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Isotek Systems, LLC

Lasting Legacy of U-233

SARAH SCHAEFER, PRESIDENT AND PROJECT MANAGER

The U-233 Mission and Isotek

- DOE awarded the U-233 Disposition Project to Isotek Systems, LLC in 2003
- Isotek is a subsidiary of Atkins Nuclear Secured Holdings, a member of AtkinsRéalis
- The Mission: manage the U-233 inventory, design a facility to process the U-233 and safely dispose of the resulting downblended waste
- Isotek has 185 people who diligently support the mission

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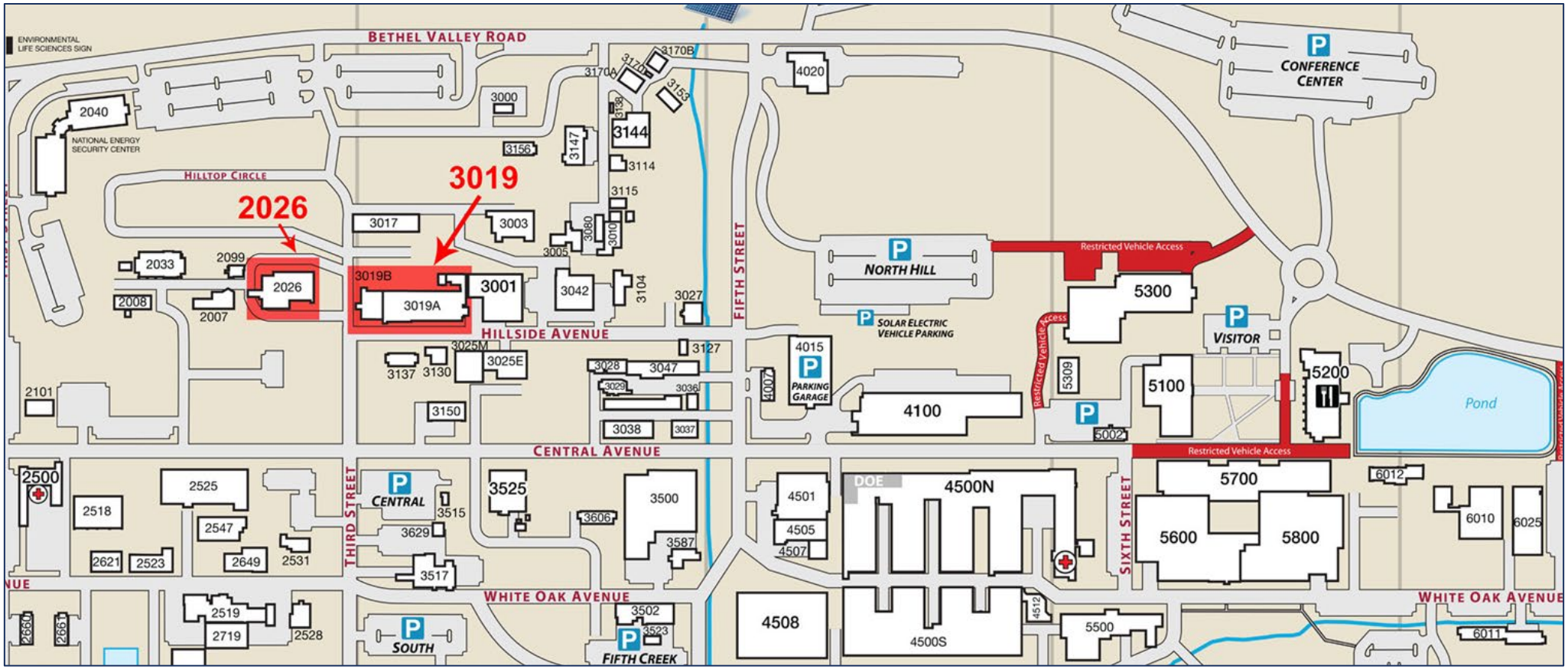
Oak Ridge National Laboratory



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Oak Ridge National Laboratory – Building 3019

- Cold War Era Facility
- Constructed in 1943
- Pilot plant to test radiochemical processes
- Designated as the U-233 repository in 1962
- Oldest operating nuclear facility in the world

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U-233 Inventory

Direct Disposition – no processing required

- CEUSP direct disposition – 100% complete
- ZPR direct disposition – 100% complete
- Transfer high purity material – 90% complete

Processing Required to Disposition

- Oxide powders – started October 2019
- Monoliths – will start in early 2025
- Metals
- MSRE Traps

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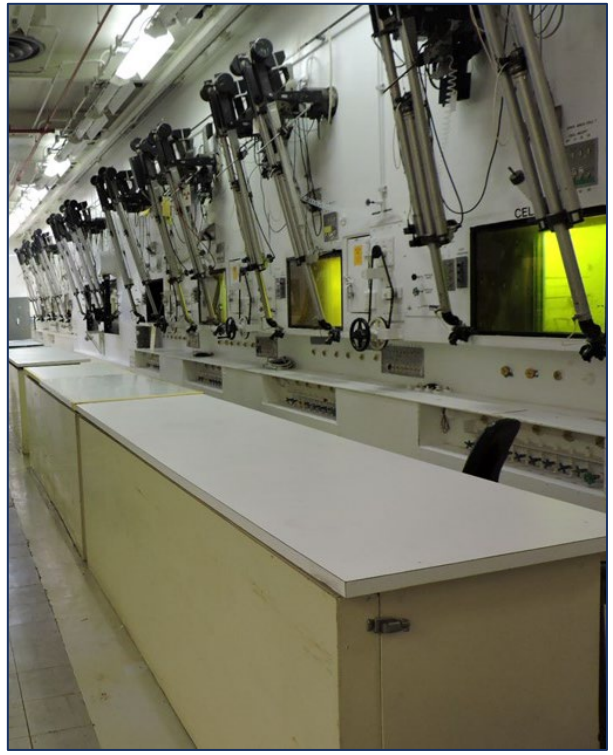
Oak Ridge National Laboratory – Building 2026

- Constructed in 1964
- Hot cell facility
- Designed for characterization of highly radioactive materials
- Operational through 2006
- Transferred to Isotek in 2017



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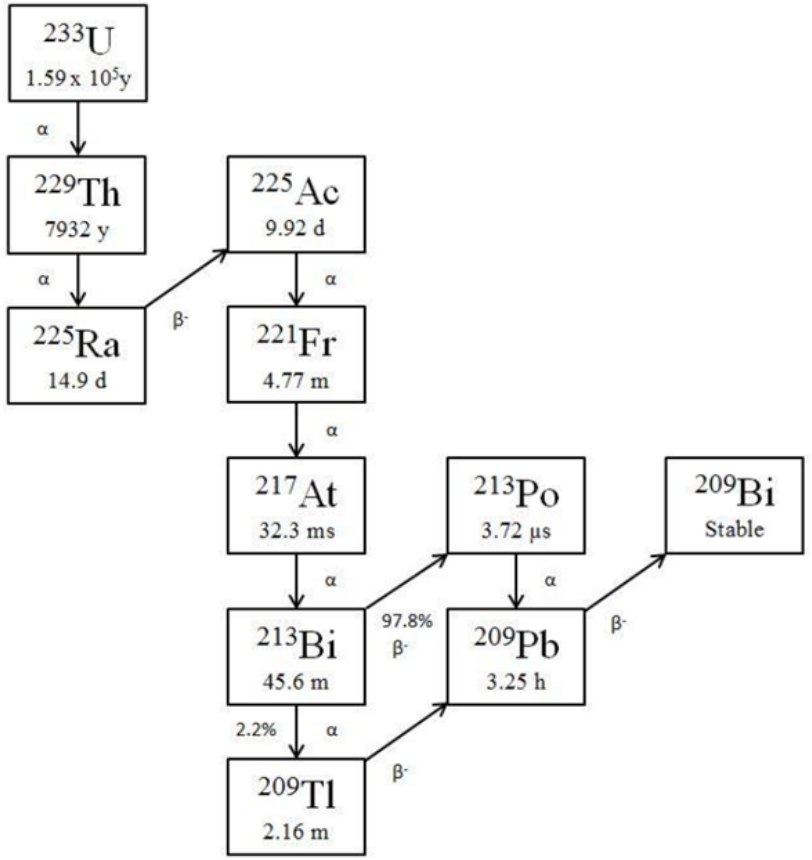
Uranium-233

- Man-made fissile isotope produced in thorium reactors
- No longer produced – limited supply
- Typically contaminated with U-232 with its high gamma emitting Thallium-208
- One daughter product is Thorium-229
- ORNL piloted the separation of Th-229 from U-233 and generation of Actinium-225
- ORNL's small amount of Th-229 has fed the medical research/clinical trials through 2023



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The Challenge

- Original U-233 contract included extracting Th-229 prior to disposal of U-233, but removed by Congress in 2005
- **2015:** TerraPower approached DOE with a business case for the extraction of Th-229
- **2015 – 2018:** Find a way to extract thorium, not impede U-233 disposition, offset cost of disposition
- **Start extracting Th-229 before 2020**

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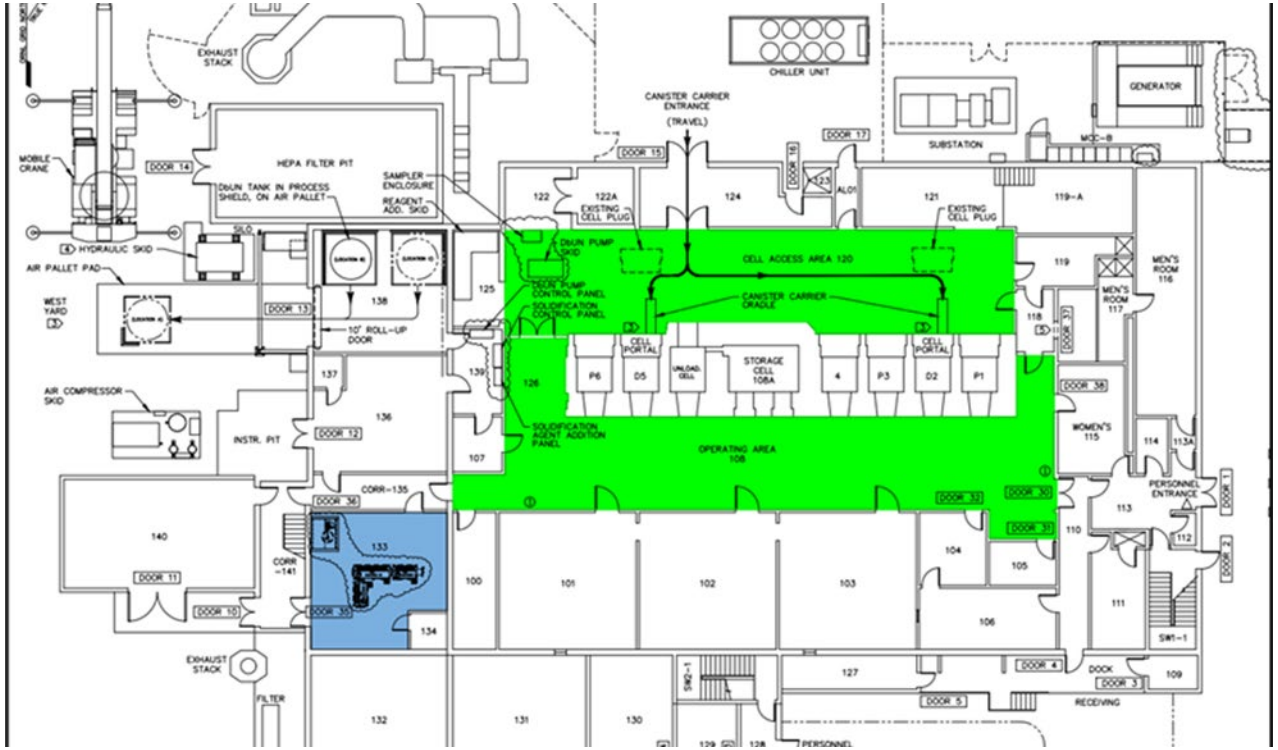
The First Answer – Thorium Express



- Small population of low U-232, uniform, well characterized Oak Ridge Oxide material
- Processed in shielded gloveboxes – funded with Th-229 proceeds
- Location would not impact hot cell renovations

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Thorium Express

- Developed glovebox design in-house
- Partnered with local fabricators
- Started training on benchtop and off-the-shelf sacrificial glovebox
- Two months prior to readiness, trained in new gloveboxes

Result: 27 canisters processed, and 1.67 grams thorium extracted. 95% of the thorium was saved.

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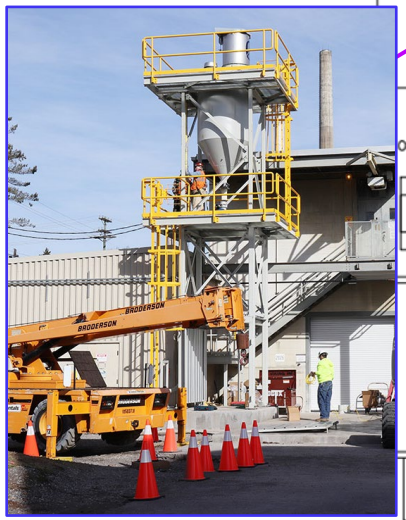
New Life for Cancer Research

- November 22, 2019
- DOE, Isotek, and TerraPower celebrated the unique partnership!

The Second Answer – Initial Processing Campaign



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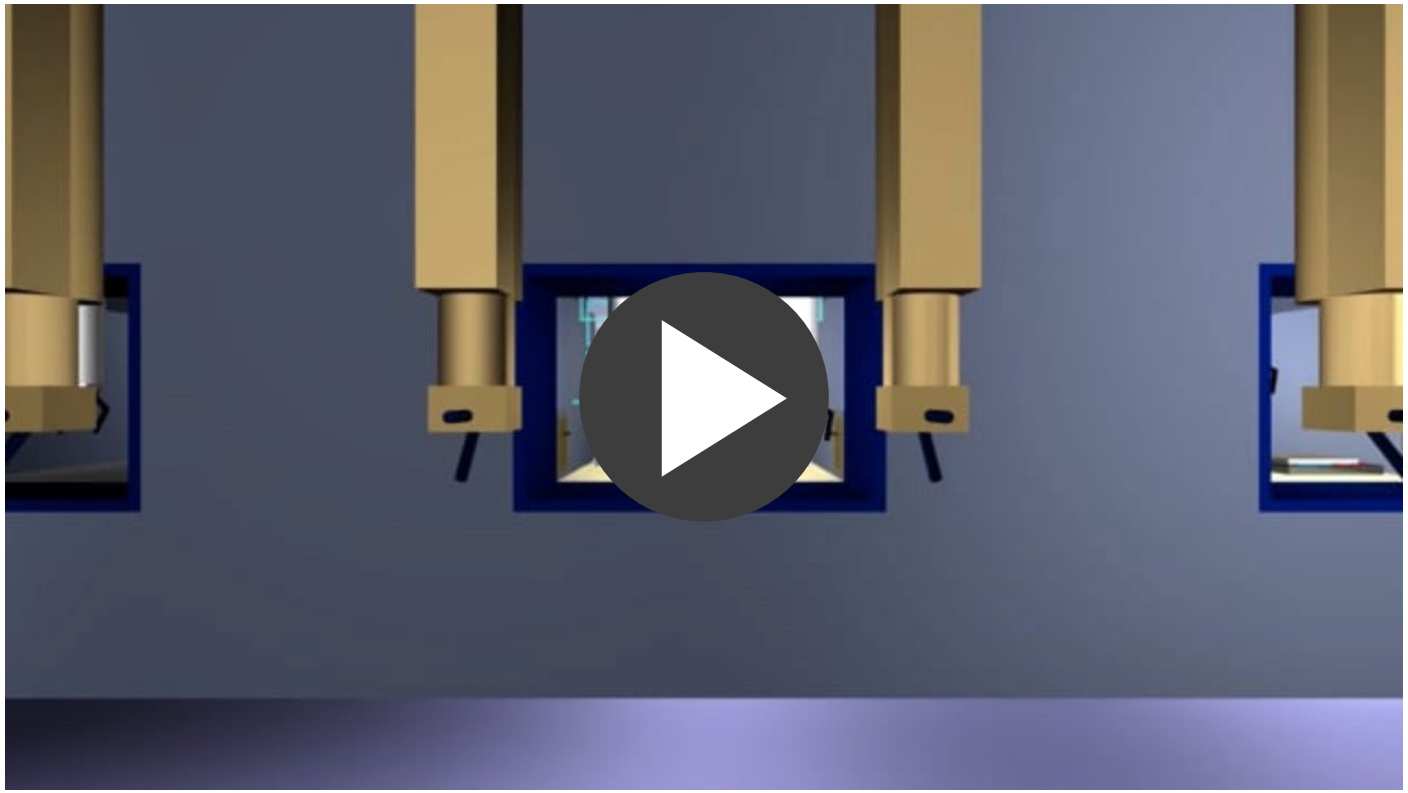
What is the Initial Processing Campaign?



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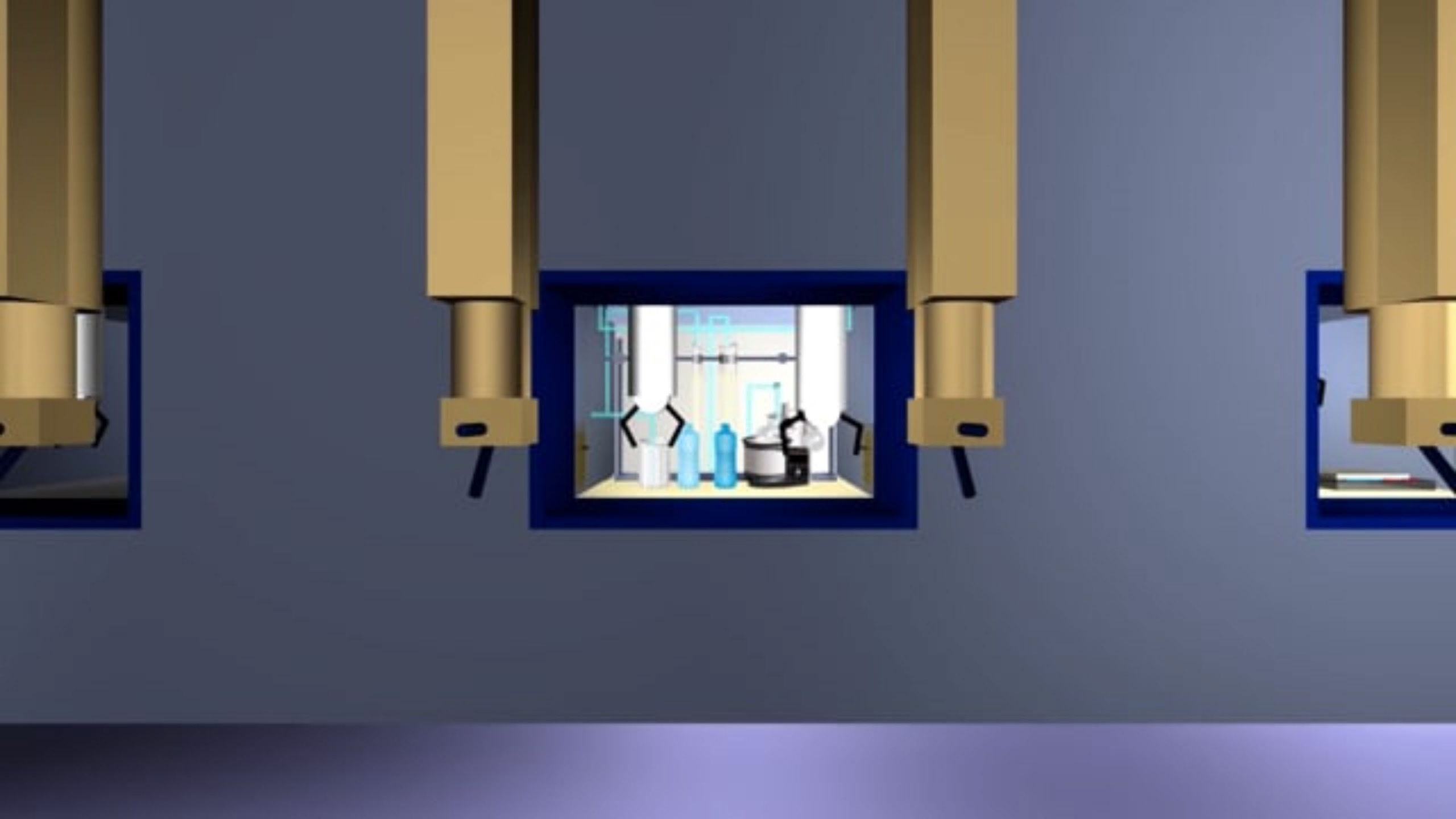
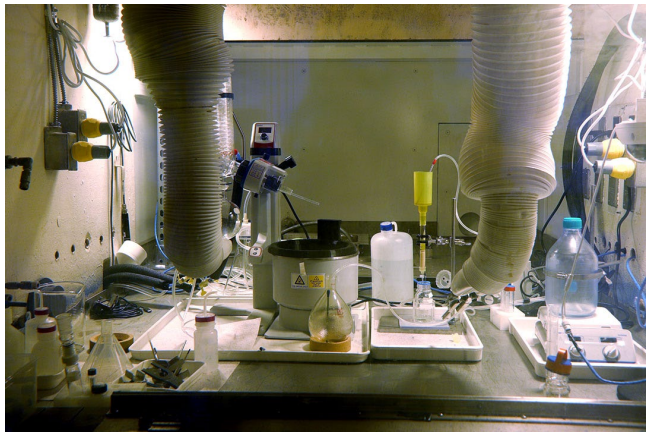


Two Years of Processing in Hot Cells

- Started processing in hot cells in October 2022
- Began in one processing area and then progressed to all
- Brought 6th hot cell online in May 2023
- Encountered equipment challenges
- In two years, processed 37% of IPC inventory
- Extracted > 10 grams Th-229 total between Thorium Express & IPC
- Extraction efficiency > 85%



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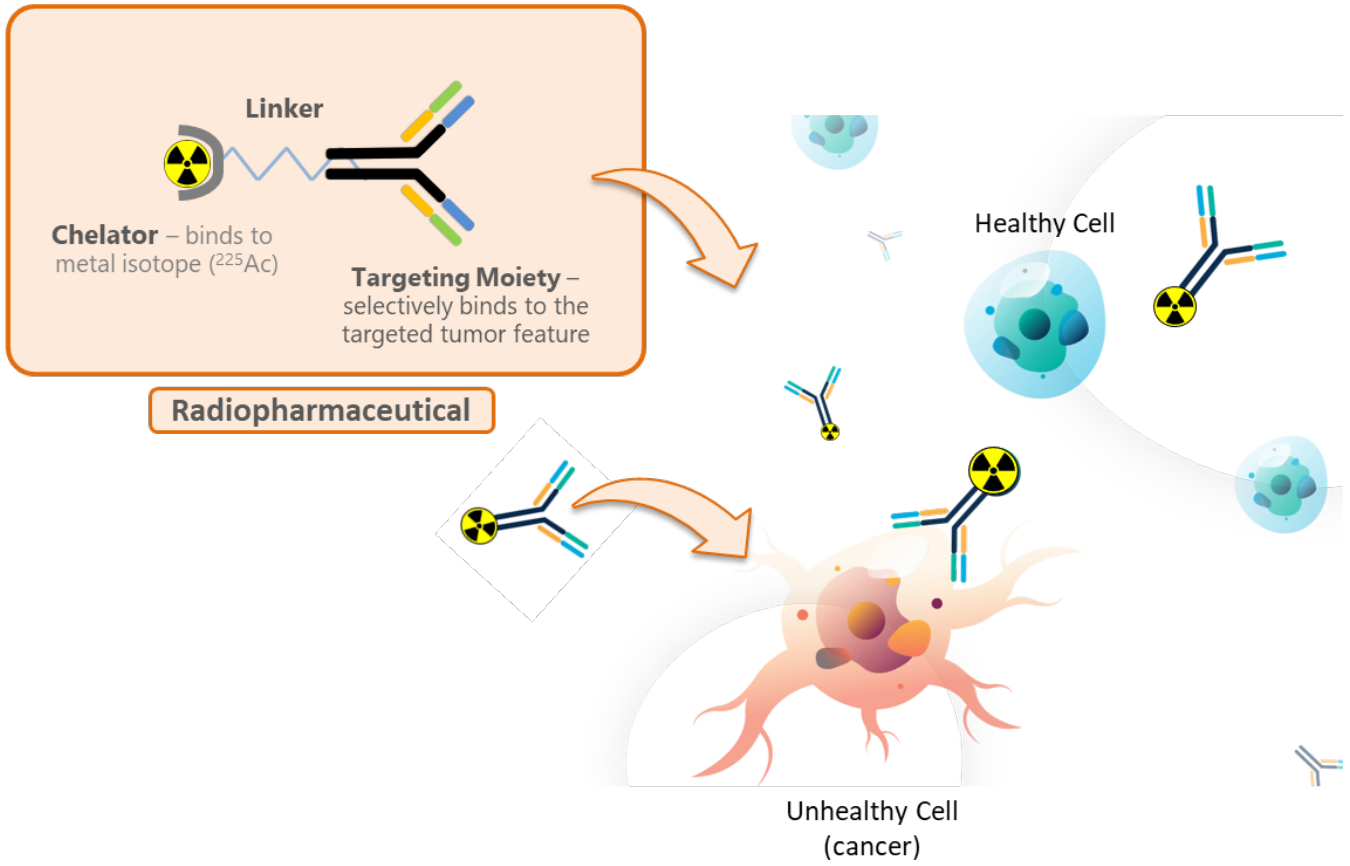
Thorium for Targeted Alpha Therapy

- TerraPower and their partners began milking the Isotek extracted Thorium-229 in early 2024
- Clinical trials using limited amount of material generated from ORNL's U-233 has shown success!
- Isotek will continue to extract thorium through the completion of the mission
- Nominally, we'll deliver 40 grams of Thorium-229
- We are saving lives and using the proceeds to save taxpayer costs



Source: Claunch, S. 2024, 'From Cold War Waste to Hope for Cancer Patients'

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THERE
IS
HOPE

There is Hope

Company	Indication	Drug Target	Compound	2024 Incidence (U.S.+EU)	Preclinical	Phase 1	Phase 2	Phase 3
Bristol Myers Squibb / RayzeBio	**GEP-NETs**	SSTR2	RYZ101	>45k				
AstraZeneca / Fusion	**Prostate Cancer**	PSMA	FPI-2265	>100k				
NOVARTIS	**Prostate Cancer**	PSMA	PSMA-617	>100k				
Bristol Myers Squibb / RayzeBio	**SCLC**	SSTR2	RYZ101	>450k				
BAYER	**Prostate Cancer**	PSMA	Pelgifatamab	>100k				
City of Hope	**Colorectal Cancer**	CEA	DOTA-M5A	>475k				
FULL-LIFE TECHNOLOGIES	**GEP-NETs**	SSTR2	Actinium–225–[not disclosed]	>45k				
janssen	**Prostate Cancer**	Hk2	Actinium–225–JNJ–69086420	>100k				
Lilly POINT BIOPHARMA	**Prostate Cancer**	PSMA	Actinium–225–PNT2001	>100k				

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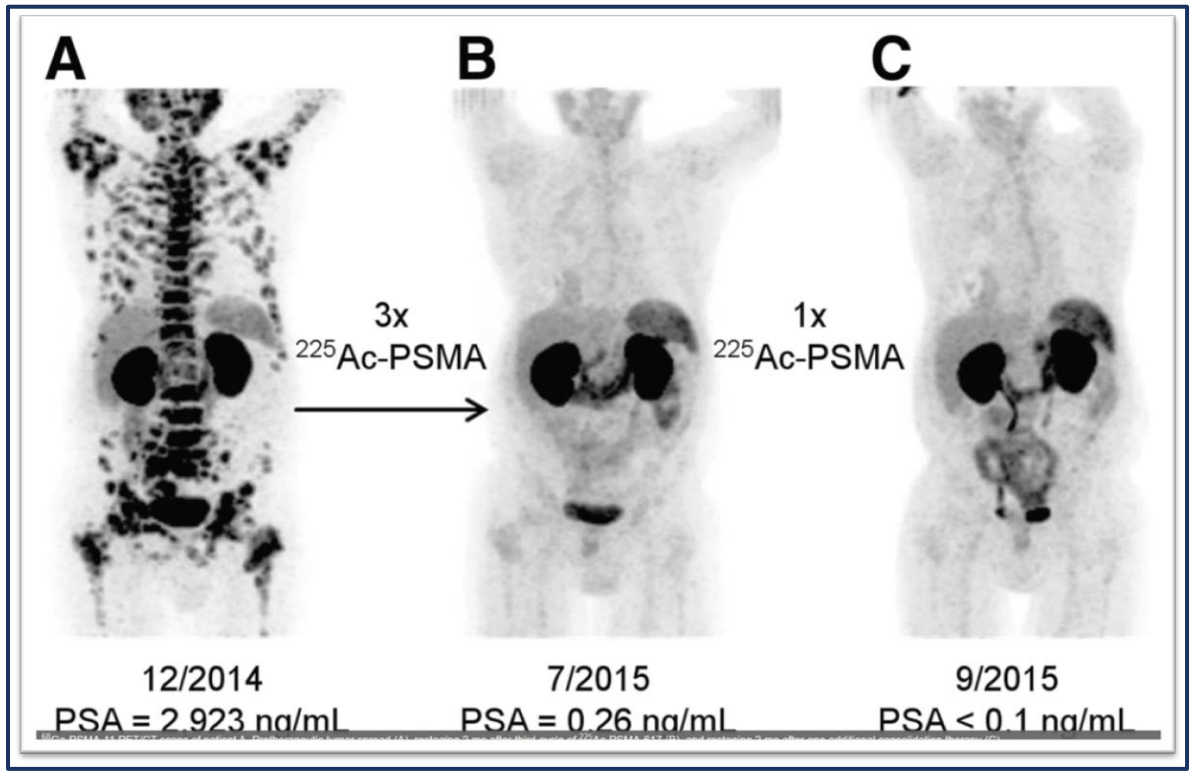
There is Hope



Results of Actinium-225 PSMA Treatments on Advanced Prostate Cancer

Source: Kratochwil, C. et al, 2016 '225Ac-PSMA-617 for PSMA-Targeted α-Radiation Therapy of Metastatic Castration-Resistant Prostate Cancer', Journal of Nuclear Medicine, vol 57 (12) 1941-1944.

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Questions?