Nuclear Fuel Cycle Technologies

ANMD-MRS23-224 · Nuclear & Fusion Technologies

A Global Sustainability Due Diligence & Market Research Study

History 2020–2024 · Base Year 2025 · Forecast 2025–2032 · Outlooks 2035 / 2040 / 2050 · Currency US$

WHY THIS REPORT

Nuclear fuel cycle technologies span the full chain that powers reactors — conversion and enrichment, fuel fabrication, and reprocessing and recycling — turning mined uranium into reactor-ready fuel and managing it through to recycle. Fuel types from low-enriched uranium (LEU) to high-assay LEU (HALEU) and mixed-oxide (MOX) underpin both today's fleet and tomorrow's advanced reactors. This decision-grade study sizes the global market three ways — value, tonnage and enrichment capacity (SWU) — across cycle stage, fuel type and application, across seven regions and four scenarios to 2032, with outlooks to 2050.

SUSTAINABILITY & SDG IMPACT — THE ANMD LENS

Sustainability is this report's backbone, not an afterthought. Beyond fuel supply, the cycle delivers measurable resource efficiency, waste-volume reduction and supply-chain security, while recycling strengthens the circular-economy story.

Mapped Sustainable Development Goals:

SDG 7	SDG 9	SDG 12
Affordable & Clean Energy	Industry, Innovation & Infrastructure	Responsible Consumption & Production

Measurable sustainability outcomes assessed:

- Resource efficiency and waste-volume reduction
- Fuel-supply-chain security
- Proliferation safeguards and mining impacts as a material risk
- Depleted-uranium tails and transport security assessed

Framework alignment: Double materiality mapped to GRI, SASB, ISSB, TCFD, TNFD, CSRD and the EU Taxonomy, with greenwashing and SDG-washing screens applied throughout.

WHAT'S INSIDE AT A GLANCE

53 Chapters	**9** Report Parts	**7** Regions Covered	**40+** Country Markets
2025–32 Forecast Horizon	**4** Forward Scenarios	**25+** Companies Profiled	**3** SDGs Mapped

REPORT COVERAGE

Geographic scope: North America, Europe, Asia Pacific, Latin America, Africa, Middle East and Rest of World — with named country intelligence. Europe leads enrichment capacity; North America is scaling HALEU; Asia Pacific is the demand engine; other regions assessed on their own merits.

- The full chain from mined uranium to recycled fuel
- Conversion-enrichment, fabrication and reprocessing-recycling
- LEU, HALEU and MOX fuels for today's and tomorrow's reactors
- Proliferation safeguards, mining impacts and transport security as risks

MARKET OVERVIEW

From single-source supply to diversified, recycled chain — where diversified enrichment, HALEU availability and recycling underpin resilience single-source supply cannot provide.

The fuel cycle is being reshaped by nuclear new-build, advanced-reactor HALEU demand and the drive to de-risk supply away from concentrated sources. Demand is driven by energy security and advanced-reactor deployment, supported by new enrichment capacity across North America, Europe and Asia Pacific. The market is read three ways — value, tonnage and enrichment capacity (SWU) — and forecast under four scenarios, each region reported separately.

- **Europe leads enrichment capacity** — France, Germany, the UK and the Netherlands, where Orano SA and Urenco Ltd operate the Western world's core enrichment base
- **North America is scaling HALEU** — the United States and Canada, investing in domestic enrichment and HALEU supply to enable advanced reactors and reduce import reliance
- **Supply security is the differentiator** — diversified enrichment, HALEU availability and recycling underpin resilience single-source fuel supply cannot provide
- **Cycle stage and fuel type segment the value** — conversion-enrichment, fabrication and reprocessing-recycling across LEU, HALEU and MOX fuels, each with distinct economics

REGIONAL OUTLOOK

Across seven reporting regions, the report separates leading markets from high-growth and emerging ones — each profiled in full rather than aggregated into Rest of World.

Region	Stage	Lead Country Markets & Drivers
Europe	Capacity leader	France, Germany, UK, Netherlands — Orano, Urenco enrichment base
North America	HALEU scaler	United States, Canada — domestic enrichment, HALEU, fabrication
Asia Pacific	Demand engine	China, South Korea, Japan — reactor fleets, fabrication, recycling
Latin America	Emerging	Brazil, Argentina — uranium resources, fuel programmes
Africa	Frontier	Namibia, Niger, South Africa — uranium mining, conversion linkage
Middle East	Frontier	UAE, Saudi Arabia — new programmes, fuel-supply agreements

KEY MARKET DRIVERS & RESTRAINTS

Drivers	Restraints
• Energy-security + supply-diversification drive • Advanced-reactor HALEU fuel demand • Nuclear new-build and fleet life-extension • Closed-cycle resource-efficiency goals • Enrichment and fabrication technology gains	• HALEU supply-chain and capacity bottlenecks • Enrichment-capacity build lead times and cost • Proliferation safeguards and policy constraints • Reprocessing economics and public acceptance • Geopolitical concentration of supply

SEGMENTATION SNAPSHOT

By Cycle Stage	Conversion & enrichment · fuel fabrication · reprocessing & recycling
By Fuel Type	LEU · HALEU · MOX / recycled · advanced fuels
By Application	LWR fleet · SMR / advanced reactors · research reactors
By End User	Utilities · reactor vendors · governments · fuel suppliers
By Business Model	Material supply · enrichment service · fabrication · managed cycle
By Scale	Pilot · regional · commercial supply

TECHNOLOGY & APPLICATION FINDINGS

Where the category is differentiating fastest — the technology and application fronts that separate leaders from followers:

- **LWR fleet** — the operating reactor fleet depends on LEU conversion, enrichment and fabrication for continuous fuel supply
- **SMR & advanced reactors** — next-generation designs require HALEU and novel fuel forms, driving new enrichment and fabrication capacity
- **Reprocessing & recycling** — closed-cycle reprocessing and MOX recover energy value and reduce waste volumes and long-lived inventory

TABLE OF CONTENTS — PARTS & CHAPTERS

The full report is organised into nine parts across 53 chapters, listed below. Detailed sub-headings, country tables and directories are provided in the full report.

COMPETITIVE & INVESTMENT SNAPSHOT

The competitive field spans integrated fuel-cycle majors, enrichment specialists and fabrication suppliers. Deal activity — enrichment-capacity expansion, HALEU supply contracts and recycling partnerships — signals a market consolidating around secure, diversified supply.

Representative players profiled in the full report:

Orano SA · Urenco Ltd · Westinghouse Electric Company LLC · Cameco Corporation · Centrus Energy Corp. · Framatome SAS · and 20+ further profiled players.

Investment intelligence: venture, infrastructure, development, climate and blended finance, green bonds and sustainability-linked loans — culminating in a bankability assessment and a conditional investment view.

KEY QUESTIONS THIS REPORT ANSWERS

- How large is the global nuclear fuel cycle market, and how fast will it grow to 2032?
- Which regions, countries and segments offer the strongest risk-adjusted opportunity?
- Which technologies and platforms reshape the addressable market and the cost curve?
- Who leads, and where is the competitive and patent white space?
- Is the investment case bankable — and under what conditions?
- How does the category align with the SDGs and disclosure regulation?

WHY ANMD — THE DIFFERENCE

Most market studies stop at units and revenue. This report is built as a sustainability due diligence instrument — fusing market sizing with ESG, SDG, climate and natural-capital intelligence and a decision-ready bankability view in a single architecture.

- **Triangulated sizing** — every market read three ways so value, volume and the physical-unit views reconcile rather than conflict.
- **Region-honest forecasting** — Latin America, Africa and the Middle East reported in full, never hidden inside Rest of World, every forecast resolved to the 2025 base year.
- **Integrated evidence base** — company, patent and project databases linked to the analysis, with published-filing patents and FTO treated as an indicator, not a legal conclusion.
- **No-fabrication discipline** — every estimate carries a data-confidence rating and disclosed sources; gaps are flagged for further diligence, never filled with invented numbers.
- **Anti-greenwashing rigour** — SDG-washing and greenwashing screens plus claim-substantiation checks built into the ESG and project analysis.
- **Decision-first structure** — 9 Parts and 53 Chapters culminating in stakeholder playbooks and a clear, conditional investment view.

WHO SHOULD BUY THIS REPORT

Utilities, reactor vendors, governments, fuel suppliers, energy planners, investors and policymakers, and strategic corporate planners and decision-makers.

Access the Full Report

The complete report delivers all 53 chapters in full, with every sub-heading, country table, company and patent directory, forecast model and due diligence checklist.

Purchase at **www.anewmarketdynamics.com** · Standard & Premium licences · Single-Site (SSL) and Global-Site (GSL) options at checkout.

Want the Complete Detailed Table of Contents?

This prospectus lists the nine parts and 53 chapters. The complete detailed table of contents — every sub-heading, country table, exhibit, company and patent directory and annex — is available on request to registered users. To receive it, register with your official company email at **www.anewmarketdynamics.com**. The full detailed table of contents will be sent directly to your registered company email address.