



## Nuclear Fuel Market Observatory Sector

# ● Quarterly Uranium Market Report

1<sup>st</sup> Quarter 2020

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## International and EU developments

In March the European Commission proposed to enshrine in legislation the EU's political commitment to be climate neutral by 2050, to protect the planet and the people. The European Climate Law sets the 2050 target and the direction of travel for all EU policy, and gives predictability for public authorities, businesses and citizens. At the same time, the Commission launched a public consultation on the future European Climate Pact.

The Commission also presented a new Industrial Strategy for a globally competitive, green and digital Europe. The Strategy is to help Europe's industry lead the twin transitions towards climate neutrality and digital leadership and it aims to drive Europe's competitiveness and its strategic autonomy at a time of moving geopolitical plates and increasing global competition. It also sets out a range of actions to support all players of European industry, including big and small companies, innovative start-ups, research centres, service providers, suppliers and social partners.

Foratom reacted to the new Industrial Strategy calling on the Commission to recognise the nuclear sector as a "strategic European industry", since "...the European nuclear industry provides not only electricity, but also medical isotopes and other applications for industry and agriculture".

The final report on EU taxonomy, developed by the Technical Expert Group (TEG) on Sustainable Finance was also published in March. The report concludes that nuclear power, not meeting two of six environmental objectives should not be included in the taxonomy. The conclusion comes from the inability of TEG to undertake a robust "do no significant harm" (DNSH) assessment "as no permanent, operational disposal site for HLW exists yet from which long-term empirical, in-situ data and evidence to inform such an evaluation for nuclear energy." Also, "the TEG recommends that more extensive technical work is undertaken on the DNSH aspects of nuclear energy in future and by a group with in-depth technical expertise on nuclear life cycle technologies and the existing and potential environmental impacts across all objectives."

Euratom - the European Atomic Energy Community, and Japan signed in March a joint declaration on the Broader Approach activities in the field of fusion energy, thus reaffirming their commitment to continuing their joint activities. As ITER is approaching its own First Plasma and the beginning of its operation, teams working on the Broader Approach will work ever more closely with ITER to ensure that it moves forward as smoothly as possible.

By the beginning of 2020, there were 442 operable reactors worldwide with the capacity of 392.4GWe net, according to the World Nuclear Association. New reactors were connected to the grid in China, Russia and South Korea, during 2019 while several reactors in China, Germany, Japan, South Korea, Switzerland, Sweden, Taiwan and the US were shut down during the same period. Three new units started to be built in 2019 - in China, Iran and Russia.

In January IAEA held its first Course on Preparedness and Response to a Nuclear or Radiological Emergency Combined with Other Emergencies. The course attended mainly by nuclear power plant operators, regulators and first responders taught "about the specific requirements different response professionals need to meet to effectively respond to combined emergencies and their associated challenges."

Nuclear power plant operators in several countries put in place measures to react to the coronavirus pandemic in order to maximize worker and public safety and minimize power shortages. Some reduced staffing and asked non-essential employees to work remotely, scheduled outages were also scrutinised.

In response to increased interest in small modular reactors (SMR), the International Atomic Energy Agency started a 3-year Coordinated Research Project "focusing on the economics of SMRs, including micro-reactors, by providing Member States with an economic appraisal framework for their development and deployment."

## Developments in the Member States

### **BELGIUM:**

In March the Belgian Constitutional Court decided to annul a law extending by 10 years operating lifetimes of Doel 1 and Doel 2 units. The ruling implements a 2019 judgment from the European Court of Justice, which decided that an environmental impact assessment must be carried out before extending the lifespan of these reactors.

### **BULGARIA:**

In January, the Ministry of Energy informed that five short-listed companies are ready to submit binding offers for Belene project. The "short list" companies are the Chinese National Nuclear Corporation (CNNC), Atomenergoprom JSC, part of Rosatom, the Korean Hydro and Nuclear Power Corporation, Framatom S.A.S,

France and General Electric, the USA. The indicative deadline for submission of the offers was set to be 31 May 2020, which was later announced likely to be extended due to the COVID-19 epidemic.

## **CZECHIA:**

In January the Czech government finalised the National Energy and Climate Plan, modestly increasing the target for renewable energy (up to 22% of the country's energy needs by 2030, compared with its original proposal of 20.8%). According to the program director of the renewables lobby group, the Association for Modern Energy, this latest target for renewables by 2030 is not very ambitious and confirms, the mistaken government policy that puts the emphasis on new nuclear capacity. (The program restates the country's 2015 long-term energy policy target for nuclear power to generate 46% to 58% of Czech electricity by 2040, compared with 29% in 2016).

GE Hitachi Nuclear Energy and CEZ signed in February a Memorandum of Understanding to examine the economic and technical feasibility of potentially constructing a 300MWe water-cooled BWRX-300 reactor in the Czechia. CEZ is already involved in the development of SMR via its daughter company UJV Rez, and in late 2019 identified several SMR projects that seemed suitable for implementation in the Czechia. Last year CEZ also signed a memorandum of understanding with the American company NuScale, which is also involved in a development of SMR.

In February the Czech Minister of Industry announced that an agreement between the Czech government and utility CEZ concerning construction of a new reactor at the Dukovany would be signed in the next few weeks. After Atmea joint venture pulled-out, five companies are allegedly still interested in building new nuclear unit(s) in Czechia - China General Nuclear, EDF, Korea Hydro & Nuclear Power, Rosatom and Westinghouse. The schedule remains unchanged - supplier should be selected by 2022, construction permit to be ready by 2029 with a commissioning by 2036.

In March CEZ applied for permission with the State office for nuclear safety to construct two new 1200MWe reactors at the Dukovany nuclear power plant. The extensive submitted documentation "describes and assesses the site's characteristics, examining the natural conditions, water supply and human activities near the power plant. Also described and evaluated are the project's concept, quality issues and preliminary impact of operations on the population and environment and the future decommissioning of the power plant" according to CEZ.

## **ESTONIA:**

The Estonian development company Fermi Energia informed in January at the occasion of a conference "New Generation Nuclear Power: FIRST EU SMALL MODULAR REACTOR DEPLOYMENT" that it is considering four SMR designs - Moltex Energy's SSR-W sodium-cooled SMR, NuScale Power's modular pressurized water reactor SMR design, Terrestrial Energy Molten Salt Reactor and GE-Hitachi Nuclear Energy's BWRX boiling water reactor design. It also announced positive results of a Prefeasibility Study regarding the economic impacts of siting, constructing, and operating a SMR in Estonia. The study found that construction of an SMR in Estonia would have several positive economic impacts on the state.

In March Fermi Energia announced potential location for Estonian SMR. The company will actively explore options in the coastal Tõstamaa area in western Estonia, in the Viru-Nigula rural municipality on Estonia's North Coast along with Pakri Peninsula in the country's northwest. Construction is currently planned to begin in the 2030 timeframe at an estimated cost of €1 billion.

Vattenfall joined in March Fermi Energia, who is leading a pilot study aimed at developing a licensing model for SMR and at establishing preliminary siting criteria and costs for the reactors. , the Swedish power company said in a statement Thursday. It thus follows Fortum and Tractebel who joined Fermi Energia in January in a common effort.

## **FINLAND:**

In January, STUK, Finland's Radiation and Nuclear Safety Authority published a report on the safety assessment and licensing of SMR. The authority informed it is preparing for the licensing of SMR "due to the national and international interest in them." STUK also noted that the Ministry of Economic Affairs and Employment is currently evaluating the need to develop the laws on atomic energy in Finland. STUK Director General Petteri Tippiä said: "We are preparing for the future to ensure that the safety of SMRs will be at least at the same level as that of the existing nuclear power plants. Good operating practices as an authority also requires that our expectations and requirements towards the operators are as transparent as possible and can be taken into account proactively."

In February Terrafame Ltd., metal mining company, informed that it received a by-product uranium recovery permit at its Sotkamo mine in Finland. It expects that to get the uranium recovery plant operational will take approximately one year.

VTT Technical Research Centre announced in February a project to develop SMR for district heating. VTT stated that decarbonising the district heat production system is "one of the most significant climate challenges faced by many cities". The objective of the project is to create a new industrial sector in Finland that would be capable of manufacturing most of the components needed for the plant.

## **FRANCE:**

It was reported in January that France decided to postpone the decision whether to build six new EPR reactors, until the end of 2022. The decision is bound to fuel-loading at EDF`s Flamanville 3, expected at the end of 2022.

In January the French government published a new version of its Multiannual Energy Programme (PPE) outlining the energy mix for the next 10 years - until 2028. The Programme, inter-alia foresees the closure of fourteen 900MW reactors. Respecting the new energy and climate law of 2019 that requires EDF to reduce the share of nuclear power in the electricity mix to 50% by 2035 (from 70% today). No dates were given for the shut-down of the reactors at identified sites, except for Fessenheim NPP, where unit 1 was shut down on 22 February 2020 and unit 2 is foreseen be shut down permanently in June 2020.

In February EDF successfully started at unit 3 of Flamanville EPR the unit`s turbine as part of ongoing hot testing. It is the first time that an EPR turbine has reached a speed of 1500 rpm, according to Adrien Mahé, EDF head of mechanical and conventional testing. The speed of turbine rotation was gradually increased until it reached the nominal speed required when the power plant will be in operation.

Orano informed in February that it received an authorization to start dismantling of George Besse gaseous diffusion plant. The plant ceased the operation in 2012 and was replaced by the George Besse II gas centrifuge facility. The project includes the disassembly of 1,400 cascades representing over 160,000 tonnes of steel, 30,000 tonnes of metallic equipment, and over 1,300 kilometres of piping.

In March, Orano suspended its 2020 financial outlook due to COVID-19. According to Orano, in the light of the pandemic it reported "taking all necessary measures to protect the health of its employees and to secure its industrial facilities while maintaining activities critical to the supply of its customers. When presenting its 2019 results, Orano issued an outlook for 2020. Given the immediate and future impact on our markets and operations of this looming global health crisis ahead, the 2020 outlook is suspended. The group will publish this new outlook as soon as it will be able to assess the real impact of the on-going crisis."

EDF reported to have abandoned its nuclear generation target for 2020 due to coronavirus-related disruption of its plant maintenance schedules. Before February, EDF had a target of 395 TWh for 2020 nuclear generation however in February it reduced its 2020 target to a range of 375 TWh to 390 TWh.

## **GERMANY:**

Unit 2 of the EnBW`s Philipsburg NPP in Germany was permanently shut-down on 31 December 2019 after 35 years of operation. Decontamination and decommissioning works are expected to start in the second half of 2020.

It was widely reported in January, that Germany`s federal government and several regional leaders agreed to phase out all coal power plants by 2038. The government plans to compensate four German states that mine lignite coal and use coal plants to with €40 billion.

## **POLAND:**

The Energy Policy of Poland Until 2040 foresees the construction of six nuclear reactors, to be launched gradually as of 2033. A Polish government spokesman Piotr Mueller said in February that a decision regarding the building of Poland`s first nuclear power plant will most likely be announced this year.

## **ROMANIA:**

SNC-Lavalin awarded Cernavoda 1 contract. SNC-Lavalin`s CANDU Energy Inc. subsidiary was awarded a C\$10.8 million contract by

In January, Romanian`s Societatea Nationala Nuclearelectrica (SNN) awarded a contract to SNC-Lavalin`s Canada`s CANDU Energy Inc. subsidiary for engineering analyses and assessments on Unit 1 of the Cernavoda nuclear power plant in Romania. The objective of the contract is extending the operating life of the plant by approximately 4 years, until it is ready for refurbishment in 2026.

Romania announced in January it plans to exit the deal with China General Nuclear Power Corporation to complete Cernavoda 3 & 4. The stated reason is that due to the European Union's Green Deal, which excludes nuclear energy from its Just Transition Mechanism, the project cannot go forward as planned. The government already started to evaluate new partners and financing methods to complete the project.

The European Commission asks Romania to recover around EUR13 million of funding from uranium company Compania Națională a Uraniului due to its restructuring plan for the company not meeting EU rules on state aid.

#### **SLOVAKIA:**

Unit 3 of Slovak Mochovce NPP is closer to the commissioning, after the regulator issued a draft decision on fuel loading. According to Slovenske Elektrarne - owner and operator of Mochovce NPP, the fuel loading was expected to start by the end of 2020. The draft decision of regulator was preceded by a series of pre-operational tests that identified some problems that required intervention of the operator and remediation actions.

#### **SLOVENIA:**

In March Slovenia presented its Integrated National Energy and Climate Plan. The Plan counts on reducing dependency on fossil fuels with the goal of becoming carbon neutral by 2050, and improving self-sufficiency in energy. Hydropower remains the preferred option, with nuclear energy maintaining its share in the energy mix.

#### **SPAIN:**

In February, TVEL of Russia signed a Memorandum of Understanding with Spanish companies ENUSA, ENSA and IDOM to cooperate in the decommissioning and dismantling of nuclear facilities, as well as in nuclear waste management and related engineering and consulting services.

#### **SWEDEN:**

In December Vattenfall shut down the Unit 2 at Ringhals nuclear power plant in Sweden after 43 years of operation. The Unit 1 is scheduled to be shut down by the end of 2020. Newer units 3 & 4 at Ringhals are expected to operate until 2041 and 2043 respectively.

#### **UNITED KINGDOM:**

In January a consortium led by Rolls-Royce informed that its next generation SMRs could be built in the north of England and North Wales. The alleged sites considered are Moorside in Cumbria and Wylfa in Wales. The joint investment of £500 million - of the UK government and the Rolls-Royce consortium - was proposed in mid-2019. SMR components would be manufactured in sections at various factories in the UK and then transported to dedicated sites for assembly. A full program with as many as 16 SMR power stations could be in place by 2050 (starting in early 2030s), with an average capacity of 440 MWe and a 60-year lifespan.

Nuclear cooperation agreement negotiations between the UK and the European Union (replacing UK's membership in the Euratom) were to start in March, "setting an ambitious nuclear cooperation agreement ... between the UK and Euratom," according to Ian Truman, a legal director at the Burges Salmon law firm in Bristol, England.

Sellafield Ltd announced it took precautionary actions, considering COVID-19 situation, and started controlled shutdown of its Magnox Reprocessing Plant, scheduled to close permanently in 2020. According to Mark Neate, the company's director of environment, safety and security "Our response has been deliberately structured so that we have dedicated resources to manage the ongoing situation while also maintaining our management and control of the Sellafield site and our nuclear facilities".

## ... and worldwide

### **CANADA:**

Canada and USA came to an agreement on cooperation improving the security of supply chains and ensure the competitiveness of their critical minerals industries. The Canada-US Joint Action Plan on Critical Minerals Collaboration moves forward the interests of two countries in securing supply chains for the critical minerals needed for manufacturing sectors.

In January, NuScale informed it submitted its 60MW SMR design for review to Canadian regulatory body, seeking to meet regulatory requirements.

GE Hitachi informed in February that it submitted application for its BWRX-300 SMR to the Canadian Nuclear Safety Commission for a pre-licensing Vendor Design Review.

### **JAPAN:**

Onagawa 2 in Japan expects restart approval after Japan's Nuclear Regulation Authority approved a report that found the unit in compliance with the necessary safety standards to resume operation if required repairs are performed. The reactor has been offline since March 2011 tsunami and earthquake. Before restart in 2021, an 800-meter long and 29-meter high seawall must be completed.

### **RUSSIA:**

Rosenergoatom informed in January that the nuclear power share in the Russian energy sector increased to 19.04% in 2019 compared to 18.7% in 2018.

Kazatomprom informed in March having completed the sale of its interest in the Uranium Enrichment Center JSC (UEC) to its partner in the joint venture, TVEL.

### **TURKEY:**

Rolls-Royce and Turkey's EUAS International ICC signed in March a Memorandum of Understanding to evaluate the technical, economical and legal applicability; and also the possibility of joint production of small modular reactors to support clean economic growth. Cooperation between Turkey's energy sector and Rolls-Royce has been ongoing since 2013.

### **UKRAINE:**

Ukraine plans to change its policy and focus on SMRs instead of building large VVER-type nuclear units. The SMR would better integrate with increasing renewable power projects, such as solar and wind.

### **UAE:**

In January Emirates Nuclear Energy Corporation (ENEC) announced that the World Association of Nuclear Operators (WANO) completed an extensive assessment concluding that the APR-1400 Unit 1 at the Barakah nuclear power plant would be ready for start-up; and fuel loading started in February following the approval of the operating license for 60 years. March marked successfully completed loading of fuel into the Unit, starting the nuclear operations expecting the commercial electricity production in the coming months.

### **USA:**

GE Hitachi Nuclear Energy and TerraPower announced their intention to design and construct a versatile test reactor based on sodium fast reactor technology for the US Department of Energy. The reactor is said to be necessary to provide sufficient high-flux neutron output to support the materials and other in-reactor testing needed to develop advanced reactors and their components.

GE Hitachi Nuclear Energy submitted its first topical report to NRC for its BWRX-300 SMR, covering the approach to meeting NRC requirements for reactor pressure vessel isolation and overpressure protection. The report is part of the series of licensing topical reports to NRC that would "serve as a foundation for the development of a Preliminary Safety Analysis Report that could potentially be submitted to the NRC by a utility customer," according to the company.

The administration of US President Trump requested in its budget for fiscal year 2021 the creation of a uranium reserve. Reserve could be funded by \$150 million a year over 10 years. The uranium reserve “is expected to support the operation of at least two US uranium mines and will ensure there is a backup supply of uranium in the event of a significant market disruption that prevents entities from acquiring fuel,” the US Department of Energy’s Office of Nuclear Energy said in February.

The US Department of Defense (DOD) started Project Pele, awarding contracts to BWX Technologies, X-energy and Westinghouse Government Services “to each begin design work on a mobile nuclear reactor prototype. Project Pele includes “the development of a safe, mobile and advanced nuclear micro reactor to support a variety of [DOD] missions, such as generating power for remote operating bases,” DOD stated.

US company Oklo submitted a combined license application for its Aurora micro reactor. Aurora, described as “advanced fission power system” is a 1.5-MW heat pipe-cooled reactor, first unit of which is planned to be built at a site at the Idaho National Laboratory. The reactor will use fuel made from high-assay low-enriched uranium recovered from processing of spent fuel.

## Uranium production

In March Orano informed about the French intentions to continue uranium production in northern Niger. Orano`s subsidiary SOMAIR expects to operate for as long as possible, with visibility of 10 years, or at least until the Imouraren project starts production.

Kazatomprom, the world's largest uranium producer, announced in March to have large enough inventories to meet future physical deliveries if U3O8 production was decreased in Kazakhstan due to COVID-19 situation. At the time no Kazatomprom`s production or processing operations were disrupted, but some operations could be impacted due to production sites in remote areas of the southern regions of Kazakhstan requiring staff to stay on site and live in close quarters.

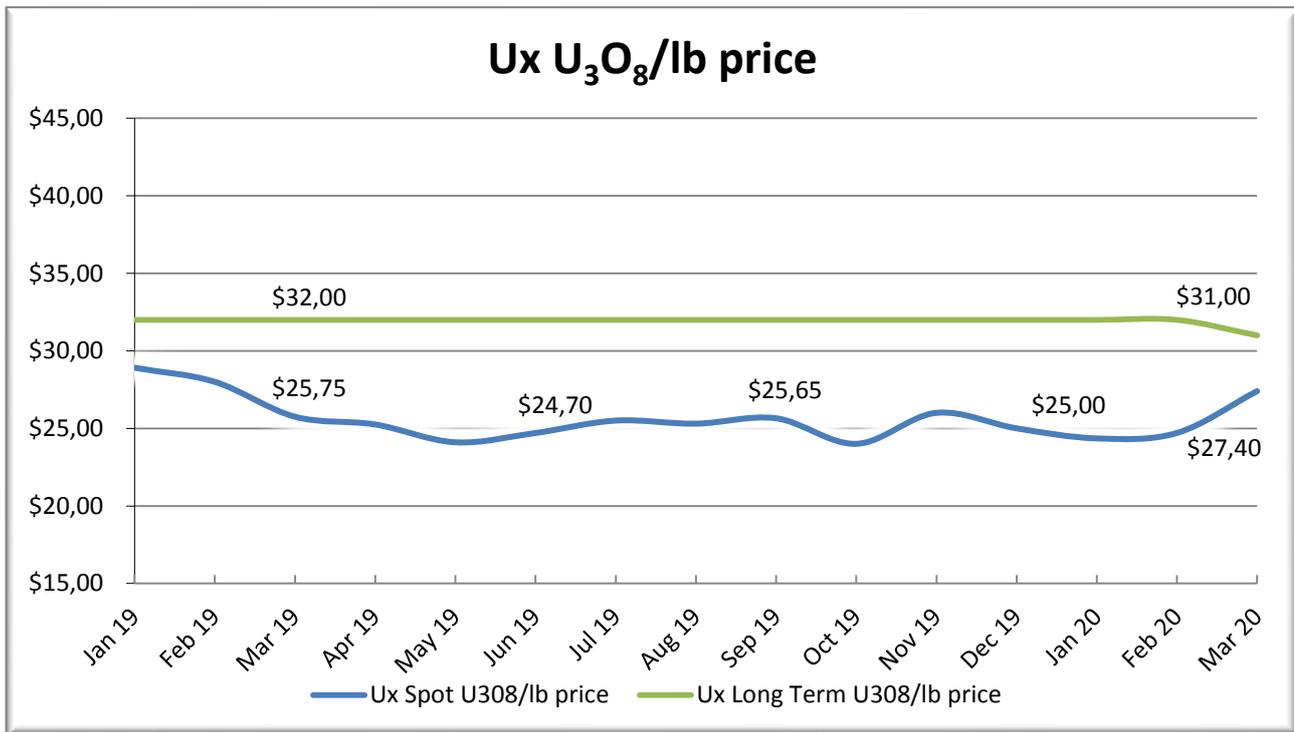
Lotus Resources Ltd, Australian-based exploration company bought the Kayelekera Uranium Mine in Malawi from Paladin Energy. On maintenance regime since 2014, the mine produced 10.9 million pounds of uranium (4193 tU) from 2009.

Cameco temporarily suspended production in March at its Cigar Lake facility in Canada, and placed it on care and maintenance, initially for four weeks, due to the coronavirus pandemic. (The suspension state remained the same in mid-May).

## Uranium prices<sup>1</sup>

In the first quarter of 2020, the UX monthly spot uranium price increased by almost 10% comparing quarter to quarter and, at the end of March, it accounted for USD 27.40/lb U<sub>3</sub>O<sub>8</sub>. It was up by more than 6% in an annual comparison.

The UX long term uranium price for the first quarter of 2020 accounted for USD 31.00/lb U<sub>3</sub>O<sub>8</sub> at the end of March which is more than 3% up when compared quarter to quarter and in an annual comparison.

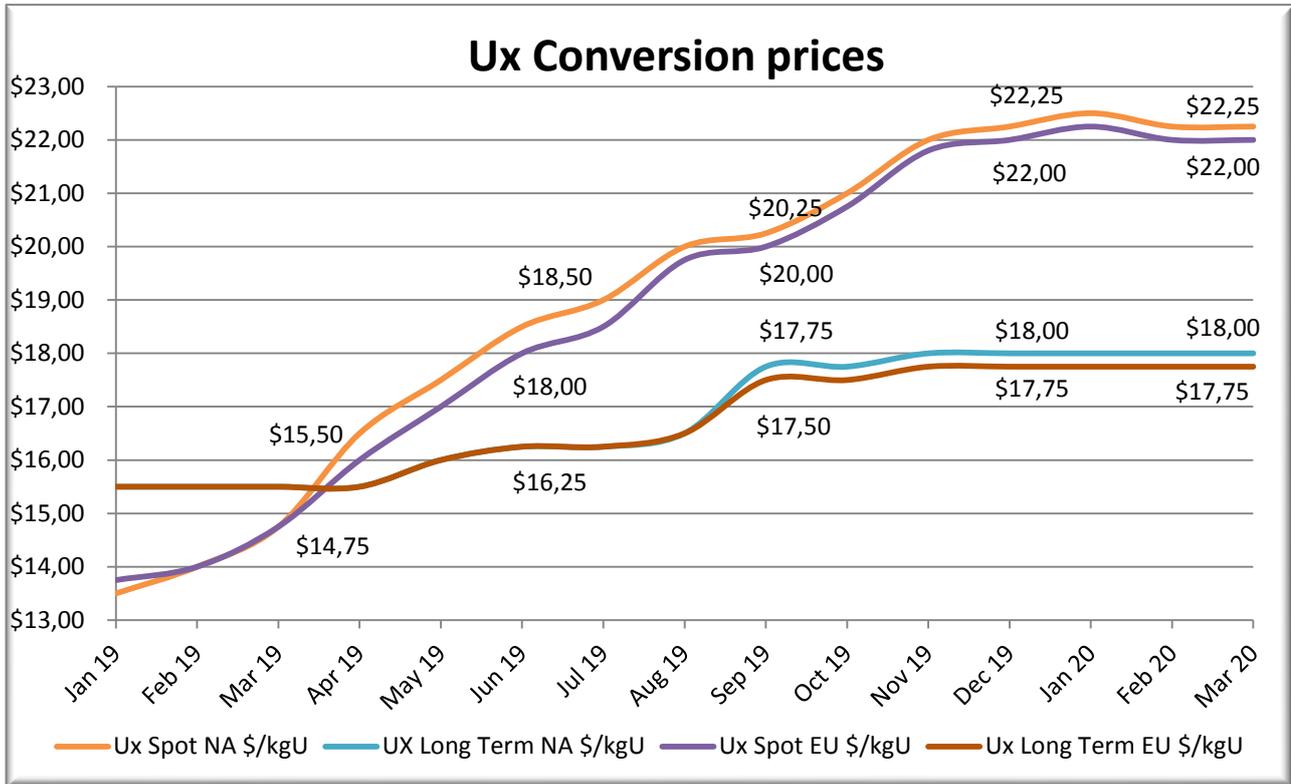


<sup>1</sup> The market price information in the following chapters: Uranium prices, Conversion and Enrichment is provided with permission of the Ux Consulting Company, LLC (UxC) [www.uxc.com](http://www.uxc.com). UxC does not bear any legal liability for the use of these data

# Conversion

In the first quarter of 2020 UX spot conversion prices in the European Union and in North America did not change compared to the previous quarter and amounted to USD 22.00/kg in the EU and USD 22.25/kg in North America at the end of march. In an annual comparison, they increased by 49% and 51%, respectively.

UX long term conversion prices amounted to USD 17.75/kg in the EU and USD 18.00/kg in North America, which means no change, when compared to the previous quarter. They increased by 15% and 16% respectively in an annual comparison.

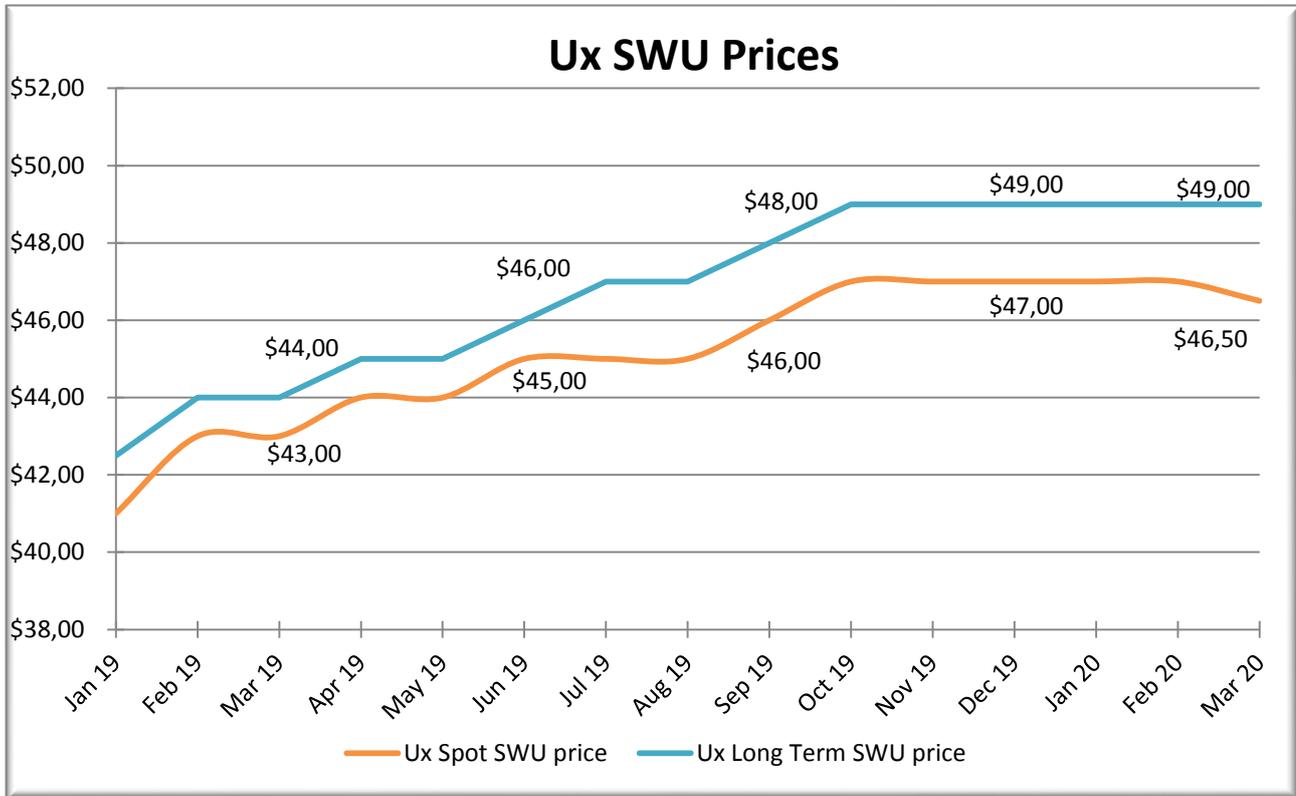


In March, NRC renewed the operating license for Honeywell International's uranium conversion facility in Metropolis, Illinois, for an additional 40 years - until 2060. The facility is currently in a "ready-idle" status, since 2017 due to uneconomical operation.

## Enrichment

At the end of March 2020, the UX spot SWU price amounted to USD 46.50 per SWU and it decreased by more 1% compared to the previous quarter. It was up more than 8% in an annual comparison.

The UX long term SWU price amounted to USD 49.00 and it did not change compared to the previous quarter and increased by more than 11% compared to the fourth quarter of 2019.



The amount of Russian enriched uranium that could be sold to US utilities in 2019-2020 under the US-Russian Suspension Agreement was limited by the US Department of Commerce to 6.1 million separative work units. The new 2019 quota is 3.12 million SWU and the quota for 2020 is 3.02 million SWU. The agreement, limiting the annual volume of Russian uranium imported to 20% of US reactors' fuel requirements, is scheduled to end in December 2020.

## Fuel fabrication

In December TVEL informed that it produced the first accident tolerant fuel assemblies (ATF) for the VVER-1000 reactor. According to the company, the fuel and energy divisions of Rosatom are planning to load the ATFs into one of the reactors at Rostov NPP. In January TVEL also reported that acceptance tests were completed for experimental fuel assemblies manufactured at the Siberian Chemical Combine in Seversk, Russia. The assemblies were fabricated with mixed uranium nitride-plutonium fuel for use in a fast neutron reactor

France's Orano reported having signed a contract with Japan's Nuclear Fuel Industries Ltd. for fabrication of MOX fuel assemblies, to be used in Kansai Electric Power Co.'s Takahama-3 and -4.

The Tennessee Valley Authority awarded Framatome several contracts for work on the company's reactor fleet. The contracts include fuel for the Browns Ferry nuclear plant, fuel handling equipment upgrades across the fleet and steam generator replacements at the Watts Bar plant. The contract to provide Framatome's Atrium 11 fuel for the three boiling water reactors at Browns Ferry will allow operators to run their plants with more flexibility and also help using the uranium in nuclear fuel more efficiently.

In February BWX Technologies Inc. (BWXT) informed that its subsidiary BWXT Nuclear Operations Inc. was awarded a \$3.6 million contract by the U.S. Department of Energy's National Nuclear Security Administration

(NNSA) to manufacture uranium-molybdenum alloy High Assay Low Enriched Uranium fuel that will facilitate the conversion of high-performance U.S. research reactors from the current use of high-enriched uranium.

## Nuclear medicine

Belgian Nuclear Research Centre and the Institut National des Radioéléments signed a public-public partnership aimed at the production of lutetium-177 (Lu-177) used in the treatment of prostate cancer.

Also Shine Medical Technologies announced the production of patient dose quantities of the medical radioisotope lutetium-177. Already in 2019 Shine entered into an agreement with the Institute of Organic Chemistry and Biochemistry in Prague to use exclusively the institute's technology for the separation of Lu-177 from irradiated ytterbium-176 targets.

For the first time Australia produced a new radioactive version of scandium in its OPAL reactor. Scandium-47, with similar properties to Lu-177 has the potential for theranostic use. According to the Australian nuclear science and technology organisation "Scandium-47 is a beta-emitting radioisotope useful for targeted cancer therapy. However, unlike Lu-177, scandium has the potential to be a true theranostic agent".

Bruce Power operating eight CANDU reactors in Ontario informed that it reduced the staff by two-thirds, as a reaction to coronavirus situation. The company took important preventative measures at the plant while ensuring the supply of Cobalt- 60.

## Concluded natural uranium contracts in the EU<sup>2</sup>

Quarter	ESA quarterly spot uranium price EUR/kgU	ESA quarterly spot uranium price USD/lb U <sub>3</sub> O <sub>8</sub>	ESA All Users quarterly spot uranium price EUR/kgU*	ESA All Users quarterly spot uranium price USD/lb U <sub>3</sub> O <sub>8</sub> *	Number of spot natural uranium contracts concluded by EU utilities**	Number of spot natural uranium contracts concluded by all parties**	Total number of contracts processed by ESA***
2019 Q1	-	-	65.33	28.54	8	10	87
2019 Q2	-	-	-	-	2	3	55
2019 Q3	-	-	60.73	25.98	3	8	86
2019 Q4	-	-	-	-	4	7	84
2020 Q1	-	-	-	-	1	6	63

\* prices converted with use of ECB reference exchange rate ([www.ecb.europa.eu](http://www.ecb.europa.eu))

\*\* including purchases, sales, exchanges and loans

\*\*\* including contracts, amendments and notifications on the front-end activities

### List of common abbreviations:

ESA	Euratom Supply Agency
IAEA	International Atomic Energy Agency
OECD	The Organisation for Economic Co-operation and Development
(US) DoE	United States Department of Energy
(US) EIA	United States Energy Information Administration
WNA	World Nuclear Association
NA	North America
USEC	United States Enrichment Corporation
NPP	Nuclear Power Plant
PWR	Pressurized Water Reactor
ABWR	Advanced Boiling Water Reactor
EPR	European Pressurised Water Reactor
VVER	Water-Water Power Reactor
SWU	Separative Work Unit
tU	tonne U (= 1 000 kg uranium)

<sup>2</sup> The statistics and data analysis provided by ESA are for information purposes only, and ESA does not bear any legal liability for using them. ESA ensures confidentiality and physical protection of the commercial data.