OCEAN WALL

THE CASE ON URANIUM – JUNE 2022

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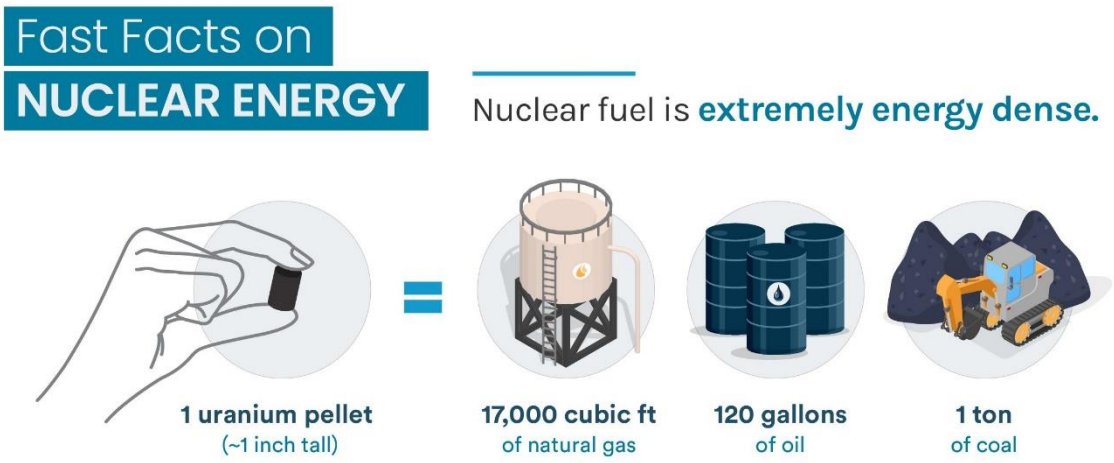
THE THESIS

"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 at around 2 cents per kilowatt-hour and is extremely energy dense.



Source: EIA

Currently 11% of the world's electricity is delivered using nuclear. With the 'electrification of everything' and advancement in nuclear energy delivery through Small Modular Reactors (SMR) there is a compelling proposition presented in terms of cost, scalability, and sustainability.

As COP26 only reinforced, all economies are coming under increasing scrutiny to deliver on initiatives to accelerate reductions in CO_2 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 nuclear power. 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 a low of $19/lb, uranium recently touched $64/lb.

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 $80/lb. 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.

In 2021, there were ~440 operating nuclear reactors worldwide. 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.

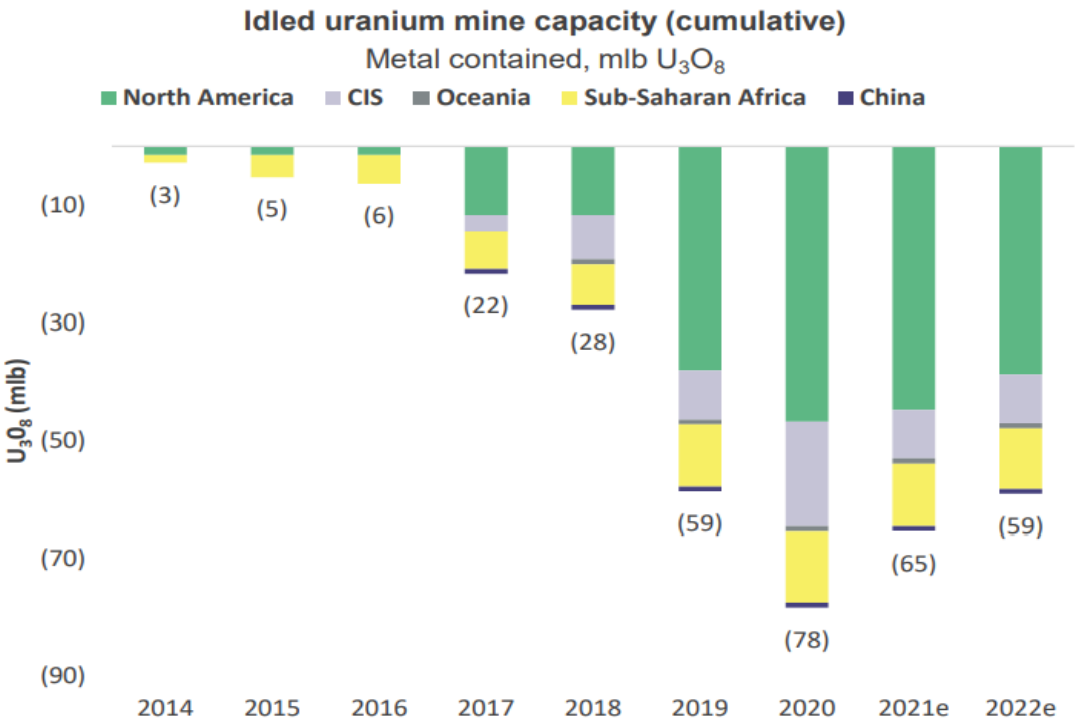
In what was the largest ever federal investment in saving financially distressed nuclear reactors, the DOE announced plans in April 2022 of a $6bn program to support uneconomical plants that are due for closure. Nuclear energy accounts for half of the US carbon-free electricity, maintaining and growing 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.

Investment in uranium	Operable reactors[1]	Reactors under construction[1]	Planned reactors[1]	Proposed reactors[1]
World Nuclear Reactor Fleet	441	56	101	325
China Reactor Fleet	51	18	37	168

Source: World Nuclear Association

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 currently 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 has been 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.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.



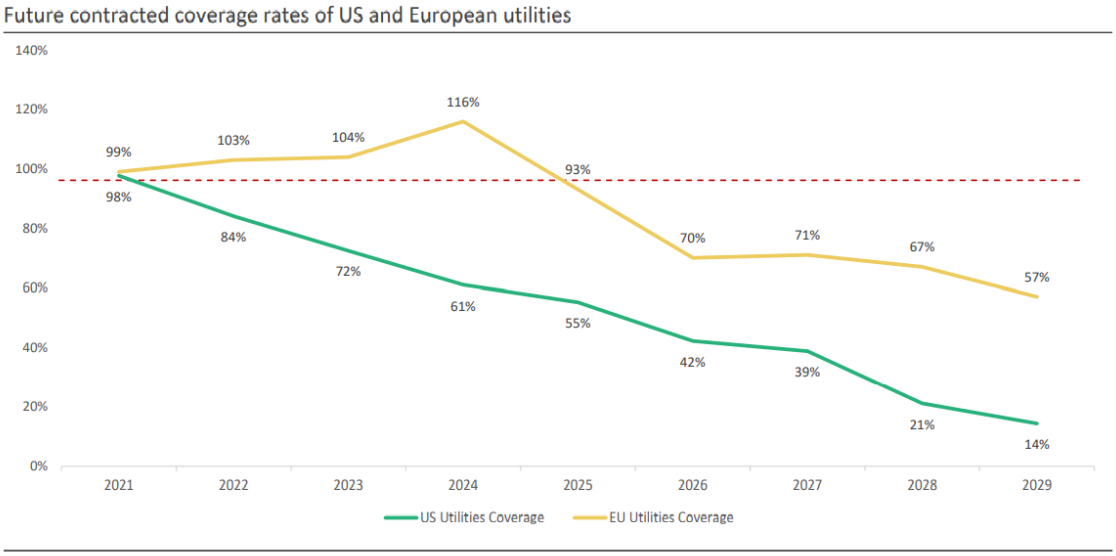
Source: MineSpans

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.

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.

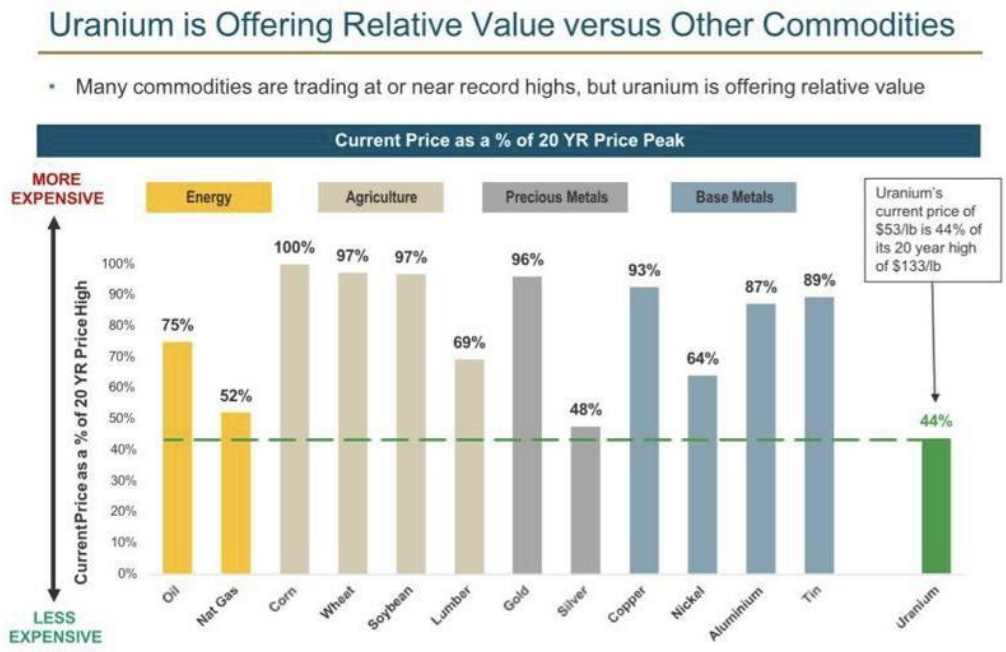
- 58% of utility owners in Europe each have less than 1500 tonnes of uranium inventories, quite a few of them less than 500 tonnes
- EU stocks on aggregate equate to 2 years supply but many individual utilities fall far short of this ESA-prescribed benchmark (20 months)
- Ownership is concentrated and in the hands of 40% of utilities
- 23,564 tUe 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.

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.



Source: EIA

The term 'commodity super cycle' is often mentioned in conjunction with brand names such as 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.



Source: Sprott Investor Deck

THE SUPPLY DEFICIT & PRICE INELASTICITY

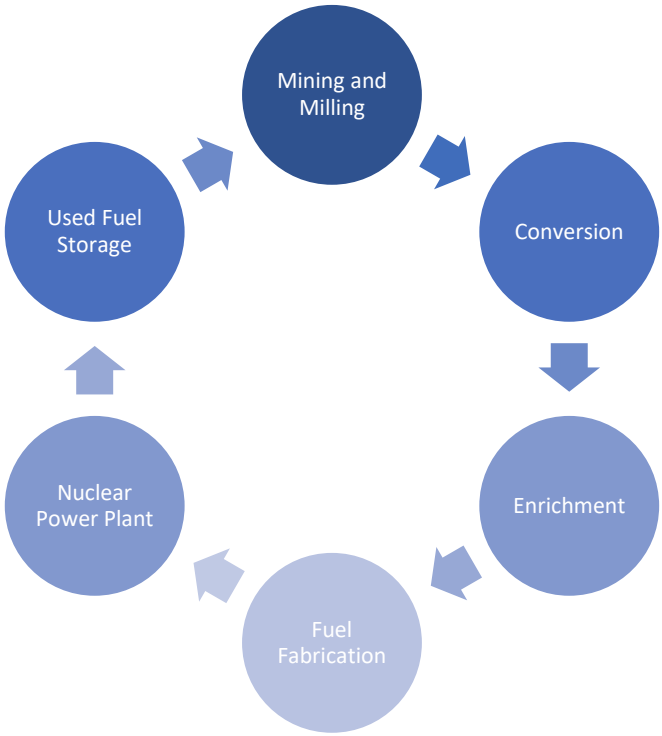
'There is a risk that there may not be enough material to satisfy all existing global demand in the mid- to long-term.' – Askar Batyrbaev, Kazatomprom CCO, September 2021.

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.5% of a nuclear plant's ongoing costs. As history showed in 2007, buyers will pay $137/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 start a bull market that saw uranium's price explode. It went from around $23/lb in 2006 to peak at $137/lb in June 2007. The trigger was the flooding of Cameco's Cigar Lake in October 2006. There was a 70m lb uranium surplus then. Last year there was a 55m lb deficit which is expected to rise to 65m lbs in 2022. 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:



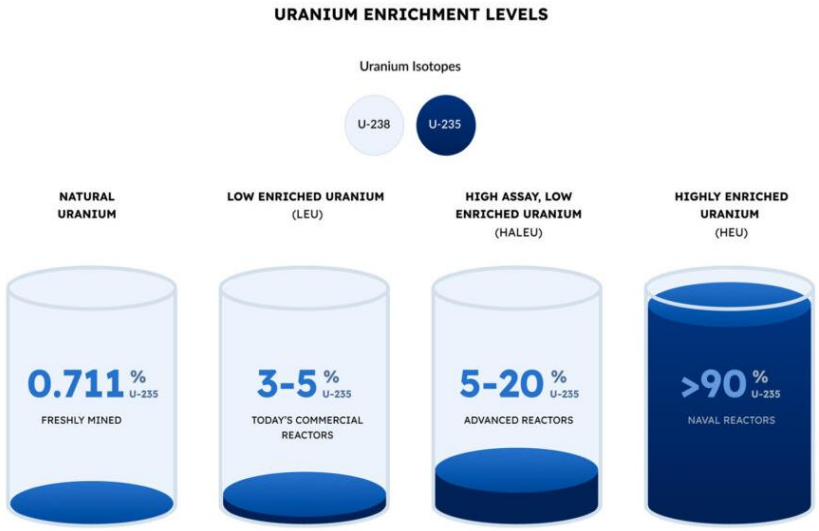
Source: Centrus Energy

- Mining and milling: Natural, or unenriched, uranium is removed from the earth in the form of ore and then crushed and concentrated.

- Conversion: Uranium concentrates (U^3O^8) are combined with fluorine gas to produce uranium hexafluoride (UF^6), a solid at room temperature and a gas when heated. UF^6 is shipped to an enrichment plant.
- Enrichment: UF^6 is enriched in a process that increases the concentration of the U^{235} isotope in the UF^6 from its natural state of 0.711% up to 5%, or LEU, which is usable as a fuel for current light water commercial nuclear power reactors.
- Fuel Fabrication: LEU is then converted to uranium oxide and formed into small ceramic pellets by fabricators. The pellets are loaded into metal tubes that form fuel assemblies, which are shipped to nuclear power plants.
- Nuclear Power Plant: The fuel assemblies are loaded into nuclear reactors to create energy from a controlled chain reaction.
- Used Fuel Storage: 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 ENRICHMENT METHODS, LEVELS & USES

There are varying enrichment levels of nuclear fuel depending on its final destination. Natural uranium is 0.711% U^{235} and needs to be enriched to between 3-5% (Low-Enriched Uranium – LEU) for use in a light water reactor (most common type of nuclear reactor today). Small Modular Reactors (SMRs), however, will require High-Assay, Low-Enriched Uranium (HALEU), which is uranium enriched up to 20%.



Source: Centrus Energy

Centrifuge enrichment has been and continues to be the main process for separating U-235 from U-238. This commercial process involves spinning centrifuges to separate the isotopes in gaseous uranium to their desired mass.

Third generation enrichment technology is also under development, which 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.

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 of ~$2.6bn, holding over 55m lbs of uranium (as of May 26th, 2022). SPUT is now the world's largest physical ETF. One could compare 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 are also listing the vehicle on the London Stock Exchange. URNM returned investors 98% between January 2021 and April 2022 and saw net assets rise from $40m to over $1bn in the same time period. 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 players like Sprott (SPUT) and Yellow Cake (YCA) also brought 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. 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 been. However, the number of uranium sector stocks has dropped from 600 in 2007 to ~70 publicly traded names today. In fact, the total value of global uranium stocks is $32bn (as of May 26th, 2022). Strip out the two main producers Kazatomprom and Cameco and the combined market cap is $15bn. In 2007 the global market cap of uranium was over $150bn!

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, so 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 to rise, 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 undoubtably 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, and 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, including uranium.

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.

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

- Global governments and utilities must reduce their reliance on Russian energy resources
- Nuclear reactors can withstand the brutality of war
- As the West imposed sanctions on an array of Russian exports, uranium was initially 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 few weeks, 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 25% 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.

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.

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.

In a March 2022 earnings call, KAP's management noted that the company had secured trans-Caspian supply routes which were already operating. Considering 50% of their deliveries travel through the Port of St. Petersburg (Russia), KAP has implemented sufficient risk mitigation strategy to ensure contract orders are fulfilled.

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 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). Additionally, a major nuclear site has been approved for development in the Midwest of the United States, where fusion technology has emerged as a possible future source of energy.

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 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.

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. Most of the rest comes from Norway and Algeria.

"While yellowcake 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 7.4% 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 9th December 2021 and came into force on 1st January 2022. 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 CO_2 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 Commission collected comments to its draft up until 12th January 2022 and adopted a final text by the end of the month. The text will now be discussed with EU governments and parliament for up to six months. Note that the likelihood of the draft being rejected appears to be relatively low as that would require 20 of the 27 EU countries to say "no".

The EU's Commissioner for the Internal Market, Thierry Breton, has given 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.

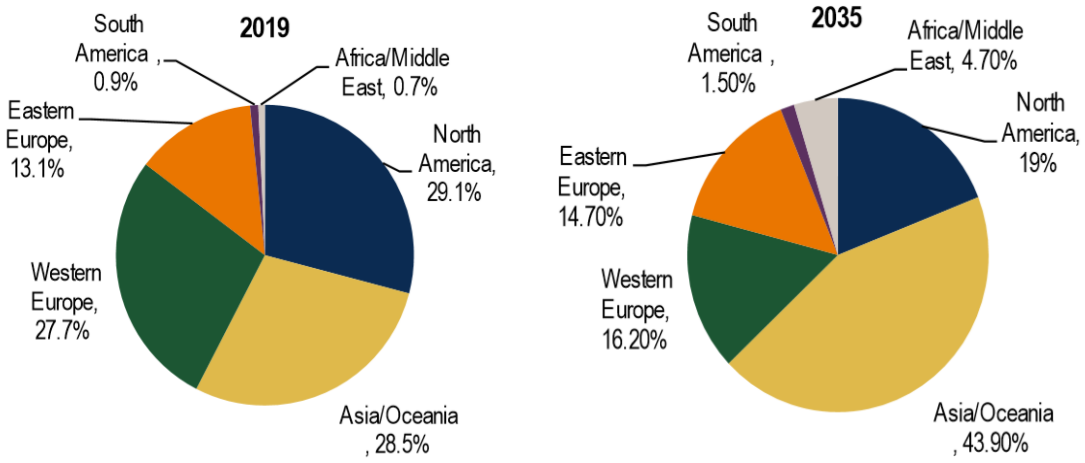
CHINA

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.

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.

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.

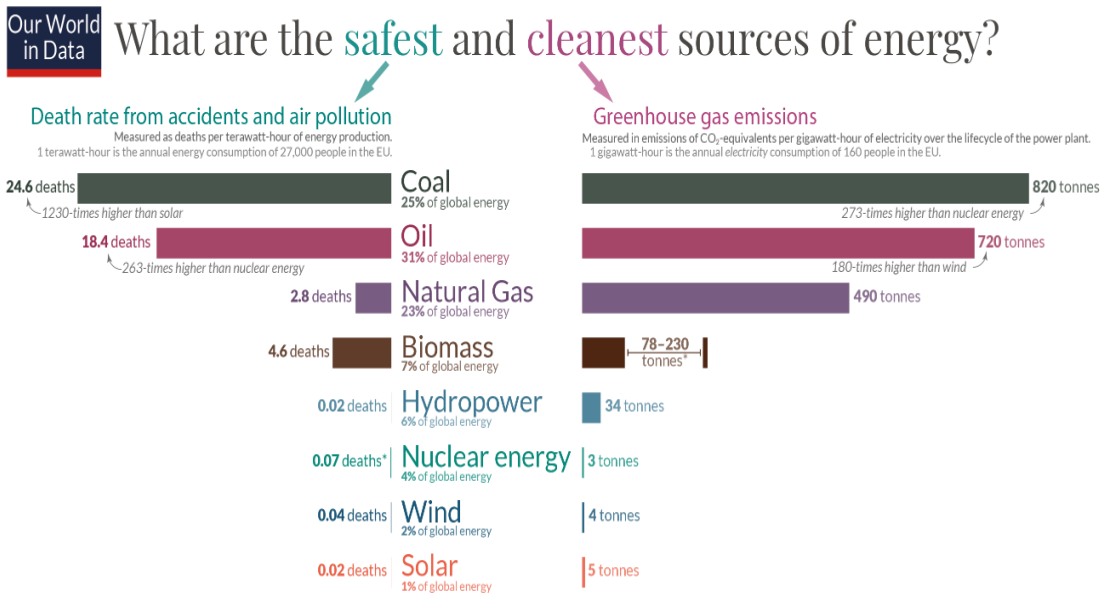
Neighbouring state, the **UAE**, has also stated plans to produce ~1mtpa of hydrogen from nuclear power.

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.



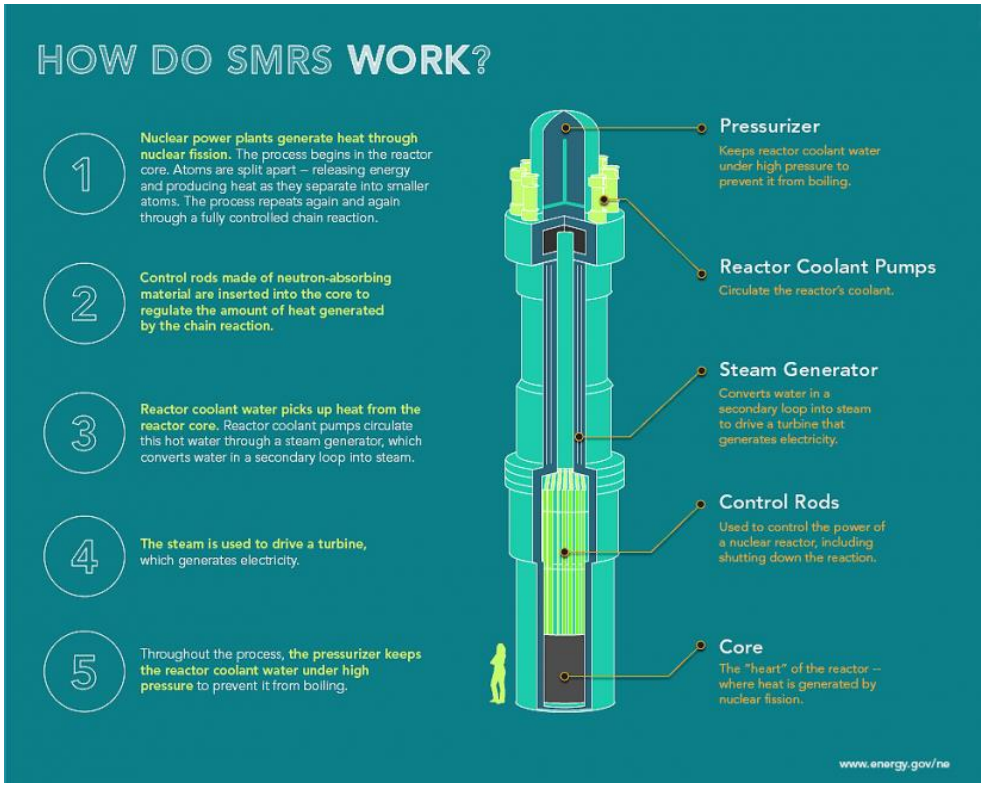
Source: Our World in Data

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. 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 advent of Small Modular Reactors is changing this. 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.



Source: energy.gov

The Roll-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 which can power a city of 1m people such as Sheffield and Leeds combined.

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.

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.

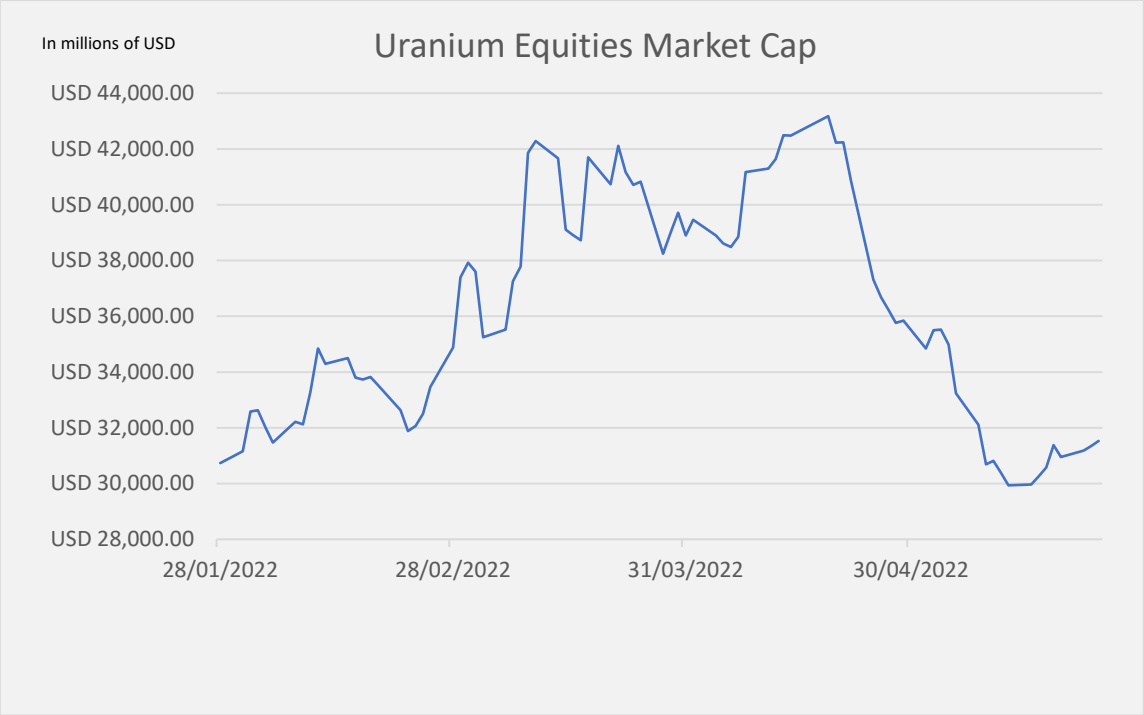
Current nuclear reactors use fission technology which heats uranium atoms to incredibly high temperatures to create a nuclear reaction. Nuclear fusion slams two atoms together to create energy, the output is 3-4x more powerful than fission. Notably, the most advanced fusion project is in California, 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:

Ticker	Company Name	Last Price		Volume	USD Market Cap $m	Status	Country
EME	ENERGY METALS LTD (XASX:EME)	USD	0.18	5,500	USD 26.61	Explorer	Australia
VMY	VIMY RESOURCES LIMITED (XASX:VMY)	USD	0.18	628,975	USD 147.00	Developer	Australia
EL8	ELEVATE URANIUM LTD (XASX:EL8)	USD	0.49	573,125	USD 95.16	Explorer	Australia
OKR	OKAPI RESOURCES LIMITED (XASX:OKR)	USD	0.23	4,590	USD 19.82	Explorer	Australia
BOE	BOSS ENERGY LTD (XASX:BOE)	USD	2.19	1,712,648	USD 502.69	Developer	Australia
PDN	PALADIN ENERGY LTD (XASX:PDN)	USD	0.72	10,409,594	USD 1,511.31	Producer	Australia
POW	PROTEAN ENERGY LTD (XASX:POW)	USD	0.01	210,000	USD 3.67	Explorer	Australia
GTR	GTI RESOURCES LTD (XASX:GTR)	USD	0.02	2,779,684	USD 16.41	Explorer	Australia
DYL	DEEP YELLOW LIMITED (XASX:DYL)	USD	0.70	733,628	USD 189.69	Developer	Australia
VAL	VALOR RESOURCES LIMITED (XASX:VAL)	USD	0.01	903,158	USD 20.61	Explorer	Australia
SLX	SILEX SYSTEMS LIMITED (XASX:SLX)	USD	1.30	37,314	USD 185.28	Developer	Australia
ERA	ENERGY RESOURCES OF AUSTRALIA LTD. (XASX:ERA)	USD	0.30	135,890	USD 780.62	Producer	Australia
AEE	AURA ENERGY LIMITED (XASX:AEE)	USD	0.20	489,828	USD 63.09	Developer	Australia
PEN	PENINSULA ENERGY LIMITED (XASX:PEN)	USD	0.17	3,143,907	USD 119.51	Producer	Australia
ACB	A-CAP ENERGY LIMITED (XASX:ACB)	USD	0.08	725,913	USD 71.24	Explorer	Australia
BMN	BANNERMAN ENERGY LTD (XASX:BMN)	USD	0.19	1,722,997	USD 199.25	Developer	Australia
LOT	LOTUS RESOURCES LIMITED (XASX:LOT)	USD	0.26	1,551,350	USD 182.85	Developer	Australia
TOE	TORO ENERGY LIMITED (XASX:TOE)	USD	0.02	4,715,463	USD 49.45	Developer	Australia
MHC	Manhattan Corporation Limited (XASX:MHC)	USD	0.01	4,134,316	USD 10.76	Explorer	Australia
EPM	ECLIPSE METALS LIMITED (XASX:EPM)	USD	0.03	1,113,230	USD 35.89	Explorer	Australia
ALGEF	ALLIGATOR ENERGY LTD (OTCM:ALGEF)	USD	0.06	32,000	USD 145.86	Explorer	Australia
RDT	RED DIRT METALS LIMITED (XASX:RDT)	USD	0.58	1,271,759	USD 125.40	Explorer	Australia
GLA	GLADIATOR RESOURCES LIMITED (XASX:GLA)	USD	0.02	1,070,199	USD 7.93	Explorer	Australia
AEC	Anfield Energy Inc. (XTSX:AEC)	USD	0.09	40	USD 28.28	Developer	Canada
VUI	VIRGINIA ENERGY RESOURCES INC (XTSX:VUI)	USD	0.40	8,280	USD 20.45	Explorer/Developer	Canada
STND	Standard Uranium Ltd. (XTSX:STND)	USD	0.12	4,168	USD 10.66	Explorer	Canada
FMC	Forum Energy Metals Corp. (XTSX:FMC)	USD	0.13	1,045	USD 17.26	Explorer	Canada
LAM	Laramide Resources Ltd. (XTSE:LAM)	USD	0.47	28,060	USD 75.13	Developer	Canada
WUC	WESTERN URANIUM & VANADIUM CORP. (XCNQ:WUC)	USD	1.23	550	USD 41.42	Developer	Canada
92E	92 Energy Ltd (XASX:92E)	USD	0.56	191,400	USD 30.79	Explorer	Canada
SYH	SKYHARBOUR RESOURCES LTD. (XTSX:SYH)	USD	0.45	16,980	USD 46.28	Explorer	Canada
FUU	Fission 3.0 Corp. (XTSX:FUU)	USD	0.11	1,800	USD 25.36	Explorer	Canada
UROY	Uranium Royalty Corp. (XNAS:UROY)	USD	2.85	41,442	USD 266.30	Royalty	Canada
ISO	ISOENERGY LTD. (XTSX:ISO)	USD	3.36	6,100	USD 278.98	Explorer/Developer	Canada
PTU	PUREPOINT URANIUM GROUP INC. (XTSX:PTU)	USD	0.08	10,400	USD 21.38	Explorer	Canada
FIND	Baselode Energy Corp. (XTSX:FIND)	USD	0.90	38,243	USD 51.91	Explorer	Canada
NXE	NEXGEN ENERGY LTD. (XNYS:NXE)	USD	4.66	178,610	USD 2,172.60	Developer	Canada
BSK	BLUE SKY URANIUM CORP. (XTSX:BSK)	USD	0.19	12,200	USD 26.71	Developer	Canada
FSY	Forsys Metals Corp. (XTSE:FSY)	USD	0.49	935	USD 74.35	Developer	Canada
GLO	Global Atomic Corporation (XTSE:GLO)	USD	2.88	14,626	USD 397.53	Developer	Canada
DML	Denison Mines Corp. (XTSE:DML)	USD	1.48	182,153	USD 936.95	Developer	Canada
AL	ALX Resources Corp. (XTSX:AL)	USD	0.05	8,299	USD 7.30	Explorer	Canada
MGA	Mega Uranium Ltd. (XTSE:MGA)	USD	0.24	11,942	USD 65.08	Developer	Canada
EU	enCore Energy Corp. (XTSX:EU)	USD	1.21	111,070	USD 302.20	Developer	Canada
CCO	CAMECO CORPORATION (XTSE:CCO)	USD	30.96	84,015	USD 9,588.20	Producer	Canada
AAZ	Azincourt Energy Corp. (XTSX:AAZ)	USD	0.09	280	USD 16.86	Explorer	Canada
GXU	GOVIEX URANIUM INC. (XTSX:GXU)	USD	0.31	99,933	USD 140.51	Developer	Canada
HURA	Horizons Glo Uranium Idx ETF (XTSE:HURA)	USD	21.10	153	USD 48.69	Fund	Canada
UEX	UEX Corporation (XTSE:UEX)	USD	0.26	586,863	USD 108.03	Developer	Canada
CVV	CANALASKA URANIUM LTD. (XTSX:CVV)	USD	0.38	4,429	USD 23.36	Explorer	Canada
MKA	MKANGO RESOURCES LTD. (XTSX:MKA)	USD	0.35	26,480	USD 52.08	Explorer	Canada
FCU	FISSION URANIUM CORP. (XTSE:FCU)	USD	0.74	337,218	USD 389.07	Developer	Canada
API	Appia Rare Earths & Uranium Corp. (XCNQ:API)	USD	0.43	5,005	USD 40.14	Developer	Canada
VO	ValOre Metals Corp. (XTSX:VO)	USD	0.39	22,500	USD 43.20	Explorer/Developer	Canada
ERC	Eros Resources Corp. (XTSX:ERC)	USD	0.09	16,000	USD 6.47	Explorer	Canada
CUR	Consolidated Uranium Inc. (XTSX:CUR)	USD	1.97	22,506	USD 117.42	Explorer	Canada
KAP	Joint stock company "National atomic company "Kazatomprom" (XLON:KAP)	USD	26.70	10,071	USD 7,170.69	Producer	Kazakhstan
BKY	BERKELEY ENERGIA LIMITED (XLON:BKY)	USD	20.55	30,630	USD 200.61	Developer	UK
YCA	YELLOW CAKE PLC (XLON:YCA)	USD	373.60	229,686	USD 843.12	Trust Fund	UK
GCL	GEIGER COUNTER LIMITED (XLON:GCL)	USD	47.25	438,592	USD 77.38	Investment Fund	UK
0UJW	AZARGA URANIUM CORP. (XLON:0UJW)	USD	0.60	500	USD 150.77	Developer	US
UEC	URANIUM ENERGY CORP. (XNYS:UEC)	USD	3.64	2,129,351	USD 1,013.19	Developer	US
LEU	CENTRUS ENERGY CORP. (XNYS:LEU)	USD	23.86	12,473	USD 345.70	Developer	US
UUUU	Energy Fuels Inc. (XNYS:UUUU)	USD	6.31	647,135	USD 1,262.01	Producer	US
URG	Ur-Energy Inc. (XNYS:URG)	USD	1.19	76,635	USD 331.06	Producer	US
URNM	Sprott Uranium Miners (ARCX:URNM)	USD	65.43	55,631	USD 964.71	Fund	US
URA	Glbl X Uranium ETF (ARCX:URA)	USD	21.42	373,141	USD 1,854.05	Fund	US
U.U	SPROTT PHYSICAL URANIUM USD UNT (XTSE:U.U)	USD	11.75	305	#VALUE!	Fund	US



Total Uranium Market Cap ($m)	USD 31,364.62
KAP & CCO - Contribution (%)	53.49%
Australia - Contribution (%)	14.38%
Canada - Contribution (%)	49.29%
US - Contribution (%)	9.89%
UK - Contribution (%)	3.57%

We publish weekly updates on the uranium sector in a segment called 'Ocean Wall's ion-U'. Should you wish to be added to the mailing list please contact ben@oceanwall.com

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