

CONTENTS

[Back to contents](#)

ROSATOM NEWS

[Cross-Cutting Green Agenda](#)[Submersion in Hydrogen](#)

ROSATOM GEOGRAPHY

[Tianwan, Xudabao Enter Construction Phase](#)

TRENDS

[Metals: Shortage Foretold](#)

TURKEY

[Atom Stimulates Turkish Economy](#)



Rosatom DG Alexey Likhachev

Cross-Cutting Green Agenda

Rosatom initiates and actively contributes to eco-friendly projects. The Russian nuclear corporation produces carbon-free energy at its nuclear plants and wind farms, decommissions hazardous dump sites and industrial facilities, and strives for worldwide recognition of nuclear energy as a sustainable source of electricity.

Russia has recognized the significance of nuclear energy and put it on the list of clean and sustainable technologies. Speaking at the plenary session of the 9th Neva International Environmental Congress, Rosatom Director

General Alexey Likhachev quoted the figures showing that global CO₂ emissions would grow by more than 2 billion tons a year if the existing 450 GW of installed nuclear capacity were replaced with hydrocarbon sources of energy. This is almost as much as all the forests on the Earth absorb every year, about 2.5 tons per annum.

Russia has long recognized the value of nuclear energy — it is now included in the government-approved list of eco-friendly and sustainable economic activities. National government agencies are busy drafting laws and regulations related to climate and sustainable finance, yet there is still much left to be done to harmonize Russian and international criteria, metrics and mechanisms.

Despite being a global environmental trendsetter, Europe has not come to a definitive

ROSATOM NEWS

[Back to contents](#)

conclusion about nuclear. **“Unfortunately, discussion in the European Union and elsewhere in the world is still underway, so our essential task is to facilitate the worldwide recognition of nuclear as a clean energy source that meets the sustainable development goals,”** Alexey Likhachev stressed.

“If here, in Russia, we think ourselves to be climate positive, but importers of our products, primarily the EU, do not consider nuclear a low-carbon energy source, then our exporters will not be able to leverage the resources we have,” explains Polina Lion, Chief Sustainability Officer at Rosatom.

It should be noted that Rosatom with its wind generation projects is already on track building sustainable supply chains. Rosatom’s wind division NovaWind sells electricity produced at its wind farms to Russian exporters and international companies and is working on a procedure for issuing ‘certificates of origin’ that will confirm a non-carbon origin of electric power consumed.

Cleanup on a commercial scale

Another Rosatom’s subsidiary Federal Environmental Operator (FEO) takes part in a number of environment protection and conservation projects initiated by the Russian government.

The closest to completion is a municipal waste disposal site in Chelyabinsk. The site has been reshaped, with gas and effluent collection and treatment systems and a protective screen installed, and then covered with soil to turn into a green hill. The project will be completed by September, and the site will be transferred to local authorities.



According to Andrey Lebedev, Director for Environmental Programs at Rosatom, a waste treatment plant was piloted at a hazardous waste landfill site near Krasny Bor, Leningrad Region. After a multi-stage treatment, liquid wastes are turned into a dry geocomposite material and water, which is clean enough to be used in fish ponds. Tests conducted by an independent laboratory show that the waste treatment plant does its job well.

In Usolye-Sibirskoye, FEO is developing a rehabilitation plan for UsolyeKhimprom, a shut-down chemical plant. The company also holds consultations about the Baikalsk Pulp and Paper Mill with the regulator and researchers from the Russian Academy of Sciences and is preparing to conduct a feasibility study and test the proposed recovery technology.

According to Maksim Korolkov, First Deputy Director for Environmental Projects at FEO, the primary task is to stop accumulation of hazardous industrial waste and eliminate the accumulated damage.

Accumulation of hazardous waste and formation of landfills may be prevented using principles of circular economy with waste fully recycled. A transparent information platform

ROSATOM NEWS

[Back to contents](#)

might also help, and FEO has already created one. About 60 Russian regions and hundreds of industrial facilities submit information to the Hazard Class I and II Waste Accounting and Monitoring System, which is now in its pilot operation phase. The system is expected to be commissioned in the fourth quarter of this year. The Russian nuclear corporation is also working to build infrastructure for the circular economy. Four of its plants are converted, and another three under construction, to process waste and produce mercury, glass, construction materials and other goods.

Federal Environmental Operator (FEO)

is Rosatom's organization in charge of waste management. FEO provides radioactive waste management, nuclear legacy elimination, site rehabilitation and radiological monitoring services. In its capacity of a Russian federal waste operator, the company is authorized to handle hazard class I and II waste.

NovaWind consolidates Rosatom's wind generation assets and is responsible for its wind energy strategy.

ROSATOM NEWS

[Back to contents](#)


Submersion in Hydrogen

In the second quarter of the year, Rosatom signed several agreements on the hydrogen economy. These partnerships with high-tech companies and prospective customers are among the first important steps in the transition to a new fuel, which is seen as a cleaner alternative to hydrocarbons.

In Sakhalin

In late April, Rosatom's subsidiary Rusatom Overseas signed three agreements aimed at establishing a hydrogen economy in Sakhalin.

On April 22, the company signed a trilateral memorandum of understanding with the industrial gas manufacturer Air Liquide and the Sakhalin government. The purpose of the memorandum is to study opportunities for the parties to set up production of low-carbon hydrogen in Sakhalin.

It is assumed that the island will be an experimental ground for achieving carbon neutrality in Russia. **"We plan to finalize a fea-**

sibility study and draft initial documents for the project by the end of 2021 and then make the most efficient decision about the planned hydrogen output. It is expected to range from 30 to 100 thousand tons per annum," President of Rusatom Overseas Evgeny Pakermanov said.

In his turn, Valery Limarenko, Governor of the Sakhalin Region, gave his assurances that local authorities would streamline administrative processes and minimize the time for obtaining construction permits, incorporation licenses and cadastral certificates.

On the next day, April 23, Rusatom Overseas signed a memorandum of understanding and cooperation with TMH Energy Solutions, a subsidiary of Russia's leading rolling stock manufacturer TransMashHolding. The parties intend to build fueling stations and other infrastructure in Sakhalin to enable the operation of hydrogen-powered trains. The second joint task is to participate in the operation of hydrogen transport in Moscow as a developer, supplier of fuel cells, and an owner of fueling stations. (For information about the relations between the two companies see below).

On April 23, another agreement to create and develop a hydrogen cluster was signed. The Ministry for the Development of the Russian Far East and Arctic, the Government of Sakhalin Region, and Rosatom signed a document providing for construction of a hydrogen production facility, building a supply chain for the domestic and external markets, and setting up a competence center for hydrogen and clean energy technology at the Sakhalin State University.

According to Rusatom Overseas, Sakhalin-produced hydrogen has good prospects of

ROSATOM NEWS

[Back to contents](#)

being exported to Japan and South Korea, which also work on establishing a hydrogen economy.

With EDF

In late April, Rosatom and EDF (France) signed an agreement on the implementation of clean hydrogen projects. The two companies plan to join their efforts in decarbonizing transport and industry in Russia and Europe. **“Rosatom works consistently to develop carbon-free energy sources and goes beyond its extensive competencies in nuclear energy. We aim to become a key player in the hydrogen production, storage, transportation and consumption chains, which are currently taking shape. The hydrogen economy has much potential as an international playing ground in the context of global decarbonization. I am sure that our partnership with EDF will create strong synergies and help us carry out joint hydrogen projects in Russia, France and all over the world,”** said Kirill Komarov, Rosatom’s First Deputy Director General for Corporate Development and International Business. **“The agreement with Rosatom, our long-standing partner in Russia and a key player in the clean hydrogen market, shows clearly EDF’s intentions to deploy a new energy model with the lowest CO2 emission in every country and region where we operate,”** Beatrice Buffon, Executive Director in charge of EDF’s International Division, supported her colleague.

At SPIEF

More agreements were signed at the Saint Petersburg International Economic Forum in early June. The partnership between Rusatom



Overseas and TransMashHolding resulted in plans to acquire a stake in TMH Energy Solutions by Rusatom Overseas. The term sheet for the acquisition was signed at SPIEF, with the deal to be closed by the end of this year.

In addition, Rusatom Overseas signed a memorandum of understanding with Metalloinvest, a major Russian steel maker, and Air Liquide. The purpose of the document is to assess technical and commercial aspects of hydrogen production at Metalloinvest production facilities in the Belgorod and Kursk Regions (Russia). The production technologies to be considered are electrolysis and steam methane reforming with carbon capture. The expected amount of hydrogen to be consumed by Metalloinvest plants is up to 150 thousand tons per annum. According to Metalloinvest CEO Nazim Efendiev, the

Rusatom Overseas is responsible for the promotion of Rosatom’s turnkey solutions for nuclear power plants and nuclear science and technology centers on international markets. The company is also an integrator for hydrogen economy projects.

ROSATOM NEWS


[Back to contents](#)

company is already prepared to upgrade its equipment so that hydrogen will make up 30% of reducing gases used in the production process. In the long term, the company might fully replace all other reducing gases with hydrogen.

Global Scale

According to the estimates of Rosatom Overseas, the global demand for hydrogen is about 74 million metric tons, including 5 million tons in Russia. Petrochemical companies are key consumers of hydrogen. Production of ammonia and methanol accounts for up to 70% of the total consumption. Steam methane conversion is the cheapest and thus most widespread hydrogen production technology,

but European regulators concentrate their efforts on increasing the share of hydrogen obtained by electrolysis. Hydrogen obtained from natural gas with CO₂ captured is also considered acceptable.

Rosatom plans to develop a hydrogen economy not only in Sakhalin, but in Western Russia as well. One of its projects provides for the production of hydrogen by electrolysis at nuclear power plants, and the other at wind farms. Building new wind farms and using their energy in hydrogen production is a potential pattern for cooperation with European countries. Rosatom sees its role in those projects as that of a co-investor, technology partner and hydrogen supplier. 

[To the beginning of the section](#)



Tianwan, Xudabao Enter Construction Phase

Today, we have a good reason to tell our readers about China as mid-May saw the launch of construction at two nuclear plants, Tianwan and Xudabao. Large-scale power projects are not, however, the only focus of interest for Russia and China, two major players of the global nuclear market.

Official kickoff

President of Russia Vladimir Putin and President of China Xi Jinping gave the go-ahead to

the construction at Tianwan and Xudabao via a video link. The new units are yet another milestone in the cooperation between the two countries.

General contracts for the construction of four power units, two at Tianwan and two at Xudabao, were signed in 2019. According to the contracts, Rosatom will design nuclear islands and supply key equipment and fuel for the Tianwan units. At Xudabao, the Russian nuclear corporation will deliver the same scope of work and also provide design supervision, installation and commissioning services. Commissioning of the four units is scheduled for 2027–2028.

The new units are the third stage of cooperation between Russia and China in commercial nuclear power generation. The initial stage

ROSATOM GEOGRAPHY

[Back to contents](#)


included construction of the first two units at Tianwan (commissioned in 2006 and 2007). At the second stage, which started in 2010, Rosatom and China National Nuclear Corporation (CNNC) signed a general construction contract for Units 3 and 4. They were commissioned in 2017 and 2018. **“The Tianwan nuclear power plant operates reliably for the good of the Chinese people and makes a substantial contribution to China’s energy security. The power units built with input from Russia have generated more than 270 billion kilowatt-hours of electricity,”** said Rosatom Director General Alexey Likhachev.

He took part in the kickoff ceremony while visiting Atom mash, part of Rosatom’s power engineering division AtomEnerg oMash (AEM) and a manufacturer of key machinery and equipment for the Chinese nuclear power plants. The equipment is being produced ahead of schedule. **“Despite a backlog of orders at Atom mash and coronavirus restrictions, the equipment for the Chinese nuclear plants is manufactured faster than set out in the contracts,”** Alexey Likhachev said.

In October 2020, Atom mash got started with the production of a reactor for Tianwan Unit 7. All in all, the company will produce two reactor pressure vessels complete with re-

actor internals and RPV heads and two sets of steam generators for Units 7 and 8. The lower half of the reactor vessel for Unit 7 is ready — it could be seen in the background of the live transmission from Atom mash during the kickoff ceremony.

Work on the equipment for Xudabao is also in progress. According to the latest news, the Petrozavodsk production facility of AEM Technologies (also part of Rosatom’s power engineering division) set to manufacture primary coolant pump casings for Xudabao Unit 3. Petrozavodsk quality inspectors and representatives of CNNP Suneng Nuclear Power Co. Ltd. (CSNP, one of Xudabao project owners) examined the first two spherical workpieces for the compliance with nuclear equipment standards and requirements. Each reactor unit has four primary coolant pumps.

Participants of the official ceremony made it clear that new power units were far from being the last joint project. Yu Jianfeng, Chairman of China National Nuclear Corporation (CNNC), proposed to expand cooperation in such areas as pressurized water reactors, fast neutron reactors, and refabrication of spent nuclear fuel. **“We offer our Chinese partners to enter a new stage of cooperation and work harder together on fast neutron reactors and spent fuel refabrication. We believe this will help us demonstrate the world the leading role of Russia and China in promoting nuclear power and developing new nuclear technologies,”** Alexey Likhachev supported his colleague.

It is likely that the cooperation will be even broader. **“We are discussing China’s participation in the international consortium to build a multi-purpose fast neutron research reactor in Dimitrovgrad,”** Vladimir Putin said.



ROSATOM GEOGRAPHY

[Back to contents](#)

Xi Jinping proposed to promote the creation of “**a fairer, more balanced and more transparent system of global energy management**” and strive for innovative development. According to him, an emphasis should be made on environmental responsibility in the nuclear industry, nuclear medicine, nuclear fuel, fundamental research into key technologies, innovations, and state-of-the-art digital technologies.

A foundation for expanding the cooperation in R&D and spent fuel refabrication is already in place. Rosatom’s Research Institute of Atomic Reactors will conduct in-pile tests and post-irradiation analysis of graphite samples for China’s Fangda Carbon New Material Co. TVEL will produce fuel for the first load of the Chinese fast neutron reactor CFR-600 and subsequent reloads during seven years. Deliveries are scheduled to begin in 2023.

Diversity of projects

China has one of the world’s largest nuclear reactor fleets. According to the IAEA, the country operates 50 nuclear power plants with a total installed capacity of 47,528 MWe. In 2019, China’s nuclear plants generated 348.36 TWh of electricity, a little

AtomEnergomash (AEM) is Rosatom’s power engineering division and one of Russia’s largest power machinery producers providing comprehensive solutions in design, manufacture and supply of machinery and equipment for nuclear, thermal, petroleum, shipbuilding and steel-making industries. Its production facilities are located in Russia, the Czech Republic, Hungary and other countries.

less than 5% of the total electric power output in the country. China boasts one of the most ambitious nuclear energy programs in the world. At present, the country is building 14 more power units with a total installed capacity of 13,175 MWe. The range of technologies employed includes pressurized water reactors, fast neutron reactors, liquid metal cooled reactors, and HTGRs. A tokamak is also under construction. China expects its total nuclear generating capacity to reach 70 GW by 2035. This goal is included in a draft version of the 14th five-year plan for national economic and social development (2021–2025) and long-range objectives through the year 2035. ^{NL}

[To the beginning of the section](#)

TRENDS

[Back to contents](#)

Metals: Shortage Foretold

The International Energy Agency (IEA) has published a report entitled ‘The Role of Critical Minerals in Clean Energy Transition.’ The report highlights that the rapid deployment of clean energy technologies might cause disruptions in the supply of certain non-ferrous, rare-earth and precious metals, drive up their prices, and thus slow down the growth of renewable energy generation. In this respect, deployment of nuclear energy is less risky given its low demand for these metals. And this is yet another argument for a larger share of nuclear energy in the global energy mix.

Energy transition and deployment of clean energy technologies stimulate demand for metals. **“A typical electric car requires six times the mineral inputs of a conventional**

car, and an onshore wind plant requires nine times more mineral resources than a gas-fired power plant,” these are the figures quoted in the report. According to the authors of the report, the renewable energy industry, particularly electricity grids, energy storage systems and electric vehicles, will account for 40% of the total demand for copper and rare-earth metals, 60% for nickel and cobalt, and almost 90% for lithium.

There is a risk, however, that supply of metals will lag behind demand, **“The prospect of a rapid increase in demand for critical minerals — well above anything seen previously in most cases — raises huge questions about the availability and reliability of supply.”**

Iron ore out of focus

The authors of the report compare demand for metals from different types of energy generation, but only those metals that are

TRENDS

[Back to contents](#)

used in capital construction and production of equipment. Metals required during operation, such as uranium, are not taken into account. **“Our analysis focuses on the requirements for building a plant (or making equipment),”** the report says.

Experts chose to analyze the supply of non-ferrous, rare-earth and precious metals. Is this reasonable? The report ignores, for reasons unknown, everything related to steels and alloying metals and thus to iron ore. Steel, however, is used to make transmission towers, reinforcement structures in hydropower dams, and electrical equipment. According to the United States Geological Survey, steel accounts for 71% to 79% of the total weight of a wind turbine. Another 5% to 17% is a share of iron and cast iron. That means the share of iron ore derivatives in a wind turbine can be as large as 96%. In a nuclear power plant, the share of steel and other iron ore derivatives is also large as they are used in the structures and equipment of the plant.

It is quite likely that the IEA does not consider iron supplies to be at risk. Thankfully, iron ore is produced and offered for sale by many mining majors in the world, but the price of iron ore is one of the most volatile among the prices of minerals. Volatility and price growth constitute another risk that is mentioned in the IEA report as the second most significant to supply disruptions, **“In the past, strains on the supply-demand balance for different minerals have prompted additional investment and measures to moderate or substitute demand. But these responses have come with time lags and have been accompanied by considerable price volatility. Similar episodes in the future could delay clean energy transitions and push up their cost.”**

In March 2021, iron ore was priced at \$88 per metric ton and reached \$230 as soon as May. The output of ore in 2020 amounted to 2.2 billion tons. The price of steel may also change dramatically. In China, the price of reinforcement steel bars grew from \$660 per ton early this year to \$865 per ton in early May. **“These prices are record high — they exceed the peaks reached during the previous market booms,”** Interfax quoted Clarksons Platou Securities as saying at that time. Two weeks later, on May 24, reports came in that the iron ore prices plummeted by 20% from the peak in May. The decline was caused by an announcement made by China’s National Development and Reform Commission in late May that it plans to fight monopolies in the commodities markets, price manipulations, speculative activity, dissemination of false information, and accumulation of excessive reserves.

This means that the iron ore and steel prices are much more significant for the power industry than the prices of non-ferrous, precious and, even more so, rare-earth metals.



TRENDS

[Back to contents](#)

Nuclear energy: reliable and cost-efficient

Offshore wind turbines use most of non-ferrous and rare-earth metals as compared to other technology, nearly 16 tons per megawatt of installed capacity, IEA experts say. Copper and zinc have the largest shares in this amount. Onshore wind turbines come second, with more than 10 tons of non-ferrous and rare-earth metals needed per megawatt. Solar panels are in the third place (7 tons of metals per megawatt). Nuclear energy consumes the smallest amount of those metals (less than 6 tons per MW) among the other clean energy technologies — only coal-fired and gas-fired power plants consume less.

The authors of the report assessed the significance of certain metals for the nuclear industry as medium and low. Only hydropower is as sensitive to them as nuclear power. The other clean energy technologies are much more sensitive and depend heavily on one or two metals. Electrical vehicles and storage batteries are the most sensitive. According to the IEA, those two segments are badly in need of copper, cobalt, nickel, lithium, rare-earth metals, and aluminum, or six out of nine metals in consideration. This means the risk of disruptions in supply and, consequently, production increases sixfold.

IEA experts forecast in their Stated Policies Scenario (STEPS) that demand of the nuclear industry for non-ferrous and other metals will grow globally by less than 10,000 tons, from 50,000 tons in 2020 to less than 60,000 tons in 2040, which is even somewhat lower than in 2030. In its Sustainable Development Scenario (SDS), the IEA forecasts the annual demand might be a little above 80,000 tons, **“In the SDS, average annual mineral demand from nuclear power between 2031 and 2040**



grows by around 60% compared to 2020 levels, reaching 82 kt. It is dominated by chromium (42%), copper (28%) and nickel (25%). Yttrium demand in 2040 is around 7.7 tons, or around 0.0015% of current global reserves.” STEPS is a scenario that follows the existing (stated) government policies. SDS assumes an accelerated transition to clean energy sources in different industries.

“Along with hydropower, nuclear is one of the low-carbon technologies with the lowest mineral intensity. Key mineral needs include chromium (2 190 kg/MW in 2019), copper (1 470 kg/MW), nickel (1 300 kg/MW), hafnium (0.5 kg/MW) and yttrium (0.5 kg/MW) (EC JRC, 2011),” the report says.

In other words, the nuclear industry will not stimulate an expected hike in the demand for metals and, therefore, will not contribute to an increase in prices or supply disruptions.

What is more, the long investment cycle for nuclear power plants and equipment makes it possible to predict demand for metals on at least a one-year horizon. As a result, it is possible to minimize the risk of supply disruptions and price growth by making contracts in advance.

TRENDS

[Back to contents](#)

The IEA data, therefore, allows us to conclude that nuclear energy is one of the most secure sources of clean energy in terms of supply and price fluctuations.

Green price spiral

IEA experts' concerns with the price and supply stability on the back of production growth in the clean energy segment have been voiced amid demands addressed to mining companies to reduce the carbon footprint. In this situation, they become suppliers of raw materials for the clean energy industry and consumers of clean energy. By making their production 'greener', they stimulate the same demand they are meant to satisfy.

One of the conclusions made in the IEA report is as follows, **“Rapid, orderly energy transitions require strong growth in investment in mineral supplies to keep up with the pace of demand growth. Policy makers can take a variety of actions to encourage new supply projects: the most important is to provide clear and strong signals about energy transitions.”**

But what will happen when the requirement for 'strong growth in investment in mineral supplies' is met? Mining companies will acquire new facilities and increase their output. They will need much money as each new construction will be a capital-intensive project because the existing mines with high ore grades and extensive infrastructure are almost depleted or close to depletion. New production facilities stimulate demand for more energy and transport, which are to be clean and, therefore, more expensive than conventional ones. All those additional costs will be weighed against investment attractiveness of new projects and have an indirect



influence, through supply and demand, on market (if any) and contract prices of commodities. Even if new construction projects are launched, their costs will be higher. And because the number of projects able to survive through a period of low prices will decrease, the lower threshold of metal prices will be higher to prevent shortage and a new price hike.

The growth of metal prices translates itself into growing costs in every metal-intensive industry, including clean energy generation, which then drives production costs in the metal and mining industry, and then the spiral — inflation spiral — makes another turn. And this is a moderate scenario that does not account for 'black swans', or events that are hard-to-predict, totally unexpected and consequential. Here is a non-exhaustive list of the factors that have influenced mining companies' prices, supplies and plans in recent years: a lengthy financial crisis, strikes at mines, coups, coronavirus pandemic, customs and antimonopoly regulation, deployment of more cost-efficient mining and extraction technology that makes the previously infeasible deposits viable options. And, of course, this list would be incomplete without the low-carbon requirements for supplies.

TRENDS

[Back to contents](#)

The result is sharp increases and declines in prices. A good example is the price of copper that fell to less than \$4,750 per ton and soared to more than \$7,880 per ton in 2020. In 2021, it came close to \$10,400 per ton.

In this sense, nuclear energy is an epitome of stability as it can guarantee consumers, including mining companies, stable pricing for the entire service life of a power unit, now believed to be able to reach one hundred years. This is a time that exceeds the development period of a majority of current non-ferrous and rare-earth metal deposits. Besides, nuclear power plants guarantee a reliable supply of electricity that does not depend on the vagaries of weather or climate changes as they are capable of operating in any climatic zone, from the tropics to the Arctic.

That means nuclear energy can support mining operations without driving up the price of metals. Mines powered by nuclear power plants will have a flat electricity component of the production cost for decades and up to a century.

Russia already has examples of a symbiotic relationship between nuclear and mining. In early June, a power transmission line connecting Peschanka, a large copper and gold deposit, and Kekura, a smaller gold deposit, with the Bilibino Nuclear Power Plant based in the same-name Arctic city (Chukotka Autonomous Region). Electricity from the nuclear power plant is needed for construction of a mining and processing plant (Baimsky GOK) at Peschanka. The cooperation between Rosatom and Peschanka owner KAZ Minerals (Kazakhstan) might be continued as the parties discuss the possibility of building several floating power plants with RITM-200 nuclear reactors for Baimsky GOK.

Moderate regulation

IEA analysts call national governments to take action to prevent a rise of metal prices and shortage of supply: **“Policy makers need to explore a range of measures to improve the resilience of supply chains for different minerals, develop response capabilities to potential supply disruptions and enhance market transparency. Measures can include regular market assessments and stress tests, as well as voluntary strategic stockpiles in some instances.”** But price mechanisms that the governments have are not many. The commercial metal market has a huge size and international significance. Government regulation or sanctions even against a single large manufacturer of copper, aluminum or nickel will affect an enormous number of market players. The market will look for any, including regulatory, mechanisms to improve the situation.

As the Chinese practice shows, it is true that the government threatening to punish for speculative activity in the market might cool down prices. By contrast, procurements for national reserves have only a limited effect. Even in the USA, the world’s largest economy, the 2022 budget does not allocate money to buy uranium from American uranium compa-




TRENDS

[Back to contents](#)

nies for the national uranium reserve, which was established by Trump's administration to support local producers. And no government funds will be enough to make any sizable reserves of copper or aluminum.

Another proposal made by IEA experts is to support geological surveys and prospecting: **“Resource-owning governments can support new project development by reinforcing national geological surveys, streamlining permitting procedures to shorten lead times, providing financing support to de-risk projects, and raising public awareness of the contribution that such projects play in the transformation of the energy sector.”** No doubt these measures are useful and important, but surveying is not what mining companies spend most of their money on — it is construction of mines. So, if we talk about government support for mining companies, we should first talk about infrastructure development through co-financing of roads,



power transmission lines and substations, electricity subsidies to mining companies, and co-financing of new generation capacity. Such mechanisms of support are considered by the Russian government. One of the potential targets might be Baimsky GOK we mentioned above. 

[To the beginning of the section](#)

TURKEY

[Back to contents](#)

Atom Stimulates Turkish Economy

Two key operations scheduled for this year — installation of the RPV and Tier 3 of the internal containment shell for Unit 1 — were completed on the construction site of Turkey’s first nuclear power plant Akkuyu. Experts are confident the Akkuyu project will make a solid contribution to the development of both the national energy industry and economy.

The installation of the reactor pressure vessel for Unit 1, one of the milestones of the equipment assembly process, was completed at the Akkuyu nuclear power plant.

The operation required on-site roads to be prepared specifically for transportation of the heavy RPV to the construction ground of Unit 1. After the roads were reinforced and leveled, a special wheeled platform delivered the RPV from the temporary storage site to the construction ground. Then the RPV was put in a vertical position with a crawler crane, lifted above the reactor island and lowered into the reactor pit.

Weighing 330 tons, the RPV measures 4.5 meters in diameter and 12 meters high.

“The installation of the reactor pressure vessel at Unit 1 is one of this year’s main events. I would like to note the impeccable work of the installation team and the operators of the lifting equipment. The installation of the vessel must be performed

TURKEY

[Back to contents](#)


with pinpoint accuracy: the maximum permissible horizontal deviation does not exceed a tenth of a millimeter. Completing the RPV installation will allow us to continue work on the reactor shaft construction,” said Sergei Butskikh, First Deputy CEO at AKKUYU NUCLEAR and director of the under-construction nuclear power plant.

The installation process was supervised by representatives of the Nuclear Regulatory Authority (NDK), French engineering group Assystem acting as an independent construction auditor, and Rosatom companies.

The RPV was installed using the Open Top technology, through the uncovered top of the cylindrical part of the reactor building. The technology combines construction and installation operations in the best way possible and thus allows starting the equipment installation and piping assembly before the completion of the floor concreting. The technology has proven itself in many NPP construction projects in China, Japan, Bulgaria and Russia, including the construction of VVER-1200 power units at Leningrad NPP II. The Open Top technology will be used to install steam generators, pressure compensators, main circulation pumps and other core reactor equipment inside the Akkuyu NPP reactor buildings.

As soon as the RPV is in place, construction workers will proceed with concreting the reactor pit, install bearings for the main circulation pipeline (MCP) components and steam generators. After the installation of steam generators and casings of the reactor coolant pumps, it will be possible to start welding the MCP, which connects the core equipment of the plant's primary loop.

The RPV for Unit 1 was delivered to the Akkuyu NPP construction site by sea in November 2020. After being unloaded at the Eastern Cargo Terminal, the RPV was transported to the storage site, where it passed the incoming inspection procedure that confirmed its integrity and high quality of manufacturing.

In early June, Tier 3 of the internal containment shell was installed at the Akkuyu NPP Unit 1 reactor building. The installation of a cylindrical structure weighing 322 tons took about a day.

With Tier 3 installed, the reactor building grew 11.6 meters to reach +28.55 meters. The next step will be to join the second and third tiers, reinforce and concrete the shell. The walls will be 1.2 meters thick. In total, the internal containment shell will consist of four tiers and a dome. As soon as all the components are installed, the shell will be tested for tightness.

The third tier of the internal containment shell is a welded metal structure consisting of 24 sections, each 11.5 m high, 5.8 m wide and weighing 13.4 tons. The sections were pre-assembled into a single block with a circumference of 138 meters on a special ground near the Unit 1 reactor building. After the structure was assembled, the quality of all welded joints was confirmed by ultrasonic testing.

TURKEY

[Back to contents](#)

Before that, Unit 1 had a core catcher assembled, two structural supports concreted, and a dry shield and thermal insulation of the vessel's cylindrical part installed. Right before the RPV installation, a support ring, which bears the entire load of the vessel, was fixed inside the reactor pit.

The Akkuyu project makes a solid contribution to the development of Turkey's national economy. Said Anton Dedusenko, Chairman of the Board at AKKUYU NUCLEAR, in his speech at the opening ceremony of NPPES 2021. He reminded that the International Energy Agency had designed a global sustainable recovery plan for the energy sector in 2020. Its three main goals are to maintain and create jobs, boost economic growth, and improve energy sustainability and resilience. He added that new nuclear projects across the globe met the three goals.

Anton Dedusenko noted that Akkuyu would generate nearly 35 billion kWh of electricity per annum after commissioning. **“This means the plant will meet 10% of the country's demand for electric power. It is safe to say the construction project has turned into a point of attraction for people. It is a project that improves local production, creates new jobs, and offers many business opportunities to international companies,”** he said. Anton Dedusenko also stressed that local content in the Turkish project accounted for about 40% of works and supplies at the current construction phase with over 400 Turkish companies included in the authorized supplier list.

Experts point out the role of Akkuyu in the economic growth and creation of new jobs. According to Dr. Rahmi İncekara, Assistant Professor of the International Trade and

Nuclear Power Plants Expo & Summit (NPPES)

The 4th summit and the 8th exhibition dedicated to nuclear energy was held online this year. The agenda of the event included discussions of nuclear technology in Turkey and business opportunities for Turkish companies in connection with the Akkuyu Project.

NPPES was organized by the Ministry of Energy and National Resources of Turkey, Scientific and Technological Research Council of Turkey (TÜBİTAK), Nuclear Industry Association of Turkey (NSD), and Ankara Chamber of Industry. Key partners of the NPP Expo and Summit are Rosatom and AKKUYU NUCLEAR.

Logistics Department of Istanbul Kent University, the cost of construction of a single power unit is equivalent to three months' costs of imported natural gas. **“Every month the Turkish economy will receive around USD 7.2 billion, plus we will not spend money to buy electricity from abroad. If we consider those two factors, diversification of energy sources and independence from external supplies, the nuclear project is extremely beneficial,”** he added.

Since the work on the construction site was not suspended during the pandemic, the Akkuyu NPP became one of major employers in the country. At present, nearly 11,000 people are involved in the project. It is expected that their number will grow to 12,500 at the peak of the construction, but decrease to 4,000 after the plant is commissioned. What makes Akkuyu special is the level of female employment as more than 1,000 women work at the construction site.


TURKEY

[Back to contents](#)

Alikaan Ciftci, Chairman of the Nuclear Industry Association (NSD), points out, **“According to a study by the Nuclear Energy Institute based in Washington, every 100 employees of nuclear power plants create about 66 more jobs in other areas. So, in addition to direct employment at nuclear plants, it is important to remember about indirect employment. If we count jobs in Turkish companies supplying goods and services for nuclear power plants, we will arrive at very large figures. What is more, our economy will have much more added value as the use of nuclear technology expands.”**

The Akkuyu NPP project will be a driver of education, Prof. Dr. Niyazi Meriç from Ankara University Institute of Nuclear Sciences, is sure, **“For now, Turkey has only three departments offering nuclear-related majors. I am sure there will be more insti-**

AKKUYU NUCLEAR was established in Ankara in December 2010. The Akkuyu nuclear power plant is constructed on Turkey's southern coast in the Mersin Province. The plant will have four power units with VVER-1200 reactors and a total capacity of 4,800 MW. The project is governed by the Russian-Turkish Agreement on Cooperation in Akkuyu NPP Construction and Operation.

tutes to train researchers willing to work in this area after the Akkuyu NPP is commissioned. Nuclear technology has penetrated in almost every area of life even if we have no clue. I believe that the nuclear plant construction will stimulate Turkish students to seek degrees in nuclear energy.” 

[To the beginning of the section](#)