

High-Assay Low-Enriched Uranium (HALEU) Overview

RadWaste Summit 2.0

Sal J. Golub

Associate Deputy Assistant Secretary

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Office of Nuclear Energy Mission and Priorities

Our Mission

To advance nuclear energy science and technology to meet U.S. **energy**, **environmental**, and **economic** needs.

Our Priorities

1

Enable continued operation of existing U.S. nuclear reactors

2

Enable deployment of advanced nuclear reactors

3

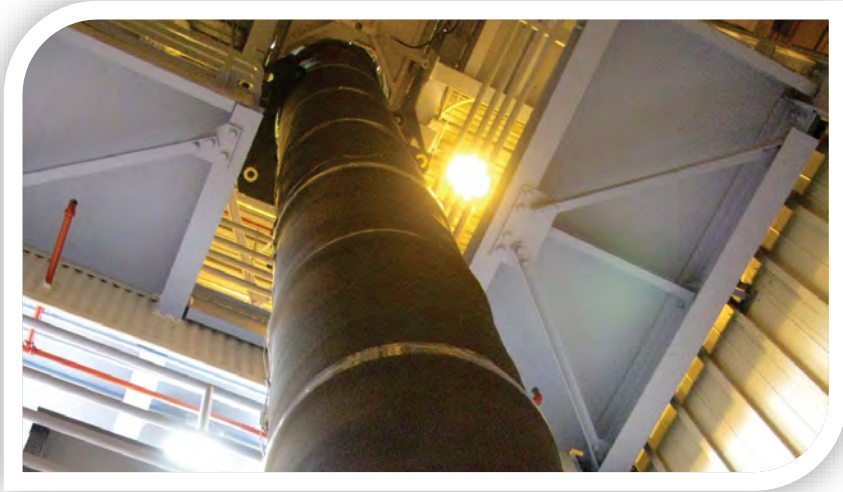
Develop advanced nuclear fuel cycles

4

Maintain U.S. leadership in nuclear energy technology

HALEU

HIGH-ASSAY LOW-ENRICHED URANIUM



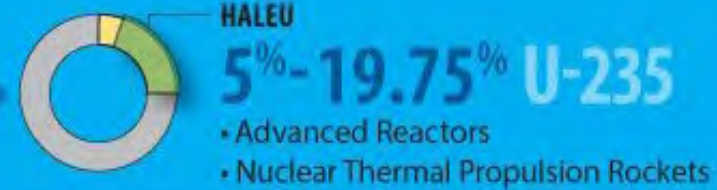
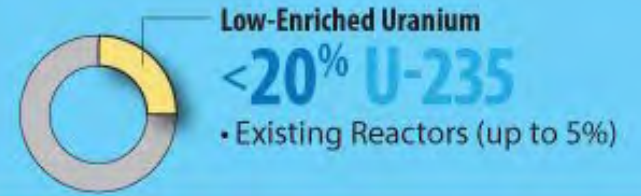
What's Next? -- A next generation fuel for next generation nuclear reactors.

WHAT IS IT?

Uranium enriched between

5% AND 20%

in uranium-235—the main fissile isotope that produces energy during a chain reaction.



ALLOWS FOR...



Smaller Designs



Longer Life Cores



Increased Fuel Efficiency



Less Waste

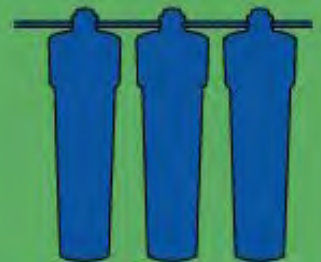
HOW IT'S MADE

Chemical Processing

Recycle used government-owned HEU and downblend to HALEU.

Enrichment

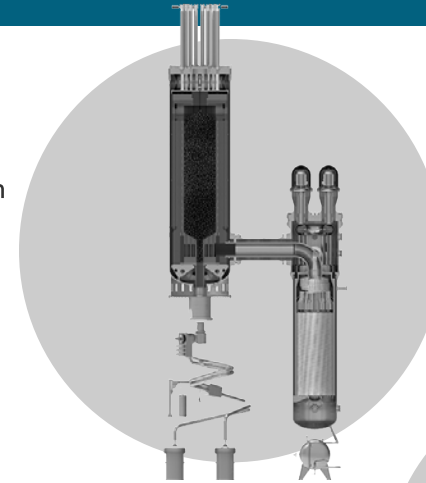
Gas centrifuges separate uranium isotopes by weight to produce a higher percentage of U-235 in the uranium.



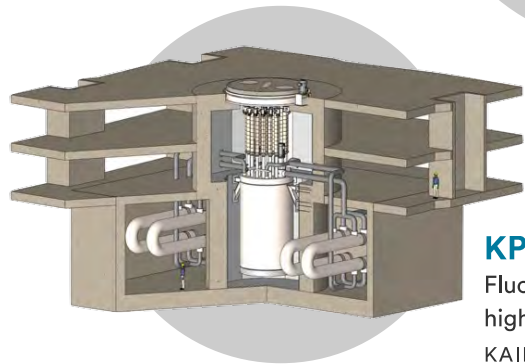
Several Advanced Reactors Need HALEU Fuel



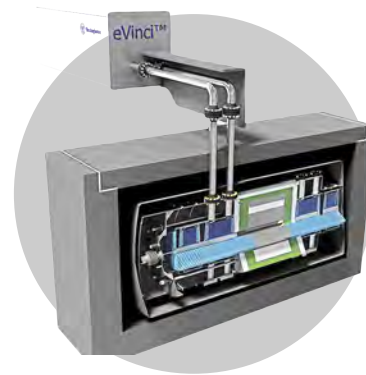
Sodium Reactor
Sodium-cooled fast reactor +
molten salt energy storage system
TERRAPOWER



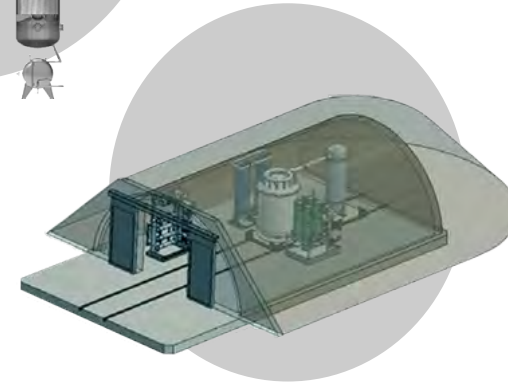
Xe-100
High-temperature gas reactor
X-ENERGY



KP-FHR
Fluoride salt-cooled
high-temperature reactor
KAIROS POWER

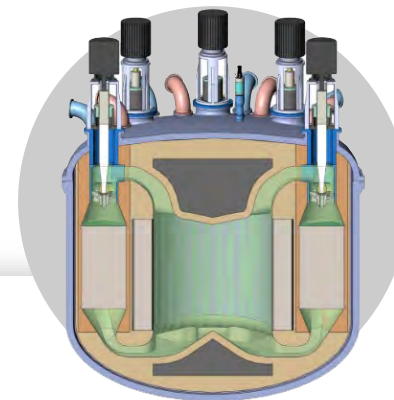
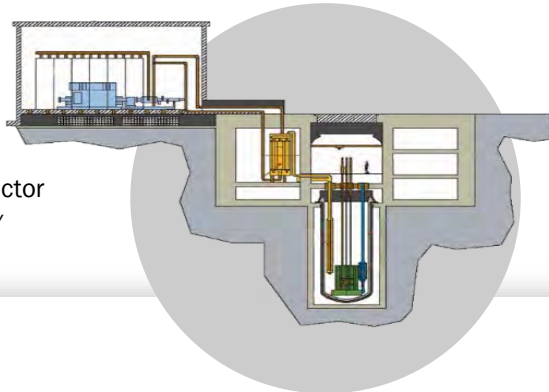


eVinci
Heat pipe-cooled microreactor
WESTINGHOUSE NUCLEAR



**BWXT Advanced
Nuclear Reactor (BANR)**
High-temperature gas-cooled
microreactor
BWXT TECHNOLOGIES

ARC-100
Sodium-cooled fast reactor
ARC CLEAN TECHNOLOGY



Molten Chloride Fast Reactor
SOUTHERN COMPANY

HALEU Availability Program (HAP)– Authorities and Funding

- **Energy Act of 2020, Section 2001. Advanced Nuclear Fuel Availability**
 - President’s FY2024 budget request includes funding for activities supporting HALEU supply in multiple accounts
- **Inflation Reduction Act of 2022, Section 50173. Availability of High-Assay Low-Enriched Uranium**
 - Appropriated \$700 million to implement SEC. 2001 EA2020
 - ...In addition to amounts otherwise available, there is appropriated to the Secretary of {Energy} for fiscal year 2022, out of any money in the Treasury not otherwise appropriated, to remain available through September 30, 2026—*

HALEU Availability Program (HAP)

The objectives of the HALEU Availability Program (HAP) include:

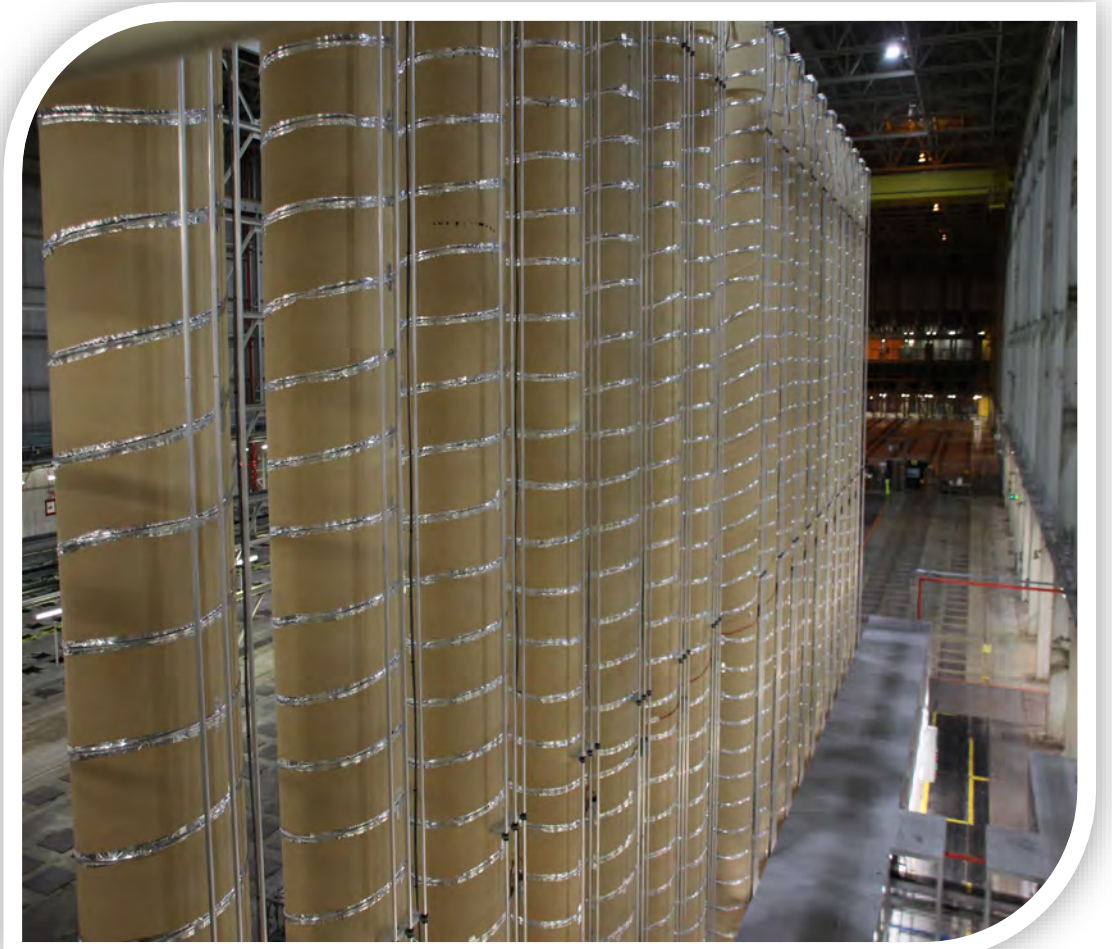
- Establishing a robust, secure, diverse, market-based domestic nuclear fuel supply chain
- Supporting the development and deployment of innovative U.S. nuclear technologies to enhance U.S. technology leadership and global economic competitiveness
- Reducing our reliance on Russian nuclear fuel cycle imports

Our program implementation strategy includes a combination of:

- Competitively awarded contracts
- Competitively awarded, cost-shared, financial assistance opportunities
- Program directed activities with the National Laboratories
- Collaborative activities with allies (bilateral and/or multilateral cooperation)

Multiple Pathways to HALEU Supply

- **HEU Recovery and down-blending**
 - Electrochemical processing of EBR-II fuel
 - Uranyl nitrate from Savannah River Site
- **HALEU Enrichment Demonstration Cascade at Piketon**
- **HALEU from limited quantities of HEU bearing material in DOE inventory**
- **International collaboration**



Stakeholder Engagement

- **HALEU Workshops, comprehensive Request for Information**
- **Sources Sought, Industry day**
- **Coordination with NRC**
- **USG interagency coordination**
- **Engagement with tribal communities**
- **Prioritize equity and environmental justice**
- **Public engagement through NEPA process**



HALEU Consortium

- **HALEU Consortium prescribed by the Energy Act of 2020**
 - Establishment of Consortium announced on December 7, 2022
- **Membership composition**
 - Membership includes entities involved in any stage of the nuclear fuel cycle, to partner with the Department to support HALEU availability
- **Functions**
 - Biennial survey
 - Cost-recovery schedule
 - Buy HALEU for commercial use
 - Carry out demonstrations
- **Website: HALEUConsortium@nuclear.energy.gov**



HALEU Acquisition Approach

- **Issue two solicitations to stimulate the market**
 - HALEU Enrichment/Acquisition (including mining/milling, conversion, enrichment, storage)
 - HALEU Deconversion from UF6 to oxide and metal forms (including transport and storage)
- **Issue draft RFPs, incorporate feedback and issue final RFPs**
- **Multiple awards envisioned to meet supply diversity objectives**
 - subject to pricing and funding availability
- **Completion of NEPA activities (DOE and NRC) influence timing of certain activities**
- **Additional cost-shared financial assistance (FOAs) to enhance HALEU supply chain**
 - Consistent with EA2020 and IRA2022

Conclusions

- **Energy security and national security considerations dictate reducing reliance on untrustworthy foreign entities for our nuclear fuel supply.**
- **We must enhance our domestic capabilities to meet both current and future mission needs and achieve our clean energy goals.**
- **Solving this problem is complex, time-consuming and expensive.**
 - DOE will seek to avoid adversely impacting the market
- **Success will require effective engagement and support between**
 - Government (Administration, Federal agencies, Congress)
 - Tribal Nations
 - International partners
 - Private Sector Industry (developers, suppliers, users)
 - Public and other stakeholders