UNIVERSITY OF OSLO

Every Nation for Itself – Or Be Serious About Nuclear Power?

Ole Reistad
Norwegian Nuclear Research Centre (NNRC)/ DNV
University of Oslo

January 14, 2026



Fission is changing – less may be more

UNIVERSITY OF OSLO

Master thesis. Spring 2025

Investigating the use of open-source methodology for assessments of Russian PWR naval reactors

The case of the sunken submarine K-278 'Komsomolets'

Marius Torsvoll
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60 ECTS study points

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ICSOS2025-13

Identification of **nuclear reactor systems** for international commercial marine vessels: **the shipping perspective**

Baltasar Johannes Hemmerle
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1st of September 2025
University of Oslo, Norwegian Nuclear Research Centre

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Master's thesis

Exploring Fuel Properties in the BANDI-60 Small Modular Reactor for Maritime Applications

A Fuel Matrix and Enrichment variation study

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Reference Accidents and Regulatory Considerations for a Nuclear Propelled Ship utilizing Modular High Temperature Gas-cooled Reactors Visiting Norwegian Harbors

Elise Harila Christensen[a], Ella Hedegart Flaata[a], Baltasar Johannes Hemmerle[a], and Hannah Westgaard[a]

[a]University of Oslo, Norway

August 2025

PHYSOR 2026

PHYSOR 2026 - The International Conference on Physics of Reactors · Torino, Italy · April 19 – 23, 2026

Comparative Neutronic Analysis of Uranium-based Fuel Matrices on the BANDI-60 SMR for Maritime Applications

Maia O.G. Wirgenes [1,*]

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Project Description

Maia O.G. Wirgenes

December 16, 2025

From JEEP II to Microreactors: Developing and Validating a Generalizable Framework for Backend Purposes

PhD Project Description

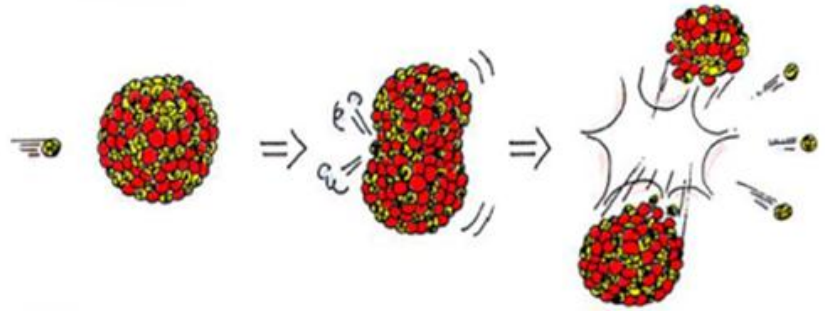
William Eivik Olsen

November 2025

Title of Project

Model-Based Digital Twin of a Nuclear Microreactor for Remote and Maritime Application

On nuclear – the fundamentals (reactors, nuclear/ fissile/ fertile materials)



4 key issues for all nuclear reactors:

VERY SENSITIVE

1. **How can we ensure that there is sufficient fissile materials?** → **= ENRICHMENT, REPROCESSING, FUEL PRODUCTION**

SENSITIVE

2. **How can you take care of the neutrons and ensure that they contribute to new fission?** → **= DESIGN/ SPECIAL MATERIALS**
   - **Water/ heavy-water (PWR/ BWR)**
   - **High-temperature gas (HTGR)**
   - **Molten-salt (MSR)**
   - **Liquid-metal cooled (LMCR)**

NOT VERY SENSITIVE

3. **How can you take care of the heat each fission provides?** → **= DESIGN/ COOLANT**

NOT VERY SENSITIVE

4. **How can you take care of the rest (residual products – or waste)?** → **= BARRIERS**

DNV

Nuclear 2026: large-scale facilities continues to be built, though high capital costs (some regions worldwide)

- **Large-scale (~GW facilities) water-water technologies continue to be installed**
- **Long construction times/ high capital costs and lack of regulatory harmonisation hamper implementation**
- **Western countries are technically deficient (e.g. lacking forging capabilities for ultra-large components)**

	USD/kW
Olkiluoto 3 (Finland)	7,400
Flamanville 3 (France)	8,800
HPC (UK)	19,000
Vogtle 3&4 (US)	14,800
Saeul 1&2 (South Korea)	2,500

Same reactor

Source: DNV White Paper (2025)

Nuclear future: small and modular (SMR) (~300 MW_e), new technologies, fabricated off-site, with lower capital costs

KLT-40 (PWR) (Russia)

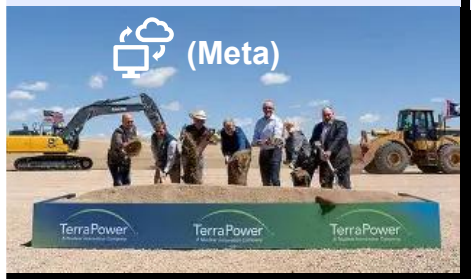


BWXT-300 (BWR) (Canada)



Holtec (PWR) (US)

TerraPower (MSR-fast) (US)



Nuward (PWR) (France)



Rolls-Royce (PWR) (Wales)

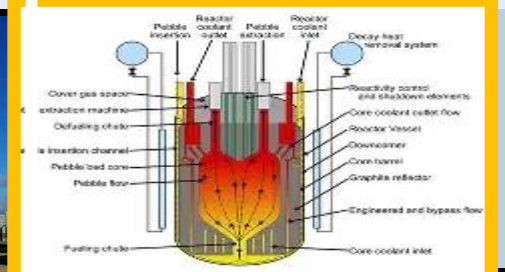
BWXT-300 (BWR) (Poland)

2020 2021 2029 2030 2031 2032 2033 2035

HTR-PM (HTGR) (China)



Kairos (MSR-thermal) (US)



(Google)

Oklo (LMCR-fast) (US)

(Energix/ Switch)

Xe-100 (HTGR) (US)



(Amazon)

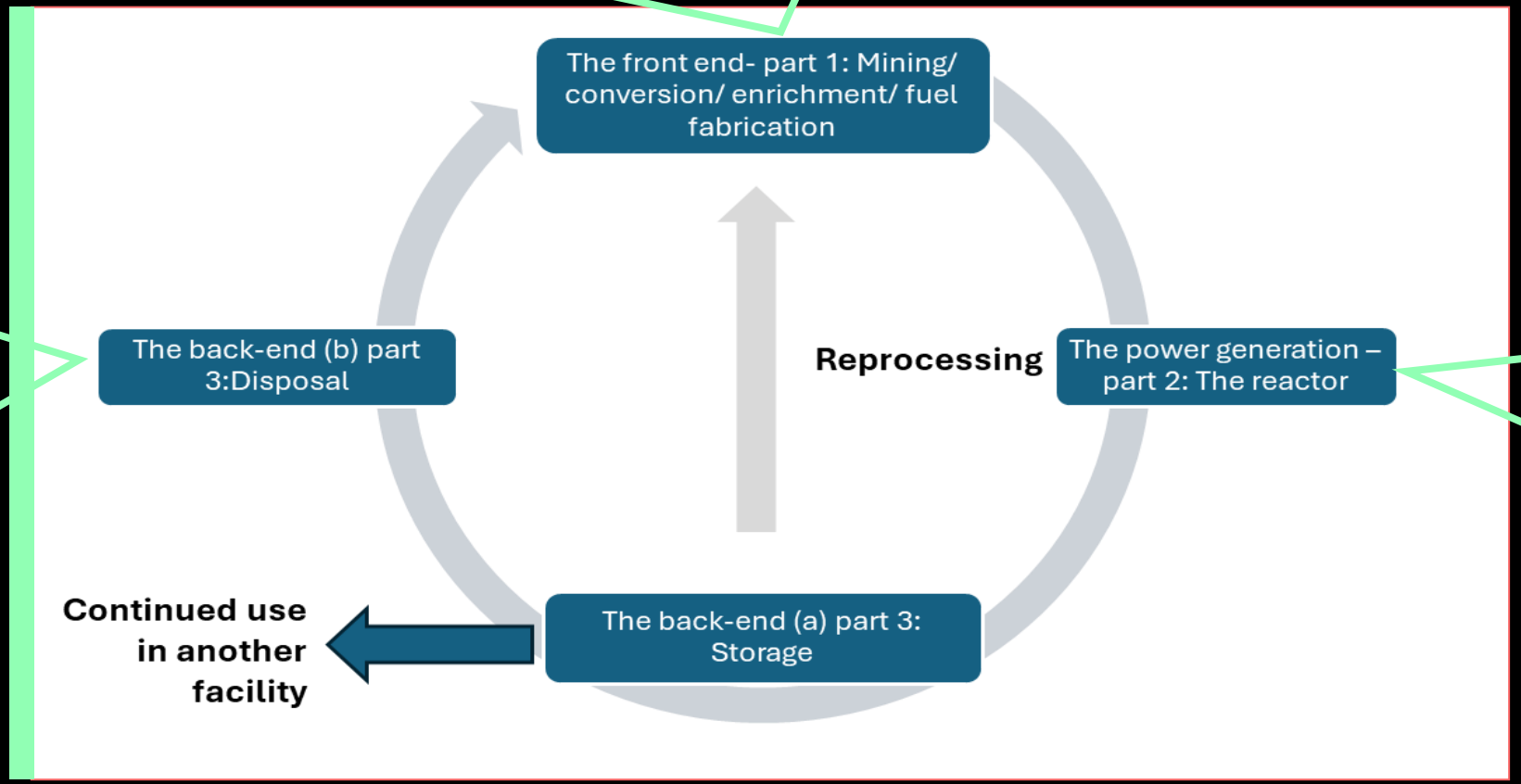
AI a major driving force behind several agreements on future nuclear

Nuclear is all about the fuel cycle - joint challenge for all nuclear designs: More robust fuel cycle and supply chain.

Disruptive supply, Europe lacks a joint strategy on nuclear fuel supply, few facilities for fuel development

SUPPLY CHAIN FUNDAMENTAL

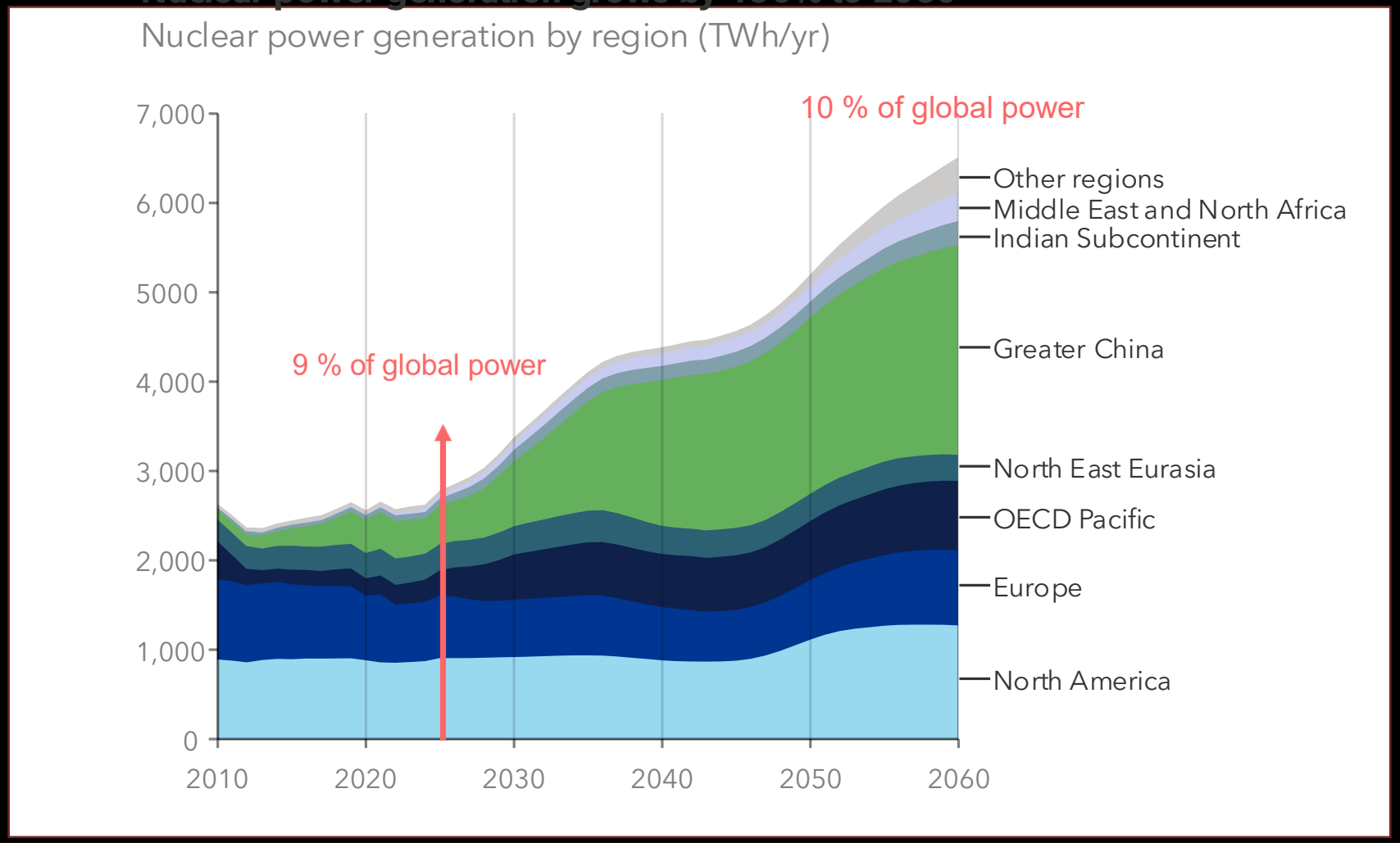
Every nation for itself – a requirement that each country establishes a repository



Ex. Europe lacks a joint strategy on nuclear (reactor types and infra-structure)

SUPPLY CHAIN FUNDAMENTAL

The projection is that nuclear energy may double in 30 years – with cooperation and burden-sharing, we may increase this

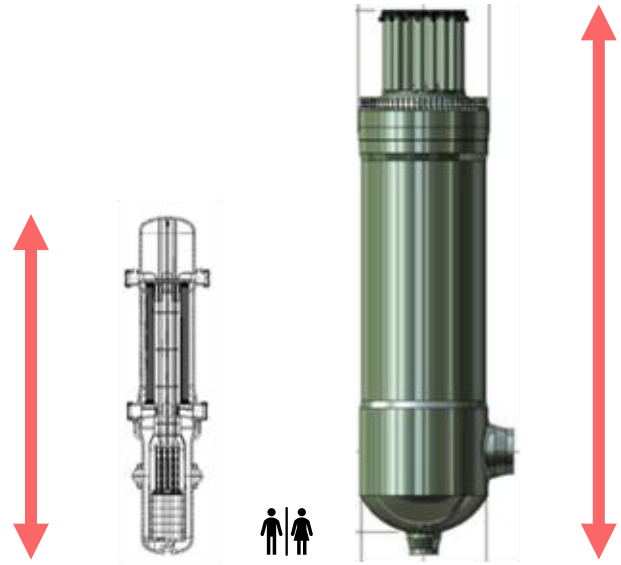


Fundamental for achieving progress:

- International cooperation on sensitive technologies (proliferation risk, geopolitical risks), and robust supply chains (regulations, security of fuel cycle and waste)
- Dependent on policy and financial support (CfD, loans)

Small “SMR” may also be suitable for shipping

- Microreactor (~ from 200 MW_e and below to 5 MW_e)
- Already established site fabrication and standardization on technologies, regulatory harmonisation
- Large international interest and broad engagement from yards and shipowners



NuScale	Xe-100
Water	Helium
200 MW_{th}	200 MW_{th}
60 MW_e	75 MW_e

** Reactor vessels drawn to scale (Xe-100 is about 22 m)*

DNV

UIO making a contribution with students and research!

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