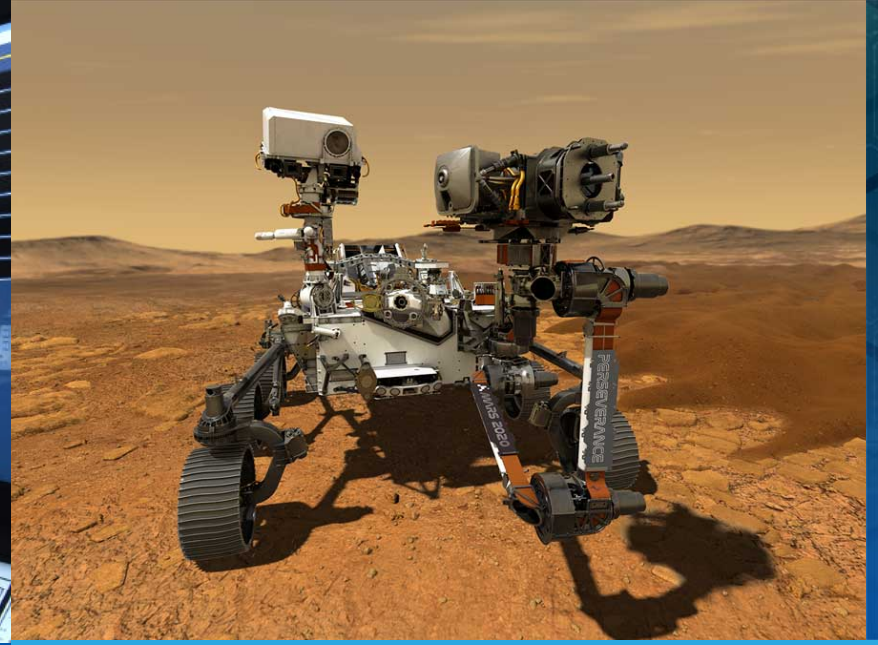


**Monica C. Regalbuto**
*Director - Nuclear Fuel Cycle Strategy*

# HALEU for ARDP Program Update

**G4SR-2 Plenary Session**
November 18-19, 2020 – Canada (Virtual Summit)

Idaho National Laboratory

# High-Assay Low-Enriched Uranium (HALEU)

## Demand

- Industrial applications
- DoD mobile microreactors
- DOE-NE research and test reactors
- Long-term defense and non-defense NNSA Mission

## Timing

- Fuel research and development
- Initial core demonstration
- Commercial

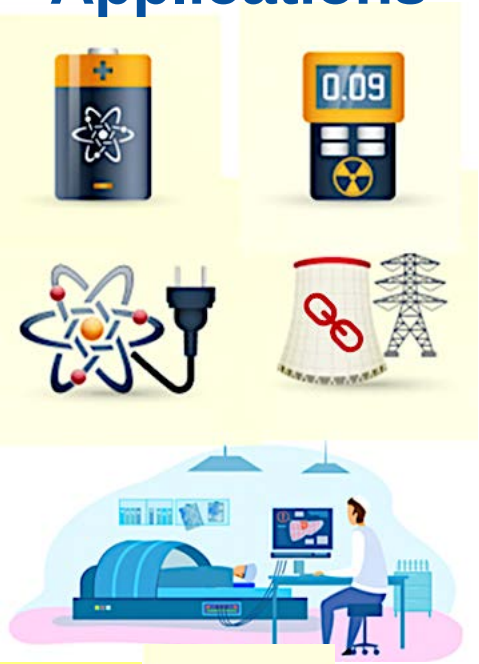
**20% HALEU 5%**

**Evolving Market**

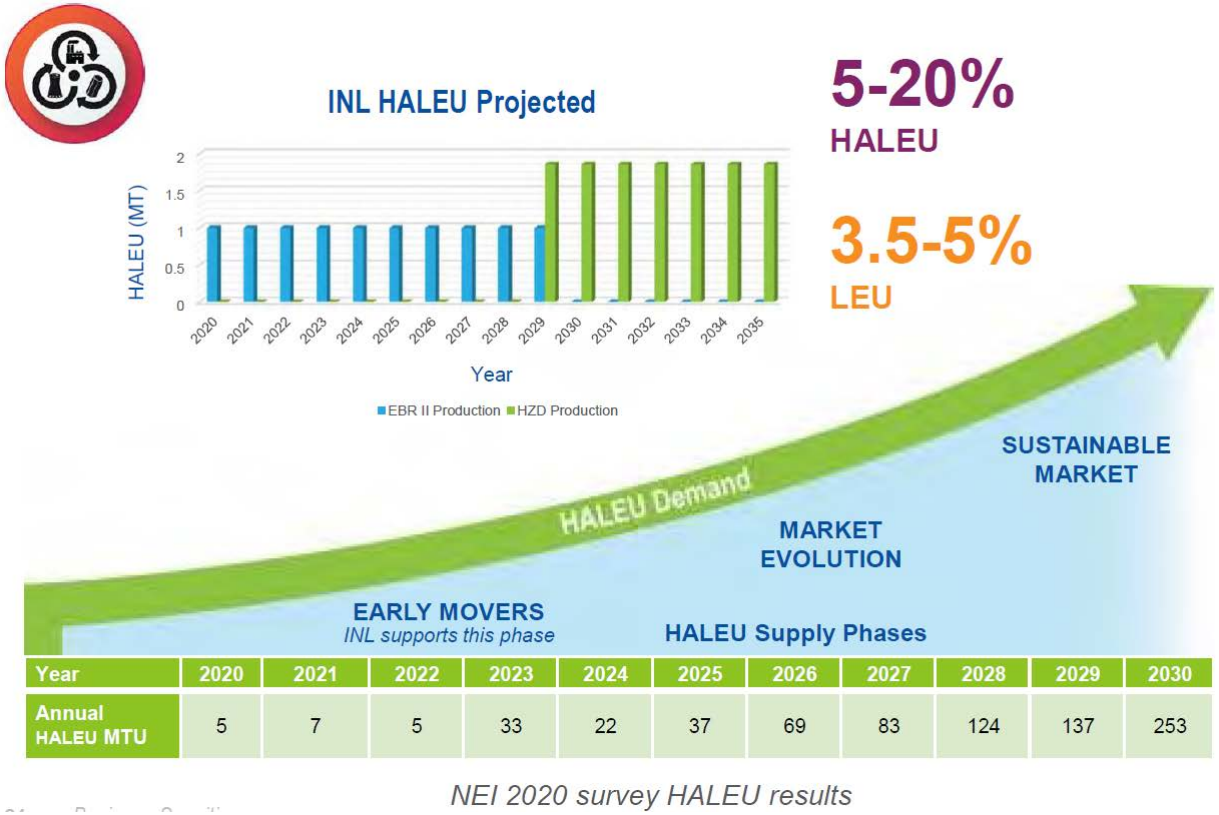
**LEU 3.5-5%**

**Existing Market**

## Applications



# Transitioning to an HALEU Economy




| Year | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual HALEU MTU | 5 | 7 | 5 | 33 | 22 | 37 | 69 | 83 | 124 | 137 | 253 |

*NEI 2020 survey HALEU results*

## *HALEU Progress to Date*

- *Proposed business model*
- *Supply for ARDP and early movers*
  - *Thermo and fast spectrum*
  - *Oxide and Metal forms*
- *Identified Infrastructure needs*
  - *Near and long term*

# HALEU Proposed Path Forward


## HALEU Sources

### Downblending

***Existing or recovered highly enriched uranium***

- Oxide, metal or other (fuel fabrication ready)
- Owner DOE
- Availability for use at DOE or alternative facility
- U vector 19.75% U-235 and U-238 or determined by irradiation history

### Enrichment

- Uranium hexafluoride ($UF_6$)
- Owner enrichment company
- Availability at enrichment facility for transportation to fuel manufacturing facility
- U vector 19.75% U-235 and U-238

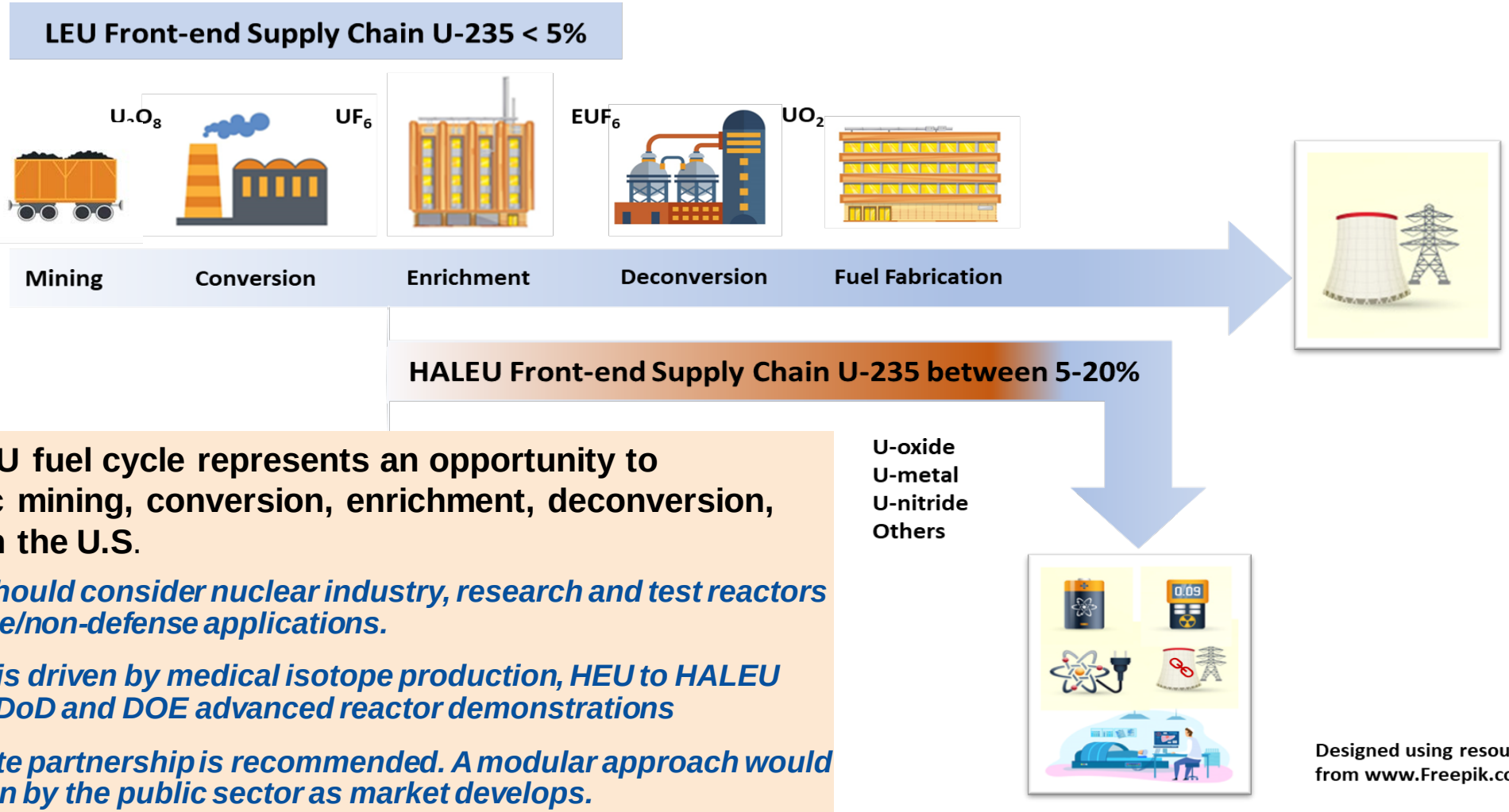
# Support for Early Movers (ARDP) ~ 20MT (mid 20's)

***An aggressive deployment schedule is being pursued by advanced reactor developers eager to penetrate an evolving world market***

***Various approaches support meeting HALEU demand in this phase:***

- ***Recovery and downblending***
  - ***INL** – 1MT of HALEU per year until 2035. HEU downblending from EBR-II and ATR origin yields 10MT and 20MT*
  - ***SRS** – Potential 20MT HALEU available from fuel take back processing*
  - ***BWXT** – Downblending available HEU, 10MT by 2022 and 40MT by 2025*
- ***Enrichment***
  - ***The American Centrifuge Operating LLC** – ongoing 16 machine cascade demonstration 600 kgs of $UF_6$*
  - ***URENCO USA** – Commercial enrichment facilities for HALEU enrichment between 5% and 10%*

# Need for an Integrated Supply Strategy




**Developing the HALEU fuel cycle represents an opportunity to reinvigorate domestic mining, conversion, enrichment, deconversion, and fuel fabrication in the U.S.**

- ***HALEU capabilities should consider nuclear industry, research and test reactors and long-term defense/non-defense applications.***
- ***High-fidelity demand is driven by medical isotope production, HEU to HALEU reactor conversions, DoD and DOE advanced reactor demonstrations***
- ***An initial public/private partnership is recommended. A modular approach would allow future expansion by the public sector as market develops.***

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