

NUCLEAR INTELLIGENCE WEEKLY®

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WEEKLY ROUNDUP

Germany Extends Three Reactors Through April

- Germany's coalition government this week moved forward with plans to allow not just two — but three — power reactors to operate until next Apr. 15. On Thursday the cabinet amended the Atomic Energy Act to allow this. The policy shift represents a victory for the pro-business Free Democrats and for reactor operators who argued that the original idea of putting at least two reactors — E.On's Isar-2 and EnBW's Neckarwestheim-2 — on "cold reserve" during the same period next year didn't provide enough certainty. The decision was also welcomed by RWE whose Emsland reactor in the northwest will now be allowed further operation as well. Finance Minister Christian Lindner, who had pushed for the unit's continued operation, called the decision on Emsland, to which the Greens finally agreed, "a clear signal" both to Germany and to Europe "that we really do everything in our power to eliminate shortages in the electricity market." But after Apr. 15, "it's over," said Federal Minister for Economic Affairs and Climate Protection Robert Habeck in an official statement Oct. 19, referring to the legally mandated phaseout. Next winter "we will be able to import significantly more gas" and "the power grids will be strengthened."

- Russia and Ukraine are trading accusations of each other planning to blow up the Kakhovka hydro-electric dam on the Dnipro River, a step that would unleash a devastating flood across a large area of southern Ukraine and, according to Energoatom, "lead to a nuclear disaster" by disrupting cooling at the Russian-controlled Zaporizhzhia nuclear power plant (ZNPP). Ukraine has meanwhile repaired its last remaining operating 750 kilovolt power line at the plant, which was lost for the third time in 10 days, according to the latest International Atomic Energy Agency (IAEA) update on the plant's situation Oct. 18. Back-up power restored late last week means the plant is no longer reliant on diesel generators in the event of further losses but the "power situation remains fragile," said IAEA Director General Rafael Grossi. Grossi expressed "deep concern" about the "recent detentions of two other ZNPP staff members," after the release of the plant's deputy director general, Valeriy Martynyuk, who was detained early last week. That follows the detention and eventual release earlier in October of ZNPP Director-General Ihor Murashov.

- France's behemoth nuclear power producer has "reached a preliminary wage deal with unions," according to an Oct. 21 report from Bloomberg. The preliminary compromise, which is still subject to union consultation with plant workers next week, follows more than a week of labor strikes that have impacted about one-third of EDF's fleet at a time when nearly half its reactors are down for checks and repairs on stress corrosion anomalies found on crucial piping. EDF's struggles to accelerate the restart of the reactors come as the continent grapples with a major energy crisis ahead of winter and in the wake of Russia's invasion of Ukraine. EDF pledged to restart 28 of its 56 reactors currently off line over the next few months, but the French power system operator RTE last month discounted the claim and placed the French power system under "reinforced monitoring" over the high-demand winter.

Market Points

Orano's Philippe Coste conversion plant is experiencing a technical problem that has affected production since at least the summer.

Aggressive bids from a trader drove the uranium price 5% higher to \$52/lb. U3O8 on Oct. 20, according to Energy Intelligence's Uranium Price Panel.

Operational issues at the Inkai joint venture have delayed a shipment using a new route from Kazakhstan through the Caspian Sea.

UPP: \$52.00/LB U3O8



NUCLEAR FUEL MARKET

Orano's UF6 Problem Strains Supply

France's Orano has been experiencing a technical problem at its Tricastin conversion facility in southern France that is impacting UF6 production, sources have confirmed to Energy Intelligence. The problem threatens to exacerbate the already-tight availability of UF6 in the front-end nuclear fuel market.

Few details were made available about the nature of the problem at Orano's Philippe Coste conversion plant (otherwise known as Comurhex II), but Energy Intelligence understands that it has been ongoing since at least the summer and could be resolved by year's end with the replacement of certain components. An Orano spokesperson only responded to a request for comment with: "Like any plants, we have periodic maintenance shutdowns where we carry out modifications or equipment changes."

The Philippe Coste facility is already behind on its 15,000 tU ramp-up previously anticipated for near-completion this year. Orano produced 8,600 tons UF6 in 2021 and had planned to produce between 11,000 tU-13,000 tU this year, but with its latest technical challenge, the target is unlikely to be met.

One source indicated that Orano has been aggressively procuring more UF6, possibly to replace lost production at the site. In its second-quarter report, Cameco said it agreed to lend Orano up to 1,150 tU of conversion supply in addition to 1.2 million pounds of U3O8 from 2022-24, with U3O8 repaid in kind by the end of 2027 and UF6 repaid in kind by the end of 2035.

Complicating matters, US lawmakers are pushing a bipartisan ban on Russian nuclear fuel supplies beginning in 2025 that is expected to go to a vote after the November mid-term elections. Energy Intelligence understands that Western enrichers — Orano and European consortium Urenco — could offset Russian supply by the time such a ban would take effect if they make a full switch to overfeeding. Urenco is understood to be at about 60% of the switch to full overfeeding. But getting to 100% requires more UF6 (and utilities adjusting the tails assays higher on their contracts) meaning that all Western conversion capacity on line and coming on line produces at full throttle.

Continued operational issues at Orano could put a wrench in plans to cut off Russian supply in that time frame. And even while US and European utilities seek to rush deliveries of Russian nuclear fuel, including UF6, that capacity is limited. Not to mention, the vast majority of nuclear operators in OECD countries have stopped procuring new contracts for Russian material since Russia's invasion of Ukraine in late February.

Conversion capacity in the West is already constrained to Cameco's Port Hope facility in Canada. Port Hope is operating near full annual capacity of 12,500 tU. And Honeywell's Metropolis plant, which will return to production next year, is expected to squeeze out about 5,000 tU in its first year of operation, in part by shortening its maintenance outage, as it ramps up to 7,000 tU per year.

Continued strain in Western conversion capacity could limit the extent to which uranium producers and mining juniors experience the demand they need to justify increasing production. But tightness in the conversion market has so far had little effect on the uranium price, which this week gained more than \$2 per pound on aggressive bids from a trader that one source suggested is driven by new investor interest.

The uranium price delivered by Energy Intelligence's Uranium Price Panel rose to \$52/lb. U3O8 on Oct. 20, from \$49.63/lb. on Oct. 13.

In Kazakhstan, Kazatomprom has continued to experience operational issues at its in situ recovery Inkai joint venture (JV) with Cameco that has delayed by almost a month a shipment using a new route from Kazakhstan through the Caspian Sea. The JV partners are working together to secure the alternative route to their primary route through Russia to Europe. Currently, a vessel in the Georgian seaport of Poti in the Black Sea is awaiting a second batch of uranium, expected to arrive from Inkai late next week, before embarking onward to Europe. The Inkai shipment is destined for Cameco's Blind River facility in Canada.

Jessica Sondgeroth, Washington

URANIUM PRICE PANEL

For the week ended October 20, 2022

	Chg.	Weekly Spot Market Prices												
		Oct			Sep			Aug				Jul		
		20	13	6	29	22	15	8	1	25	18	11	4	28
Price (\$/lb U3O8)	2.38	52.00	49.63	47.88	48.54	49.82	50.03	51.83	52.50	48.38	47.75	47.63	47.84	48.85
Total Assessments	-2.00	10.00	12.00	9.00	8.00	10.00	10.00	8.00	8.00	9.00	10.00	9.00	8.00	9.00
% within 1 StDev	-13.33	70.00	83.33	77.78	87.50	60.00	70.00	75.00	62.50	77.78	80.00	77.78	75.00	55.56
Low (\$/lb U3O8)	2.50	51.50	49.00	47.50	48.25	49.00	49.00	51.25	52.00	48.00	47.50	47.25	47.50	48.50
High (\$/lb U3O8)	2.00	52.50	50.50	48.25	49.00	51.00	51.00	52.00	53.50	49.00	48.25	48.00	48.25	49.25
Variability*	-0.50	0.25	0.75	0.07	0.08	1.00	0.38	0.19	0.39	0.38	0.25	0.04	0.00	0.00

*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

Finland, Sweden Join Baltic Nuclear Push

Helsinki and Stockholm both signaled major new nuclear power initiatives this week, as Finland's state-owned Fortum launched a feasibility study into new nuclear and Sweden's new center-right government took office promising to direct state-owned Vattenfall to develop nuclear plans, backstopped by some 400 billion Swedish kronor (\$36 billion) in government loan guarantees.

The new initiatives from the two Nordic countries creates something of a ring of interest in nuclear power in countries on the Baltic Sea, also including Estonia and Poland. But while those two countries are launching nuclear programs, and must therefore build out the legal, regulatory and market infrastructure necessary for a civil nuclear program, both Sweden and Finland boast decades of experience with nuclear power.

Their renewed determination for new nuclear is a response to multiple factors: a new focus on energy security, continued climate commitments, and — in the case of Finland — an attempt to compensate for the collapse of Hanhikivi-1, the large-scale Russian-supplied nuclear project developed by Fennovoima that was canceled earlier this year following Russia's invasion of Ukraine.

"From the state's point of view, we still need more nuclear power and, in practice, wind and solar power, in a situation where the Fennovoima power plant project has failed," Finland's Economic Affairs Minister Mika Lintila told the STT news agency in an Oct. 17 interview.

In Sweden, meanwhile, the new policy was announced alongside a condemnation of previous policies committed to nuclear phaseouts. Six reactors have now been shut "for political reasons" after years of helping Sweden be "self-sufficient in electricity all days of the year, all hours of the day," Prime Minister Ulf Kristersson complained in an Oct. 18 statement. "This government's assessment is that this was bad for business, bad for the climate, bad for the household economy — and also bad as a security policy."

Pulling Out the Stops

Sweden's new center-right coalition government took power Oct. 18, and quickly set the tone as one of the world's most vociferous nuclear advocates. In the "Tido Agreement" concluded four days prior at the eponymous castle near Vasteras, four political parties (supported by the far-right Sweden Democrats who won't be a formal member of the government) agreed to a political agenda that among other things pulled out the stops for an expanded Swedish nuclear industry.

The agreement declared that Vattenfall "should immediately start planning" new nuclear capacity at Ringhals "and other suitable locations," and promised roughly 400 billion kronor in government credit guarantees "with more generous terms than the current system." It also dropped a 10-reactor ceiling on the number of operating Swedish reactors, ending a compromise first engineered in a coalition agreement launching a previous government, in June 2016. And the government will seek to inoculate nuclear operators from further swings of the political pendulum: "New rules must be introduced that prevent politics from arbitrarily shutting down nuclear power plants — nuclear power must be guaranteed the right to operate and produce electricity as long as the facilities are in good condition and operated safely."

Beyond encouraging newbuilds, the Tido Agreement committed the government to investigate the possible restart of Ringhals-1 and -2, which were respectively shuttered in 2020 and 2019. Sweden's long-term energy policy will now shift from a goal of 100% renewables to 100% "fossil free."

Most intriguingly, the government will pursue an electricity market reform that will compensate power producers that contribute to the "support services" that are "required for a well-functioning electricity system" — and this compensation will come from power producers that don't contribute to these support services. This appears to be a reference to system costs — the concept, as articulated by the Nuclear Energy Agency, that "in the presence of uncertain and variable electricity generation the total costs are more than the sum of plant-level costs as calculated with the levelized cost of electricity methodology" — and raises the prospect of renewables operators subsidizing nuclear operators.

Whether and how quickly these policy objectives are achieved remains to be seen. Vattenfall CEO Anna Borg has already pushed back on the feasibility of restarting Ringhals-1 and -2, although she said Vattenfall has been contacted by vendors and investors interested in a Vattenfall small modular reactor (SMR) push.

Momentum in Finland

Although Vattenfall is in a pole position to lead any Swedish newbuilds, big or small, Fortum may also have its eye on Swedish government financing; the two-year feasibility study it launched will investigate the deployment of both SMRs and conventional large reactors, with a "geographic focus" of both Sweden and Finland. The study will "take a deep look at the newbuild process, such as progress of planning, siting and licensing," said Fortum in an Oct. 17 announcement, and Fortum intends to engage "political decision-makers, civil servants, and nuclear safety authorities" in both countries.

Any new nuclear project in Finland will need a government decision-in-principle (DIP), something granted to both Fennovoima for Hanhikivi-1 and TVO for a mooted Olkiluoto-4

in 2010, when the government rejected Fortum's pitch for building a third reactor at its Loviisa plant. TVO then suspended its plans for Olkiluoto-4 in 2014, and given its continued difficulties commissioning the French-supplied EPR at Olkiluoto-3 it's unlikely TVO will be flirting with another large reactor newbuild anytime soon. This week the utility announced that damage in the turbine island's feedwater pumps will most likely delay the start-up of commercial operation, previously slated for December.

Finland's Lintila pointed out that in a way the Fortum effort comes at a propitious time, as Helsinki is drawing up a new nuclear energy law that will enable the deployment of SMRs — something that might tempt both Fortum and TVO. Lintila also said talks are under way with Washington to conclude a memorandum of understanding on civil nuclear cooperation by year's end. Given the two countries have long had nuclear cooperation agreements, this could refer to a "nuclear cooperation memorandum of understanding," something unveiled under the Trump administration to facilitate a US government-backed nuclear export push.

Phil Chaffee, London

GENERATION

Constellation Eyes More Nuclear Output

US-based Constellation Energy expects that recently enacted federal and state subsidies will allow it to increase its nuclear fleet generation by 6% through plant uprates from 2026-30, and support 20-year reactor life extensions. But there are challenges, including material supply-chain constraints and time-consuming regulatory approvals. And it remains uncertain how much deregulated nuclear operators like Constellation can simultaneously benefit from both state and federal support.

Constellation nuclear fuel buyer Tae Wook Ahn told the Nuclear Energy Institute's (NEI) International Uranium Fuel Seminar in Las Vegas this week that government support will "allow us to really, really strategize long term because it provides a very strong floor for us to continue with power uprates and life extensions." But continued operation of Constellation's fleet will require major upgrades and regulatory approvals while supply-chain constraints challenge industry timelines. "We're simply trying to maximize profitability by maximizing our revenue and minimizing our cost," Ahn said.

In August, Congress passed the Inflation Reduction Act of 2022 including \$30 billion in nuclear production tax credits (PTCs) to prevent struggling reactors from retiring as part of the Biden administration's plan to decarbonize the domestic electricity

sector by 2035. Constellation operates 21 of the nation's 40 merchant reactors that would theoretically qualify for the PTCs, but there are limits to how much a reactor can collect if it is performing well financially. The PTCs are designed to ensure that the least economic reactors are prioritized by considering not just reactor costs but gross revenue, including from other taxpayer contributions either at the federal or state level.

For Constellation, rising energy prices and access to state subsidies in Illinois and New York should contribute to higher revenue. At the same time, PTCs would incentivize investments by the operator in capital-intensive plant upgrades and life extensions. However, legal provisions in Illinois suggest some of Constellation's reactors will not be able to collect both state and federal support.

In Illinois, where there are two state subsidy programs for ailing reactors, Constellation faces challenges benefiting from one that covers the Byron, Dresden and Braidwood nuclear plants (6.5 gigawatts total). After former parent company Exelon threatened to close the reactors, the state passed a 2021 "carbon mitigation credit program" to support the three plants. But amid the fallout of a bribery scandal implicating Exelon, lawmakers required applicants to provide revenue projections, including "known or anticipated federal attribute credits, known or anticipated tax credits, and any other direct federal support."

Constellation "may face an uphill battle convincing Illinois regulators that they 'need' financial assistance while earning tax credits" from the federal government, ClearView Energy Partners consultant Tim Fox told Energy Intelligence.

The state's 2016 Zero Emissions Credit (ZEC) program that provides financial assistance to Exelon's Clinton and Quad Cities plants (2.96 GW total), however, "did not contemplate the possibility of federal assistance to existing nuclear plants, and its reductions in ZEC prices correspond with higher market prices, not plant revenue. Therefore, these plants may be able to benefit from both state and federal programs," Fox said.

Planning for the Future

Ahn told the NEI conference on Oct. 17 that Constellation is considering power uprates for its fleet on a case-by-case basis "dependent on the continued support of state and federal support." The current plan is to increase Constellation's "fleet generation by 6% and of that 6%, about 60% is financially viable and we are very close to implementation," Ahn said. For the remainder, "we are considering the business case in the fourth quarter this year or the first quarter next year."

But Constellation needs federal regulatory approval for power uprates and life extensions from the US Nuclear Regulatory Commission (NRC) in what Ahn characterized as "first-of-a-kind implementations which are taking a little longer than we anticipated." The company plans to use turbine upgrades and

enhanced measurement techniques for heat flow aimed at squeezing more power out of uprates. This “essentially reduces our margin because we have more accurate reads and it can up the power plant’s power by 1 to 2%,” Ahn explained.

Reactor turbine upgrades — including modifications to pumps, generators and transformers — can also add to a reactor’s power supply to the tune of up to 20%, but these are costly particularly with supply-chain issues plaguing manufacturers. Ahn said Constellation is hoping to mitigate these capital expenditures by reducing labor costs and conducting asset work during maintenance outages.

Besides the NRC, in deregulated markets these changes also require regulatory approval from regional power grid operators in the form of revised connection agreements. Where that process used to take one to two years, it now takes about three to five, Ahn said, attributing the regulatory backlog to the accelerating addition of new renewable generation. Constellation’s 21 reactors extend across three regional grid systems, including the largest US grid operator the PJM Interconnection, the New York Interconnection System Operator, and the Midcontinent Independent System Operator.

Constellation is also in the process of considering 20-year reactor life extensions for all 21 of its reactors on a case-by-case basis, which Ahn estimates, if implemented, “would be more clean energy than all the renewables being added to the grid combined.”

PTC Implementation

The federal nuclear PTCs take effect in 2024 and expire at the end of 2032. Qualified reactors can benefit from a base rate of \$3 per megawatt hour, with an increase to \$15/MWh if the qualified reactor meets prevailing wage standards. For reactors generating more than \$25/MWh in electricity revenue, including revenue from other taxpayer contributions either at the federal or state level, the PTC would be reduced by the lesser of \$3/MWh or 80% for every \$1/MWh in revenue that exceeds the \$25/MWh threshold. The credit zeroes out for reactors with revenue in excess of \$43.75/MWh.

The US Treasury Department is still in the early stages of implementing the PTC program. On Oct. 5, Treasury issued six notices for comment, including on state-provided financial assistance. Treasury asks what it should “consider in determining whether a payment” from a separate government-assistance program constitutes “any portion of the electricity produced by the facility?” It also asks whether guidance is needed to clarify “gross receipts” for reactors that receive revenue from “cost-of-service regulation or regulated contracts and who do not sell electricity in a manner attributable to individual nuclear reactors such as through sales into organized electricity markets or via power purchase agreements to third parties.” Comments are due Nov. 4.

Jessica Sondgeroth, Washington

UNITED KINGDOM

Newbuild Awaits Government Stability

The UK is one of the world’s most pro-nuclear countries, with a commitment to building 24 gigawatts of new nuclear capacity through 2050, but that goal is growing ever more distant in the roiling political and economic waters of Westminster, into which Prime Minister Lizz Truss plunged this week.

If there’s an upside to the latest debacle — which follows the decapitation of no less than four chancellors of the Exchequer since January — it might be the ability of what’s left of UK leadership to convince financial markets that sober deficit-conscious policies are once again in favor. Truss had unwisely promised tax cuts with no way to pay for them and tried to save her own skin by firing her chancellor and letting him take the blame. With both now out of office, the most immediate concern is how Truss will be replaced — there are renewed calls for a general election — and how quickly new leadership can stabilize government and begin to draw in wary capital. For nuclear policies favored by both Conservatives and Labour, political and economic stability is even more critical given the thorny issues surrounding long-term nuclear finance.

“As we know from the past, one of the easiest cuts for the Treasury to make is a cut in a long-term capital program, because there are hardly any immediate victims,” Tim Yeo, chairman of the New Nuclear Watch Institute (NNWI), said Oct. 18 at the NNWI 2022 Forum in London. Yeo served as environment minister in 1993–94, and has for decades advocated new nuclear capacity. “That’s the reason for the abysmal state of our transport infrastructure,” and “given the importance of energy security and of climate change,” even worse than cutting spending on transport infrastructure “would be to cut spending on a new nuclear program. But I have to say, in the present circumstances, there is a risk.”

Returning to State Control

If there is a shortage of stability, the same can’t be said about the political climate surrounding nuclear, which is marked by a growing multiparty commitment to a muscular government role in new nuclear. Already committed to launching one large-scale nuclear newbuild project by the end of the current Conservative-led Parliament in 2024, in March the government rolled out an energy security strategy with a goal of 24 GW in new nuclear capacity by 2050, and promised a new “Great British Nuclear” (GBN) government vehicle to enable this.

Then on Sep. 27 Labour leader Keir Starmer outlined his party’s intent to launch (when in power) “Great British Energy,” a government-owned champion of clean energy, including

renewables and new nuclear. “A lack of domestic champions has often compromised the UK’s sovereign capability,” Labour said in an announcement. “It is clear that the Conservative government’s preference for foreign investors stalled our nuclear program in the 2010s — even to the point that national security was compromised through Chinese encroachment into the UK’s nuclear capacity.”

This logic seems to have purchase with the Conservatives as well. After Truss met French President Emmanuel Macron on Oct. 6, the FT reported that an agreement was in the offing to finance Sizewell C, the EDF-supplied twin-EPR project in Suffolk, with 50% equity stakes from the UK and French governments, possibly via GBN and EDF. This would be a nuclear program entirely removed from the private sector, and back to the model of state control that built the existing UK nuclear fleet.

Continued Uncertainty

A model of state control, however, requires a state to be in control, and the UK government is rudderless as it has been for much of the year: both the 24 GW new nuclear commitment and the promised creation of GBN came from Truss’ predecessor Boris Johnson, an enormous nuclear advocate, and it’s not clear whether the next prime minister will sign onto these policies, or to the weeks-old plans agreed by Truss and Macron.

As a civil servant it is “my job” to “explain and support and even defend government policies of the day,” Chris Heffer, the director of nuclear power and decommissioning at the UK Department of Business, Energy & Industrial Strategy, told the NNWI conference only two days before Truss resigned. “I ask you if they change while I’m on stage, please do let me know.”

This was a laugh line, but one that hit close to home. Among other things Heffer has been tasked with helping to launch GBN, but any decisions as to its mandate and funding must now wait until another government is firmly in place.

“We’re hoping for a moment — I’d say, I think — in the next three or four weeks, where we’ll be able to make an announcement across the board,” said Heffer when asked about the GBN rollout. “Bodies take a little while to set up” and may “grow into” their role. But critical will be “how much funding” a “delegated authority” like GBN will have. Funding is “probably the hardest” question at the moment, said Heffer. If and when GBN is launched, there may be more details on its mandate and the kind of people it employs — whether they’re bureaucrats, bankers or nuclear operators, or some combination. “But I would watch the funding.”

There will be nuclear projects beyond Sizewell C eager for UK government funds — either via GBN or other mechanisms. Heffer claimed to have solved the issue of financing models with the rollout this past year of a nuclear regulated asset base (Rab) model that allows project developers to recover revenues while in construction. But that doesn’t cover the pre-final investment

decision (FID) period that is incredibly expensive for first-of-a-kind projects, such as a Rolls-Royce small modular reactor at an as-yet to be determined site, or an AP1000 at Wylfa Newydd, something pitched by Bechtel and Westinghouse.

“It seems that the UK [government] have woken up to the fact” that new nuclear requires “actually being a customer themselves,” Ivan Baldwin, Bechtel’s UK business development director for nuclear power, told the NNWI conference. Therefore pre-FID funding at Wylfa, for example, “would have to be covered by “direct investment, or the Rab, or some other government-led investment,” he added, implying that the nuclear Rab law would have to be modified to allow for it. That’s “the basis of the plans so far,” said Baldwin, apparently reflecting the thinking inside Bechtel and Westinghouse.

Phil Chaffee, London

NUCLEAR FUEL

Goranson on Supply-Chain Headaches

The difficulty of developing uranium assets in the current inflationary environment, compounded by supply-chain challenges, was driven home this week by industry veteran Paul Goranson, who is spearheading EnCore Energy’s effort to bring its Rosita ISR project in South Texas on line by next year.

“We have all heard about it in the news, but you really don’t get context on supply-chain interruptions and delays and everything until you actually go do it,” Goranson told the Nuclear Energy Institute’s (NEI) International Uranium Fuel Seminar in Las Vegas this week. “This is not my first rodeo.”

Goranson, EnCore’s COO, has wrangled with uranium mining efforts across Wyoming and Nebraska over the past three decades, working for Uranerz and Cameco Resources, before assuming his current position as COO at EnCore. In that time he watched a reasonably healthy, if relatively small, uranium industry all but disappear. Now, with higher prices and an improved look for nuclear, there are signs of a comeback in the US market. But that’s being tested by the lack of supportive infrastructure, he says.

“We were used to having multiple inventories, vendors had large storage areas that would hold inventory for us, and also multiple manufacturers that would be able to dedicate production lines we needed to supply our operations,” Goranson said, adding that those resources allowed miners to “operate in a competitive environment.” All that’s changed since the Covid-19 pandemic ushered in a tectonic shift in labor and manufacturing that has disrupted supply chains and transportation

across industries and across the globe, bringing with it a new challenge: inflation.

The US Bureau of Labor Statistics' production price index — which measures prices domestic producers charge for their output — has increased by 17% since January 2021. And it's not just a problem for US mining juniors either. Even major uranium producers, Cameco operating in Canada and Kazatomprom in Kazakhstan, have underscored recent production challenges and rising costs due to inflation and supply-chain disruption — in sulfuric acid supply, drilling and transportation.

For greenfield or brownfield uranium projects in regions where uranium production had disappeared or never existed, the availability of resources is likely to present a number of obstacles. In the US, production dwindled to levels so low the US Energy Information Administration stopped reporting production figures in 2020.

But the uranium price has increased from the low-\$20s in recent years to \$45-\$60 per pound this year, benefiting from geopolitical conflicts. A case in point is the US Department of Energy sourcing about 1 million pounds of already mined, domestically produced U₃O₈ as part of the \$75 million National Nuclear Security Administration (NNSA)-managed uranium reserve mandated by Congress in December 2020. Energy Intelligence understands the NNSA is expected to make an award before the end of the year.

Rising Costs, Longer Waits

Goranson's EnCore Energy has already inked three offtake agreements with nuclear power operators and is targeting the third quarter of 2023 to bring back into operation its 100%-owned Rosita ISR wellfield development and processing plant in Texas — a small project with only 800,000 lbs. of U₃O₈ output per year.

Rosita operated from 1990-99, producing a total of 2.64 million lbs. of U₃O₈, and in 2007-08 EnCore's parent company URI made upgrades to the central processing plant but did not complete them due in part to low prices and the rising cost of

production. EnCore picked up where URI left off in 2021, with plant modernization followed by the installation of monitors in the production area in 2022.

While EnCore has not yet provided public guidance on its all-in-sustaining costs (AISC), Goranson told Energy Intelligence that "based on current expenditures and anticipated production costs, we expect our AISC will be less than \$40/lb."

But for Goranson, reviving Rosita has brought new challenges, perhaps most notably the longer delivery times for basic components. Goranson recalls "just-in-time" deliveries, in which "I pick up the phone, call the supplier, two days later" they drop the material off. Now, Goranson said he has to order materials in bulk about six to eight months ahead of time.

"Now you have to go and negotiate with vendors to get materials," he said, adding that several manufacturers that supply those vendors simply don't exist anymore and it's becoming harder for vendors to control when their suppliers are able to deliver due to transportation backlogs. For example, Goranson said EnCore ordered pumps that were expected to arrive within two weeks, but those two weeks turned into four weeks and then 12 weeks because certain components required to manufacture the pumps were stuck at the Port of Los Angeles. "There aren't as many trucks on the road as there were," he said.

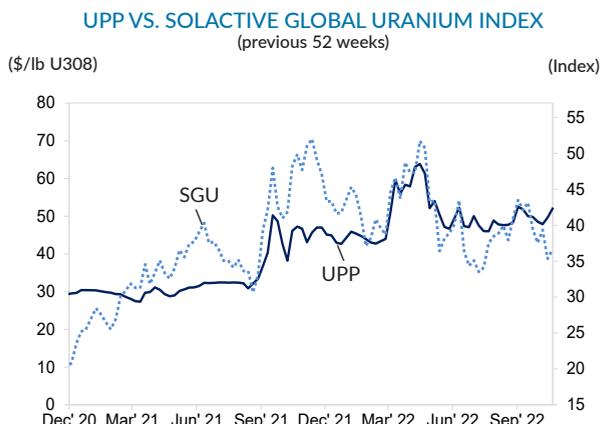
Inflation has not only increased costs, but it has also made it harder to lock in fixed prices in contracts for future deliveries of materials, like chemicals and reagents, and equipment, like PVC pipe. "They would say, well if you order now you can get it at this price, but maybe not," Goranson said, with the alternative being to order supplies in small batches that are still subject to delays.

Overcoming these challenges requires early planning, early procurement of supplies, and alternative sources of supply for things like liquid oxygen. "We can't just rely on drop shipments. We can't rely on an adjustment plan," he said. "We had to start looking ahead" and "start procurement months earlier than we normally would have in our prior experience. It's not entirely foolproof."

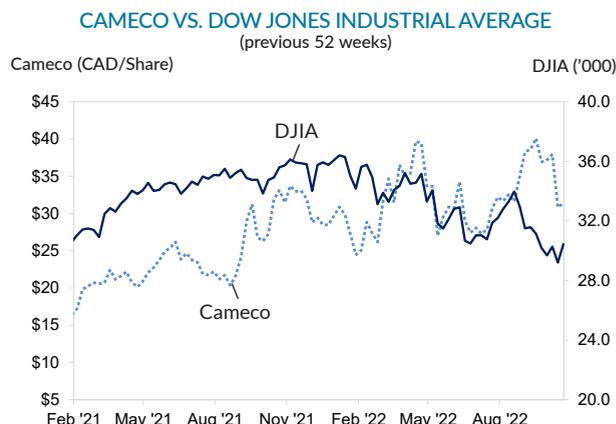
Jessica Sondgeroth, Washington

URANIUM MARKET UPDATE

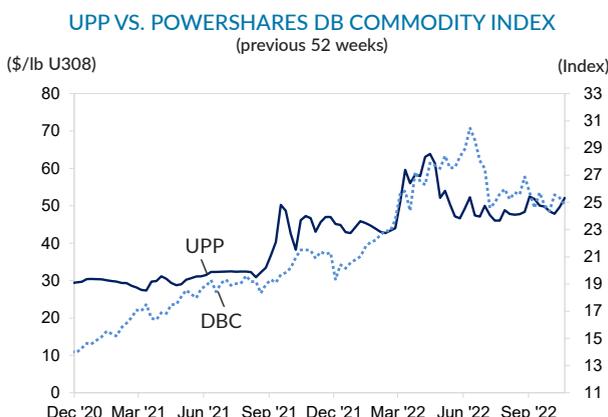
All prices as of Thursday, October 20, 2022



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.



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.



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.



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	
		Sep '22	Aug '22	Jul '22	Jun '22	May '22	Apr '22	Mar '22	Feb '22	Jan '22	Dec '21	Nov '21	Oct '21
Uranium (\$/lb U3O8)													
Low	+1.00	48.50	47.50	45.50	45.50	46.00	52.50	51.00	42.50	43.00	42.00	43.00	36.00
High	-1.00	52.50	53.50	50.50	52.50	54.00	64.00	60.00	44.50	46.50	47.00	47.50	48.00
Conversion (\$/kgU)													
Low	-	36.00	36.00	32.00	30.00	30.00	28.00	26.00	16.00	16.00	16.00	15.00	16.00
High	-	39.00	39.00	37.00	33.00	33.00	30.00	28.00	17.00	17.00	17.00	18.00	19.00
Enrichment (\$/SWU)													
Low	+2.00	92.00	90.00	89.50	84.00	84.00	82.00	100.00	59.00	57.00	56.00	56.00	55.50
High	+4.00	96.00	92.00	95.00	150.00	150.00	150.00	150.00	61.00	59.00	57.00	57.00	57.50

NIW monthly UF6, SWU and U3O8 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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