

Fueling Nuclear Growth

A view on the Fuel Cycle Challenges

Global uranium resources, production and demand

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OECD Nuclear Energy Agency



Nuclear Energy



***Uraninite from Shinkolobwe mine
(Congo)***

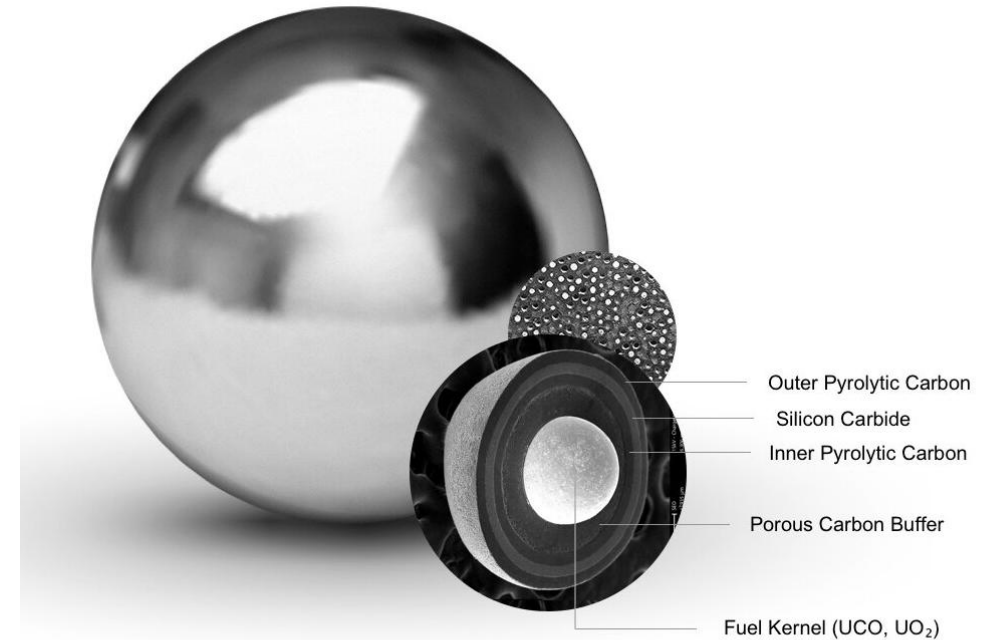


***GAIA PROtect Enhanced Accident Tolerant Fuel
(EATF) PWR fuel assembly (Framatome)***

Nuclear Energy

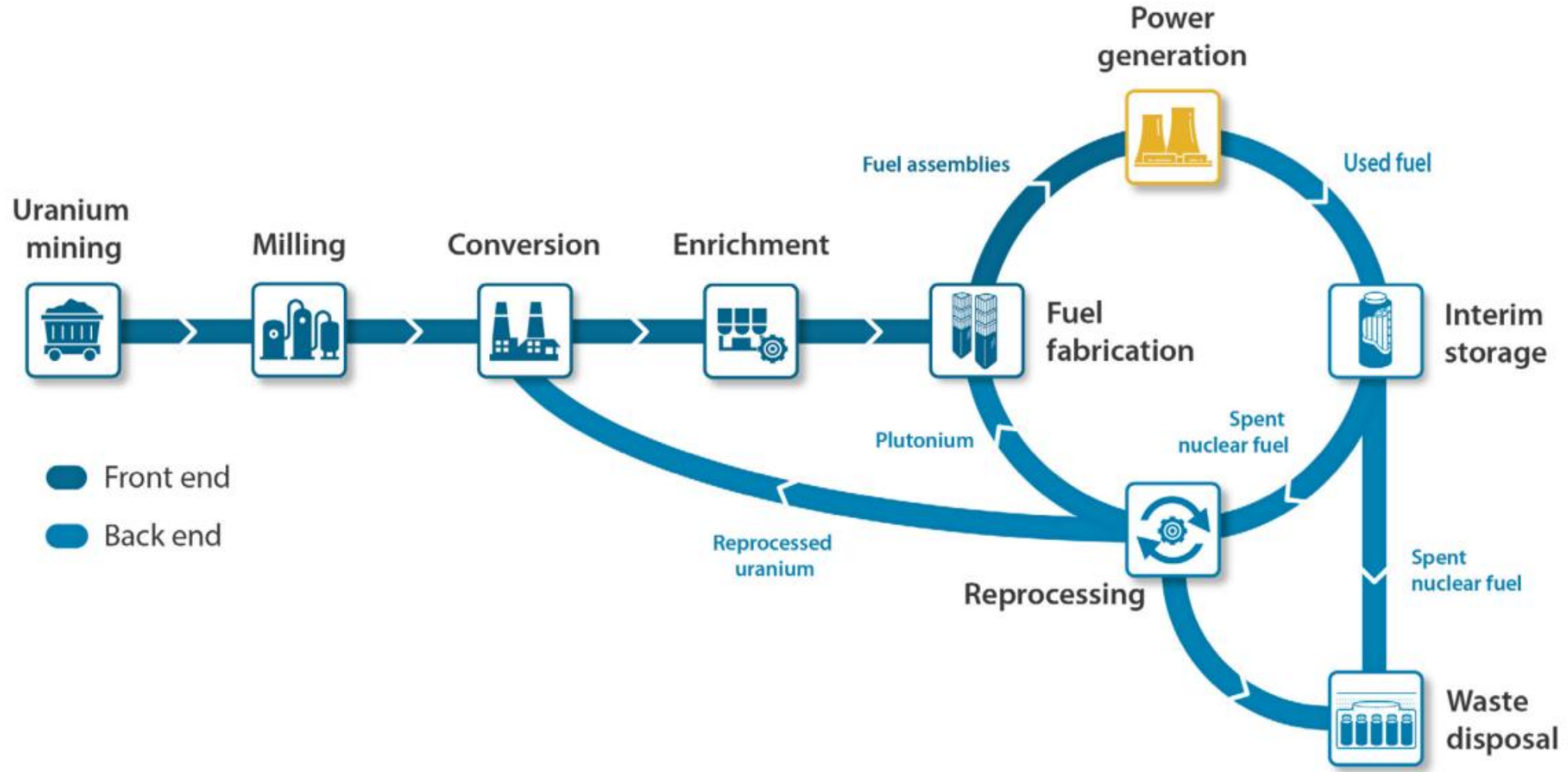


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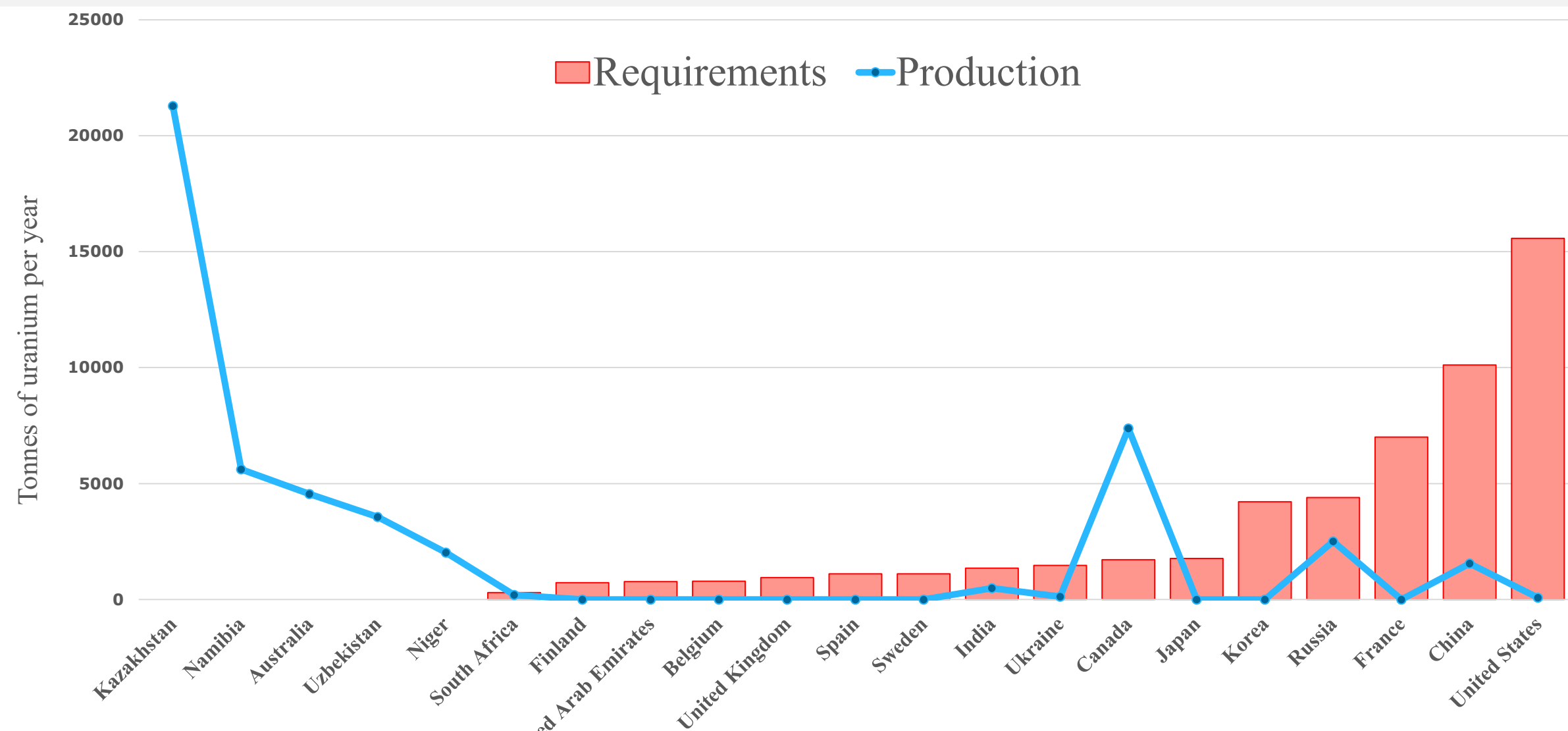


***X-Energy TRISO-X patented technology
HALEU***

The Nuclear Fuel Cycle : a series of value-adding steps



Uranium producing and consuming countries

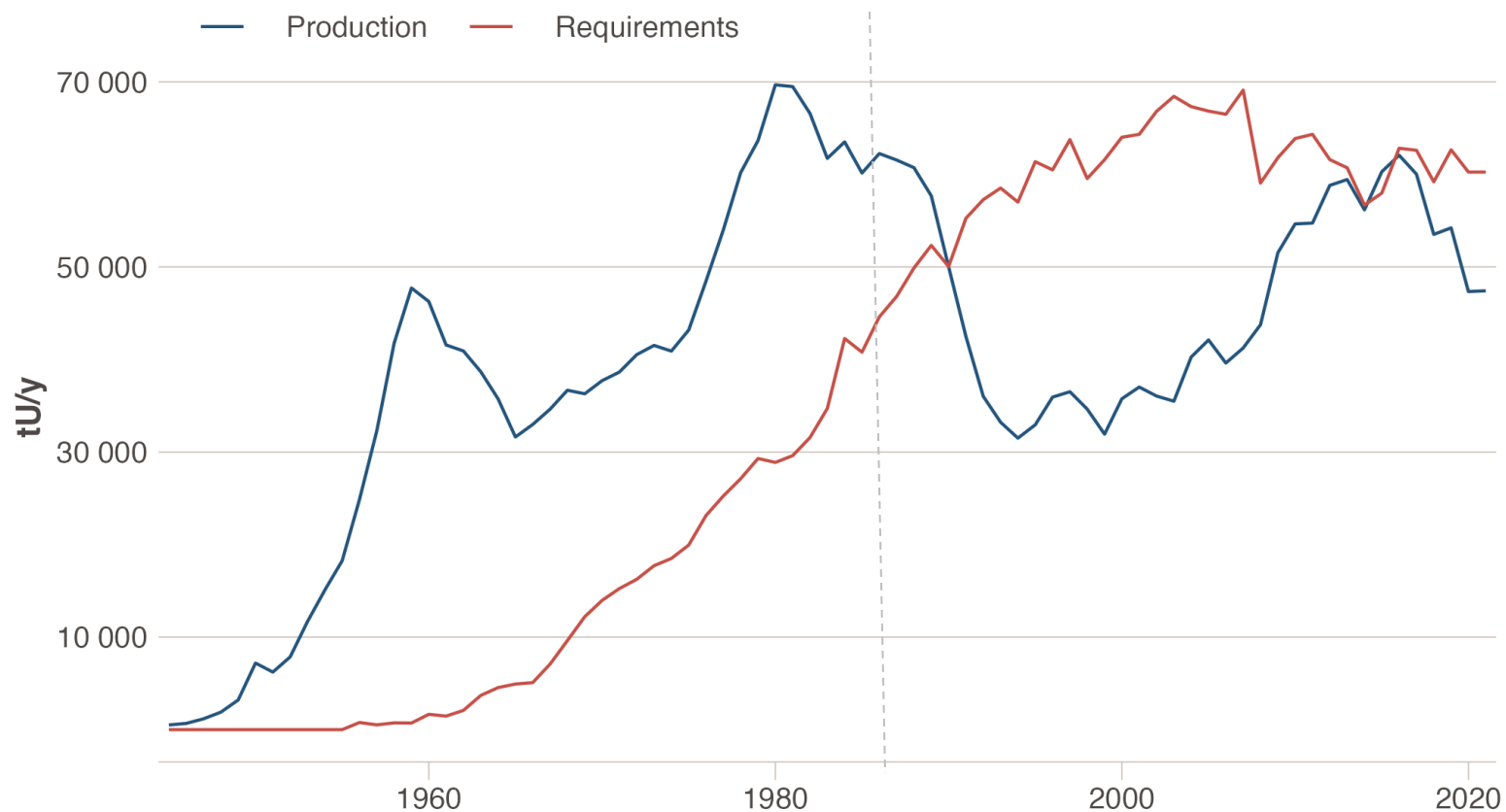


Data: Red Book 2024 (NEA/IAEA)

Uranium production and demand

- ☐ In recent years, primary production below demand.
- ☐ Stocks are drawn down when requirements exceed production.
- ☐ Potential of secondary supply inevitably decreasing over time if requirements continue to exceed production.

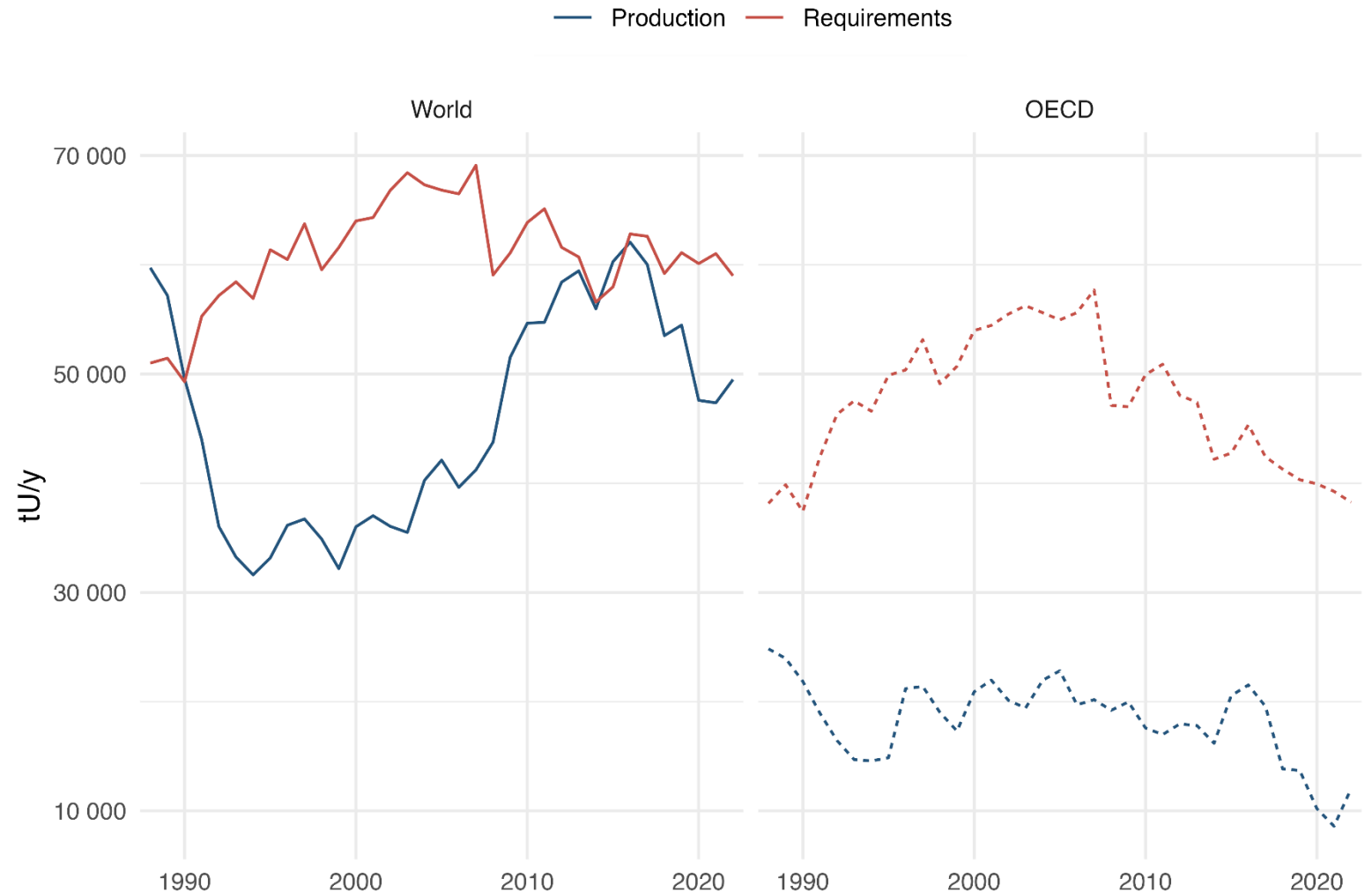
History of world uranium production and requirements
tonnes of uranium per year



Source : NEA Red Book 2024

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Source : NEA Red Book 2024

World uranium resources

**Total :
around 8 million tonnes
(identified recoverable)**

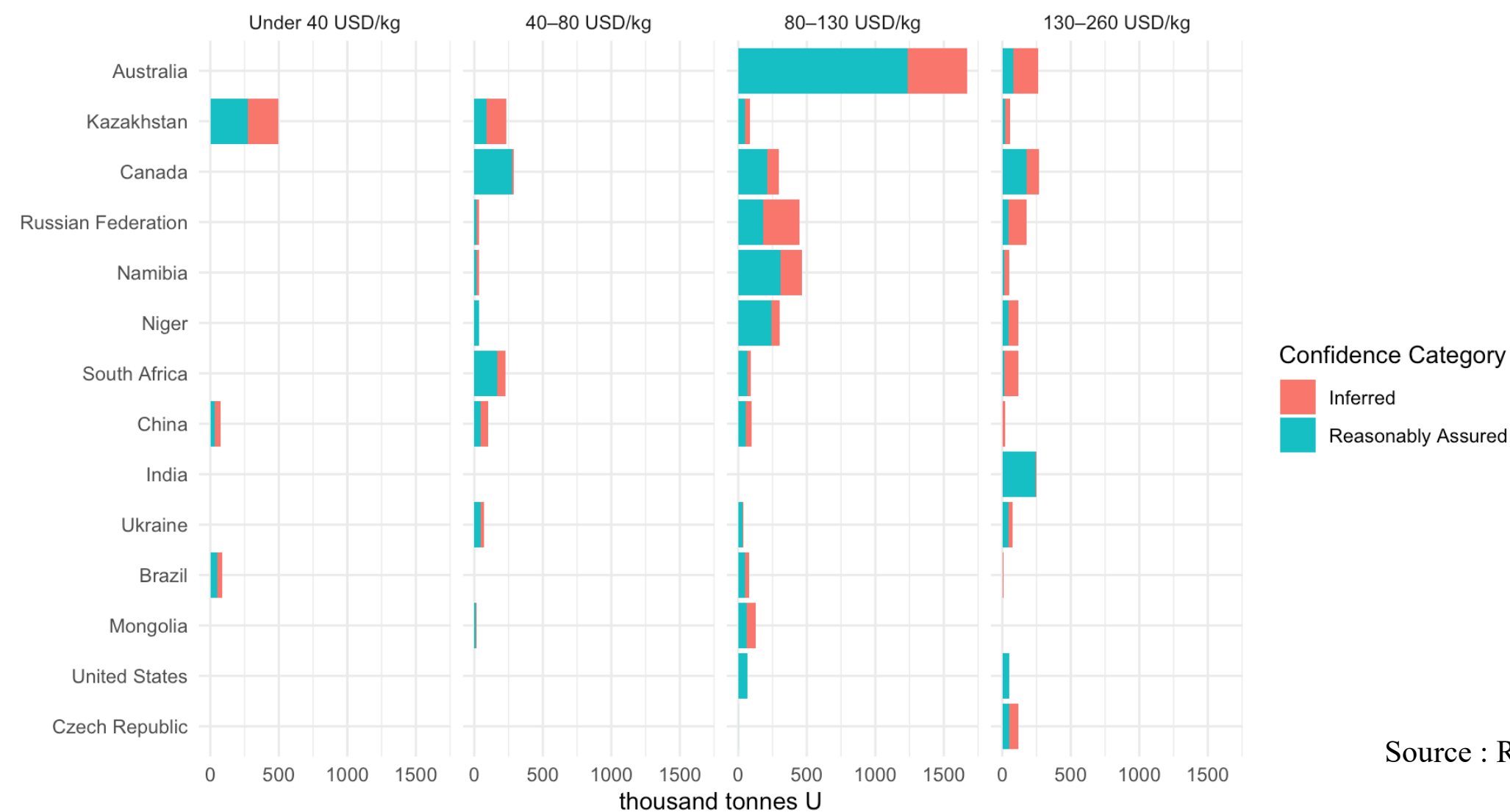


Figure 1.1. Global distribution of identified recoverable conventional uranium resources

(<USD 130/kgU as of 1 January 2023)

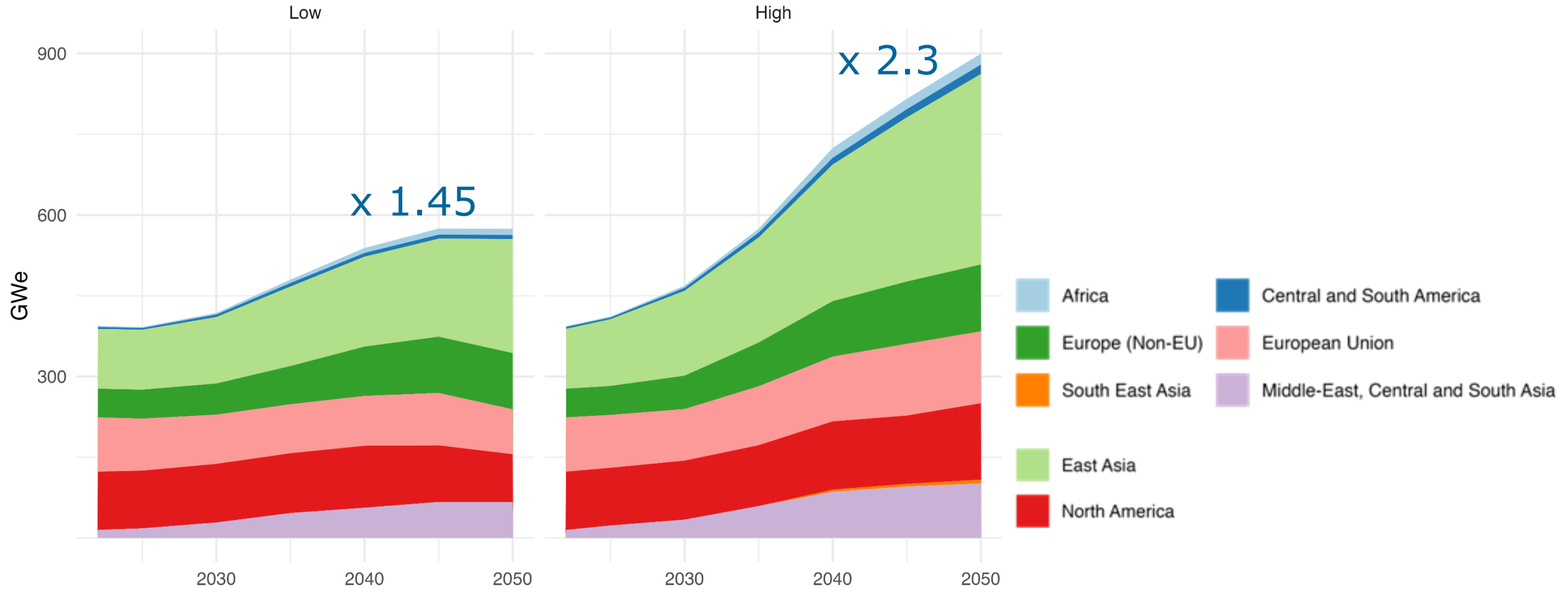
Source : NEA Red Book 2024

Identified uranium resources : different confidence and cost categories



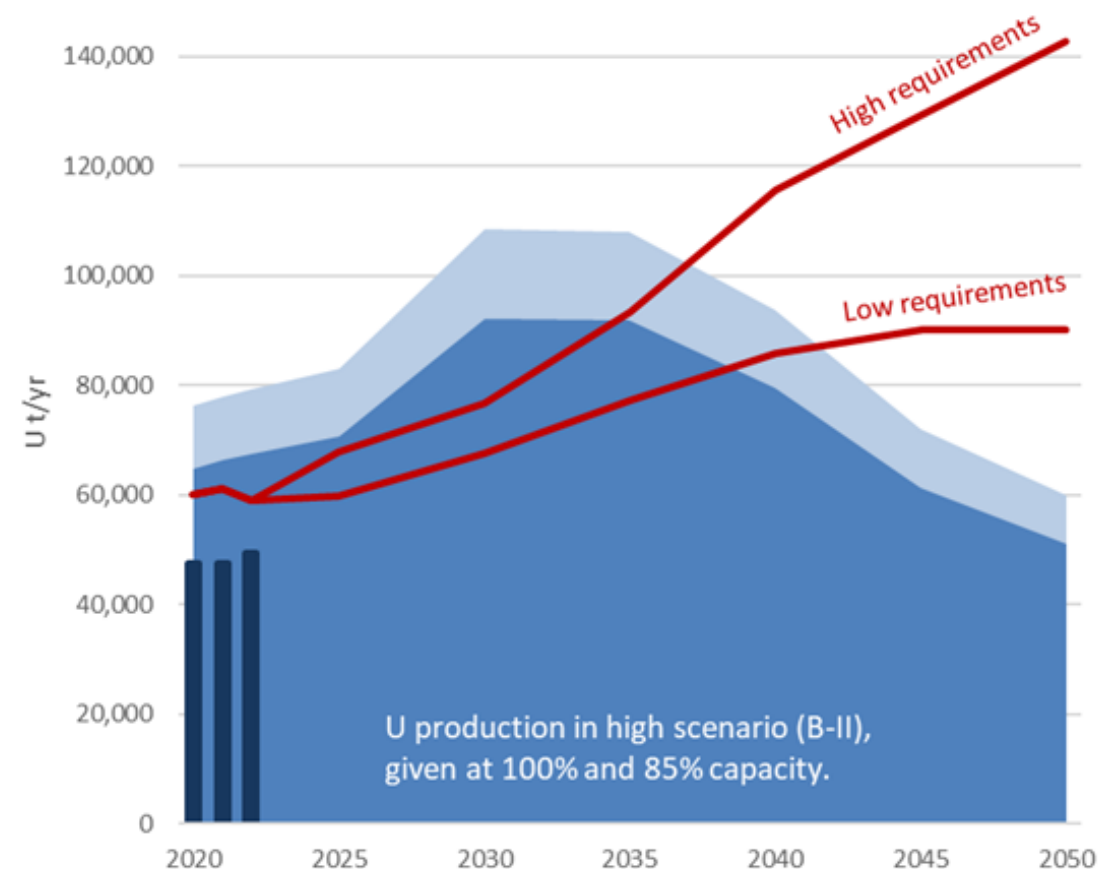
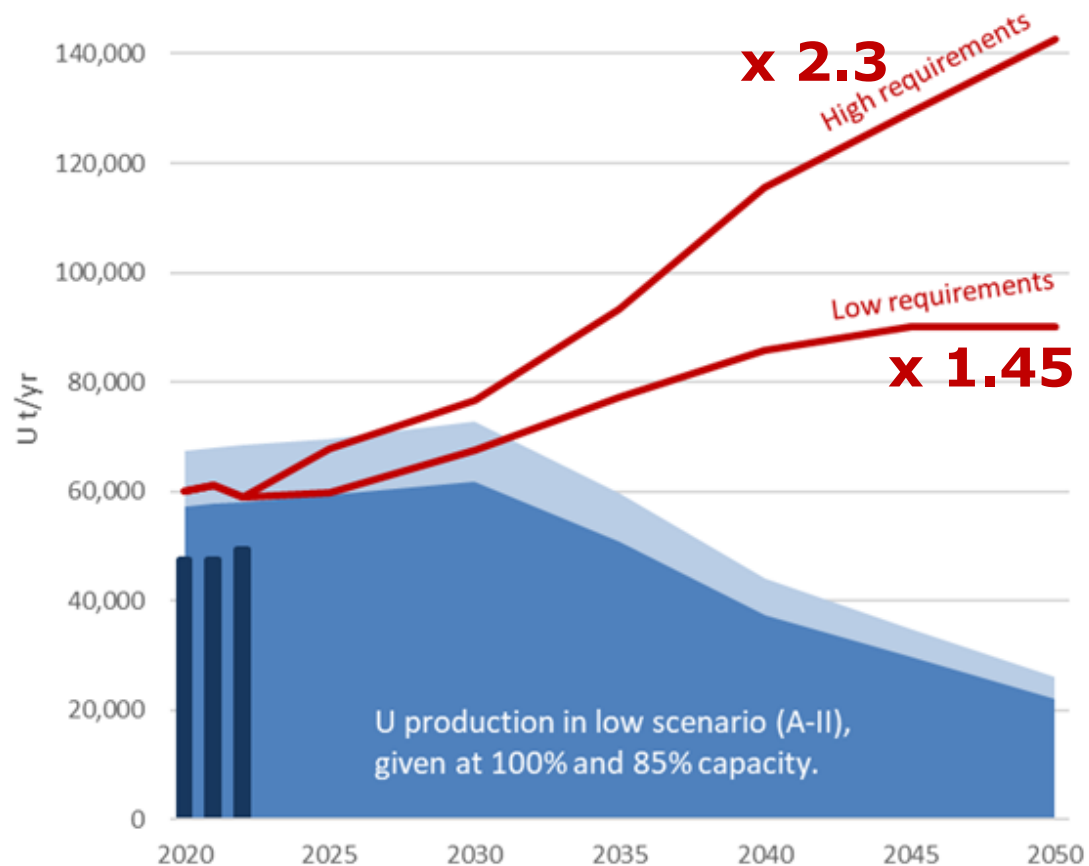
Source : Red Book 2024

Red Book 2024 : Projected nuclear generating capacities



❑ Significant growth in both low and high scenarios mainly driven by the expansion in East Asia.

Demand & Supply Adequacy to 2050



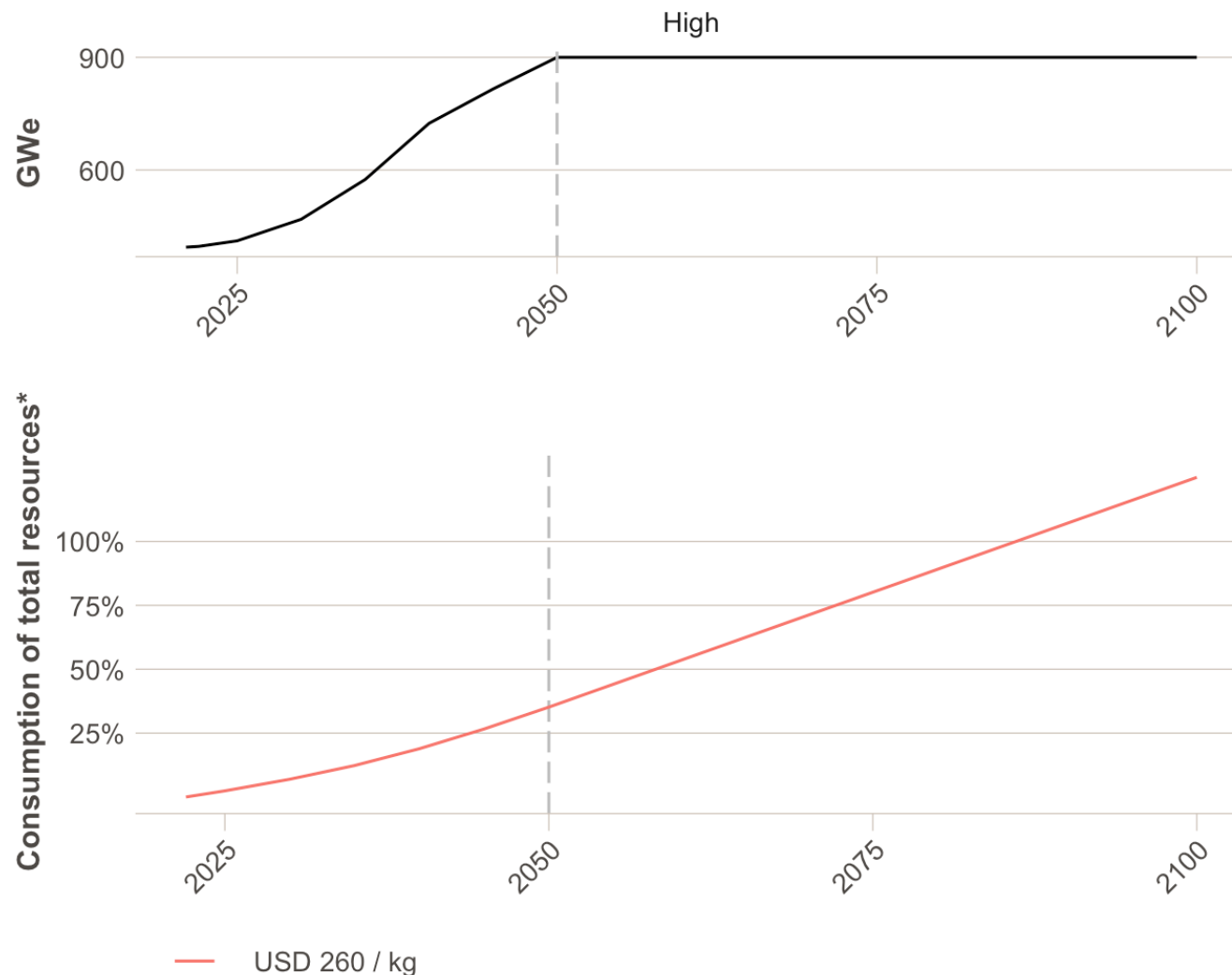
What it means : High Demand Scenario and Identified Resources

- **Assumption:**

Based on the RB2024 High Demand Scenario (2.3x increase) until 2050, followed by a constant demand thereafter.

- **Implication:**

By 2090, 100% of all globally identified resources in the highest cost category (8 million tU) would need to be mined to meet demand.



On uranium supply and demand

❑ Uranium Supply and Demand Adequacy:

- The current uranium resource base is sufficient to meet even high-growth demand projections through 2050 but achieving this will require timely investments to convert resources into active production.
- Beyond 2050, sustaining both high-growth and low-growth demand scenarios into the second half of the century—a timeframe aligned with the operational lifespan of new reactors—will necessitate investment in uranium exploration and new production centers to replenish depleted reserves.

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Nuclear boom sparks urgent call for investment in new uranium mines

Currently identified resources are forecast to be used up by the 2080s



Interest in nuclear energy is at its highest level since the oil crises in the 1970s © Martin Divisek/Bloomberg

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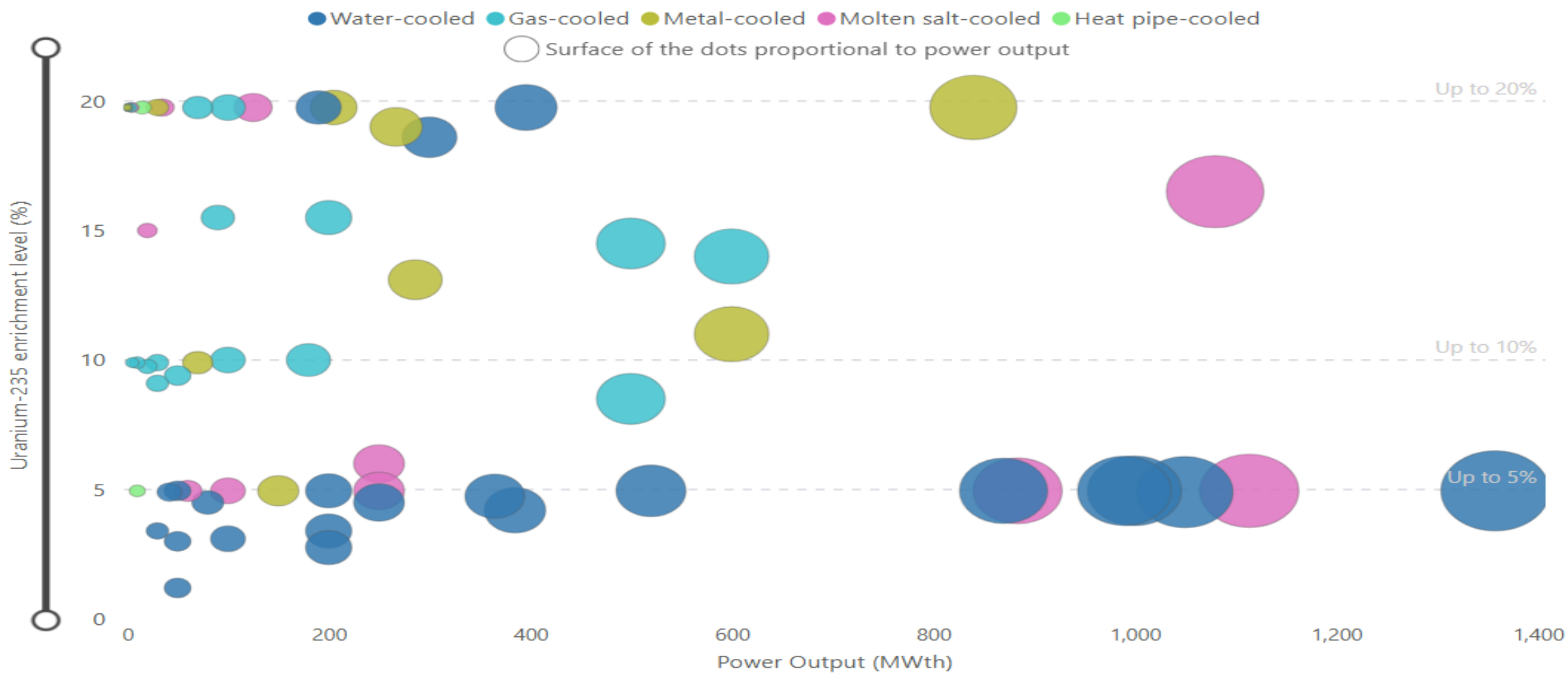
Camilla Hodgson in London

Published APR 8 2025

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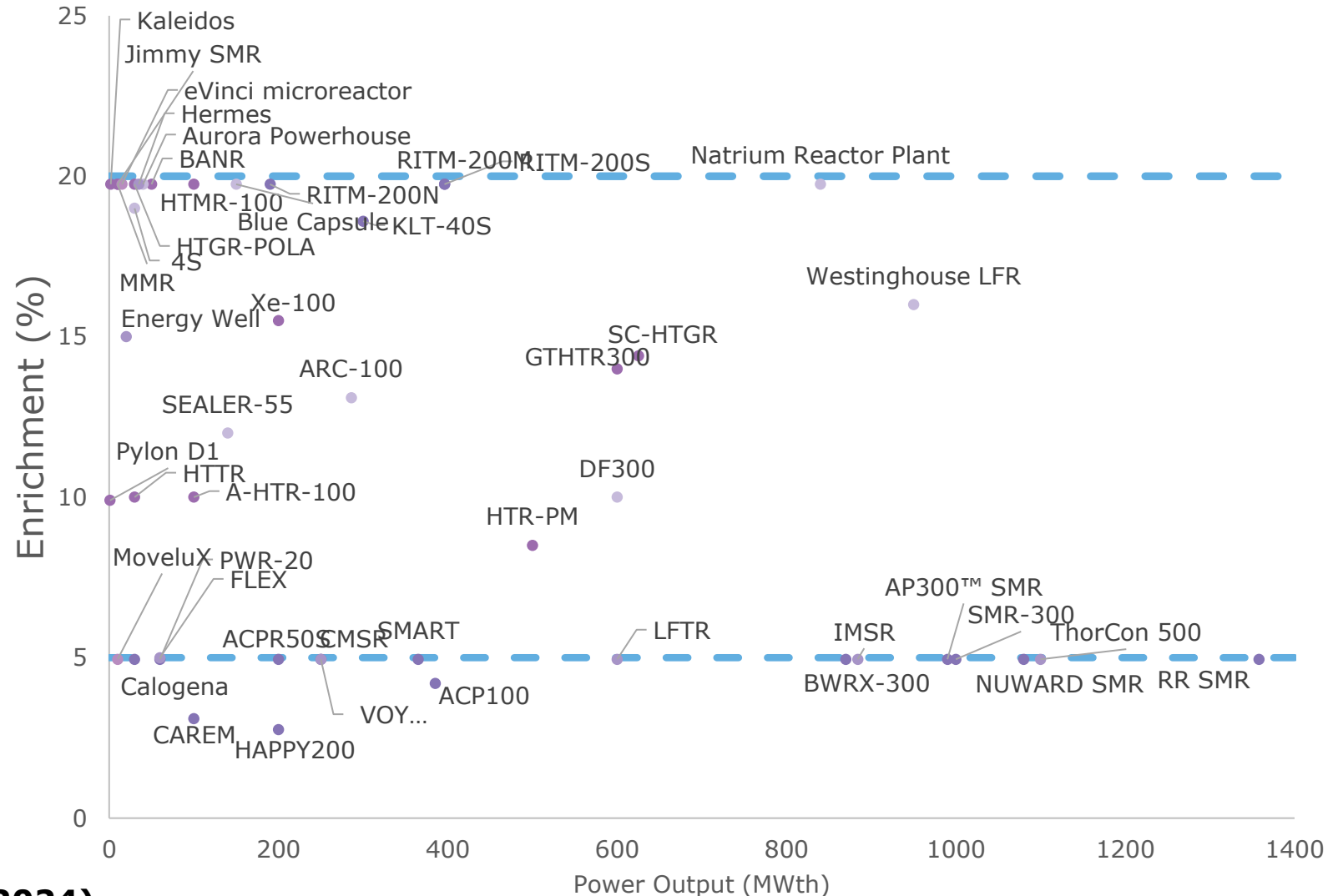
[Maps](#)[Configurations](#)[Concepts](#)[Fuels](#)[Deployment Pipeline](#)

Uranium enrichment requirements



Various SMR concepts under development

- ❑ Many SMRs require **HALEU** (High Assay Low Enriched Uranium)
- ❑ Most Generation IV SMRs need HALEU or other higher % fissile fuels (e.g., Pu/MOX).

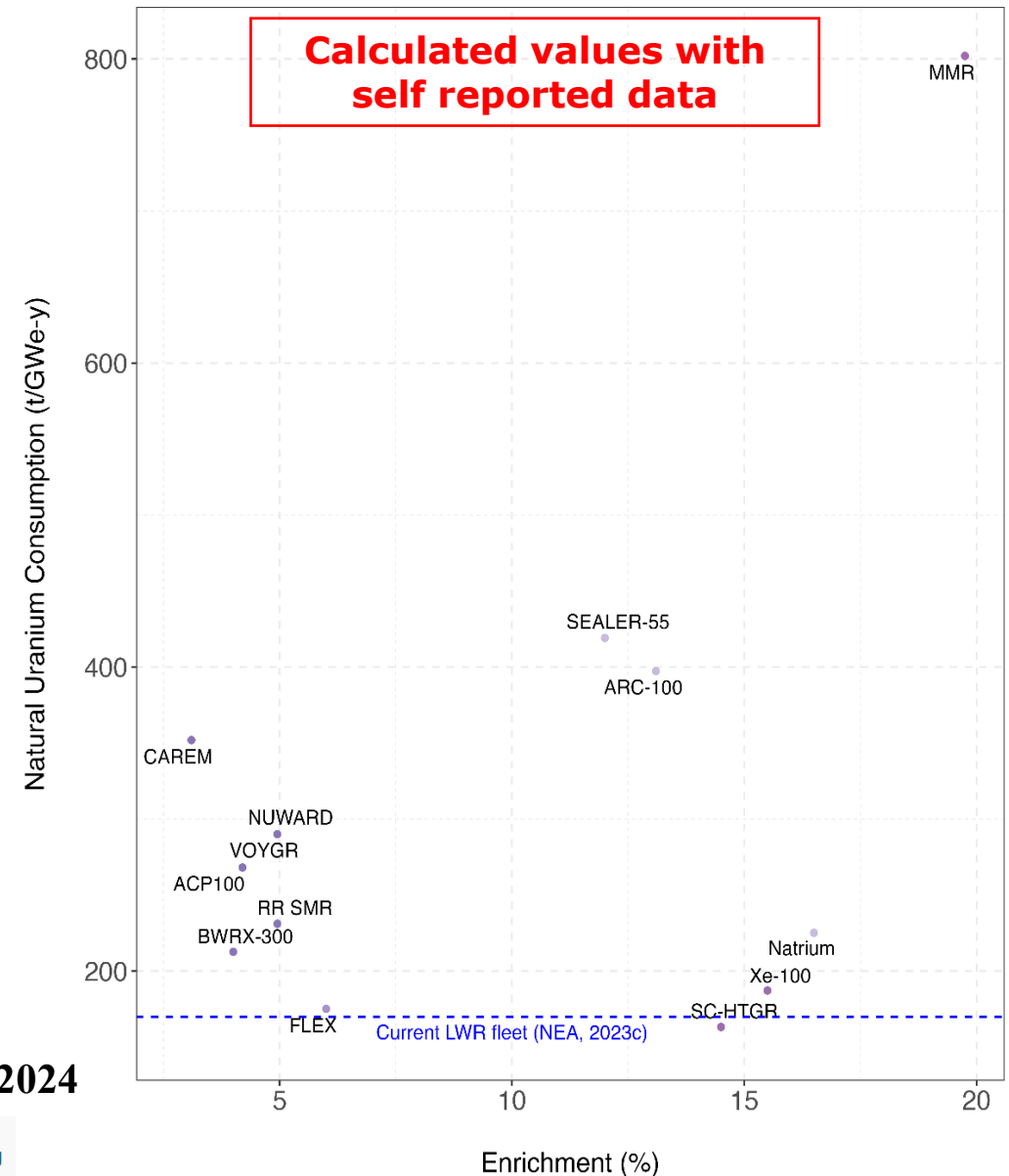


Source : NEA SMR Dashboard (2024)

Preparing for new technologies being deployed

- **Some Small Modular Reactors (SMRs) using HALEU** may present very different fuel cycle requirements than conventional, existing fleets
- Important to acknowledge these differences in future demand projections incorporating advanced or SMR technologies

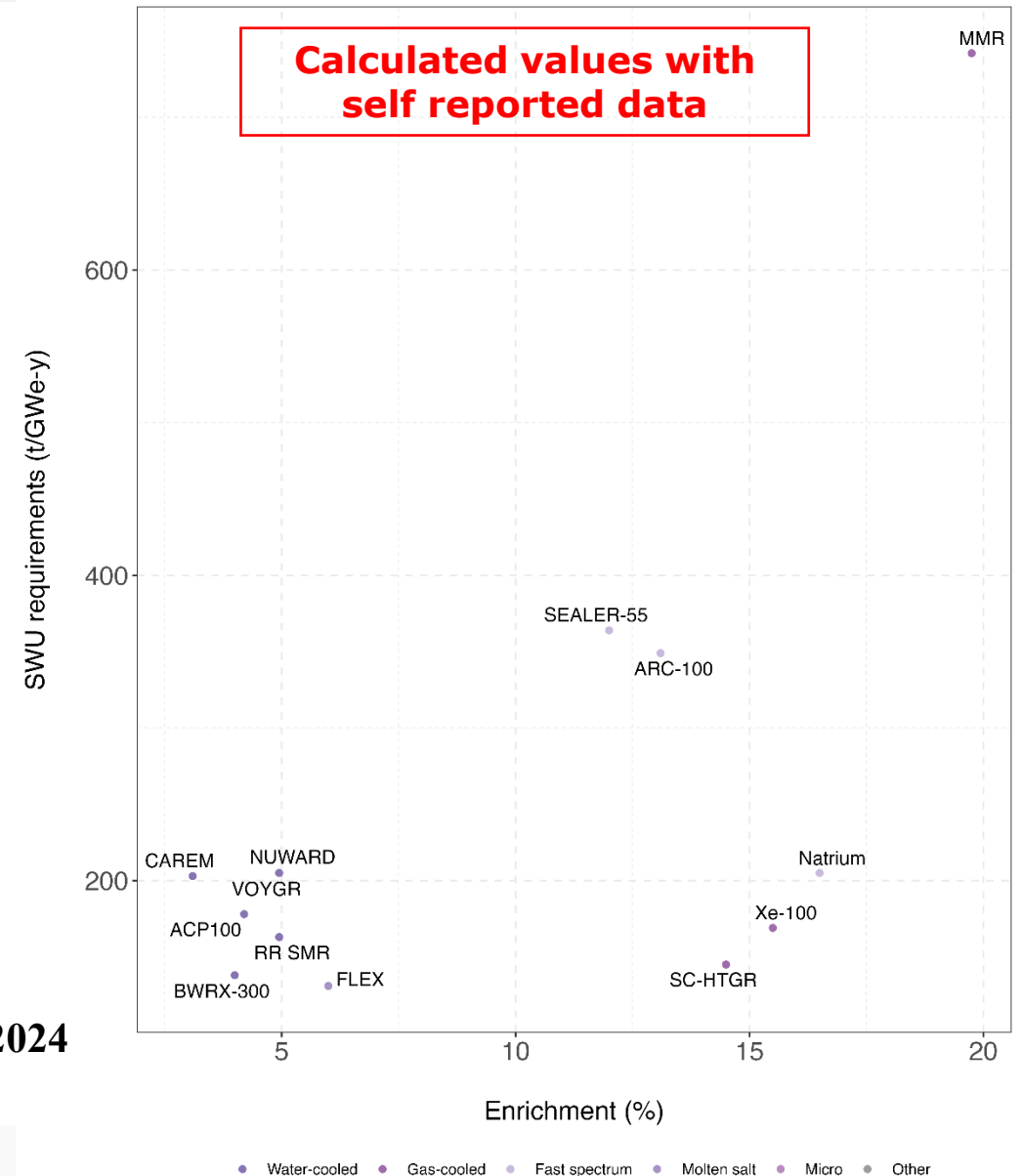
Source : NEA, HALEU Report 2024



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Source : NEA, HALEU Report 2024



Take Aways

- **After more than two decades of stagnation, nuclear power is making a strong comeback**, with 40+ countries integrating it into their strategies and **70+ GW now under construction**
- **Investment is accelerating in both large reactors and SMRs**, driven by energy security priorities, emerging business models, and rising demand from sectors such as data centres.
- **Geopolitics and rising global demand are heightening front-end vulnerabilities**. Secure fuel supply chains are essential to enable deployment, spanning uranium resources, production, conversion, and enrichment.

Take Aways

- **Innovation in nuclear** (Gen-IV, SMRs and advanced reactors) **must be aligned with national or regional fuel cycle strategies and fuel cycle infrastructure**, which is the industrial backbone of any future fleet and defines feasible deployment pathways.
- **As nuclear deployment grows, reprocessing and recycling are gaining strategic importance.** With uranium being a critical resource, long-term stewardship is essential. Circularity strengthens sustainability and resilience, keeping longer-term options open for an uncertain world.



Thank You