



Clean • Safe • Secure • Affordable

TRISO-X Overview

Dr. Pete Pappano, *President, TRISO-X*

June 23, 2022

Commercializing Advanced Nuclear: What's It Gonna Take?

- Courageous, entrepreneurial leadership and investment from the private sector
- U.S. government investment, via cost-share, to overcome long lead and high-risk items
- Building off great work funded by DOE at the National Labs – TRISO fuel best example (in my view)
- Updated and more interactive regulatory structure
- Increased and enhanced U.S. manufacturing to have complete and secure supply chains – Uranium (HALEU) biggest threat to commercialization

X-energy Leading the Way – Private Sector Leadership



Dr. Kam Ghaffarian
Founder & Executive Chairman

Space

Business Success



Founded and grew SGT to \$650 mm in annual revenue and 2,400 employees. SGT was ranked as the U.S. National Aeronautics & Space Administration's second largest engineering services company.

Acquired by KBR in 2018 for ~\$355 mm on an initial \$25k investment

Moon 2021



Founded Intuitive Machines in 2016 to leverage NASA technologies for commercial space and terrestrial applications. Intuitive Machines won its first Commercial Lunar Lander Contract from NASA in 2018.

Landing on the Moon in 2021

ISS



Founded Axiom Space in 2017 to develop a commercial replacement to the ISS while making access to Low Earth Orbit global during the remainder of ISS' lifetime. Sole winner of NASA contract to commercialize International Space Station.

First commercial International Space Station

Energy

Nuclear Energy



Founded X-energy in 2009 with the goal of providing a SAFE, SECURE, CLEAN and AFFORDABLE energy source to consumers around the globe.

XE's vision is to be the world's leading provider of highly innovative, 100% safe & environmentally friendly small-scale nuclear energy solutions for government, industry and private consumers.

XE is commercializing & deploying a High Temperature Gas-cooled Reactor (HTGR) as well as manufacturing a proprietary version of TRISO fuel (TRISO-X) to ensure supply & quality control.

Unlocking Nuclear,
Disrupting the energy industry

Dr. Ghaffarian has invested in excess of \$80 mm in X-energy

Innovation & Investment

iBX.

IBX is an innovation investment firm committed to advancing the state of humanity and human knowledge. We explore new frontiers in space, technology & energy to push human potential and make a positive impact in the world.

New frontiers in space, technology & energy

Philanthropy

Emerging Light Foundation

Emerging Light Foundation, which is dedicated to improving the condition of humankind through a variety of charitable endeavors was established to support, educate and inspire great purpose while helping transcend limitations all over the world.

Limitless Space Institute

Inspires and educates the next generation to travel beyond our solar system and to support future interstellar human space exploration.

Imagine. Believe. Execute.

2009

Company Founded

Rockville,
MD*

Headquarters

320

Employees

*Including 40 PhDs and 38
Masters in Engineering /
Science*

\$1.2B

Funding secured
through ARDP

2028

First Xe-100 plant online in Washington state

X-energy's next generation nuclear technology:



Xe-100

200 MWt / 80 MWe Small Modular Reactor ("SMR") that can be scaled into a 'four-pack' 320 MWe power plant, or larger. The Xe-100 plant is walk-away safe and requires no operator actions under any adverse conditions.

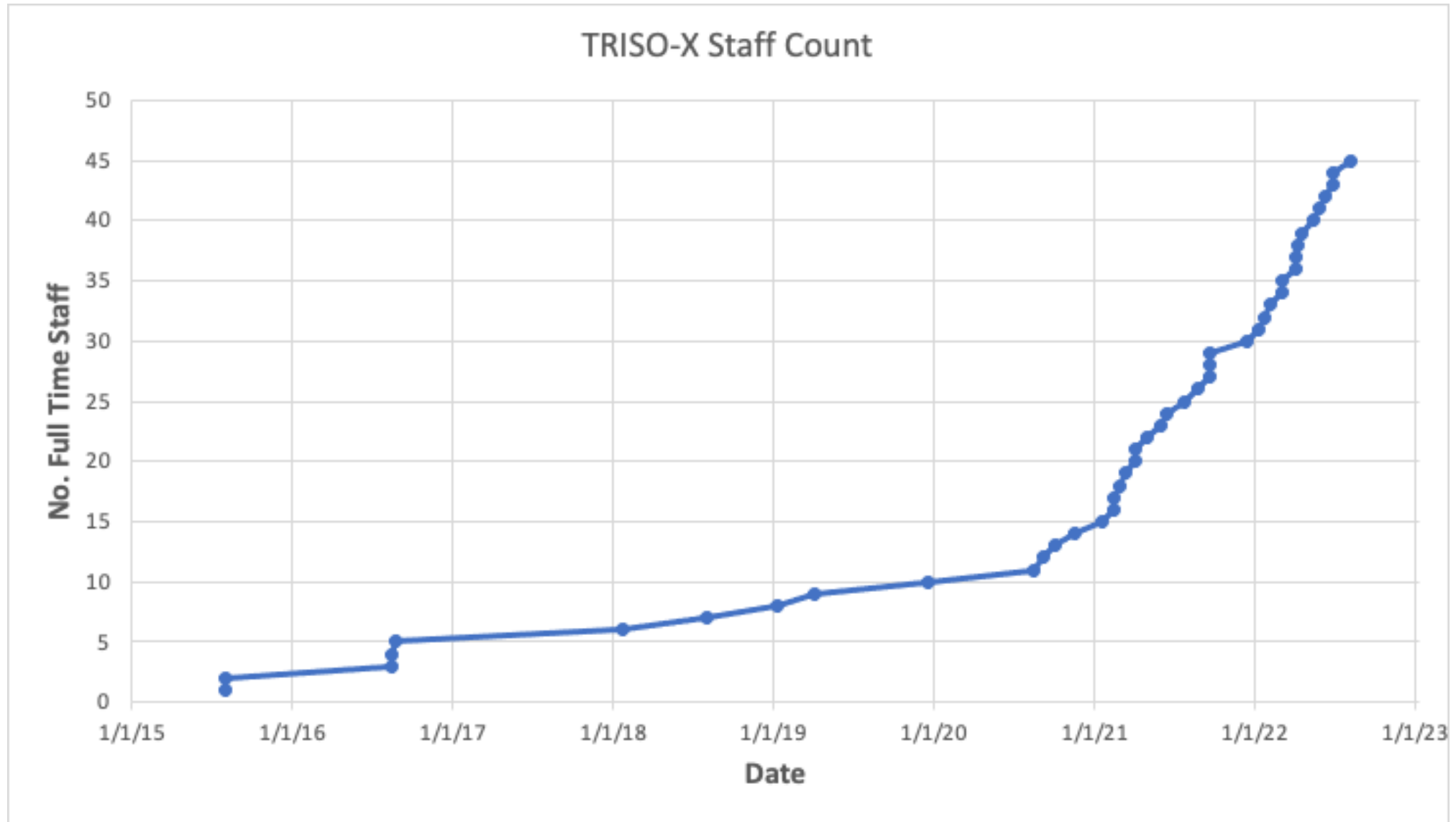


TRISO-X

Proprietary fuel designed as cue ball-sized pebble with microscopic kernels of uranium wrapped in indestructible layers of carbon. TRISO-X fuel retains waste and fission products during all conditions and cannot melt.

*Note: TRISO-X HQ will transition to Oak Ridge

TRISO-X Specific Growth



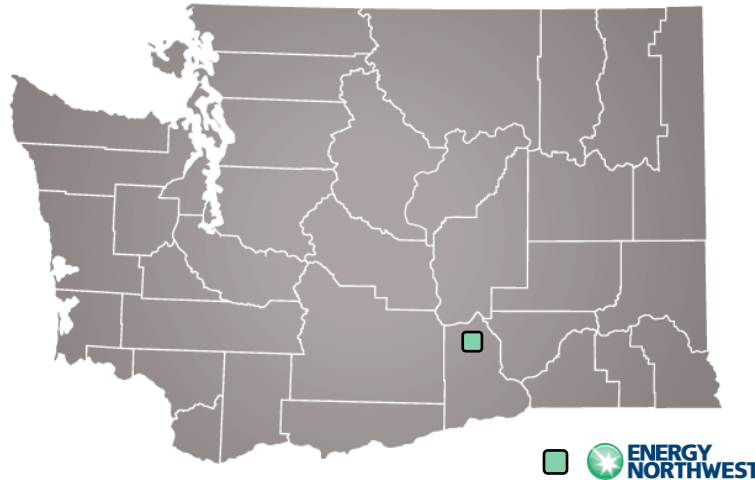
Competitive Position Reinforced by ARDP

X-energy's selection for the DOE's Advanced Reactor Development Program ("ARDP") represents a critical advantage that cannot be replicated

ARDP Overview

- In May 2020, the DOE announced the ARDP to speed the transition of next generation nuclear reactors from concept to demonstration through cost-share partnerships
- In October 2020, X-energy was selected to deliver a commercial a first-of-a-kind advanced nuclear plant with Energy Northwest¹ as well as a commercial TRISO-X fuel fabrication facility
- ***The program provides 50% cost share on all costs to deliver the first plant***

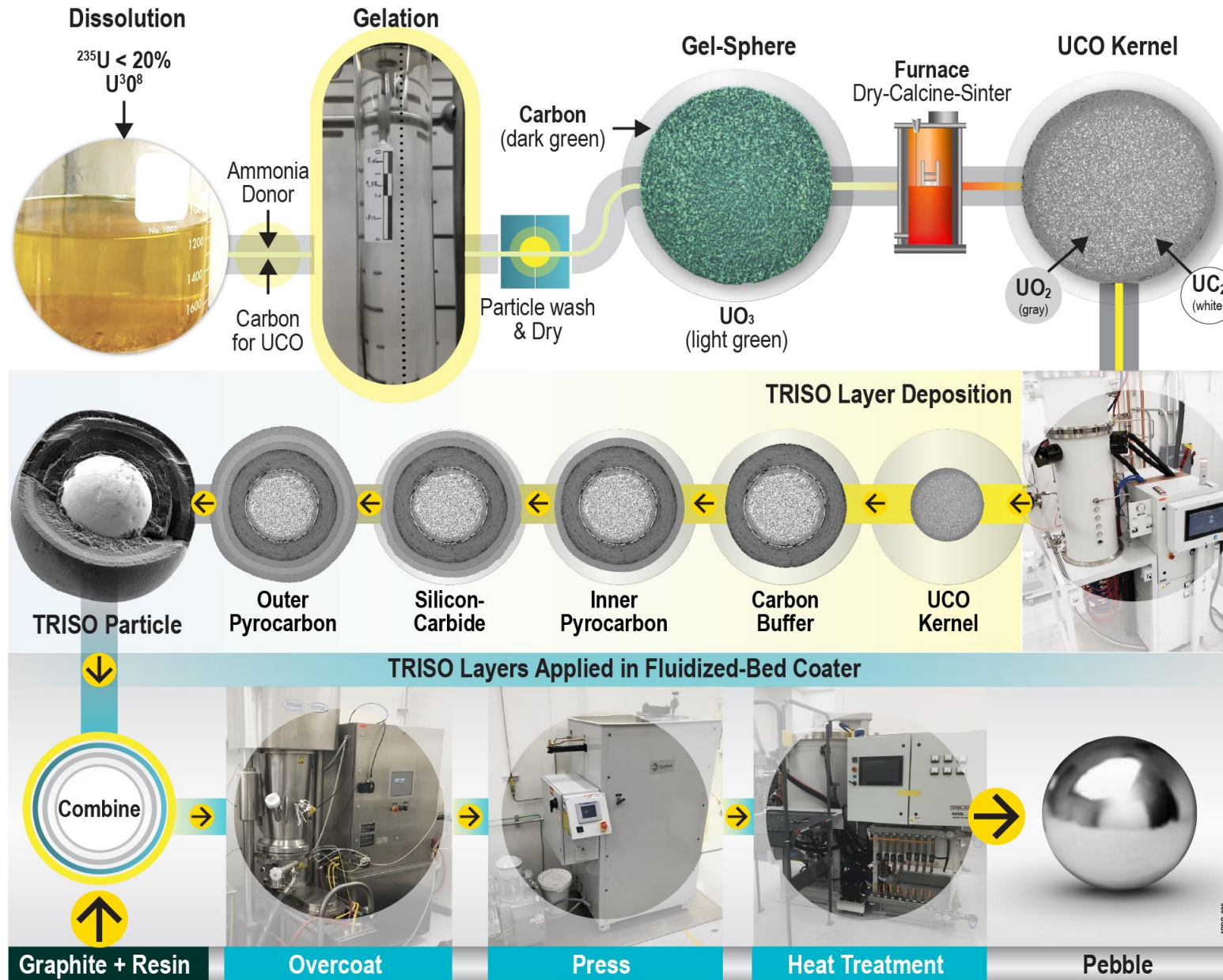
Our ARDP Project With Energy Northwest



What ARDP Selection Means to X-energy

- ✓ **Recognition from the DOE as an advanced reactor technology of choice**
 - Selected out of ~50 applicants
- ✓ **Secures first customer deployment**
 - Partnered with Energy Northwest to deploy with one of the public utility districts
 - Customer also benefits from the 50% cost-share on their development and construction costs
- ✓ **Provides \$1.2 billion in funding from the DOE**
 - Fully funds all remaining design, licensing, and commercialization milestones of the reactor, including overnight CAPEX
 - Funds the completion of the first TRISO-X fuel fabrication facility
- ✓ **Strengthens DOE's support of the advancement of TRISO fuel**
 - Exemplifies the DOE's commitment to scaling TRISO fuel production in the U.S.
 - We are the only advanced reactor company producing TRISO fuel

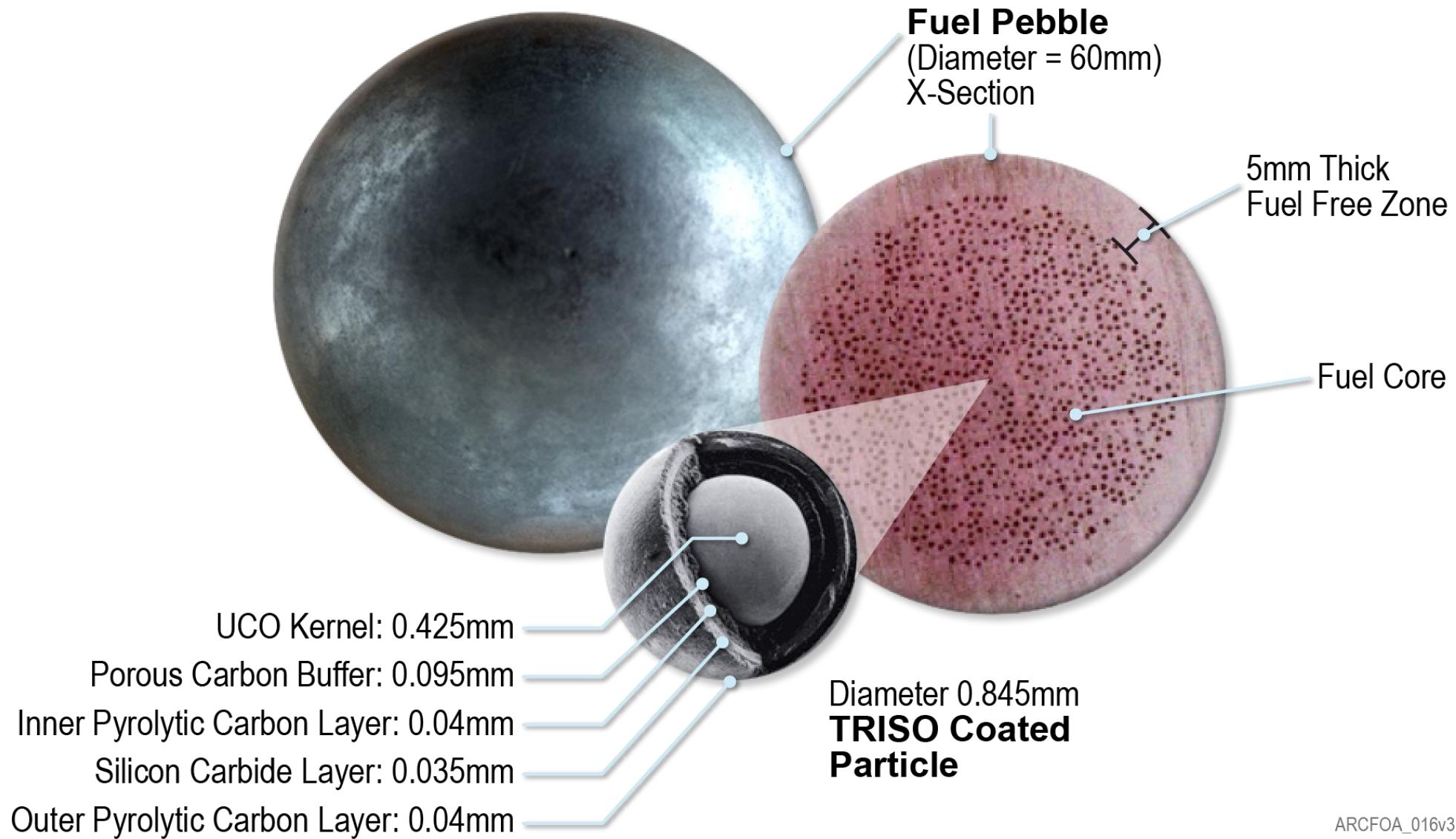
1) In negotiation with Grant County PUD, but exact utility under Energy Northwest agreement is still being determined.



Coated Particle Fuel Fabrication Overview

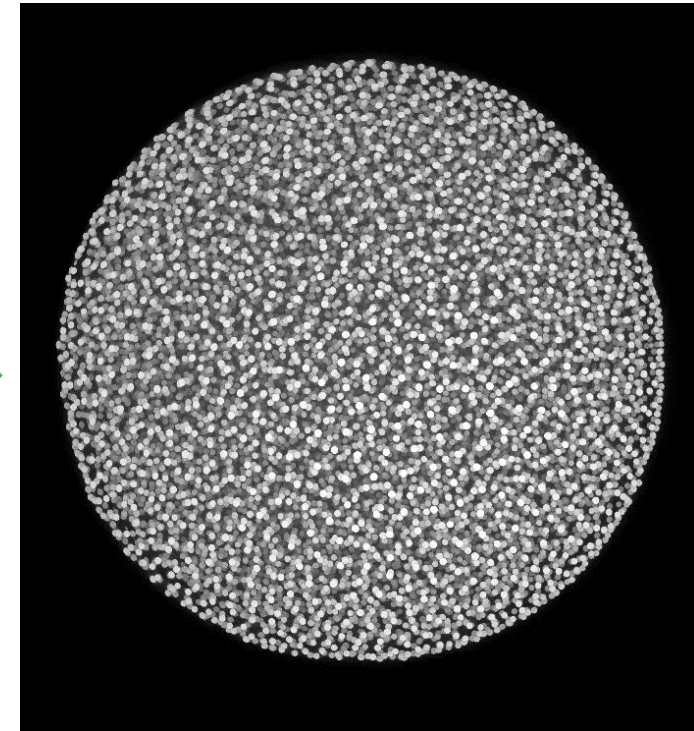
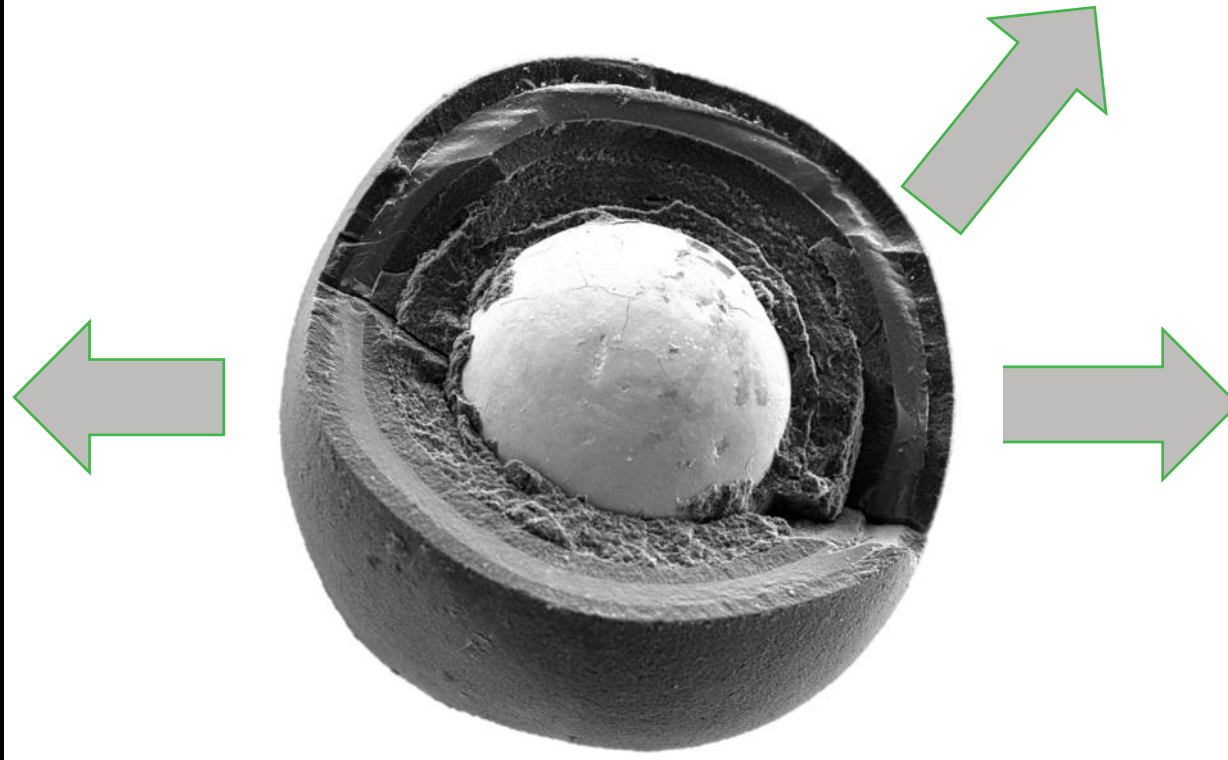
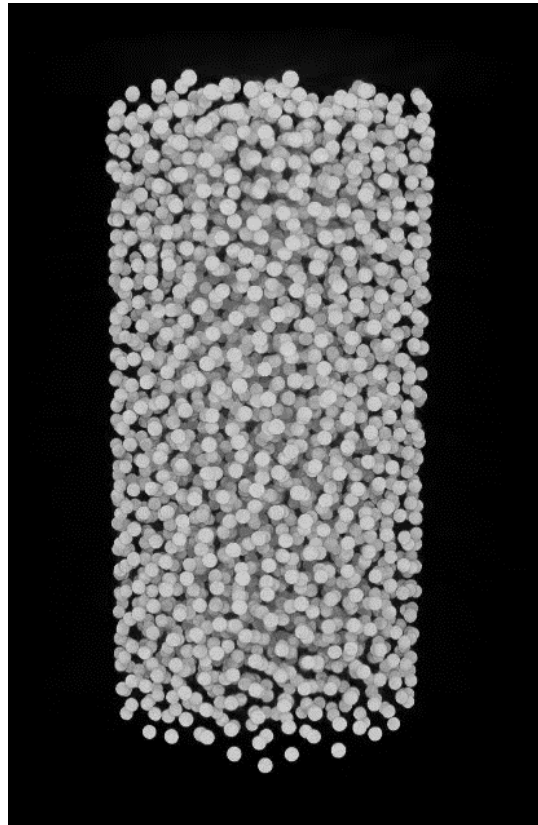
Acknowledgements: This work is being performed at the Oak Ridge National Laboratory (ORNL) by a team from X-energy and ORNL, supported by the U.S. Department of Energy, under Award #DE-NE0008472

Xe-100 Pebble Fuel Diagram



ARCFOA_016v3

Cross-cutting Nature of Encapsulated Fuel



Coated Particles Support Multiple Reactor or Propulsion Designs



TRISO-X Pilot Facility inside ORNL, public/private partnership with X-energy engineers

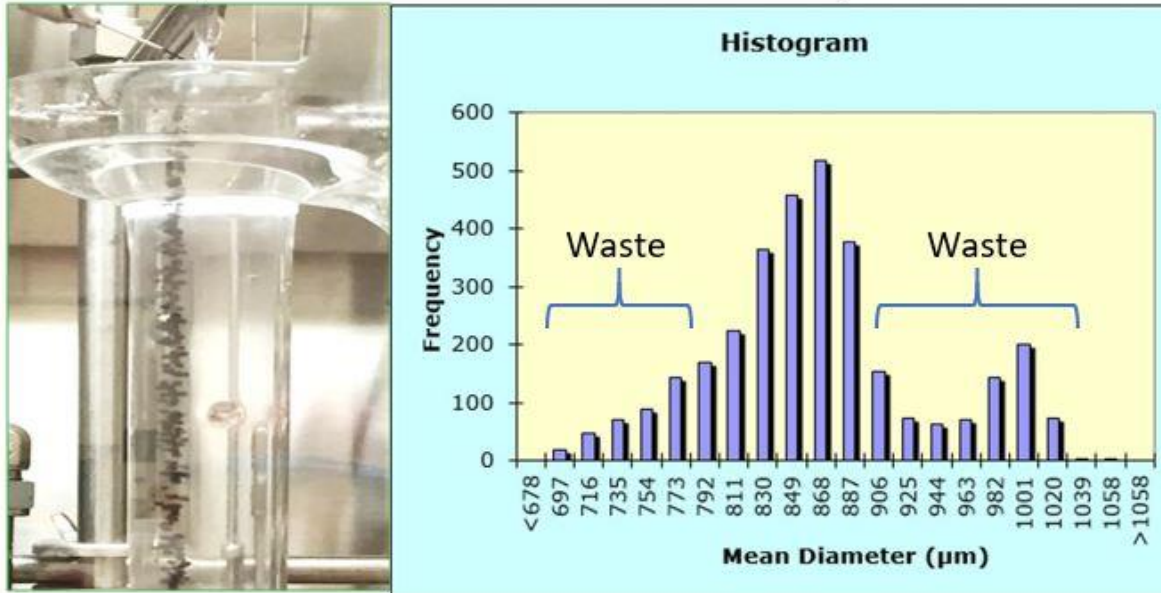
TRISO-X Research & Development Center



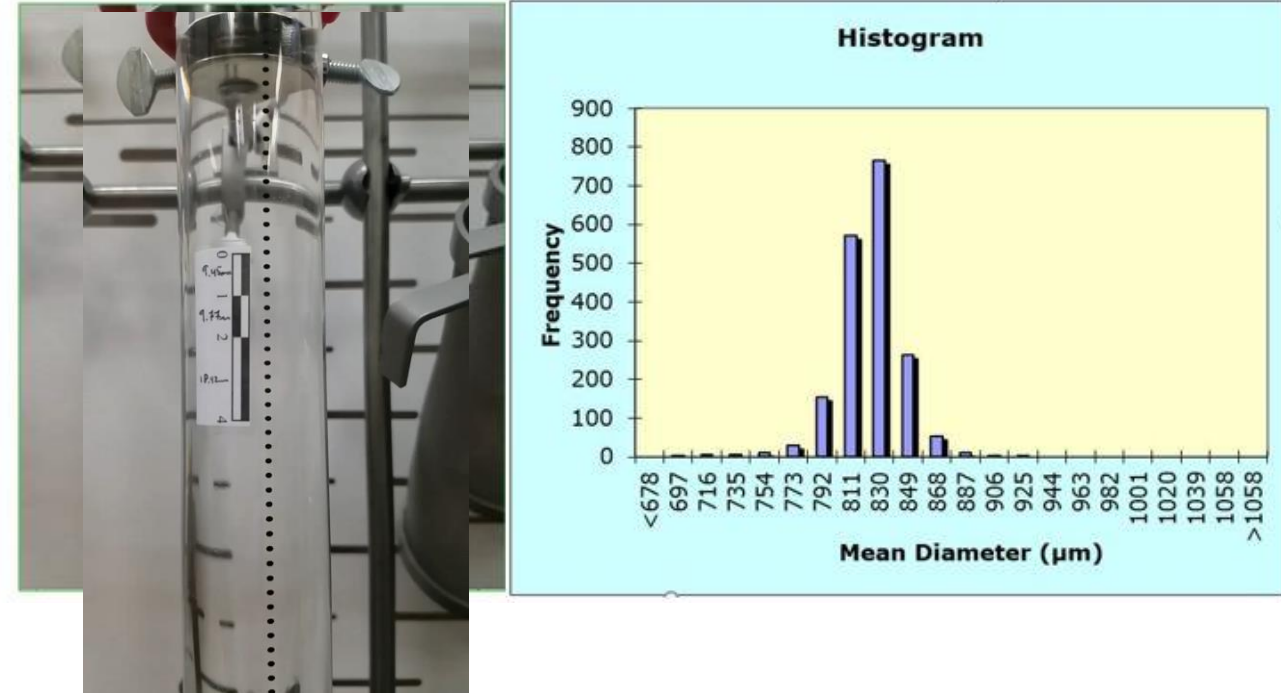
TRISO-X R&D Center Inside Centrus TMC. ~50,000 sq ft Operator Training Center

Kernel Droplet Formation Improvements

Historical Droplet Formation



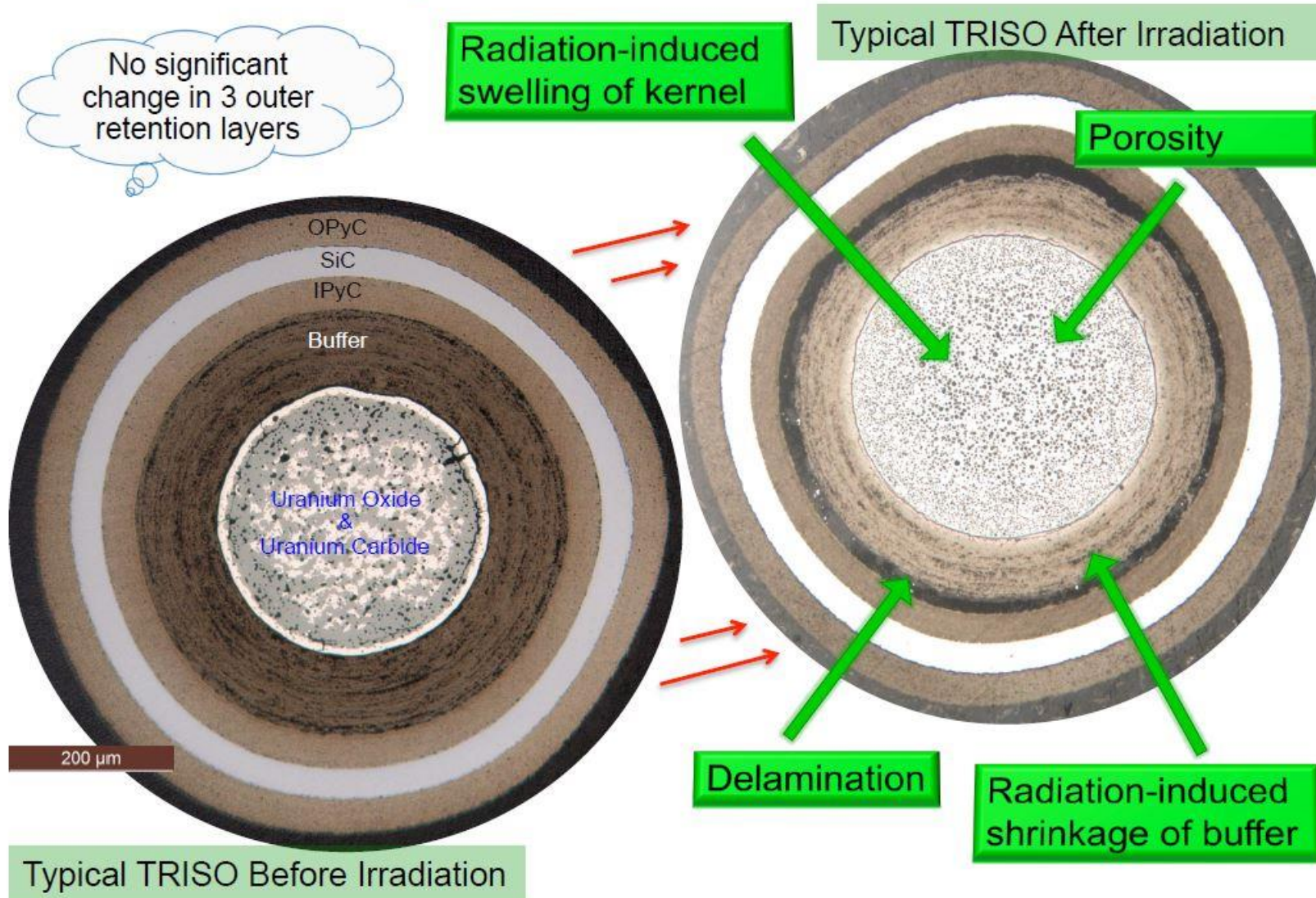
X-energy Novel Droplet Formation



The reduction in waste saves money and makes TRISO-X more cost-effective than other fabrication programs

Typical Irradiation Behavior of TRISO Pebble

Evolution of particle microstructure



Hunn et. al., Examination of Coated Particle Fuel Irradiation Performance. *XXIV International Materials Research Congress* Cancun, Mexico August 16–20, 2015

TRISO-X Fuel Fabrication Facility (TF3)

Project Overview:

Acquired 110 acres and build ~500,000 sq ft
nuclear fuel facility in Oak Ridge TN
NRC licensed – Category II
~400 jobs
8 MTU/year capacity
(>1 million pebbles/year)
Operational in 2025
>\$300 million investment
DOE NE Announcement (below)

*“The TRISO-X, LLC Fuel Fabrication Facility (TF3) will be the nation’s first **High-Assay, Low-Enriched Uranium (HALEU)** fuel fabrication facility” – from DOE Milestone Announcement*

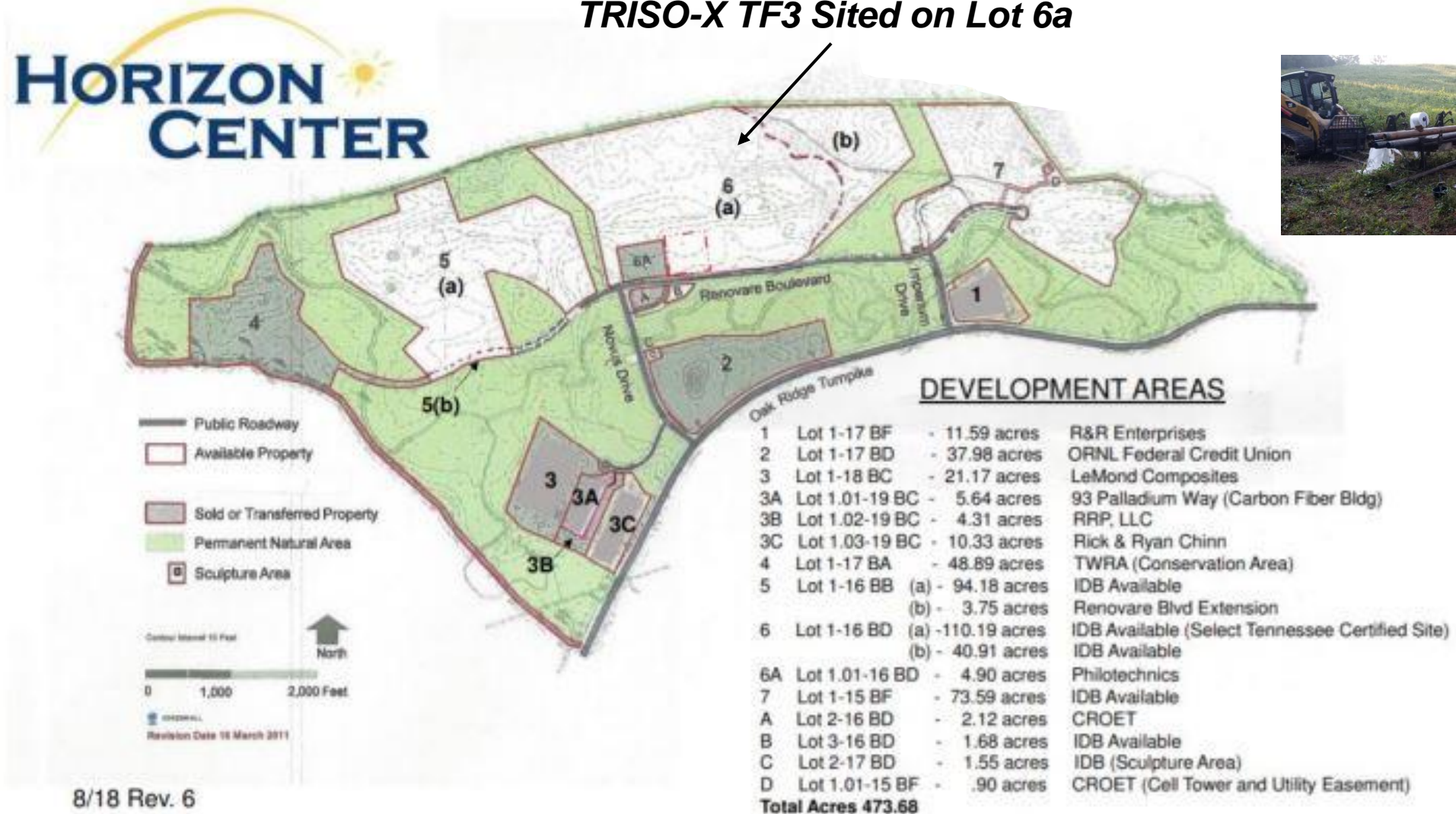


TRISO-X TF3– Aerial Visualization

<https://www.energy.gov/ne/articles/x-energys-triso-x-fuel-fabrication-facility-produce-fuel-advanced-nuclear-reactors>

Horizon Center Parcel Overview

TRISO-X TF3 Sited on Lot 6a





TF3 110 Acre Site

First Ever Category II Fuel Fabrication Facility License





empowering earth

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