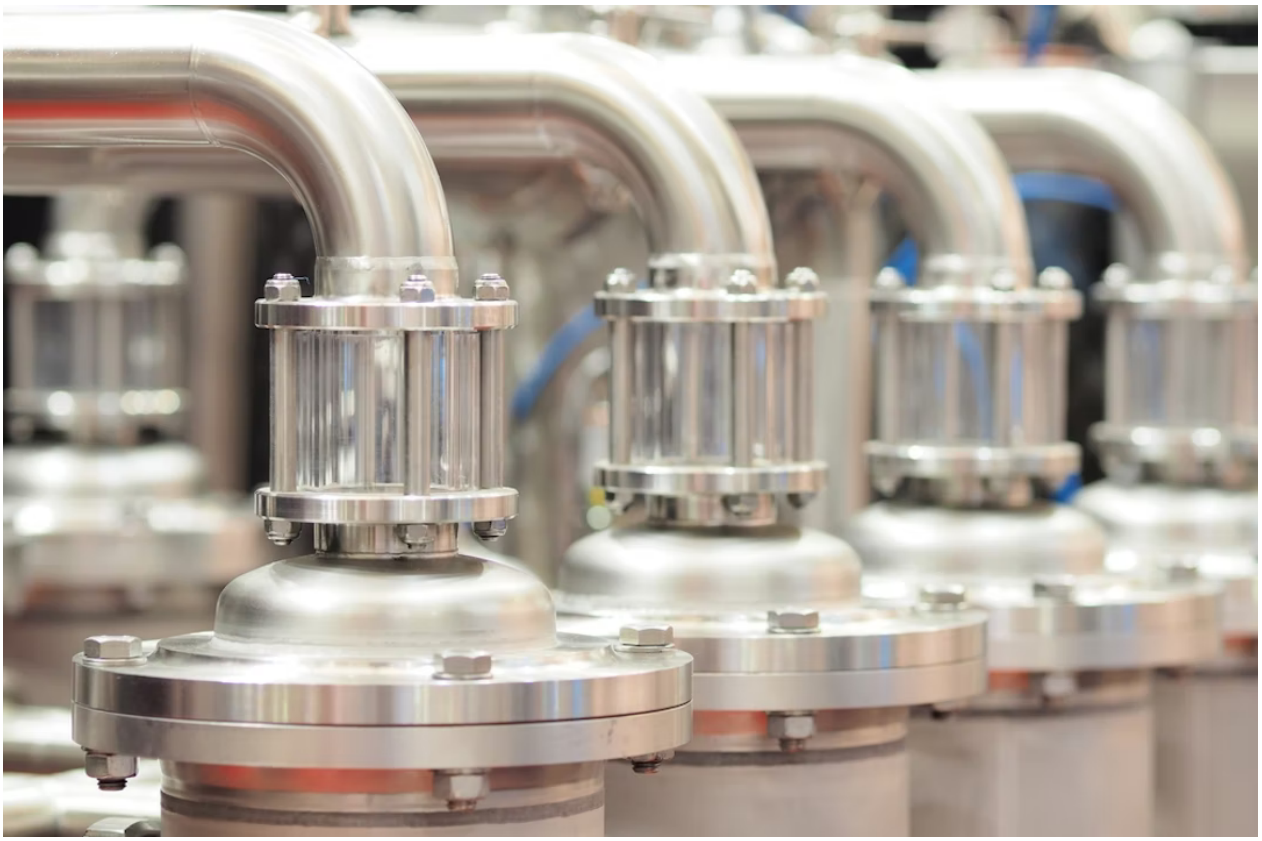
THIRD WAY

MEMO *Published August 12, 2021 • 5 minute read*

Background and Policy Issues – HALEU Fuel Supply



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Multiple advanced reactor designs are swiftly approaching demonstration and deployment within the next several years (*see Table below*). These reactors are vital foundations for a new clean energy tool in the fight against climate change, as well as a technology that is critical for American leadership in nuclear technology and policy, competitiveness in the global market, and job creation for Americans. ***However, a crucial bottleneck exists in the commercial supply of high-assay, low-enriched uranium (HALEU), which many of these rapidly progressing reactor technologies will require as fuel.***

Near-Term Timelines and Needs of Selected Advanced Reactor Developers

	TerraPower	X-energy	Oklo	Kairos Power
Target completion date of FOAK unit or demonstration	2027	2027	2023-2025	2027
Planned site of first unit or demonstration	Wyoming (Specific site TBA)	Richland, Washington	Idaho Falls, Idaho	Oak Ridge, Tennessee
Fuel needs	HALEU	HALEU	HALEU	HALEU

Source: Ahn, Alan, et al. "Advanced Reactors: Turning the Corner." Third Way, https://www.thirdway.org/blog/advanced-reactors-turning-the-corner; Benahmed, Farah and Mykael Goodsell-SooTho, "Fueling America's Nuclear Energy Leadership." Third Way, https://www.thirdway.org/memo/fueling-americas-nuclear-energy-leadership.

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The Biden-Harris Administration has a very ambitious civilian nuclear energy agenda, and deeply appreciates the promise and potential of advanced reactor technologies. HALEU is a critical issue that must be addressed for advanced nuclear to fulfill its promise and help this administration achieve its broader objectives on climate, jobs, national security, and the economy.

Today's conventional nuclear power plants generally use low-enriched uranium (LEU) fuel, enriched up to around 4-5% of the uranium isotope, U-235. HALEU is uranium that is enriched to higher levels than LEU, up to 20% U-235. Worldwide, there is presently an *extremely limited* number of enrichment providers that are able to make HALEU: Russia (TENEX) is now the major supplier globally, and Chinese vendors are capable of producing the material.

Domestically, there is currently no enrichment capacity that can support significant HALEU production, and efforts to develop such capacity will likely be longer-term endeavors. Barring any dramatic near-term actions, there is ***essentially no choice for advanced reactor developers but to initially rely upon Russian-supplied HALEU, particularly given the expedited timeframes for their first demonstrations and units.***

Steps must be taken now to support the development of a robust domestic commercial supply of HALEU for the following reasons:

- **Vulnerability to supply disruption:** While there may be limited risk from short-term reliance on Russian HALEU supply for the first advanced reactor demonstrations and units, continued dependence on Russian (or later, Chinese) suppliers—especially as more plants are built and they collectively assume a greater share of domestic energy generation—would increase our vulnerability to supply shocks, particularly those arising from broader geopolitical competition and increasing complexities in the management of these diplomatic relationships.

- **Impact on export competitiveness:** Dependency upon Russia and/or China for HALEU would not only affect domestic advanced nuclear plants, but potentially also bids to export these technologies. This impact would be especially acute in scenarios in which U.S. advanced reactor companies are in direct competition with Russian and Chinese civil nuclear vendors for overseas projects. On the other hand, the development of a domestic commercial HALEU industry could bolster the competitiveness of U.S. advanced reactor companies in international markets, potentially through the bundling of assured fuel supply with reactor exports.

- **Unintentional spread of Russian/Chinese influence:** Long-term reliance on Russian and/or Chinese HALEU—particularly if this reliance extends to fuel supply for U.S. advanced reactor exports—could make U.S. industry an unwitting medium for spreading geopolitical influence on behalf of Moscow and Beijing, in that it would also tie other countries to Russian/Chinese supply.

- **Setting safeguards and security standards for HALEU:** Safeguards and security issues and challenges associated with the transportation and use of HALEU are currently a focus of investigation and research. Developing a strong domestic market for HALEU that can supply advanced reactors both home and abroad will be important to ensure that we are able to guide and shape global practices in safeguarding and securing this material. Moreover, supporting advanced reactor exports with assured supplies of HALEU fuel will not only bolster export competitiveness, but also help disseminate these best practices internationally.

- **Confluence of jobs and national security interests:** U.S.-origin enrichment capacity will be needed in any event for defense applications (naval reactor fuel, tritium production, etc.) as there are statutory prohibitions on foreign sources for these purposes. A domestic enrichment industry (as part of a broader U.S. uranium fuel sector) that scales with increasing national and international advanced reactor deployment could be a significant driver for economic and jobs growth.

Considering the various reasons and issues outlined above, we recommend the Biden-Harris Administration consider:

- Actions to ensure that U.S. advanced reactor developers can secure HALEU supplies in international markets in the short-term, while also taking steps to encourage the development of domestic infrastructure to support U.S. production in the longer-term.

- Various proposals to spur investment in commercial HALEU production capacity, such as a federally-led HALEU reserve or bank, that could send market signals to encourage commercial investment in HALEU production capacity. If done through a competitive process, these policies could help the domestic industry secure financing for commercial plants at little to no cost to taxpayers.

- Pathways for bridging major gaps in HALEU production, including downblending existing highly enriched uranium (HEU) stockpiles or small-batch production methods—for example, the administration could seek to facilitate and support DOE activities on initial HALEU production through processing of EBR-II spent fuel at Idaho National Laboratory (INL) so that this program is back on schedule. While not a replacement for policies to support domestic enrichment capabilities, this could help provide fuel in the near term.
- Engaging with key international allies who are also seeking advanced nuclear technologies, including the United Kingdom, France, Canada, and Japan, on potential development of HALEU capacity in North America, Europe, etc.

This is an issue of vital importance for U.S. civilian nuclear capabilities, job creation, competitiveness, international leadership, security, and addressing climate change. Given the sensitivity of this issue and the short timeframes before advanced nuclear developers will need the fuel to start their reactors, it is urgent that the government address it.

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