Thematic Research

Uranium: Asymmetry at its Finest

November 23, 2022

All figures in USD unless otherwise stated

Producers	
Cameco Corporation	CCO
National Atomic Company Kazatomprom	KAP
Paladin Energy Ltd	PDN
Uranium Energy Corp.	UEC
Energy Fuels Inc.	UUUU
Ur-Energy Inc.	URG
Lotus Resources Limited	LOT

Developers	
Nexgen Energy Ltd.	NXE
Denison Mines Corp.	DNN
Boss Energy Ltd	BOE
Global Atomic Corporation	GLO
Fission Uranium Corp.	FCU
Encore Energy Corp.	EU
Peninsula Energy Limited	PEN
Goviex Uranium Inc.	GXU
Western Uranium & Vanadium Corp.	WUC

Explorers	
Forum Energy Technologies, Inc.	FET
Isoenergy Ltd.	ISO
Skyharbour Resources Ltd.	SYH
Baselode Energy Corp.	FIND
Canalaska Uranium Ltd.	CVV
Anfield Energy Inc.	AEC
Nimy Resources Limited	NIM
Kraken Energy Corp.	UUSA
Purepoint Uranium Group Inc.	PTU
Fission 3.0 Corp.	FUU
Labrador Uranium Inc	LUR
Standard Uranium Ltd.	STND
Strathmore Plus Uranium Corp.	SUU
Alx Resources Corp.	AL

Other	
Sprott Physical Uranium Trust	U.UN
Yellow Cake Plc	YCA
Uranium Royalty Corp.	UROY

Please refer to the applicable disclosures on the back page
Source: Atrium Research, CapitalIQ, FactSet, Company Documents

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What you need to know:

- We are expecting demand for uranium to scale upward over the next 5+ years due to decarbonization and energy security trends
- Limited brownfield projects and the lack of incentive for greenfield projects at $50/lb U3O8 will create a supply/demand imbalance
- The new utility contracting cycle and Sprott Trust will continue to create price momentum for spot uranium

While demand for uranium continues to progress higher due to shifting government policies to meet decarbonization goals and the newfound focus on energy independence, spot prices remain too low to incentivize new production. We believe this provides an asymmetric upside opportunity for owning uranium equities as we progress through the early innings of this energy cycle. This report serves as a general primer on the thematic trends in the uranium and nuclear energy space that we expect to drive the market over the next 3-5 years.

Demand

Decarbonization

With energy systems being pressured by inflation and dependency on Russia, the tide has begun to turn regarding the sentiment on nuclear power, with many regions now classifying nuclear as clean energy (which we believe it always should have been). This year, we have seen supportive policies come out of the EU, UK, U.S., China, and France, to name a new. This shift has led to reactor restarts, extensions, and new build plans which we outline below. World Nuclear estimates that 18,850 gross MWe will come online in 2023 compared to 13,500 MWe in 2022, demonstrating the quick shift to bringing more nuclear power online.

Restarts & Extensions

- Japan restarted 10 reactors with 7 more being restarted by summer 2023
- France extended four reactors to January 2023
- Belgium approved a ten-year extension for two reactors
- Illinois extended two reactors for 20+ years

New Reactor Plans

- China to build 150 reactors by 2035 (currently 54)
- France to build 14 new reactors by 2050 (currently 56)
- India announced that it will expand its nuclear capacity by three-fold over the next decade (currently 22 reactors). India also accelerated plans to build 10 PHWRs.
- Egypt approved construction of its second reactor and plans to build an additional four
- Poland announced construction of its first nuclear reactor alongside the U.S. and plans to build four additional reactors with South Korea
- Russia received approval to build two reactors in Hungary
- Small modular reactor plans from Canada, the U.K., France, and the U.S.

Policy Changes

- EU labels certain nuclear projects as a sustainable energy source
- U.S. announced $6.0B program to support nuclear plants near closing
- South Korea plans to reverse its nuclear phase-out

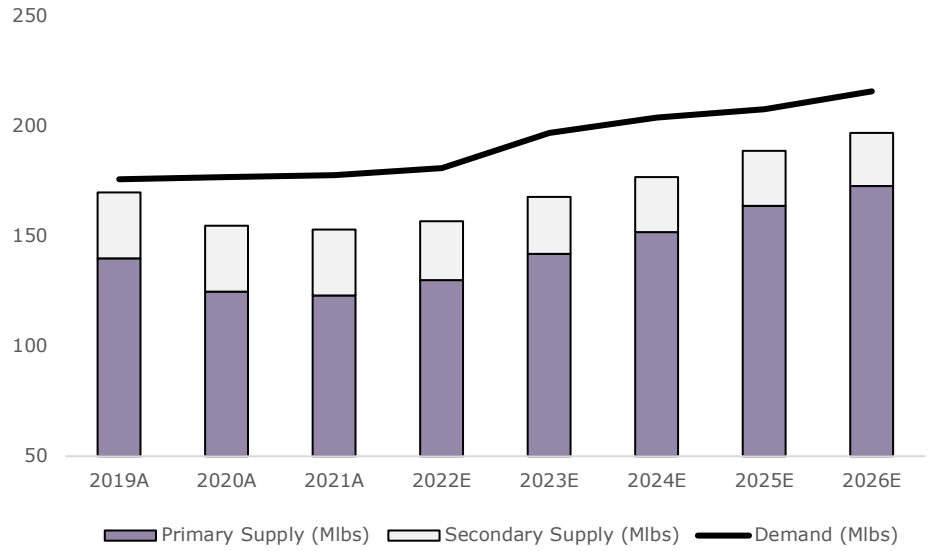

Figure 1: Supply Demand Dynamic (Source: WNA)

While we will not go in-depth on this topic in this report, nuclear energy has been proven to be one of the cleanest, most affordable, and safest energy sources (figure 2); in addition to being the only energy source that is scalable enough to allow countries to become net zero carbon emitters in the long-term. We think there has been vast ignorance regarding how attainable it is to get to net zero emissions over the next 30 years; fossil fuels currently represent 81% of energy consumption, compared to 82% ten years ago, despite $3.8 trillion of investment in renewables. We believe fossil fuel-based energy will always remain a major component of energy consumption, but if governments insist on hitting their carbon emissions reduction goals, it seems that nuclear is the only solution in the medium-term.

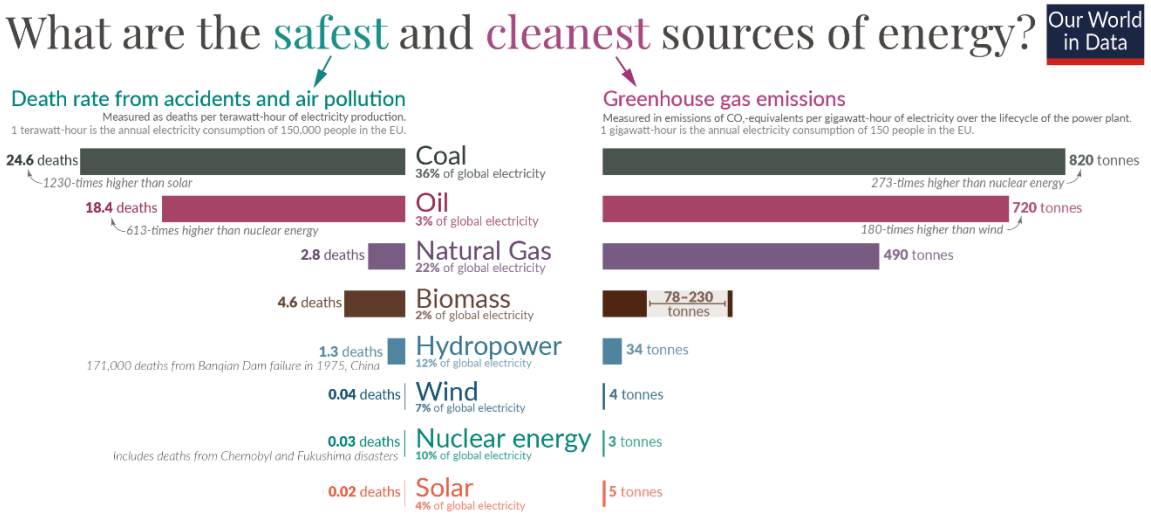

Figure 2: Safest and Cleanest Energy Sources (Source: Our World in Data)

Energy Security
With increased political, social, and environmental turmoil globally, energy security has reached the forefront of almost every country's energy policy. This goes beyond the decarbonization trends mentioned above, as countries do not want to rely on Russia/China/other countries for the livelihood of their citizens. We think onshoring will be a global trend in the short-term, with nuclear energy being the easiest solution for countries that are desperate to produce energy independently while also meeting their decarbonization goals. We are already seeing this throughout Europe, and we think the trend continues beyond those that were dependent on Russia.

New Utility Contracting Cycle
In the last uranium cycle when spot prices increased from $12/lb in 2003 to highs of over $120/lb in 2007 (not adjusted for inflation), there was an influx of long-term contracts signed by utilities. The elevated levels of contracting continued until 2012 and subsequently went through 10 years of little activity (Figure 3). These contracts are now rolling off and should support price momentum similar to what we saw in the last uranium cycle. This factor, combined with the SPUT draining the spot market (see section below), means that utilities will be contracting for 2030 and beyond at much higher prices. YTD, contracting volumes are already over 100 Mlbs, compared to the 194 Mlbs seen in 2012 and 72 Mlbs in 2021.

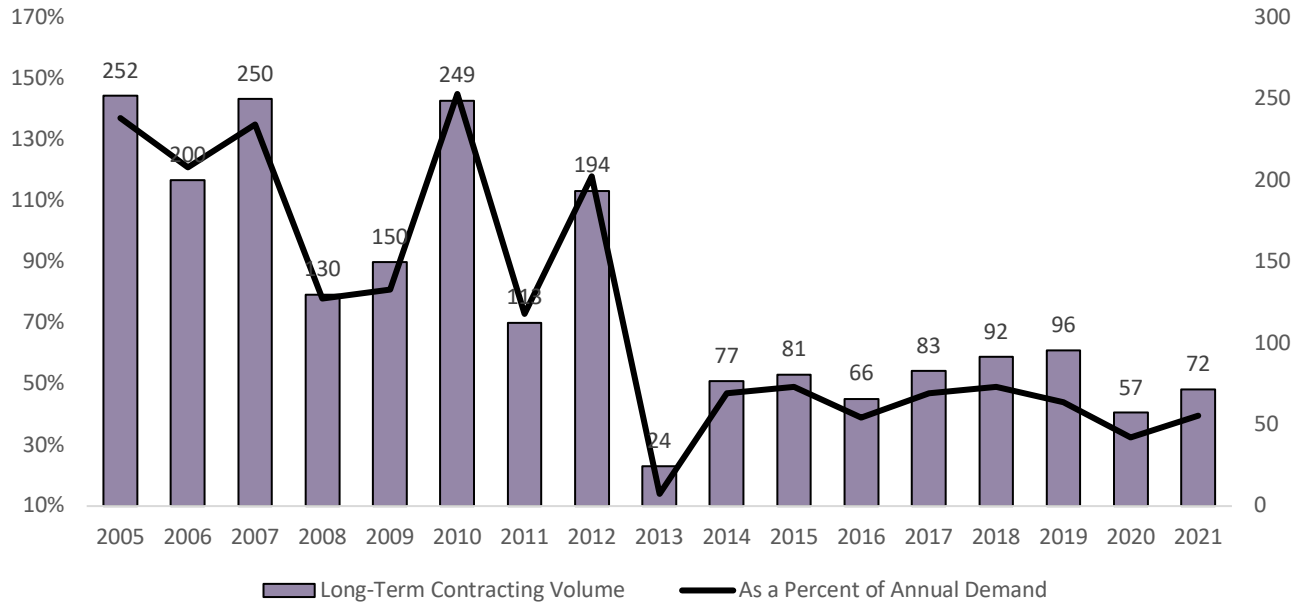

Figure 3: Utilities Contracting Cycles (Source: UxC)

Sprott Physical Uranium Trust
The Sprott Physical Uranium Trust (U.UN:TSX), commonly referred to as SPUT, is a financial instrument designed to accumulate physical uranium. The U3O8 that Sprott purchases is permanently taken off the market and moved into storage, with no mechanism for reselling it. SPUT has already taken 59 Mlbs of U3O8 out of the market, compared to the annual supply of ~150 Mlbs.

Sprott is able to continue purchasing physical uranium through its ATM (at-the-money) equity program where it can issue U.UN shares and sell them in the open market in order to raise cash and buy uranium. The current size of the ATM program is $3.5B, ~$1.9B of which has already been tapped. Sprott typically utilizes this mechanism when the trust trades at a premium to its NAV. This occurred mainly through 2021 and H1/22, but Sprott has still been purchasing uranium intermittently over the last few months.

Sprott is incentivized to grow the AUM of the trust since it generates a 0.96% management fee on the AUM. This incentivizes SPUT to issue as many shares as possible when there is physical uranium available to purchase. Given that the physical uranium market is quite illiquid, Sprott's purchases move up the price of uranium, unlocking more liquidity. This becomes a cycle where the uranium price continues climbing higher and Sprott continues utilizing its ATM financing.

U3O8 prices have been stagnant for the last few months and Sprott has not been buying much physical uranium due to its illiquidity (Sprott can't source any more) but if spot prices begin to tick up due to the fundamental factors mentioned in this report, more liquidity will come online and feedback loop will begin again.

In a blue-sky scenario, U.UN becomes the de-facto uranium play in public markets (given the lack of producers), creating a Greyscale Bitcoin/Ethereum Trust-like scenario where the trust trades at a 100-200% premium to NAV. While this was once a realistic thesis, SPUT's failure to get an NYSE uplisting puts this in our blue-sky scenario.

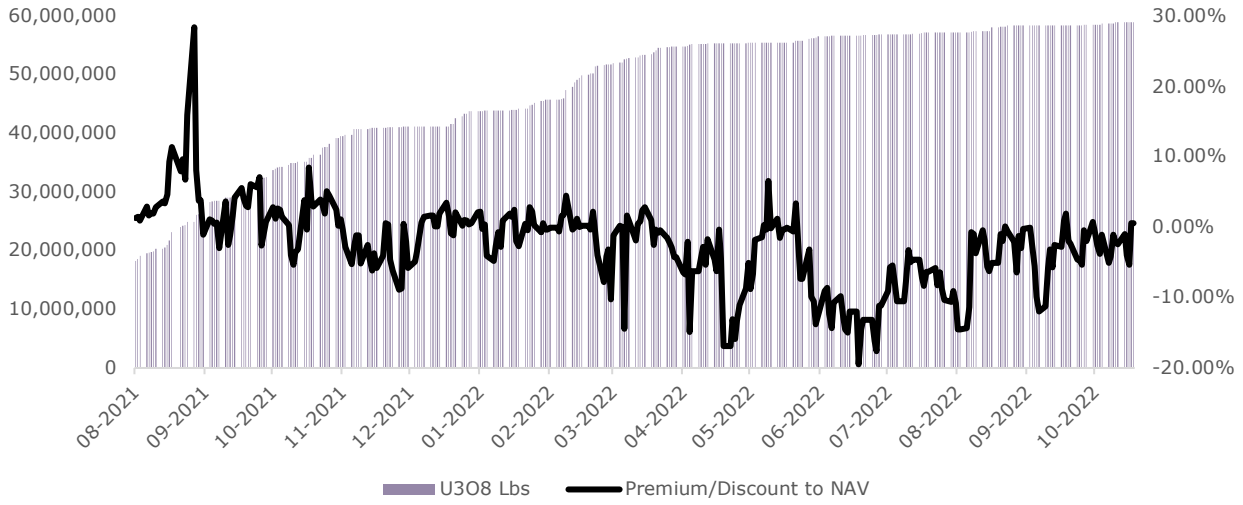

Figure 4: SPUT Buys at Premium to NAV

Supply

The depressed uranium price over the last ten years has resulted in a dramatic decline in global mine supply with many producers shutting-in due to unprofitability and limited greenfield projects coming online. Fortunately, the secondary supply market has been able to fill this lack of mined uranium over the last decade through underfeeding and the processing of large stockpiles from the bull market in the early 2000s. However, with the anticipated increase in uranium demand, the secondary supply beginning to dwindle, and the lack of greenfield projects being funded, a supply issue is beginning to develop. We believe the only way out of a significant future market imbalance is a large rally in uranium spot prices which will incentivize new production.

Brownfield Supply

Brownfield supply is the quickest supply that could come online if uranium prices allow for it. This is particularly true for uranium mining as the permitting risk and time to permit are much greater for greenfield projects compared to other metals. With the recent rally in spot prices, we are beginning to see plans for brownfield projects. Most notably, Cameco has begun restarting production at its McArthur River mine which has been offline since 2017. This restart could add 15 Mlbs/year, however, the project restart will still require 18-24 months to ramp (the company expected to mine 5 Mlbs in 2022). Additionally, Kazatomprom (the world's largest producer) has been operating at 20% below capacity for years but

has the ability to increase output from 57 Mlbs to over 70 Mlbs/year. Other brownfield supply additions do exist, though these are the most notable.

Greenfield Supply
Beyond the near-term brownfield projects coming online, greenfield projects require a higher sustained uranium price and future outlook before we expect significant capital to be deployed into these projects. As a result, there are limited advanced uranium projects in this group, and it causes the uranium supply to be relatively spot price inelastic compared to other commodities. We believe a sustained uranium price of $65-70/lb is required before we see greenfield projects start to be capitalized. The most notable advanced greenfield project is the Arrow deposit, owned by NexGen. This project could ultimately be one of the largest uranium operations globally, but it isn't expected to be in operation for 5+ years. This operation would make up ~17% of the current primary supply.

Considering the relatively low uranium price, even what is considered a "Tier 1" project is likely to struggle to find adequate funding given the current market and the high cost of capital. This factor, combined with the 5-10 years it takes for a uranium project to get into production only heightens our concerns about the future greenfield supply.

Secondary Supply
For the last 20 years, the uranium supply from mining operations has been less than the demand for uranium required in nuclear reactors. This supply gap has been met and continues to be met, from inventories and secondary supplies. As of 2021, ~30 Mlbs of uranium demand was met with secondary supplies (previously 50+ Mlbs/year during 2010-2015). There are a variety of secondary supply sources, such as inventories, stockpiles, tails re-enrichment, recycled nuclear fuel, and down-blending of highly enriched uranium. We estimate that the secondary supply of uranium will continue in the 20-30 Mlbs/year range over the next five years.

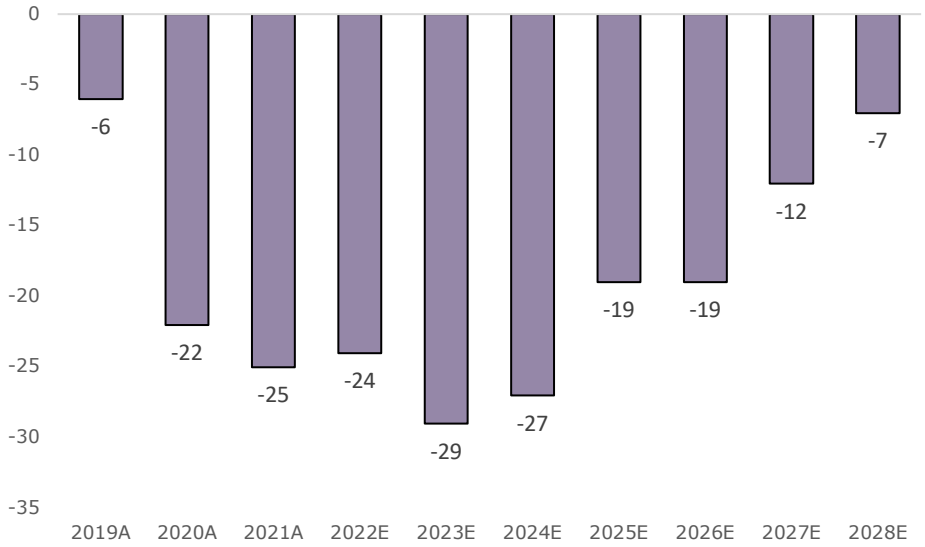

Figure 5: Market Balance (Mlbs, Source: WNA)

Russia
Russia's invasion of Ukraine and the resulting global push for energy independence has caused the world to reconsider its view on nuclear energy and in turn, provides a more bullish outlook for uranium. Aside from Russia's invasion, its involvement in the uranium supply chain could play a major role in the supply/demand outlook in the future.

Russia currently accounts for ~38% of the world's conversion capacity and ~43% of the world's enrichment capacity; meaning that global uranium supply is incredibly reliant on Russia and that sanctions on Russian enrichment could reduce supply drastically. We believe the rest of the world could pivot to stop using Russian enrichment but not without dramatically increasing the global demand for mined uranium. The enrichment supply could be made up by turning the global enrichment capacity from underfeeding to overfeeding (this is when recoveries are dropped, and more uranium ore is processed per day resulting in more uranium produced). This global switch to overfeeding (excluding Russia) could increase the annual demand for mined uranium by as much as 20 Mlbs.

Price Dynamics

We remind readers that during the past two uranium cycles, inflation-adjusted spot prices peaked at over $150/lb (3x from today's prices). Specifically, there have been various analogies of today's environment being similar to the 1970s with record inflation levels, increasing interest rates, an incoming recession, an oil crisis, and growth in demand for nuclear energy (70 global reactors grew to over 200 reactors by the end of the 1970s). The other major factor we are watching is the short interest of uranium stocks, which provides further asymmetry to this trade. Cameco (CCO:TSX) currently has a short interest of 4.3%, off from lows of 1.6% seen in 2021. This compares to other market-leading miners in different commodities such as Newmont Corporation (NEM:US) at 1.6%, Rio Tinto (RIO:US) at 1.0%, BHP Group (BHP:US) at 0.3%, and Freeport-McMoRan (FCX:US) at 2.4%.

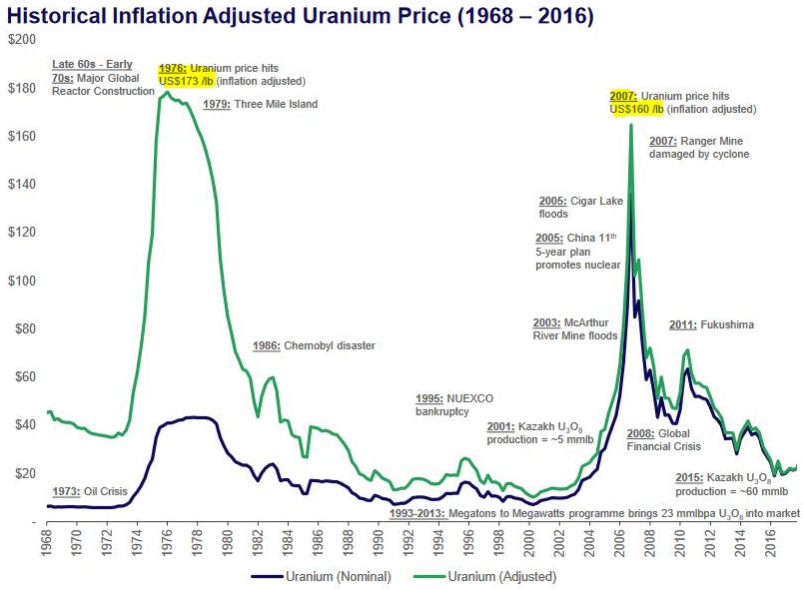

Figure 6: Uranium Price History (Source: John Quakes)

	Ticker	Share Price (Local)	Mkt Cap (C$M)	EV (C$M)
Producers				
Cameco Corporation	CCO	31.97	13,827	13,489
National Atomic Company Kazatomprom	KAP	26.02	9,019	8,361
Energy Fuels Inc.	UUUU	6.84	1,441	1,319
Ur-Energy Inc.	URG	1.26	376	338
Developers				
Nexgen Energy Ltd.	NXE	4.51	2,889	2,819
Paladin Energy Ltd	PDN	0.80	2,106	1,979
Uranium Energy Corp.	UEC	3.85	1,776	1,736
Denison Mines Corp.	DNN	1.21	1,318	1,253
Boss Energy Ltd	BOE	2.45	768	650
Global Atomic Corporation	GLO	3.71	660	645
Fission Uranium Corp.	FCU	0.79	538	502
Encore Energy Corp.	EU	3.04	327	296
Lotus Resources Limited	LOT	0.22	253	249
Peninsula Energy Limited	PEN	0.16	140	130
Goviex Uranium Inc.	GXU	0.20	119	110
Western Uranium & Vanadium Corp.	WUC	1.37	59	45
Explorers				
Forum Energy Technologies, Inc.	FET	28.82	6,347	6,344
Isoenergy Ltd.	ISO	3.26	348	367
Skyharbour Resources Ltd.	SYH	0.35	50	45
Baselode Energy Corp.	FIND	0.56	43	32
Canalaska Uranium Ltd.	CVV	0.41	42	30
Anfield Energy Inc.	AEC	0.07	41	32
Nimy Resources Limited	NIM	0.31	31	31
Kraken Energy Corp.	UUSA	0.43	23	11
Purepoint Uranium Group Inc.	PTU	0.07	22	18
Fission 3.0 Corp.	FUU	0.18	53	39
Labrador Uranium Inc	LUR	0.32	18	7
Standard Uranium Ltd.	STND	0.08	12	12
Strathmore Plus Uranium Corp.	SUU	0.28	8	8
Alx Resources Corp.	AL	0.04	8	6
Other				
Sprott Physical Uranium Trust	U.UN	15.37	3,642	3,626
Yellow Cake Plc	YCA	3.96	725	608
Uranium Royalty Corp.	UROY	2.74	267	231

Figure 7: Uranium Equity Universe

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