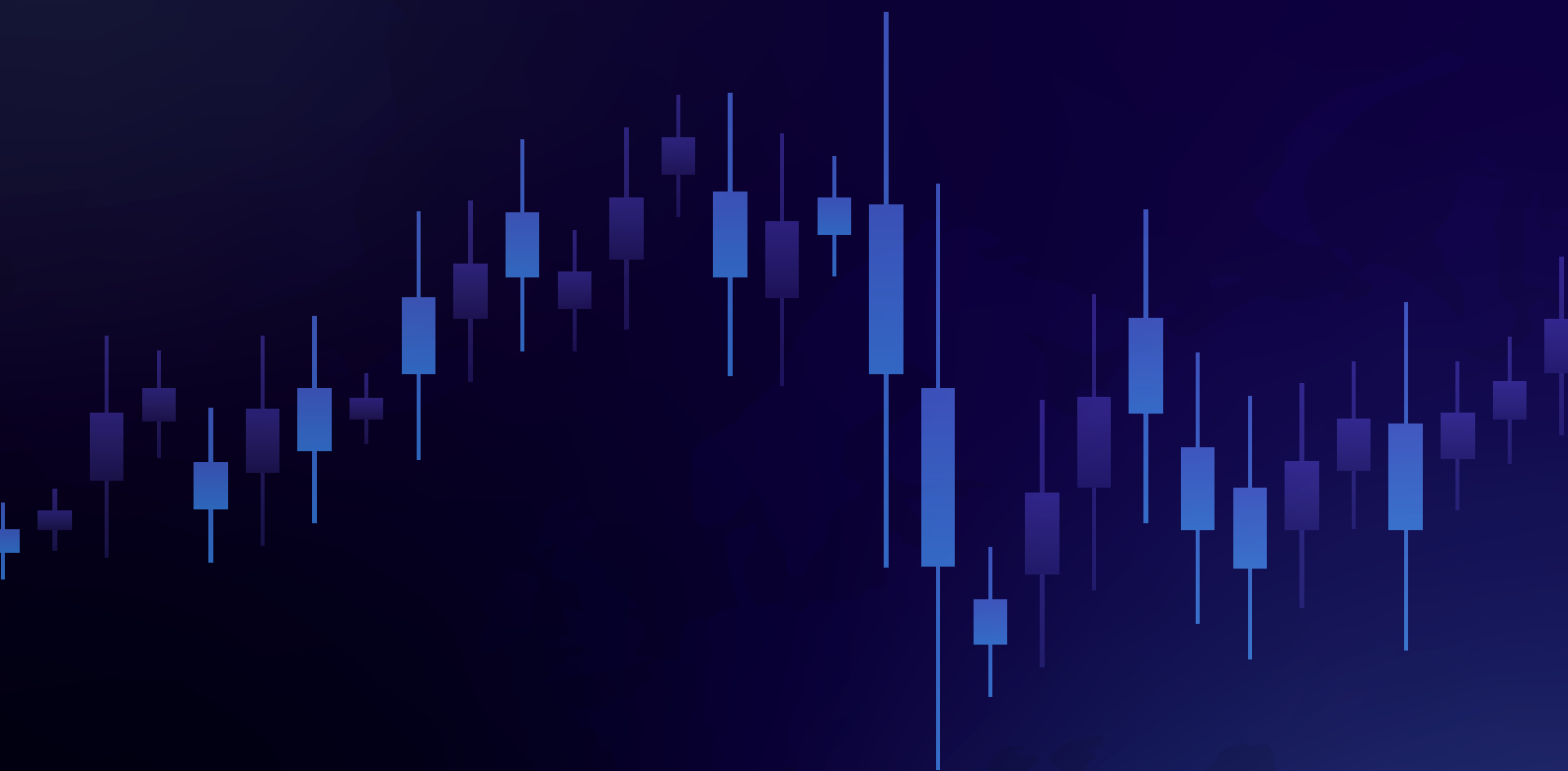




THE CASE FOR URANIUM

A Deeply Fundamentally
Supported Story



THE CASE FOR URANIUM

A Deeply Fundamentally Supported Story

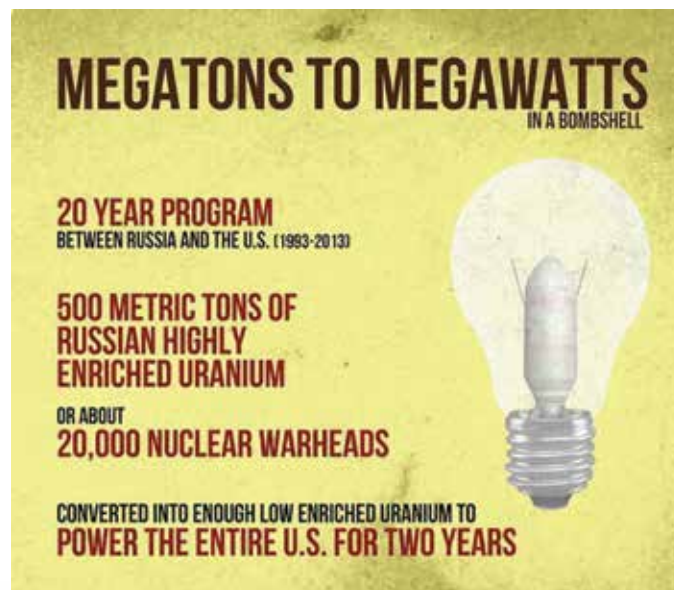
On Friday March 11, 2011, Japan experienced a magnitude 9.0 earthquake followed by a large tsunami that devastated an entire region of the country. The earthquake was centered 130 km offshore the city of Sendai in Miyagi prefecture on the eastern coast of Honshu Island and was a rare and complex double quake giving a severe duration of about 3 minutes. The Fukushima-Daiichi plant and all six of its external power supply sources were lost due to earthquake damage, so the emergency diesel generators located in the basements of the turbine buildings started up. Unfortunately, the tsunami submerged the diesel generators, and as a result, the station blacked out and three reactors experienced a partial meltdown.

In the years before the Fukushima-Daiichi accident, there had been growing hope that a nuclear renaissance was imminent. The events in Japan, however, profoundly influenced the uranium sector as it gave rise to an unexpected drop in worldwide uranium consumption and abrupt changes in national energy policies. Before the earthquake and tsunami hit, Japan had 54 operational nuclear reactors. In the ensuing months, Japan shut down its entire operating nuclear fleet, leaving a gaping hole in its national energy potential.

Japan's decommissioning of more than 10% of the world's nuclear capacity ushered in an almost 10-year long uranium bear market. Counterintuitively, in the wake of the accident, the uranium mining companies continued to produce, largely producing into their long-term contract books. Amongst these producers, a colossal source of new supply was emerging in Kazakhstan – which became the world's largest producer in 2009. This state-owned operation benefited from both the most economical method of extraction (in situ recovery – "ISR") and its ever-weakening local currency, the Kazakh Tenge. Production out of Kazakhstan continued to climb, ultimately peaking in 2016 with an incredible 63.9M lbs. of uranium production that year.



As is the case for many commodities that plunge in price, capital for uranium exploration and development dried up as corporate budgets were tightened. Worldwide expenditures on exploration and mine development imploded from \$2bn/yr. in 2014 to \$500mn/yr. in 2018. It bears mentioning that the uranium cycle was also adversely impacted by several other sector-specific anomalies that further elongated the price recovery process, including both enrichment underfeeding and uranium supply that arose from the Megatons to Megawatts (MTMW) nuclear warhead decommissioning program (1993-2013)...both of which added significant secondary uranium supply into the market.

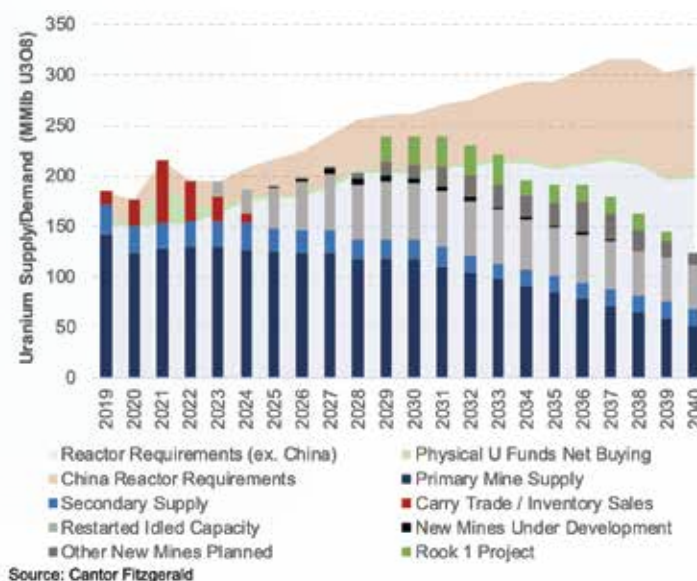


The trajectory of uranium both before and after the events at Fukushima followed a recurring pattern in commodities – the “boom-bust” cycle that accompanies strong demand followed by an increase in production, only to fall victim to contracting economic growth in the midst of excess supply. The cycle is self-correcting – low prices eventually disincentivize supply, and so goes the expression, “the cure for low prices...is low prices.” As described above, the last uranium bust cycle was amplified by a very specific idiosyncratic event – the aforementioned Fukushima Daiichi accident and the ensuing closure of Japan’s entire nuclear fleet – demand destruction compounded by simultaneous supply expansion.

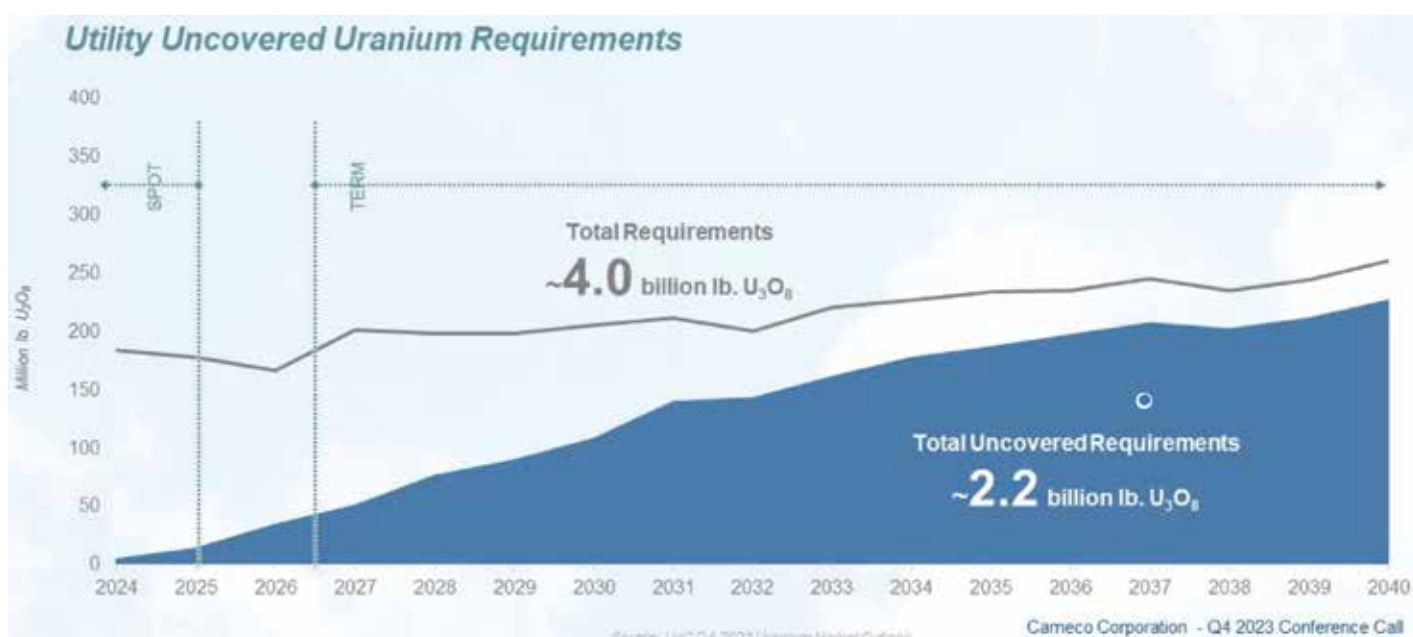
Uranium Demand Vastly exceeds Annual Production

Over the last thirteen years since the Fukushima accident, a multitude of factors have coalesced to create the conditions for the multi-year bull market for uranium that has already begun, the feedstock for the world’s 436 operating nuclear reactor fleet (392GW).

The sector’s leading analysts are projecting primary annual uranium production to remain at a 30-50 million lb. annual deficit for the foreseeable future. Based upon our analysis, the potential for even larger shortfalls exists, largely due to unexpected secondary demand (financial interests buying and sequestering uranium) and higher transactional and operational enrichment tails.



It is important to point out that the last bull market in this sector (2003–2007) occurred during a period where annual supply exceeded annual demand. Why? Because the market was supported by large quantities of secondary uranium supplies. Today, we have a large annual structural deficit at a time where once again a utility contracting cycle to secure pounds has just begun. To those who need a clear picture why utilities must engage in large scale long-term contracting over the balance of this decade, examine the chart below:



Unlike other industries or commodity sectors, uranium supply responds very slowly, even in an environment where most development projects can be profitable. New uranium mines can take 10–15 years to come online. This lack of “supply response” means that even when accounting for the new mines scheduled to commence production over the balance of the decade, supply will not be enough to satisfy projected demand any time soon, as current operating mines will be slowly depleting even as new projects begin producing. Moreover, the emergence of financial buyers (the physical uranium acquisition funds and individual hedge funds) have become an important new source of demand.

A Supply-Constrained Market is Now Confronting Accelerating Demand Growth

After close to three years of doing research in the late ‘teens on what was then a thoroughly orphaned sector, we formally launched this service in August of 2019. We were convinced at that time that due to the events that occurred post-Fukushima that the uranium market – having been deprived of capital and plagued by below-production uranium pricing – had all the ingredients of a commodity market that was out of balance and would correct itself. While nuclear power was still wildly out of favor at that time, the

operating fleet of nuclear reactors still had to be supplied with fuel. That was the core of our bullish thesis – demand would outstrip supply and the price would have to rise.

Since that time, public and governmental views towards nuclear have changed profoundly in positive ways that frankly we couldn't have imagined back in 2019. Additionally, the entrance of financial players operating through physical acquisition funds served to accelerate the self correcting scenario we envisioned. What we did know 5-7 years ago was that the requirements of the operating reactors were highly quantifiable and that their demand was highly inelastic. There are very few industries in the world where you can predict future demand with such precision. Having said that, the nuclear incident at Fukushima was the type of idiosyncratic event that could and did disrupt that certainty. It is our belief that safety changes and modifications to plant designs since the Fukushima Daiichi accident have greatly minimized this already remote risk going forward.

Our bullish construct on the way the structural supply/demand imbalance would play out and the subsequent trajectory of uranium prices has validated our research conducted years ago, although back then we projected the future demand for mined uranium to be a slow growth proposition of +1-2% YoY. Because of the myriad of events that have occurred over the last 12-24 months, it is becoming clearer that global nuclear capacity (and therefore uranium demand) is growing much faster than our initial assumptions. Our +1-2% YoY projected growth rate has now been ratcheted up to a +4-6% YoY growth rate. Powerful new factors have turned what was a "supply constrained" thesis into a "supply constrained/accelerating demand" thesis. Needless to say, this is unbridledly bullish for the sector and further strengthens our convictions that the bull market in uranium is going to be a long-lived event. The factors that are contributing to this ramp up in demand are discussed in this section.

On March 21, 2024 Fortune ran a story entitled, "The U.S. could need the equivalent of 40 new nuclear plants over the next 5 years, by one estimate—and power hogs crypto and cannabis are to blame" wherein they laid out several elements that are contributing to current projected increase in electricity demand.

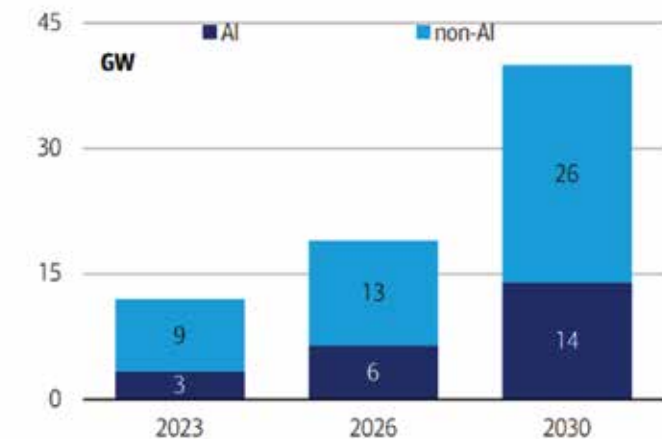
The extremely large electricity requirement created by Artificial Intelligence (AI) data centers is likely to be significant and will be an additional tailwind for nuclear energy. This rapidly emerging demand driver (See graphic below) was not even considered only a couple short years ago. To quote John Mauldin, publisher of **Mauldin Economics**: "The energy usage from AI is going to be a massive game changer that is not in the price or even in the narrative today. We will look back in ten years and ask, 'How did we miss it?'" AI data centers will require always-on, baseload energy. If a focus going forward will continue to be on clean energy, unless the data centers will only be built in jurisdictions with expandable hydroelectricity, nuclear energy (likely SMRs) will be the answer.

Sam Altman, the founder of OpenAI recently said that “While investors trip all over themselves to get into Nvidia **\$NVDA**, energy is the hardest part.” Now consider how the market values AI plays as well how aggressively investors are scouring for second and third derivative plays on AI, and then compare those AI-inebriated valuations with those of energy companies. Are we the only ones who are starting to figure this out? Hardly...just look at the stock performance of Constellation Energy which has the largest fleet of nuclear power plants in the U.S. Then look at the attention that Amazon’s recent purchase of a data center campus located adjacent to a Susquehanna nuclear power plant garnered. Treva Klingbiel, President of the well respected industry analyst, TradeTech, had this to say in a recent presentation to Australian investment house Shaw & Partners:

“we are facing a future defined by higher energy demand. As reported by Bloomberg, by 2030 the surge in AI alone, meaning U.S. data centers, may gobble up more demand than households.” Look for this theme to broaden out and continue to positively impact the entire energy sector including uranium stocks.

Exhibit 10: US hyperscaler workloads by type

AI data center demand sprouted up almost overnight and some project a 4x rise in AI data center power demand at hyperscaler facilities by 2030



Source: McKinsey datacenter demand model

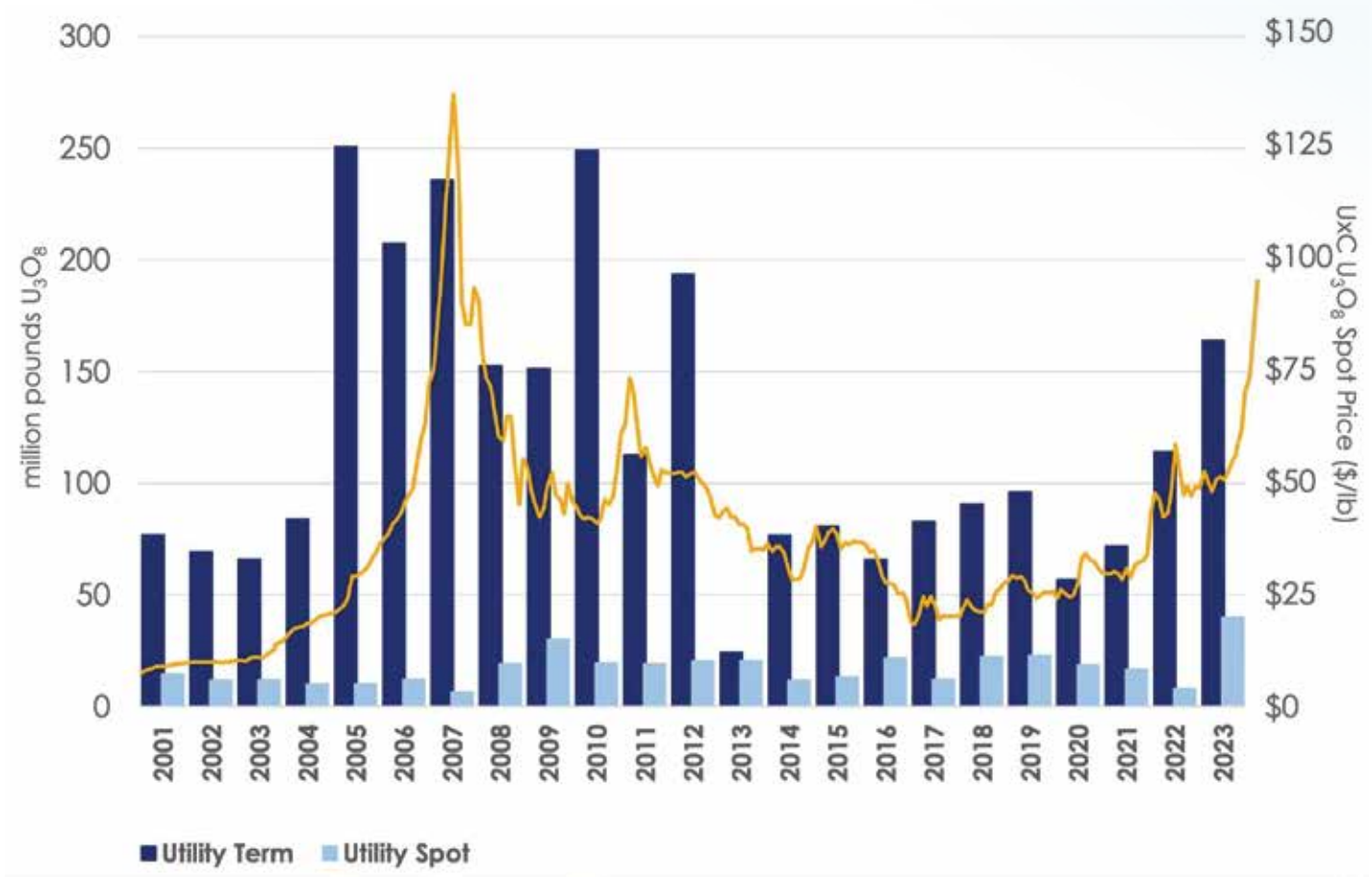
BofA GLOBAL RESEARCH

Replacement-Rate Long-Term Contracting

There are several steps that must be taken between the extraction of uranium from the ground and the delivery of bespoke fabricated fuel rods to a nuclear power plant. This process is called the “nuclear fuel cycle,” and its duration is ~18-24 months. Nuclear utilities, therefore, must accumulate uranium and fuel cycle services (conversion, enrichment, fuel fabrication) years in advance. The world’s 436 operating reactors consume an estimated 180 million pounds of uranium annually.

Due to the vicissitudes of natural commodities cycles as described above, high-volume contracting in the long-term market by nuclear utilities also tends to occur in cycles. During periods when uranium is cheap and abundant, utilities tend to sign fewer long-term contracts and instead rely on the spot market (<12 months settlement) and shorter-term carry trades. However, when inventories diminish and the uranium price recovers into a clear uptrend, utilities will place a focus on security of supply, and tend to enter into more long-term contracts and in much higher volumes.

Utilities around the world currently consume approximately 180M lbs. of uranium annually, therefore in order to replace that amount of uranium consumed, they need to contract for at least that amount each year. That is called “replacement-rate contracting.” 2023 was the first year in over a decade that long-term volumes roughly equaled annual consumption. These contracting cycles typically last for 5-7 years. A uranium bull market is accompanied by many years of greater than replacement-rate term contracting, and conversely a bear market is characterized by a multiple year period of less than replacement-rate term contracting. In the chart below, you can clearly see where we are at in this cycle. To put it simply, we are still in the early stages of a multi-year long-term contracting cycle that is likely to continue to put upward pressure under the price of uranium.



Nuclear is a Growth Industry

The world presently has 436 operating reactors, 62 under construction, 118 ordered/planned, and 323 additional plants proposed. Twenty-six (26) of these new reactors currently under construction will come online over the next three years. China intends to increase its nuclear fleet to reach its goal of 150GW of nuclear generation by 2035 (China currently has ~55GW of nuclear output). To put that in perspective, that is more new reactors in the next ten years than the entire world has built in the last thirty years. India has stated it will triple its nuclear plant footprint, aiming to add an additional 8.4GW. Even Japan has admitted it is impossible to achieve its climate and energy security goals without nuclear power, and plans to achieve 20-22% of its electricity from nuclear power by 2030 – which will require the restarting of an additional 20 idled reactors.

In the United States (the country with the world's largest nuclear power fleet), the future operation of the existing nuclear fleet has been largely de-risked through pro-nuclear policy. The U.S. Inflation Reduction Act provides material financial support for the operators of the 94 operating domestic reactors via clean energy production tax credits, enabling them to remain open and continue operating well beyond their planned lifespans. Reactor life extensions are a direct result of the growing recognition that nuclear plants can perform safely for up to 80...even possibly 100 years, and are vital to the stability of the grid.

Finally, few of the industry projections are factoring in the impact that Small Modular Reactors (SMRs) are expected to have on demand – and it could be quite significant – in the next decade and beyond. A leading nuclear industry consultancy, TradeTech, estimates cumulative SMR uranium demand on the order of 200 million pounds of uranium by 2035. The practicality of replacing coal-fired plants that are already connected to an existing electric grid with SMRs is part of the future energy reality. In fact, Bill Gates' TerraPower is about to do just this in the State of Wyoming.

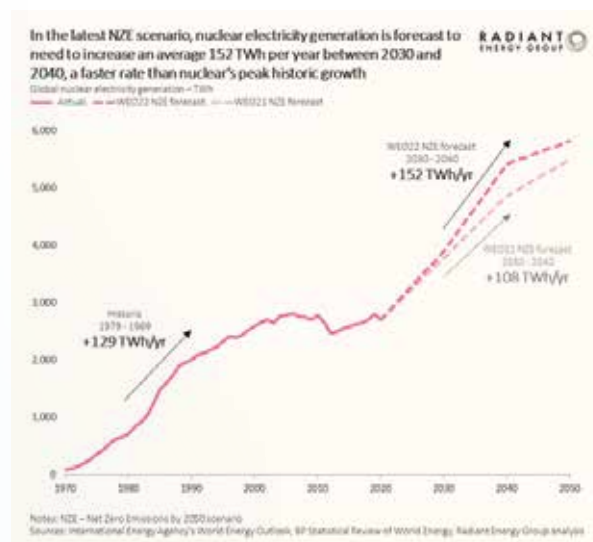
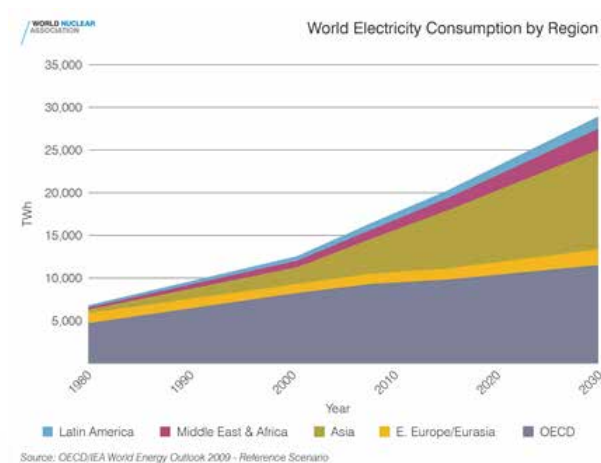
In summary, the global climate and energy crises, paired with increased trust in the safety and reliability of nuclear power, have spurred the sector's growth.



The “Electrification” of Everything

The electrification of everything, the growth of AI computing, and the worldwide push towards electric vehicle production will put new and unprecedented strain on the world’s power grids. Elon Musk, the most prominent voice on electric vehicles, recently stated that EVs will double the world’s need for electricity by the year 2040. Musk, logically, has also endorsed nuclear energy.

“climate change” saviors, both sources are experiencing slowing growth due to cost overruns and the inherent problems of grids having too large a percentage of these intermittent energy inputs. Put simply, the world needs reliable, clean 24/7 baseload power...the kind nuclear power can provide. We believe this trend will continue as physics inevitably “wins.” The embracing of nuclear power that we are witnessing currently is not only likely to continue but more than likely will accelerate as global electricity demand grows. In fact, the International Energy Agency projects that in order to achieve “Net Zero” by 2050, global nuclear-generated capacity will need to essentially double, requiring the fastest global nuclear build out in history.



Securitization is Playing a Pivotal Role

Financial players have sensed the opportunity in uranium. Physical acquisition funds have already accumulated nearly 85 million pounds of uranium in the open market, providing investors the opportunity for direct exposure to the uranium commodity. Open market spot purchases of uranium by the Sprott Physical Uranium Trust (U:UN: TSX), and Yellow Cake plc (YCA: LSE) – the two largest physical acquisition funds – have gone a long way towards clearing out excess above-ground mobile inventory and have contributed to the very thin current status of the uranium market. In addition to these large publicly-traded physical funds, individual hedge funds have been accumulating uranium.

Dramatic Change in Public Attitudes towards Nuclear Power

Importantly, there has been a noticeable and measurable change in public attitudes towards nuclear power over the last several years. Millions of citizens worldwide have a new understanding of the key role nuclear power has to play in a clean energy future. Nuclear power generation is not only emissions free, but is also reliable, baseload energy. Nuclear plants operate at incredibly high capacity factor – essentially, aside from brief refuelings, they are generating electricity 24/7/365.

One key example of how profound this shift in public attitudes has been can be highlighted by Japan. Ironically, according to the polls, the country that experienced the most recent nuclear accident is now majority in favor of restarting more idled nuclear power plants.

As is the customary pattern, when government policymakers want to change course, you can expect to see more and more favorable press to surface. That is precisely what has happened as pro-nuclear power articles have been appearing

with increasing frequency in the business and general press. This formerly orphaned clean energy source has in some ways been reintroduced to the public as a potential solution to the collective climate challenges and power shortages around the globe. Perhaps most critically, public support and perceptions of the need for nuclear power have shifted dramatically over recent years.

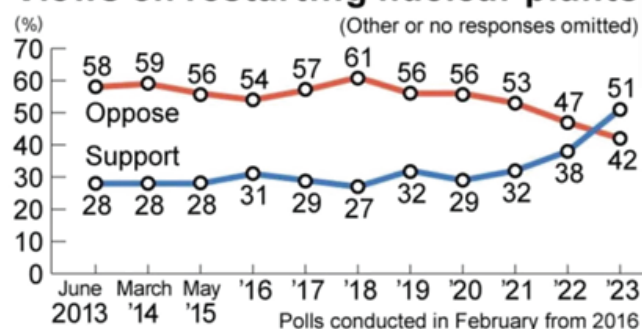
During the recent U.N. COP 28 Climate conference held in Dubai the U.S., U.K., France, Sweden, Finland, South Korea, and 22 other signatory nations pledged support for a plan to triple nuclear capacity globally by 2050.

Growing Institutional Interest

Wall Street's tendency to be attracted to "themes" is well documented. Increasingly, institutional investors are applying non-financial factors as part of their analysis process of determining whether an investment is suitable for the funds they steward. How does that relate to the uranium industry? Climate change is a hot-button issue. Industries, from EV manufacturers to solar stocks to renewable energy alternatives that address carbon emissions receive beneficial and often outsized valuations. In fact, all manner of industries that address carbon emissions are receiving outsized valuations.

Japanese Poll on Nuclear Acceptance

Views on restarting nuclear plants



How impactful can ESG-driven investment flows be? In 2022, Morgan Stanley issued an insightful research report entitled *“Rate of Change – ESG investing is going mainstream,”* citing valuation changes in what they labeled as the *“U.S. clean energy space.”* In that report they included the following passage: *“With more money moving into ESG, pure-play green investments have seen valuations skyrocket... we think the power behind green investing and socially responsible investing will continue to grow...”*

From our perspective, this trend is undeniable. Nuclear power – once thought of by many as a menacing source of power generation – is now being embraced, including by the environmentalist Left, as a vital and necessary component of achieving climate goals. Nuclear power has finally been labeled as “strategic” for the European Union’s decarbonization goals. In short, nuclear power and uranium producers now check many of the ESG boxes. Along with all of the other underlying elements that support our bullish uranium investment thesis, the increase of ESG investment flows into this tiny space will, in our view, lead to dramatic increases in uranium equity valuations over time.



Accordingly, we anticipate increased allocation by generalist, natural resource funds, and further aggressive investing from hedge funds. Despite providing 10% of the world’s energy needs and ~19% of those in the U.S., the uranium sector still only has a global market cap of ~\$70 billion, with a freely tradable float of perhaps 70% of that. Along with the marked change in public sentiment as nuclear becomes increasingly accepted as “green,” we expect the share of institutional ownership of nuclear and uranium-related equities to continue to grow.

Summary

A confluence of factors has coalesced and refocused both interest and growth in a longstanding, time-tested technology that produces clean, carbon-free energy: nuclear power. Unlike other commodities, uranium is largely inelastic to economic contractions. Nuclear power plants do not drastically alter their electricity generation based on economic booms or busts. Importantly, procuring uranium represents <5% of the overall cost of operating a nuclear power plant – therefore, significant upside exists for this necessary commodity. The costs associated with shutting down a plant FAR outweigh the cost increases due to more expensive fuel. We expect to see many years of accretive pressure on the price of uranium due to persistent supply shortfalls (even after large development projects are producing late-decade) and the stable and growing demand outlook.

The climate imperative has added extra momentum due to scarcity of reliable alternatives for clean, baseload power, and has further strengthened the case for nuclear energy. We believe we are in the midst of a historic bull market for uranium. The bullish investment case is clear. This is a generational opportunity to invest in a big cycle – a nuclear renaissance that we believe is still in its infancy.

How should a Rational Investor Seek to take Advantage of this Opportunity?

While the opportunity is vast – like all sectors of the market, there are always winners and losers. Investors want to be positioned in those companies that will truly be able to take advantage of this historic opportunity and emerge as strong cash flowing producers into this robust pricing environment while at the same time avoiding those companies that are never going to make it to the finish line. That's why we distill close to 200 sector companies down to our select Focus List – what we believe are the 10 best risk vs. reward companies in the space. We hope you choose to join this journey with us. Those who became subscribers since we started in 2019 have already profited handsomely.....but we believe there is still a long way to go for this historic investment opportunity.

JUSTIN HUHN is the Founder & Publisher of
The Uranium Insider – Independent Research Newsletter

Email: support@uraniuminsider.com

Website: www.uraniuminsider.com