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Diversified and Sovereign Fuel Cycles

Securing Reprocessing Pathways for Fleet Longevity

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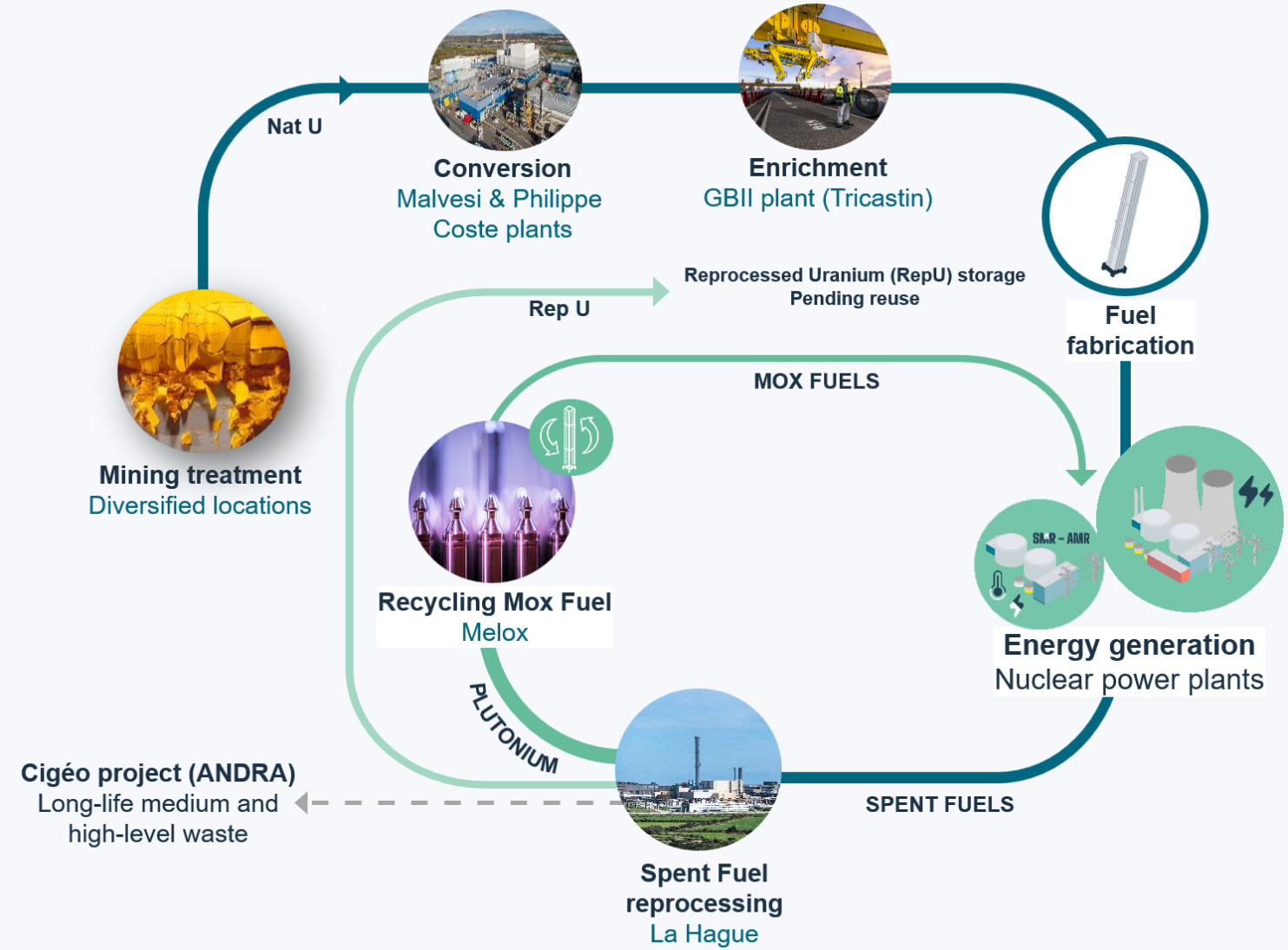
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Nuclear Fuel cycle: Orano's expertise at every stage of the value chain

Nuclear fuel is increasingly recognized as a strategic asset at the heart of the European Union's energy security, industrial resilience, and decarbonization strategy.

As a major player in the nuclear fuel cycle, Orano transforms nuclear materials to offer its customers high value-added products and services.



01

Addressing Spent Nuclear Fuel (SNF) long-term management challenges

SNF management becoming a strategic constraint

Nuclear expansion creates unavoidable spent fuel inventory challenges

More SNF

New and renewed fleets **increase** annual **SNF inventories types** and **volumes**

Pool saturation

Operators need additional capacity to preserve full-core discharge margins

Longer storage

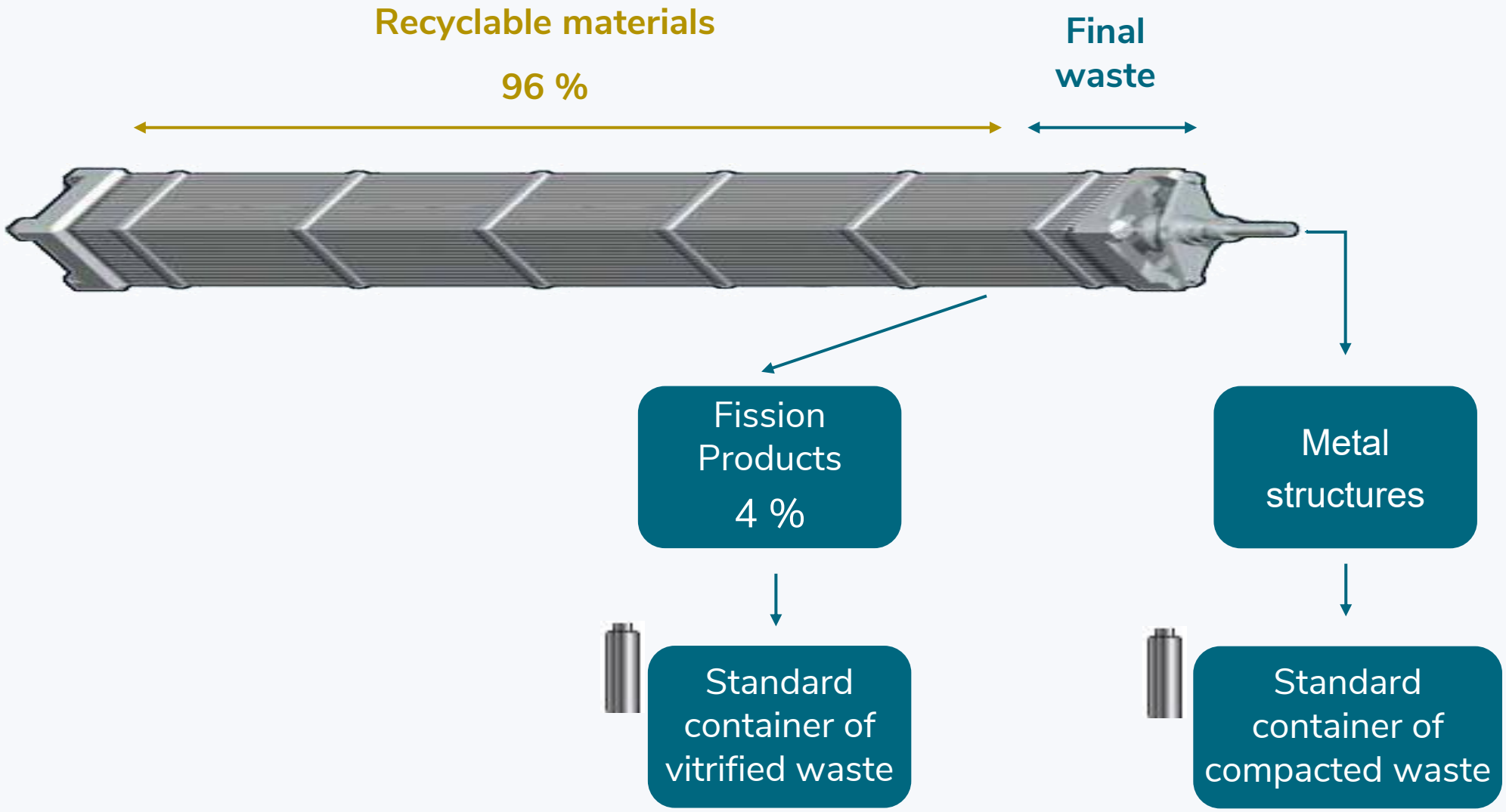
Storage infrastructures multiply, together with ageing, monitoring and safeguards obligations

Deep Geological Repository (DGR) uncertainty

Repository schedules remain multi-decadal and project-specific

The mismatch between continuous SNF generation and uncertain DGR availability represents a key risk

SNF reprocessing: reducing the waste volume and toxicity



Universal Canisters, predictable management of final waste



Thanks to reprocessing operations

- The **volume** is **reduced by 5**
- The **toxicity** is **reduced by 10**
- **HLW safe and stable** conditioning in glass matrix over the very **long term** (> 100 000 years)



French vitrified waste amounts to ***5 grams per inhabitant per year***



Orano's interim storage hall for vitrified waste



No safeguards, no corrosion, no leakage, no safety issue, high public acceptance

Foreign country storage facilities (ex: The Netherlands)

SNF Reprocessing:
Enabling development of sustainable nuclear fuel cycle strategies

- **Increasing industrial predictability**
  by turning uncertainties into controlled industrial processes : reducing inventories by using stable waste forms, identical for all reprocessed SNF

- **Reducing economic uncertainties**
  by improving the predictability of long-term financial commitments

- **Strengthening confidence in nuclear energy development**
  by reinforcing the credibility of national spent fuel management strategies

- **Enabling diversification of fuel supply**
  by maintaining nuclear fuel cycle options open in a changing environment

Turning liability into resource: using the potential of spent fuel towards energy independence

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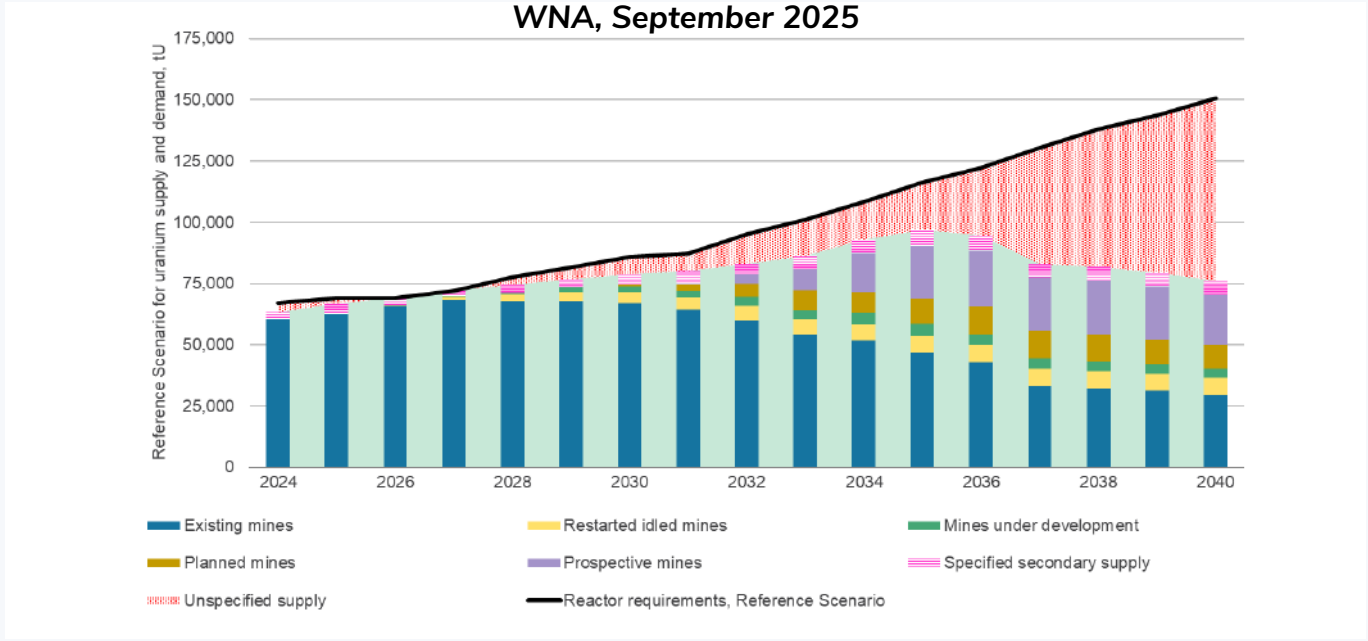
Fissile material supply, an evolving market

Natural resources exposed to fluctuating prices and geopolitical risks

Ux Spot U_3O_8 Price - 10years evolution



Global Scenarios for Demand & Supply
WNA, September 2025

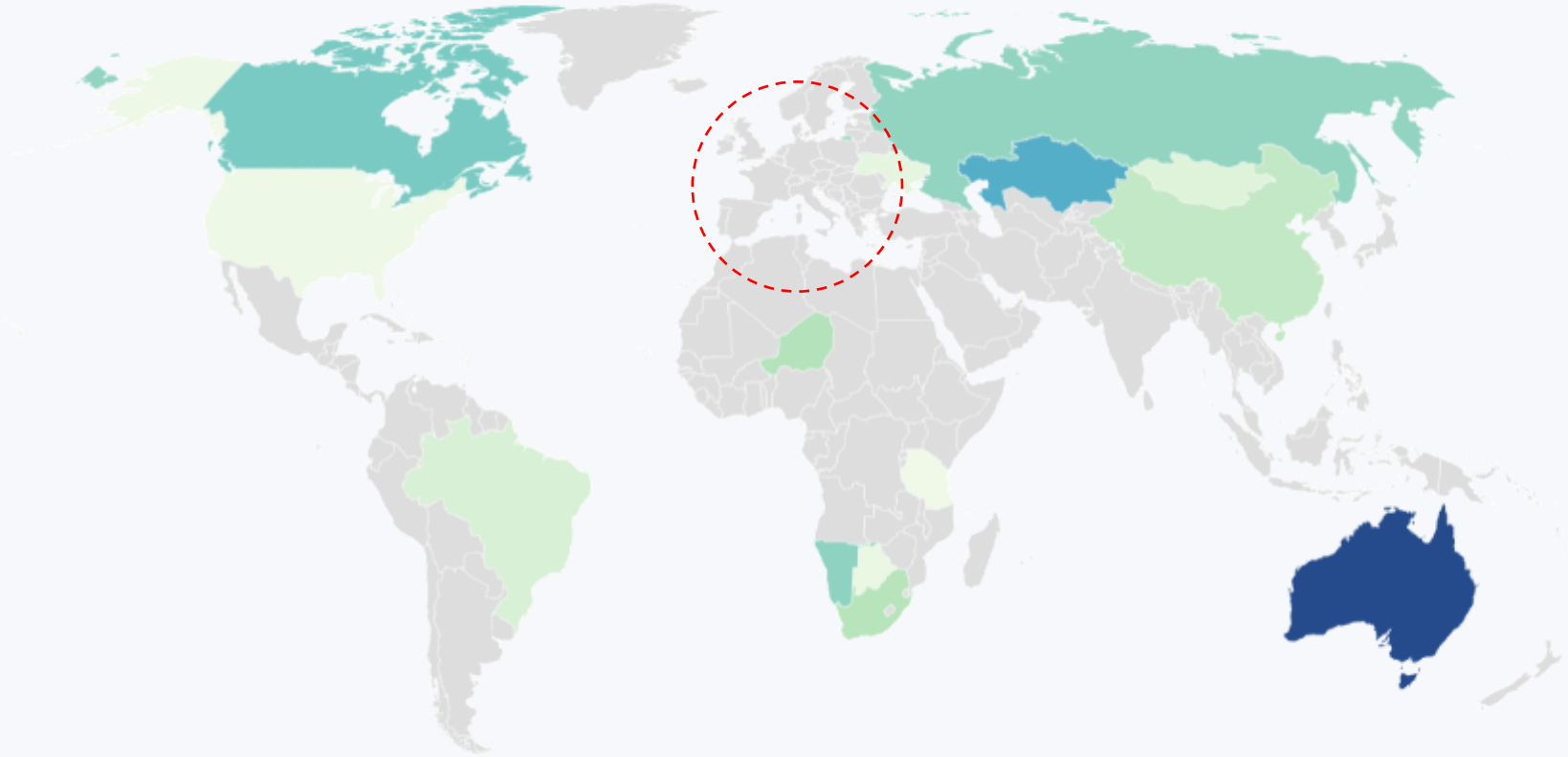


Need to reinforce fissile material security of supply

Fissile material supply, an evolving market

While NPP LTOs are implemented, and new NPP projects are developed, European geology is not changing

Uranium resources to $130/kg U by country in 2023 (reasonably assured resources plus inferred resources)



	tonnes U	percentage of world
Australia	1,671,200	28%
Kazakhstan	813,900	14%
Canada	582,000	10%
Namibia	497,900	8%
Russia	476,600	8%
Niger	336,000	6%
South Africa	320,900	5%
China	270,500	5%
Brazil	167,800	3%
Mongolia	144,600	2%
Ukraine	106,700	2%
Botswana	87,200	1%
USA	67,800	1%
Tanzania	57,700	1%
Other	324,900	5%
World total	5,925,700	100%

Identified resources recoverable (reasonably assured resources plus inferred resources), to $130/kg U, 2023, from OECD NEA & IAEA Uranium 2024: Resources, Production and Demand ('Red Book')

SNF reprocessing: reusing 96% of the nuclear fuel

Recyclable materials

96 %

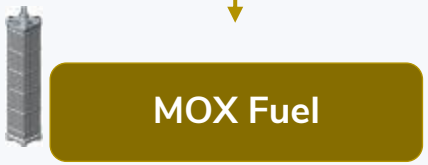
Final waste



Plutonium
1 %

Uranium
95 %

Recycling



MOX Fuel



ERU Fuel

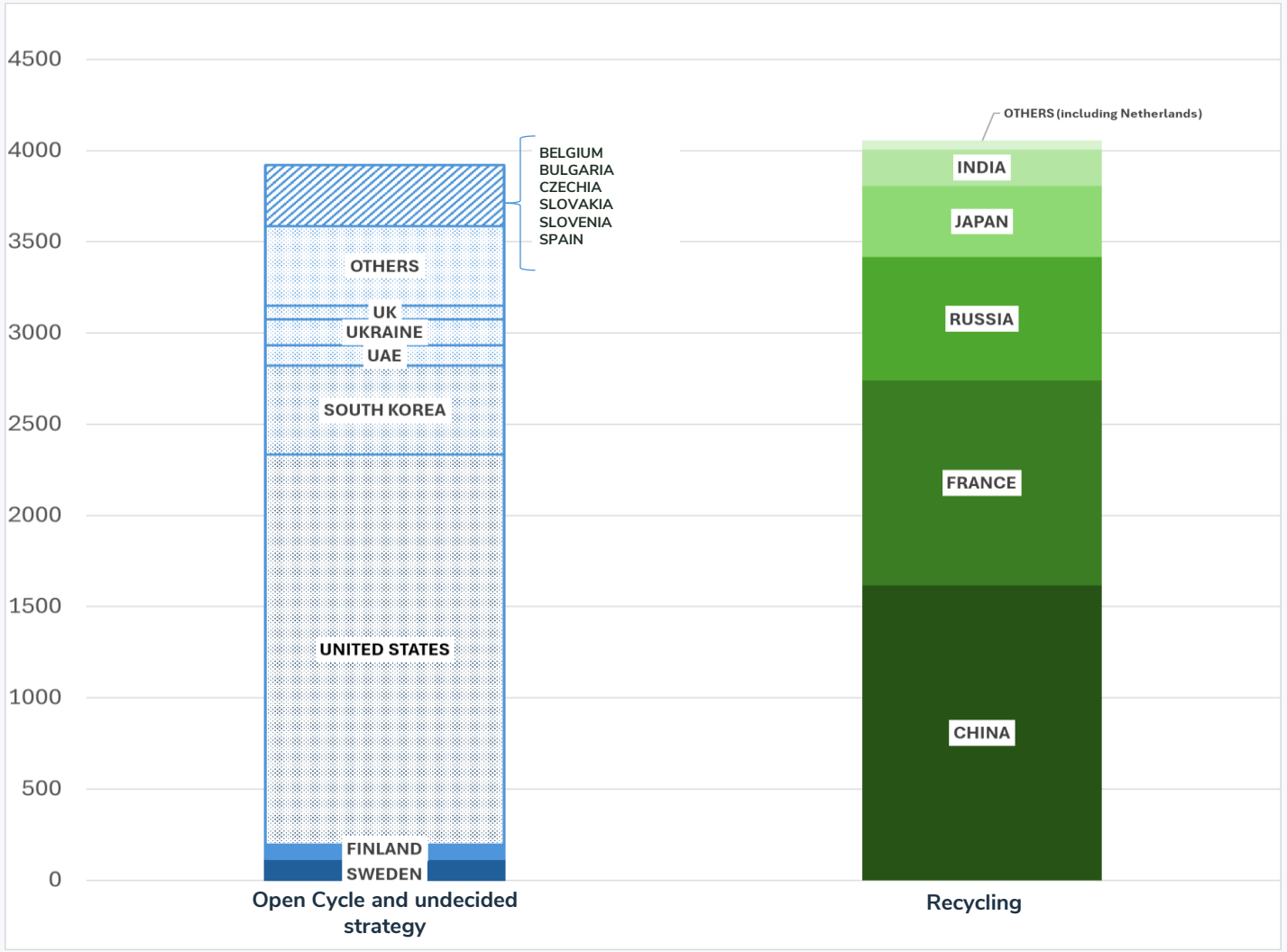
THE ENERGY POTENTIAL OF NUCLEAR MATERIAL

1g of plutonium or 100g of uranium or 300g of depleted uranium = 1t metric ton of oil

By the end of 2025, the spent fuel inventories stored in all EU Member States are estimated at ~60 000 tML

➔ 600 tPu ➔ 57 000 tU

Nuclear Fuel Cycle strategies around the world



Reprocessing-Recycling strategy

is selected as the safe and optimized fuel management strategy by **countries representing**

50% of world LWR's nuclear output by 2030.

03

Experience and perspectives for SNF Reprocessing and Recycling

The French leading track record for SNF reprocessing & MOX manufacturing

LA HAGUE REPROCESSING PLANT





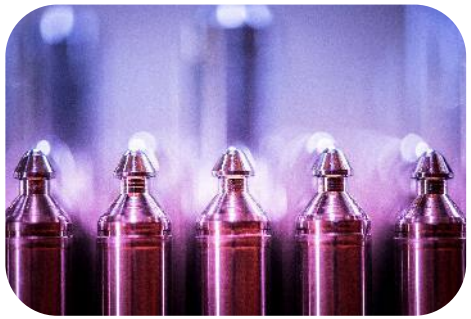


LWR FUEL REPROCESSING:

~30 000 tHM reprocessed for France

~10 500 tHM reprocessed for 6 other countries

MELOX FUEL FABRICATION PLANT



LWR MOX FABRICATION:

~ 3 100 tHM MOX fuel produced, loaded in **43 reactors** worldwide

A STRATEGIC ASSET WITH 50 YEARS OF EXPERIENCE, SHARED WORLDWIDE

France will pursue its reprocessing-recycling strategy
Strategic vision turned into government & industry commitment



French nuclear policy, "PPE3" and 2024, 2025 and 2026 Nuclear French Policy Councils**:**

- **Confirmed the renewal of the back-end nuclear fuel cycle facilities at La Hague, which are needed for the storage and recycling of spent fuel as well as the policy guidelines for achieving closure of the nuclear fuel cycle in France in the second half of the century.**

- **Reaffirmed of its commitment to fuel-cycle closure and initiated a dedicated program to pave the way for the next industrial step, enhancing the long-term sustainability, resource efficiency and resilience of nuclear energy while reducing exposure to future resource and geopolitical uncertainties.**

French decision to pursue recycling strategy beyond 2100:

- **Life extension / resilience program: extending operations La Hague and Melox existing plants beyond 2040**
- **"Aval Du Futur" Project to renew existing assets**
- **Launch of a dedicated four-year design development program to mature Sodium Fast Reactor (SFR) and associated fuel cycle technologies, preparing next phase key decisions around 2030 to keep open the pathway to a first SFR commissioned by the mid-2040's.**



How will the French industrial capacities evolve?

Renewal of the Orano La Hague reprocessing plant

- Total future reprocessing capacity: equivalent to current capacity (1,200 t)
- Future storage capacity: 3 pools of 6,500 t each to meet the needs of EDF (1,000 t/year) and other foreign customers (200 t/year), replacing the current pools.
- Capacity to industrially reprocess spent MOX and URE fuel, **paving the way for fuel cycle closure**

Creation of a new MOX fuel fabrication facility

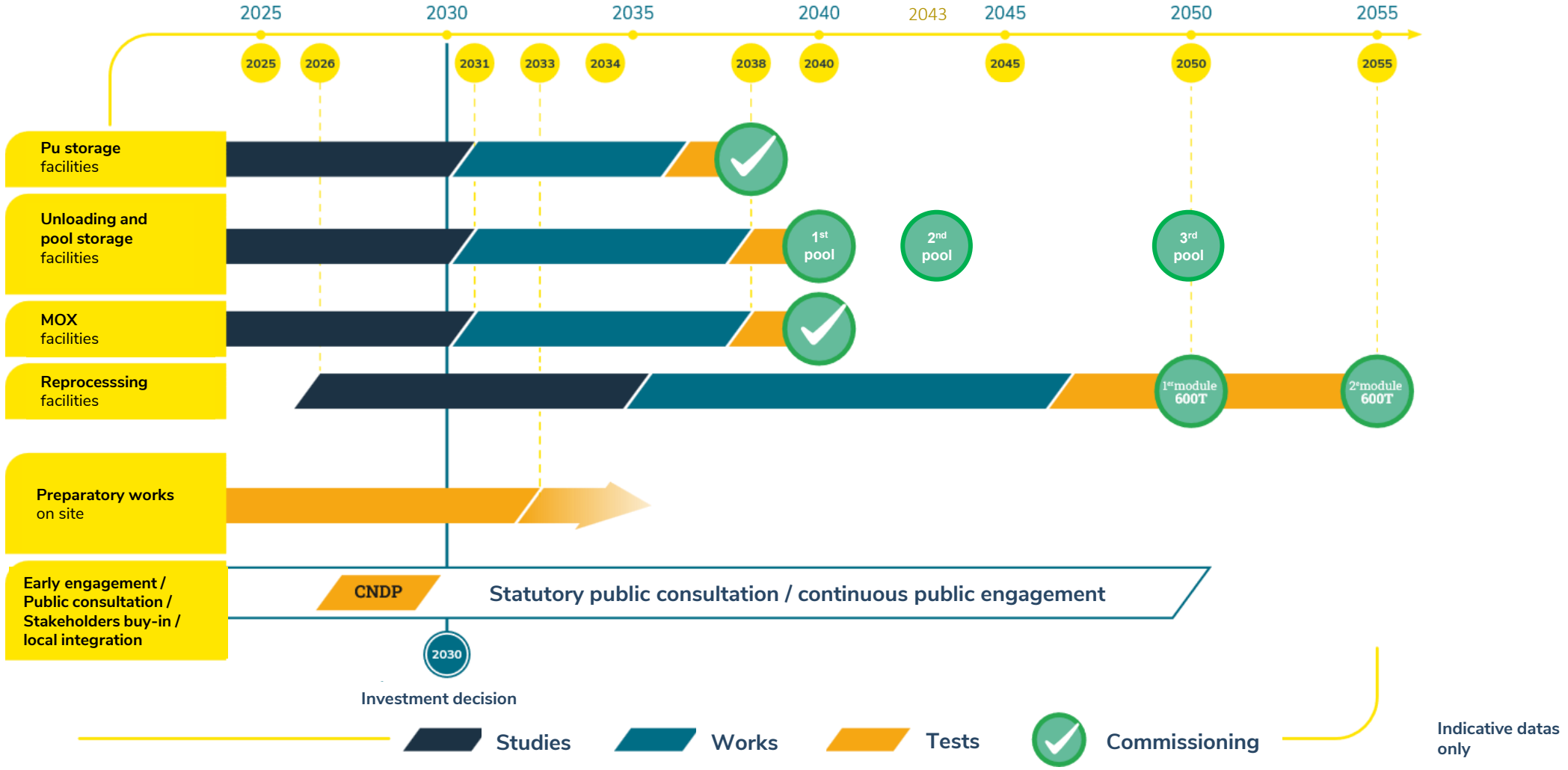
- Construction of the new MOX fuel fabrication facility, equivalent to the current capacity of the Melox plant (up to 170 tHM/year)
- **An option for a 10+ tHM/year FNR MOX line**
- **A land reservation for additional FNR MOX or LWR MOX capacities**

These facilities will operate efficiently for 80 years >>> up to 2120/2130

The **modular deployment** strategy provides some adaptability, enabling progressive adjustment of industrial capacities to **both French and international requirements** while also facilitating integration of future technologies

Anticipation and long-term vision required!

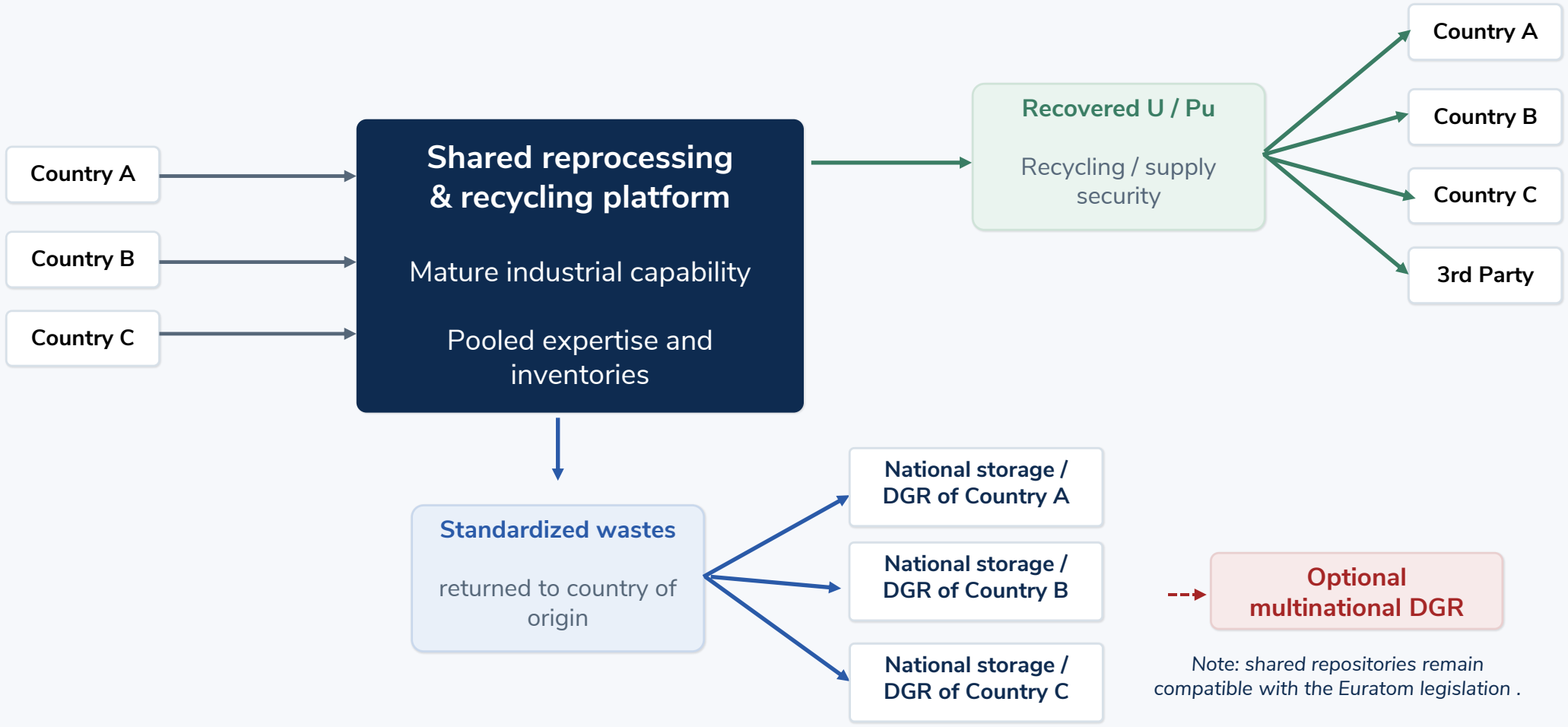
Aval Du Futur is a project spanning several decades, to deliver new Reprocessing / Recycling pants that will operate beyond 2100



04

Creating a European Reprocessing & Recycling platform for a resilient and circular fuel cycle

Shared reprocessing/recycling reduces national back-end uncertainties and facilitates shared circular fuel cycle options



EUROPEAN COOPERATION CAN MAKE CROSS-BORDER FUEL CYCLE STRATEGIES MORE PREDICTABLE AND EFFICIENT

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