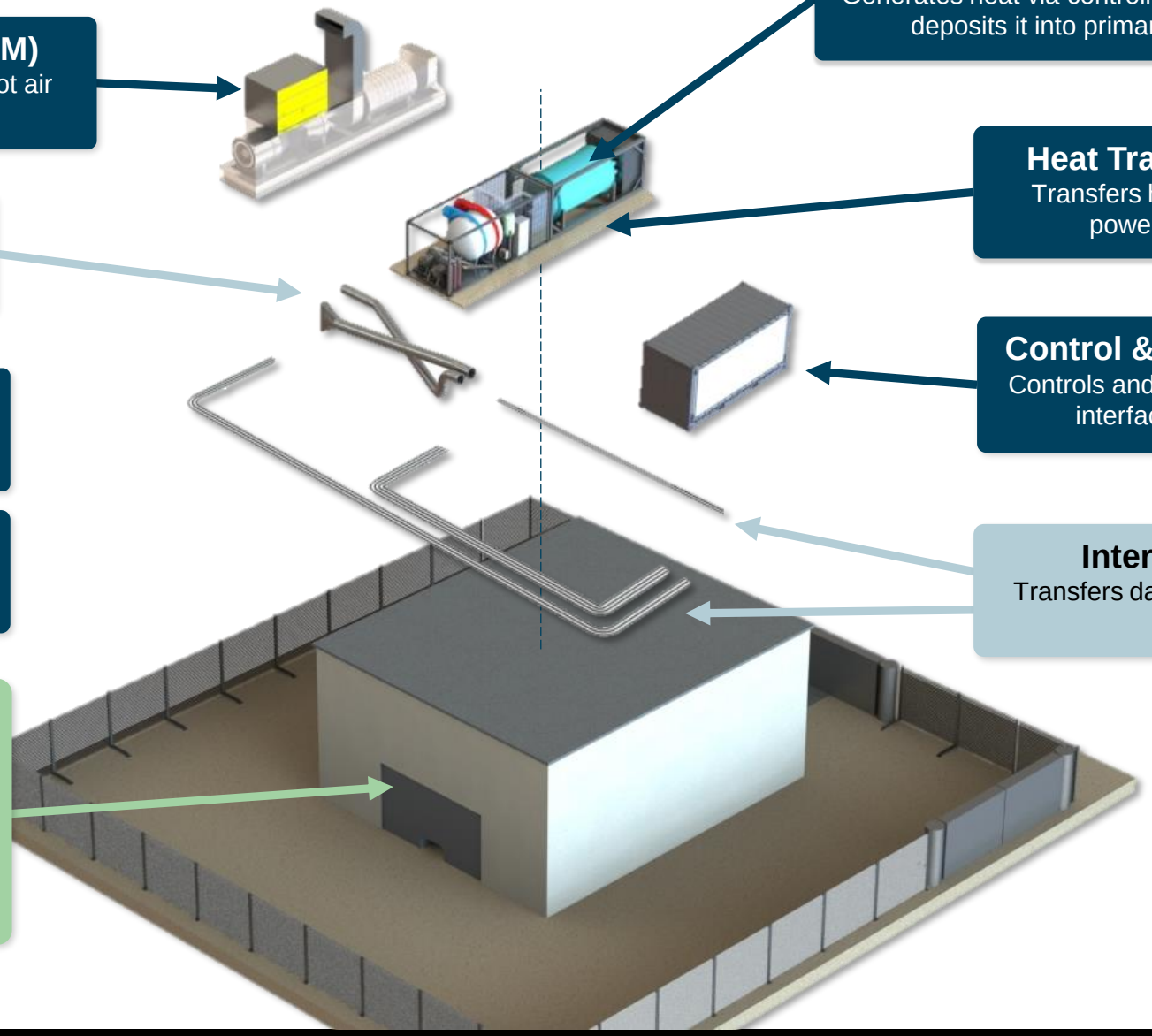
Power Generation Module (PGM)
Uses an industrial gas turbine to convert hot air into electricity

Air Pipe System (APS)
Delivers hot air from the HTM to the Power Generation Module

Electrical Room Module (ERM)
Conditions generator output and distributes to plant systems and external loads

Heat Recovery Module (HRM)
Uses turbine exhaust to boost cycle efficiency and heat water for district heating

Nuclear Island Building (Vault)
- Provide radiation shielding for components, operators, maintenance technicians, and general public
- Physically protect and restrict access to NRM and HTM



Nuclear Reactor Module (NRM)
Generates heat via controlled nuclear chain reaction and deposits it into primary working fluid (helium)

Heat Transfer Module (HTM)
Transfers heat from the reactor to the power conversion fluid (air)

Control & Safety Module (CSM)
Controls and protects the power plant and interfaces with plant operators

Inter-Module Cabling
Transfers data and power between plant systems

Plant Module

Inter-Module Connection

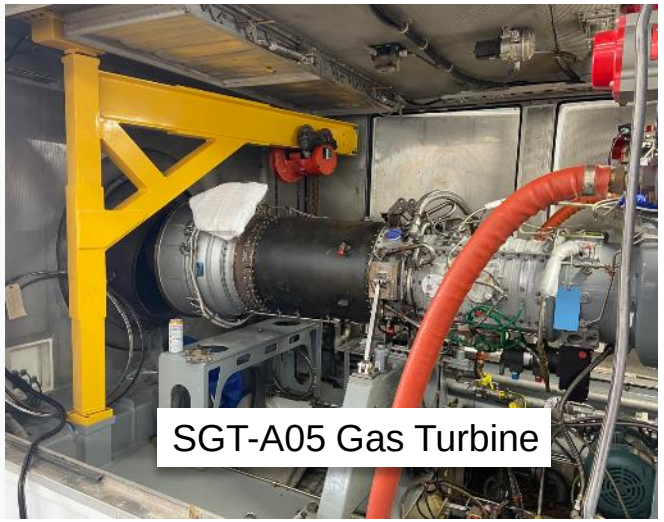
On-Site Structure

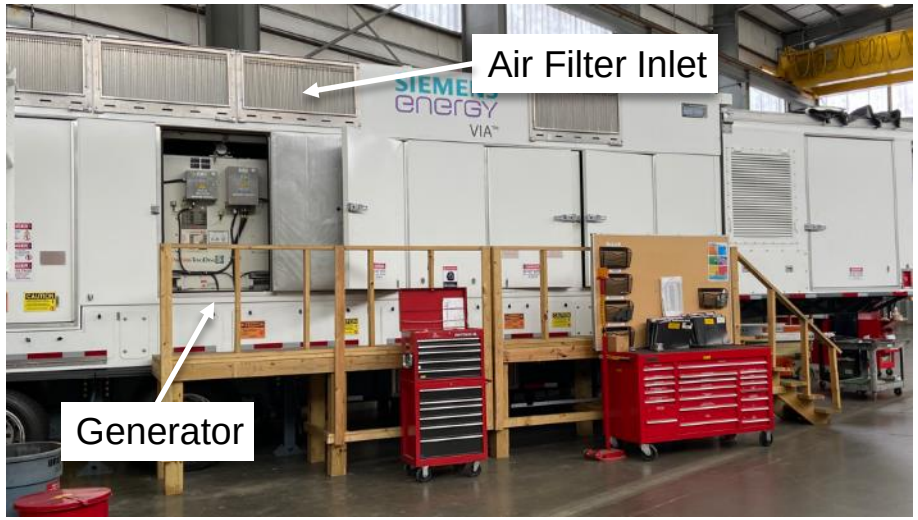
Siemens Energy Mobile Experience

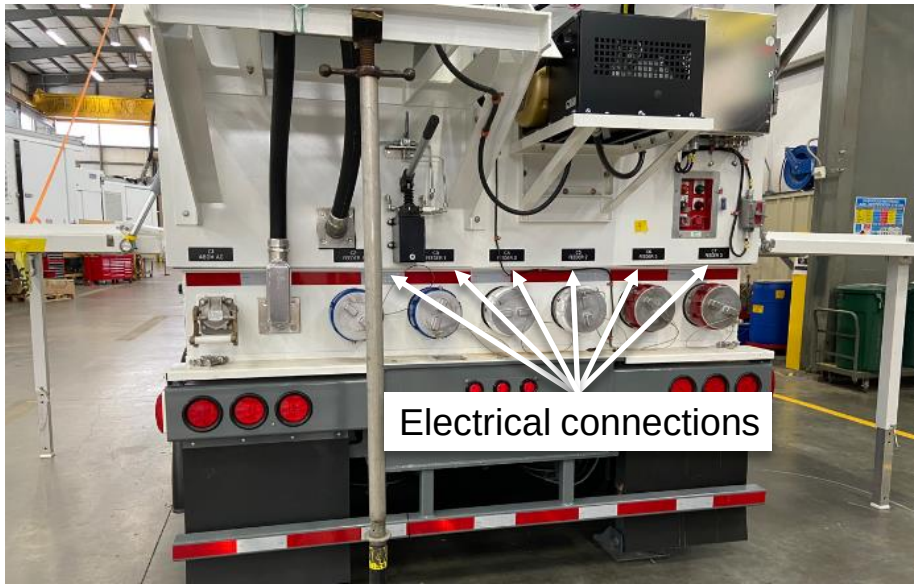
Via 5.8 Mobile Solution

- SGT-A05 gas turbine
- 5.7MW generation
- Single Trailer complete solution

Width = 2,6m (8 ft 6 in)
Length = 16.1m (53 ft)
Height = 4.2m (13 ft 9 in)
Trailer Weight = 47,627 kg (105,000 lbs)





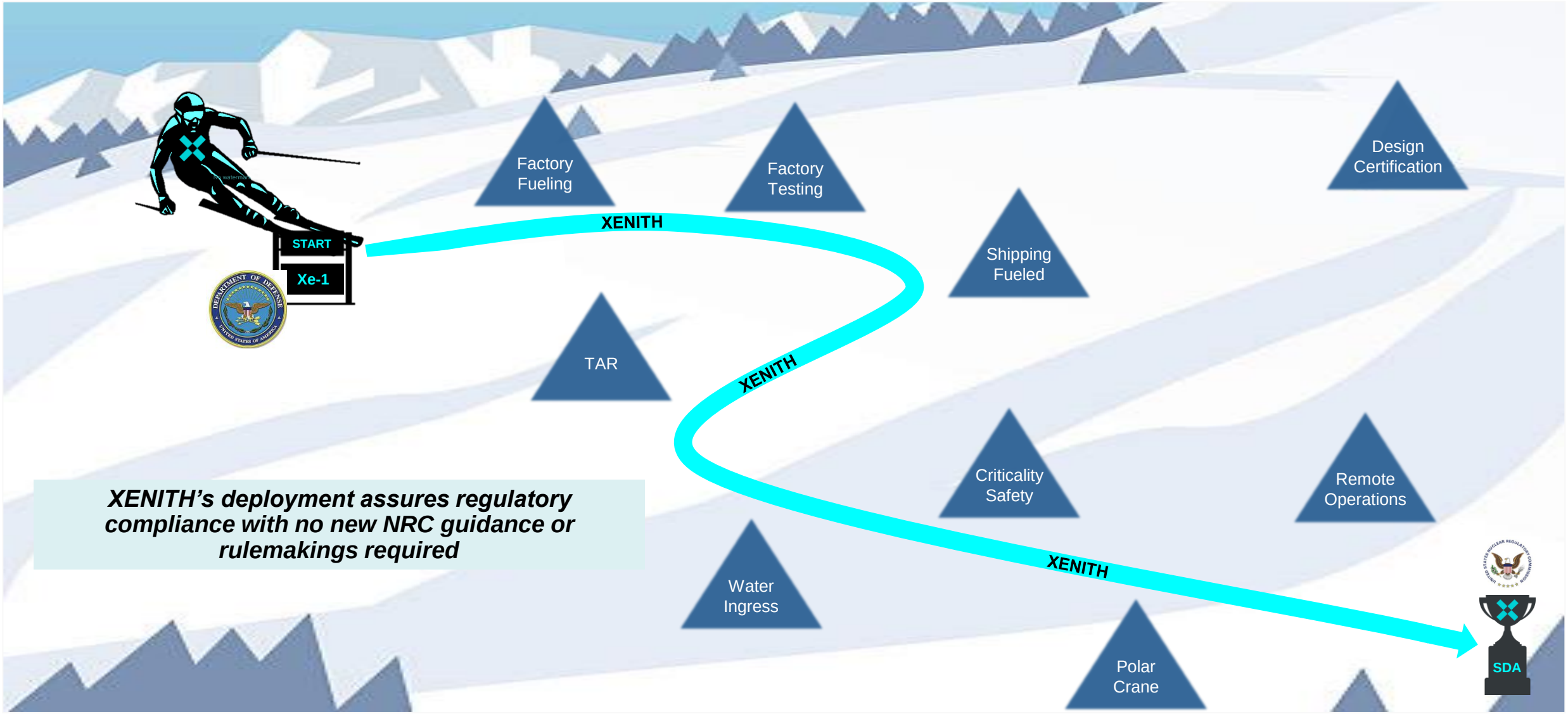


XENITH Licensing Strategy

- Licensing the XENITH Design
  - Safety & Security
  - Environmental
- Manufacturing the Modules
- Fuel Loading at Site
- Component Testing at the Factory
- Transportation
- Decommissioning

XENITH Docketed with NRC in November 2023

Evaluated & Avoided Regulatory Risks



XENITH's deployment assures regulatory compliance with no new NRC guidance or rulemakings required

Business Development

Structured customer engagement process in place

- Follows FEL stages, initiated with a Feasibility Study
- Defined milestones and deliverables

Xe-100 interest from Industrial…

- Petrochemical
- Mining
- Steel
- Chemical

And Electric customers

- Utilities
- Hyperscalers

XENITH Microreactor

- Microgrids (DOD)
- Remote and austere locations
- Maritime

Task	Scope
1	Data Collection and Site Visit
2	Site Suitability Study
3	Site Layout & Configuration
4	Plant Simulator Modeling
5	Engineering Technical Assessment
6	Cost Estimation
7	Regulatory and Communication Strategy
8	Risk Identification and Management
9	Program Management and Controls

Pre-FEL-0 Scope of Work Elements