International and EU developments

As a response to COVID-19, operators of nuclear installations as well as the national regulatory authorities in the EU implemented exceptional measures to maintain essential operations, whilst prioritising nuclear safety. The situation was monitored by the EC DG Energy together with the **European Nuclear Safety Regulators Group (ENSREG)**. Many sources, including the IAEA, the **World Nuclear Industry Status Report**, the OECD and WNA, have reported on the particular instances of COVID-19 impact on the nuclear industry.

The **Nuclear Energy Agency** of the OECD signed a **Memorandum of Understanding with the CANDU Owners Group** for a five-year long cooperation in research and activities related to pressurised heavy water reactors.

The **European Parliament** amended a proposal by the European Commission for a European Union climate law **asking for an increased emissions reductions target of 60% in 2030** (increase from 40%; the Commission proposed at least 55%).

The U.S. Energy Information Administration released in October the **International Energy Outlook 2020.** The report focuses on electricity markets for 2025 and beyond, mainly in India, Africa and Asia. By 2050, the forecast is that global energy consumption increases almost by 50% with Asia consuming about half of the world's energy by that time.

The European Commission Vice-President and the Commissioner for Climate Action Frans Timmermans mentioned that the **European Commission would not hinder the Member States to invest in nuclear energy**. During an online International Energy Agency event on the European Green Deal he stated that the nuclear energy is very costly and he hopes that the decision making process favouring nuclear would be very rational.

The **International Energy Agency** (IEA) of the OECD published in December its first ever **Electricity Market Report** which, according to IEA is "to complement other reports in the Market Report Series on energy efficiency, renewables, coal, natural gas and oil. This report focuses on developments in the world's electricity markets amid the Covid-19 pandemic. It includes an assessment of 2020 trends and 2021 forecasts for electricity demand, supply, capacity and emissions – both globally and by country. Starting in 2021, the IEA will publish a new edition of the report on a half-yearly basis with the latest updates on key developments in global electricity markets." The report projects a 2% fall in the 2020 global electricity demand, with only China seeing the electricity demand increase. In 2021 a modest rebound is expected. As regards nuclear power generation, this is expected to decrease by 20% in 2020.

Developments in the Member States

BELGIUM:

Continuing in its nuclear phase-out plans, ENGIE **Electrabel is reported to build four gas-steam plants totalling 2950MW by 2025**. This would replace the four reactors at Doel, closed by then.

BULGARIA:

Bulgaria signed a **Memorandum of Understanding on strategic cooperation in nuclear energy for civilian purposes with the US,** making plans to build a US-designed reactor at the Kozloduy site look more realistic. The state-owned energy company Bulgarian Energy Holdings is to enter negotiations with US companies developing new nuclear technologies for civilian purposes, including small modular reactors.

Bulgaria`s National Nuclear Security and Support Center and Finland`s VTT signed a Memorandum of Understanding to further develop competences and research opportunities in the field of safe radioactive waste management. According to VTT ""there are a wide-range of lessons learned from Finland's excellent experience in waste management, geological repositories, safety, stakeholder engagement and regulatory requirements that Finland is prepared to share with other countries looking to become the next leaders with us for implementing waste management solutions."

CZECHIA:

The **Czech government plans to guarantee purchases of electricity from the new nuclear power plants**. The bill known as "Lex Dukovany" foresees the 60-year long purchase of the electricity generated by the planned 2030 Dukovany 5 unit. The minister of Economy Havlicek informed that the Czech government already started pre-notification talks with the European Commission to make sure to avoid illegal state aid. The construction of Dukovany 5 will be funded by a loan by Czech government of up to 70% of the total project capital with the remaining 30% funded by the Czech power company CEZ.

ESTONIA:

Fermi Energia planning to build a small modular reactor (SMR) is in **discussions with the municipality of Viru-Nigula concerning the potential location for its reactor**. Fermi Energia also agreed with Vattenfall to expand the ongoing cooperation on the development of its SMR.

Estonian cabinet informed in November that "the government discussed the possibilities of using nuclear energy in Estonia and decided that a **national working group of nuclear energy should be created** to define the nation's positions towards the issue." The group will analyse the feasibility of nuclear power use in Estonia in cooperation with foreign experts. According to the Estonian Prime Minister Ratas, "the introduction of nuclear energy after 2030 is one possible way of increasing Estonia's energy security, sustainability, and competitiveness, as well as reaching the climate goals set for 2050."

FINLAND:

Business Finland, Finnish **government organisation for innovation funding is financing a new SMR development project EcoSMR**. The project led by VTT Technical Center of Finland brings together another nine Finnish organisations with the aim to support the development of small modular reactors known as Finnish Ecosystem for Small Modular Reactors - EcoSMR.

Fortum and MIT began cooperation on techno-economic modelling tool for SMR projects. The 3-year cooperation aims to increase understanding of SMR projects and characteristics.

Finland's Radiation and Nuclear Safety Authority (STUK) notified the authorities in charge of radiation safety in the countries that supplied the uranium for Finnish nuclear power plants of **Finland's intention to begin the final disposal of used nuclear fuel in the mid-2020s**. Normal inspections of nuclear materials cannot be performed once the materials have been finally disposed of, and so procedures related to such inspections must be specified before the initiation of final disposal.

FRANCE:

French regulator **ASN authorised the reception and storage of nuclear fuel at EDF's Flamanville EPR**. The reception of fuel, which will be stored in the pool of the building intended for this purpose, is another step in the sequence leading to the commissioning of Flamanville EPR.

French President **Emmanuel Macron believes in importance of nuclear energy in France**. Although nuclear is to be reduced in its electricity mix to 50% by 2035, a statement was published on Macron's "three convictions" that guide the future of French nuclear power: "Our energy and ecological future depends on nuclear power; our economic and industrial future depends on nuclear power; and France's strategic future depends on nuclear power."

HUNGARY:

The **programme of the Budapest University of Technology and Economics became a part of the International Nuclear Management Academy**, endorsed by the International Atomic Energy Agency. According to IAEA "the International Nuclear Management Academy supports universities to establish and deliver master's degree programmes focusing on technology management for the nuclear sector including nuclear power programmes, nuclear applications, and radiological technologies. It provides guidance for master's programmes that have a specialized focus on the advanced aspects of management and leadership required by the nuclear sector."

Hungary's energy regulatory authority **MEKH issued its permit for the construction of Paks 2**. The authority analysed the security of supply to the electricity grid. The procedures related to the safety of nuclear technology are to be conducted by the Hungarian Atomic Energy Authority HAEA, with the decision expected in the second half of 2021.

LITHUANIA:

IAEA conducted a virtual safety peer review mission in Lithuania. Although there is room for improvement in the area of radioactive waste management, the conclusion is that Lithuania definitely strengthened its regulatory framework for nuclear and radiation safety in recent years.

POLAND:

Poland and US signed a 30-year cooperation agreement towards developing Poland`s civil nuclear energy program. The agreement, worth $18 billion will help Poland decrease the dependence on Russia and improve its energy security.

ROMANIA:

Romania signed an intergovernmental agreement with the U.S. to finance refurbishment of Cernavoda unit 1 and construction of Cernavoda unit 3 & 4, keeping CANDU 6 technology. The U.S. company AECOM will lead the $8 billion project in which Romanian, Canadian, and French companies are involved. In this context Romania also signed a declaration of intent on civil nuclear cooperation with France, companies of which will participate in the works on Cernavoda units.

SLOVAKIA:

Estimates for completion of Mochovce 3 and 4 increased again to now total of EUR 6.2 billion. The initial estimate was EUR2.8 billion in 2008.

SLOVENIA:

Slovenia signed a **Memorandum of Understanding on civil nuclear cooperation** with **the US in December.**

SWEDEN:

Municipality of **Osthammar approved the Swedish final spent fuel repository at Forsmark**. The final decision on the construction license, which SKB applied for in 2011, will be made by the Swedish government.

UNITED KINGDOM[1]:

UK makes **nuclear part of its plan to achieve carbon neutral economy**, by including it in its 10-point plan announced by Boris Johnson. Construction of large scale nuclear plants and small modular reactors will benefit from GBP 525 million funding.

EDF Energy announced its **plan to close Hinkley Point B not later than July 2022**.

… and worldwide

BELARUS:

Rosatom informed in November that the **Ostrovets NPP unit 1 was connected to the grid** and started supplying electricity. In its conclusions on 11 December 2020, the European Council "underlines the importance of ensuring nuclear safety of the Belarusian nuclear power plant Ostrovets and invites the Commission to investigate possible measures preventing commercial electricity imports from third countries' nuclear facilities that do not fulfil EU recognised safety levels".

CHINA:

President Xi Jinping announced at the 75th United Nations General Assembly in September that **China plans to become carbon neutral by 2060.**

CNNC`s Fuqing NPP unit 5 became the world's **first Hualong One reactor connected to grid**. Commercial operation is planned for the end of 2020, with unit 6 following a year later.

Hualong One design (HPR1000) received in November a formal compliance certification from the European Utility Requirements (EUR). The process started in August 2017.

JAPAN:

Japan's Prime Minister Yoshihide Suga announced that his **country plans to become carbon neutral by 2050**. The plan to achieve the goal includes a significant renewable energy construction campaign. Nuclear energy is part of the plan with "maximum priority on safety."

SOUTH KOREA:

South Korea's **Kepco Engineering & Construction Company (Kepco E&C) and Daewoo Shipbuilding & Marine Engineering (DSME) signed a Memorandum of Understanding to develop floating nuclear power plants**. The

[1] UK's withdrawal from the European Union came effective on the 1 January 2021. During the reporting period of this Quarterly Report, UK was still in the transition period prior to the final withdrawal.

agreement is supposed to lead to the development of floating offshore nuclear power plants equipped with Kepco`s small modular 60MWe reactor BANDI-60.

UKRAINE:

After 24 years, **EBRD closed Chernobyl Shelter Fund** after it received no objections from the assembly. The fund was created in 1997 to help Ukraine set-up a temporary shelter (sarcophagus) over Chernobyl's destroyed reactor 4 with the aim for its eventual dismantling and decommissioning.

The **new Interim Spent Nuclear Fuel Storage Facility (ISF-2) at the Chernobyl** plant **received the first canister of spent fuel** in November. ISF-2 is the largest dry-type spent fuel storage facility in the world with a planned operating life of at least 100 years.

Rovno NPP unit 1 was granted a 10-year life extension, following a number of recent upgrades. This is the second 10-year life extension of the unit that began operation in 1980.

USA:

The **US department of Commerce and Rosatom signed a 20-year amendment to the Suspension agreement on uranium** from the Russian federation. The amendment extends the Agreement to 2040 and reduces imports of Uranium from Russia to an average of approx. 17% over the next 20 years.

Uranium production

Global Atomic Corporation of Canada received a mining permit for its Dasa Uranium Project in Niger. Underground mining technology is planned to be used with an output of 4.4 million pounds U3O8 per year in the phase I.

Kazatomprom`s 2020 Q3 production decreased by 23% due to coronavirus pandemic, compared to a year earlier. However, Kazatomprom honoured its contracts from inventory and purchases on the spot market with its sales more than doubled.

Cameco temporarily suspended production at Cigar Lake due to Covid-19, mid-December 2020. The mine would be maintained in a safe state of care with significantly reduced number of personnel. The suspension would cost company between C$8 million and C$10 million per month, which would be expensed directly to cost of sales. Additional costs might be incurred in relation to the purchase of uranium, which is more expensive than its production. The temporary production suspension impacted Cameco`s plans to produce planned 5.3 million pounds U3O8 in 2020.

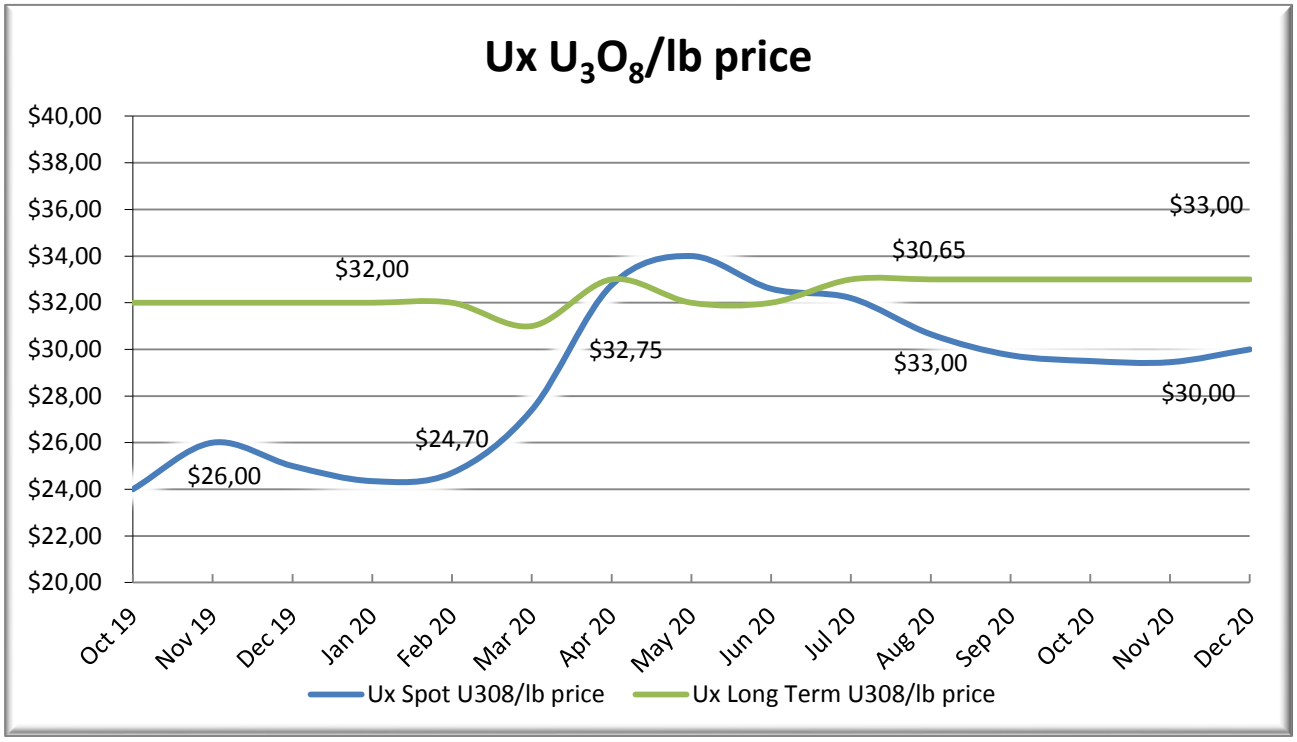
Orano Canada also temporarily suspend production at McClean Lake uranium mill, in a move taken in tandem with Cameco`s suspension at Cigar Lake uranium mine.

Uranium prices[2]

The UX monthly spot uranium price increased by y 1% comparing quarter to quarter and, at the end of December, it accounted for USD 30.00/lb U_3O_8. It was up by more than 20% in an annual comparison.

The UX long term uranium price accounted for USD 33.00/lb U_3O_8 at the end of December which is no change when compared quarter to quarter and more than 3% up in an annual comparison.

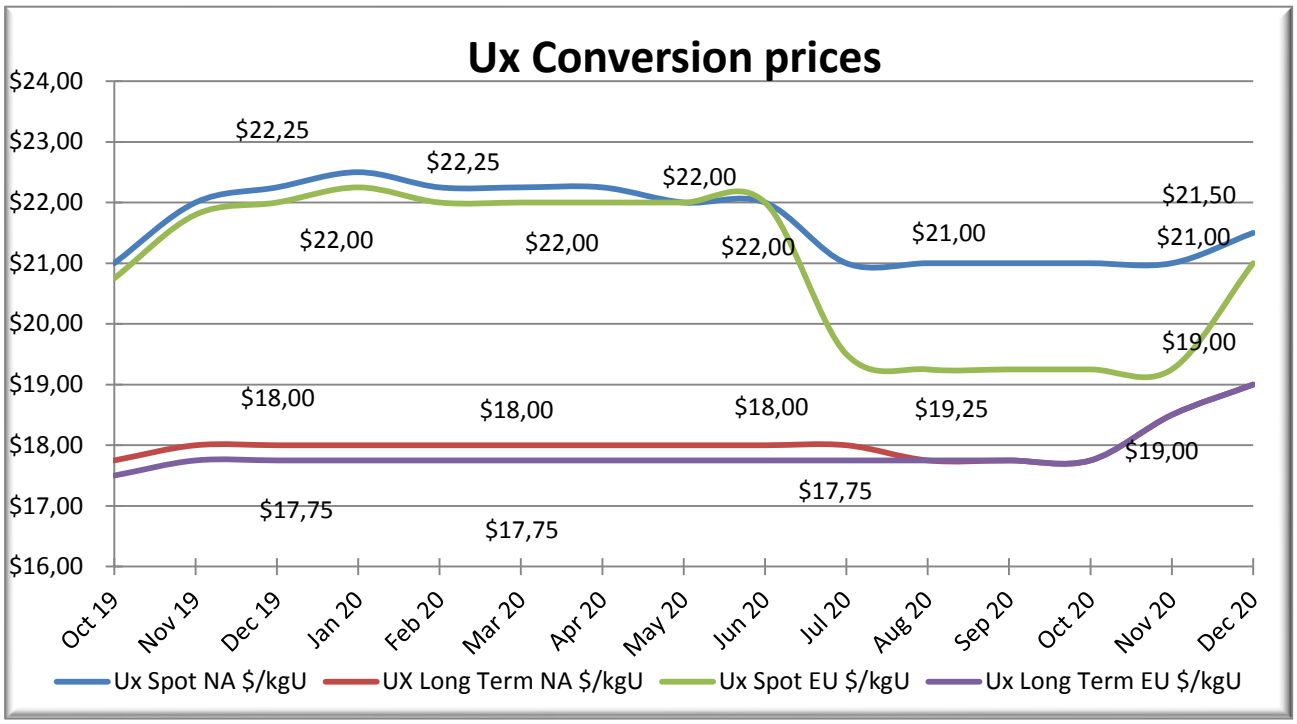
[2] *The market price information in the following chapters: Uranium prices, Conversion and Enrichment is provided with permission of the Ux Consulting Company, LLC (UxC) www.uxc.com. UxC does not bear any legal liability for the use of these data.*



Conversion

Spot conversion price in the European Union increased by 9% and in North America by 2% compared to the previous quarter and amounted to USD 21.00/kg in the EU and 21.50 /kg in North America at the end of December. In an annual comparison, they decreased by 5% in the European Union and by 3% in North America.

UX long term conversion prices amounted to USD 19.00/kg in the EU and in North America, which means increase by 7% in the European Union and in North America, when compared to the previous quarter. They increased by 7% in the European Union and by 6% in North America in an annual comparison.

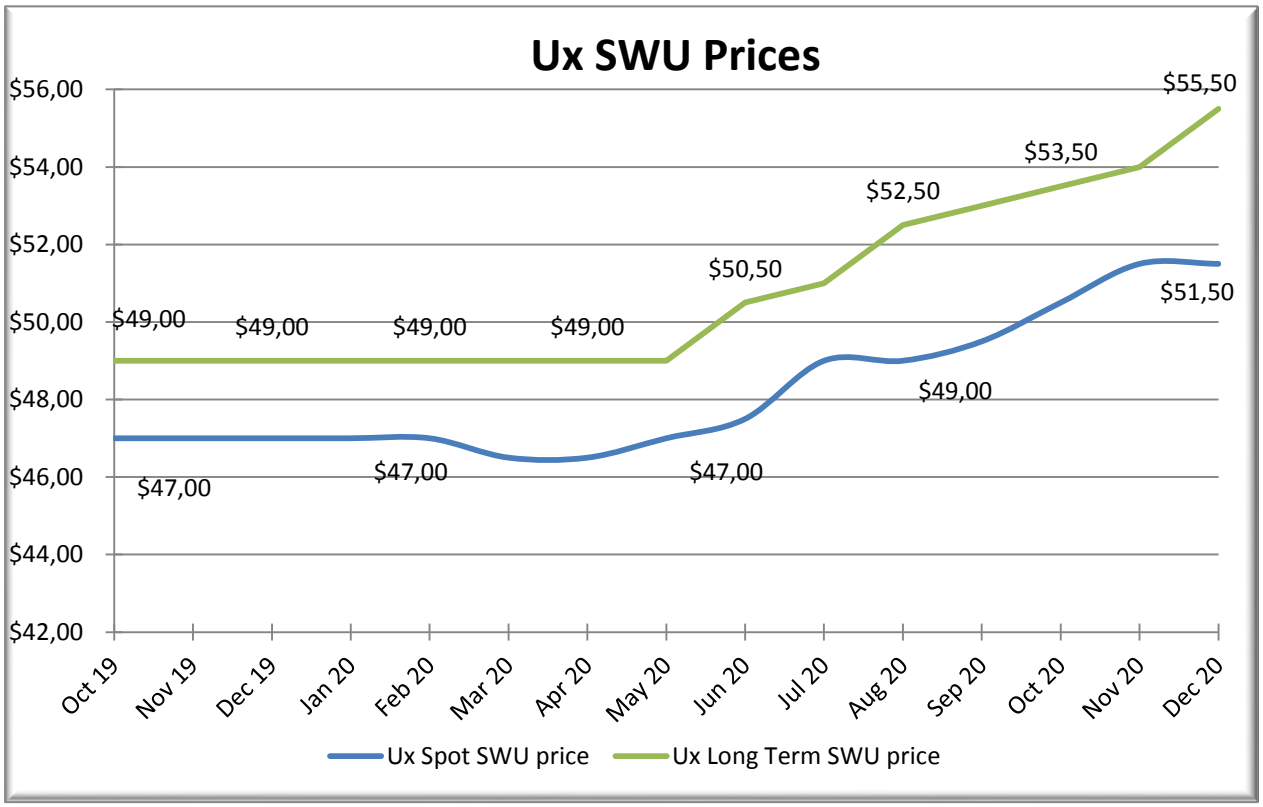


Framatome US opened new $20 million uranium recovery facility at its fuel manufacturing site in Richland, Washington. Advanced processes are used to recover scrapped uranium from manufacturing feed streams and convert the material to uranium dioxide powder to be reused in the fuel fabrication process.

Enrichment

At the end of December 2020, the UX spot SWU price amounted to USD 51.50 per SWU and it increased by more than 5% compared to the previous quarter. It was up by almost 10% in an annual comparison.

The UX long term SWU price amounted to USD 55.50 and it increased by almost 5% compared to the previous quarter and by more than 13% compared to the same quarter of 2019.



Uranium enrichment complex of the **Oak Ridge Gaseous Diffusion Plant has been dismantled** and the area cleaned-up. The operation of the very first historic removal of a uranium enrichment complex which started in late 1990s transformed the site into a multi-use industrial park that is providing new economic opportunities to the community.

Fuel fabrication

Westinghouse and Energoatom signed a contract for the supply of VVER-440 fuel for the Rovno NPP. Westinghouse already supplies VVER-1000 fuel for several Ukraine`s NPPs. The companies also signed a letter of intent to facilitate local production of fuel assembly components by Atomenergomash in Ukraine.

Framatome informed that its 3D-printed nuclear fuel elements completed the first irradiation cycle in operation at Gösgen NPP, Switzerland. Components, installed for a five-cycle program will be further analysed to confirm real operating conditions behaviour.

Russia's Siberian Chemical Combine produced more than 1000 experimental fuel elements based on mixed uranium-plutonium nitride fuel during its participation in the Proryv (Breakthrough) project since 2014. Fuel elements are tested in the BN-600 fast reactor at the Beloyarsk NPP. The data will serve the fuel element design planned to be used for the production of fuel rods for the BREST-OD-300 lead-cooled fast neutron reactor.

Nuclear medicine

The **IAEA agreed to work with the Institute for Nuclear Sciences Applied to Health of University of Coimbra, Portugal (POR-ICNAS) in the area of radioisotopes and radiopharmaceuticals production**. According to IAEA, POR-ICNAS will be the first IAEA Collaborating Centre in the field of cyclotron radiopharmaceutical production as well as the first one dedicated entirely to field of radiopharmacy.

Concluded natural uranium contracts in the EU[3]

Quarter	ESA quarterly spot uranium price EUR/kgU	ESA quarterly spot uranium price USD/lb U_3O_8	ESA All Users quarterly spot uranium price EUR/kgU*	ESA All Users quarterly spot uranium price USD/lb U_3O_8*	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 Q4	**-**	**-**	**-**	**-**	**4**	**7**	**84**
2020 Q1	**-**	**-**	**-**	**-**	**1**	**6**	**63**
2020 Q2	**-**	**-**	**-**	**-**	**4**	**9**	**65**
2020 Q3	**-**	**-**	**64.52**	**29.26**	**3**	**5**	**79**
2020 Q4	**-**	**-**	**-**	**-**	**4**	**7**	**69**

* prices converted with use of ECB reference exchange rate (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)

[3] *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.*