Status and Prospects for HALEU Production in the United States

June 2, 2021

Forward-Looking Statements

Disclaimer: Our commentary and responses to your questions may contain forward-looking statements, including our financial projections, and Centrus undertakes no obligation to update any such statement to reflect later developments. Factors that could cause actual results to vary materially from those discussed today include changes in the nuclear energy industry, pricing trends and demand in the uranium and enrichment markets and their impact on our profitability, timing of physical delivery to customers, the competitive environment for our products and services, the impact and potential extended duration of the current supply/demand imbalance in the market for low-enriched uranium, risks related to trade barriers and contract terms that limit our ability to deliver LEU to customers, risks related to actions that may be taken by the U.S. government or other governments that could affect our ability or the ability of our sources of supply to perform under contract obligations, including the imposition of sanctions, restrictions or other requirements, as well as those provided in our most recent Annual Report on Form 10-K and subsequent reports as filed with the SEC.

Industry / Market Data: Industry and market data used in this presentation have been obtained from third-party industry publications and sources as well as from research reports prepared for other purposes. We have not independently verified the data obtained from these sources and cannot assure you of the data's accuracy or completeness.

9 of 10 Reactors Funded by DOE's Advanced Reactor Demonstration Program Need HALEU

Company	Fuel	Company	Fuel
TerraPower	HALEU	Southern Company	HALEU
X energy	HALEU	Westinghouse	HALEU
BWXT BWX Technologies, Inc.	HALEU	ARC CLEAN ENERGY	HALEU
HOLTEC INTERNATIONAL	LEU	GENERAL ATOMICS	HALEU
Kairos Power	HALEU	MIT Massachusetts Institute of Technology	HALEU

U.S. HALEU Production by 2022

First-of-a-Kind, NRC-licensed HALEU production capacity under construction in Piketon, Ohio with support from U.S. DOE.

- ✓ Completed assembly of 16 centrifuges. Construction of "balance of plant" systems well underway.
- ✓ License application submitted and NRC is conducting its review.
- ✓ Program remains on cost and schedule – however, some COVID-related challenges in the supply chain could have an impact.

Centus expects to begin demonstrating production of HALEU (19.75% U-235) early next year.

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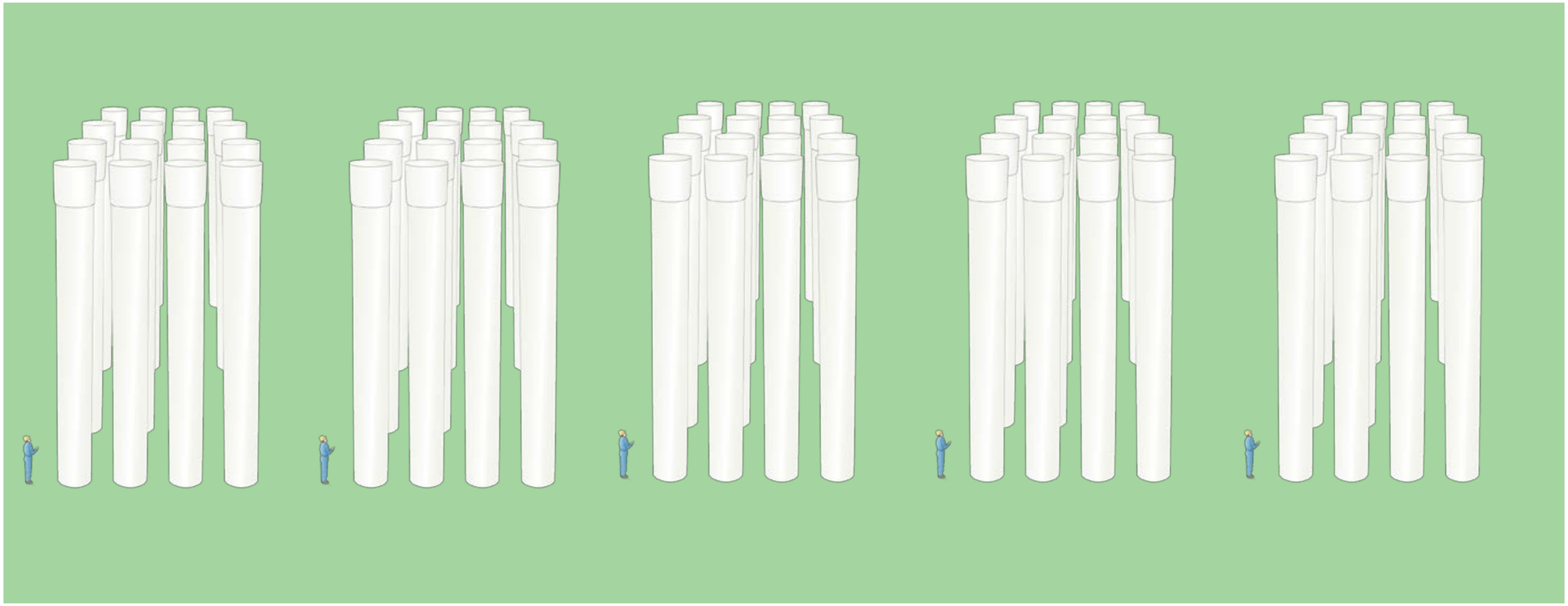
Deployment Model:
Small, Modular Production



Modular expansion of enrichment to match demand…
…subject to availability of funding and/or offtake contracts.

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USG Demand for HALEU is Larger & More Predictable than Commercial Demand Through 2030

		Quantity	Timing	Customer
Certain	Research Reactor Conversion (HEU to HALEU)	3-7 MTU/yr[1] (through 2033) 7-9 MTU/yr[1] (after 2033)	Ongoing	DOE/NNSA
	Energy Act of 2020 (Consolidated Appropriations Act)	DOE required to provide quantities needed for demonstration and commercial reactors	No later than Jan 1, 2026	DOE
Likely or Possible	First of a Kind / Demonstration Reactors (NE-ARDP, etc)	~5-10 MTU/yr	Mid-late 2020s	DOE
	DOD Microreactors (potential)	~1-3 MTU per reactor	Beginning in mid 2020s	DOD
Uncertain and Long-Term	Nth of a Kind Advanced Reactors	large, but uncertain	2030s	Commercial
	Accident Tolerant Fuels	large, but uncertain	Late 2020s/ early 2030s	Commercial

1) Source for research reactor HALEU quantities: DOE/NNSA, Amendment to NNSA RFI for Supply of Enriched Uranium (Q&A), 2017.

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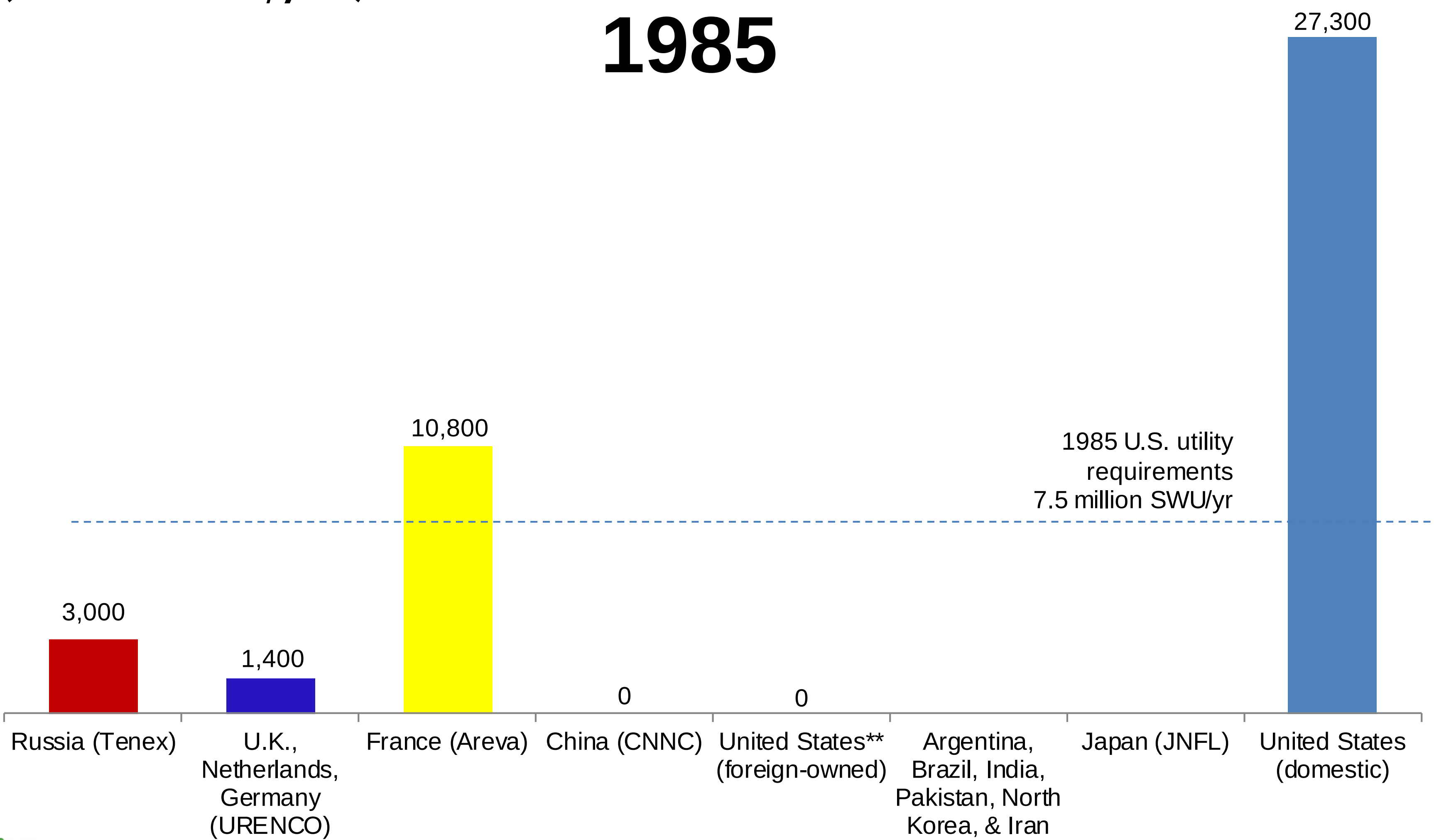
The Loss of U.S. Nuclear Fuel Leadership

Uranium Enrichment Capacity
(Thousand SWU/year)



* Separative Work Units (SWU) are used to measure the amount of work done to enrich uranium.
**The only remaining enrichment plant physically located in the U.S. is controlled by URENCO, a European state-owned corporation.

Source: World Nuclear Association 2015
Congressional Budget Office, 1985

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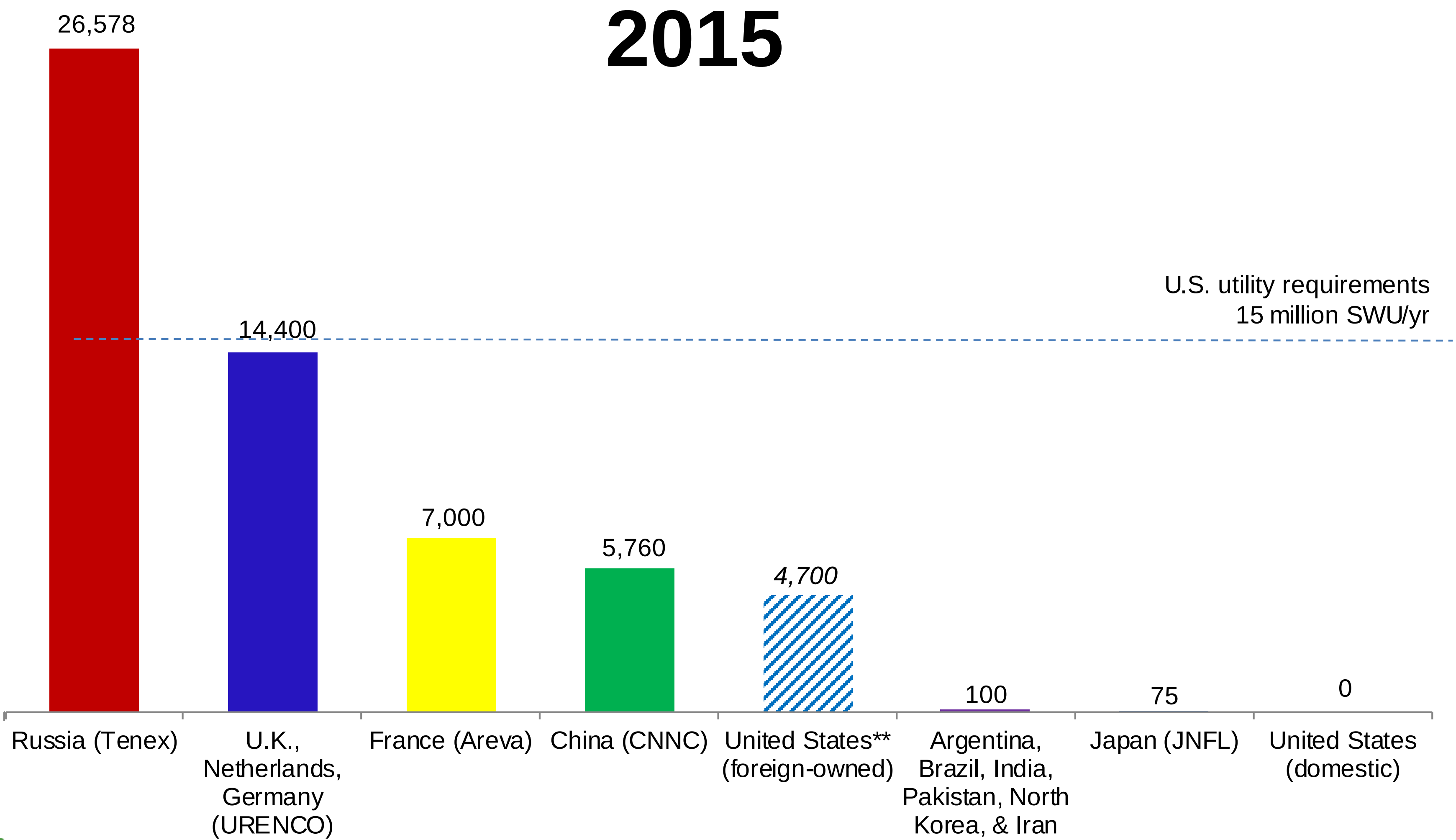

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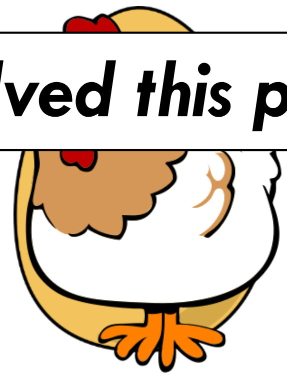
Which Will Come First?



The U.S. has solved this problem before…

U.S. Advanced Reactors:

Who will buy them if the U.S. lacks a guaranteed fuel supply?

High Assay Enrichment:

Who will invest in HALEU licensing/production without a guaranteed customer base?

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A Proven Model: Leverage Enduring Demand from USG to Promote Civilian Nuclear Leadership


The Paducah Sun-Democrat

AEC To Build A-Plant At KOW Site

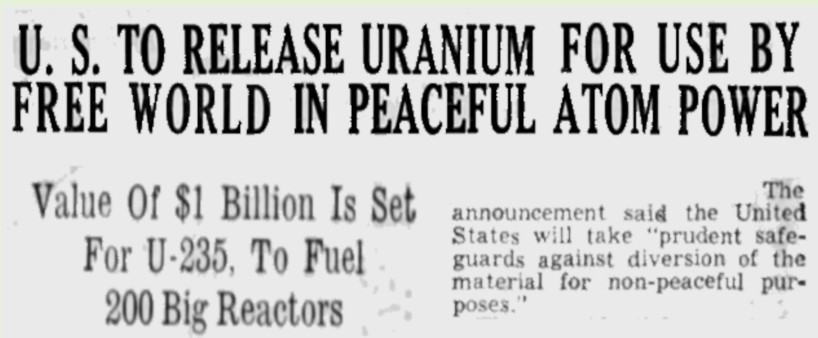
Chinese Reds Drive Into UN Beachhead

Building Force Of 10,000 May Be Required

Cost Set At $500,000,000;

<u>1940s-1950s:</u>

U.S. built enrichment plants for military use.


U. S. TO RELEASE URANIUM FOR USE BY FREE WORLD IN PEACEFUL ATOM POWER

Value Of $1 Billion Is Set For U-235, To Fuel 200 Big Reactors

The announcement said the United States will take "prudent safeguards against diversion of the material for non-peaceful purposes."

<u>1956:</u>

Ike makes fuel available for commercial reactors.

This approach could work again for the next generation of reactors and fuel. DOE should lead the way.

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Economics of HALEU

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HALEU: Different Economics Than LEU

Published SWU Prices Not Applicable to HALEU

	LEU	HALEU	Implication
NRC Licensing	Category 3	Category 2	*Significant new regulatory and safety requirements drive costs*
On Site Deconversion (UF6→Oxide→Metal)	No	Yes	*Additional capex and opex at enrichment plant*
U.S. demand (near term)	~15,000,000 LEU SWU/yr	<100,000 HALEU SWU/yr	*Very different economies of scale*
Certainty	Bankable demand from Fortune 500 utility companies	Startup companies; demand level highly uncertain	*Absent funding or bankable offtake contracts, financing construction will be difficult*

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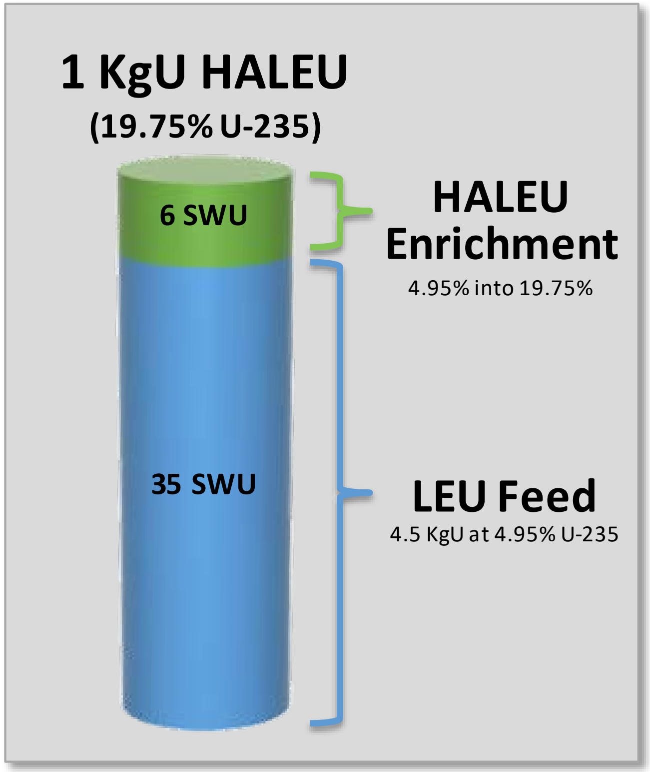
Medium/Long Term: Feed Costs Will Drive Overall Costs



- The feed material for a HALEU cascade is 4.95% LEU.
  - LEU feed could be produced on site by an adjacent cascade or purchased elsewhere.
- 85% of the SWU needed to produce HALEU is already contained in the LEU feed material.
- **KEY TAKEAWAY:** As we continue to scale up, the biggest factor in fuel costs of commercial advanced reactors will be the market price of 4.95% LEU (natural uranium + conversion + LEU enrichment), *not the cost of HALEU enrichment.*

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Euratom Supply Agency: Target Prices for HALEU

- In 2019, the Euratom Supply Agency (ESA) evaluated options for supplying European Research Reactors with HALEU. They set a target price, including deconversion to metal, of **€20,000 (~$24,000) per kgU**.
- According to ESA, the cost of HALEU metal from U.S. downblended stocks or Russia is **€12,000 (~$14,400) per kgU.**
- Caveats:
  - The ESA price targets are based on very low production volumes. As demand and production scale increase, prices will come down below these levels.
  - The first **~$6,000 per kgU** of the prices shown above reflects the cost of the LEU used as feed material, based on today's spot prices. This part of the price is "baked in" and is more likely to go up in the future than down.

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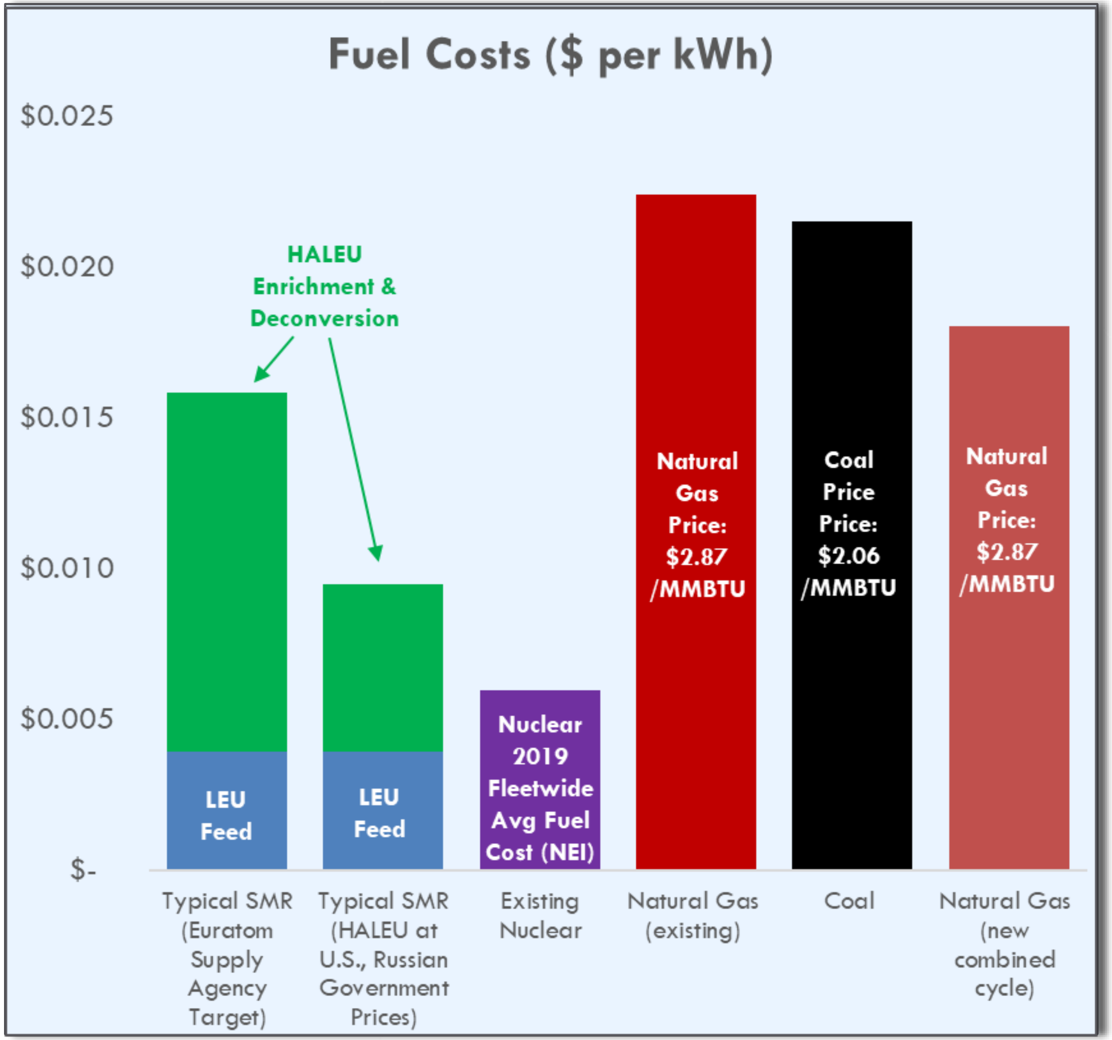
Goal: 1 Cent Per KWH or Less

Even at the high end, the ESA price target translates to ~1.5 cents per kWh for a typical SMR.

At higher production levels, the price will be well below one cent.

TAKEAWAY: Competitiveness of SMRs depends upon their success in reducing capital costs of new nuclear. Fuel costs at or below 1 cent/kWh should not be "make or break" for these reactors.



Graphic reflects the cost of the fuel required to produce 1 kWh of electricity given the efficiency of typical gas and coal plants and the thermal efficiency and burnup rate typical of SMR designs. This does not include the capital costs of building gas, coal, or nuclear, or fuel fabrication costs.

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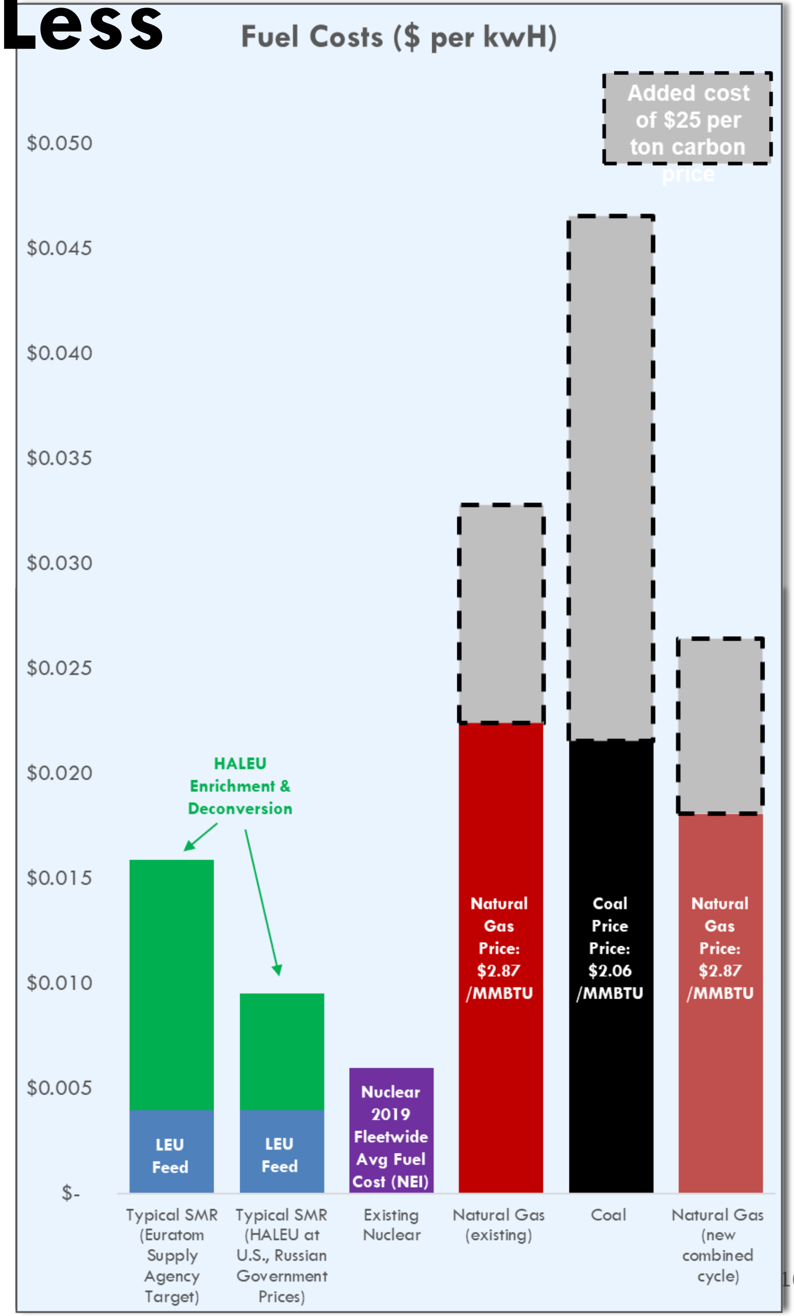
…factoring in even a modest $25/ton carbon price makes the fuel costs of SMRs even more attractive.



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Advantages of HALEU

HALEU Enrichment: The Best and Safest Option

(Slide 1/2)

- **HALEU does not require reprocessing or recycling.** There is no need to separate plutonium.

- **HALEU can reduce the frequency of refueling.** Refueling a reactor is one of the most proliferation sensitive steps in the fuel cycle. By reducing the number of refuelings, HALEU can present fewer opportunities for mischief.

- **On-site deconversion reduces risk of diversion.** While LEU is typically shipped as UF6, HALEU will likely be deconverted to oxide or metal before it leaves the enrichment plant, making it much harder to re-enrich.

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HALEU Enrichment: The Best and Safest Option

(Slide 2 of 2)

- **Used fuel volumes can be lower with HALEU.** In many Gen IV designs, the use of HALEU allows for burnups 2-4x higher than with traditional LEU, so the volume of used fuel that must be stored/disposed of can be significantly smaller.

- **HALEU allows for smaller core designs and improved economics.** The higher energy density of HALEU compared to LEU allows for reactors that are physically smaller, reducing the cost and complexity of construction and offering the potential of improved reactor economics.

Domestic Enrichment: The Best Path to HALEU

(Slide 1 of 2)

- **Domestic HALEU enrichment solves the "chicken vs. egg" dilemma.** Establishing domestic production of HALEU – initially to meet U.S. government mission requirements – would eliminate uncertainty about whether a domestic source of HALEU will be available to support commercial reactors, removing one of the biggest obstacles to deployment of Gen IV reactors.

- **Domestic HALEU enrichment dovetails with U.S. national security requirements.** The United States needs a source of domestic-technology enrichment for future national security missions. Establishing that capability today reduces the long-term costs and risks of meeting those requirements.

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Domestic Enrichment: The Best Path to HALEU

(Slide 2 of 2)

- **Alternatives to Domestic Enrichment Don't Solve the "Chicken vs. Egg" Problem:**
  - Foreign Imports: U.S. utilities will want to have at least one assured, domestic source of HALEU before making a 30-60 year commitment to a HALEU-fueled reactor. Imports can provide price competition, but not fuel assurance -- nor do they support NNSA's requirements for unobligated enrichment.
  - Downblended or Reprocessed HEU: While there may be a limited role for downblending, it does not provide the long-term fuel assurance that utilities would need to confidently purchase a reactor. No one will purchase a reactor if they aren't certain it can be refueled.
    - To the extent that downblending or reprocessing HEU compete against or displace enrichment, they can make the chicken vs. egg problem worse.

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