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THE POWER OF **INSIGHT**

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A CLOSER LOOK AT URANIUM

Is this Dog About to Have its Day?

- A full five years after the meltdown at the Fukushima-Daiichi nuclear facility very little has changed within the nuclear industry.
- Nuclear power's contribution to the global electricity mix remains steady at roughly 11% according to the International Energy Agency (IEA).
- Globally, the nuclear fleet numbers 440 in size across 30 countries requiring around 170 million pounds of uranium. 66 reactors are under construction and another 173 are planned[1].The existing fleet generates 382 GW of electricity.
- The uranium market is adequately supplied with current demand at 172 million pounds of U3O8 and primary supply of 146.5 million pounds plus secondary supplies of 42.9 million pounds as of 2014.

(1) According to the World Nuclear Association, "planned" nuclear reactors are defined as those where "Approvals, funding or major commitments are in place, mostly expected in operation within 8-10 years"

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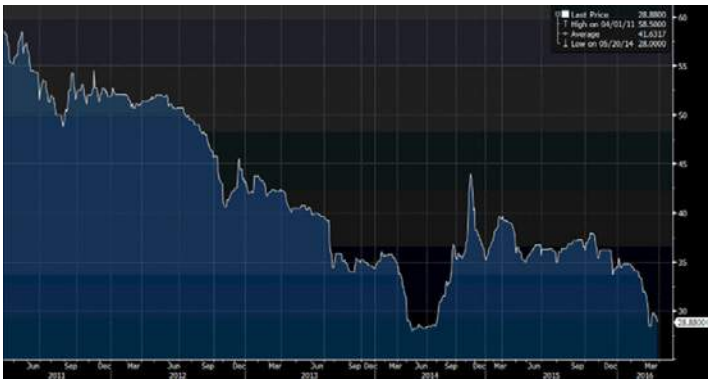
- The current uranium spot price of around $28 per pound reflects an evolving dynamic consisting of excess supply, reactor underfeeding (excess enrichment capacity), and uncertainty around the Japanese reactor fleet where only three of the 54 reactors are back on line.
- Current prices are too low for producers to consider major capital investments with many believing that the incentive price is ~$65 per pound.
- The recent Paris COP21 agreement, whereby 195 countries agreed in principle to move towards carbon-free sources of energy is a catalyst for cleaner sources of energy. Nuclear currently stands alone as the single scalable source of baseload electricity. Japan's intention to re-start a select number of reactors in their existing fleet going forward is also a positive catalyst, though many are disappointed that this hasn't happened sooner.
- Another tailwind has come from the strength of the US Dollar. The USD has appreciated by 16% against the Canadian Dollar, 29% against the Kazakh Tenge, 20% against the Australian Dollar, and 59% against the Russian Ruble – all major uranium producing jurisdictions; this has alleviated somewhat producer margin compression.
- New reactor technologies, including Small Modular Reactors (SMRs), are a welcome sign but could be indicative of lower long-term uranium demand. This will be an interesting dynamic to watch closely.
- Despite the many paradoxes, uranium remains critical to the growth of zero-emission base load electricity; I believe the underperformance of a basket of uranium names demonstrates a unique contrarian opportunity in a moribund commodity sector.

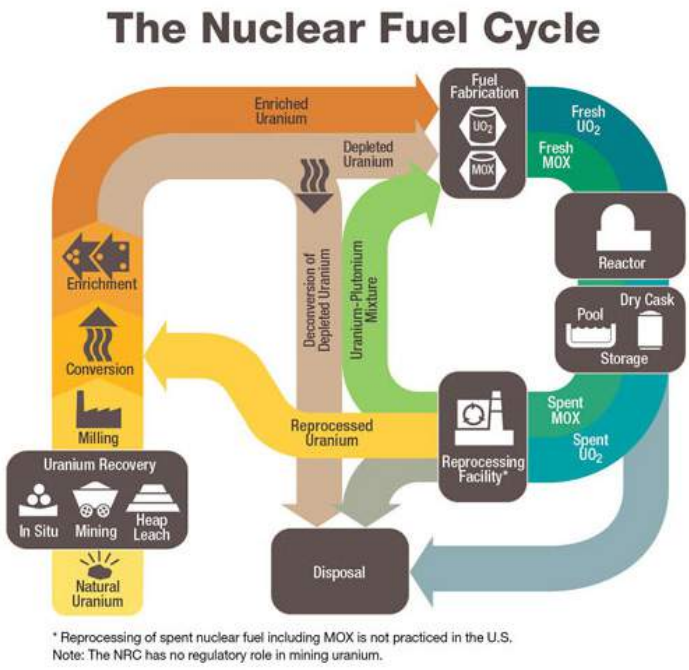
Uranium Spot Price Since 2011



Source: Bloomberg

INTRODUCTION

ASSUREDLY, THERE ARE THOSE WHO WILL DISAGREE WITH MY REFERENCE TO URANIUM AS A "DOG" IN THE SUBTITLE OF THIS REPORT. URANIUM CONTINUES TO BE THE MOST CONTROVERSIAL METAL I COVER. WHEN I LEFT THE URANIUM SECTOR IN MARCH OF 2013, I WASN'T CERTAIN WHEN I WOULD COME BACK AS ADEQUATE SUPPLY AND FUKUSHIMA-INDUCED FEAR SEEMED DESTINED TO HANG OVER THE SECTOR INDEFINITELY. HOWEVER, DESPITE THE FACT THAT URANIUM IS SUBJECT TO THE CYCLICAL NATURE OF COMMODITIES, ITS INDISPENSIBLE ROLE IN THE GLOBAL ELECTRICITY GENERATION MIX DICTATES THAT IT CANNOT BE IGNORED.



Source: US GAO; Industry Interviews

Uranium is typically purchased via long term private contracts, whereby a utility, the user, will enter into a multi-year supply contract for a set amount of U3O8, or yellow cake. The "story" around uranium may be about to change as utilities such as Exelon (EXC:NYSE) or Electricite de France SA (EDF:EPA) who burn uranium in reactors are entering a new cycle where supply contracts will need to be renewed. Uncovered requirements, or the difference between locked-in supply and future requirements, are a key driver for higher uranium prices. According to uranium consultancy UxC, 25% of demand is currently uncovered in 2019 and this rises to 75% of demand in 2025.

Reactor build outs are continuing apace, led by China with 24 under construction. The additional uranium demand from new reactors coming online coupled with the demand needed to satisfy the existing fleet and the eventual restart of a portion of the Japanese fleet, have many thinking that higher uranium prices are in the offing. I would agree as the current uranium spot price, languishing at $28 per pound, is a detriment to significant exploration or development of deposits.

INDUSTRY OVERVIEW

Like other energy metals, uranium production is a concentrated industry, with four producers accounting for roughly two thirds of global uranium supply and nine producers accounting for almost 90% of production.

	2014 tU Produced	%
KazAtomProm	18,081	25
Cameco	8,956	16
ARMZ-Uranium One	6,944	12
Areva	6,496	12
BHP Billiton	8,851	6
CNNC/CGN	2,684	5
Navoi	2,400	4
Paladin	2,816	4
Rio Tinto	2,296	4
Other	6,978	12
Global Total	56,217	

In addition, 66% of this production originates from three countries – Kazakhstan, Canada, and Australia.

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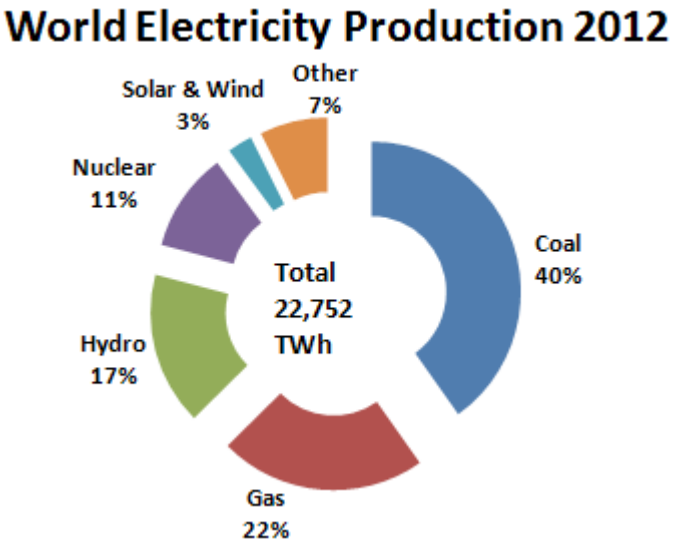
	2014 tU Produced
Kazakhstan	28,127
Canada	9,184
Australia	5,001
Niger	4,057
Namibia	8,255
Russia	2,990
Uzbekistan	2,400
USA	1,919
China	1,500
Ukraine	962
Global Total	56,252

Source: WNA

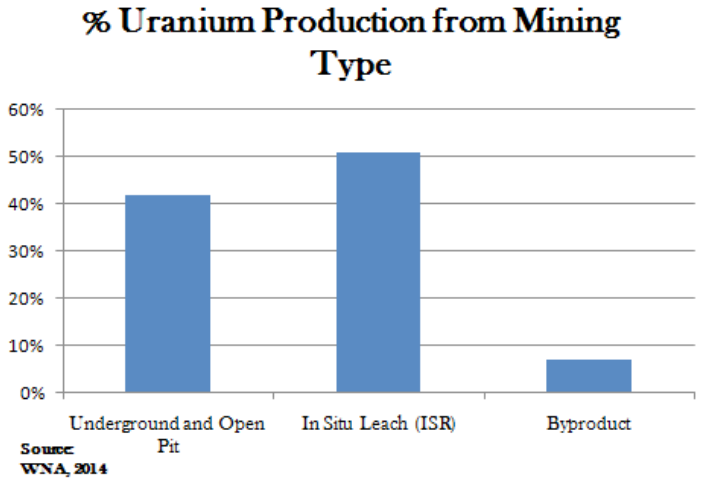
Though slightly dated, 22,752 terawatt-hours (TWh) of electricity were generated in 2012 and nuclear power was responsible for 11% of this according to the IEA. The IEA forecasts this to grow to 31,772 TWh by 2035, a 40% increase.



Source: IEA, 2014

Uranium is mined primarily by two methods – underground/open pit and in situ leaching (ISR). ISR has become the most popular method owing to its low cost profile. As far back as 1990, roughly 55% of uranium came from underground mines with ISR at a minimum. Due to the need to lower costs and also advances in uranium extraction technology, ISR is now the most widely used uranium extraction method.

Much of this increase has originated in Kazakhstan whose processing methods and proximity to Russia (who wants supply to feed their enrichment capacity) are key drivers in ISR growth. How Kazakhstan continues this growth trajectory will be a key for the direction of the uranium price going forward.



ISR is now the most widely used uranium extraction method.

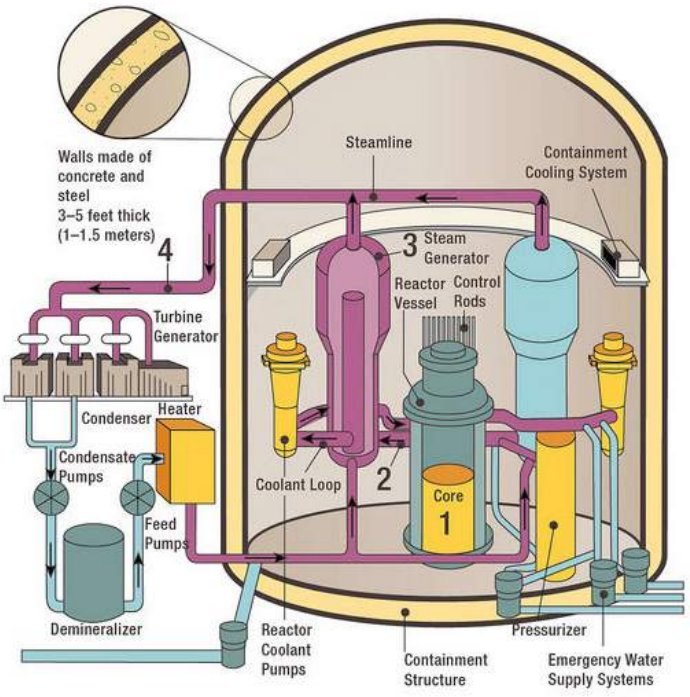
The Top 15 Uranium Mines Around the Globe:

MINE	COUNTRY	MAIN OWNER	MINE TYPE	2014 tU Production	%
McArthur River	Canada	Cameco (69.8%)	Conventional	7,856	18
Katco	Kazakhstan	Areva	ISL	4,822	8
Olympic Dam	Australia	BHP Billiton	By-Product	8,851	6
SOMAIR	Niger	Areva (68.6%)	Conventional	2,881	5
Budenovskoye 2	Kazakhstan	Uranium One / Kazatomprom	ISL	2,084	4
South Inkai	Kazakhstan	Uranium One / Kazatomprom	ISL	2,002	3
Priargunsky	Russia	ARMZ	Conventional	1,970	4
Langer Heinrich	Namibia	Paladin	Conventional	1,947	4
Inkai	Kazakhstan	Cameco	ISL	1,922	3
Central Mynkuduk	Kazakhstan	Ken Dala JSC / KazAtomProm	ISL	1,790	3
Rabbit Lake	Canada	Cameco	Underground	1,602	3
Budenovskoye 1, 2 & 4	Kazakhstan	Ken Dala JSC / KazAtomProm	ISL	1,594	3
COMINAK	Niger	Areva (84%)	Underground	1,501	3
Rossing	Namibia	Rio Tinto (69%)	Open Pit	1,808	2
South Moinkum & Khanzhugan	Kazakhstan	Mining Co Taukent / KazAtom	ISL	1,174	2
Top 15 Total				86,250	64.5

Source: WNA; Cigar Lake omitted, but production in 2015 equated to 11.5 million pounds.

There is no shortage of different types of nuclear reactors, both in production today and experimental. To properly delve into the pros and cons of each would likely require a report on its own. The two main types of reactors in use today are Pressurized Water Reactors (PWRs) and Boiling Water Reactors (BWRs).

PWRs, sometimes called thermal power plants, essentially heat water, but don't let it boil. While the water does reach a temperature of roughly 325 degrees Centigrade, it is kept under high pressure (about 150 times atmospheric pressure). As the fission of uranium atoms occurs in the reactor core, this generates heat which is fed to a steam generator. The steam is then fed to a turbine which generates electricity. This is the most common type of reactor and is used for naval propulsion as well. A schematic of a PWR:



Source: nrc.gov

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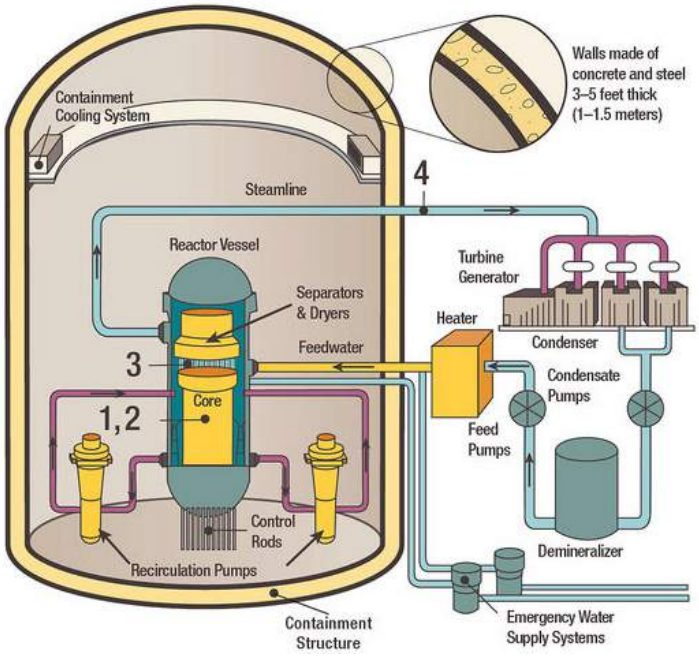
BWRs, first developed in the 1950s, heat water in the reactor core and create steam there as it is under lower pressure. The steam is then fed to a condenser and through to the turbines where electricity is created. Like PWRs, BWRs are a type of reactor known as "light water" reactors. A schematic of a BWR:



Source: nrc.gov

Other reactor types include Pressurized Heavy Water Reactors (PHWR, or CANDU), Advanced Gas-Cooled Reactors (AGR), Light-Water Graphite-Moderated Reactors (RBMK), and Small Modular Reactors (SMRs). It is the SMRs that seem to hold out the greatest promise as their smaller size (300 MWe), better economics, and simple design have many believing that this is the future direction for nuclear power.

SUPPLY AND DEMAND

Today, there exists a gap between the amount of uranium mined (primary supply) and the amount of uranium consumed (primary demand) in the existing (and growing) nuclear fleet. Our analysis indicates that demand is approximately 172 million pounds per year while primary supply is running at 146.5 million pounds. This gap (and source of excess supply) is filled by secondary supply to the tune of 40 million pounds per year. Secondary supply consists of stockpiles of uranium already mined and/or refined, and looking for a home, in addition to secondary supplies internal to Russia from their weapons-grade down blending program, so-called "megatons to megawatts". In the face of steady demand, ultimately these secondary sources will be depleted.

Given the current low price of uranium, high cost production and additional exploration has largely been halted, as it was for nearly 25 years, starting in the mid 1980's. This produced the supply-demand gap that eventually drove the uranium price from $7 to $140 per pound in just seven years, between 2001 and 2008. These dynamics look to be at play again, and can only mean that the gap between supply and demand will shift in favor of increased demand. As additions to the global nuclear fleet connect to the electric grid coupled with the wane of uranium exploration and mining, a pinch may be in the offing. Demand for uranium is forecast to increase to roughly 220 million pounds per year by 2025 from 172 million pounds today. To meet this demand, the equivalent of five Cigar Lakes (2015 production was roughly 10 million pounds) will need to come on stream. Cameco (CCO:TSX, CCJ:NYSE) also states that 10% of future demand will need to be met from new supplies, meaning that existing mines and secondary supplies will not be enough to equilibrate supply and demand.

REACTOR TYPE	COUNTRIES	Number	GWe	FUEL	COOLANT	MODERATOR
Pressurized Water Reactor (PWR)	USA, France, Russia, Japan, China	277	257	Enriched UO2	Water	Water
Boiling Water Reactor (BWR)	USA, Japan, Sweden	80	75	Enriched UO2	Water	Water
Pressurized Heavy Water Reactor (PWR)	Canada, India	49	25	Natural UO2	Heavy Water	Heavy Water
Gas-Cooled Reactor (AGR & Magnox)	UK	15	8	Natural U (Metal), Enriched UO2	CO2	Graphite
Light Water Graphite Reactor (RBMK & EGP)	Russia	15	10.2	Enriched UO2	Water	Graphite
Fast Neutron Reactor (FBR)	Russia	2	0.6	PuO2 and UO2	Liquid Sodium	None

Source: WNA

A word of caution is in order here. As uranium is a relatively small market with few players, much of what I know about supply, demand and price can really only be relied upon with a relative degree of uncertainty. Uranium transactions take place many times in both the spot and contract markets between multiple parties and as there is no true "market" vis-à-vis a futures market for uranium, pricing data ought to be welcomed, but allowed a margin of error.

SALIENT ISSUES

There are always salient questions aside from a simple supply and demand analysis that ought to be debated. Uranium is no different in this regard. From our perch, I see four issues.

First, when will the Fukushima-induced panic subside and allow nuclear power to truly be taken seriously again? The current disconnect in the nuclear power sector is that despite the safety record, it can take a single accident (Fukushima, Chernobyl, Three Mile Island) to slow the wide acceptance of nuclear power for years. This is despite us knowing in great detail exactly what caused each of the three incidents and the safety measures implemented in the wake of each. The fear of "radioactivity", while legitimate, is typically wildly blown out of proportion. One simply needs to be open to the actual outcomes. When viewed against much more frequent disasters in the coal mining industry, for example, Three Mile Island and Fukushima are comparatively trivial when looked at in isolation.

Second, given that the uranium market is by and large a contract market, when will utilities emerge and lock up supply for the next cycle? This is a crucial question as it can provide visibility for all market participants across the nuclear power supply chain. Currently, UxC forecasts that 25% of uranium demand will be "uncovered" by 2019 and this will rise to 75% by 2025. Obviously, deals will need to be completed well in advance of this looming pinch as security of supply becomes more prevalent. Many contracts which were set at higher prices in the past are set to roll off in the next two years. The specifics of any new contractual obligations will tell us a great deal about the sentiment around nuclear power. Should contract prices be set

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at lower prices than in the past, this will certainly squeeze producers and continue the challenging environment for uranium exploration and development. The paradox here is that a lack of exploration and development ultimately sets the industry up for higher uranium prices.

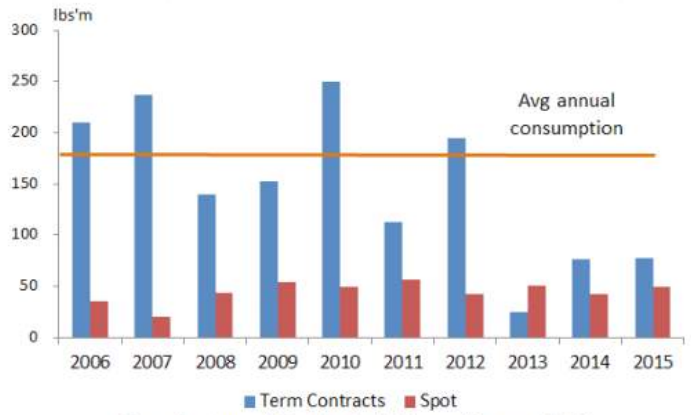

Figure 1 – Annual Contracted Volume (Source: UxC)

Source: Peninsula Energy; UxC

Cameco has stated that only 35% of uranium consumption over the past three years has been replaced under long term contracting[2]. The low spot prices and excess supply on the market are the culprits here, but this state of affairs will not be permanent and this signals action on the part of utilities.

Third, as reactor technology continues to improve (and safety along with it), will this have any discernible effect on uranium supply and demand going forward? It would appear that given the high upfront costs of reactor construction as well as the lengthy permitting time, SMRs appear to be a "win-win". Though smaller than larger reactors, this ought to be outweighed by the modular approach to construction as well as the economics.

(2) https://s3-us-west-2.amazonaws.com/assets-us-west-2/quarterly/CCO-Investor-Presentation-2015-Q4.pdf

One potential drawback here, however, could be the fact that a smaller reactor would use less uranium, calling into question the rosy long-term demand forecasts. This is a wait-and-see situation, and although I view this skeptically, technology has a way of upending even the most carefully thought out forecasts.

Finally, what about geopolitics? I stated above that uranium production is concentrated geographically, with Kazakhstan far and away the world's largest producer. Recent statements by Kazak President Nursultan Nazarbayev that the country may begin to reclaim certain uranium assets on Kazakh soil is worrisome for foreign companies already invested in the country and a potentially cautionary tale for those looking at Kazakh uranium investment. This type of threat is nothing new and I would expect that any spike in the uranium price going forward promises to make governments take a more focused look on making sure their citizens get their "fair share" from foreign company mining activities. Threats such as this likely place a positive emphasis on other regions of the world with more political certainty such as Canada and Australia as future uranium suppliers.

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URANIUM MINING INDUSTRY PARTICIPANTS

Here is an abbreviated list of the current and future (potential) contributors to primary uranium supply.

Producers

NAME	TICKER	SHARE PRICE	MARKET CAP	2014 tU Production
KazAtomProm	NA			18,081
Cameco Corporation	CCJ/CCO	$16.28 CAD	6.87 B	8,956
ARMZ-Uranium One	NA			6,944
AREVA	AREVA	8.85 €	1.4 B	6,496
BHP Billiton	BHP	$25.08 USD	63.06 B	3,351
CNNC / CGN	2302 HK	8.08 HKD	1.48 B	2,684
Navoi Mining and Metallurgy Combinat	NA			2,400
Paladin Energy Ltd.	PDN	.28 AUD	393.92 M	2,316
Rio Tinto	RIO	$28.18 USD	99.56 B	2,296
Ur-Energy Inc.	URE/URG	.66 CAD	94.62 M	
Uranium Energy Corp.	UEC	.74 USD	88.94 M	
Peninsula Energy Limited	PEN	.94 AUD	165.84 M	
Energy Fuels Inc.	UUUU	$2.28 USD	118.88 M	

Source: Bloomberg; Company Documents; Amounts greater than 1,000t listed

Select Developers and Explorers

NAME	TICKER	SHARE PRICE	MARKET CAP
ALX Uranium Corp.	AL	.125 CAD	9.21 M
Azarga Uranium Corp	AZZ	.29 CAD	17.18 M
Berkley Energia Ltd.	BKY	.475 AUD	86.86 M
Denison Mines Corp.	DML/DNN	.74 CAD	383.79 M
Energy Resources of Australia Ltd.	ERA	.345 AUD	178.62 M
Fission Uranium Corp.	FCU	.65 CAD	324.23 M
Forum Uranium Corp.	FDC	.18 AUD	6.2 M
Kivalliq Energy Corp.	KIV	.085 CAD	18.43 M
Laramide Resources Ltd.	LAM	.24 CAD	22.5 M

NAME	TICKER	SHARE PRICE	MARKET CAP
NexGen Energy Ltd	NXE	2.03 CAD	665.21 M
Pele Mountain Resources Inc.	GEM	.05 CAD	9.52 M
Plateau Uranium Inc.	PLU	.81 AUD	11.45 M
Purepoint Uranium Group Inc.	PTU	.08 AUD	9.32 M
Toro Energy Ltd.	TOE	.05 AUD	114.80 M
U8O8 Corp.	UWE	.08 CAD	8.25 M
UEX Corp.	UEX	.215 CAD	57.19 M
Uranium Resources Inc.	URRE	2.48 USD	18.98 M
Western Uranium Corp.	WUC	2.00 CAD	87.84 M

Source: Bloomberg; Company Documents

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SWOT ANALYSIS

As we have stated in previous research reports, a SWOT analysis, while beneficial, can be subjective as a strength can also be viewed as a weakness when examined in a different context. Nevertheless, any balanced report ought to "lay it on the table" and have the reader make their own inferences.

Strengths

Nuclear power is currently the most realistic source of meaningful and reliable base load power that can meet the needs of major and growing populations; The technology is well understood and continues to advance; Demand for uranium appears steady over the next seven years as the demands of the existing nuclear fleet plus demand from new reactors ought to put demand at 220 million pounds per year in 2025; The ability to enter into long-term contracts can hedge against price volatility; Nuclear power is easily the most energy dense form of power relative to other sources; US Dollar strength in 2015 has helped lower cash costs in countries where uranium is mined including Canada, Kazakhstan, Namibia, Niger, and Russia.

Weaknesses

Despite its impressive safety record, nuclear power has a serious public relations problem the industry can't seem to shake; This perception issue rests with fears over reactor meltdowns, waste disposal, terrorism, and cost and time overruns; There are several glaring examples of time and cost overruns including the Olkilouto 3 reactor saga in Finland between AREVA and TVO, with these two partners in court; Uranium exists in a relatively opaque pricing environment and transactions can take place in both a spot and contractual context.

Opportunities

Reactor technology continues to advance both safety and reliability with small modular reactors (SMRs) one significant example; Gen IV and Thorium reactors always show promise but the latter always seems to be "five years away"; The recent Paris COP21 agreement where 193 countries have essentially agreed to focus on cleaner and less carbon-intensive sources of growth indicates that nuclear power must remain a significant piece of the global energy equation; Recent deals executed between CGN Mining Company and Fission Uranium (FCU: TSX) (for $82 million CAD) and Holystone Energy Company Ltd and ALX Uranium (AL:TSXV) (an equity investment in AL and a three year strategic partnership) demonstrate significant interest in developing future supply in Canada.

Threats

Nuclear power's share of electricity generating capacity has stalled and is under threat of stagnating as other sources including renewables such as solar and wind become a larger piece of the overall electricity "pie"; Governments including Germany, Switzerland, and Italy are focused on shutting down nuclear capacity – the irony here is that that capacity will likely be replaced by fossil fuel-based sources of electricity such as coal.

CONCLUSION

As Economist Milton Friedman was fond of saying, "There's no free lunch." This quote is applicable in the energy world as well as each source of power must reckon with its own benefits and drawbacks.

Nuclear power is currently the most realistic source of meaningful and reliable base load power that can meet the needs of major and growing populations

Nuclear power, despite its major PR challenges, continues to remain a mainstay of the global power mix. As reactor technology continues to advance and the need for clean and reliable sources of baseload power only become more evident as the global population continues to swell, nuclear power will remain firmly ensconced in the global power mix.

A question for investors to consider is how to play this space? With sentiment low in the wake of Fukushima and stagnant uranium pricing, the framing of uranium as a contrarian opportunity is obvious. That may be about to change and so the timing seems favorable for a review of this sector and the possible opportunities therein. The relatively rapid value creation to shareholders from recent acquisitions in the Athabasca Basin in the past four years underscores the potential.

With the need to renew long term contracts, we expect to see utilities that operate the nuclear fleet in the market in the next 18 months securing long term supply. One must also not forget about China's voracious appetite for uranium which is underpinned by the country's aggressive nuclear expansion. It would appear that a steady demand profile is facing an uncertain supply response.

Nuclear power will remain firmly ensconced in the global power mix.

Higher uranium prices are a must for significant exploration to meet the steady increase in demand and therefore positioning in select well managed uranium names with sound balance sheets should provide leverage to any increase in price.

SOURCES

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