



LEAD STORY

## EC Investigation into Paks II Deal Finished

**This means the European Commission has given a green light to Hungary's most important energy project. Two nuclear reactors to be constructed at Paks will replace 4 existing units that will remain in operation until the 2030s.**

"The European Commission has concluded that Hungary's financial support for the construction of two nuclear reactors at Paks involves state aid. It [the EC] has approved this support under EU state aid rules on the basis of commitments made by Hungary to limit distortions of competition," the EC statement says. The commission also stresses that any potential profit from Paks II will be used either to finance the country's investments or cover day-to-day expenses of the nuclear power plant. "Profit cannot be re-invested in the construction project or used to acquire additional generating capacity," the EC notes.

Rosatom welcomed the completion of the EC investigation into the Paks II project. "The construction of two new units at Paks is a mutually beneficial project for both Russia and Hungary, and we are happy to kick it off at last. Hungary will receive the latest Russian-designed Generation 3+ reactors that meet post-Fukushima safety requirements and IAEA guidelines. Similar reactors are set to be built in Finland, Turkey, Bangladesh and other countries," said Rosatom First Deputy CEO Kirill Komarov.

### **The new power plant is vital**

Power generated by Hungary's operating units satisfy a third of its domestic demand for electricity. Once they are shut down, their capacity will have to be replaced with another power source. Replacement options for Hungary are limited – it is either construction of new capacity in the country or import of electric power from abroad. But it is natural that a country wants to be self-

sufficient in energy. Besides, the last winter in Europe showed that relying on energy imports was short-sighted at best. As it is, 30% of energy consumed by Hungary is already imported. For these obvious reasons, Hungary will need an internal power source to provide base load after the 2030s. No less obvious is that the 2,000 MW capacity cannot be replaced with renewable sources. Power stations fired with coal or gas will not make up for this capacity either since their share in the European energy mix is to be reduced under the EU strategy for combating climate change and greenhouse gas emissions.

In this context, Hungary's decision to swap its existing nuclear capacity for new reactors on the same site seems logical. A more viable solution is now hard to find. Another strong argument for keeping nuclear power in Hungary's energy mix is the cost of electricity generated by Paks, now only 11 forints per kilowatt. Thanks to low generation costs, Hungarian consumers pay about 10 eurocents for one kilowatt of electricity, while the price in Germany is nearly 30 eurocents.

### **Contribution to economy**

Economic impact is one more benefit a large-scale nuclear project brings to its home country. Nuclear construction will boost the national economy, increase employment, bring in new contracts for local businesses and tax revenues for the budget, and facilitate research and so on. The project will create up to 10,000 new jobs.

From the very beginning, the Hungarian government had been showing commitment to the project and taking a strong stand in the talks with the European Commission. As a result, the EC agreed to Hungary's point, and the project was cleared.

Hungary serves as a model for those countries that plan to build new sources of nuclear power. Step by step, the

country was working its way to the construction of new reactors and securing national energy self-sufficiency.

### **Licensing ahead**

Paks II has passed the environmental licensing procedure and, according to Attila Aszódi, Hungarian Government's commissioner for the Paks expansion project, a construction license is expected to be obtained this spring. As soon as it is cleared by the European Commission, the project will enter its active phase. According to Hungarian officials, construction operations will begin in 2018.

Rosatom as a technology vendor was a logical choice for Hungary that has had a positive experience of working with VVER technology and Russian experts at the operating reactors of the Paks nuclear plant. Russia's new VVER-1200 design is among the world's best Generation 3+ reactor designs. More important is that the new design has already been proven in use at the Novovoronezh nuclear plant and put in commercial operation in late February. Russia will also grant Hungary an attractive loan to finance 80% of the project costs.

### **Paks II profitability**

It is hard to forecast electricity prices on a 10-year horizon as they are influenced by a host of factors, ranging from the supply and demand balance and fuel prices to carbon dioxide emission quotas and subsidies on renewables.

If we consider price trends on the Hungarian wholesale power market, we will see that the megawatt-hour has not been priced below 50 Euros recently. For three weeks in January, the price was even in the range of 80–100 Euros, occasionally rising to 150 Euros per megawatt-hour.

Assuming that most European generating facilities are halfway through their service lives and will be phased out within the

next 25 years, electricity price growth in the coming decades seems plausible. We have had a chance to see in the recent weeks how sensitive the European power markets are to plant shutdowns. In France, the price of electric power has doubled for the recent months to hit new

highs amidst power plant shutdowns and growing demand for electricity. In this situation, 55 Euros per megawatt-hour in the mid-2020s stated by the Hungarian government as a minimum for Paks II to remain profitable seems a realistic price.

## EVENTS

# Nuclear Plant Creates Huge Market

**Turkey's economy should focus on high tech industries, and nuclear power is one them, Koray Tuncer said at the 4th International Nuclear Power Plants Summit in Istanbul.**

Speaking at the summit opening, Head of the Organizing Committee Koray Tuncer noted that construction and operation of a nuclear plant is a very long story spanning decades. Every nuclear plant is a source of cheap electricity and a driver of adjacent industries. "By investing in nuclear and encouraging small and medium-sized businesses to manufacture relevant products, Turkey will get a chance to become a stakeholder in nuclear construction projects both in and outside its borders. This will transform Turkey from a technology importer into a technology vendor," Koray Tuncer said. According to Dr. Şule Ergün, Head of the Summit and an assistant professor at the Nuclear Engineering Department of Hacettepe University, construction of a single nuclear plant requires about 500,000 various machinery pieces and equipment components and creates 12,000 to 14,000 new jobs. "The impact of nuclear construction projects on economy can be compared to that of doping in sports. By 2060, about 30 nuclear stations



will be put in operation in Turkey, Africa and the Middle East, with each project costing around 20 billion US dollars. Thus, we are talking about the creation of a huge market worth up to 600 billion US dollars," Dr. Ergün said.

### **Akkuyu is a key project**

One of the key sponsors of the summit was Akkuyu Nükleer, an owner of the Akkuyu nuclear plant construction project. Kürşad Tosun, Director for Licensing and Government Relations at Akkuyu Nükleer, commented on the process of Akkuyu licensing. He reminded that the site selection report was approved in February 2017 and the application for a construction license was submitted to the Turkish Atomic Energy Authority on 3 March 2017. Akkuyu Nükleer expects that the documents submitted will be sufficient to obtain a limited construction permit in 2017. Once the permit is issued, the company will be able to start building the non-nuclear structures of the plant, such as the turbine island, auxiliary buildings, etc. "Akkuyu Nükleer is approaching a very intense project stage. In February of this



year, we applied for a power generation license to the Energy Market Regulatory Authority (EMRA), and it is now considering our application," Mr. Tosun added.

Esra Songur, Trade and Local Procurement Coordinator at Akkuyu Nükleer, explained the mechanism of future procurements from local suppliers. According to Ms. Songur, criteria for selecting Turkish companies will include quality assurance level, quality certifications, experience, readiness to provide designing services, staff qualification, production capacity, etc.

## Russian expertise

A centerpiece of the panel discussion was Russia's expertise in nuclear power, particularly in staff training. Vladimir Artisyuk, Director for International Affairs at Rosatom's Central Institute for Continuing Education and Training (CICET), noted that Russia had a long track record of foreign staff training. Vladimir Kondakov, Deputy Director of

Russia's National Nuclear Research University, said that the University was training over 700 foreign students from Turkey, Belarus, Jordan and other countries. Senior students from Turkey are already able to converse with teachers in fluent Russian. Not long ago, the Ankara Chamber of Industry and Russia's vocational educational institutions, including the Nuclear Construction Training Center (NCTC) and Rosatom's Central Institute for Continuing Education and Training (CICET), signed a memorandum of understanding on workforce training for nuclear construction projects in Turkey. The memorandum provides for bilateral cooperation in such areas, as research, staff training for Turkey's existing and yet-to-be-built nuclear power plants and research centers, qualified staff training for stakeholders in Turkey's nuclear projects, development and implementation of modern approaches to nuclear knowledge management, etc.

## COOPERATION



## Fennovoima Studies Staff Training Practices

Fennovoima representatives visited Russia a few weeks ago to take part in a nuclear plant operation seminar.

The seminar was focused on workforce training for the nuclear power plants under construction. Managers of the Leningrad NPP training division presented the program of staff training for new VVER-1200 reactors and key stages of commissioning the full-scale and analytical simulators. Already in operation, the simulators help quickly and effectively develop and hone skills of the entire nuclear station team, from a front-line operator to a shift supervisor. Hanhikivi-1 to be built in Finland is a single-unit nuclear power plant with the Russian-designed VVER-1200 reactor. Leningrad II will serve as a reference project for the Finnish plant. "Hanhikivi-1 is now in the licensing stage. We are also scheduling staff training sessions for the plant commissioning phase," said Eija Salo, Fennovoima's HR Director. "This is

why we are interested to know how staff training is organized at the Leningrad nuclear plant. Classroom training should go hand in hand with practice, though. For this purpose, we will have a full-scale simulator in Pyhäjoki, and it will also be used in the commercial operation stage. By now, we have completed the introductory technical training for the nuclear station personnel.” The Fennovoima representatives made a tour round the now constructed Leningrad II and were demonstrated facilities where the commissioning and pre-operational tests were running full tilt. In the reactor and turbine islands, pipe washing operations and hydraulic tests have entered the final stretch.

“The purpose of my visit to the Leningrad Nuclear Power Plant was to discuss staff training issues and see the construction site,” said Fennovoima's Operation Manager Juhani Jokinen. “Given the fact that this is a reference project for us, I would particularly like to note a modern approach to passive safety systems at Leningrad II. This is a very important part of the project.”

**Fennovoima HR Director Eija Salo:**

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It was not the first visit of Finnish nuclear experts to Russian nuclear plants. In late September 2016, Fennovoima representatives studied staff training practices at the Kalinin Nuclear Power Plant. Last November, Fennovoima's employees took a pilot training course on

Hanhikivi-1 technology in Russia. Lecturers from Rosatom's staff training center CICET explained basic operation and safety principles of advanced VVER-1200 reactors to their Finnish colleagues. The second training course will be organized later this year when Fennovoima's engineers will come to study specific systems to be installed at Hanhikivi-1.

**About Hanhikivi-1**

In 2013, Rosatom's international division Rusatom Overseas (later reorganized into Rusatom Energy International) and Fennovoima as Hanhikivi-1 project owner signed a nuclear plant construction agreement. In 2014, Russia acquired a 34% stake in Fennovoima. The Parliament of Finland approved the project by majority vote in December of the same year. In June 2015, Fennovoima applied for the construction license. The nuclear plant is expected to come online in 2024.

“Along with evaluation and delivery of construction license documents, our main tasks for 2017 are to select the I&C supplier, start manufacturing the reactor pressure vessel and turbine equipment, continue the construction and excavation operations on the plant site, and development of the organization,” a representative of Fennovoima said to the Rosatom Newsletter.

Construction of the main gate building and weather mast will be finished later this year. Construction operations in the accommodation village will begin in early 2017. In the summer, a contractor for Fennovoima's administrative building and on-site offices will be selected to start the construction in late 2017. The plant supplier will start building its social facilities, a first-aid station and site offices later this year. Excavation operations on the plant site will continue in the spring of 2017 after necessary plans are received and approved. At present, construction of

the infrastructure and auxiliary buildings continues on the site. For instance, engineering networks and the main gate building are being built and finishing touches are put to the waste sorting station. Earth works on the accommodation village site began in late 2016.

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## IN BRIEF

### **Atomenergomash increased consolidated proceeds by 13%**

JSC Atomenergomash increased consolidated proceeds according to the results of 2016 by 13% to 63,3 billion rubles.

In 2016, the consolidated proceeds of machine-building division of Rosatom Atomenergomash Group according to preliminary data, increased by 7,2 billion rubles or 13% and amounted to 63,3 billion rubles. EBITDA tripled to 6,8 billion rubles. Index of effectiveness of operating activities – EBITDA margin – increased by 7% and amounted to 11%. The growth of profitability is determined by the productivity enhancement both of the capital equipment of nuclear power plant, and of the non-nuclear business areas. Also the sale of the non-core assets of almost 1 billion rubles had the beneficial effect. “In 2014 and 2015, we modified the business model of the division's work notably: we defined the target markets, where we will develop, made the necessary changes in the organizational structure, substantially increased the stock of orders, and now this work gives a positive effect. In particular, in 2016 the maximum proceeds for the 4 years for non-nuclear businesses were received: in petrochemical industry, heat power engineering and shipbuilding, and, in general, the share of new businesses in

the total revenue of the division amounted to 43.7%. Additionally, we minimized the number of the contracts concluded through the head office by substantially expanding the self-contracting possibilities of enterprises. This fact, naturally, reduced the proceeds of the management company, however it gave the opportunity to improve efficiency, decision-making speed, and, as a result, scale up massively the consolidated indices across the whole division. One the company's overarching aims in 2017 is further enhancement of efficiency, lowering the lead time of manufacturing and management processes, increase in revenues and stock of orders in nuclear sector and other business areas”, the CEO of JSC Atomenergomash Andrey Nikipelov said. The final financial Atomenergomash Group's results will be published in the integrated annual report for 2016 after passing an audit and obtaining corresponding audit report.

### **Equipment Checks Started at Tianwan Unit 3**

Hot functional testing, a crucial pre-start procedure, began at China's Tianwan Unit 3 built with Russia's involvement. Hot functional tests involve a comprehensive check of all systems and equipment before the reactor goes critical. In fact, this is the last check before

nuclear fuel is loaded into the reactor core. During hot functional testing, all engineering and process control systems of the unit and nuclear plant are verified to be functioning as designed. According to the official statement, engineers will run more than 100 tests to be completed within 54 days. This will be followed by an inspection of key equipment

components. As soon as China's regulator issues an operating license, Unit 3 will be loaded with fresh nuclear fuel. Tianwan Unit 3 is expected to go critical later this year, with commercial operation scheduled to begin in 2018.