

Uranium's Structural Supply Gap: Creating the Next Investment Opportunity



Executive Summary

Uranium offers exposure to a structural, multi-year supply-demand deficit with scarcity, pricing power



+124% 2040 demand growth

A Structural, Not Cyclical, Deficit

WNA raised its 2040 demand forecast from +99% to +124% (175m to 391m lbs), with electrification, AI data centres and 31 countries targeting a tripling of nuclear capacity providing further upside.



1.4bn lb cumulative deficit to 2045

Supply Response Faces Structural Constraints

The shortfall could exceed 3.0bn lbs if nuclear capacity triples. Mine supply is highly concentrated, with Kazakhstan accounting for 38% and relying on routes through Russia, while new mines can take more than 10 years to reach production.



\$226bn front-end investment to 2050

Mid-Cycle Bottlenecks Drive Value

Conversion and enrichment remain the hardest fuel-cycle stages to replace. Investment needs are concentrated in enrichment (\$74bn) and fuel fabrication (\$88bn), where Western capacity remains the most constrained.



27.1M SWU held by largest enricher

Concentration Is The Risk To Underwrite

Russia held the largest share of global enrichment capacity in 2024, while the U.S. has no domestically owned enrichment capacity. This concentration supports pricing but also creates significant exposure to sanctions and export restrictions.

Source: Aranca Research. WNA World Nuclear Fuel Report 2025; UxC; TradeTech

Nuclear Anchors The Low-carbon Grid Through Reliability And Efficiency

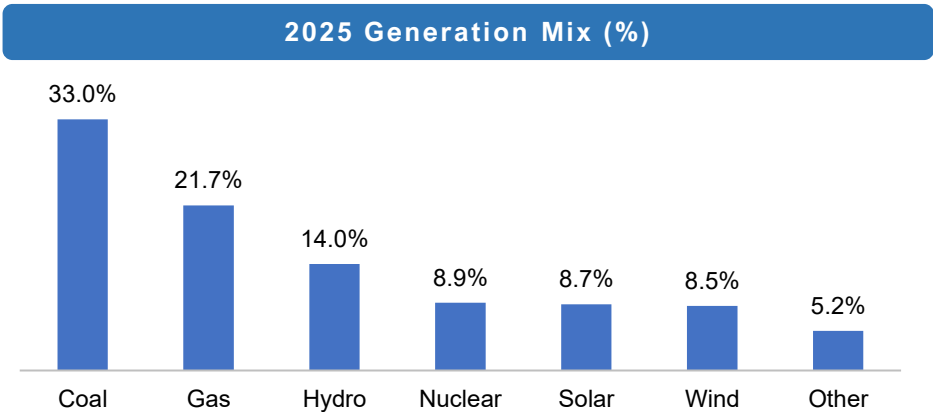
More reliable, cleaner, safer and far less land-hungry than any other electricity source at the same time

Record Generation: Global electricity generation reached 31,779 TWh in 2025 (+2.8%)

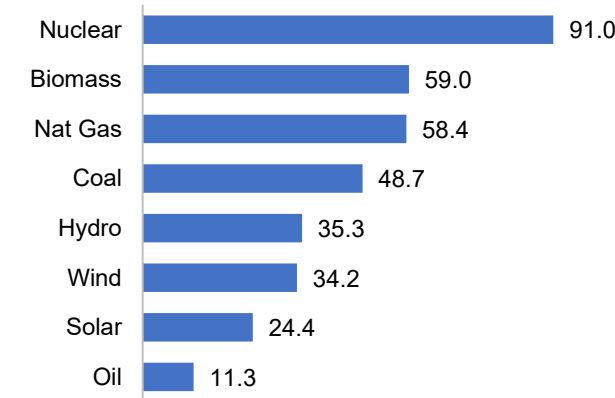
Renewables Lead: Renewables (33.8%) overtook coal (33.0%), while nuclear provided 8.9% as the largest always-available low-carbon source

Nuclear’s Role: Reliable power becomes more important as weather-dependent renewables scale, benefiting uranium demand.

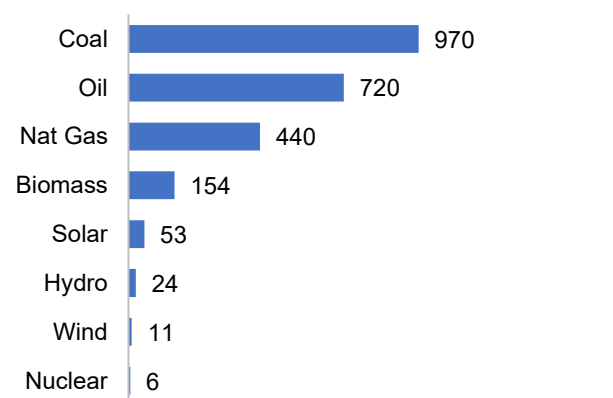
Why Nuclear? Reliable baseload power with a low carbon footprint, low mortality rates, minimal land use and low waste generation.



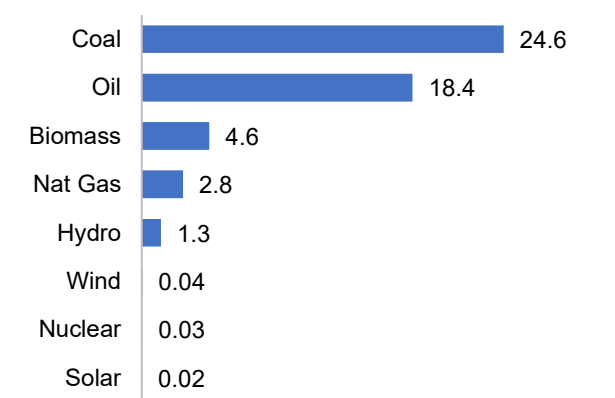
Capacity Factor (%)



Lifecycle Emissions (g CO₂e/GWh)



Mortality (deaths per TWh)



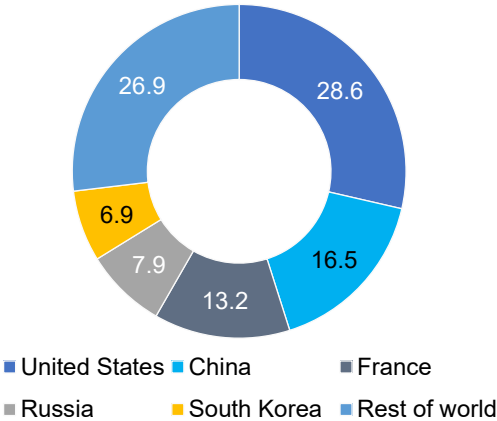
- Reliable
- Clean
- Safe
- Efficient
- Uses less land
- Least waste

Source: Aranca Research, Sprott Physical Uranium Trust Investor Presentation (March 2026) and American Nuclear Society; Cameco.

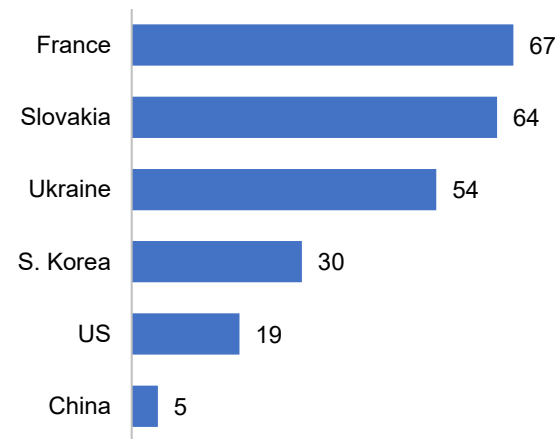
Nuclear Output Is Concentrated, While Capacity Growth Is Shifting East

Five nations produce nearly three-quarters of the world's nuclear electricity

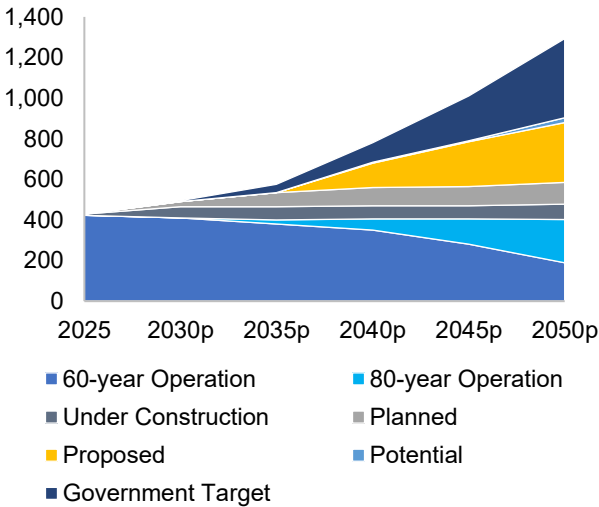
Generation By Country, 2024 (%)



Share Of Own Grid (%)



Capacity Projection (GWe)



Top 5 ≈ 73% of global output

14 countries rely on it for ≥¼ of power

Concentrated Generation

- Top 5 collectively accounted for ~73% of global output
- U.S. 782 TWh (28.6%), China 451 TWh (16.5%) and France 362 TWh (13.2%)

Growth Is Moving East

- Nuclear powers 67% of France's electricity, vs. ~30% in Korea and ~19% in the U.S.
- China's remains below 5%, yet building nearly half of all new reactors globally

Record Output, Flat Capacity

- Nuclear generation rose 1.3% to a record 2,812 TWh in 2025
- Capacity remained flat at 420 GW, with 3 GW added and 3 GW retired

New Build Is Slow

- Only 10 reactors (12.2 GW) began construction in 2025, 9 in China and one in Russia
- Major projects faced further delay

Source: Aranca Research, Energy Institute, Statistical Review of World Energy 2025; IAEA PRIS; Ember, Global Electricity Review 2026; WNA; IEA; p = projected, GWe = Gigawatt electric

Reactor Requirements Are Set To More Than Double By 2040

Structural growth in nuclear power is driving sustained increases in uranium demand

**REACTOR REQUIREMENTS
SET TO MORE THAN
DOUBLE BY 2040**

175M

lbs U₃O₈e (2024)



391M

lbs U₃O₈e (2040)



+124%

forecast, raised from +99%



Electrification

+157% World electricity demand by 2050

Global electricity demand is set to more than double from 31,229 TWh in 2023 to 80,175 TWh by 2050, driven by electrification, AI, data centres and emerging-market growth.



The Build-out

639 Reactors operating or under construction

438 operational, 79 under construction, 122 planned. 31 countries pledged at COP29 to triple nuclear by 2050.



AI & Data Centres

2.5× Data-centre power by 2030

AI power consumption alone is expected to increase more than fourfold, with major technology companies increasingly turning to nuclear power to secure reliable, around-the-clock electricity.



Policy Reversal

49→194m U.S. lbs needed by 2050

U.S. uranium demand is expected to rise from 49m lbs to 194m lbs by 2050, supported by policies targeting a ~4× increase in nuclear capacity, while Europe is reversing nuclear phase-outs.

Clear Sign of a Structurally Undersupplied Market: Demand is not only growing, but forecasts are also being revised higher (WNA raised its 2040 demand growth forecast from +99% to +124%)

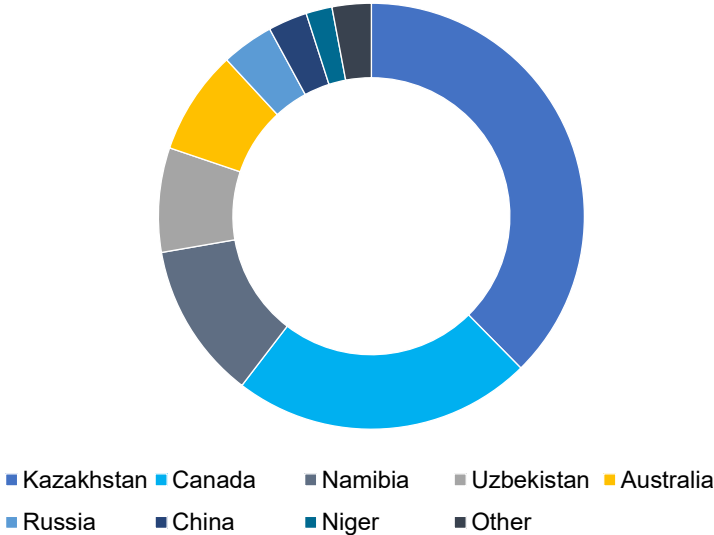
Source: Aranca Research, Sprott Physical Uranium Trust Investor Presentation, Mar 31, 2026

Uranium Supply Cannot Keep Pace With Structurally Rising Reactor Demand

A widening deficit: reactor demand outpaces mine supply year after year

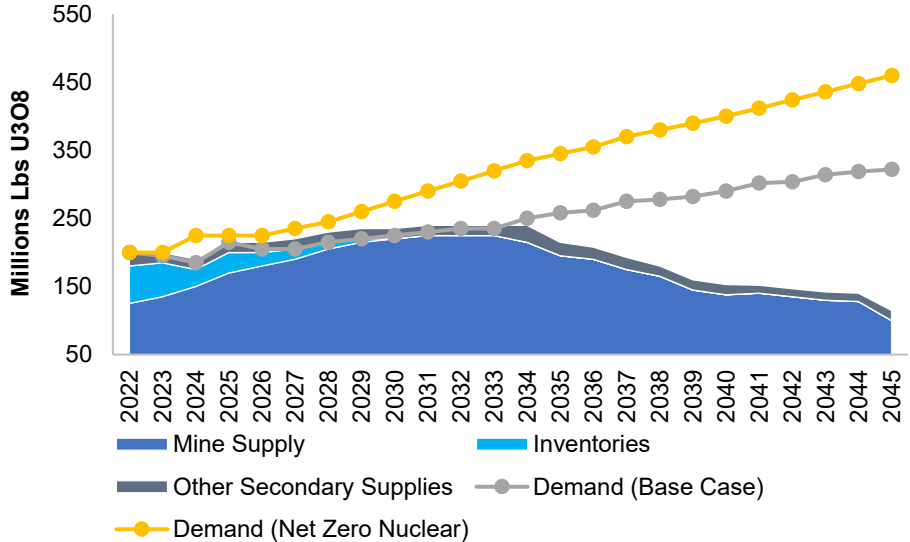
Cumulative 1.4 billion lb uranium deficit to 2045 and over 3.0 billion lb if the world triples nuclear capacity by 2050

Largest Uranium Producing Countries, 2024 (%)



Kazakhstan, which accounts for **38% of global uranium supply**, ships much of its output through Russia. The Russia-Ukraine war, sanctions and export restrictions have disrupted this supply chain.

Uranium Supply & Demand Estimates (M Lbs U₃O₈)



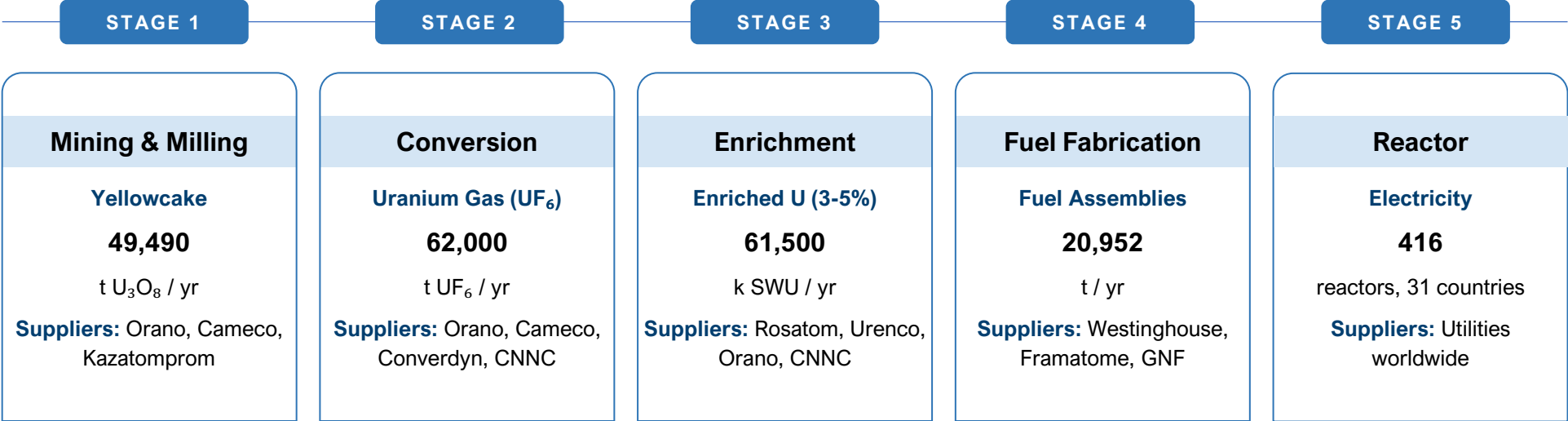
Demand rises to c.320 (base case) and c.460 (net-zero) by 2045 as supply peaks near 2032, then declines

Greenfield mines take 10+ years from discovery to production; utilities have contracted below replacement for 13 straight years

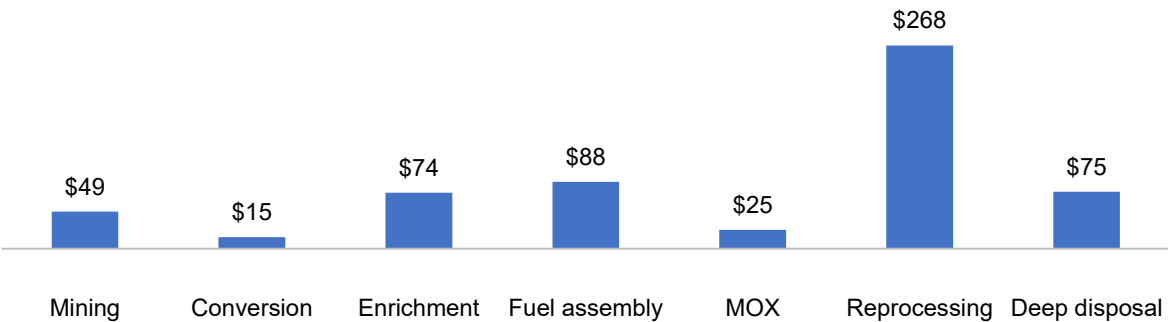
Source: Aranca Research, Sprott Physical Uranium Trust Investor Presentation, (UxC LLC & Cameco 3/31/2026; WNA Nuclear Fuel Report 2025; TradeTech/UxC prices).

Conversion And Enrichment Are The Critical Fuel-cycle Bottlenecks

One fuel cycle; distinct markets; separate capital needs



Fuel-cycle Investment Need, 2025-50 (US\$ Bn) - The Back End Dominates



Capital-heavy And Concentrated

- Reprocessing alone requires \$268bn of capital, more than the entire front end combined
- Conversion is a relatively small \$15bn market but one of the tightest, with just 5 plants worldwide
- Russia further adds to this concentration, accounting for half of global conversion capacity and ~40% of enrichment capacity

Source: Aranca Research, World Nuclear Association, Economics of Nuclear Power & World Uranium Mining Production, USGS Fact Sheet 2025-3057; IAEA PRIS; EY-Parthenon.

A Diversified Nuclear Index Captures The Theme Across The Value Chain

The Solactive Global Uranium & Nuclear Components TR Index (SOLURANT)

01

Diversified exposure across the global uranium and nuclear value chain; miners, developers, physical uranium vehicles and nuclear technology companies.

02

Global universe selecting eligible companies from developed and emerging markets on predefined criteria.

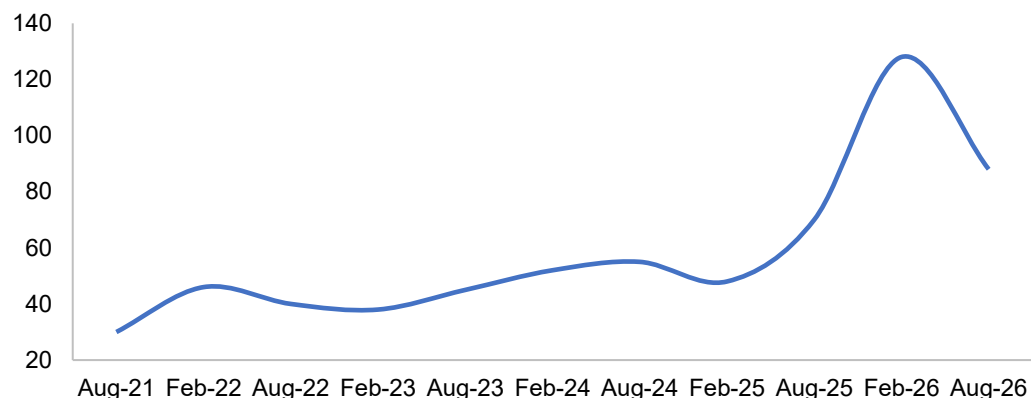
03

Rule-based selection (UxC Uranium Suppliers Annual): pure-play, non-pure-play or nuclear-component producers.

04

Liquidity and market-cap filters ensure free-float and trading requirements, enhancing investability.

SOLURANT Index Price (USD)



+5.16%
YTD

+29.26%
1 Year

+31.57%
3 Year

Top 10 Index Components by Weight

Cameco Corp.	22.22%	NAK Kazatomprom AO	4.38%
Sprott Physical Uranium Trust	6.36%	Energy Fuels Inc	3.46%
NexGen Energy Ltd.	6.17%	X-Energy ORD	3.26%
Oklo Inc.	5.94%	Centrus Energy Corp-class A	3.16%
Uranium Energy Corp.	5.31%	Paladin Energy Ltd.	3.08%

Source: Aranca Research, Solactive / Stoxx Factsheet; Bloomberg. Performance as of August 19, 2026.

ETFs Offer Diversified Access, But Exposure Differs Materially By Holdings Mix

Nuclear-focused ETFs give diversified exposure across the nuclear value chain

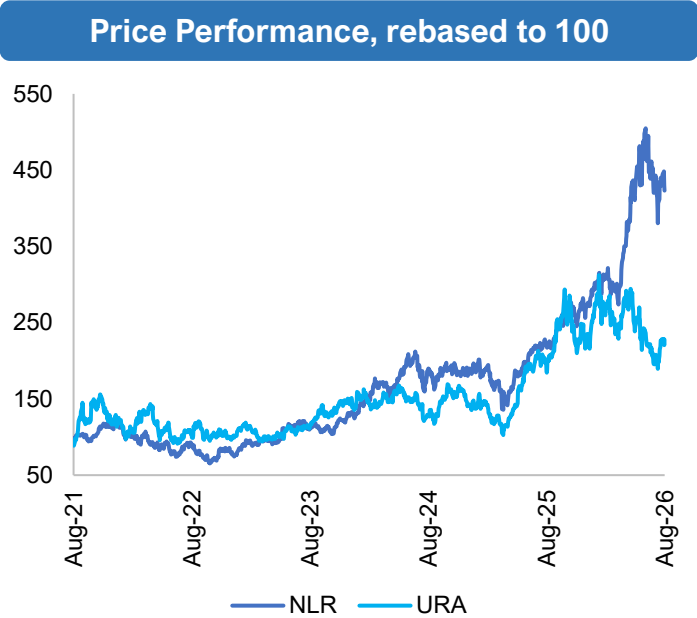
VanEck Uranium & Nuclear ETF (NLR)

Tracks the MVIS Global Uranium & Nuclear Energy Index: uranium producers plus utilities, power generators, reactor developers and engineering firms.

Global X Uranium ETF (URA)

Exposure to uranium mining, exploration, refining and nuclear fuel production, plus manufacturers of nuclear components.

Price Performance	NLR	URA
YTD	55.75%	5.34%
1 Year	94.12%	23.48%
3 Year	54.86%	24.85%
5 Year	34.34%	20.37%



Top 5 Index Components by Weight

NLR				URA			
Constellation Energy	8.79%	Fortum Oyj	5.71%	Cameco Corp	22.22%	Oklo Inc.	5.95%
Cameco Corp	8.01%	Bwx Technologies Inc	5.59%	Sprott Physical Uranium	6.37%	Uranium Energy Corp	5.14%
Public Service Enterprise	6.51%			NexGen Energy	6.17%		

Source: Aranca Research, VanEck (NLR) & Global X (URA) fact sheets; Bloomberg. Performance as of August 19, 2026, rebased Aug 21

Supply Concentration And Execution Remain The Key Risks To The Thesis

Supply reversal, geopolitical concentration, ramp-up challenges and trade risks



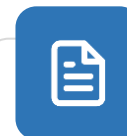
Supply Discipline Reversal

Kazatomprom cut its planned 2026 production from 32,777 to 29,697 t U₃O₈ and retains the option to reduce output by a further 20%, which can be reversed at short notice.



Expropriation Risk – Niger

Niger took control of the SOMAIR uranium mine in June 2025, removing Orano from its operations. However, an international court ruled that the disputed uranium cannot be sold or moved.



Licence & Concession Risk

Uranium production in Kazakhstan operates under fixed-term agreements. The Akdala agreement expired in March 2026 and had to be renewed, with terms potentially changing upon renewal.



Ramp-Up Execution Risk

Restarted mines are struggling to meet production targets. Paladin cut guidance for Langer Heinrich in FY25, while Boss Energy cut FY26 guidance for Honeymoon project due to commissioning and weather delays.



Trade Restriction Risk

Under U.S. law, Russian uranium imports are being phased down through 2026-27, with all exemptions ending on January 1, 2028. Russia responded with similar restrictions in 2024.



Demand Timing Risk

Delays to TEPCO's Kashiwazaki-Kariwa reactor in Japan and the Palisades reactor in the U.S. have pushed demand further out. Nuclear reactors create uranium demand only once they start operating.

Source: Aranca Research, Kazatomprom; Orano; Paladin Energy; Boss Energy; Public Law 118-62; U.S. Energy Information Administration

Key Takeaways For Investment Managers

The structural case, the routes to exposure, and what to watch, distilled for portfolio decisions

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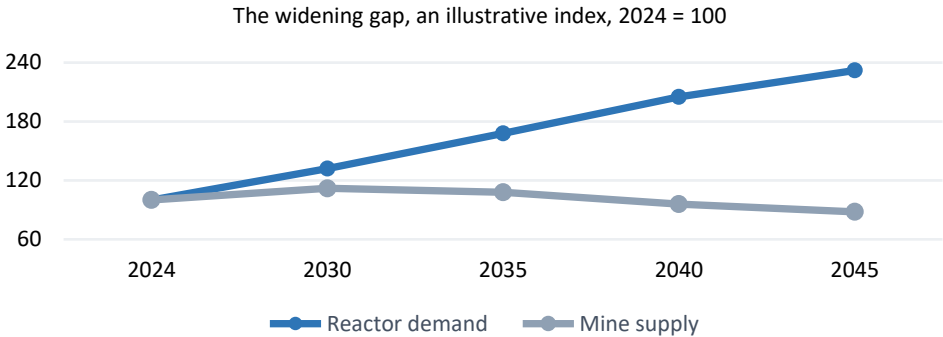
uranium demand
by 2040

639

reactors in the
global build-out

1.4bn

lb cumulative
shortfall by 2045



Demand more than doubles while mine output stalls — a structural shortage, not a market cycle

01-02 · THE STRUCTURAL CASE



01

Structural, Multi-Year Deficit

Demand more than doubles by 2040 while mine supply falls behind.

A cumulative shortfall near 1.4bn lb by 2045 points to a deficit the market must price in, not trade around.



02

Durable, Policy-Backed Demand

A 639-reactor build-out underwrites decades of offtake.

Electrification, AI and data-centre load growth, and pro-nuclear policy make this demand unusually insensitive to price.



03

Bottlenecks Beyond the Mine

Conversion and enrichment are the tightest links in the chain.

Each carries its own supply and pricing dynamics. Concentrated mine supply and thin Western capacity compound the squeeze.



04

Several Routes to Exposure

Direct value-chain equities, the SOLURANT index, or ETFs such as NLR and URA.

Each blends physical uranium, miners and utilities differently, the wrapper decides the risk you own.



05

What to Monitor

Term-vs-spot spread, utility inventories, restart capacity, enrichment prices.

There is no central uranium market, so the spot price is a thin signal and rarely reflects true supply and demand.

Source: Aranca Research

Connect with Our Team



Ruchika Mungekar

Assistant Manager, Investment Research

✉ ruchika.mungekar@aranca.com



Dharmishtha Tripathi

Junior Analyst, Investment Research

✉ dharmishtha.tripathi@aranca.com



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