



Welcome to the WNE-2018

Digitalisation of the civil nuclear sector

Gérard Kottmann,
chairman of WNE and AIFEN

For the past few years, the nuclear sector has been engaged in a process of digital transformation across the entire value chain: from research to decommissioning, via construction, operation, maintenance, training and more. Technology is innovating ever more rapidly, with profound changes to the sector building the nuclear industry of tomorrow. Objective: enabling significant cost-savings while optimising quality, efficiency and thus safety in existing installations and new developments.

At the same time, Digitalisation of the civil nuclear sector is reinventing industrial processes, offering a unique opportunity to attract the next generation and build a skills base on which tomorrow's talented professionals will rely.

From 26 to 28 June, WNE 2018 will offer a window into this new era for the civil nuclear industry. It will highlight new technologies, innovations and research programmes, real drivers for performance and competitiveness on this pathway of excellence: atom-level modelling and simulation, artificial intelligence, robotics, cobotics, drones, additive manufacturing, augmented reality, connected objects, etc.

WNE 2018 will help enhance the growth of this new ecosystem in which international cooperation flourishes, based on collaborative, interactive and secure technological solutions.

Like the previous two editions, this third show looks very exciting, with 750 exhibitors already signed up – up 10% on 2016 – including 15 international stands and a sig-



nificant expansion in the show area compared to 2016.

WNE is increasingly representative of the sector and its international dimension, with 40% international exhibitors, and over 20,000 visitors expected from all over the world. To keep up with such developments, a change of venue was needed. Paris Nord Villepinte was chosen as the site, offering more modern halls and easier access – it's just 15 minutes from Roissy Charles de Gaulle airport and has a direct RER rail service from Paris.

The programme for the 2018 show boasts a number of new features.

Together with a wide-ranging programme of talks and round tables, attended by experts and globally renowned leaders, four themes have been selected to illustrate the major advances in the sector (programme can be downloaded from the WNE website): 'Small Modular Reactors (SMR)' and 'Advanced re-

actors GEN IV & beyond' – the subject of the two lunch debates, and 'Digitalisation' and 'Decommissioning/Deconstruction', covered in themed guided tours.

Following its 2016 successes, WNE is also announcing the second WNE Awards, showcasing the real innovations and talents with 8 prizes rewarding innovation, skills and knowledge management, operational excellence and nuclear safety. New for 2018, micro- and small- and medium-sized enterprises will have their own prizes awarded in each of the four categories. To date, almost 150 nominations have been submitted, and the winners will be announced on the first evening of the show in the Panel discussions hall.

The 'young shoots' shaping the nuclear industry of the future will have their own space, the Startup Planet. Presentations (contributions by experts, demonstrations, pitches) will allow them to showcase their innovative capabilities and interact with visitors and professionals at the show.

Another new feature in this edition will be an 'Investors' Day' on Thursday 28 June, a prime opportunity for French and international investors to meet the most promising startups seeking finance.

Finally, alongside the show, the INDEX conference (International Nuclear Digital Experience) will take place on 25 and 26 June, organised by the SFEN in association with WNE, highlighting digital technologies and their role in transforming the nuclear industry.

At a time when the world's growing need for energy is at odds with the need to fight global warming, WNE stands out as the international meeting-place for the civil nuclear industry, a key component in the bundle of carbon-free energy sources (and one which is also non-intermittent) to be promoted to protect the planet.



Most important forum

The leading event for the global civil nuclear energy

The World Nuclear Exhibition (WNE), the leading event for the global civil nuclear energy community, takes place 26–28 June 2018. For the convenience of visitors, particularly those travelling from outside France, WNE is being held in Hall 7 at Paris Nord Villepinte Exhibition Centre, which is ideally located just 15 minutes from Paris Charles de Gaulle Airport and easily accessible from the centre of Paris by train. This third edition will focus on a new era of nuclear energy. Covering an area of 25,350 m² and with more than 20,000 visitors expected from all over the world, WNE continues to grow year on year.

tours (digitalisation and D&D) taking place on Wednesday 27 and Thursday 28 June.

WNE is a business show par excellence and over the years has confirmed its standing as the B2B event for the international nuclear energy community. In 2016, over 3,200 targeted business meetings were set up in advance, enabling stakeholders in this high value-added industry to network, forge partnerships, find new suppliers and grow their businesses beyond national borders.

Boosted by this success, WNE 2018 is expecting to host 4,000 B2B meetings and

will be offering a more extensive and efficient matchmaking service to facilitate the sharing of experience and best practice among the industry's suppliers and key decision-makers worldwide. The beating heart of the nuclear community. More than a trade show, WNE is the unifying force behind a community of experts and hosts a number of high-profile events running in parallel with the main exhibition, including INDEX, the international nuclear digital experience conference organised by the French nuclear energy association, SFEN.

WNE 2018 will celebrate Excellence in the nuclear energy sector with the latest advances from around the world, including networking of several Generation III reactors, startup of major maintenance and decommissioning projects, and new technologies. This year the exhibition expects 800 exhibitors, 37% of them international from 27 countries, 20 national pavilions.

WNE will address four specific topics for the first time:

- Small modular reactors (SMRs);
- Advanced reactors (Generation IV and beyond);
- Digitalisation;
- Decommissioning and Dismantling (D&D).

These four themes will be the subject of lunch discussions (SMRs and Advanced reactors – Gen IV and beyond) and guided



Nuclear-powered strategy

Alexei Likhachev: 'In addition to its leadership position in nuclear technologies, Rosatom also works in other innovative areas'

Director General of State Atomic Energy Corporation Rosatom Alexei Likhachev reported to the President of Russia Vladimir Putin about Rosatom's performance and the implementation of its investment strategy in Russia and abroad. This meeting was in the Moscow Kremlin.



Rosatom CEO Alexei Likhachev said: 'Our programme for the development of the nuclear-powered icebreaker fleet is based on two main issues: our projections regarding the increase in the transportation of raw materials produced in the northern regions, and the possibility of rerouting cargo from alternative itineraries, including marine routes such as the Suez Canal.

As we see it, we must ensure the eastward transportation of at least 70 million tonnes of cargo to the growing Southeast Asian markets starting in 2030.

This means that we need two more multipurpose icebreakers in addition to the three 60 MW icebreakers that are being built at the Baltic Shipyard. We also need a flotilla of medium-sized icebreakers for the westbound deliveries to Europe. And lastly, we need to adopt a decision on the construction of a new-generation icebreaker in late 2018 or early 2019.

The icebreaker Lider with a 120 MW power plant, which will make it many times more powerful than any of the existing icebreakers. The main task is to ensure a service speed of at least 10–12 knots per hour in two-meter ice.

This unique icebreaker – there are no such icebreakers anywhere in the world now – will enable us to develop our northern deposits at the speed projected in the plans of our mining companies, primarily NOVATEK. The required meetings regarding this issue have been held, including at the level of the Prime Minister.

Coming back to the state corporation's investment programme, firstly, I would like to tell you about our general approach. The amount of investment is growing. Over the past six years it has grown by around 20 percent, while the share of budget investment has dropped from 40 to 24 percent. The corporation invests its money both in new products and, obviously, in construction of nuclear power plants.

We have reached all the main construction targets both in Russia and outside the country for the previous year. For the first time in modern Russia, we conducted two first criticality programmes, including for Unit 4 of the Rostov NPP. With your involvement, in January we

started increasing its capacity to the nominal output. Everything is on schedule.

Another first criticality procedure was conducted on Unit 1 of the Leningrad NPP 2. It is very important to note that it is the second operating 3+ generation unit in Russia that meets all the post-Fukushima safety

actor, plus fuel production and fuel recycling modules.

The thing is that the combined use of thermal and fast neutron reactor technologies allows using nuclear fuel waste over and over again in a closed fuel cycle.

This project has three major benefits. First of all, the risk of accidents is many times lower in fast neutron reactors and the level of security is therefore much higher. It is important that by using our raw materials several times in the fuel cycle we make our raw materials base almost infinite. In other words, the uranium we have now will serve us for thousands of years to come.

And lastly, we will reduce the amount of radioactive nuclear waste that has to be buried, which is very expensive, to nearly zero. We will have a so-called equivalent exchange as if it were with Nature, returning to it only as much radioactivity as we take from it.

requirements, including both active and passive safety systems.

It is the second energy unit in Russia of this type. In February 2017, the so-called sixth unit of the Novovoronezh NPP was put in commercial operation, which became a true breakthrough in global nuclear energy construction.

Thanks to that unit, last year we set a record in electricity output by exceeding 200 billion kWh and reaching 203 billion. The Soviet record brought about by the Russian as well as Ukrainian, Armenian and Lithuanian nuclear power plants was 212 billion kWh. We are moving fast towards breaking that record.

It is also very important to note that the corporation is developing not only high-capacity facilities but a whole number of small and medium-capacity sources. This year, we are launching our 'first-born', the Akademik Lomonosov floating nuclear power plant. We are planning first criticality procedures.

All these projects on our nuclear energy agenda are helping us maintain global leadership. Despite fierce competition, we are building more units abroad than all the other countries put together. We sense that competition is tightening, and sooner or later our partners, friends and rivals will gain access to this technology, which is why we are focusing on completely new areas.

We are working with the Kurchatov Institute and the Academy of Sciences on a thermoelectric energy programme. It is a very serious field where we keep abreast with the international scientific community. Of course, we also believe that the immediate future, that is, the time that is within our reach, belongs to the so-called two-component power units, where traditional VVER (pressurised water reactor) thermal reactors are complemented with fast neutron reactors.

Ours is the only company with commercial experience of using such reactors. We have them, the BN-600 and BN-800 reactors, at the Beloyarskaya NPP in the Sverdlovsk Region. We have launched a breakthrough Proryv project in Sever'sk in the Tomsk Region, where we are working on the experimental BREST-300 re-



What is the biggest problem in this sphere? It is obvious that we would like to go over from the pilot project, Proryv, to commercial production. We want to start building fast reactors around the world. This calls for building the first such commercial reactor with a capacity of at least 1,200 MW in Russia.

We have submitted this proposal to the Government, and we hope to be able to add the first 1,200 MW fast reactor to the national energy system in 2020.

After that, we will be able to offer our partners and other countries around the world the construction of not just standard water-cooled and water-moderated reactors, but entire commercial energy complexes, which is exactly what we are doing right now.

In addition to its leadership position in nuclear technologies, Rosatom also works in other innovative areas. Technological leadership beyond our industry is the next decade's challenge for Rosatom, as well as to gain a foothold outside Russia. The plans involve powerful energy storage devices, superconductivity, of course, and the use of powerful lasers for peaceful purposes.

And digital products, too. Following your instructions, the instructions of the Government, we are working on the programme for the digital transformation of the Russian economy. Our job is to develop four basic end-to-end technologies, extremely important, namely quantum technologies, virtual augmented reality technologies, Big Data technologies, and new industrial production reserves.

Here it is important to emphasise that we at Rosatom have quite a few digital developments of our own, which we use for our own purposes, including for the nuclear weapons industry. Our job now is to turn them into products, make them attractive primarily for Russian companies. They should certainly meet the highest requirements of the world market.

In general, the task you assigned us of making new products, civilian products in the nuclear weapons industry is significant and challenging. As of today, the results of the past year are that civilian production accounted for 26 percent of what the nuclear weapons industry did.

But it should be noted that outside the industry, it only accounts for 15 percent; we supply 40 percent of our civilian orders to the nuclear weapons industry; we are actually building up competencies and getting ready



to enter the big market, as they say. At the same time, last year 100% of the state defence order was executed on time.

Mr President, none of this work would be possible without people. Rosatom is working hard on recruitment, starting from school age. Our industry universities, our flagship university MEPhI train thousands of young professionals. We recruit more than 1,000 people annually – the best students, with an average GPA over 4.5.

It is gratifying that a whole range of programmes and initiatives are now developing at the federal level: Mentor, Leaders of Russia, and Russia – Country of Opportunities. We will be taking an active part.

Last year, for the third consecutive time, we won the Russian WorldSkills competition of end-to-end working professions – a true celebration of the working man. You know the winners in many industries. And now, together with the government of Tatarstan, we are working to hold a world championship here in 2019.

We would also like the city of Kazan to host, in addition to these world competitions in traditional working professions, a kind of professional Davos, like the world leaders' meeting, to discuss the needs of the labour market, the training of personnel in the long term, so that our secondary vocational schools and higher educational institutions – the line between them is gradually eroding as the levels of training are converging – received a personnel training order for the next few years directly from the leaders of the world economy, from the leaders of countries.'

The pre-stressing system

At Unit 1 of Belarus NPP (General Architect and General Contractor is ASE, Engineering Division of ROSATOM) specialists have completed installing the containment pre-stressing system. At the present time, specialists of the Representation Office of Trust RosSEM LLC in the Republic of Belarus (part of the Engineering Division of ROSATOM) have completed tension of all bundles with the initial controlled force.

'Readiness of the pre-stressing system is one of the necessary conditions of the next critical operation that is the strength and integrity tests of the reactor containment', Sergey Olontsev, Senior Vice President for Russian

Projects Management at JSC EC ASE noted. 'All these operations are conducted as part of the reactor systems and equipment preparations for cold trials,' he said.

The Belarus NPP construction project provides for two containments: outer and inner ones. The inner containment is a passive safety system component which prevents radioactive substances releases into the environment in case of hypothetical accidents.

The containment pre-stressing system is part of the inner containment of the reactor building. It consists of 126 bundles of high-strength reinforcement strands formed of seven 5-mm wires. This system

allows for significant increase in strength and reliability of the reactor building. The outer containment, along with the inner containment, serves as physical protection against natural and man-induced external impacts, including earthquakes and tornado.

Belarus NPP with two VVER-1200 reactors and total power capacity of 2,400 MW is built to the Russian design in Ostrovetz (Republic of Belarus). The Russian design of Generation III+ has been selected for the first NPP in Belarus. It fully meets international safety standards and recommendations of the International Atomic Energy Agency (IAEA).



ASE Group and MIIT

Development and implementation of prospect projects



ASE Group of Companies, the Rosatom State Corporation Engineering Division and the Russian Transport University (MIIT) have outlined their intentions in the area of joint implementation of infrastructure projects by signing a cooperation agreement. The document is focused on development and implementation of projects related to the development of design, construction and transport infrastructure operation technologies, development of projects in the area of high speed transport systems, joint programmes in the area of the digital transformation of the transport industry.

The works are being implemented at the national level to

ensure transition to the knowledge-driven economy including through implementing the advanced digital intellectual production technologies. The Russian University is implementing a programme providing a scientific rationale to establish a transport system in the digital economy since MIIT is an integrator of R&D works in the area of development and implementation of the transport digital technologies. ASE Group of Companies has been considered in turn as a leader in the area of the digital industrial platform for engineering activities. This is why we are sure that our cooperation will be mutually beneficial and useful', Boris Levin, the rector of MIIT pointed out.

The specialists of ASE Group of Companies and MIIT have to

solve together scientific problems related to the analysis and structuring of the transportation infrastructure operational data in large volumes, carry out works for optimization of solutions related to information modelling of design objects, improve the processes in the areas of virtual and augmented realities.

'The Rosatom State Corporation Engineering Division is a principal investigator in the 'Digital Economy' programme approved by the Government of Russia'. ASE Group of companies is developing and implementing its own digital platform based on Multi-D technology. The collaboration with the Russian Transport University will result in exchange of the experience accumulated by our organizations in the area of

digital technologies which will facilitate the national technical leadership in engineering, designing and construction of complex engineering facilities in various economies', Vyacheslav Alenkov, JSC ASE EC Director for System Engineering and IT pointed out as part of signing the bilateral agreement.

ASE Group of companies was established in the frame of the engineering division of Rosatom State Corporation by merging four leading companies of the industry: (JSC ASE EC – Atomstroyprom JSC – Atomenergoproekt JSC – ATOMPROEKT JSC) / ASE is one of the global leaders in nuclear power engineering and holds 30% of the global NPP construction market. ASE has representative offices, branch offices and operational offices operating in 15 countries around the world, with almost 80% of its portfolio coming from the projects abroad.

Besides the company also provides services in the field of NPP decommissioning, construction of facilities for RAW and SNF management, research reactors, thermal power plants as well as a full range of EPC, EPC(M) and PMC services for any complex engineering assets. ASE company develops and implements an innovative Multi-D project management system in the area of complex engineering objects construction which allows more efficient budget, time frame and quality management.

The Federal State Budgetary Higher Education Institution 'Russian Transport University' (MIIT) is an intermodal and general transport research and educational centre, the largest industrial university in Russia, the basic centre to guarantee staff support and scientific supervision to the transport industry.

Presentation in Mongolia

ROSATOM presented the latest developments at the seminar of 'Russian Design of Nuclear Science and Technology Centers' in Ulaanbaatar. The seminar was organised by ROSATOM and showed Russian solutions in the Centres of Nuclear Science and Technology (CSNT).

More than 50 Russian and Mongolian nuclear energy specialists took part in the seminar: heads and representatives of ROSATOM, Nuclear Energy Commission under the Government of Mongolia, as well as researchers and scientists.

Wide range of issues were discussed during the seminar, ranging from the construction of the Centre of Nuclear Science and Technology comprehensive proposal, to the ROSATOM decisions on topic of creating high-quality infrastructure and training personnel.

The seminar participants had an opportunity to get acquainted with the competitive advantages of ROSATOM on the international market in the field of nuclear energy modern development trends.

According to Dmitry Vysotsky (JSC Rusatom Overseas, director of research reactors), the creation of the Centre of Nuclear Science and Technology is an extremely important project in the sphere of cooperation between Russia and Mongolia. 'The Centre has great importance for the scientific cooperation of our countries. The creation of the CSNT in Mongolia will also create additional jobs. Another advantage of the project is the possibility of producing isotopes for medical and industrial purposes. The construction of the centre will provide a new level of mining technology. In the long term, a network of radiation centres can be created, this will allow to preserve food products longer' said Dmitry Vysotsky.

Secretary of the Nuclear Energy Commission Gun-Aajav Manlajav noted the importance of the CSNT project for Mongolia: 'First of all, the establishment of the centre will contribute to the development of Mongolian nuclear scientists research conditions. Secondly, this will be an important step on the way



to the development of nuclear energy personnel. When Mongolia will start using nuclear energy we will need professionals. Third, the centre will provide economic benefits in terms of import substitution in areas such as nuclear technology in the food sector, agriculture and health, and in production of radioactive isotopes. I am confident that the seminar is an important step for the implementation of the

CSNT project construction in Mongolia.' For more than 60 years research reactors contribute to the development of scientific innovation and education in more than 50 countries around the world. At the moment, there are 245 workers in research reactors in the world, 58 installations are operated on the Russian Federation territory. ROSATOM has built more than 120 research reactors in Russia and abroad.

The loading of the VVER-1200

At the power unit No 2 of Novovoronezh NPP-2 the loading of the fuel assembly initiators has started. According to the technology, before loading the reactor core with the nuclear fuel it is required to check the systems. In order to do this, 163 steel initiators – of the same weight and size as the fuel assemblies (FA) – are to be loaded in the reactor. The difference between them is that the initiators have leaden tablets instead of uranium dioxide ones.

'We use them for testing of the basic hydraulic characteristics of the reactor core, the main circulating pumps and other reactor systems. They will be used during the hot and cold trial that will last for 21 days', the leading engineer-physicist of the Nuclear

Safety and Reliability Department of NV NPP Mikhail Zhuk explained.

It is to be noted that these are the initiators that were used two years ago at the innovative power unit No 1 of Novovoronezh NPP-2 with VVER-1200 reactor, then they were moved to the power unit No 1 of Leningrad NPP-2. Now they are brought to Novovoronezh again.

The Novovoronezh nuclear power plant is a branch of the Rosenergoatom. The station is located on the bank of the Don River in 42 km to the south of Voronezh. It is the Russia's first nuclear power plant with VVER reactors (water-to-water power reactors of case type with regular water under pressure). Each of five reactors of the station can be a main one – a prototype of serial power reactors: the power unit No. 1

with the VVER-210 reactor, the power unit No. 2 with the VVER-365 reactor, the No. 3, 4 power units with the VVER-440 reactors, the power unit No. 5 with the VVER-1000 reactor.

The first power unit was launched in 1964, the second – in 1969, third – in 1971, fourth – 1972, fifth – 1980. There are three power units (power units No. 1, 2 were stopped in 1984 and 1990 respectively) in work at the moment. The power units Nos 1 and 2 were stopped in 1984 and 1990, respectively. The power unit No 3 was stopped in 2016 for decommissioning activities. The power unit No 1 of Novovoronezh NPP-2 was commissioned on 27 February, 2017. The power unit No 2 of Novovoronezh NPP-2 is in the middle of construction and installation works; its commissioning is planned for 2018.

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Valery Limarenko (Atomstroyexport) discusses progress and challenges



At the end of 2017, the order book of Atomstroyexport (ASE), the engineering division of Russian state nuclear corporation ROSATOM, was more than \$92bn, ASE president Valery Limarenko told Ria Novosti. It is similar to the 2016 level, despite the completion of work at facilities which have now begun operation.

'This in itself is an achievement, given the current international political situation,' he said. 'Most of the portfolio is the traditional business for us – the construction of large nuclear power plants. The contract last year for two more units in India is a significant contribution to our portfolio. Taking this into account, the division's portfolio currently includes 33 power units abroad.'

However, there are challenges. The amount of work involved in the contracted portfolio is more than ASE or the industry as a whole has encountered before. 'This is a huge challenge for us, and in response, the division has launched a transformation programme aimed at improving the management system, improving the quality of work from design to delivery of facilities.' The programme is being implemented jointly with the industry leadership. 'Not everything is easy, as the changes require considerable effort. But we are aware of the need for change to fulfil our commitments,' Limarenko explained.

It is a task which ASE cannot tackle alone, and Rosatom leadership is also involved. 'A large portfolio of projects requires a large number of specialists of all kinds – primarily experts in the field of design because the design work comes first'. There is a shortage of resources. 'However, it's not that we do not have enough people, but that the requirements related to the quality of projects have increased substantially, and we need highly skilled people who are able to do work primarily for European customers.'

This problem is being approached on several levels. 'First, we must work with our own personnel to improve their skills – and from unit to unit, they will become more experienced; second, we need to take people from the market; third, we must involve young professionals; and finally, we have to include local subcontractors who will help to adapt our project documentation to those markets where we are present.'

Concerning procurement and supply of products and services for projects, Limarenko sees fewer problems because of the high level of skills and high labour productivity. 'We have been dealing with these things for a long time and coping with them. We are introducing digital technologies and believe this will solve the issue of labour resources in this direction.' The main deficit is in human resources for project management. 'No one prepares such people, and there are very few in the market... in practice, we are developing them ourselves.' The growth rate of project teams is decisive in deciding the number of projects.

As for construction and installation, to avoid an acute shortage, ASE decided to build only a nuclear island and to give the rest to local contractors. 'Nevertheless, we will have to double the number of our personnel to ensure the timely construction of facilities in the next few years.'

Limarenko also spoke about preparations being made to build Iran's Bushehr 2. 'We consider the safety of the nuclear facilities being constructed as our priority. To this end, a complex

of complicated technical and design solutions has been developed and is now being implemented. One of them is the reinforcement of soils under the main buildings. We use the most advanced technologies and world experience here.' He said soil reinforcement was a definite challenge. It was undertaken first at the site of the Rooppur NPP in Bangladesh, then at Bushehr and is also planned for the Paks II in Hungary and possible for El-Dabaa NPP in Egypt. 'Previously this was rarely used in nuclear power engineering,' he said, 'but this method has great prospects because it increases our ability to build facilities where it may otherwise be inconvenient.'



'There are technologies that can change the conditions of the site in such a way that it becomes possible to build an NPP with the specified parameters,' Limarenko said, adding that Bushehr would not be possible without strengthening the ground.

'It is gratifying to note that Iranian companies have high competence in this field. This accounted for the success of the Iranian contractor in the international open tender for work to strengthen the soil. We are confident that the Iranian subcontractor will

honourably fulfil the obligations undertaken and will strengthen the soil in a qualitative and timely manner.'

Limarenko added that the subcontractor has received 'good results' in the pilot area and has already begun to strengthen the soils under the main buildings of the reactor compartment of unit 2.

He noted that good progress was also being made at the Kudankulam NPP in India where construction of units 3 and 4 (phase two) was now well under way. With regard to phase three (units 5 and 6), the necessary agreements and contract were signed in 2017 and the implementation stage has begun. 'At the moment, work is

single Multi-D design technology to a single digital industrial and technological platform for managing the construction of both NPPs and any other complex engineering facilities,' Limarenko explained.

'The architecture of the digital platform and the concept of data management in engineering processes have already been developed taking into account the introduction of a single platform solution, and work has begun on developing a solution.'

He added that the digital platform Multi-D is already becoming popular on the market. 'We are working on the possibility of introducing elements of technology in a number of large companies in the oil and gas industry, railways and the like. In parallel with Rosatom, ASE is participating in the programme to create a single digital product portfolio for the state corporation, which will include the main modules of the Multi-D technology.'

It is also in demand abroad. Foreign customers for Hanhikivi 1 in Finland, Paks II in Hungary, El-Dabaa in Egypt, and Bushehr II in Iran, already prescribe a strict requirement for models of their nuclear plants with information technologies that make it possible to work with this model on the customer's premises. The main contracts include the development, filing of data and the transfer of an information management system (Multi-DIMS, Information Management System) to the customer, as well as ensuring the work of all project participants can take place in the common information space, for which the ASE is responsible.

Limarenko said EDF has also expressed interest 'in our comprehensive approach to the management of information about nuclear power plants throughout the life cycle, using the information model of the facility and the methodology for managing the configuration of the station, worked out in the Multi-DIMS tool'. EDF is currently using the Multi-D system at one nuclear unit as a pilot project.

Source: 'Nuclear Engineering International' Magazine

'Atomenergomash' for Turkey



The Volgogradsk Branch of JSC 'AEM-technology' (a part of Machine Building Division of Rosatom-Atomenergomash) proceeded to the overlaying and welding of the equipment units for Akkuyu NPP in Turkey. The Turkish Nuclear Power Agency (TAEK) approved the beginning of the production.

The TAEK representatives and plant building operators – company JSC 'Akkuyu Nuclear' – carried out the conformity assessment of the reactor and steam generator parts at Atomenergomash, earlier passed to production for machining. Visual and dimensional inspection of the finished items has been performed on a selective basis.

The inspectors also assessed the readiness of the Volgogradsk Branch of JSC 'AEM-technology' for the beginning of the overlaying and welding works on the parts and assembly units of the reactor vessel and steam generators for the power unit No.1 of the Turkish NPP. Foreign colleagues checked the readiness of the process equipment and the measurement assurance,

the availability of the qualified personnel, the design and process documentation and activities on quality assurance.

It has been established, based on the inspection of TAEC and JSC 'Akkuyu Nuclear' that Atomenergomash can proceed to the overlaying and welding works on assembly units of the equipment for Akkuyu NPP: upper, lower semi-vessels of the reactor vessel and the cover of the upper unit, and also on the shells and head.

'Akkuyu' NPP in Turkey is being built according to the modernized project with the power units of III generation, with the increased safety and enhanced technical and economical characteristics. JSC 'Atomenergomash' is a single source manufacturer and supplier of the power unit equipment and power house for all four units of the NPP. The reactors, steam generators, pumping, heat exchange and other equipment shall be produced by the enterprises of the Division that will ensure the NPP safety for overall plant service life.

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Nuclear partnership

Russia, China sign several major contracts in nuclear sphere

Russian and Chinese nuclear executives have signed the biggest package of contracts in the history of the two countries' nuclear partnership. The package consists of 4 deals and envisages the construction of 4 Gen 3+ VVER-1200 units (at the Xudabao and Tianwan sites), cooperation in the CFR-600 fast reactor pilot project, and supply of the RITEG (Radioisotope Thermoelectric Generator) parts for China's lunar exploration programme.



The signing ceremony was attended by Russian President Vladimir Putin and People's Republic of China president Xi Jinping.

ROSATOM CEO Alexey Likhachev commented: 'Today, Russia and China are the leaders of the world's nuclear energy [industry]. The signing of these agreements is the best confirmation of our partnership with our Chinese friends. I note that over the course of longstanding cooperation with our reliable partners – China's Atomic Energy Authority, the National Energy Administration, and the CNNC corporation – we have created an unprecedented level of trust. Therefore, we developed a framework for joint design and construction at the Tianwan site by both Russian and Chinese specialists. We continue to jointly build the most modern Gen 3+ units

in China. Moreover, today we agreed to start the construction of VVER-1200 power units at a greenfield site. We have great plans to cooperate in the nuclear sphere, not only with regard to high-power nuclear power plants.'

There were signed two deals on the construction of 4 new units – two at the greenfield site of Xudabao and two at Tianwan (units 7 and 8). All 4 units will feature Russia's latest Gen3+ VVER-1200 reactors. The reactors, as well as all other necessary equipment, will be developed and supplied to the nuclear island by Russian side.

Third deal envisages the supply of the equipment, fuel, and services for the CNNC-developed CFR-600 fast reactor pilot project.

Finally, was signed a deal for the supply of radionuclide heat units (UHR) used as parts of radioisotope thermoelectric generators to power equipment in China's space programme, for use in lunar exploration in particular.

Notes to the editor:

The package of contracts was prepared in accordance with a joint declaration by the governments of Russia and China about the development of strategic cooperation on the use of nuclear energy for peaceful purposes.

Russia and China cooperate in various nuclear energy projects, including, but not limited to, the construction of nuclear power plants and supplying isotope products for nuclear medicine.

Tianwan NPP is the largest facility used in Russian-Chinese economic cooperation. Power units No.1 and No.2 were started up in 2007. These first two units of Tianwan NPP annually generate above 15 billion KW/hour of electric power. Power unit No.3 was connected to the grid last December. The design of Tianwan NPP is based on Russia's AES-91 project with a VVER-1000 reactor, which fully meets the requirements of current Chinese, Russian, and IAEA regulation. The construction of Tianwan nuclear power plant is being carried out by Jiangsu Nuclear Power Corporation (JNPC) in cooperation with Russia's Atomstroyexport, a part of the ASE Group of Companies.

Venture fund

ROSATOM has announced launching a venture fund for new and promising areas. The fund will focus on developing new business areas connected with perspective sectors of Russian and world economy. The key investment areas will be artificial intelligence and other digital solutions in industry and service applications, renewables and smart energy, 3D printing and new materials, development systems for smart and energy efficient cities.

Main investment objects will be early and seed stage companies, as well as companies entered the scaling stage. The key parameters in selection of the investment objects are fast

growth prospects, potential for global technological expansion and synergy with main areas of development of ROSATOM.

The fund is created as an investment partnership agreement and is open for co-investors. On its part, ROSATOM invests up to RUB 3 billion in the fund, but the fund format – the investment partnership – has been selected by the state-owned corporation to attract and interest other market investors increasing the volume of investments by 2-3 times.

First Deputy Director General and Director for Development and International Business of ROSATOM Kirill Komarov said: 'The creation of the corporate venture fund is an important driver of develop-

ment of new business areas of ROSATOM and aimed at substantial broadening of capabilities and growth potential. The fund is one of the tools of the system of innovation development and control being created in ROSATOM and operates in close synergy with other divisions. The most important task of the fund is to make the path for start-ups to Russian and world market more realistic and fast with the use of ROSATOM's capabilities.'

The management company will be headed by General Director of Orbita Capital Partners Evgeniy Kuznetsov, ex-head of Russian Venture Company. The important mission of the fund is to create an effective mechanism for synthesis of the



governmental and corporate development instruments with the start-up environment created in Russia. We plan to be very active supporting implementation of programs such as 'National Technological Initiative' and 'Digital Russia', 'Skolkovo' project to develop most effective growth capabilities for Russian companies and technologies,' he said.