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Nuclear in the New Industrial Revolution

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Nuclear in the New Industrial Revolution

Nuclear energy is being embraced internationally as the cornerstone of a carbon-free energy future

Climate Change & Decarbonization Goals

Increasing Importance of Energy Security

Positive Shift in Public Perception



UNITED STATES

Dec 2023

U.S. leads coalition to **triple nuclear power** by 2050 in effort to address climate change¹



CANADA

Feb 2023

Canada announces **small modular reactor program** to help fund development²



UNITED KINGDOM

Jan 2024

UK government set out the **biggest expansion of nuclear power** to support energy security³



CHINA

Aug 2024

China approves 11 new nuclear reactors for total **investment of US\$31 billion**⁴



JAPAN

Feb 2023

Japan Cabinet approves policy to **extend operation of current reactors a construct new reactors**⁵



SOUTH KOREA

Sep 2024

President Yoon Suk Yeol **reverses previous nuclear policy** and increases role of nuclear to cut emissions⁶



INDIA

Jun 2024

India to **increase nuclear power generation capacity by 70%** in the next 5 years⁷



SWEDEN

Nov 2023

Sweden unveils roadmap for up to **10 new large-scale reactors** by 2045⁸



FRANCE

Feb 2022

Macron announces **major nuclear power program** to build 14 new reactors and fleet of smaller reactors⁹

BlackRock.

Microsoft

GLOBAL INFRASTRUCTURE PARTNERS

BlackRock, Global Infrastructure Partners, Microsoft, and MGX launch new AI partnership

"\$100 billion investment potential will enhance American competitiveness in AI while meeting the growing need for energy infrastructure to power economic growth"

"The capital spending needed for AI infrastructure and the new energy to power it goes beyond what any single company or government can finance," said **Brad Smith, Vice Chair and President of Microsoft**

Constellation Energy to restart Three Mile Island nuclear plant, sell the power to Microsoft for AI

"The decision here is the most powerful symbol of the rebirth of nuclear power as a clean and reliable energy resource," said **Constellation CEO Joe Dominguez**

"In this rebirth, we see the most powerful sign that America will turn to the enduring promise of nuclear energy, an old and loyal ally that is renewed and ready to light the way forward"

Constellation.

Microsoft

¹ U.S. leads coalition to triple nuclear power by 2050 in effort to address climate change; CNBC

² Canada Launches New Small Modular Reactor Funding Program; Government of Canada

³ Biggest expansion of nuclear power for 70 years to create jobs, reduce bills and strengthen Britain's energy security; Gov.uk

⁴ China Makes \$31 Billion Nuclear Push With Record Approvals; BNN

⁵ Cabinet approves change in Japanese nuclear policy; WNN

⁶ In New Nuclear Push, South Korea Revives Plans to Build Two Reactors; Time Magazine

⁷ June 25, 2024 Press Release; Department of Atomic Energy

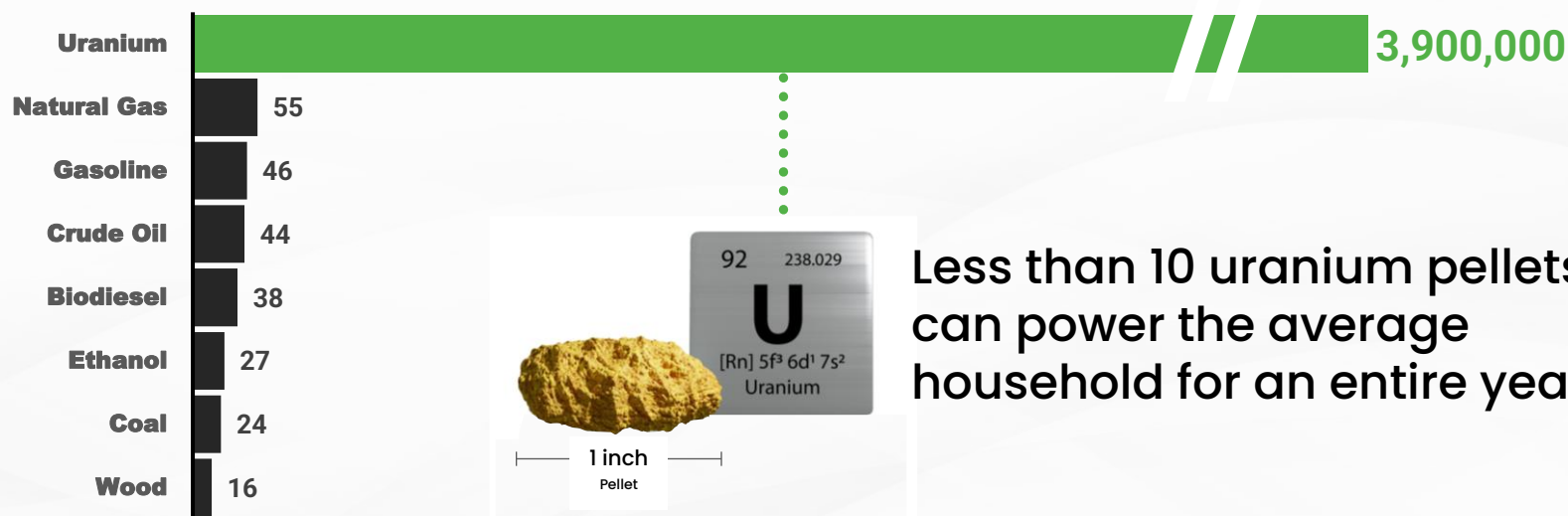
⁸ Sweden plans 'massive' expansion of nuclear energy; WNN

⁹ France Announces Major Nuclear Power Buildup; New York Times

Uranium's Energy Density

Uranium's unique energy density enables nuclear power to generate vast amounts of electricity with relatively small quantities of fuel, reducing the logistical and environmental burden compared to fossil fuels

Energy Density by Fuel Source (MJ/kg)¹



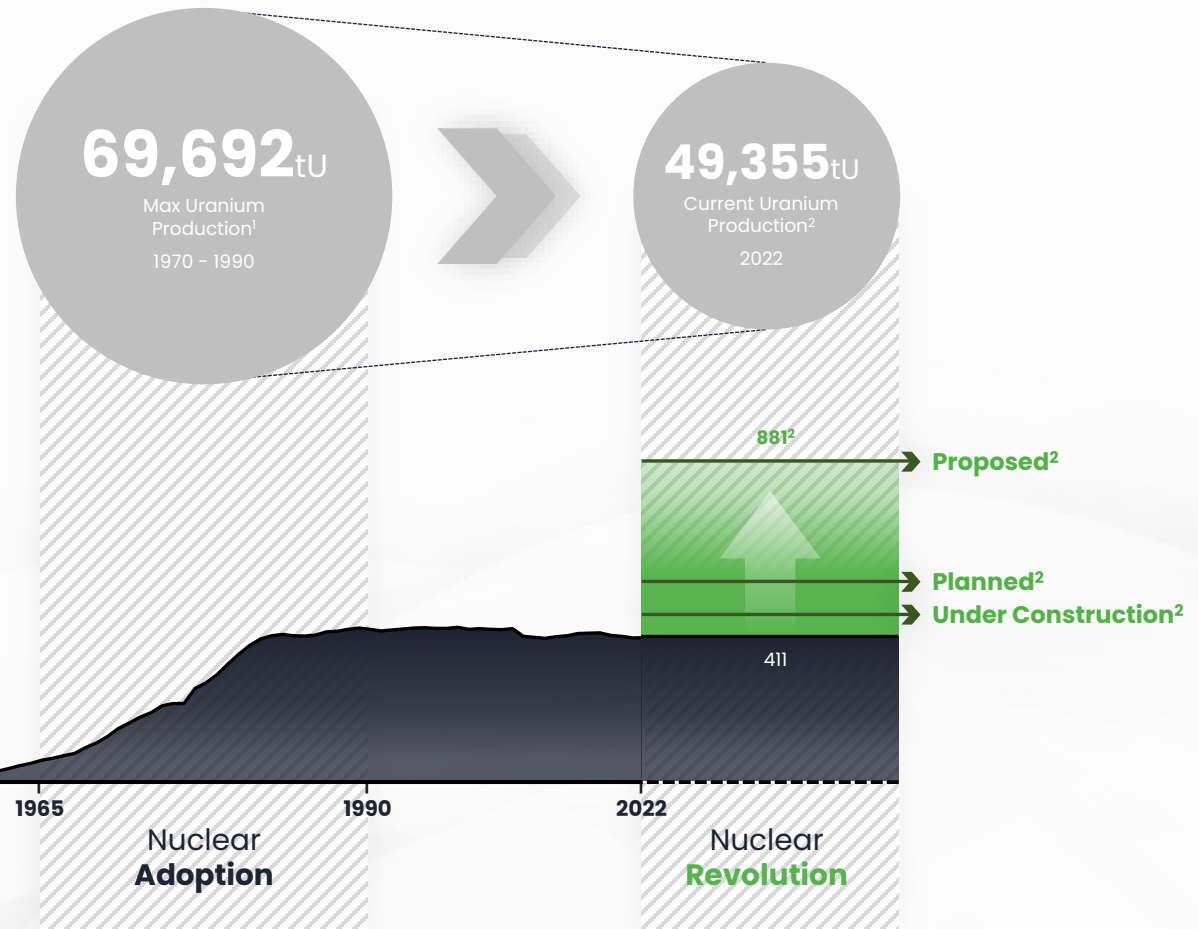
¹ I. Hore-Lacy, "Future Energy Demand and Supply," in Nuclear Energy in the 21st Century, 2nd ed., London, UK: WNUP, 2011, ch.1, sec.6, pp.9
² Mining.com; The power of a uranium pellet

A Multigenerational Inflection Point

Global uranium production levels remain below the amount produced during initial **nuclear adoption**

The current **nuclear revolution** suggests a pressing need to expand uranium supply

Nuclear Reactors by Year (1954 – 2022)³

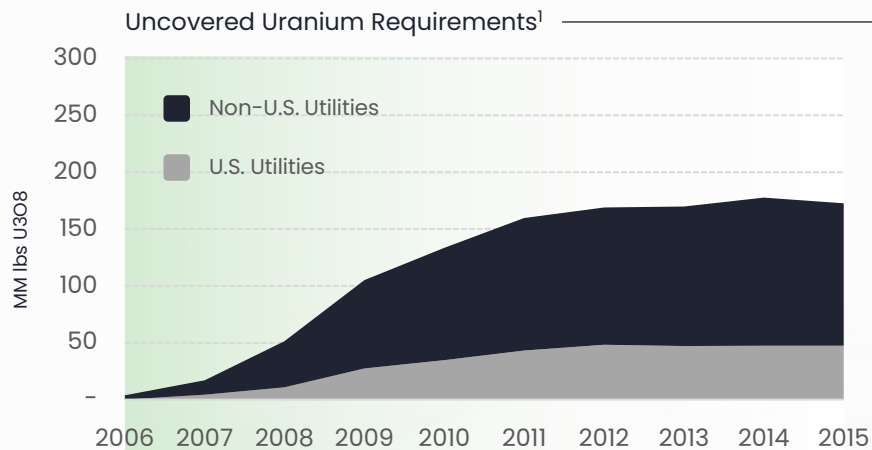


¹Forty Years of Uranium Resources, Production and Demand in Perspective; The Red Book Retrospective; Nuclear Energy Agency
²World Nuclear Association; Proposed, Planned, and Under Construction added to 411 current reactors
³Nuclear Power Reactors in the World; IAEA

A Unique Contracting Cycle

Nuclear Adoption

2006 Contracting Cycle

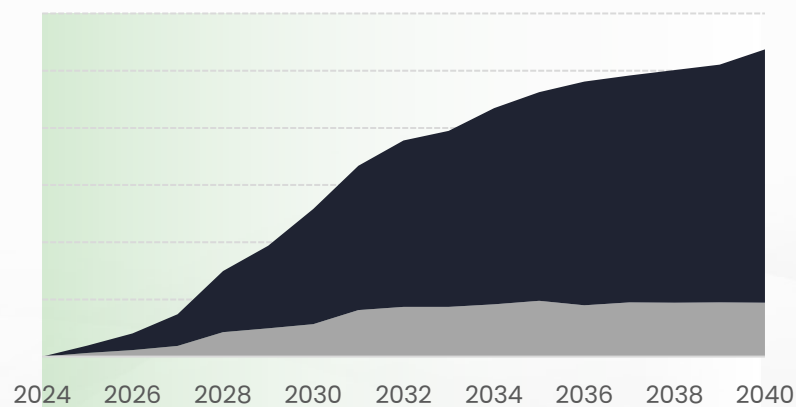


263%

Price appreciation to subsequent 2-year high

Nuclear Revolution

2024 Contracting Cycle



TBD

Price appreciation to subsequent 2-year high

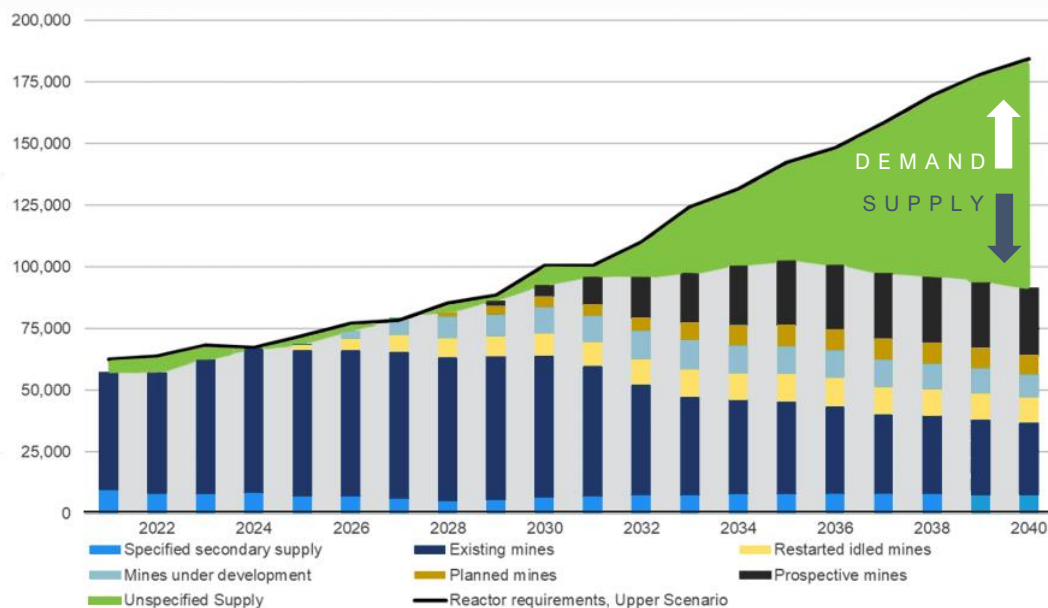
¹ The Uranium Market Outlook, Executive Summary, UxC

Supply & Demand Profile

Growing supply deficit calls for 5 new Rook I sized projects to be found, permitted, financed, and constructed over the next 20 years

Current mine supply has never been more fragile

Projected Supply and Demand of Uranium (tonnes U)¹



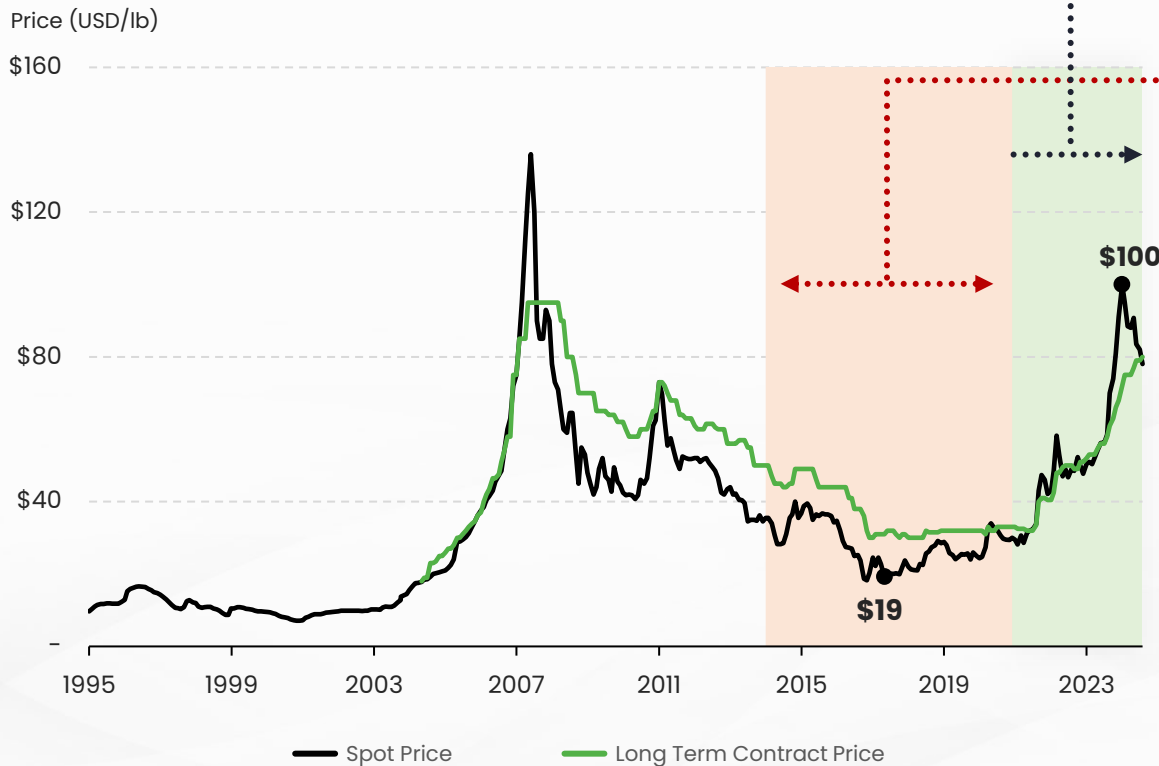
Demand for uranium is expected to rise by
127% by 2030
 and
200% by 2040

Creating a ~240M lbs. deficit in 2040 that will continue to widen¹ as growth in annual demand of 180-190mlbs is expected to triple by 2050².

¹The World Nuclear Fuel Report
²OECD Uranium 2022, Resources, Production, Demand

Uranium Price Environment

Uranium Price History¹



✓ Economic investment into supply growth

! Major underinvestment in new uranium supply

- Uranium mine development can take over 10 years²
- Uranium is a small portion of overall reactor operating cost
- Utilities are prioritizing supply over pricing as a driving metric

¹Historical U308 pricing; UxC
²URAM-2018: Ebb and Flow – the Economics of Uranium Mining; IAEA

Fundamental Supply Factors

Supply Deficits

- Underinvestment in exploration and mine development during 2014-2020¹
- Strategic reserve and mine depletion
- Secondary supply drawn down
- Bottlenecks in fuel services
- Idled mines face challenged restarts

Geopolitical Risk

- Geopolitical Risk
- Prohibiting Russian Uranium Imports Act
- Nationalization
- Unprecedented conflict
- Highly concentrated supply chains
- Trade and logistic challenges
- Bifurcating markets

Supply Landscape

- Supply Landscape
- U3O8 supply ~130M lbs./yr¹
- Structural primary deficit ~60M lbs./yr²
- Mobility of supply issues
- Producers contracted for 5+ years, limiting access
- Uranium supply will need to triple by 2050³ to meet the growing demand

¹2023, Q2 Goehring and Rozencwajg Market Commentary / World Nuclear Association / TradeTech / UxC
²WNA - World Nuclear Fuel Report 2023 - Upper Case scenario
³OECD Uranium 2022, Resources, Production, Demand

Fundamental Demand Factors

Demand Shocks

- Extensions / Refurbishments
- Closure U-turns
- Capacity Increases
- Physical Trusts
- Small Modular Reactors
- Procurement of uranium, LEU and HALEU for strategic reserves

Government Policies

- COP28 - triple nuclear capacity pledge by 2050
- EU Net Zero Industry Act & Great British Nuclear
- ADVANCE Act
- Japanese Green Transformation
- China 5-year Plan

Industry Growth

- U3O8 Demand ~190M lbs./yr¹
- ~60 reactors are under construction, an additional 110 planned²
- Doubling of nuclear capacity expected by 2050³
- Conversion of coal facilities to nuclear
- AI development & Electrification

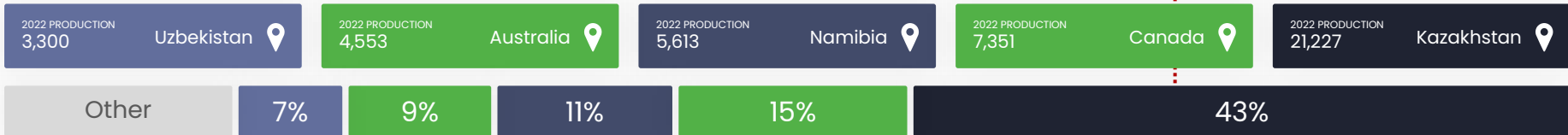
¹2023, Q2 Goehring and Rozencwajg Market Commentary / World Nuclear Association / TradeTech / UxC
²WNA - World Nuclear Fuel Report 2023 - Upper Case scenario
³OECD Uranium 2022, Resources, Production, Demand

Production Overview By Country

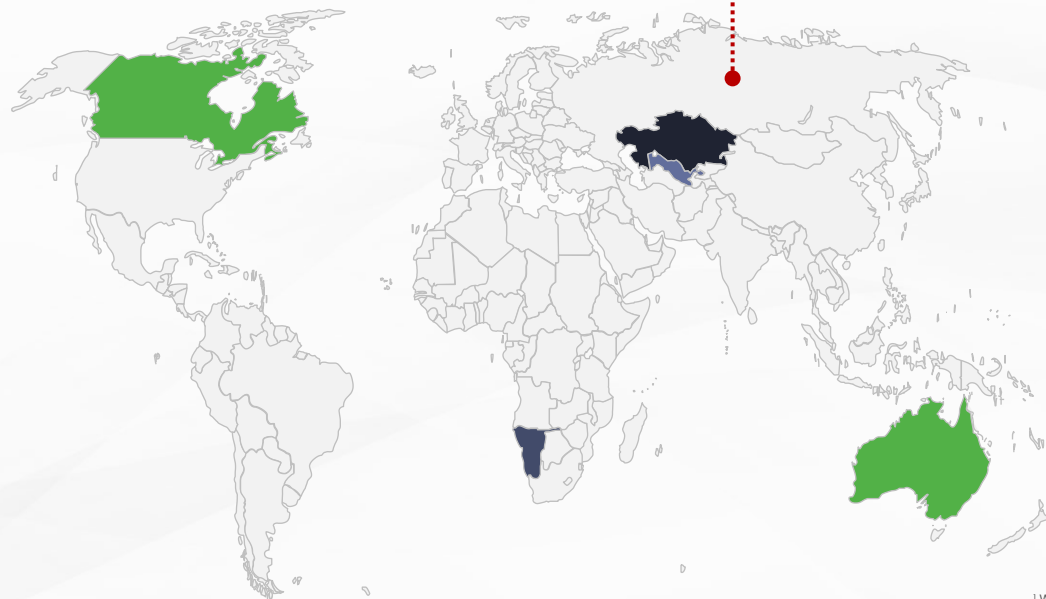
Uranium market bifurcation has prompted supply chains to focus on securing domestic supply

! Russia's invasion of Ukraine has exposed fragility in the uranium supply chain²

Top 5 Uranium Producers Globally (tonnes U)¹



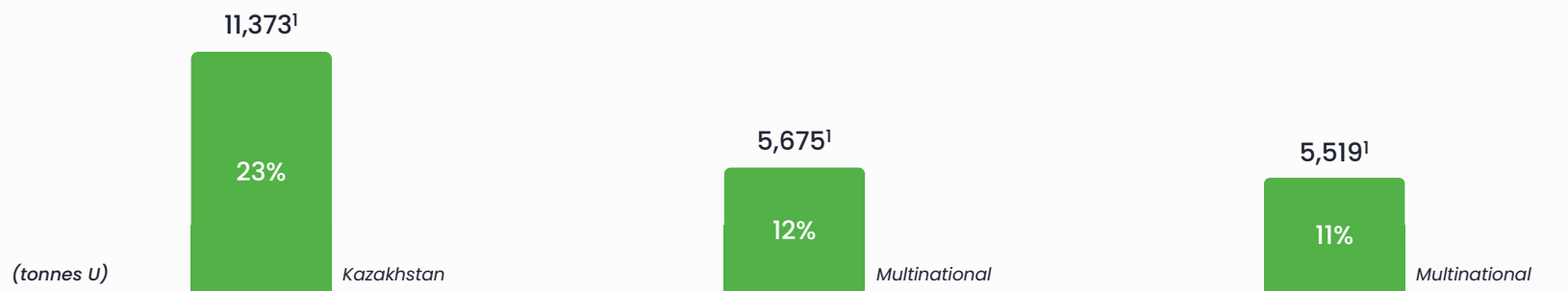
- **5 countries comprise 85%** of the world uranium production¹
- **50%+** of supply is embedded with significant geopolitical risk¹
- The U.S. is the **largest consumer of uranium** and has less than 0.2% of global production¹



¹ World Nuclear Association
² U.S. Rethinks Uranium Supply for Nuclear Plants After Russia's Invasion of Ukraine; The Wall Street Journal

Production Overview By Producer

The **top 3 global producers** account for nearly half of global production and are facing production challenges



2024 PRODUCTION GUIDANCE CUT²
 Announced a 14% cut to production guidance for 2024
 February 1, 2024

2025 PRODUCTION GUIDANCE CUT³
 Announced a 17% cut to production guidance for 2025
 August 23, 2024

2023 PRODUCTION MISS⁴
 Announced 2023 production volumes (17.6M lbs) fell short of guidance (20.3M lbs), citing mine restart issues
 February 8, 2024

KEY LAKE OPERATIONAL CHALLENGES⁵
 Announced lowered guidance due to lack of skilled personnel and supply chain issues
 September 5, 2023

NIGER MINE LICENSE REVOKED⁶
 Following a 2023 political coup in Niger, the local government evicted Orano from one of its largest global uranium deposits
 June 22, 2024

INTERNATIONAL COST CHALLENGES⁷
 Increased uranium mineral extraction taxes in Kazakhstan target increased production and are raising costs on low-cost production options
 July 10, 2024

¹ World Nuclear Association; Uranium production by company 2022
² Kazatomprom 4Q23 Operations and Trading Update; February 1, 2024
³ Kazatomprom 1H24 Financial Results and 2025 Production Plan Update; August 23, 2024
⁴ Cameco Annual Report 2023
⁵ Cameco Production and Market Update; September 5, 2023
⁶ Le Monde; Niger's junta evicts French multinational Orano from one of its largest uranium deposits; June 22, 2024
⁷ Kazatomprom corporate release; July 10, 2024

Growing International Supply Competition

The U.S. relies heavily on international markets for uranium supply but securing supply may become increasingly difficult

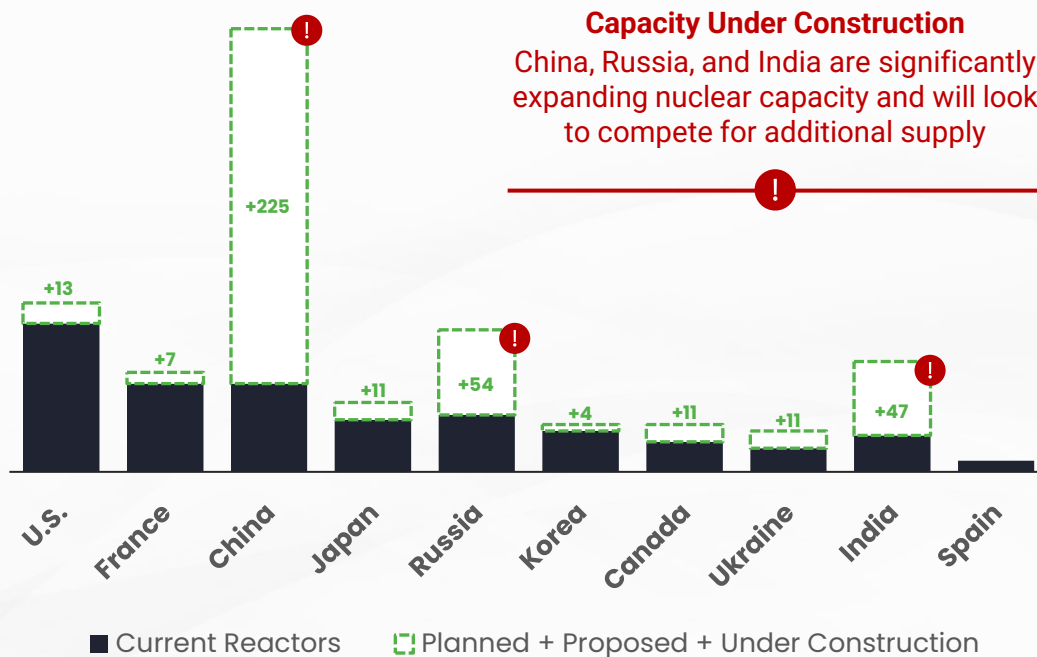
Nuclear Reactors by Country¹

Nuclear capacity by country (Reactors)

The **U.S.** is the largest global uranium consumer but accounts for less than 0.2% of global uranium production²

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Susceptible to supply shocks



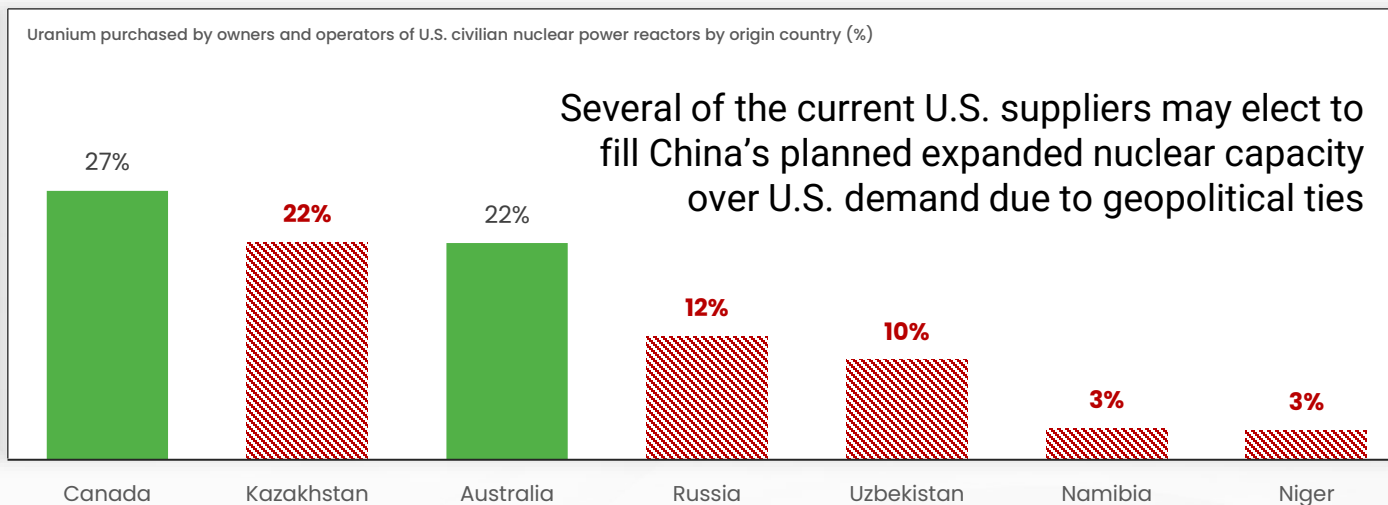
¹ International Atomic Energy Agency, Power Reactor Information System
² World Nuclear Association

U.S. Supply Dynamics

Over 50% of U.S. supply is sourced from countries with significant geopolitical and supply chain risks



U.S. Uranium Imports by Country¹



Several of the current U.S. suppliers may elect to fill China's planned expanded nuclear capacity over U.S. demand due to geopolitical ties

Russia takes 49% stake in Kazakhstan's second largest uranium deposit (2023)²

Kazatomprom approves long-term supply agreement with China, with value exceeding 50% of Kazatomprom's total book value²

Bill banning Russian uranium imports passes U.S. House committee (2023)³

Military coup overthrows Niger government (2023)⁴

¹U.S. Energy Information Administration; Uranium Marketing Annual Report; 2023 data
² Uranium: Kazatomprom's Major Deals With CNNC and Rosatom; Energy Intelligence; 2023

³ Bill banning uranium imports from Russia passes US House subcommittee; Reuters
⁴ Niger arrests politicians after coup, other juntas voice support; Reuters

Additional Resources

U.S. Department of Energy

- [Restoring America's Competitive Nuclear Energy Advantage](#)

International Atomic Energy Agency

- [Energy, Electricity and Nuclear Power Estimates for the Period up to 2050](#)

U.S. Energy Information Administration

- [2023 Uranium Marketing Annual Report](#)
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