

Uranium: Only Getting Started

May 27, 2024

All figures in USD unless otherwise stated

Ben Pirie | Equity Research Analyst | bpirie@atriumresearch.ca | 647-688-9661
Nicholas Cortellucci, CFA | Equity Research Analyst | ncortellucci@atriumresearch.ca | 647-391-3314

Producers

Cameco Corporation	CCO
National Atomic Company Kazatomprom	KAP
Paladin Energy Ltd	PDN
Energy Fuels Incorporated	UUUU
Ur-Energy Inc.	URG

Developers

NexGen Energy Ltd.	NXE
Uranium Energy Corp.	UEC
Denison Mines Corp.	DNN
Boss Energy Ltd	BOE
Encore Energy Corp.	EU
Fission Uranium Corp.	FCU
Lotus Resources Limited	LOT
Global Atomic Corporation	GLO
Peninsula Energy Limited	PEN
Western Uranium & Vanadium Corp.	WUC
GoviEx Uranium Inc.	GXU

Explorers

IsoEnergy Ltd.	ISO
F3 Uranium Corp.	FUU
Anfield Energy Inc.	AEC
Canalaska Uranium Ltd.	CVV
Skyharbour Resources Ltd.	SYH
Forum Energy Metals Corp.	FMC
Baselode Energy Corp.	FIND
Purepoint Uranium Group Inc.	PTU
Strathmore Plus Uranium Corp.	SUU
Standard Uranium Ltd.	STND
ALX Resources Corp.	AL
Nimy Resources Limited	NIM
Kraken Energy Corp.	UUSA

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, Company Documents

What you need to know:

- Uranium spot prices are up 84% since our last report in late 2022, yet we still expect further momentum in the sector.
- The sentiment on nuclear power from governments around the world has begun to shift, with many nations ramping plans for reactors.
- While new mines begin production and future mines achieve financing, we continue to believe the current spot price is too low in the short term.

Since our initial thematic research report on uranium from November 2022 (read [here](#)), spot prices are up 84%, reaching highs of \$106/lb in January 2024. This surge in prices was building up for years (perhaps decades) as demand steadily increased due to lofty decarbonization goals and future supply remaining uncertain. We continue to believe spot prices are too low to incentivize new production and there remains a runway for uranium prices to rally. As our previous insights and forecasts proved accurate, this report aims to update each component of our previous investment thesis for the various events that have occurred over the past 1.5 years.

Overview

Our previous uranium note highlighted key demand developments for nuclear energy as uranium spot prices remained stagnant through 2022. Many nations were incorporating nuclear energy into their strategies as countries strive to reach net-zero emission goals, a theme that continues today. Since then, numerous agreements and declarations have been signed by nations across the globe to triple nuclear power capacity by 2050. With this, uranium spot prices increased from \$50/lb to \$92/lb since our previous thematic note. As Russia’s invasion of Ukraine continues to play out, we have seen multiple sanctions from both the U.S. and European nations that have major implications on uranium pricing.

As for the supply side, a large rally in uranium spot prices has led to once-idled mines to come back online, as predicted. In addition to that, we spoke about the lack of greenfield supply and the 5–10-year delay in establishing production at new sites. Therefore, we continue to believe that uranium spot prices will rise over the next few years while capital is being deployed into greenfield projects.

Demand

Decarbonization

As mentioned previously, global energy systems were pressured by inflation and dependency on Russia, and as such the tide had begun to turn regarding the sentiment on nuclear power. Many countries had not classified nuclear as clean energy, making it nearly impossible to meet their net-zero carbon emission goals by 2050. This year, we saw the first-ever Nuclear Energy Summit held in Brussels, where 32 nations confirmed their commitment and support for nuclear expansion. The International Energy Agency (IEA) forecasts a ~10% increase in global nuclear power generation by 2026 compared to 2023. This growth is driven by the addition of new reactors and the restart of existing ones in several countries including China, India, and parts of Europe, which we outline below.

Restarts & Extensions

- France’s EDF received €5.8B in green loans to extend the life of its existing nuclear reactors
- Bulgaria extended the operations on two of its reactors from 30 to 60 years
- Japan restarted four reactors in 2023 and work is underway on another 13
- New Jersey’s three nuclear power plants seek to extend licences for 20 years

New Reactor Plans

- China approved the construction of an additional four nuclear power plants, currently, 26 are under construction (41 are in the planning stage)
- Sweden is planning to build two reactors by 2035 and 10 reactors by 2045
- Bulgaria’s new energy plan proposed four new nuclear reactors
- Poland is planning to build new reactors in partnership with Rolls Royce for SMR technology
- India is planning an additional 12 reactors, currently, seven are under construction as the country aims to triple nuclear power capacity by 2032
- Poland is collaborating with the US and South Korea to build its first nuclear reactors
- Small modular reactor plans continue from Canada, the U.K., France, and the U.S.

Policy Changes

- At COP28, 22 countries launched the declaration to triple nuclear energy capacity
- President Joe Biden announced the U.S. would be prohibiting importing uranium fuel from the Russian Federation
- Italy announced it will reintroduce nuclear energy in the country
- Sweden amended current law to allow reactors to be built on new sites

COP28

COP28, the 28th annual session of the Conference of the Parties to the United Nations Framework Convention of Climate Change (UNFCCC) was held this past December. Various nations discussed critical global climate change challenges with a significant focus on the role of nuclear power in achieving net zero global emissions by 2050. During the conference, 22 countries including the U.S., the U.K., the UAE, and Canada, reached a pivotal agreement to triple their nuclear energy capacity by 2050. The development of Small Modular Reactors (SMRs) was a key topic of discussion amongst the nations, which we will touch on more in depth below. Consequently, we believe this ambitious expansion of nuclear energy will continue to drive demand and squeeze the supply of uranium as utilities ramp up supply to meet new energy targets.

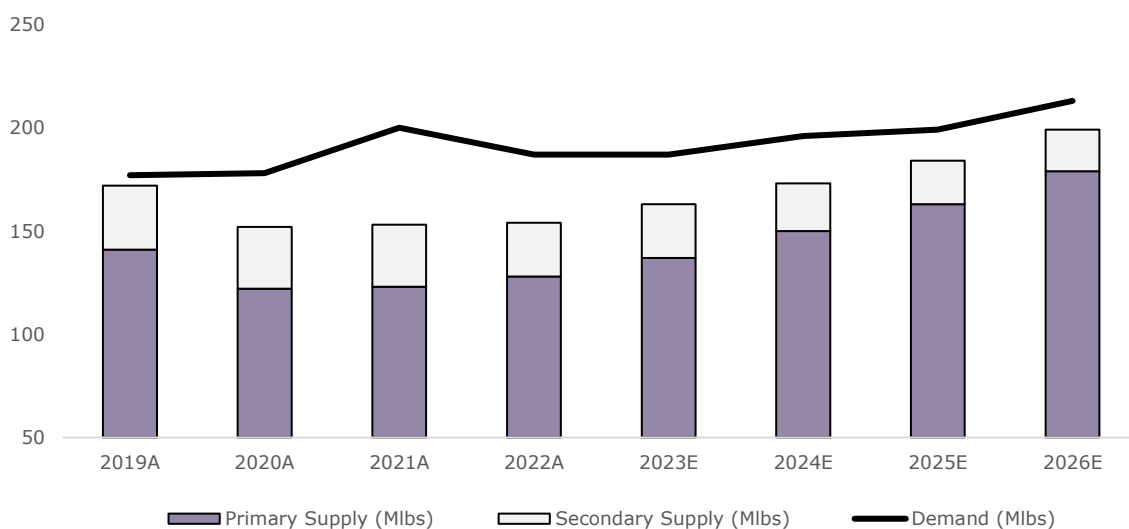


Figure 1: Supply Demand Dynamic (Source: WNA)

Energy Security

With growing political, social, and environmental instability worldwide, energy security has become a top priority for nearly every nation’s energy policy. This concern extends beyond the already mentioned decarbonization trends, as countries are increasingly wary of depending on Russia, China, or other nations for their citizens’ well-being. We anticipate that onshoring will become a global trend in the near term, with nuclear energy emerging as the most viable solution for countries striving to produce energy independently while meeting their decarbonization goals. This trend is already evident throughout Europe, and we expect it to continue spreading beyond countries previously reliant on Russia.

Utility Contracting Cycle

As mentioned in our previous uranium note, during the last uranium cycle when 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 2). In 2023, as spot prices began to rise and with 22 nations declaring support for tripling nuclear energy capacity to achieve global net zero by 2050, uncertainty rose regarding securing nuclear fuel supplies to meet growing demand. 2023 saw utilities place ~160 Mlbs of U3O8 under long-term contracts compared to 125 Mlbs in 2022. The uranium contracting cycle reached a long-awaited turning point, reaching replacement rate levels. We believe that the period characterized by uranium inventory reduction and utility complacency has concluded.

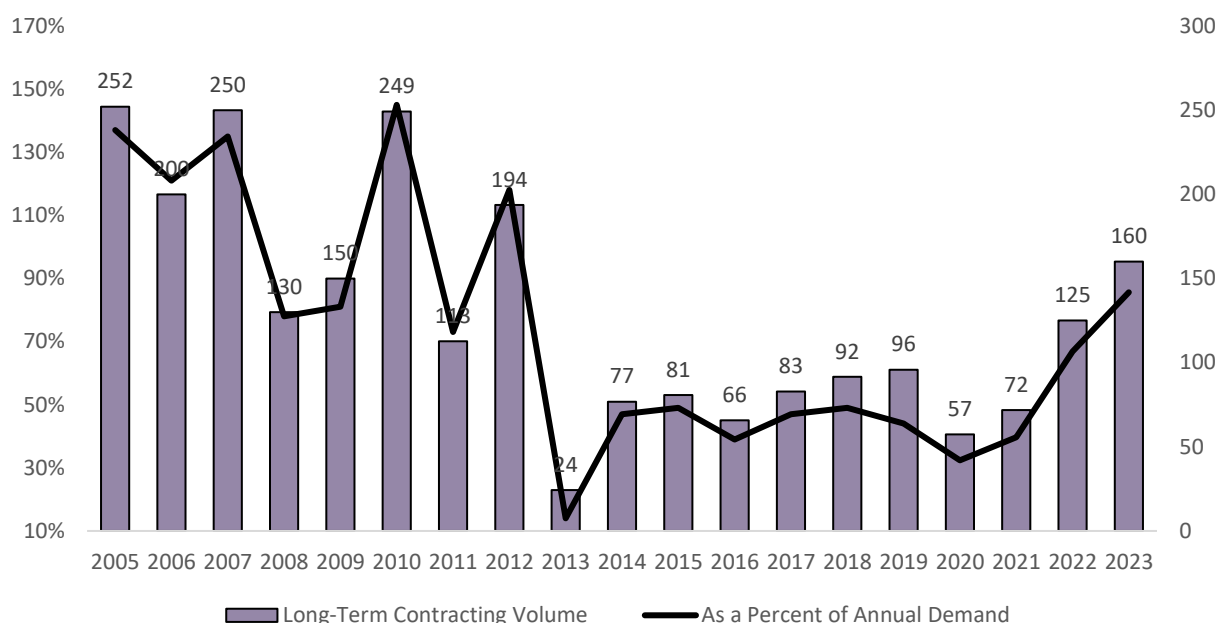


Figure 2: Utilities Contracting Cycles (Source: UxC)

Small Modular Reactors

SMRs are defined as small nuclear reactors with a maximum output of 300 MWe, by comparison, large-size nuclear power plants have an output of over 1000 MWe. However, SMRs have a range of advantages over traditional nuclear power plants including greater flexibility for site selection, modularity, production cost efficiency, and can be factory assembled and transported to sites. RBC predicts the global SMR market to reach up to \$300B annually by 2040.

SMRs are currently still in the development stage within countries such as Canada, the U.K., the U.S., and Sweden with installments to come between 2028 and 2030. Italy recently announced its return to nuclear energy with a plan to install two SMRs by 2030. The development and installation of SMRs globally throughout the next decade will continue to fuel demand for uranium.

Sprott Physical Uranium Trust

We break down the Sprott Physical Uranium Trust further in our previous uranium report, which can be viewed [here](#). Since November 2022, SPUT has acquired an additional 5.9 Mlbs of U3O8, growing its inventory to 65.2 Mlbs, which represents a 10% increase (Figure 3). In addition, Sprott's share price has risen from \$15.55/share to \$29.57/share since November 2022, which represents a 90% return. Sprott's purchases have slowed down significantly in 2024 due to the inability to source physical uranium, but the firm continues to chip away at the heavily illiquid physical market.

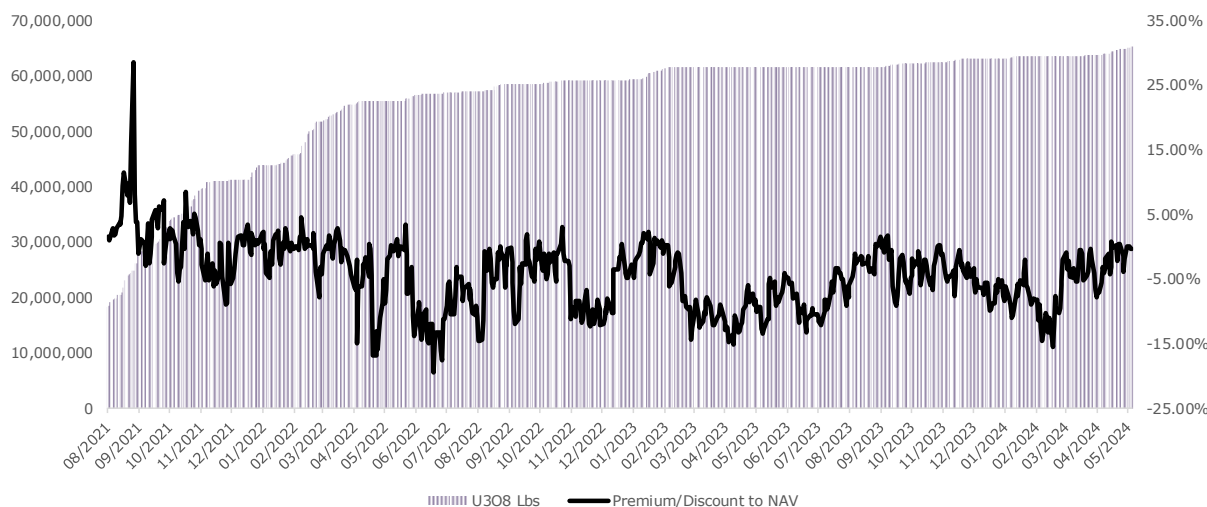


Figure 3: SPUT Buying (Source: Sprott)

Supply

The supply situation for uranium remains incredibly tight as new mines are only beginning to get financed this past year. Below are some of the major supply updates over the last 1.5 years:

- Kazatomprom announced that it will cut its supply guidance from 25,300tU to 21,750tU for 2024, a decrease of over 14%.
- In 2023, Cameco produced 17.6Mlbs of uranium, which was below its originally planned production of 20.3Mlbs for the year. The Company set its guidance at 22.4Mlbs for 2024.
- The ongoing coup in Niger, which began in July 2023, has increased uncertainty in the region, prompting Orano to halt production at its SOMAIR operation for an indefinite period.

We continue to believe that the only way out of a significant future market imbalance is a large rally in uranium spot prices to incentivize the financing of new mines and future production. A further breakdown of brownfield and greenfield uranium supply can be found below.

Brownfield Supply

Brownfield supply is the quickest supply that can come online in a uranium bull market and has seen several companies announce the reinstatement of mining operations.

- Cameco Corporation resumed production at its McArthur River mine and Key Lake mill facilities, producing up to 2Mlbs of U3O8.
- Orano SA announced it would resume mining at McClean Lake in Saskatchewan and is targeting 800Klbs of U3O8 in 2025 and 3Mlbs of U3O8 production between 2026 and 2030.
- Uranium Energy Corp. announced its plans to restart of Christensen Ranch in Wyoming, with a licensed capacity of 2.5Mlbs of U3O8.
- Paladin Energy Ltd. announced that the Langer Henrich uranium mine in Namibia is expected to be back online in August.
- Boss Energy is focused on a re-start of its Honeymoon Uranium mining operation, which is expected to enter production in Q3/24.

Other brownfield supply additions and restarts do exist, though these are the most notable. However, some mine restarts have not gone as smoothly as hoped, as Cameco fell short of its 2023 guidance as it worked through operational issues caused by ageing equipment. Kazatomprom also slashed its 2023 guidance as it cited difficulties sourcing sulfuric acid.

Greenfield Supply

We have yet to see a greenfield uranium project enter production. The world’s closest to completion greenfield uranium project, Dasa, owned by Global Atomic, was set to begin production in 2025, which has now been pushed to 2026 due to an ongoing coup in Niger. Other notable greenfield projects are several years away from construction, especially when considering permitting, financing, and construction obstacles. In addition, the prolonged uranium bear market up until the last two years has led to difficulties that can take years to resolve, such as the loss of skilled workers for mine construction and operation.

As spot prices hit 15-year highs, it is now time that we hope to see new greenfield projects come to fruition. Capital is finally beginning to flow back into the sector, which should aid in the financing of Tier 1 projects. However, investors and developers need assurance that prices will remain at or near current levels throughout the project’s lifecycle to justify its development. 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. For more information on capital raised amongst uranium explorers and developers, refer to our mining monthly reports [here](#).

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 held by national utilities:

- According to the EIA, U.S. utilities held approximately 104Mlbs of uranium at the close of 2022, marking a 4% decrease from the previous year, equivalent to roughly two years of forward coverage.
- The Euratom Supply Agency reported that the EU held about 94Mlbs by the end of 2022, showing a 3% decline year-over-year.
- Estimates from the WNA indicate that China maintained an inventory of around 343Mlbs as of 2022, sufficient to cover approximately 12 years of reactor requirements at current consumption rates.
- India held an estimated 44Mlbs of U3O8 at the end of 2022.
- Japan has historically maintained one of the largest inventory reserves due to the prolonged shutdown of its reactors post-Fukushima. However, as Japan proceeds with restarting its reactor fleet, we anticipate these inventories will be drawn down.

Although these inventory levels seem substantial, their mobility is becoming less flexible as reactor demands increase and utilities seek to secure additional fuel for their reactors. We expect many of these countries to continue growing their inventories.

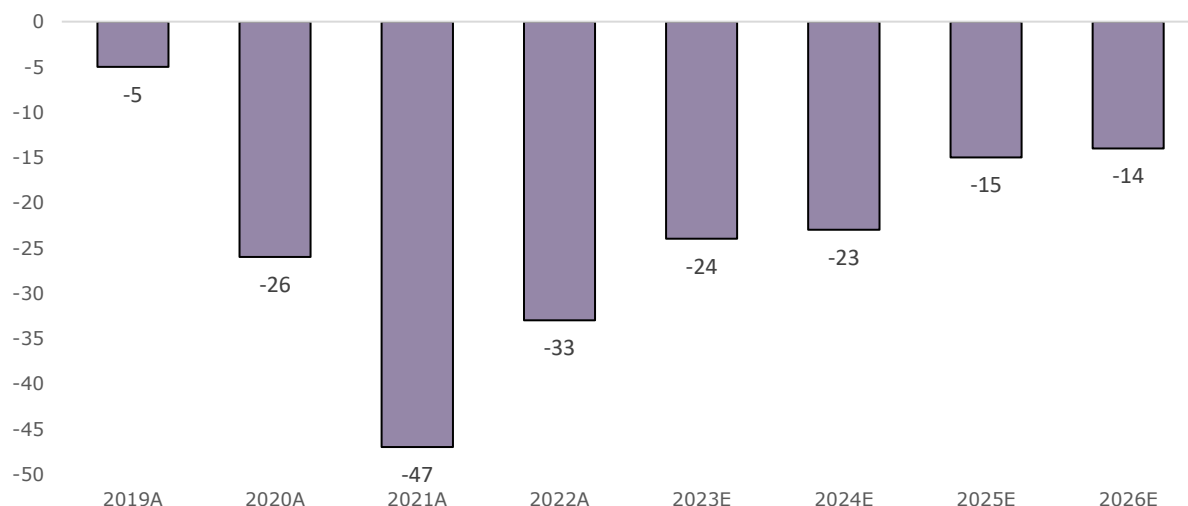


Figure 4: Market Balance Including Secondary Supply (Mlbs, Source: WNA)

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, continues to provide a more bullish outlook for uranium. At the time of our last uranium thematic note, Russia's invasion of Ukraine occurred only eight months prior. Now, as the invasion has lingered for almost two years, sanctions and policy changes have played a large impact on Russia's prior stronghold in the uranium industry.

On April 13th, 2024, the London Metal Exchange (LME) banned the sale of Russian metals produced on or after April 13th to comply with U.S. and U.K. sanctions imposed on the nation. And most recently, on May 13th, 2024, U.S. President Joe Biden signed into law a ban on imports of uranium from Russia. Currently, Russia supplies about 20% of the US reactor fleet's nuclear fuel at a cost of about \$1B annually. The legislation unlocks \$2.7B to bolster domestic enrichment capabilities, previously contingent on sanctions against Russia's Rosatom. While this has enormous effects on uranium supply worldwide, other supply chain effects from the war continue to linger as well.

Kazakhstan, the world's largest supplier of uranium, requires large amounts of sulfuric acid to operate. Historically the country has relied on Russia to provide the chemical, but the current conflict is creating enormous problems, and Kazatomprom continues to slash its guidance, straining U3O8 supply further.

	Ticker	Share Price (C\$)	Mkt Cap (C\$M)	EV (C\$M)
Producers				
Cameco Corporation	CCO	72.41	31,469	32,855
National Atomic Company Kazatomprom	KAP	79.19	28,062	29,361
Paladin Energy Ltd	PDN	14.38	3,886	3,932
Energy Fuels Incorporated	UUUU	8.96	2,003	1,743
Ur-Energy Inc.	URG	2.38	917	844
Developers				
NexGen Energy Ltd.	NXE	10.63	8,144	7,938
Uranium Energy Corp.	UEC	9.92	5,475	5,366
Denison Mines Corp.	DNN	3.16	3,847	3,705
Boss Energy Ltd	BOE	4.86	1,799	1,594
Encore Energy Corp.	EU	6.34	1,165	1,098
Fission Uranium Corp.	FCU	1.12	934	794
Lotus Resources Limited	LOT	0.42	691	679
Global Atomic Corporation	GLO	2.40	502	494
Peninsula Energy Limited	PEN	0.10	183	158
Western Uranium & Vanadium Corp.	WUC	2.25	124	108
GoviEx Uranium Inc.	GXU	0.11	89	91
Explorers				
IsoEnergy Ltd.	ISO	4.16	742	702
F3 Uranium Corp.	FUU	0.38	179	144
Anfield Energy Inc.	AEC	0.08	81	82
Canalaska Uranium Ltd.	CVV	0.58	89	73
Skyharbour Resources Ltd.	SYH	0.41	75	65
Forum Energy Metals Corp.	FMC	0.14	53	42
Baselode Energy Corp.	FIND	0.32	42	26
Purepoint Uranium Group Inc.	PTU	0.04	18	14
Strathmore Plus Uranium Corp.	SUU	0.30	14	13
Standard Uranium Ltd.	STND	0.19	9	8
ALX Resources Corp.	AL	0.03	6	5
Nimy Resources Limited	NIM	0.04	5	4
Kraken Energy Corp.	UUSA	0.11	6	3
Other				
Sprott Physical Uranium Trust	U.UN	29.54	7,554	7,554
Yellow Cake Plc	YCA	11.80	2,559	2,445
Uranium Royalty Corp.	UROY	3.69	445	434

Figure 5: Uranium Equity Universe

Disclosures

Analyst Certification

Each authoring analyst of Atrium Research on this report certifies that (i) the recommendations and opinions expressed in this research accurately reflect the authoring analyst's personal, independent and objective views about any and all of the designated securities discussed (ii) no part of the authoring analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed in the research, (iii) to the best of the authoring analyst's knowledge, she/he is not in receipt of material non-public information about the issuer, (iv) the analyst does not own common shares, options, or warrants in the company under coverage, and (v) the analysts adhere to the CFA Institute guidelines for analyst independence.

Nicholas Cortellucci and Ben Pirie hold common shares of Sprott Physical Uranium Trust Fund (U.UN:TSX, Not Rated)

Atrium Research Ratings System

BUY: The stock is expected to generate returns of over 20% over the next 24 months.

HOLD: The stock is expected to generate returns of 0-20% over the next 24 months.

SELL: The stock is expected to generate negative returns over the next 24 months.

NOT RATED (N/R): Atrium does not provide research coverage on the respective company.

RATING	COVERED COMPANIES
BUY	13
HOLD	0
SELL	0

About Atrium Research

Atrium Research provides institutional quality issuer paid research on public equities in North America. Our investment philosophy takes a 3-5 year view on equities currently being overlooked by the market. Our research process emphasizes understanding the key performance metrics for each specific company, trustworthy management teams, unit economics, and an in-depth valuation analysis. For further information on our team, please visit <https://www.atriumresearch.ca/team>.

General Information

Atrium Research Corporation (ARC) has created and distributed this report. This report is based on information we considered reliable; we have not been provided with any material non-public information by the company (or companies) discussed in this report. We do not represent that this report is accurate or complete and it should not be relied upon as such; further any information in this report is subject to change without any formal or type of notice provided. Investors should consider this report as only one factor in their investment decisions; this report is not intended as a replacement for investor's independent judgment.

ARC is not an IIROC registered dealer and does not offer investment-banking services to its clients. ARC (and its employees) do not own, trade or have a beneficial interest in the securities of the companies we provide research services for and does not serve as an officer or Director of the companies discussed in this report. ARC does not make a market in any securities. This report is not disseminated in connection with any distribution of securities and is not an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal.

ARC does not make any warranties, expressed or implied, as to the results to be obtained from using this information and makes no express or implied warranties for particular use. Anyone using this report assumes full responsibility for whatever results they obtain. This does not constitute a personal recommendation or take into account any financial or investment objectives, financial situations or needs of individuals. This report has not been prepared for any particular individual or institution. Recipients should consider whether any information in this report is suitable for their particular circumstances and should seek professional advice. Past performance is not a guide for future results, future returns are not guaranteed, and loss of original capital may occur. Neither ARC nor any person employed by ARC accepts any liability whatsoever for any direct or indirect loss resulting from any use of its research or the information it contains.

This report contains "forward looking" statements. Forward-looking statements regarding the Company and/or stock's performance inherently involve risks and uncertainties that could cause actual results to differ from such forward-looking statements. Such statements involve a number of risks and uncertainties such as competition, technology shifts, market demand and the company's (and management's) ability to correctly forecast financial estimates; please see the company's MD&A "Risk Factors" Section for a more complete discussion of company specific risks for the company discussed in this report.

ARC has not received any compensation from any of the companies mentioned in this report. ARC retains full editorial control over its research content. ARC does not have investment banking relationships and does not expect to receive any investment banking driven income. ARC reports are primarily disseminated electronically and, in some cases, printed form. Electronic reports are simultaneously available to all recipients in any form. Reprints of ARC reports are prohibited without permission. To receive future reports on covered companies please visit <https://www.atriumresearch.ca/research> or subscribe on our website.

The information contained in this report is intended to be viewed only in jurisdictions where it may be legally viewed and is not intended for use by any person or entity in any jurisdiction where such use would be contrary to local regulations or which would require any registration requirement within such jurisdiction.