



LEAD STORY

Second to None Competencies

Rosatom supplied unique isotopes for an international scientific experiment searching for neutrinoless double beta decay. The search for neutrinoless double beta decay remains the most intriguing area of present-day fundamental physics. The experiment aims to challenge the accuracy of the standard model of elementary particles. If it produces evidence of the double beta decay with no neutrino emissions, this will mean that neutrino and antineutrino are the same elementary particle, as it was presumed by Ettore Majorana back in the 1930s.

Several international collaborations are trying to find evidence of this reaction by using isotope-based detectors. One of

those collaborating groups is GERDA (GERmanium Detector Array) experimenting with detectors made of highly pure germanium enriched with germanium-76 exclusively at the Electrochemical Plant (ECP, a subsidiary of Rosatom's TVEL Fuel Company).

In the first phase, the experiment found no neutrinoless decay of germanium-76, but made certain progress towards the goal. At present, GERDA is preparing for the second phase. The researchers plan to substantially increase the sensitivity of the detection unit. As part of this plan, they held a meeting with representatives of Kurchatov Institute, Institute for Theoretical and Experimental Physics, TVEL, ECP and Izotop in 2016 to discuss the terms of germanium-76 supplies. ECP having the required experience and competencies was selected as a germanium-76 supplier. The isotope was shipped under the contract between Izotop, Rosatom's isotope specialist, and the Max Planck Institute for Nuclear Physics.

“The Electrochemical Plant is one of the world’s largest producers of isotopes. Quality of its products has been repeatedly recognized by major testing laboratories,” said Dmitri Timofeev, Deputy Director for Isotope Production at ECP, in his interview to Rosatom Newsletter. “It is not the first time ECP has participated in the project. The first shipment of germanium-76 for the GERDA project was made in 2004–2005. It was back then we acquired the competencies required to store and transport this isotope. Just as in 2005, the quality of germanium powder was again appreciated by our partners. Unlike then, though, when we shipped only several kilograms of germanium-76, this batch amounts to as much as twenty kilos.”

According to Mr. Timofeev, germanium acts as both a source and a detector of target processes, achieving the maximum possible efficiency of particle registration. “The germanium-based detection unit is also compact and requires minimum construction materials, which is extremely important to maintain low background radiation.

High energy resolution typical of germanium detectors and innovative research methods developed by GERDA allow for lower natural background radiation, thus increasing sensitivity of the detector,” Mr. Timofeev said.

Unparalleled process

According to Maria Varlakova, Lead Sales Manager at ECP, production of germanium-76 is different from that of other isotopes. Since the isotope remains on the detector surface for a very limited period of time, the production technology must be strictly followed so as to ensure maximum protection against cosmic background radiation. “For this reason, we control each production stage and



record all inventory flows in accordance with the procedure. Fabricated isotopes are stored in a special underground storage facility till the shipment,” she said.

“Special requirements are also set for the transportation of isotopes,” said Dmitry Timofeev. “A 15-ton TUK nuclear cask was used during the transportation for the same purpose as the underground storage facility – it protects germanium isotopes from cosmic radiation. The nuclear cask was produced at ECP in 2004 to transport the first batch of germanium-76. Later it was upgraded in accordance with the customer’s requirements to protect the material from external radiation.”

Thanks to well-coordinated manufacturing and logistic processes organized by ECP with the input from Izotop, the material was timely delivered to the customer. Tests on the customer’s site have confirmed that quality of the isotope is in compliance with the terms of the contract.



INTERVIEW

Alexander Merten: Nuclear Plants Are Not Our Only Global Product

The Nuclear Week organized by Rosatom at Astana Expo 2017 served an opportunity for the Russian nuclear corporation to present its non-nuclear products ranging from renewable sources of power to non-energy solutions for medicine, agriculture and IT. In an interview to the Russian news agency TASS, Alexander Merten, President of Rusatom International Network (RIN), spoke about the advantages of Rosatom's non-nuclear products and shared plans to construct renewable power stations. RN publishes excerpts from the interview. Its full version is available on the website of TASS.

– Much attention during the Nuclear Week was given to Rosatom's non-nuclear products. Why does the company focus on this line of business?

– Our core product – nuclear power plants and related construction and operation services – is well known to everyone. This is where Rosatom holds a strong lead globally. The Nuclear Week was organized specifically to present our non-nuclear and non-energy products. Rosatom's mechanical engineering division AEM manufactures machinery for both nuclear and non-nuclear industries, such as petrochemistry and thermal power generation. ASE Group, another division of the nuclear corporation, provides engineering design and consulting services in nuclear or other construction projects. ASE has developed and piloted the Multi D technology offering online control of design, procurement, construction and budgeting

processes in the construction of complex industrial facilities. Other divisions of Rosatom specialize in applying nuclear technologies in medicine and agriculture and developing renewable energy. We are observing much interest to wind power on the global scale, and we have solutions to be offered to those interested. Having won a contract to build 970 MW in wind generation capacity in Russia by 2024, Rosatom has become a leader of the national wind power industry. AEM's subsidiary Ganz Engineering and Energetics Machinery (Ganz EEM) based in Hungary has developed containerized small hydro power plants. The first contract has already been signed to deliver one of them to Georgia.

- What would you mention as key areas of cooperation with Kazakhstan?

- Our cooperation with Kazakhstan dates back many years. For example, we have long been working with our partners from Kazatomprom. Our five joint ventures operating in Kazakhstan extract uranium by in-situ leaching with the lowest production costs in the world. We are also working on a low enriched uranium reserve project in Kazakhstan. Besides, Kazatomprom is a co-owner of the Uranium Enrichment Center established in Russia at the Ural Electrochemical Plant, the world's largest uranium enrichment plant. We see that Kazakhstan is interested in creating food irradiation facilities. An agreement to this effect was signed with Antares Group at Atomexpo 2017 held in June in Moscow. Other areas of interest include nuclear medicine, petrochemical equipment, and construction of wind parks and small hydro power plants in the country. Kazakhstan is seen by us as one of our major partners. We are members of the Customs Union, and our cooperation can be of great interest for the both parties in terms of economic benefits.

- Could you give more detail on your joint plans to develop renewable energy in Kazakhstan?

- The Government of Kazakhstan has adopted a renewable energy development plan to increase the share of renewable sources to 50% of the national energy mix by 2050. The country is ideally positioned to develop renewables, including lower tariffs for electricity from renewable energy sources, such as wind and hydro power facilities, and favorable climatic conditions. Natural water bodies in Southern Kazakhstan, mostly mountain rivers, allow for effective use of our small hydro power plants.

Renewable energy has a positive effect on the environment as it reduces greenhouse gas emissions. But we should not forget about more stable power sources that could provide a sustainable electricity supply for public and industrial needs regardless of the weather. It is good that Kazakhstan intends to develop its carbon-free power industry in line with the Paris Agreement, which provides for the reduction of CO2 emissions. It would also be logical to develop nuclear energy because it is able to provide baseload power.

The idea of building a nuclear power plant in Kazakhstan has been discussed with our Kazakh partners for long. The country is going to adopt its national nuclear strategy in 2018. We hope that Kazakhstan will finally venture to develop its nuclear power industry – all the more so because the country has everything it needs for this purpose, including uranium mines, the Ulba Metallurgical Plant manufacturing uranium products, and a stake in the Russia-based Uranium Enrichment Center. In our turn, we are ready to offer our latest solutions for the construction and operation of nuclear

power plants. As you know, Russia has already commissioned the world's first Generation 3+ power unit at Novovoronezh. It operates commercial fast neutron reactors and carries out the Breakthrough Project that will close the nuclear fuel cycle. I believe that our technology might be of interest for Kazakhstan, given the fact that the first fast neutron reactor was built and operated in Aktau (Kazakhstan) supplying the entire city with fresh water.

Calling for the nuclear energy development, we by no means see nuclear power as opposing renewables – otherwise Rosatom would not build wind parks. What we want to stress is that nuclear and renewable sources of power are integral components of a carbon-free power industry.

– What is the progress in cooperation with Vietnam that decided to mothball its nuclear program and suspend the nuclear plant construction? Can the decision stimulate joint initiatives of building renewable power stations in that country?

– We respect the decision made by Vietnam and are ready to resume the dialog if the country's government so decides. But nuclear power plants are not Rosatom's only product on the global market. At the moment, we are working on the construction of a nuclear science and technology center in Vietnam in accordance with the cooperation agreement signed in 2011. The memorandum of understanding on the project was signed on 29 June in Moscow.

Once the feasibility study is approved by the Vietnamese government, we will start consultations on the project finance. We also intend to work out a joint plan to develop Vietnam's nuclear infrastructure. In addition, Rosatom contributed to establishing the Nuclear Information Center in the country. It is aimed at raising public awareness and promoting engineering sciences. We hope that these efforts will change the general public attitude to nuclear power and technologies and will someday persuade Vietnam to revise its decision on nuclear power plants.

– Late last year Rosatom's subsidiary concluded the first contract to deliver and install a small hydro power plant in Georgia. When will the project be completed?

– Completion of the project depends on our customer as much as on us. According to the contract, the customer is to carry out a groundwater study and select a site for the plant installation. Once the study is over, we will be able to install the unit. I would like to note that this product has drawn much attention of almost every country worldwide. Negotiations are now underway to deliver these plants to Southeast Asia and Africa. Similar talks are running with Kazakhstan. There are companies wishing to distribute our products, and we have already signed a framework agreement with a company from South Africa. The main advantage of small hydro power plants is that they require no dams or massive structures to be built and generate 'green' power.

IN FOCUS

Alibaba-Like Digital Platform

ASE plans to release a pilot version of its digital construction management platform by 2018. The pilot version of the integrated digital platform designed to manage complex infrastructural construction projects will facilitate information exchange and communication between contractors and suppliers and enable them to place online orders, developers say.

Speaking at Astana Expo 2017, Vyacheslav Alenkov, ASE Director for System Engineering and IT, said the beta version of the platform would be released by 2018. "We will need three more years to finalize the product, streamline all the processes and tune up the new procurement system," he added. According to Mr. Alenkov, what makes the platform different is that it allows for direct communications between construction project stakeholders, be it customers, suppliers or engineering companies. "It operates like Alibaba trading platform where the customer communicates directly with the vendor," he said.

The platform can be used to run complex construction and infrastructural projects in the nuclear, petrochemical, oil and gas industries. With all the opportunities offered by the integrated construction management platform, it is without peer globally, Mr. Alenkov added.

Multi D at core

The new digital platform is a logical continuation of project management competencies gained by Rosatom's engineering divisions in using the Multi D technology in the construction of nuclear and thermal power plants. The



technology earned global recognition as an online monitoring tool to guide construction projects through phases, manage project requirements and digital document flow, and process time, progress and technical data to identify gaps, overlaps or collisions in advance.

"Since Multi D incorporates a modeling function, many issues are solved in the virtual environment. Before the technology was developed, we had to draw time schedules by hand so that only a dedicated expert could see collisions and overlaps in the operation sequence. Now you can see them on the screen, and the system identifies mistakes early in the project design phase and fixes them right away," Mr. Alenkov said.

Less risks, no delays

The Multi D technology reduces the risk of delays in the construction process. A good example is Rostov Unit 3 that was constructed two months ahead of the schedule with the help of the new technology. As Mr. Alenkov noted, reduction in construction time is not an ultimate goal of Multi D, yet unification of construction steps and processes will make it inevitable if the technology enters common usage.

Interest from abroad

Rosatom is currently holding talks with a number of Russian and foreign companies, which are offered Multi D as a tool to manage construction of the infrastructure and power generation

facilities. Most interest comes from foreign companies, but the technology will find buyers in Russia and the CIS, Mr. Alenkov assures.

“Our colleagues from Kazakhstan take great interest in it. We are also holding negotiations with a large number of Russian companies from different industries, including oil and gas producers,” he said.

Rosatom is considering two options of providing access to Multi D – users will either have to buy a software license or be granted temporary access for the construction period.

“International engineering companies are interested in the technology. We plan to work with some of them on the promotion of the technology,” Mr. Alenkov said.

IN BRIEF

Kudankulam III Enters Project Engineering Phase

Rosatom’s subsidiary ASE and the Nuclear Power Corporation of India Limited (NPCIL) signed contracts in late July for project engineering, detailed design and delivery of core machinery for Kudankulam III. “The project to construct Kudankulam Units 5 and 6 has been finally kicked off. We have started the project design development and procurement of core machinery for the third phase of the Indian nuclear plant project,” said Andrei Lebedev, ASE’s Vice President for South Asian Projects. The framework agreement for the construction of Kudankulam III was signed by ASE Group and NPCIL at the 18th Annual Indian–Russian Summit held in St. Petersburg. The parties also signed a credit protocol providing for a loan to be made available to India for the purpose of purchasing machinery and paying for technical documents to be developed by Russian specialists for Phase 3 of the nuclear plant project. The framework agreement provides for the construction of Russian-designed Units 5 and 6 at Kudankulam.

Tianwan Gets Fuel Loading Permit

On 9 August 2017, Tianwan Unit 3 built with the input from ASE Group (Rosatom’s engineering division) was issued an official permit to load nuclear fuel. The permit was given by the National Nuclear Safety Administration of China after a detailed review of the Final Safety Analysis Report (FSAR) and three rounds of negotiations between representatives of the nuclear power plant and the Chinese regulator. “The reactor startup phase will begin within the shortest time possible once the first fuel assembly is loaded into the reactor,” said Alexei Bannik, ASE Project Manager in China. “We will load a total of 163 fuel assemblies. As soon as the loading process and subsequent tests are completed, Unit 3 will go critical. The next step after the criticality is connection to the Chinese power grid.” “The project design for Tianwan Unit 3 was completed in mid-2016. Russian experts monitor the construction process and supervise each step in the run-up to the commissioning of Unit 3. We plan to bring the power unit online by late 2017 and continue with the commissioning of Unit 4,” said Valery Kedrov, Deputy Director at AtomProekt.