

OCEAN WALL

THE CASE ON URANIUM

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THE THESIS

"I have spent 37 years in this wonderful uranium and nuclear energy industry. We've gone through all the highs and lows; I have to say we are probably in the most exciting phase in the nuclear energy industry's history in these years that lie ahead of us." – Scott Melbye, Uranium Royalty Corp & VP, Uranium Energy Corp

Nuclear energy is enjoying a renaissance. There is now an almost global political consensus that it presents a scalable, non-intermittent and zero-carbon solution. Intermittent power sources such as wind and solar cannot be relied on for continuous energy output and do not supply the same baseload power that nuclear energy can produce. One only needs to look at the images of frozen wind turbines in Texas last year to visualise the importance of non-intermittency. Additionally, nuclear power presents one of the lowest operating costs and is extremely energy dense.

Fast Facts on NUCLEAR ENERGY

Nuclear fuel is **extremely energy dense**.



Source: EIA

Currently c.10% of the world's electricity is delivered using nuclear. With the 'electrification of everything' and advancement in nuclear energy delivery through next generation reactors, there is a compelling proposition presented in terms of cost, scalability, and sustainability.

As COP27 only reinforced, all economies are coming under increasing scrutiny to deliver on initiatives to accelerate reductions in CO₂ output and meet the Paris climate goals. The US, EU, UK, France, Japan, Canada (to name a few) have all pledged to carbon neutrality by 2050, with China committing to by 2060.

Over 30 countries are now working with the International Atomic Energy Agency (IAEA) to explore introducing or expanding nuclear power capacity. The IAEA forecast nuclear-generation capacity to double by 2050.

The host of benefits nuclear presents are becoming too apparent to ignore, particularly considering rising global energy prices and more frequent power outages. As the world concentrates on natural gas and oil prices, uranium (the fuel needed to run nuclear reactors) has more than doubled in the past 12-months. The move follows a 10-year secular bear market after the nuclear accident at the Fukushima Daiichi nuclear power plant in 2011. Having hit highs of c.\$143/lb in 2007, uranium hit lows of \$19/lb post Fukushima. The uranium spot price has since doubled to c.\$50/lb, reaching c.\$64/lb in March 2022.

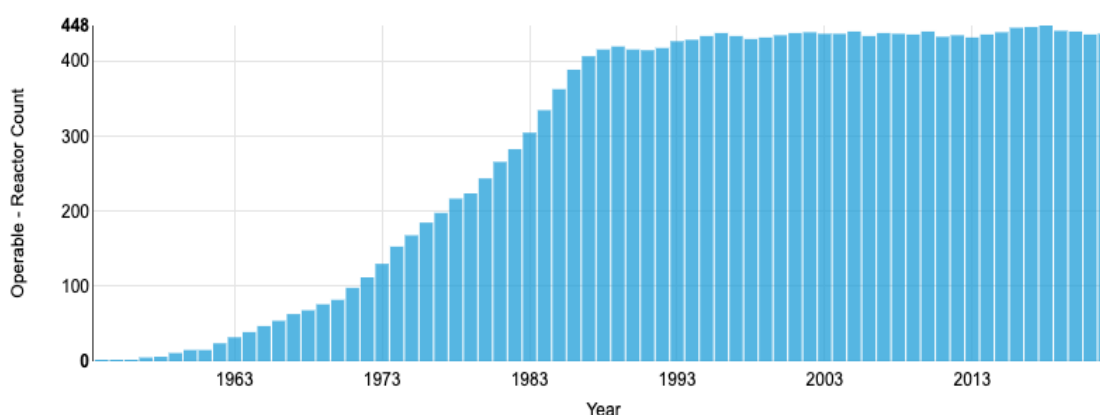


Source: Trading Economics



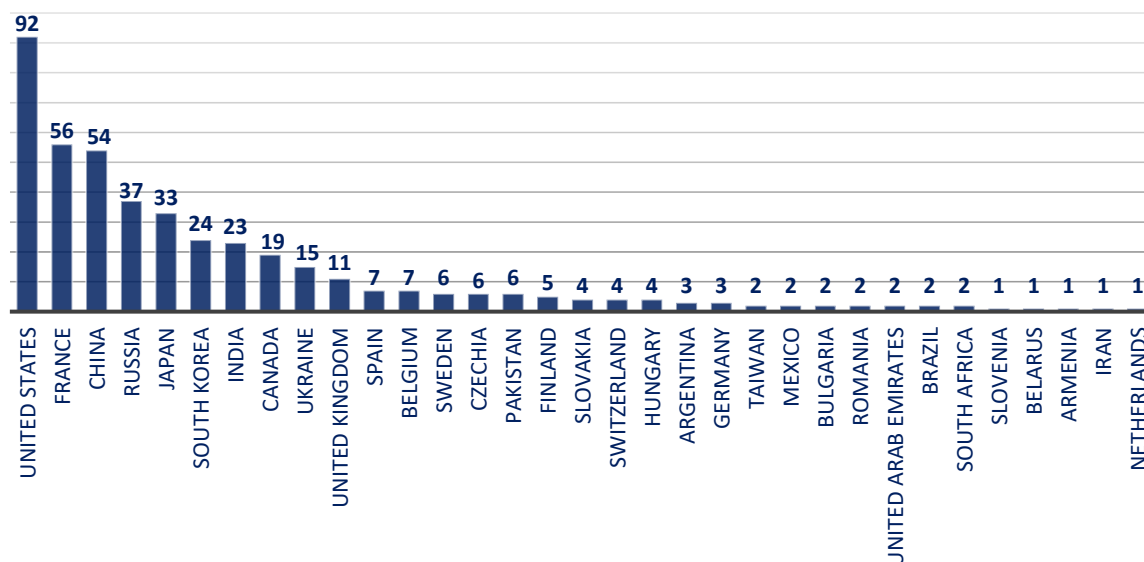
After Fukushima, the Japanese decommissioned their nuclear fleet and flooded the uranium spot market with inventory. As the chart shows, prices collapsed getting to distressed levels that saw most uranium mining operations become cost ineffective. Operating expenses differ by location and company (e.g., Kazatomprom \$20/lb compared to Cameco \$80/lb), the average breakeven of a Western uranium mine was previously around \$55/lb, however, given recent supply chain disruption and cost inflation, this is now estimated to be even higher. Just as rising uranium prices have a compounded effect incentivising exploration and mining activities so falling prices have the reverse and only recently has investor capital begun to return.

As of January 2023, there were 438 operable nuclear reactors worldwide, 60 reactors under construction, 103 reactors planned, and 325 proposed. While there are standard designs for reactors such as Light Water Reactors in the US, and VVER reactors out of Russia, the common theme among them is that many are starting to age, with a production ramp up flattening out in the late 1980s.



Source: World Nuclear Association

Number of Operable Nuclear Power Reactors Worldwide, by Country (as of May 2022)

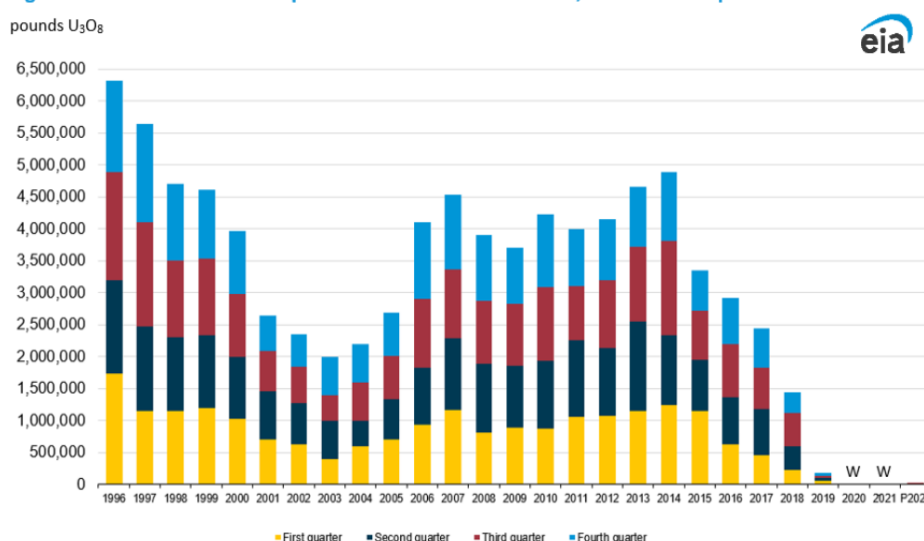


Source: Statista, Ocean Wall

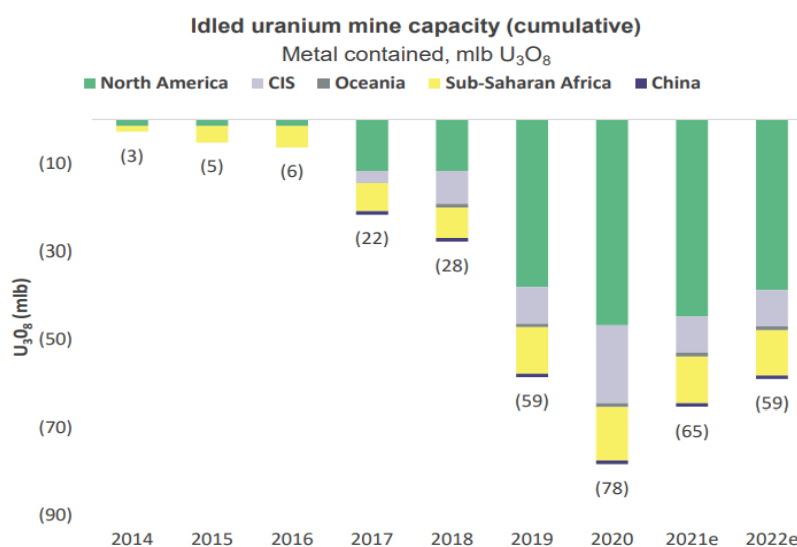
In what was the largest ever federal investment in saving financially distressed nuclear reactors, the DOE announced plans in April 2022 of a \$6bn program to support uneconomical plants that are due for closure. Nuclear energy accounts for half of the US carbon-free electricity, maintaining and growing the industry is clearly a key aim for the Biden-administration. The week that followed the announcement, a bidding process opened for a civil nuclear credit program. The program will give priority credits to plants using domestically produced uranium. Priority will also be given to those plants that have already stated their intention to close.

As less uranium was required post-Fukushima, exploration companies and miners curtailed their production, because even though capacity was there, demand was not. Uranium is now in a long-term structural supply deficit as idle mines wait for the spot price to reach the point where they can resume their operations. This was exacerbated by the pandemic which forced Cameco, the world's second largest producer, to close every one of its uranium mines in Canada, while the US produced zero uranium in 2020 and negligible volumes in 2021-22.

Figure 1. Uranium concentrate production in the United States, 1996 to third-quarter 2022



Source: EIA



Source: MineSpans

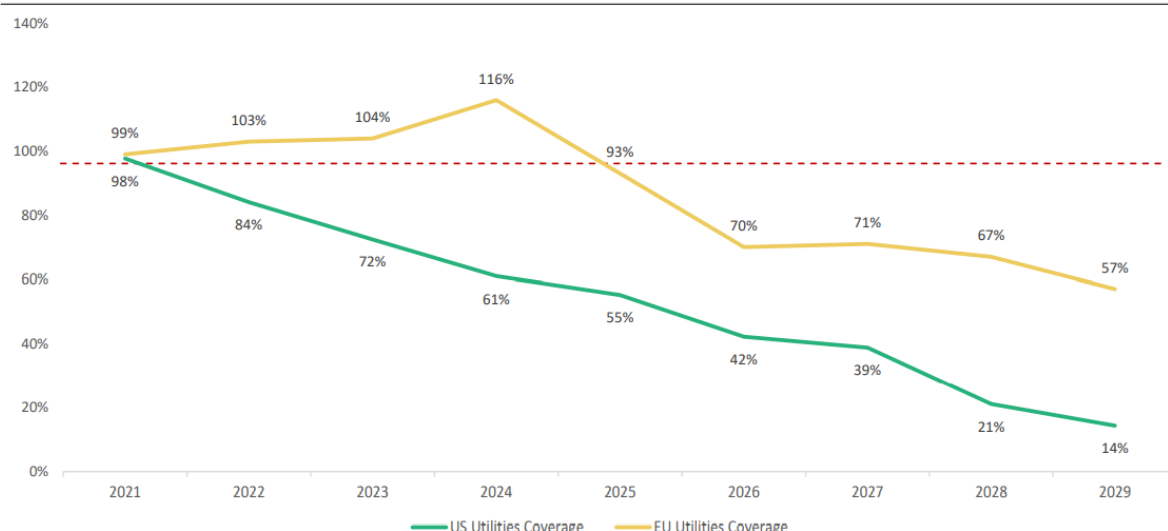
Primary supply will not reach previous levels even when the spot price exceeds incentive levels as idle mines take 12-18 months to restart due to government approvals, safety checks, capital, workers, and machinery all needs to be reengaged. In addition, exploring, permitting, developing, and putting into production a new mine can take as long as ten years. Additionally, many contracts are coming to an end which will see utilities sign new contracts at above market prices.

After 2007, global operations were at a near decade long standstill, this meant utilities were not looking to secure uranium in the long-term due to uncertainty around price. As nuclear makes its comeback, utilities will once again look to source long-term security of uranium, tightening the spot market and driving prices.

Utilities such as Constellation Energy in the US, look to contract for fuel requirements six years ahead of time. This will affect market prices now as utilities scramble to secure fuel supply into the back end of the decade. Historically, inventories had been stockpiled and regularly replenished to satiate demand for uranium, however today, inventories held by utilities are at risk of running out.

- 58% of utility owners in Europe each have less than 1500 tonnes of uranium inventories, quite a few of them less than 500 tonnes
- EU stocks on aggregate equate to 2 years supply but many individual utilities fall far short of this ESA-prescribed benchmark (20 months)
- Ownership is concentrated and in the hands of 40% of utilities
- 23,564 tU of buffer stocks distributed across the front-end supply chain – about 16 months' worth of supply
- Between 2018-2020, inventories of enriched uranium or UF₆ have halved in the US
- US utilities may have limited capability to independently manage a protracted supply disruption
- In the US, supplier inventories in Natural Uranium, UF₆ and EUP in 2020 was about half compared to 2016-2019
- Japanese owned materials represent one of the largest sources of surplus inventories globally
- Inventories held in Japan are relatively illiquid and will be used for domestic consumption
- US utilities might start to think about strengthening inventories like their European and Asian peers

Future contracted coverage rates of US and European utilities



Source: EIA

It is worth noting that the ‘nuclear renaissance’ of 2006/07 was a single movement, today it is part of a much wider climate crisis agenda. Capital is flooding into sustainable, cheap, and scalable forms of energy and nuclear is once again showing why it not only should be in the discussion but must be.

The term ‘commodity super cycle’ is often mentioned in conjunction with brand names such as oil, gas, gold, silver, copper and nickel. The chart below compares uranium’s relative value to its peers. More specifically, we see uranium to be the cheapest valued asset relative to its all-time high when compared with other major commodities.

Uranium is Offering Relative Value versus Other Commodities

- Many commodities are trading at or near record highs, but uranium is offering relative value



Source: Sprott Investor Deck

THE SUPPLY DEFICIT & PRICE INELASTICITY

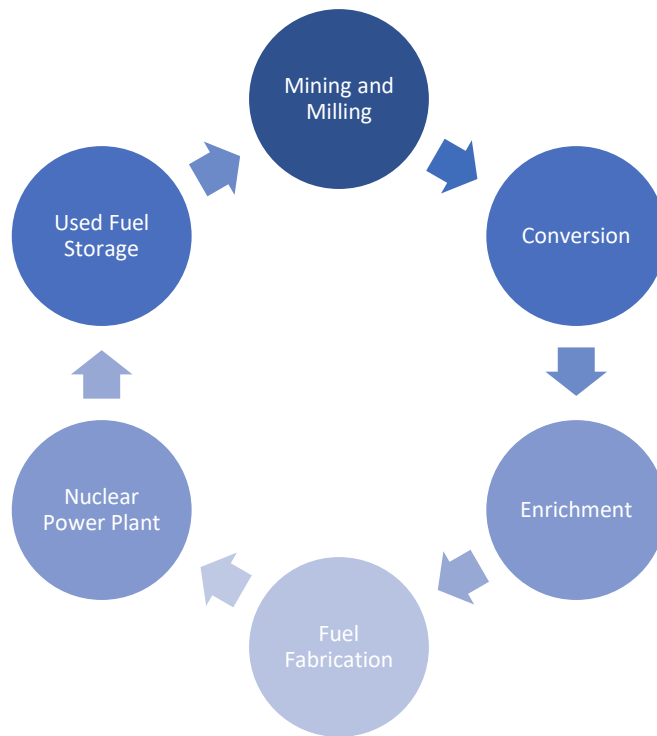
‘There is a risk that there may not be enough material to satisfy all existing global demand in the mid- to long-term.’ – Askar Batyrbaev, Kazatomprom CCO, September 2021

The fuel buyer at the nuclear power plant will never get in trouble for the price they pay for uranium, but instead for not securing the supply of it. To the world’s nuclear power plants uranium is completely price inelastic – they must have it. They are also price agnostic – uranium represents c.3-5% of a nuclear plant’s ongoing costs. As history showed in 2007, buyers will pay \$143/lb as readily as \$20/lb because, if they ever run out, the restart costs of a nuclear plant are hundreds of millions of dollars. Adjusted for inflation, the 2007 uranium price would be \$190/lb.

This price inelasticity of demand helped ignite a bull market that saw uranium’s price explode. It went from around \$23/lb in 2006 to peak at \$143/lb in June 2007. The trigger was the flooding of Cameco’s Cigar Lake in October 2006. For reference, Cigar Lake was not in operation and was expected to account for 10% of global uranium production. There was a 70m lb uranium surplus then. In 2021, there was a 55m lb deficit which is expected to rise to c.65m lbs in 2022, with a multi-hundred million lb deficit over the next decade. Financial players are clearly accelerating price discovery in a thinly traded spot market, but this would not be occurring were there not a fundamental supply deficit.

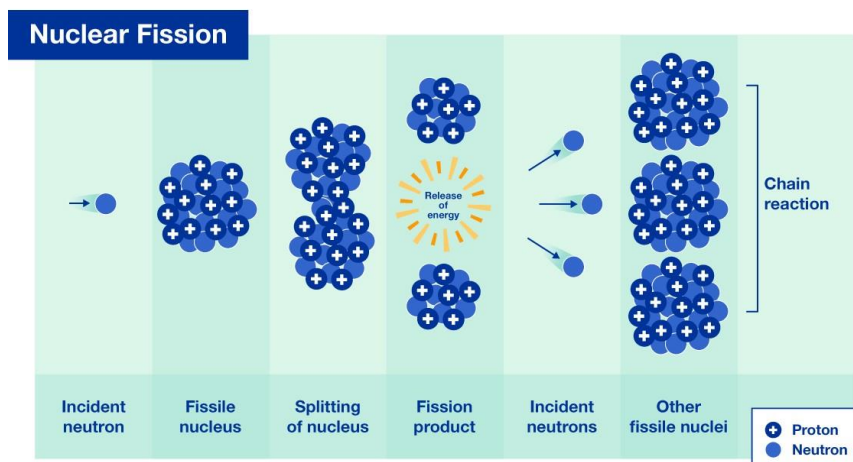
THE NUCLEAR FUEL CYCLE

The nuclear fuel cycle describes the entire process of converting natural uranium (the raw material) to serviceable nuclear fuel. The infographic below outlines this process:



Source: Centrus Energy

The atomic nucleus of U-235 will nearly always fission when struck by a free neutron, and the isotope is therefore said to be a "fissile" isotope. The nucleus of the U-235 isotope comprises 92 protons and 143 neutrons ($92 + 143 = 235$). When the nucleus of a U-235 atom is split in two by a neutron, some energy is released in the form of heat, and two or three additional neutrons are thrown off. If enough of these expelled neutrons split the nuclei of other U-235 atoms, releasing further neutrons, a chain reaction can be achieved. When this happens repeatedly, many millions of times, a very large amount of energy is released using a very small amount of uranium.



Source: IAEA

EXPLORATION

Geiger counter was the original radiation detector, recording the total count rate from all energy levels and [scintillation counters](#).

Airborne [radiation detectors](#) or [spectrometry](#) are also methods used when surveying potential uranium deposits. Airborne geophysics has evolved to permit deeper analysis and more resolute data extraction to better identify radioactive material.

Upon identification of radioactivity, geologists conduct ground surveys to pinpoint the best options to begin drilling.

EXTRACTION

Natural, or unenriched, uranium is removed from the earth in the form of ore and then delivered to a mill where it is crushed and concentrated before chemicals are added to dissolve the uranium. Naturally occurring uranium consists primarily of 0.71% isotope U-235.

MINING

- In Situ Recovery (ISR) – Recover uranium via boreholes drilled into the deposit. Dissolving the minerals by pumping sulphuric acid into the ore body via a borehole which dissolves the ore and is extracted via a second borehole. As of 2020, 57% of world uranium mined was by ISR methods. Most uranium mining in the USA, Kazakhstan and Uzbekistan deploys this method. ISR is used by Kazatomprom, the world's largest uranium producer, as well as large developers such as Uranium Energy Corp and enCore Energy. The process has environmental considerations at its core, and is considered the most environmentally friendly, and cost-efficient uranium extraction method.
- Heap Leach - The mined ore is usually crushed into small chunks and heaped on an impermeable plastic or clay lined leach pad where it can be irrigated with sulphuric acid to dissolve the valuable metals.
- Open Pit Mining – Also known as strip mining, the open pit method removes surficial soil and waste rock to get at the ore body beneath. Ore grades associated with this method are usually lower, and typically this type of mining is only possible at depths of up to 400 ft.
- Underground Mining - Underground uranium mining is in principle no different from any other hard rock mining and other ores are often mined in association (e.g., copper, gold, silver). The ore is drilled, then blasted to create debris, which is then transported to the surface, then on to a mill. This method is used to get higher grades of uranium that are too deep for open-pit mining.

MILLING

- Mined uranium ores are normally processed by grinding the ore materials to a uniform particle size and then treating the ore to extract the uranium by chemical leaching.
- The milling process commonly yields dry powder-form material consisting of natural uranium, "yellowcake", which is sold on the uranium market as U3O8.

CONVERSION

Usually milled uranium oxide, U3O8 is then processed into either of two substances depending on the intended use.

For use in most reactors, U₃O₈ is usually converted to uranium hexafluoride (UF₆), the input stock for most commercial uranium enrichment facilities. A solid at room temperature, uranium hexafluoride becomes gaseous at 57 °C (134 °F). At this stage of the cycle, the uranium hexafluoride conversion product still has the natural isotopic mix (0.71% of U-235).

Conversion supply is extremely concentrated. With the closure of the Springfields plant in 2014, c.80% of the conversion needs for the West came from three facilities: Orano's COMURHEX (France), Cameco's Port Hope (Canada), and ConverDyn's Metropolis (US).

There are other very small conversion facilities, but most of the balance of the world's UF₆ comes from Russia and China.

ENRICHMENT

The natural concentration (0.71%) of the fissionable isotope U-235 is less than that required to sustain a nuclear chain reaction in light water reactor cores. Accordingly, UF₆ produced from natural uranium sources must be enriched to a higher concentration of the fissionable isotope before being used as nuclear fuel in such reactors.

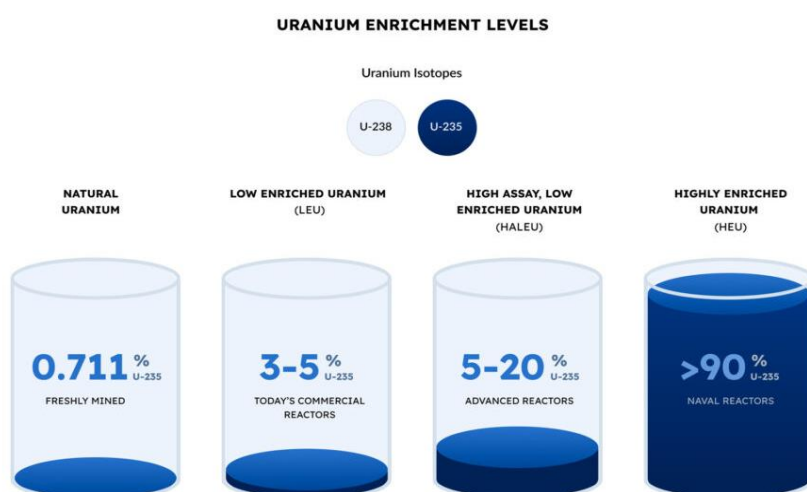
The level of enrichment for a particular nuclear fuel order is specified by the customer according to the application they will use it for: light-water reactor fuel normally is enriched to 3.5% U-235, but uranium enriched to lower concentrations is also required.

Enrichment is accomplished using any of several methods of [isotope separation](#). Gas centrifuge is the most common uranium enrichment method, but new enrichment technologies are currently being developed such as GLE (global laser enrichment.) This process involves separating isotopes through laser excitation. Silex Systems are an ASX listed vehicle who are pioneering this technology and have been for over 30 years.

Cameco has a 49% interest in GLE, the exclusive licensee of the proprietary Separation of Isotopes by Laser Excitation (SILEX) technology. GLE is commercialising this third-generation uranium enrichment technology. Cameco is also the commercial lead for the project.

See our report from March 2022 on Silex Systems [here](#).

HALEU



Source: Centrus Energy

In connection with a number of Small Modular Reactor (SMR – more on this later) designs, attention is turning to the need for high-assay low-enriched uranium (HALEU), with enrichment levels between 5%-20% U-235.

HALEU can be produced with existing centrifuge technology, but a number of arrangements would need to be made for this, as well as for deconversion and fuel fabrication. New transport containers would also be required as those for today's enriched UF₆ could not be used due to criticality considerations.

FUEL FABRICATION

The Enriched Uranium Product ("EUP"), then needs to be converted to uranium dioxide (UO₂) prior to pellet fabrication. Conditioned UO₂ powder is fed into dies and pressed biaxially into a cylindrical pellet form using a load of several hundred MPa – this is done in pressing machines operating at high speed.

For most reactors, pellets are just under one centimetre in diameter and a little more than one centimetre long. A single pellet in a typical reactor yields about the same amount of energy as one tonne of steaming coal.

The physical structures for holding the fuel rods are therefore engineered with extremely tight tolerances. They must be resistant to chemical corrosion, high temperatures, large static loads, constant vibration, fluid, and mechanical impacts. Yet they must also be as neutron transparent as possible.

The fuel assemblies are loaded into nuclear reactors to create energy from a controlled chain reaction.

SPENT NUCLEAR FUEL

After the nuclear fuel has been in a reactor for several years its efficiency is reduced, and the assembly is removed from the reactor's core. The used fuel is warm and radioactive and is kept in a deep pool of water for several years.

Uranium comprises about 96% of used fuel. When used fuel is reprocessed, both plutonium and uranium are usually recovered separately.

Uranium recovered from reprocessing used nuclear fuel (RepU) is mostly U-238 with about 1% U-235, so it needs to be converted and re-enriched for recycling into most reactors. This is complicated by the presence of impurities and two isotopes, U-232 and U-236, which are formed by or following neutron capture in the reactor and increase with higher burn-up levels.

Approximately one-half of the spent nuclear fuel discharged annually around the world is slated for reprocessing, and the other half is slated for direct disposal.

REPROCESSING

Mixed uranium oxide + plutonium oxide (MOX) fuel has been used in about 30 light-water power reactors in Europe and about ten in Japan. It consists of depleted uranium (about 0.2% U-235), large amounts of which are left over from the enrichment of uranium, and plutonium oxide that derives from the chemical processing of used nuclear fuel (at a reprocessing plant). This plutonium is reactor-grade, comprising about one third non-fissile isotopes

REMIX (Regenerated Mixture) fuel is produced directly from a non-separated mix of recycled uranium and plutonium from reprocessing used fuel, with a LEU (up to 17% U-235) make-up comprising about 20% of the mix.

France's plutonium recycling program reduces its uranium requirements by only about 10 percent, which could be achieved at much less cost in other ways, such as by adjusting enrichment plants to extract a higher percentage of the U-235 isotopes in natural uranium. Second, with proper accounting, it is not at all clear that recycling produces a net reduction in the volume of radioactive waste requiring deep geological disposal.

DISPOSAL

Disposal of low-level waste is straightforward and can be undertaken safely almost anywhere. Storage of used fuel is normally under water for at least five years and then often in dry storage. Deep geological disposal is widely agreed to be the best solution for final disposal of the most radioactive waste produced.

REACTOR TYPES

Pressurised water reactors (PWRs) are the most common type of nuclear reactor accounting for two-thirds of current installed nuclear generating capacity worldwide.

Boiling water reactors (BWRs) are the second most common nuclear reactor type accounting for almost one-quarter of installed nuclear generating capacity. In a boiling water reactor, water is turned directly to steam in the reactor pressure vessel at the top of the core and this steam (at about 290°C and 7 MPa) is then used to drive a turbine.

Pressurised heavy water reactors (PHWRs) are originally a Canadian design (also called "CANDU") accounting for ~6% of world installed nuclear generating capacity.

The advanced gas-cooled reactor (AGR) is a second-generation UK-designed nuclear reactor only used in UK. AGRs account for about 2.7% of total global nuclear generating capacity.

URANIUM EQUITIES

The Sprott Physical Uranium Investment Trust (SPUT) catalysed gains in the uranium market at the end of 2021. Since launching in August 2021, SPUT quickly ran through its initial \$300mn AUM and now has a total net asset value close to \$3bn, holding over 59m lbs of uranium (as of January 10th, 2022). SPUT is now the world's largest physical uranium ETF. There are obvious parallels between what we are seeing with Sprott to what we saw with the Grayscale Bitcoin Trust, which gave investors direct exposure to Bitcoin. Sprott has done the same thing for uranium and as a result, a previously opaque spot market now has real price discovery and liquidity.

In April 2022, Sprott completed its acquisition of the North Shore Global Uranium Mining ETF (URNM) and have also listed the vehicle on the London Stock Exchange. URNM returned investors c.200% between IPO in December 2019 and September 2022 and saw net assets rise from \$40m to over \$1bn (currently \$850m as of January 10th 2023). The Sprott Uranium Miners ETF (still URNM), aims to capitalise on a growing interest in European markets for uranium exposure, bringing with it the same strategy initially implemented by North Shore. The ETF seeks investment opportunities in mining and exploration activities for nuclear fuel.

In conjunction with this, we saw unprecedented levels of retail participation in uranium equities as the 'Reddit Crew' further drove the bull run, although this involvement contributed to a harsh correction at year end reflecting that they were not long-term holders.

The emergence of uranium sequesters like Sprott (SPUT), Yellow Cake (YCA), and ANU Energy (Kazakh uranium fund) continues to attract more institutional capital to the sector, bringing with it deeper and more widespread analyst coverage. An example of this is multi-billion-dollar hedge fund Caxton, who in March 2022 bought an

estimated \$250m of physical uranium via SPUT. In addition, Goldman Sachs Investment Strategy Group have announced a 'tactical long position in spot uranium', although figures were not disclosed.

The fundamentals are now the tightest they have ever been. However, the number of uranium sector stocks has dropped from c.600 in 2007 to just 70 publicly traded names today. In fact, the total value of global uranium stocks is only c.\$33bn (as of January 10th, 2023). Strip out the two main producers Kazatomprom and Cameco and the combined market cap is just \$15bn. In 2007 the global market cap of uranium was over \$150bn! We believe the fundamentals of the uranium market and supportive environment for nuclear today provide a significantly **more** bullish backdrop today than in 2007.

"We had the last bull market with half the world against us" – Scott Melbye, Uranium Royalty Corp & VP, Uranium Energy Corp

As to the convexity some of the uranium explorers can have to uranium, in 2007 there was a 1,000x share price increase for the miner Paladin Energy and large-cap Cameco went from under \$4 to \$60, returning 15x.

M&A in the uranium sector has been quiet since the events in Fukushima. Since the disaster, spot prices remained low and companies with uranium resources presented little asset value. As the spot price continues its ascent, companies with these assets are becoming increasingly attractive.

For those directly exposed to the spot price, what was worth 'Y' in 2021 is now worth 'Yx2', with prices more than doubling. There are undoubtedly attractive M&A opportunities starting to resurface in the uranium sector, and we expect to see capital pour into these deals as uranium companies previously crippled asset values start to rise.

GEOGRAPHICAL BREAKDOWN

RUSSIAN INVASION OF UKRAINE

Russia's invasion of the Ukraine in February 2022 highlighted the need for governments and utilities to reduce their reliance on Russian resources. The geographical supply of uranium is incredibly concentrated, the market is becoming increasingly bifurcated, as such, utilities remain at the mercy of ongoing geopolitical risk from the world's largest uranium producers.

The invasion saw investors flock to commodity markets seeking a safe haven to hedge their portfolios from what was already a highly volatile equity market. The prices of oil, natural gas, fertiliser and nickel – to name a few – skyrocketed, carrying other hard assets with them.

Russian forces went as far as attacking Europe's largest nuclear plant, Ukraine's Zaporizhzhia, starting a fire, and causing panic around Europe of a 'Chernobyl-like disaster'. Shortly after, it was reported that no radioactivity had been detected and a quick sell-off in uranium stocks reversed.

In addition, it was reported that security data was no longer being transmitted to the United Nations watchdog from Chernobyl. This came after fighting around the nuclear plant caused a power outage, sparking radiation concerns about spent nuclear fuel assemblies. The International Atomic Energy Agency said there was no immediate safety threat from the loss of power. In August 2022, an IAEA support team arrived at the plant for a safety and maintenance inspection.

The war in Ukraine has taught us three key lessons about uranium and nuclear power:

- Global governments and utilities must mitigate Russian interference from their supply chains
- Nuclear reactors can withstand the brutality of war

- As the West imposed sanctions on an array of Russian exports, uranium has been broadly exempt

The role uranium plays in the energy materials mix is integral. Most notably, unlike oil, there is not significant reserve inventories, and you cannot turn on the tap and start pumping uranium. The ongoing supply deficit has come into the spotlight over the past couple of years, uranium is completely demand inelastic, utilities must have it or run the risk of hundreds of millions of dollars in losses resulting from plant closures.

However, on March 17th 2022, four Senators introduced a bill to ban imports of Russian uranium. Russia's Rosatom accounts for ~35% of the world's enriched uranium supply. New investments in Russian conversion, enrichment fabrication and purchase are already banned. As Rosatom is directly involved in taking control of Ukrainian reactors it is highly likely Russian uranium will be sanctioned.

The war also had uranium investors anxious over the resulting response of Kazakhstan, the world's largest producer of uranium.

KAZAKHSTAN

As 40% of the world's uranium supply, Kazakhstan sits at the epicentre of uranium discussions. For context, Kazakhstan's dominance in uranium is four times that of Saudi Arabia's contribution to global oil production. State-owned Kazatomprom (KAP) is the largest uranium producer in the world, with a c.19% free float for international participation.

Events of January 2022 in Kazakhstan saw major protests over rising fuel price inflation. Rising prices have caused major political and investor unrest in Kazakhstan. Inflation is both unpopular and potentially destabilising and has seen the price of fuel skyrocket. As one would imagine, this had major implications for uranium equities globally.

The events serve as a reminder for utilities that an over-reliance on any one source of supply is risky. It also reinforces the shift in risk from suppliers to utilities that has occurred in this market.

KAP's asset base goes into decline in 2026 and production collapses after 2031. Although it has a portfolio of exploration assets the incentive price to mine those will be considerably more than \$20/lb it currently costs.

In November 2021, KAP announced that they will become the key supplier to a new, Kazakh-based uranium fund, ANU Energy. The fund, similar to YCA and SPUT, will raise capital and purchase uranium for long-term sequester at their Western storage facility, Blind River. The fund has raised \$74m to date.

In an August 2022 earnings call, KAP's management noted that the company will look to increase its usage of a trans-Caspian supply route which will avoid Russian territory. Considering 50% of their deliveries travel through the Port of St. Petersburg (Russia), KAP is at high risk of delivery delays as their primary export route becomes increasingly difficult to use. While the trans-Caspian route did complete one successful delivery in 2022, KAP's mention of implementing a transport network via Shanghai to the West does is not feasible in our view. We have written an internal report titled: *'Chasing the Dragon: Can Uranium Go East?'*, for access please email ben@oceanwall.com

We have also examined potential pinch points in the KAP transport network given intensifying geopolitical risk in their international supply chain. We have compiled a detailed report which is publicly available titled: *'Uranium and its New Silk Road – Further Problems for Western Buyers'*, which can be found [here](#).

UNITED STATES

Under the Biden administration, the US officially re-joined the Paris Agreement, and in November 2021 set out its plan to distribute a \$1 trillion infrastructure package, of which \$2.5 billion has been allocated towards the development of SMRs. The US is also set to construct a \$4 billion advanced power plant backed by Bill Gates and Warren Buffet in Wyoming.

The United States receives 20% of its electricity generation from nuclear power. It currently has 94 operating commercial nuclear reactors at 56 nuclear power plants in 28 states. Florida, for example, gets 90% of its clean energy from five nuclear reactors (Progress Energy's Crystal River, Florida Power & Light's St. Lucie 1 and St. Lucie 2 in Jensen Beach, and FPL's Turkey Point 3 and Turkey Point 4).

In August 2022, California lawmakers voted to keep Diablo Canyon nuclear plant open. The plant which supplies c.10% of the State's electricity needs was scheduled to close in 2025 but has now been extended to 2030, and potentially 2035.

For context, 50% of uranium into the US is from Kazakhstan, Uzbekistan, and Russia, meaning that 1/10 homes in the US are run on fuel from these countries.

The US government have also begun procurement for their domestic strategic uranium reserve.

UEC, a US based uranium developer, was awarded a contract to supply the US government 300,000 lbs at a price of \$59.50/lb, representing a 24% premium to the current spot price.

The week after, enCore Energy, a Canadian based producer, was awarded a contract to supply the US government 100,000 lbs at \$70.50/lb, representing a 48% premium to the current spot price.

As the US continues to add pounds to its reserves and source the fuel needed to feed its nuclear fleet, we expect pounds out the ground from Canadian and US miners to be purchased at a premium.

The political stance on nuclear is changing too, with Joe Manchin, the powerful Senator for coal and natural gas-rich West Virginia, wanting to implement a tax credit to keep nuclear plants operating. Under the version passed by the House, a credit of as much as \$15 per megawatt-hour could be claimed for the next six years. Manchin, whose support is necessary for Senate Democrats to pass the legislation on a party-line vote, wants the tax credit to last 10 years instead.

In August 2022, the passing of the Inflation Reduction Act (IRA) included a \$700m funding package to support the ongoing HALEU Availability Programme which is being conducted over the next four years by the DOE.

As the fuel needed for the majority of next-generation reactor designs, HALEU availability has been a hot topic on the minds of those we have spoken to in the enrichment space. Currently, the only commercial supply of HALEU comes from Rosatom subsidiary, TENEX.

RUSSIA

Putin's superpower is built on a foundation of oil, gas, and uranium and these assets are his weapons in the Colder War. He has embraced such diverse international pariahs as theocratic Iran, Assad's Syria, and socialist Venezuela. He has cut deals on all sides, everywhere from China to Israel, from Algeria to Brazil and it is always about energy. Putin is turning his country's newfound influence against a Western alliance that is unprepared for the geopolitics of energy. Before the war, Russia supplied c.50% of the EU's natural gas imports.

"While yellowcake [uranium] production is important for controlling the market, it's not the critical element...owning all the yellowcake on the planet won't help you one bit with the ability to turn it into something a nuclear reactor can use...The choke point in the whole process isn't in the mines but in the conversion and enrichment facilities that turn yellowcake into nuclear fuel. That's Putin's goal: to corner the conversion and enrichment markets...control those and you control the availability and pricing of a product whose demand will be rising for decades." – Marin Katusa, Author of The Colder War

Russia's dominance in uranium spans much further than their enrichment capacity. Rosatom estimates Russian uranium reserves amount to 1.2bn lbs, which would be the second largest in the world. Add in Russia's foreign projects in Kazakhstan, Ukraine, Uzbekistan, and Mongolia, and analysts estimate that Russia's sphere of influence could contribute 140m lbs of uranium per year, or 70% of current annual global demand.

With control of not only uranium production capabilities, but also enrichment and conversion operations in multiple countries, Katusa describes Russia's grip on uranium in one word: "*Stranglehold*".

In December 2021, a [report](#) came out of Russia from the Natural Resources Ministry that Russia may face a shortage of uranium raw materials by 2030-35 "due to a depletion of developed deposits." Russia possesses significant uranium reserves, but the Ministry note that most are low quality.

AUSTRALIA

Despite holding one-third of the world's uranium reserves, Australia accounts for only c.8% of global supply. There are currently two operating mines in the country; BHP's Olympic Dam and Heathgate's Beverley operations, there is also a third mine preparing to restart production.

Australia, which has bans on nuclear power stations in every state and territory due to environmental and safety concerns, has never had an operating nuclear power station. However, in October 2021, the national secretary of the Australian Workers Union (AWU) called for these bans to be revisited and proposed the introduction of Small Modular Reactors (SMRs) into Australia's climate change discussions.

EU

The EU Sustainable Taxonomy, the EU's ambitious labelling system for green investment, was passed on July 6th and came into force on 1st January 2023. It described the sustainable criteria for renewable energy, car manufacturing, shipping, forestry, and bioenergy and more, and included a "technology-neutral" benchmark at 100 grams of CO₂ per kilowatt-hour for any investments in energy production. It is worth noting that Western and Central Europe (including Great Britain) is responsible for almost one third of current global civilian uranium demand and is a growing electricity market.

The European Union has elected to classify some nuclear energy projects as 'green' in its Sustainable Taxonomy draft. Under the draft's terms, nuclear power plants would be classified as green provided the project has a plan, the required funds, and a site to safely dispose of radioactive waste. The development also needs to receive its construction permits before 2045.

The EU's Commissioner for the Internal Market, Thierry Breton, gave an [interview](#) with France's weekly Journal Du Dimanche saying that a "colossal" investment will be needed over the next 30 years to meet the EU's emission targets. Existing nuclear plants need EUR50bn of investment through to 2030, while the next generation will require EUR500bn between now and 2050. Breton said nuclear energy combined with investment in renewable sources will be crucial for meeting the EU's objective of net zero emissions by 2050.

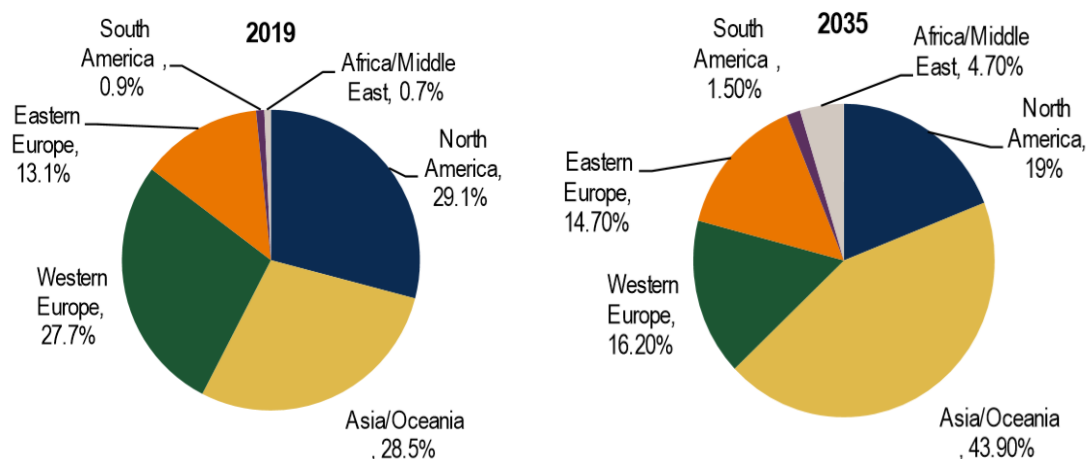
CHINA

China plans to become the world's biggest nuclear power generator, with 150 new reactors to be built in the next 15 years. Costing \$440 billion, their plans would see the country build as many reactors in 15 years as have been created globally over 35 years. In 2021 China announced their plan to create a strategic uranium stockpile at a location on the border with Kazakhstan. The 'Alashankou' warehouse is expected to hold an amount equal to around 40m lbs, or the annual production of Kazakhstan.

At the current rate of Chinese procurement, we could see 1bn lbs of uranium sequestered from the market over the next 15 years, equivalent to 7.6x global annual production.

In 2019, the EU and US accounted for over half of nuclear energy production, however, with such aggressive plans for expansion, forecasts show China will quickly overtake both in becoming the global nuclear powerhouse. Couple this with countries like Germany who have plans to close their remaining three nuclear plants and it becomes quickly apparent how China will soon assert dominance on production.

Nuclear power generation capacity by region:



Source: Bank of America Merrill Lynch

FRANCE

After the oil shock of 1974, France created energy policies to rapidly expand the country's nuclear power capacity. As a result, France has achieved substantial energy independence and is the world's largest net exporter of electricity due to its very low cost of generation.

Over 70% of France's electricity is generated using nuclear power, the most by any nation globally. It comes as little surprise therefore to see French President Emmanuel Macron announcing in October 2021 that nuclear power must continue to play a significant role in the country's energy program. Additionally, in November 2021 he [announced](#) that France would build additional nuclear reactors to support energy independence and forecasting that construction of six new reactors would be announced shortly.

UK

Boris Johnson announced in March 2022 plans to deliver nuclear power at "warp speed", with the aim to increase its contribution to Britain's energy mix to 25%.

The UK intends to build up to 8 new reactors to boost the country's energy independence by 2050. In his much-anticipated energy strategy, Johnson announced the formation of a new body called 'Great British Nuclear', which aims to triple nuclear production from 8GW to 24 GW by 2050.

The UK also continues to display its willingness to host Small Modular Reactors (SMRs) on home soil, as Rolls Royce have come to surface as the front runners in the race to build these reactors in the UK. Competition was not far behind with US based Last Energy in advanced talks with the UK government to build a fleet of these advanced reactors across England and Wales, aiming to build its first "mini-nuclear" power plant by 2025.

In August 2022, Boris Johnson delivered his final speech as PM, announcing a £700m investment in the proposed Sizewell C nuclear plant in Suffolk.

At the start of 2023, the UK government announced the creation of the ‘Nuclear Fuel Fund’, comprising £75m in UK government funding to support the development of alternatives to Russian fuel supply and strengthen UK energy security. The fund will invest £50m to stimulate a diverse and resilient nuclear fuel market, and support projects aiding the fuel requirements for both traditional but also advanced nuclear.

JAPAN

Post-Fukushima, Japan suspended 46 of its 50 operational nuclear plants. According to the WNA, Japan needs to import c.90% of its energy requirements, and until 2011, nuclear accounted for 30% of electricity in the country. Japan currently has seven operating reactors, and three offline for maintenance purposes. However, there are plans for another 16 reactors to come back online, and for nuclear to account for 20% of electricity production by 2030.

Pro-nuclear PM Kishida announced in August 2022 that he has instructed officials to deliver a concrete plan by year end to further include nuclear in the country’s plans for carbon neutrality by 2050. This plan will look at extending the lives of current reactors, constructing new reactors, and integrating next-generation nuclear into the country’s energy mix.

The impact on the demand side for uranium cannot be understated. As the largest advanced economy in Asia, Japanese nuclear expansion would have significant implications for demand of U3O8, adding further pressure to prices.

INDIA

Also in Asia, India’s largest power producer announced plans in August 2022 for the construction of two 700-megawatt reactors in Madhya Pradesh. This news follows the announcement earlier in the month from NTPC – India’s largest energy conglomerate – that it is targeting its nuclear power debut with two reactors in the northern state of Haryana.

Indian PM, Narendra Modi, has been vocal in his support of nuclear, aiming to more than triple India’s nuclear fleet over the next decade. India currently generates c.70% of its electricity from coal, and c.3% from nuclear.

SAUDI ARABIA

Saudi Arabia plans to develop the country’s vast uranium resources to feed into its nuclear energy program and to supply the fuel to the world market. We assume that any uranium volumes are the ones identified by the Saudi geological survey rather than a pipeline of development projects. This implies execution of the project is many years away with no real indication of how much it will cost to develop.

In January 2022, Saudi Arabia’s energy minister indicated that the country was looking at producing “pink hydrogen”, which is hydrogen made using nuclear energy. The plans propose the construction of two reactors by 2030 and bring 17GW of nuclear capacity online by 2040. Alongside its nuclear industry, Prince Abdulaziz said the country would look to develop its own uranium reserves.

Neighbouring state, the **UAE**, has also stated plans to produce ~1mtpa of hydrogen from nuclear power.

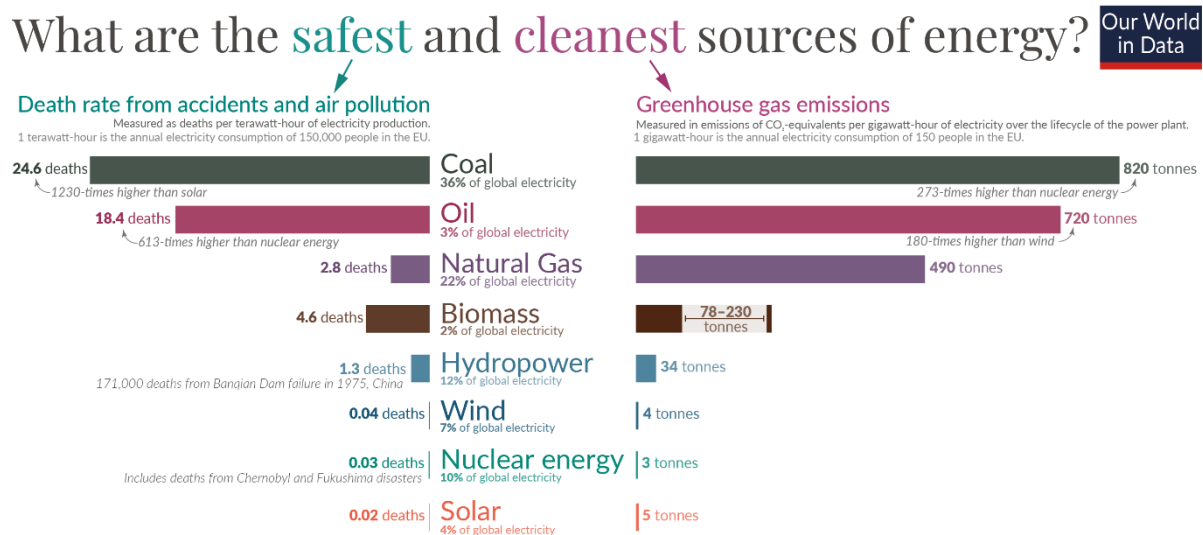
SOUTH KOREA

In South Korea, pro-nuclear President Yoon Suk-yeol has pledged to reignite the country’s nuclear industry. Industry analysts and officials have made it clear that SMR technology will be core to this revamp, something that is unsurprising given Korea’s track record of producing quality technology for nuclear plants. Among these

companies is Doosan Heavy Industries, who are likely to pioneer Korean SMR production given their current involvement with numerous SMR design firms.

NUCLEAR SAFETY AND SMALL MODULAR REACTORS (SMRS)

Nuclear accounts for only 0.07 deaths per terawatt-hour of energy production compared to 18.43 for oil and 32.72 for brown coal. However, there remains backlash surrounding the safety of nuclear as an energy source. The advent of Small Modular Reactors is changing this.



Source: Our World in Data

Over the last four decades, the average time it has taken to build a new nuclear power plant has ranged from 58 to 120 months – or, in other words, up to a decade. These projects are often completed late and significantly over budget, for example the Atucha-2 reactor in Argentina where construction began in 1981 and was grid connected in 2014. This is a long-term commitment, meaning that many countries simply idled capacity rather than tear it down even when the industry suffered image issues following Fukushima.

The benefits of SMRs are:

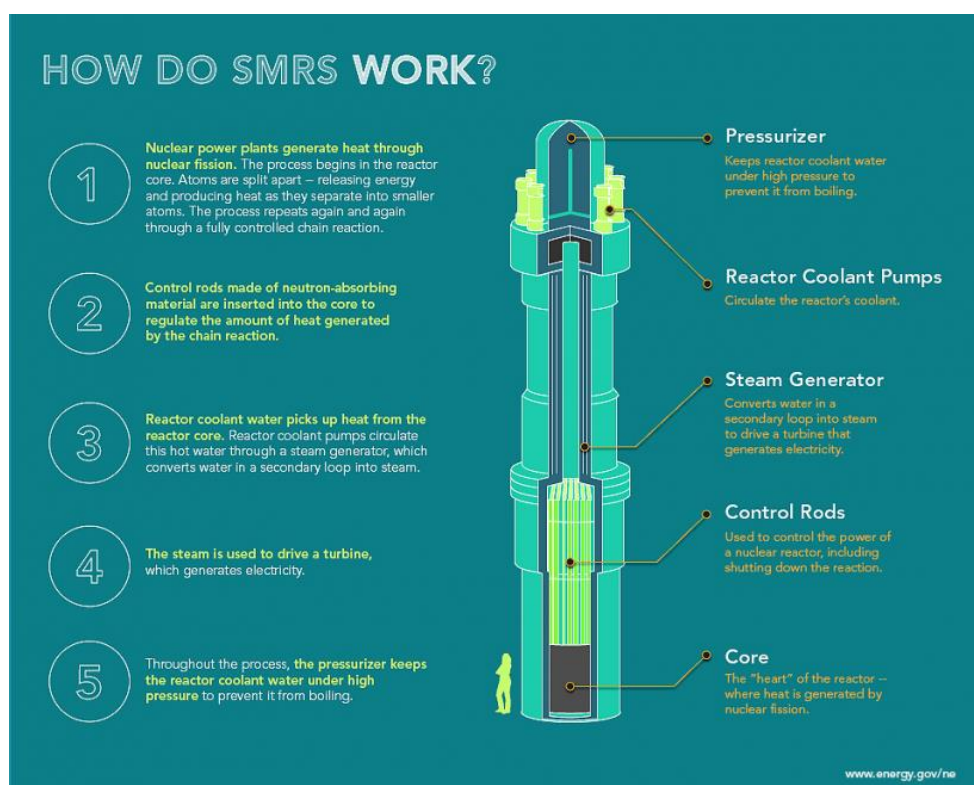
- **Safety:** Facility protection systems, including barriers that can withstand design basis aircraft crash scenarios and other specific threats, are part of the engineering process being applied to new SMR design.
- **Modularity:** the ability to be able to put major components of the reactor together in a factory, requiring limited onsite preparation
- **Cheaper:** Reduced capital investment due to the lower plant capital cost, mainly associated with modularity.
- **Location:** SMRs can provide power for applications where large plants are not needed or sites lack the infrastructure to support a large unit, creating far better site flexibility.
- **Efficiency:** SMRs can be coupled with other renewable energies or fossil fuels to leverage resources and produce higher efficiencies and multiple energy end-products while increasing grid stability and security.
- **Economic:** deployment of a 100 MW SMR could create 7,000 jobs and generate more than \$1 billion in sales.

The Rolls-Royce SMR project, for example, targets a 500-day construction time on a 10-acre (4 ha) site. Overall build time is expected to be four years, two years for site preparation and two years for construction and commissioning. These SMRs will have power capacity of 470MW and could be capable of powering 1 million homes - equivalent to a city the size of Leeds, Austin or Lille.

In 2017, the UK government provided funding of up to £56 million over three years to support SMR research and development. In 2019 the government committed a further £18 million to the development from its Industrial Strategy Challenge Fund. In November 2021, the UK government provided funding of £210 million to further develop the design, partly matched by £195 million of investment by Rolls Royce. They expect the first unit will be completed in the early 2030s.

In the US in 2020, the DOE awarded \$160 million to X-energy and TerraPower through their 'Advanced Reactor Demonstration Program'. There is the potential for billions more in further funding, and projects completion dates are expected to be around 2027. The DOE intends to invest about \$3.2bn over the next seven years into advanced nuclear.

NuScale is the first and only publicly traded pure play on next generation nuclear reactors. The company currently has the only NRC approval for a Small Modular Reactor (SMR). Having a publicly listed vehicle purely focused on the development of these reactors makes the promise of nuclear 2.0 much more real. NuScale aims to deliver its first SMR in the US by 2029.



Source: energy.gov

RISKS

The greatest edge-risk for the uranium sector remains another major accident like Chernobyl or Fukushima. An event of this kind would undoubtedly set the nuclear agenda back years. As we have discussed, the advent of SMRs is significantly improving safety concerns around nuclear.

Additionally, there is always the possibility of an alternative fuel to uranium. Thorium is a potential competitor, and while there are currently no operating thorium reactors, there are several in production. Notably, uranium reactors cannot be converted to thorium reactors, so the friction in transitioning from one metal to another will likely be sufficient to deter utilities.

As part of the European Commission Taxonomy, the first nuclear related activity that is mentioned is R&D of advanced technologies that minimise waste and improve safety standards. The main environmental concern associated with nuclear energy is radioactive waste. There are several companies exploring depleted uranium as a fuel source, which would significantly reduce the demand for the original metal.

Furthermore, advancements in energy storage will reduce the significance of non-intermittency, as the grid would have backup power stored to meet demand. Hydrogen is one possible threat as it can be easily stored due to its lightweight and high energy density.

Current nuclear reactors use fission technology which heats uranium atoms to incredibly high temperatures to create a nuclear reaction. Nuclear fusion slams two atoms together to create energy, the output is 3-4x more powerful than fission. Notably, the most advanced fusion project is in California, with estimates that the first nuclear fusion power will be delivered to the grid in 10-15 years.

A more recent demand side risk is associated with Russia's invasion of the Ukraine. Currently, 18% of the 439 operating nuclear reactors globally were made in Russia. This has implications for care and maintenance as component parts need to be sourced from the OEM. In something as high risk as nuclear technology, trying to design and manufacture component parts from alternative sources to the OEM is highly dangerous. Should these reactors be unable to source component parts from Russia due to embargoes/sanctions, then they run the risk of closure. The market for Russian sourced component parts is estimated to be ~\$4.3bn annually, not an insignificant source of capital for Putin's war machine.

OCEAN WALL URANIUM TRACKER

We have developed a proprietary live uranium tracker encompassing all uranium related equities and ETFs to analyse broad trends within the theme:

WUC	WESTERN URANIUM & VANADIUM CORP. (XCNQ:WUC)	USD	1.14	5.56%	\$	2.97	\$	1.01	82,812	CAD 46,635,560	USD 34.98	Developer	Canada
FIND	Baselode Energy Corp. (XTSX:FIND)	USD	0.51	9.68%	\$	1.30	\$	0.38	276,562	CAD 46,004,167	USD 34.50	Explorer	Canada
SYH	SKYHARBOUR RESOURCES LTD. (XTSX:SYH)	USD	0.39	1.32%	\$	0.84	\$	0.29	184,620	CAD 57,098,233	USD 42.82	Explorer	Canada
API	Appia Rare Earths & Uranium Corp. (XCNQ:API)	USD	0.34	9.84%	\$	0.76	\$	0.28	82,387	CAD 40,697,341	USD 30.52	Developer	Canada
TOE	TORO ENERGY LIMITED (KASX:TOE)	USD	0.01	0.00%	\$	0.03	\$	0.01	858,193	AUD 43,588,880	USD 30.08	Developer	Australia
VO	ValOre Metals Corp. (XTSX:VO)	USD	0.31	-3.13%	\$	0.63	\$	0.24	44,048	CAD 47,641,172	USD 35.73	Explorer/Developer	Canada
92E	92 Energy Ltd (KASX:92E)	USD	0.47	-1.05%	\$	0.94	\$	0.35	83,807	CAD 41,158,130	USD 30.87	Explorer	Canada
MKA	MIKANGO RESOURCES LTD. (XTSX:MKA)	USD	0.26	13.04%	\$	0.58	\$	0.16	13,000	CAD 49,034,230	USD 36.78	Explorer	Canada
AEC	Anfield Energy Inc. (XTSX:AEC)	USD	0.07	7.69%	\$	0.15	\$	0.06	855,773	CAD 45,420,081	USD 34.07	Developer	Canada
CVV	CANALASKA URANIUM LTD. (XTSX:CVV)	USD	0.43	0.00%	\$	0.73	\$	0.27	255,938	CAD 50,157,607	USD 37.62	Explorer	Canada
EFM	ECLIPSE METALS LIMITED (KASX:EFM)	USD	0.02	4.35%	\$	0.06	\$	0.01	1,685,918	AUD 46,557,910	USD 32.12	Explorer	Australia
BSK	BLUE SKY URANIUM CORP. (XTSX:BSK)	USD	0.11	5.00%	\$	0.34	\$	0.09	373,630	CAD 22,874,754	USD 17.16	Developer	Canada
FUU	Fission 3.0 Corp. (XTSX:FUU)	USD	0.40	-1.25%	\$	0.43	\$	0.07	2,308,296	CAD 124,584,303	USD 93.44	Explorer	Canada
EME	ENERGY METALS LTD (KASX:EME)	USD	0.15	7.14%	\$	0.32	\$	0.11	13,500	AUD 29,355,660	USD 20.26	Explorer	Australia
OKR	OKAPI RESOURCES LIMITED (KASX:OKR)	USD	0.17	0.00%	\$	0.49	\$	0.14	104,134	AUD 25,047,540	USD 17.28	Explorer	Australia
PTU	PUREPOINT URANIUM GROUP INC. (XTSX:PTU)	USD	0.07	0.00%	\$	0.13	\$	0.05	255,700	CAD 22,346,246	USD 16.76	Explorer	Canada
TRAC	TRACTION URANIUM CORP. (XCNQ:TRAC)	USD	0.39	13.24%	\$	1.08	\$	0.27	200,300	USD 23,195,968	USD 23	Exploration	US
EEL	ENRG ELEMENTS LTD (KASX:EEL)	USD	0.03	-3.33%	\$	0.05	\$	0.02	421,680	AUD 27,840,060	AUD 19.21	Exploration	Niger
FMC	Forum Energy Metals Corp. (XTSX:FMC)	USD	0.11	0.00%	\$	0.30	\$	0.09	347,163	CAD 20,782,278	USD 15.59	Explorer	Canada
GTR	GTI ENERGY LTD (KASX:GTR)	USD	0.01	-8.33%	\$	0.03	\$	0.01	1,973,912	AUD 18,065,800	USD 12.47	Explorer	Australia
VAL	VALOR RESOURCES LIMITED (KASX:VAL)	USD	0.01	0.00%	\$	0.02	\$	0.01	2,045,289	AUD 22,356,210	USD 15.43	Explorer	Australia
VUI	VIRGINIA ENERGY RESOURCES INC (XTSX:VUI)	USD	0.46	5.75%	\$	0.94	\$	0.26	172,142	CAD 30,055,380	USD 22.54	Explorer/Developer	Canada
AAZ	Azincourt Energy Corp. (XTSX:AAZ)	USD	0.06	0.00%	\$	0.23	\$	0.05	996,166	CAD 12,501,950	USD 9.38	Explorer	Canada
STND	Standard Uranium Ltd. (XTSX:STND)	USD	0.09	13.33%	\$	0.26	\$	0.06	437,456	CAD 15,249,348	USD 11.44	Explorer	Canada
MHC	Manhattan Corporation Limited (KASX:MHC)	USD	0.01	0.00%	\$	0.02	\$	0.01	650,000	AUD 9,157,670	USD 6.32	Explorer	Australia
GLA	GLADIATOR RESOURCES LIMITED (KASX:GLA)	USD	0.02	0.00%	\$	0.04	\$	0.02	56,480	AUD 9,615,060	USD 6.63	Explorer	Australia
GCOM	GREEN SHIFT COMMODITIES LTD. (XTSX:GCOM)	USD	0.11	5.00%	\$	0.36	\$	0.10	249,600	CAD 6,077,270	USD 4.56	Exploration	Colombia
HAR	HARANGA RESOURCES LIMITED (KASX:HAR)	USD	0.12	0.00%	\$	0.30	\$	0.10	50,000	AUD 4,808,610	USD 3	Exploration	Senegal
ERC	Eros Resources Corp. (XTSX:ERC)	USD	0.06	0.00%	\$	0.14	\$	0.05	24	CAD 5,384,160	USD 4.04	Explorer	Canada
UVA	Uvre Ltd (KASX:UVA)	USD	0.14	3.85%	\$	0.29	\$	0.12	5,000	CAD 4,095,000	USD 3.07	Explorer	Canada
POW	PROTEAN ENERGY LTD (KASX:POW)	USD	0.01	-11.11%	\$	0.01	\$	0.01	30,000	AUD 5,855,520	USD 4.04	Explorer	Australia
USD 33,384.58													
Ticker	Company Name	Last Price	% Change	52 Week High	52 Week Low	Volume	Market Cap	USD Market Cap \$m	Status	Country			
CCO	CAMECO CORPORATION (XTSE:CCO)	USD 33.33	1.49%	\$ 41.05	\$ 23.03	1,618,752	CAD 14,415,228,333	USD 10,811.42	Producer	Canada			
KAP	Joint stock company "National atomic company "Kazatomprom" (XLON:KAP)	USD 30.80	1.05%	\$ 37.00	\$ 22.05	24,150	KZT 3,353,481,000,000	USD 7,377.66	Producer	Kazakhstan			
NKE	NEXGEN ENERGY LTD. (KNYS:NKE)	USD 4.51	2.50%	\$ 6.56	\$ 3.39	6	CAD 2,846,199,000	USD 2,134.65	Developer	Canada			
PDN	PALADIN ENERGY LTD (KASX:PDN)	USD 0.75	0.00%	\$ 0.97	\$ 0.53	13,607,691	AUD 2,220,078,000	USD 1,531.85	Producer	Australia			
UEC	URANIUM ENERGY CORP. (KNYS:UEC)	USD 3.92	0.26%	\$ 6.60	\$ 2.34	123	USD 1,449,627,760	USD 1,449.63	Developer	US			
UUUU	Energy Fuels Inc. (KNYS:UUUU)	USD 6.61	3.28%	\$ 11.00	\$ 4.69	12	link	USD 1,040.00	Producer	US			
DML	Denison Mines Corp. (XTSE:DML)	USD 1.72	5.52%	\$ 2.32	\$ 1.19	3,254,307	CAD 1,417,225,304	USD 1,062.92	Developer	Canada			
YCA	YELLOW CAKE PLC (XLON:YCA)	USD 402.80	-0.10%	\$ 486.80	\$ 293.50	88,311	GBP 732,768,800	USD 893.98	Trust Fund	UK			
LEU	CENTRUS ENERGY CORP. (KNYS:LEU)	USD 35.29	2.14%	\$ 55.77	\$ 17.36	130,753	USD 513,108,130	USD 513.11	Developer	US			
ERA	ENERGY RESOURCES OF AUSTRALIA LTD. (KASX:ERA)	USD 0.22	3.57%	\$ 0.42	\$ 0.16	8,463	AUD 775,190,500	USD 534.88	Developer	Australia			
BOE	BOSS ENERGY LTD (KASX:BOE)	USD 2.22	0.00%	\$ 3.10	\$ 1.61	1,052,571	AUD 782,725,100	USD 540.08	Developer	Australia			
GLO	Global Atomic Corporation (XTSE:GLO)	USD 3.82	2.69%	\$ 5.10	\$ 2.58	385,717	CAD 689,236,488	USD 516.93	Developer	Canada			
DYL	DEEP YELLOW LIMITED (KASX:DYL)	USD 0.74	-1.34%	\$ 1.26	\$ 0.55	5,181,511	AUD 561,207,300	USD 387.23	Developer	Australia			
SLX	SILEX SYSTEMS LIMITED (KASX:SLX)	USD 3.89	9.89%	\$ 4.14	\$ 0.99	1,112,464	AUD 726,801,000	USD 501.49	Developer	Australia			
FCU	FISSION URANIUM CORP. (XTSE:FCU)	USD 0.84	-5.62%	\$ 1.14	\$ 0.56	1,761,159	CAD 585,554,844	USD 439.17	Developer	Canada			
URG	Ur-Energy Inc. (KNYS:URG)	USD 1.27	5.83%	\$ 1.95	\$ 0.95	50	USD 362,930,200	USD 362.93	Producer	US			
ISO	ISOENERGY LTD. (XTSX:ISO)	USD 3.06	5.15%	\$ 5.80	\$ 2.51	171,690	CAD 333,967,482	USD 250.48	Explorer/Developer	Canada			
EU	enCore Energy Corp. (XTSX:EU)	USD 3.51	7.34%	\$ 5.91	\$ 2.84	383,696	CAD 382,138,965	USD 286.60	Developer	Canada			
UROY	Uranium Royalty Corp. (KNAS:UROY)	USD 2.51	1.21%	\$ 5.00	\$ 2.10	120	CAD 330,820,200	USD 248.12	Royalty	Canada			
BMN	BANNERMAN ENERGY LTD (KASX:BMN)	USD 1.93	3.76%	\$ 3.25	\$ 1.50	547,819	AUD 279,853,400	USD 193.10	Developer	Australia			
LOT	LOTUS RESOURCES LIMITED (KASX:LOT)	USD 0.23	4.55%	\$ 0.46	\$ 0.18	1,874,512	AUD 291,989,100	USD 201.47	Explorer	Australia			
UEX	UEX Corporation (XTSE:UEX)	USD 0.50	16.47%	\$ 0.60	\$ 0.24	9,418,620	CAD 269,742,577	USD 202.31	Developer	Canada			
BKY	BERKELEY ENERGIA LIMITED (XLON:BKY)	USD 17.40	-2.52%	\$ 40.00	\$ 11.25	76,564	GBP 138,197,000	USD 168.60	Developer	UK			
ALGEF	ALLIGATOR ENERGY LTD (OTCM:ALGEF)	USD 0.03	0.00%	\$ 0.11	\$ 0.02	55,000	AUD 145,343,700	USD 100.29	Explorer	Australia			
GXU	GOVIEUX URANIUM INC. (XTSX:GXU)	USD 0.25	6.38%	\$ 0.51	\$ 0.18	929,689	CAD 140,035,700	USD 105.03	Developer	Canada			
CUR	Consolidated Uranium Inc. (XTSX:CUR)	USD 1.84	2.79%	\$ 3.13	\$ 1.43	127,472	CAD 145,048,028	USD 108.79	Developer	Canada			
PEN	PENINSULA ENERGY LIMITED (KASX:PEN)	USD 0.15	3.45%	\$ 0.29	\$ 0.12	9,964,493	AUD 182,272,200	USD 125.77	Producer	Australia			
RDY	RED DIRT METALS LIMITED (KASX:RDY)	USD 0.47	2.17%	\$ 0.83	\$ 0.32	894,003	AUD 191,643,300	USD 132.23	Explorer	Australia			
FSY	Forsys Metals Corp. (XTSE:FSY)	USD 0.50	3.09%	\$ 0.97	\$ 0.39	365,031	CAD 97,584,750	USD 73.19	Developer	Canada			
ELB	ELEVATE URANIUM LTD (KASX:ELB)	USD 0.42	-2.35%	\$ 0.83	\$ 0.35	428,278	AUD 117,085,700	USD 80.79	Explorer	Australia			
LAM	Laramide Resources Ltd. (XTSE:LAM)	USD 0.48	4.40%	\$ 0.95	\$ 0.39	363,798	CAD 100,191,607	USD 75.14	Developer	Canada			
AEE	AURA ENERGY LIMITED (KASX:AEE)	USD 0.28	1.82%	\$ 0.37	\$ 0.15	607,284	AUD 140,973,500	USD 97.27	Developer	Australia			
MGA	Mega Uranium Ltd. (XTSE:MGA)	USD 0.24	2.17%	\$ 0.41	\$ 0.17	1,394,863	CAD 84,349,866	USD 63.26	Developer	Canada			
ACB	A-CAP ENERGY LIMITED (KASX:ACB)	USD 0.08	1.25%	\$ 0.18	\$ 0.05	248,008	AUD 98,594,810	USD 68.03	Explorer	Australia			
URA	Gibi X Uranium ETF (ARCK:URA)	USD 21.55	1.80%	\$ 28.49	\$ 17.65	2,398,511	USD 1,497,131,200		Fund	US			
U.U	SPROTT PHYSICAL URANIUM USD UNIT (XTSE:U.U)	USD 12.04	-2.03%	\$ 16.05	\$ 9.40	28,677			Fund	US			
HURA	Horizons Glo Uranium Idx ETF (XTSE:HURA)	USD 23.39	2.68%	\$ 29.57	\$ 18.12	12,643	CAD 50,125,679	USD 37.59	Fund	Canada			
GCL	GEIGER COUNTER LIMITED (XLON:GCL)	USD 45.93	0.39%	\$ 77.00	\$ 31.00	53,274	GBP 58,608,680	USD 71.50	Investment Fund	UK			
URNM	Sprott Uranium Miners (ARCK:URNM)	USD 34.39	2.72%	\$ 47.43	\$ 27.00	527,411	USD 826,468,282	USD 826.47	Fund	US			

Total Uranium Market Cap (\$)	USD 33,384.58
KAP & CCO - Market Cap (\$)	USD 18,189.08
KAP & CCO - Contribution (%)	54.48%
Australia - Market Cap (\$)	USD 4,639.12
Australia - Contribution (%)	13.90%
Canada - Market Cap (\$)	USD 16,889.28
Canada - Contribution (%)	50.59%
US - Market Cap (\$)	USD 3,388.86
US - Contribution (%)	10.15%
UK - Market Cap (\$)	USD 1,062.58
UK - Contribution (%)	3.18%

We publish weekly updates on the uranium sector, should you wish to be added to the mailing list please contact ben@oceanwall.com - *Note this is available for institutional investors only*

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