

NUCLEAR INTELLIGENCE WEEKLY[®]

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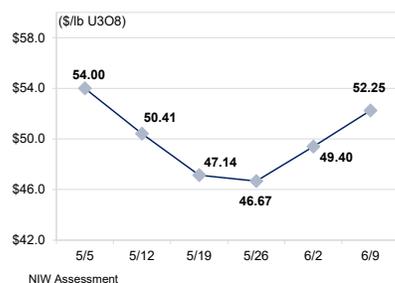
Market Points

The Biden administration's US Department of Energy is seeking \$4.3 billion in congressional appropriations to buy nuclear fuel across the supply chain from domestic producers, although details remain muddy.

Tracking rising investor interest in equities and physical uranium funds, the uranium price delivered by Energy Intelligence's Uranium Price Panel rose to \$52.25 per pound U3O8 on Jun. 9, up from \$49.40/lb. last week.

In Namibia, meanwhile, Rossing Uranium increased 2021 production by 16% from 2020 to 2,882 tons of U3O8, with the majority of that production going to China National Nuclear Corp.

UPP: \$52.25/LB U3O8



WEEKLY ROUNDUP

BWXT to Supply Pentagon's Prototype Microreactor

- The US Department of Defense has selected BWX Technologies (BWXT) to manufacture and deliver to Idaho National Laboratory its "Project Pele" full-scale transportable microreactor prototype in 2024 for up to three years of testing. BWXT beat out X-energy for a contract to demonstrate that its high-temperature gas-cooled reactor — at a power level between 1 and 5 megawatts — can "meet a variety of operational needs" of the Department of Defense, according to a Jul. 9 statement from BWXT. "The entire reactor system is designed to be assembled on-site and operational within 72 hours. Shut down, cool down, disconnection and removal for transport is designed to occur in less than seven days." For BWXT, the microreactor could have "commercial applications for disaster response and recovery, power generation at remote locations, and deep decarbonization initiatives." The Pentagon will work with the Department of Energy (DOE) to oversee the demonstration, which upon arrival in Idaho will be fueled with Triso fuel that requires high-assay low-enriched uranium (Haleu), although given current constraints on the availability of Haleu it's not certain how DOE plans to get the material.
- US engineering, procurement and construction veteran Bechtel signed a memorandum of understanding this week with Toshiba for the Japanese firm to "join" a consortium led by Bechtel and Westinghouse to pursue "a new civil nuclear power plant project in Poland." Bechtel announced the prospective tie-up on Jun. 7, following a signing ceremony with Toshiba America Energy Systems and Toshiba Energy Systems & Solutions. This would be Toshiba's most notable move into the global market since 2017, when it retracted its nuclear business to Japan in the wake of former subsidiary Westinghouse's bankruptcy. This new cooperation appears limited to the turbine island of any consortium-supplied AP1000, but given the optics of the former Toshiba-Westinghouse relationship it's no surprise that Westinghouse didn't sign the memorandum alongside Bechtel. The two US firms are currently completing a "front-end engineering design for the Polish government's consideration for a three-unit plant on the Baltic Sea coast," said Bechtel. Warsaw expects to receive this "late summer," and to choose between offers from the US consortium, France's EDF and Korea Hydro & Nuclear Power "in the fall," a senior official said last month.
- Kazatomprom CEO Mazhit Sharipov met with Cameco CEO Tim Gitzel in Nur-Sultan this week to discuss the "ongoing evaluation of a potential future investment" to use Cameco refining technology at Kazatomprom's Ulba metallurgical facility that's home to a new fuel fabrication plant. Several years ago the two companies "completed a feasibility study to evaluate the design, construction and operation of a uranium refinery in Kazakhstan with the capacity to produce 6,000 tU annually as uranium trioxide (UO3)," according to a December 2017 announcement from Cameco. Cameco's refining technology, the UO3 output of which is essentially the first part of Cameco's conversion process, has tempted Kazatomprom for years, and was licensed to it in 2020 as part of a broader agreement. Kazatomprom spokesperson Cory Kos said the Kazakh miner is evaluating "how we could contribute to what could be a shortfall in these next-level services in the future."

NUCLEAR FUEL MARKET

DOE Seeks \$4.3 Billion for Domestic Fuel Procurement

The Biden administration's US Department of Energy (DOE) has been meeting with Congressional staff to quietly request billions of dollars to procure domestic nuclear fuel supply, although details about the nature of this request remain vague. This suggests that the Biden administration would likely impose restrictions on Russian nuclear fuel shipments to the US — in response to the Russian aggression in Ukraine — if the DOE receives adequate congressional support for the effort and the nuclear fuel supply chain is able to respond in kind.

The DOE did not respond to questions as of press time, but Energy Intelligence confirmed with a source a Jun. 7 Bloomberg report that the agency is seeking \$4.3 billion to buy nuclear fuel, across the supply chain, to loosen Russia's hold — at roughly one-fifth of US demand — on the US nuclear fleet. The terms by which the DOE intends to procure the material are uncertain, although the biggest beneficiaries are likely to include Urenco's enrichment plant in New Mexico and the Metropolis conversion plant in Illinois. Purchase of nuclear fuel supplies from ally nations is also a possibility.

The news follows a May 27 letter Energy Secretary Jennifer Granholm sent to the powerful centrist Democrat Sen. Joe Manchin requesting "additional, catalytic investment to boost domestic manufacturing" of low-enriched uranium for existing reactors and high-assay, low-enriched uranium (Haleu) needed to fuel the agency's first round of advanced reactor demonstration projects.

The letter is part of a host of discussions DOE is having with Congress outlining the agency's options for weening US nuclear reactors off Russian fuel supply. DOE spokesperson Karla Olsen told Energy Intelligence last week that the "technical assistance that we provided to Congress seeks to encourage build out of domestic enrichment capabilities," but that it would consider all US enrichment options, "as well as opportunities to partner with allied democracies."

But the \$4.3 billion price tag to procure domestic production of nuclear fuel is a big, expensive ask from Congress. And some lawmakers, including Sen. Joe Manchin of West Virginia, would seemingly prefer to build out the US nuclear fuel supply chain. For the

Biden administration, that's not a timely solution. The White House is looking to use all the levers at its disposal to thwart Moscow's war in Ukraine without putting US troops on the ground. But with polls indicating Republicans are poised to take control of the House and Senate in November's midterm elections, Democratic President Joe Biden is running out of time to work out a compromise on wider energy and climate plans.

Although the path forward remains anything but clear, the hint that Russian imports might finally be banned helped US uranium miners secure new future supply contracts with US buyers, according to several sources who attended the World Nuclear Fuel Market conference in Montreal this week. The news also sent investors flocking to US mining companies for equity stakes and Sprott's physical uranium trust, boosting share prices and inevitably helping lift uranium prices.

The uranium price delivered by Energy Intelligence's Uranium Price Panel rose to \$52.25/lb. U3O8 on Jun. 9, up from \$49.40/lb. on Jun. 2.

Meanwhile, in Namibia, Rossing Uranium produced 2,882 tons of U3O8 in 2021, a 16% increase compared to 2020, according to a Jun. 8 statement. Rossing Managing Director Johan Coetzee added that "despite sales volume being 11% higher than in 2020, revenue was 6% lower at N\$4.26 billion [US\$268.6 million] due to the impact of a stronger Namibian dollar against the US dollar."

Rio Tinto in July 2019 sold its 68.7% interest in the Rossing uranium mine to China National Uranium Corp., a wholly owned subsidiary of China National Nuclear Corp. (CNNC), for \$107 million. The deal was understood to extend operations beyond Rio Tinto's planned 2025 shutdown, ensuring more long-term supply.

The Namibian miner said this week it "currently sells" about 66.6% of Rossing production to CNNC reactors, while 26% goes "into an existing long-term contract portfolio" including North America, Europe, the Middle East and Africa, and 7.4% is sold to other customers in Asia.

Jessica Sondgeroth, Washington

URANIUM PRICE PANEL

For the week ended June 9, 2022

	Weekly Spot Market Prices													
	Chg.	June		May				Apr				Mar		
		9	3	26	19	12	5	28	21	14	7	31	24	17
Price (\$/lb U3O8)	2.85	52.25	49.40	46.67	47.14	50.41	54.00	52.13	61.28	63.88	63.07	57.94	58.34	56.00
Total Assessments	0.00	10.00	10.00	12.00	10.00	9.00	11.00	9.00	10.00	10.00	9.00	10.00	9.00	9.00
% within 1 StDev	30.00	70.00	40.00	75.00	80.00	77.78	72.73	55.56	60.00	90.00	77.78	80.00	66.67	66.67
Low (\$/lb U3O8)	2.70	51.70	49.00	46.00	47.00	49.00	53.50	51.25	59.00	63.75	63.00	57.50	58.00	55.00
High (\$/lb U3O8)	2.35	52.50	50.15	47.50	47.50	52.00	55.00	53.00	63.25	64.00	63.50	58.75	58.50	57.00
Variability*	0.08	0.40	0.32	0.05	0.00	0.28	0.50	0.50	0.75	0.08	0.00	0.28	0.13	0.50

*This represents the value of the potential range of conceivable final averages that might result when random elimination is used to balance market positions within the panel.

NEWBUILD

Behind Riyadh's Exclusion of Westinghouse and EDF

Riyadh's recent decision to exclude Westinghouse from the formal reactor selection process for its mooted large power reactor program promises to jolt geopolitical calculations in Washington, which has long insisted that Riyadh formally abandon its nuclear fuel cycle ambitions before signing any bilateral nuclear cooperation agreement (NCA).

Riyadh's decision advances Russia's Rosatom, and China's China National Nuclear Corp. — companies owned by Washington's two key geopolitical adversaries — alongside Korea Electric Power Co. (Kepco). France's EDF appears to have been excluded alongside Westinghouse, although there is at least one report to the contrary. To keep US-based Westinghouse in the mix, Washington may be forced to back down from previous intellectual property and export control considerations it has asserted for any Kepco supply.

"This is not sending two middle fingers to Washington, DC, but it's certainly sending one," one US industry source told Energy Intelligence. It's not clear how Washington might respond, but if US President Joe Biden proceeds with a planned visit to Saudi Arabia later this month or next, the technical Bid Invitation Specification (BIS) process for the nuclear program will almost certainly be on the agenda.

In some ways the Saudi exclusions can be justified on commercial grounds: US-based Westinghouse and to a lesser extent France's EDF appear to have been increasingly unresponsive to the King Abdullah Centre for Atomic and Renewable Energy (Ka-Care) as it developed the BIS process, and both vendors are in commercial disarray. EDF is hemorrhaging money thanks to its troubled French operating fleet, while Westinghouse has been put up for sale by its Canadian private equity owner.

While multiple sources agree that Westinghouse was excluded from the BIS, the situation with EDF is less clear. One Korean newspaper reported May 31 that EDF had received the BIS, while EDF executive Xavier Ursat said in an early May post on LinkedIn that EDF was "positioning" itself for the sale of two EPRs to Saudi Arabia. EDF declined to comment when asked by Energy Intelligence about the Saudi tender.

Back to the 123

Assuming Riyadh has indeed excluded both Westinghouse and EDF, most sources agree that commercial considerations alone wouldn't be worth the political blowback Riyadh has likely already incurred. Instead sources all point to the years-long stalemate over a US-Saudi Arabia NCA, known in Washington as a 123 Agreement. That stalemate centers around two key

Washington demands: that Saudi Arabia commit in the NCA to not pursuing a domestic uranium enrichment or reprocessing program and that it sign and ratify the International Atomic Energy Agency's Additional Protocol (IAEA AP), which would allow fuller access of nuclear inspectors to the Saudi nuclear program.

The exclusion of Westinghouse "may be a message to the United States to get on the stick and accelerate negotiations toward an agreement that would permit the US to have nuclear cooperation with Saudi Arabia," Mark Hibbs, a nuclear expert with the Carnegie Endowment for International Peace, told Energy Intelligence. "Even at this point, I would not conclude, based on the invitation that we hear about, that the United States is out of this."

But Riyadh is committed to maintaining its nuclear options and probably more so with every hawkish announcement from Tehran regarding its growing nuclear enrichment program, so it's hard to envision either side backing down on their nuclear fuel cycle demands.

"The \$64,000 question is whether anything has really changed, particularly in the region, that would satisfy the Saudi Arabians to the extent that they would be willing to go forward with an agreement that would tie their hands on the future of their nuclear fuel cycle?" asked Hibbs. To the extent that the answer to this question is no, the BIS exclusions might have a more subtle goal than forcing through a US-Saudi NCA on Riyadh's terms. Saudi planners may be instead focused on forcing Washington to accept a Saudi deal with Kepco and South Korea.

A Solution From Seoul?

Without any obvious geopolitical reasons to exclude EDF and annoy Paris — particularly given that a Saudi-French NCA has been in place since February 2011— Riyadh may have excluded any possibility of French supply to assure Washington it still has a hand to play. In this reading of the situation, Riyadh may be signaling Washington that if it wants to keep this incredibly sensitive nuclear supply arrangement from going to the Russians or the Chinese, it must back the South Korean bid.

It's worth noting that in the previous 2017 request for information process, which saw all five hopeful vendors supply generic information about their offerings to Ka-Care, the Kepco offering was widely viewed as the most commercially attractive.

Still unresolved, however, is the issue of the APR1400+ that Kepco is offering to Saudi Arabia. While Kepco and Seoul argue that this is a fully indigenous offering, completely developed in South Korea, both the US government and Westinghouse contend it is not. They say it is derived from a design originally supplied by Combustion Engineering (a US company long-since engulfed by Westinghouse) and that there is key US-origin technology and Westinghouse-owned intellectual property in the APR1400.

If Riyadh were to award Kepco a contract with this issue still unresolved, Westinghouse could theoretically push it into arbitration while Washington insists on a 123 Agreement. “There are a thousand things the US can do” to pressure against a Saudi Arabia–South Korea deal, said Henry Sokolski, executive director of the Washington-based Nonproliferation Policy Education Center.

But if the Biden administration wants foremost to prevent Riyadh from falling into the arms of Beijing or Moscow, and depending on talks with Riyadh and Crown Prince Mohammed bin Salman, it’s conceivable that Washington could back down on a South Korean supply arrangement to Saudi Arabia.

Some resolution of the APR1400+ dispute may be in sight: on Wednesday, Jun. 8, the CEOs of Kepco and Westinghouse agreed to “develop a cooperative model for joint entry into the foreign–large nuclear power plant market,” according to a Jun. 9 statement from Kepco. This made no reference to the APR1400+, or of any specific third country markets, but it does show the two firms are at least speaking to each other. Should this result in an agreement on the intellectual property within the Korean reactor offering — and its relative indigenouslyness — then a compromise between Washington, Seoul and Riyadh might be possible. Washington might overlook a 123 Agreement with Saudi Arabia in favor of a Kepco supply deal, for instance, if Riyadh signs and ratifies the IAEA AP.

Phil Chaffee, London, Stephanie Cooke, Washington

SAUDI ARABIA

The Political Momentum in the Nuclear Tender Launch

Riyadh’s decision to launch a formal reactor vendor selection process is part of a broader surge in activity in Saudi Arabia’s on–again, off–again nuclear power program.

Over the past several months Saudi Arabia has begun hiring globally to fill out the governmental nuclear power organizations that have been largely embryonic since Riyadh formed the King Abdullah Centre for Atomic and Renewable Energy (Ka–Care) in 2010. While Ka–Care is at the center of all Saudi nuclear activities, there are signs that planners will start to fill out both the Saudi Nuclear Energy Holding Co. (Snehc) under Ka–Care and potentially various Snehc subsidiaries.

One obvious model here is Abu Dhabi’s nuclear program, in which the Nawah Energy Co. that operates the Barakah plant is a subsidiary of Emirates Nuclear Energy Corp., although in the Saudi case it’s not yet clear where project management competencies will be based — to say nothing of nuclear operations. What’s clear is that

all of these Saudi organizations are ultimately answerable to the Ministry of Energy, Industry and Mineral Resources headed by Prince Abdulaziz bin Salman, half–brother of Saudi Arabia’s de facto ruler Crown Prince Mohammed bin Salman.

Given the political sensitivity of the initial exclusion of US–based Westinghouse — and likely of France’s EDF as well — from the formal reactor vendor selection process, it’s fair to assume that both Prince Abdulaziz and Prince Mohammed were consulted when the technical Bid Invitation Specification (BIS) process was launched this spring. The crown prince was likely similarly involved four years ago when Riyadh declined to down–select from five the number of respondents to a 2017 request for information (RFI).

In the following years Ka–Care selected its preferred site for the initial twin–unit plant at Khor Duweihin on Saudi Arabia’s Gulf coast just north of Abu Dhabi’s four–unit Barakah nuclear plant. And by the end of last year it developed an enormous tender document. From January the energy ministry reviewed that enormous document and it was only after a couple of months that the ministry sent a limited technical BIS to at least three of the five hopeful vendors: China National Nuclear Corp., Korea Electric Power Co. and Russia’s Rosatom.

This BIS was a purely technical tender, focusing on performance, quality and management issues, and technical parameters. Where the RFI asked for just data — it contained dozens of questions on the vendor reference plant — the BIS asks the hopeful vendors to explain how their reactors will adapt to Saudi specifics, such as the Khor Duweihin site characterization report, the Saudi grid, stability and reliance issues, and the initial high–level regulations that have been developed by the nascent Saudi nuclear regulator.

Therefore while one source said that the BIS could be called “the RFI 2.0,” it’s still possible that it could be followed by a second commercial BIS focused on the business case, contracts, risk allocations and funding schemes on offer from the various vendors.

Phil Chaffee, London

IAEA

Grossi Pushes for IAEA Visibility Across Multiple Crises

Debates over International Atomic Energy Agency (IAEA) visibility in Ukraine, Iran and North Korea heated up this week during the agency’s quarterly board meeting and on social media. As diplomats in Vienna mulled these disparate high–profile situations, they also learned that Brazil is seeking “special” safeguards for its long–planned nuclear propulsion program — adding another knot to issues raised by the planned transfer of such technology to

Australia. Most dramatically, Director General Rafael Grossi promised that IAEA inspectors would visit the Russian-occupied Zaporozhye nuclear plant in Ukraine “sooner or later — and better sooner,” following a request he said was made by Ukrainian authorities, but Ukrainian operator Energoatom denounced the claim, saying that Grossi “is lying again” and that there was no invitation to visit the six-unit plant.

“With the steep challenge of guarding against military diversions in Brazil, continuing troubles in Iran and the difficulty of doing right by Ukraine, the IAEA has to guard against the meltdown of its nuclear safeguards system,” warned Henry Sokolski, executive director of the Washington-based Nonproliferation Policy Education Center.

Grossi’s Jun. 6 opening statement to the IAEA Board of Governors included “observed indications” of an upcoming nuclear test in North Korea, disputes over safeguards access in Iran, and news that Brazil had requested “special procedures” to safeguard nuclear fuel for its naval propulsion program, a development that for some highlighted proliferation concerns expressed last year when the US, UK and Australia announced their nuclear submarine technology sharing agreement known as Aukus. The common thread across all of these issues was the nature of IAEA oversight and access, and nowhere was Grossi more forceful on this front than in his assertive off-script comment on Ukraine.

“Of the seven pillars of safety and security that I enumerated at the fateful beginning of this tragic episode of contemporary history, almost all of them have been violated at Zaporozhye. And still people are doubting whether the material is ready for nuclear weapons or not, or whether the director general is irresponsible about talking about these things,” Grossi told the board, stressing that he would continue discussions with the Ukrainians, Russians and the UN about visiting the plant. “If this agency doesn’t care when we have the biggest nuclear power plant in Europe disconnected from the safeguards systems we better do something else. So we are going to Zaporozhye as requested by Ukraine.”

Threading the Zaporozhye Needle

Grossi’s speech received immediate pushback from the Ukrainian side. In a Jun. 7 statement posted to Telegram, Energoatom said that Grossi’s determination to visit the plant is “another attempt” to “legitimize the stay of the occupiers there and in fact, to approve all their actions.” The loss of safeguards data transmission was blamed on “the actions of the Russian occupiers” and the “information is stored on the server and will be transferred” when communication links are restored.

The state-owned operator, which lost control of Zaporozhye following an occupation of Russian troops starting Mar. 4, argued that the Ukrainian side “did not invite Grossi” to visit Zaporozhye and had even “denied him such a visit, emphasizing that a visit to the power plant will be possible only when our country regains control over it.” It went on to complain that

roughly a quarter of “IAEA leadership,” or “about 100 people,” are Russian, including the head of the nuclear energy department, Mikhail Chudakov.

By stressing a safeguards aspect to the situation at Zaporozhye, as he did on May 25 at Davos, Grossi is in a stronger position to demand an onsite inspection, unlike with issues affecting safety and security, according to an expert in Vienna. Grossi claimed in his speech that Ukraine’s regulator said “they have ‘lost control over’ the facility’s nuclear material,” which is subject to safeguards and that there had been a loss of safeguards data communication from Zaporozhye to the agency. But this will be a difficult needle to thread, given the Ukrainian belief that any IAEA visit to Zaporozhye would legitimize the Russian occupation.

Grossi’s quest is supported by the US, perhaps Ukraine’s most important ally. The “safeguards status” at Zaporozhye is “cause for concern,” US Ambassador Laura Holgate told the board in Jun. 9 remarks. The interruption of remote transmission of safeguards data from that plant, and the declaration of Ukraine’s nuclear regulator that it has “lost control” over nuclear material at the plant, said Holgate, “raises the danger that continuity of knowledge could be lost if inspectors cannot return to the facility soon; they must be able to conduct inspections safely and in a manner consistent with Ukraine’s safeguards agreements and Additional Protocol.”

Losing Continuity of Knowledge in Iran

In an interesting parallel, maintaining such IAEA access to Iranian facilities was the other major issue of the week — although in the case of Iran the facilities in question aren’t a nuclear power plant, but are instead dedicated to a uranium enrichment program, from centrifuge production plants to research and development facilities.

On Jun. 8 Iran announced the same day it was ordering the agency’s new Online Enrichment Monitor shut down, and at facilities from Natanz to Isfahan it started shutting down IAEA cameras dedicated to monitoring the 2015 nuclear deal. In a Jun. 8 statement the Atomic Energy Organization of Iran claimed that 80% of the IAEA cameras at its facilities were dedicated to safeguards, and would be kept on, while Grossi told reporters on Jun. 9 that roughly 40 cameras were safeguards-dedicated and would stay on, compared to the 27 dedicated to verifying the 2015 deal that the Iranians were turning off.

Since February 2021 Iran has allowed the IAEA to collect and store the data from those 27 cameras, but access to it was postponed until an agreement was reached to revive the 2015 nuclear deal between Iran the US and five other countries.

“What we see is that we are in a very tense situation,” with the negotiations for the revival of that 2015 deal at “a low ebb,” said Grossi, “and our bilateral process with Iran — with the

clarification of a number of outstanding issues not being successful so far.” Grossi warned that within three to four weeks the IAEA will lose all continuity of knowledge over the Iranian program, and said this would be “a fatal blow” to any hopes of reviving the 2015 deal.

Iran’s action was prompted by a relatively mild Western-backed resolution calling on Iran to “act on an urgent basis” to “clarify and resolve” outstanding safeguards issues. The resolution received overwhelming support from the board on Jun. 8, with only Russia and China opposing it and India, Pakistan and Libya abstaining, amidst little evidence the agency will get the desired cooperation from Iran.

Tehran’s subsequent escalation — and its linkage of its actions to the board resolution in Vienna — prompted quick pushback from Washington. “The Board spoke to Iran’s safeguard obligations, which are separate” from the 2015 nuclear deal, Washington’s Iran envoy Robert Malley tweeted. “We are ready for a mutual return to full compliance immediately. Iran just needs to decide to drop its extraneous demands & agree to the deal that’s been available since March.”

Waiting for Pyongyang’s Next Test

The final crisis on the IAEA’s radar is North Korea, which Washington worries may imminently conduct a seventh nuclear test. That’s after launching some 31 ballistic missile tests since January, including eight alone from various parts of the country on Jun. 5, according to the US Special Representative to North Korea, Sung Kim, who provided an on-the-record briefing by telephone to reporters on Jun. 7. That was “the largest number of ballistic missiles ever launched in a single day by the DPRK,” he said, and “the most ... in a single year, surpassing its previous record of 25 in 2019. And it’s only June.”

“In addition to launching an unprecedented number of ballistic missiles, the DPRK’s senior officials have used rhetoric that could suggest the use of tactical nuclear weapons,” said Kim. “We also assess that the DPRK is preparing to conduct a seventh nuclear test.”

Grossi described indications of test preparation at the Punggye-ri test site, and ongoing indications that the 5 megawatt reactor at Yongbyon is operating, with “possible waste treatment” at the site’s Radiochemical Laboratory. Meanwhile, a roof has been installed on the annex to the reported Centrifuge Enrichment Facility, “so the annex is now externally complete.” He also reported “ongoing indications of activities at the Kangson complex and the Pyongsan Mine and Concentration Plant.”

Grossi concluded that the IAEA “continues to maintain its enhanced readiness to play its essential role in verifying” North Korea’s nuclear program.

Stephanie Cooke, Washington, Phil Chaffee, London

NONPROLIFERATION

Brazil Follows Aukus Into ‘Special’ IAEA Talks

International Atomic Energy Agency (IAEA) Director General Rafael Grossi’s announcement this week that the agency had begun discussions with Brazil over its nuclear propulsion plans underlined the growing importance of this previously obscure area of nonproliferation. The use of nuclear propulsion in non-nuclear weapons states has worked its way repeatedly onto the IAEA agenda following last year’s announcement of plans for the US and UK to share nuclear submarine technology with Australia, in an initiative known as Aukus.

Initial discussions about a safeguards arrangement for a Brazilian nuclear submarine program were held at the end of May between Brazil, Abacc (Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials) and the secretariat, Grossi told the IAEA’s Board of Governors in a Jun. 6 statement. After expressing his “satisfaction with the engagement and transparency shown” by the three Aukus countries in two technical discussions held since March, Grossi commended Brazil “for its transparent approach and decision to work closely with the Agency on this important project.” He said that after the initial discussions another meeting is planned “before the end of the year.”

At issue in all these talks over nuclear propulsion plans for non-nuclear weapons states — specifically in Australia and Brazil, but possibly later in other countries — is the question of whether existing IAEA safeguards are effective enough, or can be suitably adapted, to prevent diversion of sensitive nuclear material.

To cover the Aukus plans, the agency set up a secretariat-level team to review the trilateral arrangements, and Grossi told a quarterly board meeting this week that he plans to present a report on the situation at the September board meeting. “Another important development,” he added, is Brazil’s “formal communication to initiate discussions with the secretariat on an arrangement for Special Procedures for the use of nuclear material under safeguards in nuclear propulsion and in the operation of submarines and prototypes, as set out in the Quadripartite Safeguards Agreement.”

That 1991 agreement between Brazil, Argentina, Abacc and the IAEA duplicates the relevant language in Infirc 153, an important 1972 IAEA document. Paragraph 14 of Infirc 153 allows for the “non-application of safeguards to nuclear material to be used in non-peaceful activities” in non-nuclear weapons states.

Disparate Criticisms

Critics say that language is too vague because “non-peaceful activities” has not been adequately defined, although historically

it's been interpreted to mean nuclear propulsion. After Aukus was announced last November, Grossi announced that the agency had adequate means to develop safeguards specific to the arrangement, pushing back against a proposal by China to set up a "special committee" that would develop a comprehensive system of safeguards to cover nuclear propulsion.

China has continued its campaign against Aukus, and it succeeded this week in getting the issue on the board's agenda for a third time. Wang Qun, China's ambassador to the IAEA, "expressed hope that the IAEA board meeting would continue to focus on core issues of Aukus and seek solutions to safeguard the NPT and the international nonproliferation regime," according to a Jun. 7 statement, which argued that the repeated elevation of the issue to the board's agenda reflected "the international community's serious concerns over the trilateral deal." This statement, however, said nothing about the Brazilian development.

Others weren't so sanguine. "Brazil's initiation of discussions within the IAEA over its naval propulsion program was always a likely consequence" of Aukus, James Acton, co-director of the nuclear policy program at the Carnegie Endowment for International Peace, said in an email to Energy Intelligence.

"Other countries are likely to follow (albeit probably not immediately)," said Acton. "This underscores the importance of the Aukus partners setting a strong nonproliferation precedent. I am concerned, however, that instead they are looking for an approach that minimizes the need for difficult negotiations within the Board of Governors."

Tariq Rauf, former IAEA head of verification and security policy coordination, has previously pointed out that the concept of 'non-peaceful or non-proscribed nuclear military activities' has never been tested at an NPT review conferences or by the IAEA Board of Governors.

"As expected," Rauf wrote in an email this week, Aukus "has opened the door and now Brazil has stepped out of the shadows to do the same. For years, Brazil has refused to sign the IAEA safeguards Additional Protocol, citing its naval nuclear propulsion program. Iran, Japan and South Korea also could opt for nuclear ships or submarines in the near future. Exempting hundreds of kilograms of HEU [highly enriched uranium] for naval nuclear propulsion from IAEA comprehensive safeguards risks gutting the Agency's 50-year-old verification system."

Defending Aukus

A former US State Department official familiar with the Brazil situation noted that Brazil's naval propulsion program has "existed for a long time" and "is not a response to Aukus." He said that "even if Aukus never existed, Brazil would have notified the IAEA of its desire to work out arrangements to ensure that enriched uranium used in Brazilian naval reactors is not diverted to a nuclear weapons program."

Now the IAEA will be working separately with Brazil and the Aukus partners to develop suitable arrangements to ensure non-diversion. "Although the Australians, Americans and British have not formally announced key parameters of their cooperation," said the former US State Department official, citing unanswered issues such as who will provide the naval reactors, who will supply the enriched fuel, and who will build the submarine hulls, "they have held detailed discussions with the IAEA and want to move quickly to set a high bar of transparency and accountability — a 'gold standard' — that would set a precedent for future IAEA arrangements with other states, including Brazil."

The former US official discounted predictions that Aukus will lead to many non-nuclear weapon states pursuing nuclear-powered submarines and increasing risks of nuclear weapons proliferation. "South Koreans have expressed interest in nuclear-powered submarines but the US has tried to discourage them," the former official continued. "Iran has cited an interest in nuclear naval propulsion but that is a pretense for achieving high levels of enrichment. It is unlikely ever to build nuclear submarines. So far at least there is little interest in joining the club."

John Carlson, former director-general of the Australian Safeguards and Nonproliferation Office and former chair of the IAEA's Standing Advisory Group on Safeguards Implementation, has long argued in favor of a case-by-case approach for "specifically tailored" safeguards solutions, and notes that Brazil's situation is very different from Australia's since Australia isn't producing its own fuel.

"Brazil is producing its own fuel — it has enrichment and fuel fabrication — so the diversion opportunities are greater," Carlson wrote in an email this week to Energy Intelligence. "IAEA inspectors will need to follow the nuclear material flow to ensure nuclear material is not being diverted at any point." Meanwhile in Australia's case "the nuclear fuel will not be accessible to Australian personnel, nor to IAEA inspectors. As currently envisaged, the fuel will arrive in Australia already loaded in the reactor, with the reactor built into a section of hull."

Stephanie Cooke, Washington

UNITED STATES

Senators Push NRC Nominees on Reprocessing

Senators this week urged two nominees to the US Nuclear Regulatory Commission (NRC) to ensure the agency is prepared not just to license advanced reactor designs, but to license spent nuclear fuel reprocessing facilities and reactor designs that would use the recycled fuel. This comes only months after the NRC's decision last summer to discontinue work on rulemaking for

licensing commercial reprocessing facilities, and over four decades after the US government abandoned a commercial reprocessing program.

In a Jun. 8 hearing of the Senate Environment and Public Works Committee, US senators met with the two nominees to the NRC who would bring the five-member commission to full quorum after nearly a year with only three commissioners serving. One of the nominees, Republican Annie Caputo, a former Senate staffer and Exelon executive, would be returning to the commission after a one-year hiatus that concluded when her term expired in June last year. The second nominee, Democrat Bradley Crowell, is both a former Senate staffer, US Department of Energy (DOE) liaison to Congress, and environmental official for the state of Nevada with experience in advanced nuclear technologies and nuclear waste disposal.

For Crowell, his Nevada credentials and stance on nuclear waste might put him in a strong position to advocate for the revival of rulemaking on reprocessing at the NRC. Caputo, meanwhile, encouraged vendors interested in reprocessing to begin pre-application talks with the agency.

Nuclear Waste to Reprocessing

Spent fuel reprocessing was one of the main topics of discussion at the committee hearing and among the committee's Democrats, even though the party has been traditionally opposed to reprocessing. In 1977 the US halted all federal support for reprocessing, citing its connection to weapons proliferation, but Republicans have occasionally since then revived the topic. Most recently, in 2019, under the Trump administration, the DOE began once again exploring reprocessing options.

This support seems to have bled over into the Biden administration as geopolitical tensions between the US and Russia, in particular, and China have heightened competition on the global nuclear stage. This became evident with an increase in fiscal 2022 funding for DOE's Advanced Research Projects Agency-Energy (ARPA-E) that on Mar. 10 awarded a total of \$36 million to 11 projects related to reprocessing used nuclear fuel or dealing with the "waste and storage challenges" associated with advanced reactor fuel cycles. For congressional lawmakers with operating or closed reactors in their states, reprocessing may present a possible avenue for removing waste stored at reactor sites. And for some of DOE's advanced reactor vendors, like Oklo and TerraPower, reprocessing could be part of the fuel supply design.

Crowell's five-year term at the Nevada Department of Conservation and Natural Resources, and his nomination for the commissioner's seat by Nevada Democrat Sen. Catherine Cortez Masto, may make him amenable to reprocessing. The vast majority of the Nevada delegation has long opposed siting a permanent repository for spent nuclear fuel at Yucca Mountain in the state, and strongly favored a consent-based siting approach for both permanent and interim waste storage, an area in which the NRC

and the DOE have been subject to heavy criticism. So it's not terribly surprising that Crowell's stance fits neatly into that of the Nevada delegation, and that one of the issues he is "most interested in delving into" as a way to "mitigate" the nation's unresolved issues around nuclear waste disposal is nuclear waste reprocessing.

Committee Chairman Sen. Tom Carper, a Democrat from Delaware, asked both NRC nominees whether the US should look to France for help. France's Orano operates the La Hague reprocessing plant and storage facility in Normandy, northern France. But France's back-end fuel cycle has faced growing problems: Orano's separate Melox mixed-oxide fuel production difficulties are threatening storage capacity and operating margins for La Hague. In fact, last month the French nuclear regulator said the "malfunctions at the Melox plant are causing faster than anticipated saturation of the storage capacity for plutonium-bearing materials, requiring the licensee to take urgent measures in 2022."

No matter Orano's difficulties, Carper wondered whether the US should export its spent nuclear fuel to France — which he said is "willing to take spent fuel, spent fuel rods, spent nuclear waste and compete for the right to house that." Caputo referred to the DOE, which is looking into reprocessing options. Orano, for its part, told Energy Intelligence: "We would welcome the opportunity to include this expertise in the many ways we already support and enhance the nuclear industry here in the US."

Sen. Sheldon Whitehouse, a Democrat from Rhode Island, cautioned the NRC nominees against regulatory rulemaking that would inhibit reprocessing technologies from coming to market. "My concern is that if spent fuel costs a nickel more than new nuclear fuel, that will create a disincentive that will drive all of the innovation towards new nuclear fuel and will starve the real prospect that we could actually get new clean power out of existing spent fuel," said Whitehouse. "We don't want to be in that position."

Citing a "nuclear waste issue that needs to be resolved in this country," Crowell responded that: "If we can approach advanced reactor and new nuclear technologies in a way that helps mitigate or even partially solve that issue, that's very attractive and it should be factored into that nickel cost equation that you [Whitehouse] referenced."

Speaking from her experience on the commission from 2018–21, Caputo clarified that oversight of reprocessing facilities would "fall more into a fuel facilities sector of the agency," given the processing step to prepare and fabricate the fuel. "If vendors are interested in pursuing that, then there would be encouragement for doing pre-application reviews with the agency to understand the nature of the technologies that are coming forward, and to ensure that we have resources budgeted to adequately review those, that personnel are trained to understand the technology and be prepared when those applications arrive."

Advanced Reactor Rulemaking

Sen. Shelley Capito, a Republican from West Virginia — which recently repealed a ban on nuclear energy and is now considering hosting a reprocessing facility and advanced research reactor — also pushed the nominees on the NRC’s advanced reactor rulemaking. Currently, the NRC is considering applications for “early movers” under existing regulatory frameworks and planning a final rulemaking in 2025 for the next stage of advanced reactor design applications using a technology-neutral, risk-informed approach mandated under the Nuclear Energy Innovation Modernization Act passed by Congress in 2018. Oklo was one of the first “early movers” to submit a design application to the NRC, but this was rejected by the NRC in January over Oklo’s failure to provide key safety information to the agency.

For the NRC, the future of its advanced reactor rulemaking — as it attempts to move toward a less prescriptive and more “performance-based” approach to regulation — is clearly still taking shape.

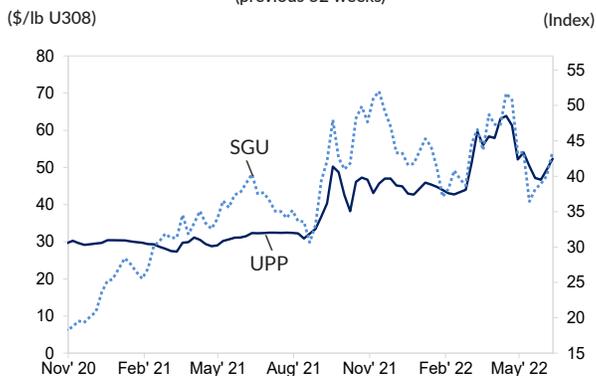
“There’s an exercise that the agency has to go through between which sections of its rules will be applied and which are not applied” from existing rules to advanced reactor applications, Caputo said. “That will be somewhat different for each of these different technologies. So that’s an unpredictable path forward as the agency has to make these determinations on each application and hopefully, with a new rulemaking there will be less of a need for exemptions and flexibility determinations because it will be flexible and performance-based.”

Jessica Sondgeroth, Washington.

URANIUM MARKET UPDATE

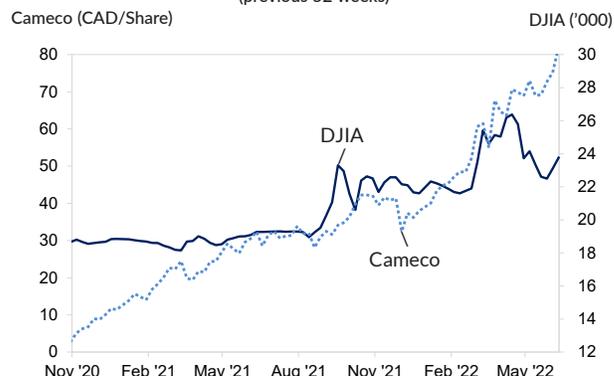
All prices as of Thursday, June 9, 2022

UPP VS. SOLACTIVE GLOBAL URANIUM INDEX
(previous 52 weeks)



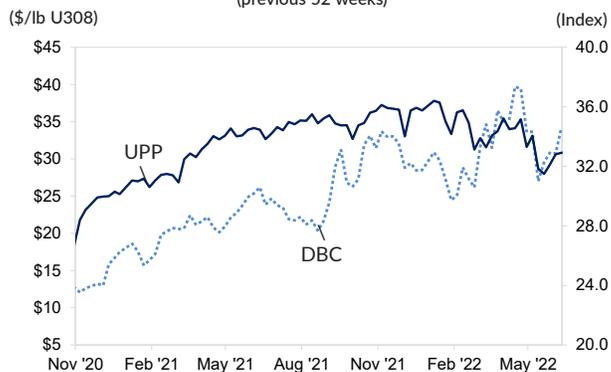
The Solactive Global Uranium Total Return Index, created by Structured Solutions AG, tracks the price movements in shares of companies active in the uranium mining industry. Calculated as a total return index and published in US\$, its composition is ordinarily adjusted twice a year.

CAMECO VS. DOW JONES INDUSTRIAL AVERAGE
(previous 52 weeks)



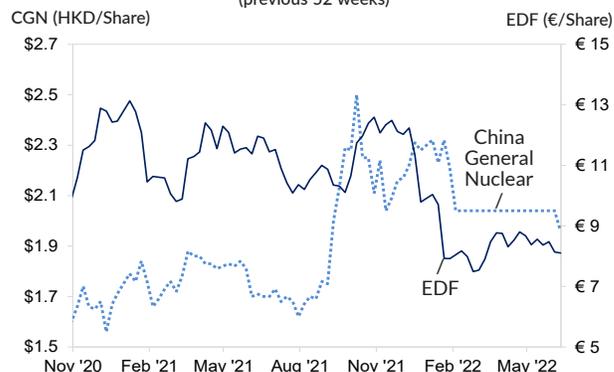
Canadian uranium miner Cameco's stock is valued in Canadian dollars compared with the US dollar on the Dow Jones Industrial Average (DJIA). Roughly two-thirds of DJIA's 30 component companies are manufacturers of industrial and consumer goods. The others represent industries ranging from financial services to entertainment.

UPP VS. POWERSHARES DB COMMODITY INDEX
(previous 52 weeks)



The PowerShares DB Commodity Index Tracking Fund is designed to provide investors with a broadly diversified exposure to the returns on the commodities markets. It is based on the Deutsche Bank Liquid Commodity Index, which is composed of futures contracts on 14 of the most heavily traded and important physical commodities.

EDF VS. CHINA GENERAL NUCLEAR
(previous 52 weeks)



The stock valuation of France's Electricite de France (EDF), largely owned by the French state, is in euros compared to state-owned China General Nuclear (CGN) Power Co., valued in Chinese yuan renminbi. Both companies build nuclear power facilities, design and service reactors, operate nuclear reactors and supply nuclear components and technology.

MONTHLY SPOT MARKET PRICES

	Chg.	2022					2021						
		May	Apr	Mar	Feb	Jan	Dec	Nov	Oct	Sep	Aug	Jul	Jun
Uranium (\$/lb U308)													
Low	-6.50	46.00	52.50	51.00	42.50	43.00	42.00	43.00	36.00	36.00	32.20	32.20	31.00
High	-10.00	54.00	64.00	60.00	44.50	46.50	47.00	47.50	48.00	51.00	36.00	32.50	32.50
Conversion (\$/kgU)													
Low	+2.00	30.00	28.00	26.00	16.00	16.00	16.00	15.00	16.00	19.00	19.00	19.50	19.50
High	+3.00	33.00	30.00	28.00	17.00	17.00	17.00	18.00	19.00	21.00	21.00	21.50	21.50
Enrichment (\$/SWU)													
Low	+2.00	84.00	82.00	100.00	59.00	57.00	56.00	56.00	55.50	55.50	54.00	54.00	54.00
High	-	150.00	150.00	150.00	61.00	59.00	57.00	57.00	57.50	57.50	56.00	56.00	56.00

NIW monthly UF₆, SWU and U308 prices rely on the general consensus of direct market participants and is informed by actual market transactions. This section was previously known as the Nukem Weekly Report and the Nukem Price Bulletin. The methodology for NIW's weekly UPP price is different – more information about the methodology behind that price is available on page two.

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