



# Be Digital

Highlights '17





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As for the projects launched, we should primarily point out the commencement of construction marked by the first concreting at the Kudankulam NPP Units 3 and 4. The third important start is the first concreting at Rooppur NPP in the People's Republic of Bangladesh. Nowadays, maintaining the leadership depends largely on the company's integration into the emerging digital economy. Our Engineering Division is making good progress while keeping this track.

We have been long involved in digitalization, and the main tool in this area is the Multi-D system that we have developed. We are creating currently an industrial IT platform that can be used by any company, both in Russia and abroad. We believe that our task consists in the active interaction with state enterprises to facilitate the development of the economy of the regions where we operate. For example, last year we signed an agreement with the Government of the Nizhny Novgorod region on cooperation in the field of application of information technologies.

3 physical start-ups of Power Units and 3 first concretings are the achievements of 2017. However, these figures reveal still more outstanding results

## Dear colleagues and partners,

This year has been vitally important for us as the decennial anniversary of the Rosatom State Corporation. We are proud to have reached this milestone with excellent achievements.

The physical start-up of the Rostov NPP Unit 4 has completes the whole era of commercial B-320 reactor power units that have proven their safety and reliability both in Russia and abroad. This is an important stage in the history of nuclear power engineering started by the Soviet specialists and completed by our staff now.

It is symbolic that the physical start-up of the Leningrad NPP-2, a generation III+ unit, was held only several days after that memorable event. It is the second power unit of the new generation that we put into operation ahead of our competitors.

At the same time, this symbolic event marks the completion of one series of reactors and the commencement of a new one. In 2017, also we implemented the successful start-up of the Tianwan NPP Unit 3 in China. The first two power units are considered to be the best among all NPPs in China. We are confident that the third power unit will be reliable and safe as well and will operate for the benefit of the Chinese people.

Within the framework of social responsibility, the Engineering Division of Rosatom State Corporation pursues a consistent policy of socially orientated business in the regions of operation, supporting social projects in the sphere of environmental protection, culture, sports, promotion of patriotism among the young generation.

Moreover, we should mention the priorities of our company, such as development of personnel social support programs, creating conditions for employees personal self-fulfillment, career advancement of young specialists, enhancing the prestige of making a career in the nuclear industry.

In order to ensure the stable economic status of the Engineering Division in severe competition, we should bring together our efforts and capabilities. In every day work, our team shows its ability to maintain the technical leadership at the global market.

Valery I. Limarenko,  
CEO of Rosatom State Corporation  
Engineering Division



# About the Engineering Division

## Our Mission

Our business involves the area of complex engineering construction project management based on the extensive experience in nuclear project implementation; it creates a stakeholder value and ensures achievement of its objectives in the Russian and international markets.

## Our Vision

We strive for establishing a competitive business that is successful in the construction and management of complex engineering projects and we are focused on the stakeholder value maximization.

## Our Values

Safety • Accountability • Efficiency  
• Joint team • One step ahead • Respect

The Engineering Division's values are in line with the values of the Rosatom State Corporation and are focused on implementing the mission and ensuring sustainability

## Our Competitive Advantages

- References being available in the Russian and foreign markets.
- Available safe standard projects based on GenIII/III+ VVER reactors with competitive advantages such as: LCOE, CAPEX, construction deadlines.
- Extensive network of NPP and other complex engineering facilities construction project management.
- Complex industrial technological Multi-D platform to ensure capital construction project management.
- Extensive expertise of management team and operation personnel based on many years' experience in construction of NPPs and other complex engineering projects.
- Own design capacities.
- Outstanding engineering & technological infrastructure.

## International Footprint



**23** countries of the world where the company runs business

**11** main business core projects

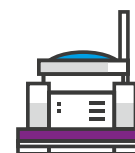
**13** countries where the company has branches and representative offices

Russia	● ● ● ● ● ○ ○	Finland	● ○	Iraq	●
Iran	● ● ● ● ○	Austria	●	Lithuania	●
China	● ● ● ● ○	Armenia	●	UAE	●
Hungary	● ● ● ○ ○	Belgium	●	France	●
Bangladesh	● ● ● ○	Bulgaria	● ○	Switzerland	●
Belarus	● ● ● ○	Great Britain	●	Japan	●
Egypt	● ● ● ○	Germany	●	Vietnam	○
India	● ● ● ○	Jordan	●	Slovakia	○
Turkey	● ● ● ○				

## Our Markets

The Engineering Division renders project management services in the area of complex engineering facilities construction and upgrading, including:

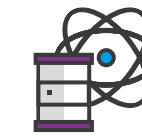
- Branch office
- Representative office



● Maintenance Services



● Core Business.  
Design and construction of nuclear power plants



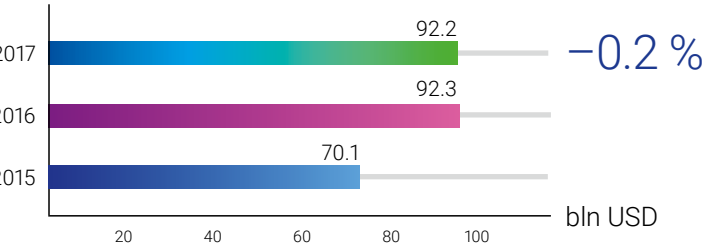
● Construction and upgrading of radioactive waste management and spent nuclear fuel facilities, decommissioning of nuclear radiation facilities



● Project Management Consulting (PMC) Services using project management tools based on the Multi-D digital platform

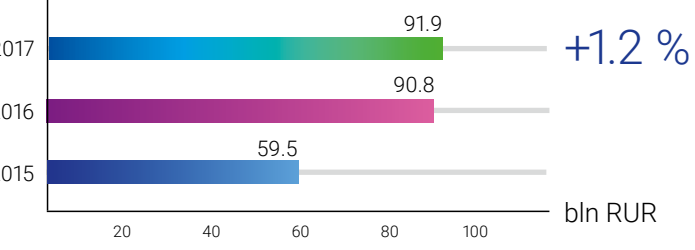
Financial and Operational Highlights 2017

10-year portfolio of overseas orders (traditional products and diversification)



The dynamics is the consequence of the signature of contracts under new projects and implementation of the current contracts. In mid-term contracting of new powerful NPP is planned driving project portfolio up.

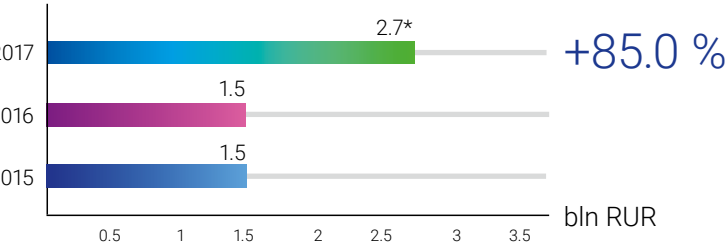
10-year portfolio of new products\* (outside the scope of the Corporation)



A new product (business) – this is a product out of the scope of the complex offer to supply a nuclear power plant and research reactors, as well as Defense Procurement implementation. In 2015-2016 new products revenue and portfolio value was calculated taking into account intracompany balance, since 2017 only the volumes out of the Rosatom State Corporation scope (external customers) are considered. Due to this, the data for 2015–2016 in this report is re-calculated and demonstrates the total volume of new products revenue and portfolio only beyond the scope of Rosatom State Corporation.

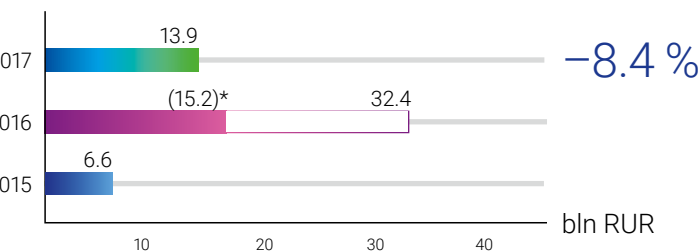
The dynamics of 2017 considering the contracts concluded by Nukem Technologies GmbH and works at radioactive waste management facilities at Kudankulam Power Units No. 5 and 6.

CAPEX



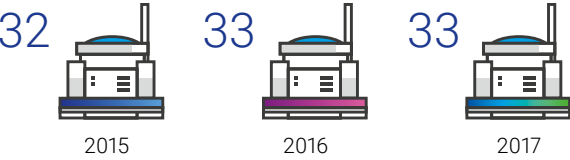
\* Financing of investment projects in 2017 was implemented at the expense of the consolidated investment resource of Rosatom State Corporation.

EBITDA



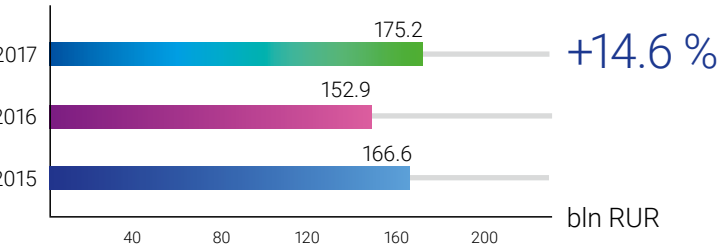
\* EBITDA of 2016 in brackets – 15.2 bln RUR is considered without the reimbursement of losses for Belene NPP (Bulgaria). EBITDA 2017/2016 dynamics is calculated to EBITDA without the reimbursement of losses.

Number of Power Units in the Portfolio



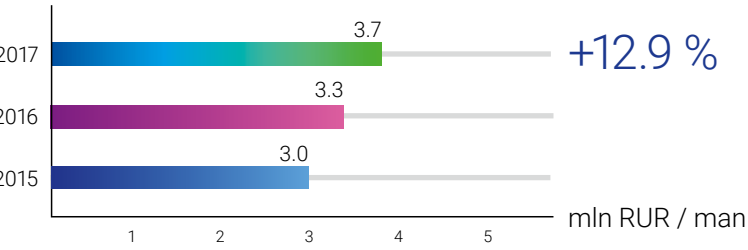
The number of power units in the Company portfolio remained the same, however, at the beginning of 2017, Kudankulam NPP was put to commercial operation, and Power Unit No. 1 of Novovoronezh NPP-2 was commissioned. In July 2017, new contracts for works under the third stage of Kudankulam NPP were signed, the project of construction of Units No. 5 and 6 has entered the stage of actual implementation.

Revenue



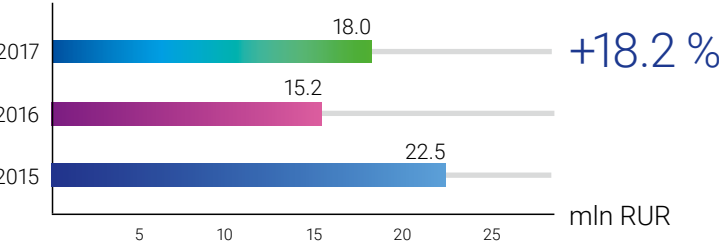
The revenue growth is related to work implementation under new projects in 2017 (e.g., El-Dabaa NPP, Paks II NPP, Bushehr-2 Power Units No. 2 and 3) and performance of a significant work scope at Belarus NPP which is currently in the active construction phase.

Labour Productivity (in terms of Own Revenue)



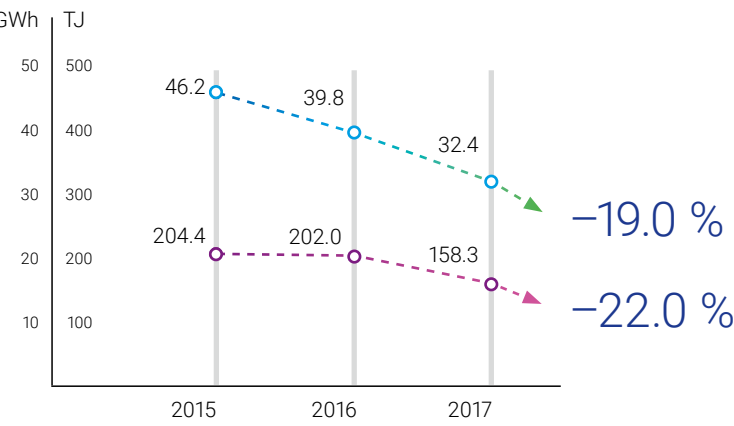
The growth of labour productivity was caused by implementation of RPS-projects and introduction of advance technologies of construction and project management as well as growth of the scope of works performed using own resources.

Expenditures for Environmental Protection Measures



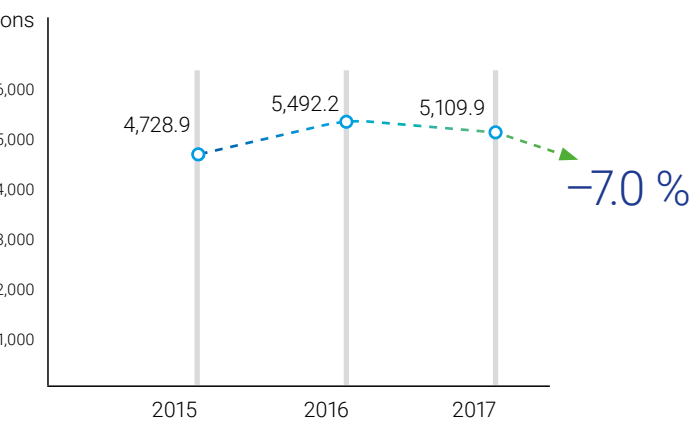
In 2017, the growth of expenses was related mainly to increased costs of industrial environmental monitoring and the necessity to re-issue permitting documentation in the sphere of environmental protection.

Consumption of Power Resources. Electrical and Thermal Power



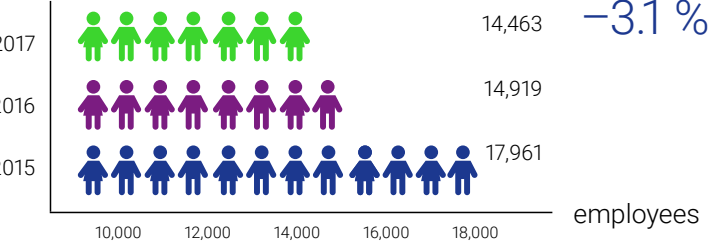
Reduced consumption of energy resources in 2017 was related to commissioning at the end of 2016 of energy conservation equipment and favorable weather conditions during the heating season.

Total Amount of Hazard Waste Classes I–V

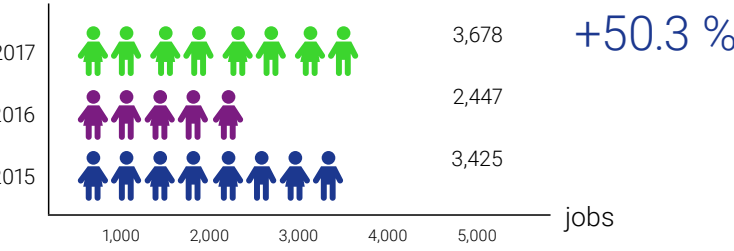


In 2017, the total volume of generated waste decreased, including waste of hazard classes IV and V that are removed to waste disposal area. Reduction of the generated waste volume is related to completion of works and commissioning of Rostov NPP Power Unit No. 4.

Average Staff



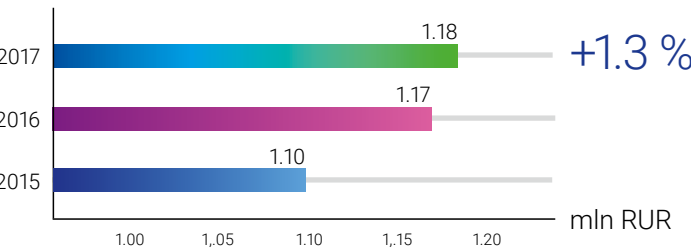
Number of New Jobs



The factors that influenced the increase of employees number in 2017:

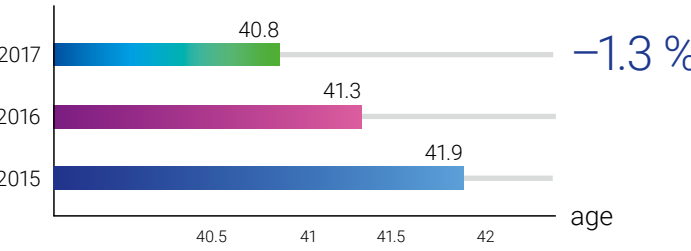
- transfer to active phase of construction of Rooppur NPP, Bushehr-2 NPP, Kursk NPP-2, increase of work scope at the NPPs that are already in the active phase of construction (e.g., Belarus NPP);
- enhancing the competence of employees of the foreign projects designing division;
- development of the Department of system engineering and IT within the digital transformation of the Engineering Division (3 per cent of the total increase in manpower).

Salaries and Other Benefits Per One Employee



The calculation was made on the basis of average headcount of the employees. The growth is caused, among other things, by annual wages indexation due to increase of consumer prices for goods and services.

Average Age of the Employees



The average age of the employees has been under 42 for three years running, it still tends to decrease. This is caused by consistent recruitment of young specialists with competences in the field of digital technologies, knowledge of foreign languages who are ready to learn from the experience and make decisions..

In 2017, there were no incidents of level 2 and higher, according to the INES scale



# The Engineering Division Milestones 2017

## January

A partnership agreement with Autodesk corporation in the field of application of information modeling (BIM), was signed.

Power Unit No. 2 of Kudankulam NPP (India) was brought to 100% power.

## February

Power Unit No. 1 of Novovoronezh NPP-2 was put to commercial operation.

## March

Power Unit No. 2 of Kudankulam NPP (India) was put to commercial mode, a one-year period of warranty operation started.

The stage of civil and erection works at Bushehr-2 NPP (Iran) started.

Additional agreement with FSUE Mining and Chemical Plant was signed for increasing the scope of works for introduction of the integrated schedule – a project management tool (for management of time frame and costs).

## April

Reactor pressure vessel of Power Unit No. 1 of Belarus NPP was installed in the design position.

A Joint Statement between JSC Atomstroyexport and Nuclear Power Corporation of India representatives regarding the final acceptance of Kudankulam NPP Power Unit No. 1, was signed.

Under the Paks II NPP project (Hungary), the EPC Contract entered in full legal force including the financial obligations of the parties.



### Legend

- The current events of the Engineering Division
- Events of the Engineering Division as part of the digital transformation

## May

JSC ASE EC has successfully passed a nuclear qualification audit performed by the Owner of Paks-II NPP (Hungary) and obtained certificate NO. SNQ/007/2017.

Power supply for auxiliary loads of Unit No. 2 of Novovoronezh-2 NPP was performed.

Conference of Rosatom State Corporation on digital economy and transformation of the nuclear industry, was held, where representatives of JSC ASE EC demonstrated the company's developments in the field of digitalization – a digital technological platform of life cycle management of complex engineering facilities Multi-D that was the winner at the international competition of engineering and technological innovations CETI AWARD 2016.

Nukem Technologies GmbH and JSC NIKIMT-Atomstroy completed the active phase of construction the first stage facilities for decommissioning of Ignalina NPP (Lithuania). B1 Facility was put to commercial operation, cold tests were completed and hot tests started at Radioactive Waste Treatment and Storage Facility B 2, 3, 4.

## June

General Framework Agreement for the construction of third stage of Kudankulam NPP (India) was signed. The agreement envisages the construction of Kudankulam NPP Power Units 5 and 6.

Agreement between the Government of the Russian Federation and the Government of the People's Republic of Bangladesh on cooperation in import to Russia of spent fuel from the Rooppur NPP, was signed.

Priority engineering survey including marine survey has been completed for the El-Dabaa NPP project (Egypt).

Rosatom State Corporation, represented by JSC ASE EC, became a member of center of competences for digital economy of the Government of RF.

JSC ASE EC became the representative of Building Smart alliance in Russia.

The main digital laboratory of JSC ASE EC was established.

### Within the framework of XXI St.Petersburg international economic forum:

• agreement with IBM was signed on cooperation in the field of digital transformation for successful reforming of business and expansion of Multi-D technology within the framework of management of capital construction facilities life cycle;

• agreement on establishment of Digital Transformation Institute was signed whose tasks are implementation of joint research, consulting, educational and pilot innovation projects and programs in the key industries of economy, with the Moscow School of Management SKOLKOVO and Center for Strategic Research "North-West".

### Within the framework of international forum "Atomexpo-2017":

• memorandum with SAP was signed on cooperation in the field of life cycle management of nuclear facilities;

• agreement on educational and scientific-research cooperation was signed with National Research Nuclear University MEPhI, in the frame of which Higher School of Engineering was established, an institution for training digital engineers and testing new solutions for digital business;

• memorandum on strategic cooperation with the Russian representative office Hilti was signed.

• memorandum on cooperation with Association on Development of Information Modeling Technologies in construction of buildings and public utilities (BIM-association), was signed;

• memorandum with French company AssystemSA was signed on cooperation in the field of promotion and practical introduction of solutions based on Milti-D technologies for NPP operators in Europe, Middle East and North Africa.

## July

JSC Atomstroyexport and Nuclear Power Corporation of India (Ltd.) signed contracts for the first priority design works, elaboration of the working documentation and supply of main equipment for Units 5 and 6 of Kudankulam NPP. The project for construction of Kudankulam NPP Units 5 and 6 has entered implementation stage.

Akkuyu NPP project (Turkey) – "Report on Site Parameters" and design documentation was approved, development of the open pit has started.

Nukem Technologies and JSC NIKIMT-Atomstroy concluded contracts for steam generators dismantling for decommissioning of Biblis NPP (Germany).

Ceremony of first concrete pouring into the reactor building foundation of Power Unit No. 3 of Kudankulam NPP (India) was held





August

The construction of national radioactive waste storage facility with a long period of decay started (NUKEM Technologies GmbH, as part of the Russian-Bulgarian consortium).

Agreement with JSC “Afrikantov OKBM” was signed that is aimed at introduction of an integrated schedule – a project management tool (in terms of time and cost).

Physical start-up of Power Unit No. 3 of Tianwan NPP (China) was performed

September

JSC ASE EC and the Government of Nizhny Novgorod region signed an agreement on cooperation in the field of application of information technologies.



October

A ceremony of commencement of works in the open pit of the main buildings of Power Unit No. 2 of Bushehr-2 NPP (Iran) was held.

Under the Hanhikivi-1 project (Finland), process of optimization of design and layout solutions for the NPP was completed, a branch office was opened in Finland.

Ceremony of first concrete pouring into the reactor building foundation of Power Unit No. 4 of Kudankulam NPP (India) was held

November

License for designing and construction of Rooppur NPP Power Unit No. 1 (Bangladesh) was obtained.

JSC ASE EC and the Industrial Development Fund of the Ministry of Industry and Trade of RF signed an agreement “On cooperation for the purpose of development of state industry information system”.

Extra-industry PMC-service contract was signed with Electricite de France (EDF).

Ceremony of first concrete pouring into the reactor building foundation of Power Unit No. 1 of Rooppur NPP (Bangladesh) was held

December

Certificates were signed on entering into legal force of commercial contracts for construction of El-Dabaa NPP (Egypt).

Under the Akkuyu NPP (Turkey) project, a ceremony of commencement of civil and erection works of preparatory period for non-nuclear part of the NPP was held in accordance with the limited permission for construction issued by TAEK.

Power start-up of Power Unit No. 3 of Tianwan NPP (China) was performed.

Reinforcement of foundation slab of reactor building of Unit No. 1 of Kursk NPP-2 started.

Achievement of the stage of systems flushing with the open reactor of Power Unit No. 2 of Novovoronezh NPP.

The reactor pressure vessel of Power Unit No. 2 of Belarus NPP was installed in the design position.








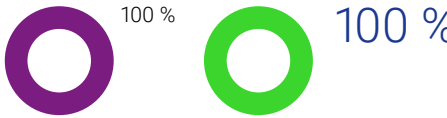



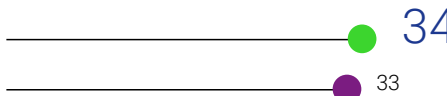
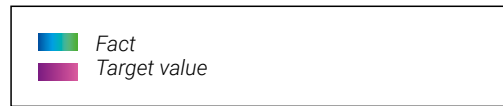
Physical start-up of Unit No. 1 of Leningrad NPP-2 was performed, the license for the power unit operation was received

Physical start-up of Power Unit No. 4 of Rostov NPP was performed





Objectives and Strategy

ROSATOM	Engineering	2017 Key Performance Indicators		2018 Objectives	2030 Objectives		
Strategic Goals	Division Strategic Goals						
To increase the Corporation's share on international markets	To increase the Division share on the global NPP construction market			<ul style="list-style-type: none"><li>Physical start-up and power start-up of Unit No. 4 of Tianwan NPP.</li><li>First concrete pouring at Unit No. 1 of Kursk NPP.</li><li>First concrete pouring at Unit No. 1 of Akkuyu NPP.</li></ul> <div></div>	> 1/3 share of the global NPP construction market		
		Portfolio of overseas orders for 10 years, for traditional business, mln dollars <small>* The actual value is between the lower and the target level of KPI.</small>	Concern Rosenergoatom investment program index (in the scope of responsibility), %				
							
		Foreign revenue from traditional products, mln. dollars <small>* 2192 mln.dollars in accordance with the Russian system of accounting. The figure was adjusted according to the rules defining actual levels of the KPIs determination and in accordance with approved methodology.</small>	Contribution to the consolidated EBITDA of Rosatom State Corporation for the nuclear order, bln RUR				
To develop new products for the Russian and international markets	Assurance of operational sustainability (diversification)			<ol style="list-style-type: none"><li>Participation of Nukem Technologies Engineering Services GmbH and JSC NIKIMT-Atomstroy in tenders abroad:<ul style="list-style-type: none"><li>decommissioning of Vattenfall NPP (Sweden);</li><li>processing and conditioning of contaminated soils during decommissioning of Kozloduy NPP (Bulgaria).</li></ul></li><li>Conclusion of contracts by JSC NIKIMT-Atomstroy:<ul style="list-style-type: none"><li>for work performance related to designing of decommissioning of Leningrad NPP;</li><li>for integrated designing, construction and supply of equipment for commissioning of radioactive waste treatment facilities at Bushehr-2 NPP .</li></ul></li><li>Commencement of works by JSC NIKIMT-Atomstroy for construction of radioactive waste treatment facilities at Rooppur NPP, opening of branch office in Bangladesh.</li><li>Implementation of contract with Electricite de France (EDF).</li><li>Works performance in accordance with road map under the project "Smart City".</li><li>Development of package of digital technologies and strategy of their promotion on foreign markets.</li></ol>	30 % share of new businesses in the Division revenue		
		Integrated index for new products, %  <small>* The actual value is between the lower and the target level of KPI. Considering the adjustment of the target value of KPI "Orders portfolio for new projects (beyond the scope)" and KPI "Revenue for new products outside the scope" according to the resolution of Rosatom Director General A.E.Likhachev on exclusion of work scope for "Research Reactors" area.</small>	Achievement of milestones for new businesses, amount				
To develop new products for the Russian and international markets	Financial stability			<ol style="list-style-type: none"><li>Execution of:<ul style="list-style-type: none"><li>digital transformation of the Engineering Division;</li><li>project of the industry digital platform introduction;</li><li>creation of information control system for projects to ensure compliance with the requirements of foreign customers to IMS;</li><li>Rosatom Production System (RPS);</li><li>program of expansion of industry cost management system jointly with Concern Rosenergoatom.</li></ul></li><li>Improvement of cost management methodology and expansion of functionality of resource management information system.</li><li>Improvement of the accuracy of planning at the stage of contract conclusion.</li><li>Development of the comprehensive cost and time management system for industry projects.</li></ol>	Sustainable achievement of the goals and further actions to upgrade leadership surpassing annual goal's indicators		
		Compliance with the time frame and cost of NPP construction abroad, %	Adjusted free cash flow of Rosatom State Corporation (considering the performance of the Division AFCF), bln RUR				
							
		Specific forecasted cost of NPP construction, reduced taking into account the timing, RUR/KW	Relatively fixed costs, bln RUR				
							
		Inventory turnover, days					

# Digital Transformation of the Engineering Division

## Our partners in digitalization:

- RFNC-VNIIEF;
- Moscow School of Management SKOLKOVO;
- Center for Strategic Research "North-West";
- NiYaU MIFI (Higher School of Engineering);
- Dassault Systems;
- Autodesk;
- IBM;
- SAP;
- Hilti Russia;
- BIM Association;
- AssystemSA etc.

In April 2017, the composition of the "Digital Economy" working group of the Economic Council under the RF President was approved by the resolution of RF President.

In July 2017, the Government of RF approved federal program "Digital Economy of the Russian Federation" that is aimed, among other things, at digital transformation of the real sector of economy – Industry 4.0. Such goal is already being implemented by the Engineering Division of Rosatom State Corporation, and the virtual prototypes of industrial and infrastructural facilities are an efficient tool of meeting the objectives.

In December 2017, the Government of RF approved the road maps for the four main directions of program "Digital Economy of RF" including the Plan for "Development of research competences and engineering capacities".

In June 2017, Rosatom State Corporation, represented by JSC ASE EC, became a member of center of competences for digital economy of the Government of RF. JSC ASE EC became the representative of Building Smart alliance in RF. A digital laboratory was created in the company.

## In June 2017, agreements were signed to facilitate the development of the company's competences in the field of digital transformation

1

### Digital platform of complex capital facilities life cycle management, means MULTI-D:

- reduction of cost and period of construction, optimization of construction works and detailed planning of sequence of operations;
- construction and design works optimization and daily planning of operating procedures
- saving up to 10 % of the project budget;
- unified web-orientated space for management of capital construction projects;
- compliance with the best global trends in the field of digital assets and project management;
- compliance with BIM 4.0, approaches;
- partnership with the leading Russian Engineering company.

**Agreement on establishment of Digital Transformation Center on the basis of Moscow School of Management SKOLKOVO, jointly with Center for Strategic Research "North-West"**, in which JSC ASE EC performs the role of the engineering partner and provides its digital transition expertise to large and medium-size industrial companies.

The programs of the Center contribute to transformation of businesses due to introduction of state-of-the-art engineering technologies under the condition of new industrial revolution, they are aimed at bringing the company to new high profit markets. The tasks resolved within the framework of the programs of the Center include the transformation of business-model of companies, transformation of organizational model and structure, reducing the time of development of new products and their placement on the market.

2

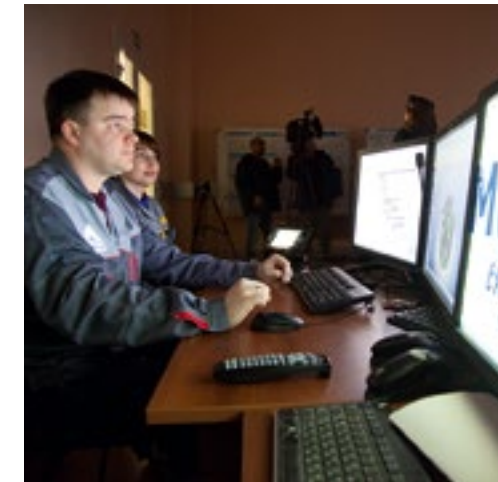
**Agreement on establishment of Higher School of Engineering of National Research Nuclear University MEPhI** for training engineers for the digital future, creation of testing areas for new solutions in digital business.

Project of National Research Nuclear University MEPhI and JSC ASE EC. Partners – Higher School of Engineering – IBM, Mail.RU, Dassault Systèmes, Autodesk, Siemens, etc. In September 2017, the pilot project of master's course "Engineers of the Digital Future" was launched, with 5 teams of 4 students each, the students are trained various professions (designers, physicists-calculators, system engineers). This pilot project helps resolve the practical tasks of the company jointly with employees of JSC ASE EC. Training fields: System Engineering, Digital Platforms, Data Science, Machine Learning, BIM, etc.

# Training and Professional Development of the Personnel During the Digital Transformation

300

employees of the Engineering Division per year will be trained in 2018–2019



In 2017, with the participation of the Engineering Division, projects were launched in Russia for development of professional standards of system engineers and BIM-designers. The training of new type of personnel is performed in the frame of the project "Higher School of Engineering" of National Research Nuclear University MEPhI – ASE".

Due to modern development of digital technologies, digital skills and knowledge in the Engineering Division, there is now a need in new professions, such as:

- **system engineers;**
- **requirements engineers;**
- **configuration managers.**

Besides the training of students under the master's course "Engineers for digital future", in 2018–2019 the employees of the Engineering Division will be trained.

Requirements to skills and knowledge in the field of digital modeling will be developed and established in 2018 for all the positions of the Engineering Division designing unit.

## New Forms of Training

- Network university – enlistment of students of the best departments from different universities.
- Modular type of training.
- Courses based on a virtual platform, VR laboratory.
- Project based training in multi-professional groups.
- Testing area for technologies testing.

## Key Requirements to a System Engineer:

- Designer's skills;
- Knowledge in the field of nuclear physics and technology;
- Understanding of the supply chain in the nuclear industry;
- Knowledge of the main suppliers of equipment;
- Ability to develop working documentation and provide both remote design supervision and supervision at the construction site;
- At least the intermediate level of English knowledge.

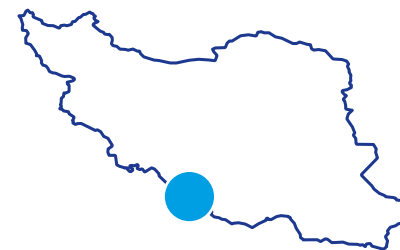


# CORE BUSINESS ENGINEERING & CONSTRUCTION OF NPP

BE DIGITAL

## Bushehr-2 NPP (Iran)

Principal – Nuclear Power Production & Development Co. of Iran (NPPD)



The NPP site is located in the province of Bushehr, the town of Bushehr.

### Type of reactor – VVER-1000

The power units are constructed under the terms and conditions of the EPC Contract.

- The Multi-D Platform is used
- Production System (RPS) is implemented in the project

From the beginning of operation and until December 2017, the total output of electricity amounted to over

27 mln MWe/h

Under construction

1,000 MWe



Unit 1

1,057 MWe



Unit 2

1,057 MWe



Unit 3

Since the date of commissioning, the Power Unit No. 1 has served for the period of 3 fuel cycles

### Key Milestones in 2017

**March.** Commencement of works for preparation of the construction site.

**May.** Completion of development and handover to the Principal of working documentation for the main buildings pit.

**June.** Completion of development and handover to the Principal of the Basic Design for soil stabilization for the main buildings.

**July.** Completion of development and handover to the Principal of the Working project for soil stabilization for the main buildings.

**August.** The Principal handed-over the site to the contractor.

**October.** Beginning of the works for digging the foundation pit under Power Unit No. 2 main buildings of Unit No. 2.

**December.** Main scope of the Basic Design for Bushehr-2 NPP Unit No. 2 has been developed and handed over to the Principal.

The Works for vertical leveling of the site, dismantling of the existing buildings and removal of technogenic soil have been completed.

### Plans for 2018

Engineering and geological survey of the offshore area where water intake facilities are to be installed.

Approval of the Basic Design of Bushehr-2 NPP by the Principal.

Commencement of licensing procedures.

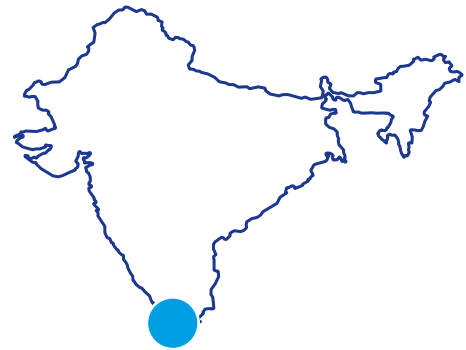
Completion of pit excavation and soil stabilization under the main buildings of Unit No. 2.





## Kudankulam NPP (India)

Customer is the Nuclear Power Corporation of India Ltd. (NPCIL)

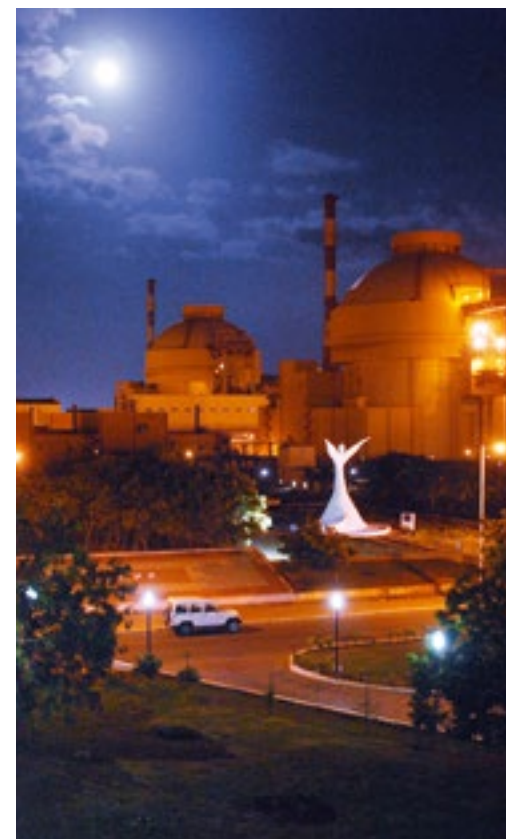
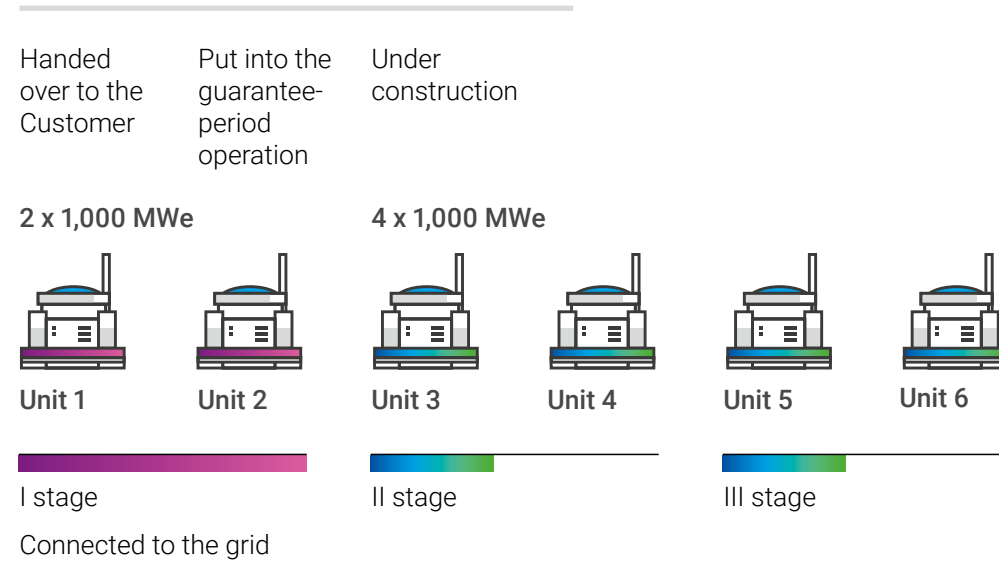


The construction site is located in the Southern India in the state of Tamil Nadu

### Type of reactor – VVER-1000

The power units are constructed under the terms and conditions of the EP Contract

● The Multi-D Platform is used



### Key Milestones in 2017

**January.** Unit No. 2 was brought to 100% of capacity.

**March.** Unit No. 2 was handed over for warranty operation.

**April.** The Final Acceptance Certificate was signed for Unit No. 1, Provisional Acceptance Certificate was signed for Unit No. 2.

**June.** General Framework Agreement for the construction of stage three of Kudankulam NPP (Units No. 5 and 6), and Intergovernmental Credit Protocol required for the project implementation, were signed.

Ceremony of first concrete pouring into the foundation slab of reactor building was held which marked the commencement of construction works at site of Power Unit No. 3.

Ground works are under way, base for implementation of the main CEW is being developed.

**July.** JSC Atomstroyexport and Nuclear Power Corporation of India (Ltd.) signed contracts for first priority design works, elaboration of the working documentation and supply of main equipment for Units No. 5 and 6 Kudankulam NPP.

**August.** Contract for technical support in construction of Units 3 and 4 was signed.

**October.** Ceremony of first concrete pouring into the foundation slab of reactor building was held which marked the commencement of construction works at site of Power Unit No. 4.

### Plans for 2018

Final handover of Power Unit No. 2 to the Customer.

Shipment to the Customer of reactor vessel and turbine generator of Unit No. 3.

Commencement of works for contract execution for supply of equipment for Units No. 5 and 6.

## Tianwan NPP (China)

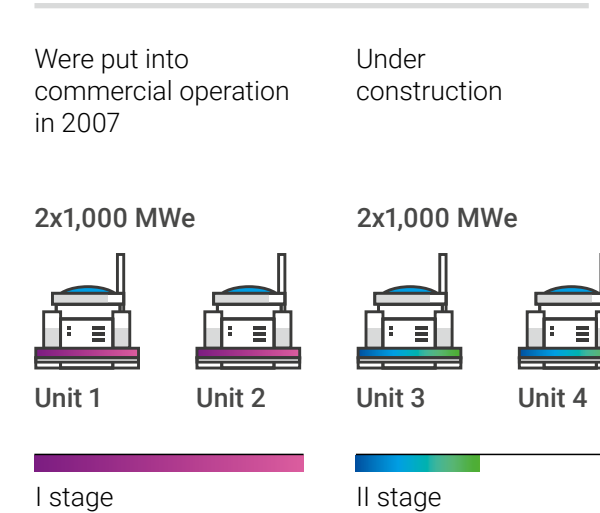
Customer – Jiangsu Nuclear Power Corporation (JNPC)



The construction site is located in the province of Jiangsu, the city of Lianyungang

### Type of reactor – VVER-1000

● The Multi-D Platform is used



The Engineering division is commissioned to design and procure nuclear island documentation and equipment and provide associated services (such as designer supervision, designer follow-up installation, designer adjustment supervision) to the Customer.

The responsibility for civil and erection, pre-commissioning works is born by the Customer.



### Key Milestones in 2017

**August.** Receipt of license for fuel loading, first fuel loading (11 days ahead of schedule).

Physical start-up of the reactor of Power Unit No. 3.

**September.** Achievement of minimum controllable level of the reactor of Power Unit No. 3.

**November.** Commencement of cold tests of Power Unit No. 4.

**December.** First connection to the grid of Power Unit No. 3.

### Plans for 2018

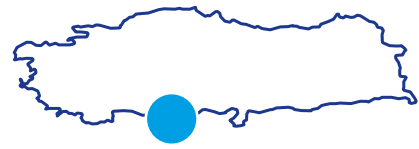
Signing of provisional acceptance certificate, commencement of the warranty period, putting Power Unit No. 3 into commercial operation.

Physical and power start of the reactor of Power Unit No. 4, achievement of minimum controllable level of the reactor of Power Unit No. 4.



# Akkuyu NPP (Turkey)

Customer – AKKUYU NÜKLEER ANONİM ŞİRKETİ



The NPP site is located near Mersin city

Type of reactor – VVER-1200

- The Multi-D Platform is used
- The Rosatom Production System (RPS) is implemented in the project

## Key Milestones in 2017

**July.** The Customer approved design documentation for Akkuyu NPP.

**August.** Pit for the foundation slab of reactor building of Unit No. 1 was excavated.

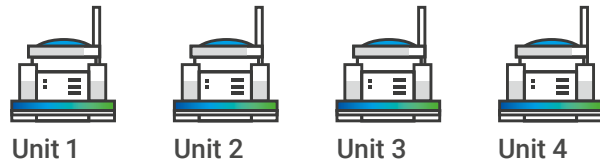
**October.** Project company Akkuyu Nuclear received from TAEK a limited permit for construction of the NPP. A limited construction permit allows to start construction and installation works at all facilities of the Nuclear Power Plant, except for the Nuclear Island safety-related buildings and structures.

Engineering survey of the detail design documentation stage were performed for the nuclear island facilities.

**November.** Concrete raft for the foundation slab of reactor building was completed, detail design documentation was elaborated and handed over the Customer to ensure the performance of civil and erection works in 2018.

**December.** A package of documentation was submitted to Rosatom for performance of a departmental review and assessment of design documentation of Akkuyu NPP.

4 x 1,150 MWe



The Engineering Division is commissioned to develop design documentation for the Akkuyu NPP project and working documentation for the Nuclear island facilities as part of the Akkuyu NPP, to perform civil erection works as part of construction of the nuclear island facilities.

## Plans for 2018

Completion of approval of documents by TAEK for the construction license of Unit No. 1.

Signature of intergovernmental agreement for spent nuclear fuel.

Completion of works for reinforcement of the foundation slab.

Obtaining of the Construction license for Power Unit No. 1.

Conclusion of legally bounding documents with the investors – signature of the shareholders agreement.

Signature package of documents of contracts and agreements required for the implementation of the project.



# Rooppur NPP (Bangladesh)

Customer – the Bangladesh Atomic Energy Commission (BAEC)



The construction site is located 160 km to the north-west from the city of Dhaka

Type of reactor – VVER-1200

The power units are constructed under the terms and conditions of the EPC Contract

- The Multi-D Platform is used
- The Rosatom Production System (RPS) is implemented in the project

2 x 1,150 MWe



## Key Milestones in 2017

**November.** The Bangladesh Atomic Energy Regulating Authority (BAERA) granted Rooppur NPP design and construction license to the Bangladesh Atomic Energy Commission (BAEC). This document confirmed the safety of the project chosen by the Bangladesh Party and made it possible to commence Rooppur NPP construction.

Ceremony of first concrete pouring into the reactor building foundation of Power Unit No. 1 of Rooppur NPP (Bangladesh) was held.

**December.** Rooppur NPP public counseling office was opened in Bangladesh.

## Plans for 2018

Concreting works with the purpose of ensuring the installation of core catcher and building A of Power Unit No. 1.

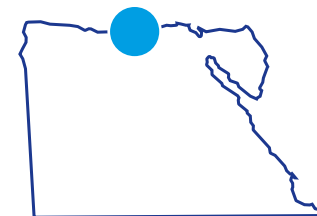
Obtaining the Construction license for Power Unit No. 2.

Ceremony of first concrete pouring into the reactor building foundation of Power Unit No. 2.

Works for concreting of the foundation slab of the reactor building, foundation slab of the turbine building, annular floor of Power Unit No. 2.

# El-Dabaa NPP (Egypt)

Owner – Nuclear Power Plant Authorities of the Arab Republic of Egypt



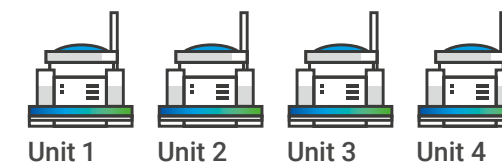
The construction site is located in the town of El-Dabaa, 130 km north-west from Cairo

Type of reactor – VVER-1200

The power units are constructed under the terms and conditions of the EPC Contract

- The Multi-D Platform is used
- The Rosatom Production System (RPS) is implemented in the project

4 x 1,194 MWe



## Key Milestones in 2017

**December.** Entering into force of the EPC-contract, commencement of the works for site acceptance by the Customer.

## Plans for 2018

Conclusion of the contract for supply of nuclear steam generating plant.

Completion of the fourth stage of engineering surveys, acceptance of the reports by the Customer.

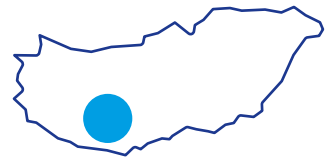
Completion by the Customer of first priority detail design documentation for CEW of preparatory period.

Submission of documents for obtaining of the Construction license for Power Unit No. 1, 2.



## Paks II NPP (Hungary)

Owner – MVM Paks II (since 06.11.2017, known as Paks II Nuclear Power Plant Private Company Limited by Shares)



The construction site is located in the proximity of the town of Paks

Type of reactor – VVER-1200

The power units are constructed under the terms and conditions of the EPC Contract

- The Multi-D Platform is used
- The Rosatom Production System (RPS) is implemented in the project

2 x 1,198 MWe



Unit 1

Unit 2

### Key Milestones in 2017

**April.** The EPC Contract entered in full legal force including the financial obligations of the parties.

The Hungarian Atomic Energy Authority (HAEA) approved the application for granting the license for the construction site of new power units at Paks-II NPP.

**November.** Initialing of Supplementary agreement No. 1 to the EPC Contract. for the erection of the construction and installation base.

**December.** Signing of an agreement with General Electric (GE) for the supply of turbine island equipment.

### Plans for 2018

Development of design documentation of the Basic Design and Preliminary Safety Analysis Report, submission of documents for obtaining the license.

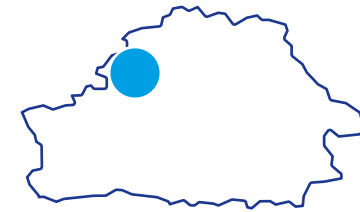
Commencement of the civil and erection works.

Organization of tender procedures, signing contracts for equipment and materials (long-lead equipment, turbine island, core catcher).

Continuation of the engineering surveys  
Nuclear qualification of the supplier of the reactor plant, nuclear assessment of the supplier of the turbine island equipment.

## Belarus NPP

Customer – RUE “Belarus Nuclear Power Plant”



The site is located in the region of Grodno, the area of Ostrovets

Type of reactor – VVER-1200

The power units are constructed under the terms and conditions of the EPC Contract

- The Multi-D Platform is used
- The Rosatom Production System (RPS) is implemented in the project

The possible boosting up to 1,200 MWe

1,150 MWe



Unit 1

1,150 MWe



Unit 2

### Key Milestones in 2017

**April.** Reactor pressure vessel of Power Unit No. 1 was installed in the design position.

**August.** One of the main stages of construction – welding of the main coolant pipeline – was completed in the reactor compartment of Power Unit No. 1.

**December.** Commencement of installation of reactor pressure vessel of Power Unit No. 2.

### Plans for 2018

Commencement of stage Revision at Power Unit No. 1.

Installation of steam generators, turbine in the turbine island and the main process equipment for preparation to flushing of the systems with the open reactor of Power Unit No. 2.

Beginning of welding of main coolant pipeline of Power Unit No. 2.

## Hanhikivi-1 NPP (Finland)

Owner – Fennovoima Oy • EPC-Contractor is RAOS Project Oy •  
EPC – Designer is JSC ATOMPROEKT



The site is located in the region of North Österbotten (north-western Finland), near the town of Oulu

Type of reactor – VVER-1200

- The Multi-D Platform is used

1,265 MWe



Unit 1

The Engineering division is commissioned to develop the design documentation and working documentation of nuclear island buildings and structures.

### Key Milestones in 2017

Under the Hanhikivi -1 NPP project JSC ATOMPROEKT (General Designer), within the framework of the contract with RAOS Project Oy (General Contractor), was in the process of developing the project and the licensing documentation so that Fennovoima Oy (the Owner) could receive the license for Hanhikivi -1 NPP construction in accordance with the legislation of Finland.

### Plans for 2018

Completion of development of the Basic Design documentation, 3D-model of the NPP in the scope of the Basic Design and licensing documentation with the purpose of submitting it to STUK.



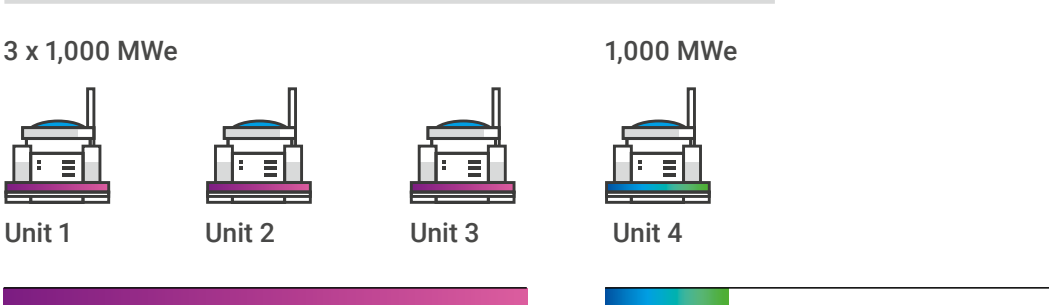


# Rostov NPP (Russia)

Customer – JSC Concern Rosenergoatom



The site is located in the Rostov Region, on the bank of the Tsimlyansk reservoir



## Type of reactor – VVER-1000

The power units are constructed under the terms and conditions of the EPC Contract

- The Multi-D Platform is used
- The Rosatom Production System (RPS) is implemented in the project

## Key Milestones in 2017

- March.** Beginning of flushing of the systems with the open reactor, testing of equipment.
- May.** Placement of the Turbine on the turning gear.
- July.** Hydraulic testing of primary and secondary circuits.
- August.** The containment testing.
- September.** Circulation flushing, hot run of the reactor plant.

- October.** Inspection of the reactor plant.
- December.** First criticality of Power Unit No. 4, bringing of the reactor plant to minimum controllable Level.

## Plans for 2018

- Power start-up of Power Unit No. 4, commencement of trial operation, comprehensive testing of the power unit at nominal power.
- Comissioning of the Rostov NPP Power Unit No. 4.

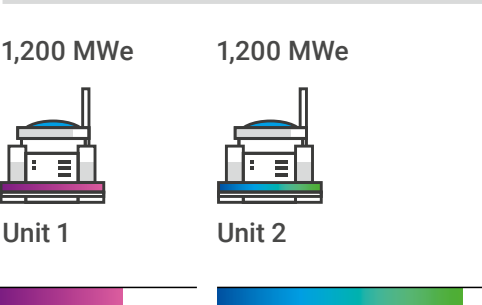
# Novovoronezh NPP-2 (Russia)

Customer – JSC Concern Rosenergoatom



Location: Novovoronezh, Voronezh region

Novovoronezh NPP-2 is the first Gen III+ NPP in Russia and in the world



## Type of reactor – VVER-1200

The power units are constructed under the terms and conditions of the EPC Contract

- The Multi-D Platform is used
- The Rosatom Production System (RPS) is implemented in the project

## Key Milestones in 2017

- February.** Unit No. 1 was put to commercial operation.
- May.** Power supply for auxiliary loads under the design diagram for Power Unit No. 2.
- December.** Commencement of flushing of the systems with the open reactor of Power Unit No. 2.

## Plans for 2018

- Completion of the reactor plant hot run-in.
- Completion of the testing of containment enclosure of Unit No. 2.

Novovoronezh NPP-2 is the first Gen III+ NPP in Russia. The construction is carried out according to the design of the NPP with the VVER-1200 reactor developed by JSC “Atomenergoproekt”. This Project is based on the technical solutions of the NPP-92 design, which was certified in April 2007 in line with all EUR technical requirements for NPPs equipped with the latest light-water reactors.

All safety functions in the VVER-1200 NPPs are implemented by separate active and passive safety systems, which guarantee a reliable operation of the Nuclear Power Plant and its resistance to external and internal impacts.

Unit No. 1 based on the Gen III+ VVER-1200 reactor was put into commercial operation on February 27, 2017. Civil and erection works are in progress at Unit 2 now.





## Kursk NPP-2 (Russia)

Customer – JSC Concern Rosenergoatom



Location: Makarovka site, Kurchatov district, Kursk region

### Type of reactor – VVER-TOI

The power units are constructed under the terms and conditions of the General Contractor

- The Multi-D Platform is used
- The Rosatom Production System (RPS) is implemented in the project

2 x 1,255 MWe



Unit 1



Unit 2

Kursk NPP-2 is being constructed in order to replace the decommissioned Power Units of the operating Kursk NPP. Commissioning of the first two Power Units of Kursk NPP-2 is planned to be synchronized with the decommissioning of Unit 1 & 2 of the operating NPP.

### Key Milestones in 2017

Preparatory works of the construction base have been performed such as excavation of soil and construction of the foundations for the buildings and structures.

**December.** Beginning of concreting of the foundation slab of the reactor compartment of Power Unit No. 1 over the current year.

### Plans for 2018

Beginning of civil and erection works:

- construction of artificial foundations under the main buildings and structures reinforcement;
- start of concreting of the foundation slab (first concrete) of Power Unit No. 1;
- beginning of concreting of the foundation slab in the auxiliary reactor building and unit pump station of Power Unit No. 1.
- beginning of reinforcement of the foundation slab of reactor building of Power Unit No. 2.

## Leningrad NPP-2 (Russia)

Customer is JSC Concern Rosenergoatom



Location: Near the town of Sosnovy Bor, the Leningrad region

### Type of reactor – VVER-1200

The NPP is constructed under the terms and conditions of contracts for engineering survey, development of basic and detailed design documentation and designer supervision.

- The Multi-D Platform is used
- The Rosatom Production System and project management are implemented in the project

2 x 1,198.8 MWe



Unit 1



Unit 2

LNPP-2 design meets the up-to-date international safety requirements. It applies 4 active (redundant) channels of safety systems including the core localization device (core catcher), passive heat removal system (PHRS) removing heat from beneath the reactor containment and passive heat removal system removing heat from steam generators.

### Key Milestones in 2017

**December.** Physical start-up of Power Unit No. 1 of Leningrad NPP.

Obtaining the power unit operation license.

### Plans for 2018

Power start-up of Power Unit No. 1.

Putting Power Unit No. 1 into commercial operation.

Nowadays, maintaining the leadership depends largely on the company's integration into the emerging digital economy. Our Engineering Division is making good progress in this field

Valery I. Limarenko,  
CEO of Rosatom State Corporation  
Engineering Division

#### Person responsible for Public Reporting:

Victoria A. Pimenova, Head of the JSC ASE  
EC Strategy Division, Deputy Chair of the  
Public Reporting Committee

E-mail: V.Pimenova@niaep.ru

#### Head of the Communication Division (press-agent)

Nina A. Dementsova

2, Bld. 1, Dmitrovskoye Schosse, Moscow,  
127434 Russia

E-mail: press@atomstroyexport.ru

Tel No: +7 495 737-90-37 ext. 7-89-30.



#### **JSC ASE EC**

Postal address (Location):  
3, Svobody Square, Nizhny  
Novgorod, 603006, Russia

Phone +7 831 421-79-00

Fax: +7 831 419-84-90;  
+7 831 421-06-04

E-mail: [niaep@niaep.ru](mailto:niaep@niaep.ru)

#### **JSC ASE**

Postal address:  
3, Svobody Square, Nizhny  
Novgorod, 603006, Russia

Location: 2, Bld. 1 Dmitrovskoye  
Schosse, Moscow, 127434, Russia

Phone +7 495 737-90-37

E-mail: [post@atomstroyexport.ru](mailto:post@atomstroyexport.ru)

#### **Atomenergoproekt JSC**

Postal address (Location):  
7, bld. 1, Bakuninskaya Str., Moscow,  
105005, Russia

Phone +7 495 633-50-50

E-mail: [info@aep.ru](mailto:info@aep.ru)

#### **JSC ATOMPROEKT**

Postal address (Location):  
82, Savushkina str.,  
St.-Petersburg, 197183, Russia

Phone +7 812 339-15-15  
(multi-channel)

E-mail: [info@atomproekt.com](mailto:info@atomproekt.com)

ATOMSTROYEXPORT.RU