



# ADVANCING AN INCREASINGLY CRITICAL CANADA-USA HALEU SUPPLY CHAIN FOR SMRS AND ADVANCED REACTORS

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## Introduction

- This paper examines the development of a strategic and coordinated Canada-USA HALEU supply chain by drawing on the key advantages of the respective Canadian and United States of America (USA) nuclear fuel cycles to secure alternative access to low enriched uranium, including to high-assay low-enriched uranium (HALEU) supplies for the global nuclear industry. HALEU is defined as uranium enriched to greater than 5% and less than 20% of the U-235 isotope.
- While the current global fleet of nuclear reactors is fuelled by uranium fuel enriched to 5% uranium-235, over 50% of the designs evaluated for the OECD Nuclear Energy Agency Small Modular Reactor Dashboard plan to use HALEU with enrichment levels between 5% and 20%".
- The development and anticipated deployment of small modular reactors (SMRs) and advanced reactor technologies will drive a shift from current HALEU applications such as in research reactors and medical isotope production to the use of HALEU in advanced reactors.
- The World Nuclear Association has identified three reasons for an anticipated increase in global demand for HALEU, including expected use of 5-10% HALEU in existing conventional light water reactors; use of 10-20% HALEU in advanced reactors and SMRs; and the ongoing transition (since the 1990s) of research reactors from high-enriched uranium (HEU) to HALEU.
- Even though HALEU is a technically proven fuel type, the geopolitical context can have an impact on global energy security, especially when countries do not diversify their fuel supply. To illustrate the complexity of the situation, the OECD/NEA recently noted in a report that "up to and including 2023 there was no commercial supply from OECD countries...[and] some [SMR] developers have announced delays in their project timelines due to HALEU unavailability".
- A 2023 Committee on Energy and Commerce of the United States of America report noted that the United States cannot reliably make sufficient low enriched uranium (LEU) or HALEU available to support the needs of today's power reactor fleet, advanced reactors, research reactors, and medical isotope production facilities. Further, in 2022, the European Union's HALEU supply vulnerabilities were noted in a EURATOM Supply Agency Report, although it primarily focused on fuel supply security for research reactors and isotope production.
- In light of the apparent HALEU supply security vulnerabilities in OECD countries and their strategic partners, the paper sets out to examine the growing urgency for diversified HALEU supply security and the role that Canada and the United States of America can play.
- What are the advantages and barriers to developing such a strategic and coordinated Canada-USA HALEU supply chain? The paper discusses the role of regulatory coordination on nuclear fuel infrastructure development and the importance of harmonized fuel transportation, so as to expedite regional HALEU fuel supplies in North America as well as for diversified exports.
- At the same time, close coordination on HALEU supplies from North America may raise supply risks for future users of SMRs and advanced reactors outside of strategic collaborations with the United States of America and Canada or, more broadly, the OECD/Sapporo 5 partnerships.

## Summary

- This paper discusses the opportunities - and the barriers - to developing a strategic and coordinated Canada-USA HALEU supply chain by drawing on the key advantages of the respective Canadian and US nuclear sectors to secure alternative access to low enriched uranium (including HALEU) supplies for the global nuclear industry.
- As part of ongoing efforts to remove potential barriers to the future scale-up of nuclear energy deployment, including SMRs and in new-comer countries, the paper examines the critical role of regulatory coordination and harmonization to promote nuclear fuel infrastructure development by examining a cross-border HALEU supply chain in North America.
- One additional question is how the OECD/Sapporo 5 partners could secure preferential access to HALEU-supplies for future new-nuclear countries, including for research reactor programs and advanced reactors located in these countries?



### The NEA Small Modular Reactor Dashboard: Second Edition



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HOME / URANIUM & FUEL / ORANO DEVELOPS TRANSPORT PACKAGES FOR ADVANCED FUELS

Orano developing transport packages for advanced fuels  
Wednesday, 9 September 2021

Orano and Urenco are developing a new cylinder designed for the transport of uranium enriched up to 20%. Meanwhile, the US nuclear regulator has approved the doubling of capacity of Orano's enriched uranium transport package.



The 308-X cylinder design: Orano

Orano and Urenco have signed a consortium agreement for testing and development of the new 308-X cylinder designed to transport uranium enriched up to 20%.

## Conclusions

- The paper concludes that the establishment of a North American HALEU supply chain, so as to provide an alternative to existing global supplies from the Russian Federation, will be challenging in the short term, in part due to lack of available HALEU production infrastructure in the United States of America and an absence of HALEU markets to send the requisite commercial impulses for investments in the supply chain.
- As part of concerted diversification efforts for HALEU supplies, the importance of Canadian uranium mining/conversion capacity will only grow and will see greater integration in a cross-border HALEU supply chain involving exports of uranium to the USA for enrichment and fuel fabrication, and re-import of HALEU fuel to Canada to power SMR programs such as at the Darlington New Nuclear Project in Ontario. Despite these challenges, the importance of a secure and reliable Canada-USA led HALEU supply chain, to diversify global markets, must not be underestimated.
- Much work remains to be done to build out the requisite enrichment infrastructure and supply chains. At the same time, the emerging HALEU supply chain in the United States of America has received strong support through extensive HALEU-focused legislation and continued collaboration with Sapporo 5 partners.