THIRD WAY

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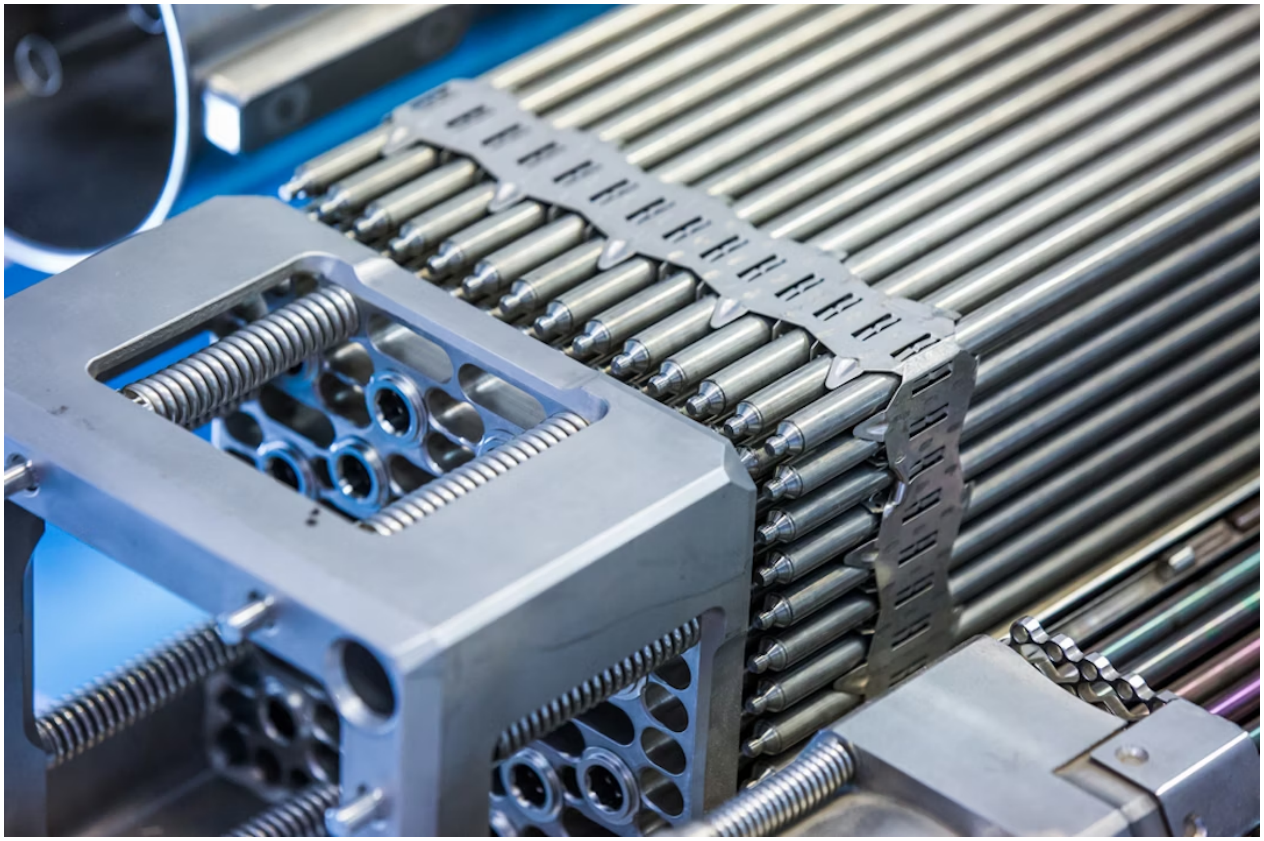
HALEU: A Fuel for the Future



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Since the 1950s, most of the US nuclear reactor fleet has been powered by low-enriched uranium (LEU), a concentrated form of naturally occurring uranium that is split apart into parts of atoms in a reactor to produce energy. LEU has fueled US reactors for decades, but it cannot fuel the new, smaller reactor designs, known as advanced reactors, that have been introduced around the world in recent years.

Allowing for more flexible and efficient deployment, advanced reactors are a core part of nuclear energy's future, but they require a different kind of fuel that isn't commercially produced in the United States—high-assay low-enriched uranium (HALEU). So what's the difference between these fuels? And why doesn't the US make HALEU?

HALEU vs. LEU: What's the difference?

Low-enriched uranium includes up to 5% U-235, the isotope needed to perform nuclear fission and generate energy. By contrast, high-assay low-enriched uranium fuel includes anywhere between 5-20% U-325, meaning a smaller amount of fuel contains more of the chemical matter needed to perform nuclear fission. All 94 currently operating nuclear reactors in the US are light water reactors powered by LEU. These reactors have been around for decades but the US has only built two in the last twenty years.

New advanced reactors are smaller and operate for longer timeframes. As such, they require more efficient and powerful fuel—HALEU.

Why doesn't the US produce HALEU? And what does that mean for US advanced nuclear?

US reactors have not historically used HALEU, so the US never built a robust domestic HALEU market. The US has to start nearly from scratch to build up its capacity. And we'll have to move quickly; as advanced reactor deployment inches closer to becoming a reality in the US, it's possible US advanced reactors will demand several hundred tons of HALEU by 2035, based on industry estimates.

Thankfully, the Inflation Reduction Act (IRA) allocated $700 million to support the development of a domestic HALEU supply chain, and FY24 saw appropriations of $2.72 billion to enhance both LEU and HALEU supply chains in the US. The Department of Energy will award these funds to US manufacturers to kickstart HALEU production and create a domestic marketplace. With supply therefore demonstrated, the hope is that private companies will sign contracts to buy more HALEU.

Why can't we just buy from somewhere else?

There is just one commercial producer of HALEU in the world—Russia, which supplies much of our LEU. We've said time and again that relying on this unpredictable, autocratic regime for fuel presents a number of security risks. Reliance on Russia forces us to remain beholden to a country that has shown it is willing to leverage energy supplies for geopolitical control over its customers. To get free from this risky situation, the US is beginning to phase out the Russian nuclear fuel imports altogether over the next five years under the newly signed Russian uranium ban.

However, the US's work to grow its nuclear fuel supply chain isn't over.

Conclusion

As the next generation of American-made nuclear technology inches toward deployment, the US must take the steps necessary to continue building out its HALEU supply chain. Existing legislation and ongoing efforts by the Biden Administration have sparked transformational momentum, but coordination across the federal government is still needed. It is also clear that successfully building out a Western supply chain will also require close coordination with industry and our international partners to edge our foreign adversaries out of the global nuclear fuel supply chain.