

# NUCLEAR INTELLIGENCE WEEKLY<sup>®</sup>

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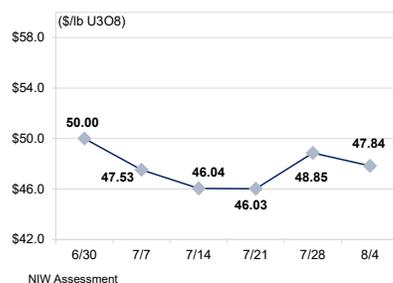
## Market Points

Covid-19-related supply chain disruptions continue to challenge Kazatomprom's ability to develop new wellfields, cutting into 2022 production and prompting the Kazakh miner to pick up more spot material.

Even so, spot market activity slowed to a crawl this week, with Energy Intelligence's Uranium Price Panel delivering an average price of \$47.84 per pound U3O8 for Thursday, Aug. 4, down from \$48.85/lb. on Jul. 27.

US-based SWU trader Centrus Energy said in its earnings update this week that it has sold more than \$135 million in new contracts and commitments in 2022, for 2022-2026 deliveries.

### UPP: \$47.84/LB U3O8



## WEEKLY ROUNDUP

### US NRC Clears Vogtle-3 for Fuel Loading After Years of Delays

- Georgia Power's Vogtle-3 was this week cleared for fuel loading and operation, the US Nuclear Regulatory Commission (NRC) announced Aug. 3. The decision followed "years of diligent and careful work by the team at the site" in the US state of Georgia to satisfy "398 required inspections, tests, analyses, and acceptance criteria ... helping ensure the unit meets strict nuclear safety and quality standards," Georgia Power said in its announcement. Fuel loading will take place over the next several weeks followed by "several months of startup testing and operations." Work on the twin AP1000 newbuilds, the first such project in the US in a generation, began in 2009 with operations forecast for both units by 2017. But the NRC didn't approve construction until 2012 after the agency ordered a redesign of the AP1000 reactor containment building. Delays and cost overruns plagued the project, but it survived the 2017 bankruptcy of primary contractor Westinghouse, which led to the demise of a parallel AP1000 project in neighboring South Carolina. Total project costs originally targeted at \$14 billion are estimated to now be more than \$30 billion.

- Russia and Ukraine exchanged accusations on Friday of shelling at or near the Zaporozhye nuclear plant, with Russia saying it had caused a fire to break out at the plant and Ukraine saying only that there was a risk of fire. But while Russia accused Ukraine of actually attacking the occupied plant, Ukraine's Foreign Ministry tweeted that artillery shelling took place near "the ZNPP industrial site" and that "as a result of 3 recorded hits, the high-voltage power supply line of the ZNPP was damaged." Both sides warned of dire consequences, with Russia invoking Chernobyl and Ukraine the "atomic bomb." The verbal exchange took place on the morning of Aug. 5 at the month-long 10th Non-Proliferation Treaty (NPT) Review Conference that opened this week in New York following a two-year, Covid-19-related delay. Japan and China sparred earlier in the week over Japan's planned release of tritiated water from Fukushima to the Pacific. Beyond these issues, attendees are grappling with major nuclear arsenal modernizations and/or expansions by all weapons states. Swiss Confederation President Ignazio Cassis complained that "disarmament is at a standstill" and said the conference's outcome "will be important in Switzerland's reassessment of its position on the Treaty on the Prohibition of Nuclear Weapons." Switzerland has not yet signed the treaty, another hot-button issue.

- Nuclear Power Corp. of India Ltd. (NPCIL) signed a "first order" this week with Holtec International for "spent fuel and damaged fuel storage racks for its new away-from-reactor wet storage facility" at the Kudankulam nuclear plant in Tamil Nadu, Holtec announced Aug. 3. This contract will serve Kudankulam-1 and -2, but NPCIL plans to similarly store all spent fuel from Kudankulam's six Russian-supplied reactors. This storage plan is controversial, with critics arguing for eventual burial and the government maintaining its closed fuel cycle policy, contending that spent fuel is "a valuable recyclable fuel ... for the next stage of reactors," according to a Jul. 27 statement to the Parliament by Jitendra Singh, minister of state for the Ministry of Science and Technology.

## NUCLEAR FUEL MARKET

# Supply Chain Woes Hinder Kazakh Supply

Amidst efforts to secure an alternative to its primary shipping route through Russia, Kazatomprom continues to experience Covid-related impacts on its supply chain, which is in turn affecting its ability to develop new wellfields and cutting into production, prompting the producer to pick up more spot material.

Spot market activity this week, however, was once more lackluster in the thick of the summer doldrums. Energy Intelligence's Uranium Price Panel delivered an average price of \$47.84 per pound U3O8 for Thursday, Aug. 4, down from the previous week's price of \$48.85/lb.

Total Kazakh production for the quarter ending Jun. 30 fell by 7%, to 5,116 tU, compared to the 2021 second quarter, and by 4% in the first half of 2022, to 10,070 tU, compared with the equivalent 2021 period, each "short of internal expectations," Kazatomprom said in its second-quarter operations update. The Kazakh miner said that the pandemic "disrupted the overall production supply chain in 2021, resulting in a shortage of certain production materials," including sulfuric acid, reagents and piping, "which led to a shift in the commissioning schedule for new wellfields."

Kazatomprom maintained its 2022 production guidance at 21,000-22,000 tU, on a 100% basis, but qualified that "final year-end volumes could fall short if wellfield development and supply chain issues continue."

As such, Kazatomprom found itself entering into "several transactions to purchase material in the spot market" in the second quarter. The miner typically targets an "inventory level of approximately six to seven months of annual attributable production," but noted that "inventory could fall below these levels" and as such, it "will continue to monitor market conditions for opportunities."

While second-quarter volumes moved through its "well-established primary" transport route through Russia to the Port of St. Petersburg "without any disruptions or logistical/insurance-related issues," the route nevertheless "presents a specific set of risks" involving "shipping insurance, and the delivery of cargo by sea vessels." As such, the company reiterated what its Inkai

joint-venture partner Cameco said last week, that the two producers are continuing to work together to secure an alternative route from Kazakhstan to Europe via the Caspian Sea.

And it was touch and go last month after Canada imposed sanctions threatened the Canadian-domiciled CISN Shipping Group, the parent company of Atlantic Project II owner Atlantic Ro-Ro Carriers, from using the port. Energy Intelligence understands that the Canadian government has since clarified that the sanctions would not extend to the transport of non-Russian-origin nuclear materials. For nuclear material that is Russian-origin, the government granted a one-year exemption to the sanctions.

To secure a trans-Caspian route to Cameco and other customers, which has been successfully used, "Kazatomprom has sought to reinforce a number of transit agreements with the pertinent authorities" along the route. Kazatomprom said it has received "approval to ship 3,500 tons of uranium and has applied for an increase in order to accommodate potential total shipments by Kazatomprom and its joint venture partners in excess of that quota."

Further down the front-end fuel cycle, US-based Centrus Energy in an Aug. 4 earnings update reported more than \$135 million in new separative work units (SWU) and uranium sales contracts and commitments in 2022 for deliveries "from 2022 through 2026." As of Jun. 30, Centrus estimates the value of its long-term order book at \$1 billion, on par with the prior year. Centrus has in recent years operated as a SWU and occasional UF6 trader and has long-term supply contracts for SWU with Russia's Tenex and France's Orano.

Centrus also noted it is meeting "all milestones" in its demonstration project to produce high-assay low-enriched uranium (Haleu) under a cost-share agreement with the US Department of Energy at the Portsmouth enrichment plant in Piketon, Ohio. "Subject to the availability of funding by the government and/or other financing, Centrus could scale up the Piketon facility to accommodate whatever level of HALEU production is required," the company said.

Jessica Sondgeroth, Washington

## URANIUM PRICE PANEL

For the week ended August 4, 2022

	Weekly Spot Market Prices													
	Chg.	Aug 4	Aug 28	Jul 21	Jul 14	Jul 7	Jun 30	Jun 23	Jun 16	Jun 9	Jun 3	May 26	May 19	May 12
Price (\$/lb U3O8)	-1.01	47.84	48.85	46.03	46.04	47.53	50.00	47.13	47.39	52.25	49.40	46.67	47.14	50.41
Total Assessments	-1.00	8.00	9.00	10.00	9.00	10.00	10.00	10.00	11.00	10.00	10.00	12.00	10.00	9.00
% within 1 StDev	19.44	75.00	55.56	80.00	55.56	70.00	60.00	90.00	72.73	70.00	40.00	75.00	80.00	77.78
Low (\$/lb U3O8)	-1.00	47.50	48.50	45.75	45.50	47.00	49.25	47.00	46.60	51.70	49.00	46.00	47.00	49.00
High (\$/lb U3O8)	-1.00	48.25	49.25	46.25	46.75	48.50	50.75	47.50	48.50	52.50	50.15	47.50	47.50	52.00
Variability*	0.00	0.00	0.00	0.00	0.31	0.50	0.16	0.06	0.09	0.40	0.32	0.05	0.00	0.28

\*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.

## TURKEY

# Rosatom Swaps Out Main Turkish Partner at Akkuyu

Rosatom's decision last week to sever its contract with the largest Turkish contractor at its four-unit Akkuyu newbuild on Turkey's Mediterranean coast prompted howls of outrage across the Turkish nuclear industry. But while Ankara has promised to "resolve the conflict" between Rosatom's Turkish nuclear developer, Akkuyu Nuclear, and Turkey's IC Ictas Insaat Sanayi, few expect Moscow to back down.

Local content has long been a key goal of Ankara's push for a nuclear power program, but not to the extent of compromising Akkuyu's schedule: President Recep Tayyip Erdogan is focused on commissioning Turkey's first power reactor in 2023, the centenary of the Turkish Republic. This focus is likely only heightened by the fact that Erdogan faces presidential elections next summer in the midst of unprecedented economic and geopolitical upheaval.

"Our main aim is to commission the first reactor in 2023, in line with the project schedule, with the supervision and approval of the Nuclear Regulatory Authority, with reference to international standards," Turkey's Ministry of Energy and Natural Resources said in an Aug. 2 statement. Noting "conflicts" between Akkuyu Nuclear, the Rosatom subsidiary that plans to own and operate the VVER-1200s and its primary Turkish contractor, the ministry said its priority "is that there is no grievance against all contractors and employees who have been serving in the construction field since the beginning of the project and that the project is put into use on time."

This was prompted by Akkuyu Nuclear's announcement last weekend of a change in contractor, couched in innocuous language. Given that work at Akkuyu has "entered a new stage" — with all four units now formally under construction — the project's management "has decided to reassign construction tasks accordingly" and now "ends its work" with IC Ictas. That private construction firm, one of Turkey's largest and closely tied to Erdogan, had in 2019 formed a 50-50 joint venture with Russia's Titan-2, a subsidiary of Rosatom domestic operator Rosenergoatom since 2017. Shortly after that the Titan2 IC Ictas Insaat JV won the lead engineering, procurement and construction (EPC) role at Akkuyu in 2019, under general contractor Atomstroyexport, and oversaw construction till as recently as the first nuclear concrete pour at Unit 4 on Jul. 21.

Rosatom is building Akkuyu under a build-own-operate model unlike any of its other foreign newbuilds, and despite many attempts failed to sell down a minority stake of up to 49%. This means that the project remained almost entirely controlled by Rosatom subsidiaries: owner Akkuyu Nuclear, general contractor Atomstroyexport and then Titan-2.

## Backlash

The Akkuyu announcement provoked a furious statement from IC Ictas, which called the Jul. 26 termination "unfair and unlawful" and said the JV "was ordered to stop all works within the scope of the project immediately" despite the fact that top officials had praised project progress only five days earlier. "Since our participation in the project as a joint venture partner, we have devoted all the managerial, technical and financial capacity of our company to this project and have achieved a significant performance level appreciated by all parties," IC Ictas said in a Jul. 29 statement pointing to the 25,000 Turkish personnel employed on site.

But while the JV may be out, Akkuyu Nuclear said in a statement to Energy Intelligence that it has a new contract with "TSM Enerji Insaat Sanayi Limited Sirketi (TSM), a company registered in the Republic of Turkey," and that "TSM and subcontractors involved in the project will sign contracts similar to those" with Titan2 IC Ictas Insaat. Akkuyu Nuclear revealed nothing about TSM Enerji, but local reports found that it was registered in 2019 with three apparently Russian shareholders: Montajno-Stroitelnoye Upravleniye, Sosnobovorel Elektromontaj and Titan-2.

"By attempting to terminate the largest single-item investment contract in the history of the Republic," Akkuyu Nuclear "creates the result of eliminating the Turkish stakeholder in the project and takes steps to appoint another fully Russian company as the project's general contractor," railed IC Ictas in its statement. "It is clear that the main purpose of the said termination initiative is to reduce the presence of Turkish companies in the management of the project and to reduce them to the subcontracting level."

Akkuyu Nuclear CEO Anastasia Zoteeva insists that it is "successfully implementing the localization roadmap developed for the project. The target level of localization is estimated at US\$6.5 billion, of which about US\$3.2 billion worth of orders have already been placed with Turkish companies."

And this may be enough for the Turkish government, particularly given its prioritization of the 2023 Unit 1 commissioning target. One Turkish industry source pointed out that the contractual shakeup came at the same time as unconfirmed reports that Russian President Vladimir Putin had agreed to unlock \$15 billion in financing for Akkuyu when he met with Erdogan during negotiations over a deal with Ukraine on safely conducted grain shipments.

That money will enable an increased pace at Akkuyu, and if Rosatom wants Russian firms to absorb more of that money, that may simply be its price of admission, and the Turkish government is unlikely to be able to push back.

*Phil Chaffee, London*

## UKRAINE

# Zaporozhye Referendum Raises Stakes at Nuclear Plant

Russia's announced plans to pursue a referendum to secure support for its ultimate control of the Zaporozhye region is complicating the issue of a visit by International Atomic Energy Agency (IAEA) inspectors to the region's nuclear power plant, which has been under Russian control since early March. Activity at the plant is obscured by the fog of war, but multiple media reports alongside Ukrainian statements portray a plant not only under siege but one that has become a *de facto* military base, with growing amounts of military hardware.

The situation was underscored by diplomatic skirmishing Friday morning, Aug. 5, at the nuclear Non-Proliferation Treaty Review Conference (RevCon) that began this week in New York. Russian and Ukrainian delegates accused each other of shelling at or near the plant, with the Russian delegate saying fire had broken out at the plant, and both agreeing that a transmission line into the plant had been compromised.

"While this war rages on, inaction is unconscionable," IAEA Director General Rafael Grossi said in an Aug. 1 statement to the RevCon. Grossi spoke only hours after the *New York Times* published an on-the-ground article from the nearby Ukrainian-controlled village of Nikopol reporting that local residents are fleeing because of both Russian shelling from the nuclear power plant and the threat of a radiological disaster. "If an accident occurs" at Zaporozhye "we will not have a natural disaster to blame," said Grossi. "We will have only ourselves to answer to." Grossi added that "the people of" Zaporozhye and "people far" from the plant "are relying on all of us to prevent war from causing a nuclear tragedy that would compound the catastrophe already befalling Ukraine and causing hunger and insecurity beyond its borders."

Grossi believes that an IAEA mission of safety and security experts, alongside safeguards inspectors, would help de-escalate the situation. But "our vital mission has not been made possible," said Grossi, who has so far failed to secure a firm invitation from Kyiv, despite maintaining that the Ukraine government has requested the mission "at the highest levels." The first evidence of such high-level support emerged this week in an Aug. 3 tweet from Andriy Yermak, head of President Volodymyr Zelensky's office. "IAEA experts should visit the station ASAP," he wrote. "The Russian invaders must remove military equipment and ammunition depots from the NPP territory. In the hands of Russian madmen, Europe's largest nuclear energy site has turned into the biggest nuclear threat."

Indeed, experts at the Washington-based Institute for the Study of War concluded in an Aug. 3 report that "Russian forces based around the NPP have attacked Ukrainian positions in Nikopol and

elsewhere in recent weeks, intentionally putting Ukraine in a difficult position—either Ukraine returns fire, risking international condemnation and a nuclear incident (which Ukrainian forces are unlikely to do), or Ukrainian forces allow Russian forces to continue firing on Ukrainian positions from an effective 'safe zone'."

Russia denies this, and in a Jul. 29 letter to the IAEA asserted that there is "no Russian military equipment on the territory" of the Zaporozhye plant. The Russian contention is that the risk at Zaporozhye instead comes from Ukraine. "We welcome in every possible way that the head of the IAEA is going to visit Europe's largest nuclear power plant," Balitsky Evgeny, the local Ukrainian politician who has embraced the Russian occupation and was reportedly appointed governor of the Zaporozhye region in May, said in an Aug. 3 Telegram post. "We are ready to show how the Russian military guards it today, and how Ukraine, which receives weapons from the West, uses these weapons, including drones, to attack the nuclear plant, acting like a monkey with a grenade."

Despite such provocative language, and the enormous risks of a radiological disaster at Zaporozhye, some in the Ukrainian government remain resistant to an IAEA mission while Russian troops occupy Zaporozhye. "We know that the Russians pushed" the IAEA "to come," Energy Minister German Galushchenko said in an interview with *Politico* published Aug. 2. "They want them to come and then the IAEA would say: 'Oh, everything is OK, the nuclear material is OK, radiation is OK, Russians are perfect guys'." Galushchenko was clear that Ukraine "will never accept this" because "that's a legitimization of the Russian occupation of the station."

## Legitimizing a Safeguards Breach?

Others have argued that an IAEA mission would also legitimize a breach of the IAEA safeguards system. Given that the IAEA has authority to inspect Zaporozhye under its 1998 comprehensive safeguards agreement with Ukraine, a visit to the plant authorized and enabled by Moscow would undermine that bilateral agreement, argue Victor Gilinsky, a former US Nuclear Regulatory Commissioner, and Henry Sokolski, executive director of the Nonproliferation Policy Education Center, based in Arlington, Virginia.

"The Russians, who have taken plant by force, are now effectively telling the IAEA, 'If you want access to the site, you have to forget about your agreement with Ukraine and come to us for permission, and thereby acknowledge that this is now a Russian plant'," Gilinsky and Sokolski wrote in a Jul. 28 article in the *Bulletin of the Atomic Scientists*. "The member countries of the IAEA face a decision: Which is more important, IAEA inspector access to the Zaporizhzhia site, or upholding the IAEA's international system of safeguards by honoring the IAEA's agreement with Ukraine and refusing Russian terms for access?"

And yet while few envisioned the current scenario, there is potentially room in Ukraine's 1998 safeguards agreement to

justify an IAEA mission to a Russian-controlled facility. “In the event of Ukraine concluding that any unusual circumstances require extended limitations on access by the Agency,” Article 76(d) of the agreement reads, “Ukraine and the Agency shall promptly make arrangements with a view to enabling the Agency to discharge its safeguards responsibilities in the light of these limitations.” With that said, the IAEA has not been able to visit nuclear facilities covered by the agreement in areas of Ukraine controlled by Russia since 2014.

Even if the IAEA and Kyiv cobble together a legal justification for such arrangements under the safeguards agreement, few doubt that Moscow would use the optics of a visit to legitimize Russian control. Moscow will “insist that inspectors come through Russian-held territory, with Russian passport checks, to demonstrate the legitimacy of Russian control,” argued Gilinsky and Sokolski.

These worries have only grown after Zaporozhye region Governor Evgeny announced last month that a referendum on Zaporozhye joining the Russian Federation would be held “in the fall” — presumably alongside similar referenda planned in other regions of Russian-occupied eastern Ukraine. Gilinsky and Sokolski worry that such a referendum, in combination with a legitimizing IAEA visit to Zaporozhye, would set the stage for Moscow to end all further IAEA missions, given that its weapons-state status precludes mandatory safeguards inspections. Ukrainian nuclear operator Energoatom, meanwhile, worries that the referendum would lay the groundwork for Russia expropriating Ukraine’s largest power generation plant.

For its part, Rosatom didn’t directly respond to an Energy Intelligence question as to who it considers the owner of the Zaporozhye plant, but in a statement it did “categorically deny any involvement of Rosatom or any of its employees in the management or operations of the plant at any level.” The Rosatom employees at the plant “are present on the site to ensure the safety of Zaporozhskaya nuclear power plant by offering technical, consulting, communications and other assistance to the operator if required.” Zaporozhye “is controlled solely by the Ukrainian operator.”

Rosatom said nothing about what might shift following the referendum. But the referendum may be weeks rather than months away, and it’s not clear how or if the IAEA can square the circle and arrange a visit to Zaporozhye with Kyiv’s signoff and without playing into Moscow’s propaganda. Such a visit “requires the understanding and the cooperation of a number of actors,” Grossi said in an Aug. 2 press conference. “It’s a Ukrainian facility, so it requires Ukraine to agree with it, to be comfortable with it, and to help me carry out the mission. At the same time, the plant is occupied by Russia. I have to talk to everybody, and especially those who are in control of the place.”

*Phil Chaffee, London*

## IRAN

# Another JCPOA Push as NPT RevCon Convenes in New York

Renewed efforts to revive the Iran nuclear talks once again are under way in Vienna — and while the outcome remains far from certain, the effort could provide supportive context for the 10th Non-Proliferation Treaty (NPT) Review Conference (RevCon), which began this week in New York.

Held once every five years to reaffirm support for the NPT, the conference was originally slated for 2020, the 50th anniversary of the treaty taking force, but was delayed by Covid-19. The 2015 Joint Comprehensive Plan of Action (JCPOA) is widely regarded as an extraordinary accomplishment in the world of nuclear nonproliferation diplomacy — China’s representative to the RevCon called it a “unique achievement of multilateral diplomacy with proven effectiveness and viability” — and rehabilitating the agreement even at this late hour would certainly improve the mood music in New York. RevCon delegates are otherwise focused on everything from Ukraine to nuclear arsenal expansion programs and the failure of weapons states to live up to their NPT disarmament promises, and a UK-US initiative to share nuclear propulsion technology with Australia’s military submarine program.

The talks to revive the JCPOA kicked off Thursday in Vienna on short notice after a renewed push announced over the weekend by EU foreign policy chief Josep Borrell, who has led the EU’s mediation of the indirect talks. On Monday, the head of the Atomic Energy Organization of Iran, Mohammad Eslami, told the Fars news agency that Iran has the “technical ability to build an atomic bomb, but such a program is not on [the] agenda.” But efforts to rescue the JCPOA have long been on a roller coaster and where or when the ride finally ends seems impossible to know.

Earlier this year, after months of negotiations, the US and Iran appeared to be closing in on an agreement to revive the JCPOA. However, it subsequently became clear that the two sides — which negotiate indirectly through other members to the deal — remained divided over several critical issues, causing the earlier sense of optimism to evaporate. In June, another round of talks resumed in Doha, Qatar — more than three months after they were suspended — following a trip to Tehran by Borrell. But the negotiations ended without progress or guidance on when they might resume.

This week’s round of talks follows a commentary published at the weekend by Borrell in which he stated that he had “put on the table a text that addresses, in precise detail, the sanctions lifting as well as the nuclear steps needed to restore the JCPOA.”

Iranian officials’ public response to the initiative was positive, while Washington moved to blacklist several companies for allegedly facilitating exports of Iranian petrochemicals to Asia,

including firms based in China. Both sides were publicly skeptical heading into arms-length discussions.

Iran has also made clear that it believes the ball to be firmly in the US' court given its withdrawal from the JCPOA in May 2018 under the Trump administration: "The US must seize the opportunity offered by the JCPOA partners' generosity; ball is in their court to show maturity & act responsibly," Ali Bagheri Kani, who leads the Iranian negotiating team, said on Twitter Thursday.

US Special Representative for Iran Rob Malley, also on Twitter, cautioned that Washington's expectations on the talks "are in check."

## Grandstanding in New York?

At the very least, however, none of the key JCPOA participants missed the opportunity to push their views on the matter in New York, with Russia calling on the "nuclear powers" to "behave with restraint and responsibility," and saying it hoped that the US and Iran "will bring things back to normal and ensure full implementation of the JCPOA," without which the previous transparency of the Iranian nuclear program is "unlikely."

China called on all parties to the negotiations to "reject the practices of pressuring with sanctions and threat of force" and demanded that the US "completely lift its relevant illegal sanctions on Iran and long-arm jurisdiction measures on third parties" as a basis for Iran's return to "full compliance."

In his opening statement to the RevCon, US Secretary of State Antony Blinken said, "Iran remains on a path of nuclear escalation," adding that while "it publicly claims to favor return to mutual compliance" with the JCPOA, since March, "Iran has been either unwilling or unable to accept a deal to achieve precisely that goal."

Tehran's ambassador to the UN, Majid Takht-Ravanchi, on Thursday told the RevCon that the main obstacle to the revival of the JCPOA is Washington's failure to give assurances that Iran will fully enjoy the economic benefits of the accord. Iran officials have said they want sanctions relief to be "verifiable" since the outset of the talks.

## The Sanctions Gridlock

Whether Washington and Tehran can ease the gridlock over sanctions is the big question. That includes Tehran's demand for the US to revoke the Trump administration's 2019 designation of Iran's Revolutionary Guard as a foreign terrorist organization. US officials have repeatedly said they will only remove nuclear-related sanctions — a bar the foreign terrorist designation does not appear to clear. Iran reportedly later suggested a halfway measure of sorts of removing sanctions against the guard-controlled construction and engineering firm Khatem al-Anbiya. But some sanctions targeting that organization predate nuclear-related restrictions.

Meanwhile, there is the question of how Iran could or would walk back the progress it's made in its nuclear program since the original pact was struck.

"The Iran of 2022 — the nuclear program — is very different from the one in 2015," Rafael Grossi, director general of the International Atomic Energy Agency, said at a UN press conference Tuesday. "And I know for a fact that in the attempts to revive this agreement, this is being taken into consideration. Because precisely of what I said: there are more facilities, there are new technologies and there are a number of new elements and factors to be taken into consideration."

Another is that the original deal contained several "sunset" clauses, with certain restrictions on enrichment due to expire after 2025 and others after 2030. Those draw nearer the longer talks are stalemated, unless the parties agree to some form of extension.

*Oliver Klaus, Dubai, Stephanie Cooke and Emily Meredith, Washington*

## NUCLEAR FUEL

# Call for Congressional Clarity on DOE Depleted UF6 Sales

A government watchdog report has recommended Congress act to clarify the US Department of Energy's (DOE) authority to sell government inventories of depleted nuclear fuel to a private company. The DOE has long maintained it has such authority, but the report sheds light on how little clarity Congress has provided — specifically on that issue — but also on other aspects of efforts by the legislative branch to bolster the nation's domestic nuclear fuel industry.

The report calls into question DOE's 2016 agreement to sell 24,000 cylinders of its depleted UF6 to Global Laser Enrichment (GLE) for use in its Silex laser enrichment technology. US-based GLE, a joint venture between Canadian uranium miner Cameco and Australia's Silex Systems, is preparing to license and demonstrate its Australian technology for tails re-enrichment in Paducah, Kentucky. GLE wants to re-enrich the depleted UF6 to produce natural-grade uranium as UF6 at an annual rate of around 2,000 metric tons UF6 per year (approximately 5.2 million pounds of U3O8 equivalent).

But in its Jul. 27 report the US Government Accountability Office (GAO) recommends that Congress clarify DOE's legal authority to sell depleted UF6 and specify "the conditions for sales" of depleted UF6, "such as requiring that DOE conduct a market impact study" to ensure that the sales, like that "of other types of uranium in the government's inventory, do not adversely affect the uranium industry." The GAO has been at odds with DOE since 2008 over the interpretation of DOE's legal authority to sell depleted UF6 to a private company.

Following an initial 2016 agreement with DOE's Office of Environmental Management (EM), GLE and the EM in 2020 signed an amended agreement for the purchase of depleted tails material, including the condition that GLE starts commercial operations before the end of 2030.

GLE told GAO officials that it has been evaluating how it could help fill US nuclear energy industry needs for low-enriched uranium and conversion services, particularly in light of concerns about US reliance on Russian nuclear fuel supply, according to the report. Indeed, even as more hawkish members of Congress, such as Wyoming Republican Sen. John Barrasso, call for a ban on Russian nuclear fuel imports, the topic of weaning the US nuclear fleet off Russian supply is increasingly aired in Congressional energy and security hearings. Yet there is little to no direction from Congress on how the industry should prepare itself, or even what a domestic nuclear fuel industry should look like, including what role companies and technologies from allied nations, such as Australia, France and Germany, should play in providing secure supply to the US fleet.

But for Barrasso, ranking member of the Senate Energy and Natural Resources Committee, bolstering domestic uranium mining in his state has long been a priority. And GLE's Silex foreign-owned re-enrichment plant would compete with domestic uranium mines — including recently planned restarts and first production — and Honeywell's conversion plant in Illinois, the sole domestic UF6 plant, scheduled to return to operations in early 2023. In 2018 Barrasso was key to securing funding for the cleanup of the Portsmouth, Ohio, gaseous diffusion enrichment site, thereby allowing the DOE to cancel a longstanding uranium bartering program that interfered with the uranium market. He even held up key DOE nominations to ensure the bartering ended.

## Different Interpretations

In arguing its position, the GAO report cites the 1996 USEC Privatization Act, which governs the disposition of DOE-owned uranium, saying that the "DOE may not sell 'any' uranium except as consistent with its [the Act's] provisions." And while the legislation "specifies the conditions for DOE's sale or transfer of a number of certain types of uranium — including ensuring that certain transactions do not have an adverse material impact on the domestic uranium industry — it does not specify conditions for the sale or transfer of depleted uranium, including [depleted] UF6."

EM and GLE, meanwhile, maintain that under both the Department of Energy Organization Act and the Atomic Energy Act of 1954, as amended, EM has the authority "to enter into agreements and to sell, transfer, exchange, store, and accept special nuclear, source, and by-product material."

GLE CEO Michael Goldsworthy told Energy Intelligence that EM's interpretation of its authority has been upheld "by the Bush, Obama, Trump and Biden administrations" and that the

"agreement executed between the DOE and GLE in 2016 for the sale/purchase of depleted tails resulted from a competitive tender process and represents a very positive financial and logistical outcome for the DOE."

Indeed, GAO concludes in its recent report that because EM has three agreements (two with another DOE office and one with GLE) that might allow it to transfer up to 30,000 cylinders, including 24,000 cylinders to GLE — "EM would reduce the amount of [depleted] UF6 it would have to convert."

And the sale of those 30,000 cylinders could facilitate a far speedier cleanup (up to 30 years of operations) of two former uranium enrichment sites (Portsmouth, and Paducah, in Kentucky) for which EM is responsible — and save more than \$2 billion in operating costs, the GAO report concluded. That activity involves the conversion of depleted UF6 — a highly corrosive byproduct of the enrichment process that can be dangerous to human health and the environment — into a more stable chemical form of depleted uranium that can be disposed of or reused.

As part of a directive from the former Trump administration, Congress in late 2020 appropriated \$75 million for fiscal 2021 to procure domestic uranium and conversion services. That procurement is currently underway. The Biden administration, meanwhile, has been largely focused on ongoing efforts to secure high-assay low-enriched uranium (Haleu) for a planned advanced reactor program, with two demonstrations expected by the end of 2027.

So far, the DOE and Congress have largely devoted their attention and appropriations to advanced reactor needs and very little to building a more robust domestic nuclear fuel supply chain for the existing fleet. And Russian nuclear fuel supply remains capped at about 20% of US demand under the Russian Suspension Agreement amended in 2020.

*Jessica Sondgeroth, Washington*

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## NEWBUILD

# NRC Moves to Certify First SMR, NuScale's 50 MW Design

Two years after it issued a final safety evaluation report for NuScale's 50 MW small modular reactor (SMR), the US Nuclear Regulatory Commission (NRC) has announced it is in the process of finalizing that approval into a formal design certification. NuScale hopes the design certification will help accelerate a subsequent review of its 77 MW design, currently planned for its prospective first-of-a-kind plant in Idaho, and it's opted for a less rigorous review procedure than the process used for the 50 MW design. Some safety experts question that choice given the size of the

uprate and unresolved safety concerns about the SMR's steam generator, and it's unclear how much, if any, difference it will make to the review timetable.

Within the US, NuScale is furthest along in the licensing process for advanced reactor technologies, and it hasn't been shy about advertising the fact in the buildup to going public, but it's got further hills to climb before the planned plant could actually operate. NuScale's goal is to have a first-of-a-kind module up and running in 2029, with subsequent modules generating power the following year. The project's primary developer, the Utah Associated Municipal Power Systems (Uamps), has struggled to keep its member utilities aboard and while it seems to be notionally working toward a six-module, 462 MW facility, it is still evaluating how big the plant will be.

NuScale's plans to apply for a standard design approval (SDA) for its 77 MW version would avoid the need for a time-consuming safety analysis report or environmental report that were part of the 50 MW design certification process, but a combined license to build and operate a plant, to be filed by Uamps, would also still be needed for the plant to generate power. NuScale plans to submit its SDA application for the 77 MW uprate in December. The SDA review is expected to take roughly 42 months to get to the final safety evaluation, according to the NRC's generic timetable, but it's unclear how long after that it would take for the process to be complete. The safety evaluation milestone was achieved in roughly three years for the 50 MW design certification application, submitted on Dec. 31, 2016, but it's taken another two years to make it final.

Meanwhile, even as Congress grows increasingly supportive of advanced reactor deployment, the Senate Appropriations Committee in an Energy and Water Development fiscal 2023 appropriations bill instructs the DOE to provide more "regular updates prior to any proposed contractual and engineering design changes for currently funded advanced reactor projects." Congress approved \$115 million for the NuScale/Uamps project in fiscal 2021 in addition to more than \$515 million in cost-shared funding already approved. The DOE also agreed to a multiyear cost-share award for up to \$1.355 billion in project funding, subject to appropriations.

In a June meeting of the NRC's independent Advisory Committee on Reactor Safeguards (ACRS), NuScale indicated that the onus would be on the NRC to keep the ball rolling on its SDA application for the 77 MW module. NuScale Licensing Manager Mark Shaver told a Jun. 22 ACRS subcommittee that while the SDA is a "stand-alone" application, there are "substantial portions of it that have not changed, so we would expect the NRC to be able to leverage — in their review, using a risk-informed review — leverage that information and focus on more of the design changes rather than things that haven't changed."

Safety advisory committee Chair Joy Rempe questioned whether a design certification process would be a more appropriate vehicle

for review given some of the design optimizations. "It just seems like some of the changes in your optimization and new design might be reasonable and important to consider" for "the DCA process," Rempe said.

"I'm skeptical that a 50 percent increase in the module power will not have significant impacts on many of the safety analyses, so I think there is a lot of work ahead," Union of Concerned Scientists' Nuclear Power Safety Director Ed Lyman told Energy Intelligence. "NuScale's safety case is based on the performance of passive systems. If the power density of the reactor increases without making changes to the safety systems — as I believe NuScale is proposing — then safety margins will decrease. Also, the radioactive source term per module will increase, reducing the safety margin to dose limits."

## Not the First Uprate

In a bid to lower costs, NuScale has steadily increased the original 50 MW design capacity, first to 60 MW in 2018, and then later to 77 MW. In 2020, NuScale touted a 720 MW plant consisting of 12 modules of 60 MW each at an estimated cost of \$6.1 billion. But faced with a declining number of committed offtakers, the company looked to decrease that overall price tag by uprating to 77 MW, and it came up with an estimate of \$5.3 billion for a 462 MW plant consisting of six modules. But experts say that even with this configuration it won't be possible to deliver electricity at a levelized cost of \$55 per megawatt hour, to which NuScale committed in a January 2021 agreement with Uamps. Under the agreement, anything above that cost would have to be reimbursed to Uamps.

Part of the problem is that NuScale is advancing some design principles that have not been demonstrated. That became apparent when the NRC in May 2020 determined it could not "sufficiently validate" the SMR's steam generator design. That issue will have to be addressed both in the upcoming SDA application for the 77 MW uprate, and in a subsequent combined operating license application.

NuScale's design involves a helical steam generator comprising tubes in a spiral configuration, but the NRC's safety advisory committee identified the alloy 690TT tubing material as subject to accelerated wear. Unlike in conventional large reactors, NuScale's steam generator is housed in the same pressurized vessel as the reactor core, and cooled water is pulled to the bottom and drawn through the core for cooling. But the advisory committee found that the steam generator design has not yet been "sufficiently validated because of uncertainties associated with unstable density wave oscillations."

Part of NuScale's incentive for the uprate was economic, but those considerations have to be made without compromising safety. "So really what we found was that the steam generator specifically was very underutilized. There was a lot of margin in the steam generator," Shaver said in the June advisory meeting.

“Also, the fuel was underutilized. So those two things really drove looking at the power uprate and how much power we could get out of the existing steam generator and fuel.” Shaver added that in an effort to conserve water, Uamps requested a modification to enable the SMR to use an air-cooled system rather than water-based cooling.

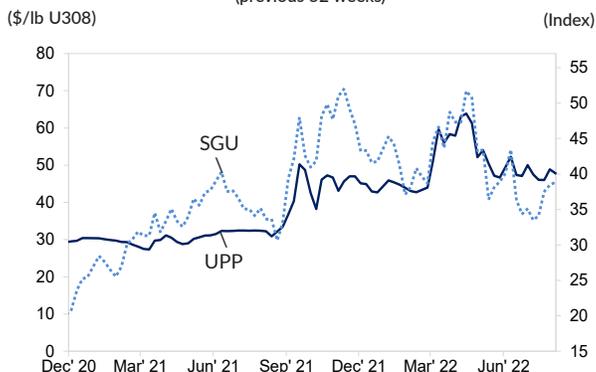
“The DCA design was a new and novel design,” Shaver said. “The first time, we had gone through a lot of the analyses, and we went through both to optimize it from an economics perspective as much as we could without impacting safety, as well as to implement some design changes that our first customer was requesting.”

*Jessica Sondgeroth and Stephanie Cooke, Washington*

# URANIUM MARKET UPDATE

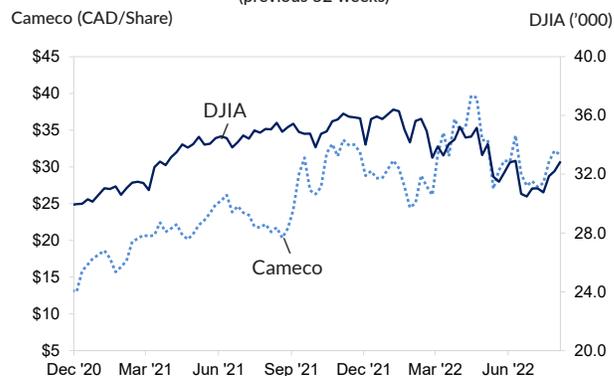
All prices as of Thursday, August 4, 2022

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



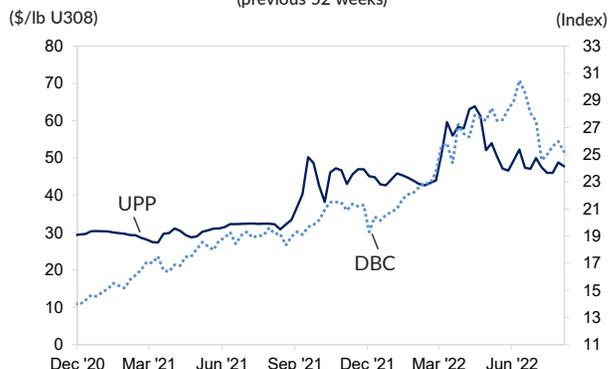
The Solactive Global Uranium Total Return Index, created by Structured Solutions AG, tracks the price movements in shares of companies active in the uranium mining industry. Calculated as a total return index and published in US\$, its composition is ordinarily adjusted twice a year.

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



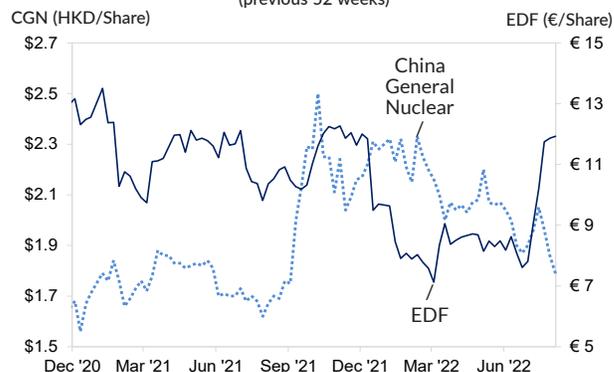
Canadian uranium miner Cameco's stock is valued in Canadian dollars compared with the US dollar on the Dow Jones Industrial Average (DJIA). Roughly two-thirds of DJIA's 30 component companies are manufacturers of industrial and consumer goods. The others represent industries ranging from financial services 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				
		Jul	Jun	May	Apr	Mar	Feb	Jan	Dec	Nov	Oct	Sep	Aug
<b>Uranium (\$/lb U308)</b>													
Low	-	45.50	45.50	46.00	52.50	51.00	42.50	43.00	42.00	43.00	36.00	36.00	32.20
High	-2.00	50.50	52.50	54.00	64.00	60.00	44.50	46.50	47.00	47.50	48.00	51.00	36.00
<b>Conversion (\$/kgU)</b>													
Low	+2.00	32.00	30.00	30.00	28.00	26.00	16.00	16.00	16.00	15.00	16.00	19.00	19.00
High	+4.00	37.00	33.00	33.00	30.00	28.00	17.00	17.00	17.00	18.00	19.00	21.00	21.00
<b>Enrichment (\$/SWU)</b>													
Low	+5.50	89.50	84.00	84.00	82.00	100.00	59.00	57.00	56.00	56.00	55.50	55.50	54.00
High	-55.00	95.00	150.00	150.00	150.00	150.00	61.00	59.00	57.00	57.00	57.50	57.50	56.00

NIW monthly UF<sub>6</sub>, 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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