

Additional Flexible Funding is Needed to Break Dependence on Russian Nuclear Fuel

Summary: An additional one-time appropriation of \$2.1 to \$3.5 billion and authority to procure domestic low-enriched uranium (LEU) and high-assay low-enriched uranium (HALEU) using a “revolving fund” would provide DOE the guaranteed funding and tools necessary to catalyze new domestic LEU and HALEU production and break our dependence on Russian nuclear fuels.

The U.S. Urgently Needs to Develop Domestic Nuclear Fuel Production Capacity

A reliable supply of nuclear fuel is critical to meeting U.S. climate, clean energy, and national security goals. The current U.S. nuclear reactor fleet reliably supplies more than half of U.S. clean electricity, and a new generation of advanced reactor designs are poised to provide the same reliability and emissions-free electricity with increased flexibility, enhanced safety features, and reduced costs. Both the existing fleet and new reactors require uranium-based fuels.

Unfortunately, Russia controls more than 40 percent of global uranium conversion and enrichment capacity, and a Russia-controlled company is the only commercial source of HALEU globally. In the wake of the invasion of Ukraine, Russia is no longer a viable source of nuclear fuel; the U.S. urgently needs to develop domestic capacity to supply existing reactors and a new generation of advanced reactors in the U.S. and abroad.

Domestic HALEU Production and Domestic LEU Production Require Different Kinds of Federal Support

The challenge of catalyzing construction of new LEU capacity is significantly different from that of catalyzing new HALEU capacity. For LEU, the long-term demand is well known (based on existing nuclear reactors) but the supply is uncertain based on the market availability of Russian nuclear fuel. For HALEU, the long-term demand is uncertain (based on future advanced reactor deployment), but no current capacity exists and must be incentivized. As a result, the market forces affecting new investment decisions are different.

For LEU, the federal government can play a critical role in catalyzing new domestic capacity through multiple policy mechanisms. The federal government could purchase domestic LEU to create a strategic uranium reserve to stimulate market demand on the open market. Alternatively, the federal government could use direct off-take agreements to support construction and operation of new domestic LEU enrichment capacity. Either policy mechanism could be used to effectively support development of new domestic LEU production capacity. Either of these options would need to be coupled with phased-in bans of Russian nuclear fuels (fully implemented over 4-5 years) to prevent Russian state-owned suppliers from manipulating markets through selling LEU below production costs.

For HALEU, previous work by the Nuclear Innovation Alliance (NIA) and other organizations has detailed options for how the federal government could catalyze this market.¹ Informal discussions with uranium enrichment companies and industry experts indicate that a market demand-focused program would be most effective at inducing private investment in new HALEU production infrastructure. Under such a program, the DOE facilitates market development by acting as a guaranteed first customer for HALEU production and then reselling HALEU contracts or material to private companies. These initial guaranteed contracts would provide private companies with the demand assurances needed to invest in, construct, and operate new domestic HALEU production facilities.

Current Available Funding for HALEU and LEU is Insufficient

The Inflation Reduction Act of 2022 (IRA) included \$500 million of funding for high-assay, low-enriched uranium (HALEU) production through the HALEU Availability Program at the U.S. Department of Energy (DOE). This funding has the potential to accelerate the availability of HALEU in the United States to support advanced reactor development and break our dependence on Russian state-owned companies for HALEU in light of the Russian invasion of Ukraine in 2022. One challenge, however, is that current funding is insufficient to support long-term HALEU off-take agreements needed to create a domestic, sustainable HALEU market. No funding has been allocated to support increased domestic LEU production that would help break our dependence on Russian nuclear fuel companies for existing or new nuclear reactors.

¹ [Catalyzing a Domestic Commercial Market for High-Assay, Low-Enriched Uranium \(HALEU\)](#)

Additional Upfront Appropriations of \$2.1B - \$3.5B is Needed to Catalyze Domestic HALEU and LEU Production Using a Revolving Fund

Successful implementation of the HALEU Availability Program requires significantly more funding than the \$500 million currently appropriated, and a DOE LEU off-take program is not currently authorized or funded. Use of direct purchase or off-take agreements can effectively catalyze new domestic capacity but requires significant spending commitments by DOE. Private companies will likely require guaranteed multi-year, multi-metric-ton-uranium (MTU) contracts to justify the large capital investments in new production facilities for LEU and HALEU. The HALEU Availability Program seeks to catalyze private investment in at least two HALEU producers, each with an annual production of at least ten metric tons of HALEU per year to create a competitive market. A new DOE LEU off-take program would seek to increase domestic production capacity by 100 MTU per year (approximately one third of current Russian LEU imports) and create an LEU stockpile of 300 MTU (approximately equal to current annual Russian LEU imports).

Operation of a “revolving fund” by the DOE would make the off-take program much more cost effective for taxpayers. Such a fund would reinvest the proceeds from HALEU and LEU sales of purchased fuel to reactor owners and operators into future DOE HALEU and LEU purchases. As a result, the program can operate with less total DOE appropriations.

The total spending commitments by DOE can be estimated based on estimated market prices and contract sizes. Without a revolving fund, combined DOE purchases needed to establish both domestic HALEU and LEU production capacity could exceed \$8 billion (\$5 billion to support HALEU purchases², plus \$3 billion to support LEU programs³).

The additional DOE appropriations needed to support the program using a revolving fund can be estimated based on expected program operation. A range of appropriation requirements to sustain a DOE HALEU program that uses a revolving fund were estimated by NIA through scenario analyses that considered the recent impacts of inflation as well as a range of projections of the costs of uranium mining, conversion, and LEU enrichment, and the quantity and timing of industry HALEU needs.⁴ Table 1 summarizes the additional appropriations needs for HALEU and LEU.

Total additional appropriations of \$2.1 billion - \$3.5 billion (in addition to the \$500 million already appropriated in the IRA) are needed by DOE to establish domestic HALEU and LEU production using a revolving fund.

Table 1. Additional federal appropriations needed to support new federal LEU and HALEU programs

Federal activity	Total DOE Purchasing Cost	DOE Appropriations Requirements using Revolving Fund	Existing DOE Appropriations	Additional Required DOE Appropriations
Support for HALEU Program	\$ 5B	\$ 1.5B – \$ 2.9B	\$ 0.5B	\$ 1.0B – \$ 2.4B
Support for LEU Program	\$ 3B	\$ 1.1B	\$ 0B	\$ 1.1B
Total				\$ 2.1B – \$ 3.5B

DOE issued a draft request for proposal (RFP) in June 2023 for the HALEU Availability Program, which stated that DOE could only award contracts based on existing appropriations.⁵ This appropriation requirement substantially limits DOE’s ability to enter into long-term off-take contracts because DOE can leverage only the funding already provided in the IRA. Without sufficient appropriations for DOE to make adequate long-term purchase agreements, this program will not be able to catalyze adequate private investment in new HALEU production facilities to create a domestic and sustainable HALEU market.

Fully funding the HALEU Availability Program through additional one-time appropriations (subject to robust Congressional oversight) and allowing the use of a revolving fund and long-term purchases through legislative direction, authorization, or existing authority would enable DOE to make long-term investments that catalyze domestic LEU and HALEU production.

Additional one-time appropriations and clarification on use of a “revolving fund” for domestic HALEU and LEU enrichment would provide DOE the guaranteed funding and tools necessary to enter into efficient long-term agreements with HALEU fuel cycle companies to accelerate HALEU production, catalyze new domestic LEU production, and break our dependence on Russian nuclear fuels.

Please contact Patrick White (pwhite@nuclearinnovationalliance.org) with questions or suggestions for additional scenarios.

² Total DOE HALEU program purchases (\$5 billion) are estimated based on a 10-year purchase of 25 MTU per year (total 250 MTU) and an average purchase price of \$20 million per MT of HALEU. Different purchase prices would result in different total costs.

³ Total DOE LEU program purchases (\$3 billion) are estimated based on a 10-year purchase of 100 MTU per year (total 1000 MTU) and an average purchase price of \$3 million per MT of LEU. Different purchase prices would result in different total costs.

⁴ NIA will be publishing details on these and additional scenario analyses in a forthcoming white paper (September 2023)

⁵ [U.S. Department of Energy to Acquire High-Assay Low-Enriched Uranium Material](https://www.energy.gov/ur-de/uranium/uranium-material)