

EURATOM Supply Agency

Nuclear Fuel Market Observatory Sector

● Quarterly Uranium Market Report 2nd Quarter 2019

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International and EU developments

In May 2019, the Euratom Supply Agency (ESA) Advisory Committee Working Group “HALEU supply beyond 2030/40” has completed its work and the resulting [report](#) has been published. The report provides an updated view of high-assay low-enriched uranium (HALEU) needs, including potential global demand. It also takes account of developments in recent years, specifically realistic scenarios for the conversion of high enriched uranium (HEU) fueled high-performance research reactors, new concepts for power reactors and fuel design, the current geopolitical situation, and issues relating to the shipping and transport of HALEU. It also addresses the pressing issue of US stocks of HEU available for downblending to HALEU, since these are only sufficient to cover needs until 2030-2040. The core part of the report presents a business model to build European capacity for the production of metallic HALEU, based on three different market demand scenarios. By providing an overview of the current situation while looking ahead to the future, this report contributes to European and international discussion on the future secure supply of HALEU and provides policymakers with a basis for making informed decisions on related initiatives.

On 28 May, the International Energy Agency (IEA) issued its first [report](#) in nearly 20 years which addresses nuclear power, “Nuclear power in a clean energy system – a key source of low-carbon power”. The report highlights the uncertain future of nuclear power in traditional advanced economies, such as Western Europe, North America, and Japan, and notes that the nuclear fleet in advanced economies is 35 years old on average, and many of these units are nearing the end of their lifetimes.

According to the statements of a European Commission official speaking at the European Nuclear Regulators Safety Group 2019 conference in early June in Brussels, European nuclear industry supply chain is now effectively non-existent and could lead to foreign contractors being used if there were to be any significant new nuclear construction in Europe in the next decade.

Speaking at Foratom's *Nuclear in a Changing World* conference organized in Bucharest at the end of June, the same European Commission official stated that life extensions of the existing EU nuclear power fleet would cost around 50 billion EUR over the next 10 to 20 years., while between 350 and 450 billion EUR would be required for new nuclear construction in the EU over the same period. As for the management of nuclear waste within the EU by 2050, it would most probably require 150 billion EUR of expenditure.

For the first time, all EU Member States have prepared draft integrated National Energy and Climate Plans (NECPs). The NECPs play a key role in the EU energy governance system to ensure that Member States join forces and deliver on climate objectives together. On 18 June, the European Commission issued the Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions “[United in delivering the Energy Union and Climate Action - Setting the foundations for a successful clean energy transition](#)”. This Communication analyses the draft NECPs and looks at their aggregated effects in reaching the EU Energy Union objectives and 2030 targets. It complements the detailed analyses at national and European level, and the specific recommendations addressed to each Member State. Together these will help Member States finalise their NECPs by the end of 2019. Energy security is an important dimension of the Energy Union and hence the NECPs. Diversification of supply, import sources and routes are key aspects of energy security. In its communication, the Commission recommends to those Member States - which have nuclear energy as part of their energy mix - to introduce in their NECPs policies to maintain adequate capacities in all the parts of the nuclear supply chain and to ensure security of fuel supply.

On 26 June, representatives from the nuclear industry issued a [manifesto](#) outlining what steps need to be taken in order to achieve a decarbonised Europe by 2050. According to the publication, meeting the EU's ambition to decarbonise its economy will require significant investment in both the long-term operation of the existing fleet and the construction of substantial new nuclear capacity (around 100GW of nuclear new build). Both are achievable if EU institutions, Member States and the European nuclear industry work together in partnership.

In late June, ESA issued its [2018 Annual Report](#), which provides an update on nuclear energy in the EU, nuclear fuel developments in the EU and around the world, and the Agency's current and future activities. The EU nuclear fuel overview is based on information provided by the utilities or their procurement organisations in an annual survey covering the following topics: fuel loaded, future fuel requirements, quantities and origins of natural uranium, conversion services and separative work and acquisition prices for natural uranium, future contracted deliveries and inventories. Following an analysis of the information gathered from EU utilities ESA concludes that, in the short and medium term, the needs of EU utilities for both natural uranium and enrichment services are well covered. However, the 100% reliance on a single supplier for VVER fuel fabrication remains a matter of concern. ESA recommends that utilities cover most of their current and future requirements under multiannual contracts from

diverse sources of supply. In line with this recommendation, deliveries of natural uranium to the EU under multiannual contracts accounted for 96% of total deliveries in 2018.

Developments in the Member States

BULGARIA:

On 23 May, it was reported that the Bulgarian government had initiated the selection process for a strategic investor in the Belene NPP project, giving potential investors 90 days to file applications to participate in the project.

CZECHIA:

Aiming to take a major role in fulfilling Czechia's 2030 European Union climate change commitments, ČEZ announced at the end of May its new strategy relating to the country's domestic power market. The main priorities listed include maintaining at high standards the existing nuclear capacity and adding new nuclear units, as well as launching renewable investments in the country and investing in digitalization and delocalized energy initiatives and energy services across the region.

ČEZ also expects to prepare the selloff of its wind, coal and gas generation assets in Bulgaria, Poland, Romania, and Turkey.

FINLAND:

On 15 April, Fennovoima officials declared that the company was confident it would receive the construction license for Unit 1 at the Hanhikivi NPP in 2021. The plant should start commercial operation in 2028.

Teollisuuden Voima Oyj (TVO) has declared having found a solution to solve by this summer some of the pending issues it must still resolve before the regulator will allow fuel loading to proceed. TVO was granted an operating licence by the Finnish government for Olkiluoto 3 on 7 March. For fuel loading, TVO still requires a separate authorisation from the country's Radiation and Nuclear Safety Authority (STUK).

According to an official government document issued in early June, the country aims towards carbon neutrality by 2035 and would welcome life extensions of existing reactors, with the support of STUK. Production of electricity and heat must be almost emission-free by the end of the 2030s, driven by the removal of energy tax relief for heavy industry and the introduction of tax benefits to purchase heat pumps, offshore wind turbines and electricity storage systems.

FRANCE:

On 30 April, official reports from the Ministry of Ecological and Inclusive Transition indicated the issue of a draft law on climate and energy, which includes the objective of zero emissions by 2050, as well as France's previously stated goal of reducing nuclear energy's role from the current level of more than 75% of electricity generation to 50% of generation by 2035. To achieve this reduction, 14 existing reactors will need to close between 2020 and 2030.

HUNGARY:

According to media reports from 9 May, the Ministry of Innovation and Technology published its National Energy and Climate Change Plan, outlining the country's plans to reduce its greenhouse gas emissions by at least 52% by 2050 compared to 1990 levels. To that end, Hungary first intends to increase the share of renewable energy in its energy mix to 20% by 2030 from 14-15% today, largely from biomass. The long-term energy strategy also emphasizes the importance of nuclear energy to decarbonize the energy sector.

In June, a ceremony was held at the construction base of the Paks II NPP to mark the start of construction works of the first buildings at the plant site, which will host two new VVER-1200 reactors (Units 5 & 6).

POLAND:

Government officials from the U.S. and Poland signed on 12 June a Memorandum of Understanding on civil nuclear cooperation, paving the way for a long-term partnership to develop the country's nuclear power infrastructure.

ROMANIA:

Early May, Nuclearelectrica and China General Nuclear Power (CGN) signed a preliminary investors' agreement in Bucharest for the continuation of the Cernavoda-3 and -4 projects. The agreement envisages the establishment of a 51/49 joint venture between CGN and Nuclearelectrica, JVCO, which should be the only technical and operational platform for the subsequent development of the project.

SNC-Lavalin, which acquired rights to the Candu design when it bought Atomic Energy of Canada Ltd. from the Canadian government, has been mentioned in Romanian media reports as the potential engineering and procurement supplier to the project.

SLOVAKIA:

According to official company statements released on 7 May, Slovenské Elektrárne has decided to delay, under political pressure from neighbouring Austria, the startup of Units 3 & 4 at the Mochovce NPP. As such, Mochovce-3 would be delayed until at earliest November 2019 and potentially as late as March 2020.

SWEDEN:

End of June, Units 1 & 2 at the Forsmark NPP in Sweden had reportedly received safety approvals to operate beyond their 40-year planned lifetimes, to 2028. The two reactors, which have a combined capacity of about 2 GWe, were awarded 10-year lifespan extensions by the Swedish Radiation Safety Authority (SSM).

Plant owner/operator Vattenfall aims to keep the two units operational for ~50 years in total since starting the units up in 1980 and 1981, respectively.

UNITED KINGDOM:

On 3 May, U.S. DoE NNSA and the Nuclear Decommissioning Authority (NDA) completed a multi-year effort to move excess HEU from the UK to the U.S. for down-blending into low enriched uranium (LEU), by removing nearly 700 kg of HEU.

On 7 June, URENCO Group officially opened their Tails Management Facility (TMF) at the Capenhurst enrichment plant near Chester, used to deconvert depleted UF₆ to U₃O₈ and hydrogen fluoride (HF) vapour.

On 27 June, the country officially passed a series of laws to end its contribution to global warming by 2050. Accordingly, the UK will need to bring all its greenhouse gas emissions to net-zero by 2050, compared with the previous target of at least 80% reduction from 1990 levels.

... and worldwide

BELARUS:

Rosatom's engineering division announced on 5 April that it had started the first stage of the commissioning activities for Unit 1 of the Ostrovets NPP in Belarus, which includes hydraulic testing and circulation flushing of the reactor installation. Belarus' first NPP will consist of two Russian Generation 3+ VVER-1200 reactors with a total capacity of 2,400 MWe.

CANADA:

The Canadian Nuclear Safety Commission received on 20 March the first licence application for a small modular reactor from Global First Power, supported by Ontario Power Generation and Ultra Safe Nuclear Corporation. The proposed Micro Modular Reactor plant would host a 15 MW (thermal), 5 MW (electrical) high-temperature gas reactor, drawing on operational experience from reactors developed by the USA, Germany, China and Japan. If and when the project description is assessed as complete, it would then become available for public comment as part of an environmental assessment process.

CHINA:

On 28 May, EDF officials reported that Unit 2 of the Taishan NPP attained its first sustained chain reaction. The unit is expected to enter commercial operation by the end of 2019. Taishan 1 and 2 are the first two EPR design reactors to be built in China.

RUSSIA:

On 14 June, Rosatom reported that its VVER-TOI nuclear reactor (a typical design of an optimized and computerized VVER Power Unit, an evolutionary development of the VVER1000 and VVER-1200 designs) had undergone an extensive design compliance review by the European Utility Requirements (EUR) experts, who concluded that it complies with modern views on NPP safety and efficiency. The EUR consists of 15 operating organizations that represent Europe's major electricity producers, and its requirements are aimed at developing standard designs of NPPs based on safety, power generation stability, and electricity costs.

SOUTH-KOREA:

On 4 June, the country's Ministry of Trade, Industry and Energy issued its third long-term energy roadmap to 2040 with specific targets as regards consumption, production, system, industry, and infrastructure. Under the roadmap, a total decrease in energy consumption by 18.6% to 171.8 million tonnes of oil equivalent (toe) is envisaged by 2040. Regarding nuclear energy, the plan maintains the existing policy to decommission reactors once they reach 40 years of operation, and to not build any more reactors apart from the current four units under construction.

TAIWAN:

According to media reports of 7 May, the country's legislative body had passed an amendment eliminating the previous national requirement calling for all NPPs on the island to halt operations in 2025. Taiwan's government, however, continues to oppose operating its NPPs beyond 2025.

Uranium production

Cameco Corp. reported it had filed a National Instrument (NI) 43-101 Technical Report for its McArthur River uranium mine in northern Saskatchewan, which shows that the company's estimated 70% share of mineral reserves translates to a mine life of 23 years. The mine represents a significant source of feed material for Cameco's wholly-owned Key Lake mill and is forecast to produce a further 388 million packaged lbs U₃O₈.

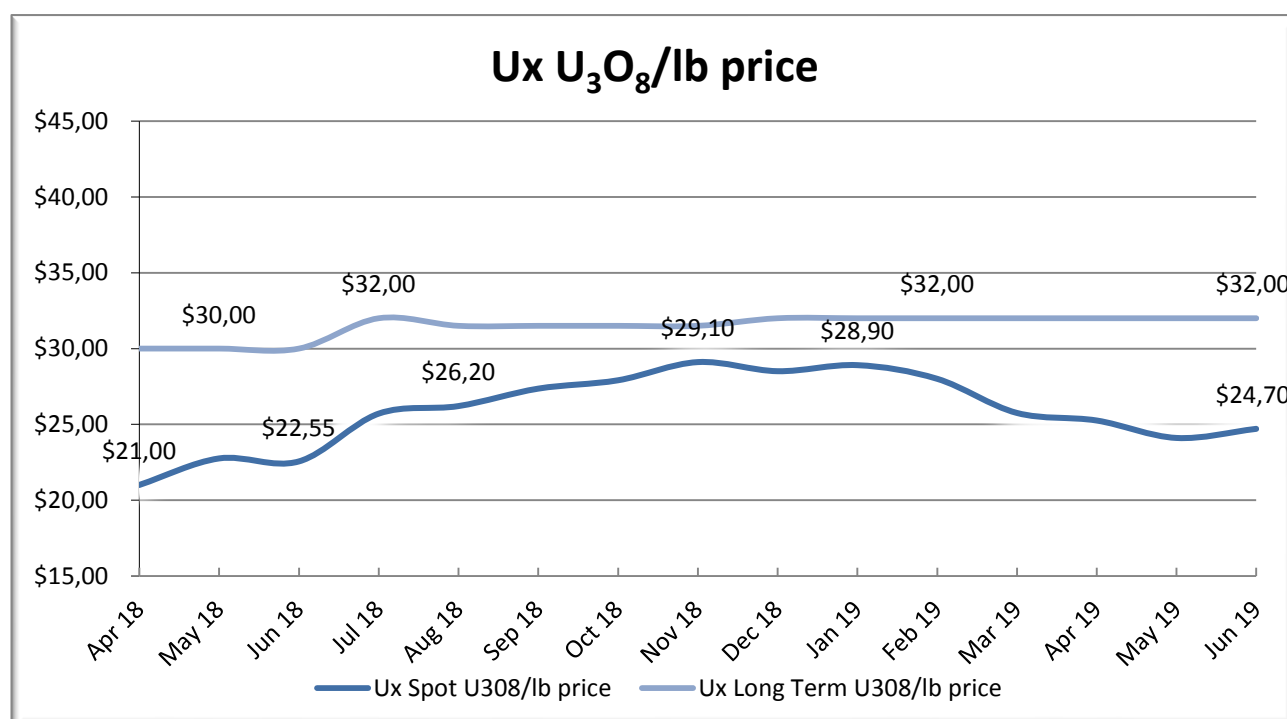
On 16 May, the U.S. Energy Information Administration (EIA) released its Domestic Uranium Production [Report](#) for 2018, which provides detailed data on U.S. uranium production activities from 2003 through 2018. U.S. uranium mines produced 0.7 million lbs U₃O₈ in 2018, 37% less than in 2017, from six in-situ recovery (ISR) mining operations and one conventional mill.

The Uranium Corporation of India Limited (UCIL) has announced it had received the Atomic Energy Commission's approval of 13 new uranium projects. A large uranium resource has been established at Lambapur-Peddagattu region in the Nalgonda district of Telengana, and UCIL proposes setting up an open pit and three underground mines with a central plant about 48 km from the mine site.

Uranium prices¹

In the second quarter of 2019, the UX monthly spot uranium price decreased by more than 4% comparing quarter to quarter and, at the end of June, it accounted for US\$24.70/lb U₃O₈. It was up by more than 9% compared to the second quarter of 2018.

The UX long term uranium price for the second quarter of 2019 accounted for US\$32.00/lb U₃O₈ at the end of June which means no change when compared quarter to quarter and almost 7% up compared to second quarter of 2018.

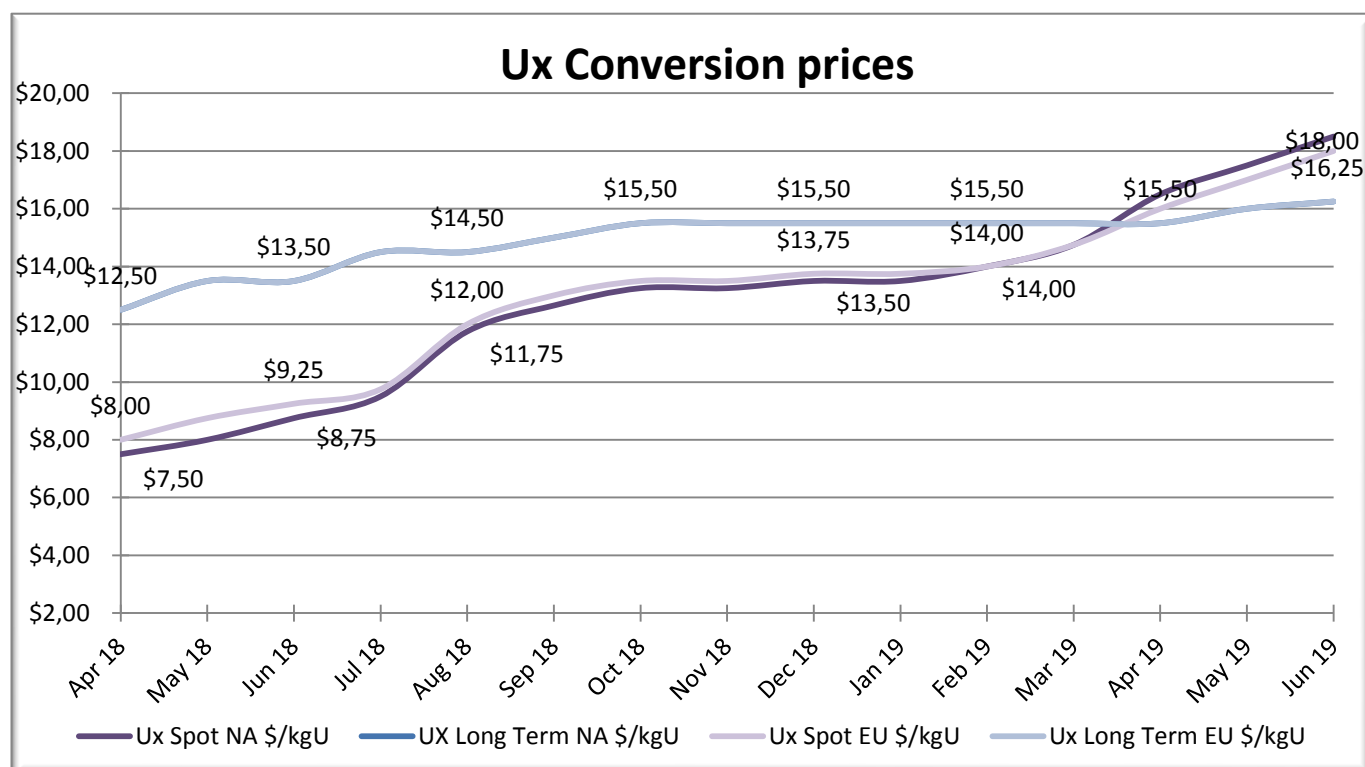


¹ The market price information in the following chapters: Uranium prices, Conversion and Enrichment is provided with permission of the UxC, LLC (www.uxc.com). UxC does not bear any legal liability for the use of these data.

Conversion

In the second quarter of 2019, UX spot conversion prices in the European Union and in North America increased by 22% and 25%, respectively, compared to the previous quarter and amounted to US\$18.00/kg in the EU and US\$18.50/kg in North America at the end of June. They were reported higher than UX long term conversion prices. In an annual comparison, they increased by 95% and 111%, respectively.

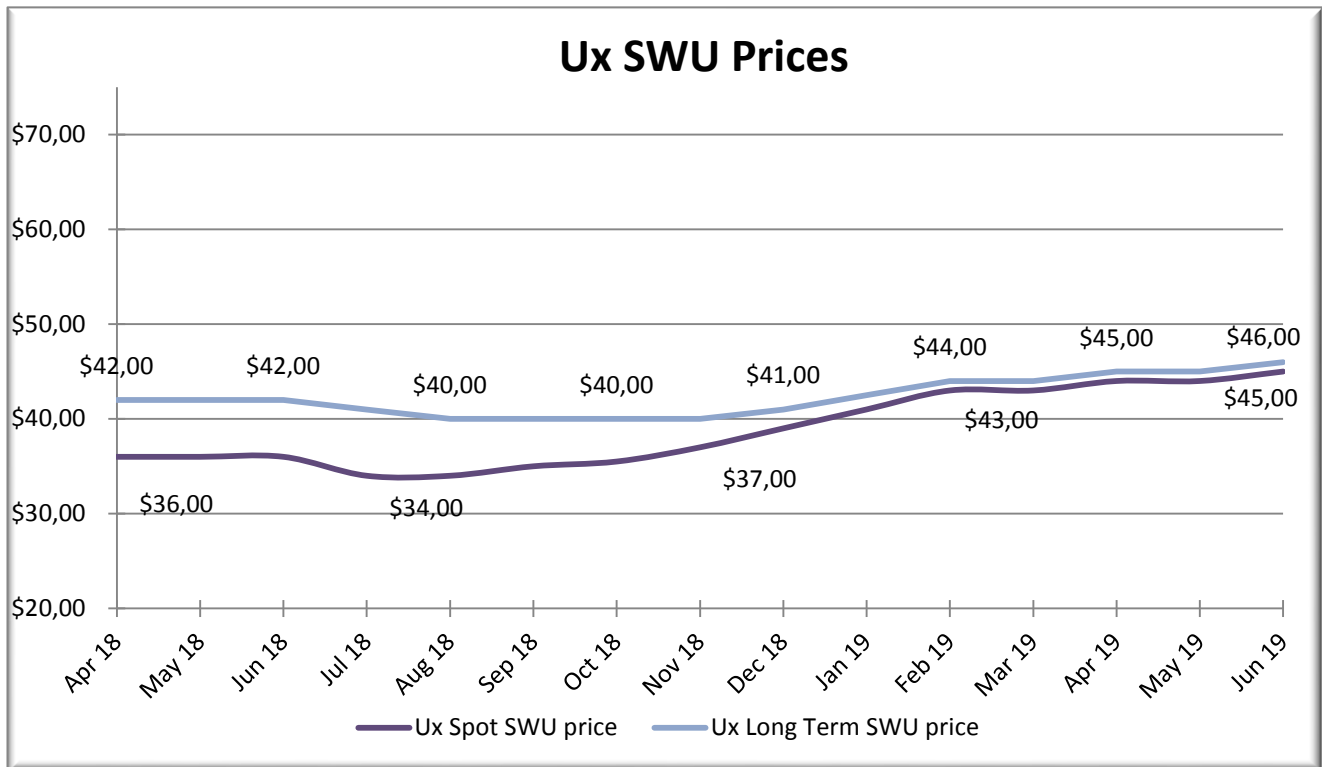
UX long term conversion prices amounted to US\$16.25/kg both in the EU and North America, which was 5% up compared to the previous quarter and increased by 20% in an annual comparison.



Enrichment

At the end of June 2019, the UX spot SWU price amounted to US\$45.00 per SWU and it increased by more almost 5% compared to the previous quarter. It was up 25% in an annual comparison.

The UX long term SWU price amounted to US\$46.00 and it was up by almost 5% compared to the previous quarter and increased almost 10% compared to the second quarter of 2018.



Fuel fabrication

Framatome announced on 5 April that its GAIA fuel assemblies, nuclear industry's first full-length Enhanced Accident Tolerant Fuel, had been delivered and loaded into Unit 2 at Georgia Power's Vogtle NPP during the spring refuelling outage. Framatome fabricated the fuel assemblies at its fuel manufacturing facility in Richland, Washington, as part of a 2017 contract with Southern Nuclear.

Nuclear medicine

NorthStar Medical Radioisotopes has signed a contract with the Belgian company Ion Beam Applications for the purchase of up to eight Rhodotron TT300 HE electron beam accelerators, to be used to expand and enhance its capabilities to produce non-uranium based Mo-99.

The city of Janesville, Wisconsin, has transferred a 91-acre parcel of land to SHINE Medical Technologies for the construction, due to start in May, of its US medical isotope production facility.

According to statements released in early April by the Australian Nuclear Science and Technology Organisation (ANSTO), work on the Synroc plant destined to treat waste from the production of Mo-99 is expected to be completed in early 2020. In June, the ANSTO Nuclear Medicine facility received a regulatory licence allowing it to move to full production of Mo-99, the limited manufacturing of which had already begun in April.

On 31 May, the U.S. DoE and a subsidiary of Centrus Energy Corp., officially signed a contract to facilitate the demonstration of High Assay Low Enriched Uranium (HALEU) production to support DoE's R&D activities and programs. Currently, there are no U.S. facilities that can produce HALEU on a commercial basis.

Concluded natural uranium contracts in the EU²

During the second quarter of 2019, ESA processed 55 transactions, including contracts, amendments and notifications on the front-end activities. Between April and June, European utilities concluded 2 new spot natural uranium supply contracts (including purchases, sales, exchanges and loans) and 2 new long term contracts.

Quarter	ESA quarter-ly spot uranium price EUR/kgU	ESA quarter-ly spot uranium price USD/lb U ₃ O ₈	ESA All Users quarterly spot uranium price EUR/kgU*	ESA All Users quarterly spot uranium price USD/lb U ₃ O 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***
2018 Q3	-	-	61.20	23.53	1	-	115
2018 Q4	62.39	27.39	55.35	24.30	8	18	75
2019 Q1	-	-	65.33	28.54	8	10	87
2019 Q2	-	-	-	-	2	3	55

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)

² 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.