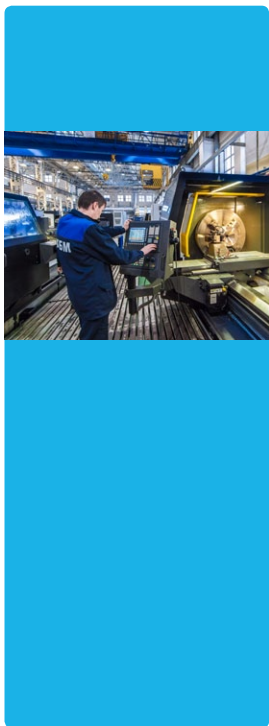


JOINT STOCK COMPANY "AFRIKANTOV OKBM"



**2017**  
**RESULTS**



To date JSC “Afrikantov OKBM” is a large scientific and production center of ROSATOM State Corporation with a multidiscipline design team and proprietary research, experimental and production facilities.

## Status in the Industry

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JSC “Afrikantov OKBM” is within the management outline of Atomenergomash JSC, ROSATOM’s Mechanical Engineering Division. In 2017, the share of JSC “Afrikantov OKBM” in the revenue of Atomenergomash was 31.7%.

JSC “Afrikantov OKBM” participates in solving tasks of ROSATOM’s first-tier financial responsibility centres of level 1, including tasks of the Directorate for Nuclear Arms Complex, Directorate for Nuclear Energy Complex, Directorate for Nuclear and Radiation Safety, Block of Innovation Management, Atomflot FSUE and others.

## Status and Functions

---

Chief Designer and Packaged Equipment Supplier of reactor plants of various application.

Lead Interdepartmental Entity for refueling problems of naval nuclear reactors.

RPS-Enterprise with assigned status of RPS Leader since 2015.

## Main Activities

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Key competencies and complete package of activities and services at the lifecycle horizon of various types of reactor facilities and NPP equipment.

A total of 9 business areas.

## Main Products

---

R&D, Supplies and Services.



# STRUCTURE



## DESIGN AND PROCESS DIVISIONS

**> 1,200** employees

**125** employees

have academic degrees  
and titles

---



## RESEARCH AND TESTING COMPLEX

**> 190** employees

**> 70** test facilities

area of

**> 22,450** m<sup>2</sup>

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## PRODUCTION COMPLEX

**> 1,600** employees

**> 500** equipment units

workshops production  
area of

**> 31,700** m<sup>2</sup>







# FROM THE FIRST PERSON

Dmitry L. Zverev

General Director, General Designer  
of JSC "Afrikantov OKBM"



*I am pleased to bring to your attention this information brochure: JSC "Afrikantov OKBM". 2017 Results".*

— It is no question that each result and each achievement reflects the contribution of every member of our multi-discipline and skilled team.

*2017 was a period of intensive work and a new step in the Company's development, including implementation of business areas, growth in efficiency of processes and competitiveness of products. The Company showed significant achievements in production activities. It is no question that each result and each achievement reflects the contribution of every member of our multi-discipline and skilled team. I extend my appreciations to our employees for responsible high-quality labor and commitment to success, to our colleagues and partners for effective cooperation and aspiration to promote it, to our customers for their confidence in us.*

*Our mission of serving the national interests and contributing to the nuclear industry development has remained unchanged and our values likewise.*

*In 2017, we continued responsible and effective fulfillment of tasks of national importance crucial for national defence capability and country's nuclear shield strengthening. The State Defence Order (SDO) was 100% fulfilled. Target indicators were achieved in all business areas. We remained actively engaged in fulfillment of strategic tasks of national importance: such as development of the RF Arctic Region, nuclear fuel cycle closure, etc.*

*JSC "Afrikantov OKBM" has been consistent in strengthening and developing the quality management system, along with planned enhancement of the Company's efficiency and competitiveness.*

*Extensive implementation and system-level integration of ROSATOM's Production System at the Company is viewed as an indisputable factor and resource facilitating the Company's development strategy implementation, increasing competitiveness of the Company and its products, and contributing to sustainable development at large. On April 1, 2017 the Company confirmed its status of RPS Leader and took the first place in the industry-level rating of RPS Leaders by the resolution of The Governing Board of ROSATOM State Corporation.*

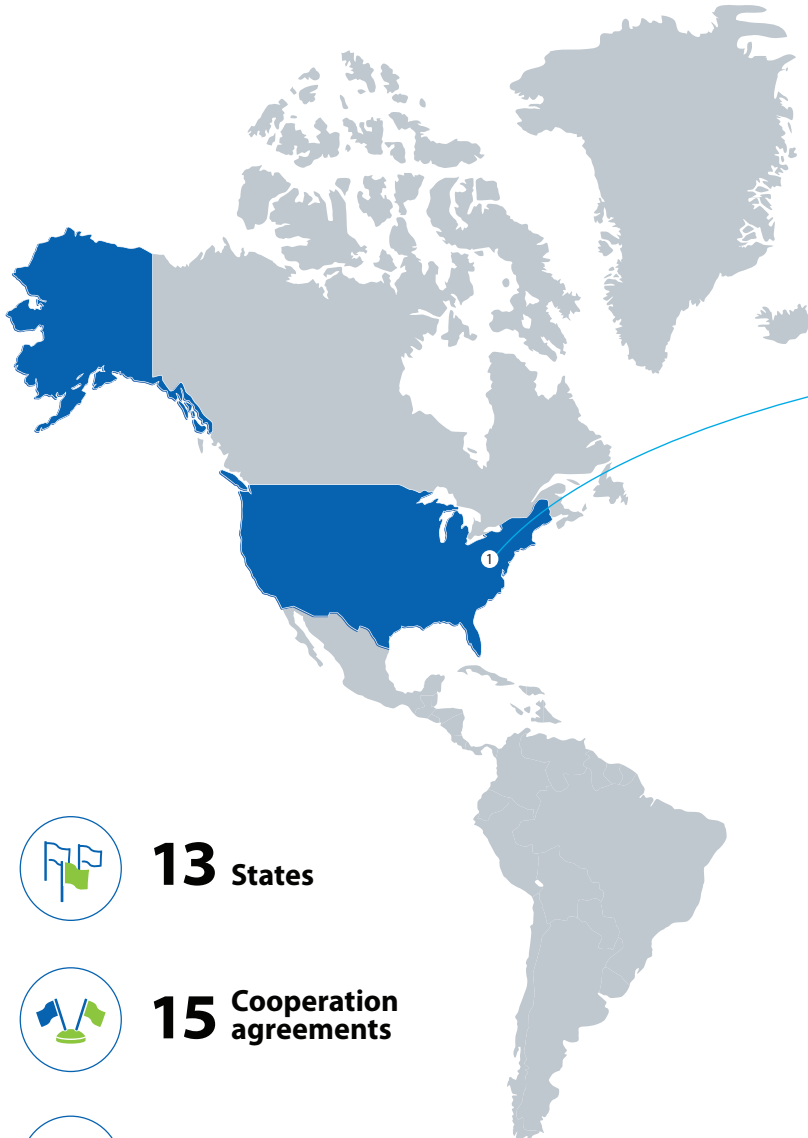
— The Company confirmed its status of RPS Leader and took the first place in the industry-level rating of RPS Leaders.

*JSC "Afrikantov OKBM" is an environmentally responsible company of JSC Atomenergomash. The Company is one of the top ten environmentally effective and energy-effective enterprises in Russia and Kazakhstan as suggested by environmental and energy rating agency Interfax-ERA in 2017; the Company was included into 100 best organizations in Russia in the field of ecology and environmental management, etc.*

— In 2017, the Company's achievements and even challenging issues opened up new opportunities for the next step of the Company's further development.

*All the achievements, successes and challenging issues of 2017 opened up new opportunities for the next step of the Company's further development. I am confident that JSC "Afrikantov OKBM" has all the resources required for further focused growth. I believe that our team will cope with challenges and tasks of any level of complexity.*

# GLOBAL PRESENCE



① **USA**  
Audit of the Quality Management System of JSC "Afrikantov OKBM" under the TVS-K Fuel Promotion Project at the USA market

② **Sweden**  
JSC TVEL and Vattenfall Nuclear Fuel AB successfully conducted the audit of the Quality Management System of JSC "Afrikantov OKBM"

③ **Bulgaria**  
The Company completed TVSA-12 development and ensured its implementation under the contract with JSC TVEL

④ **Armenia**

- Instrumental examination of pumping equipment of Armenian NPP Unit 2 in the frame of power unit life extension
- Examination of pump equipment technical condition of Armenian NPP Unit 2



**13** States



**15** Cooperation agreements



**9** Export/Import licenses



5 **Finland**

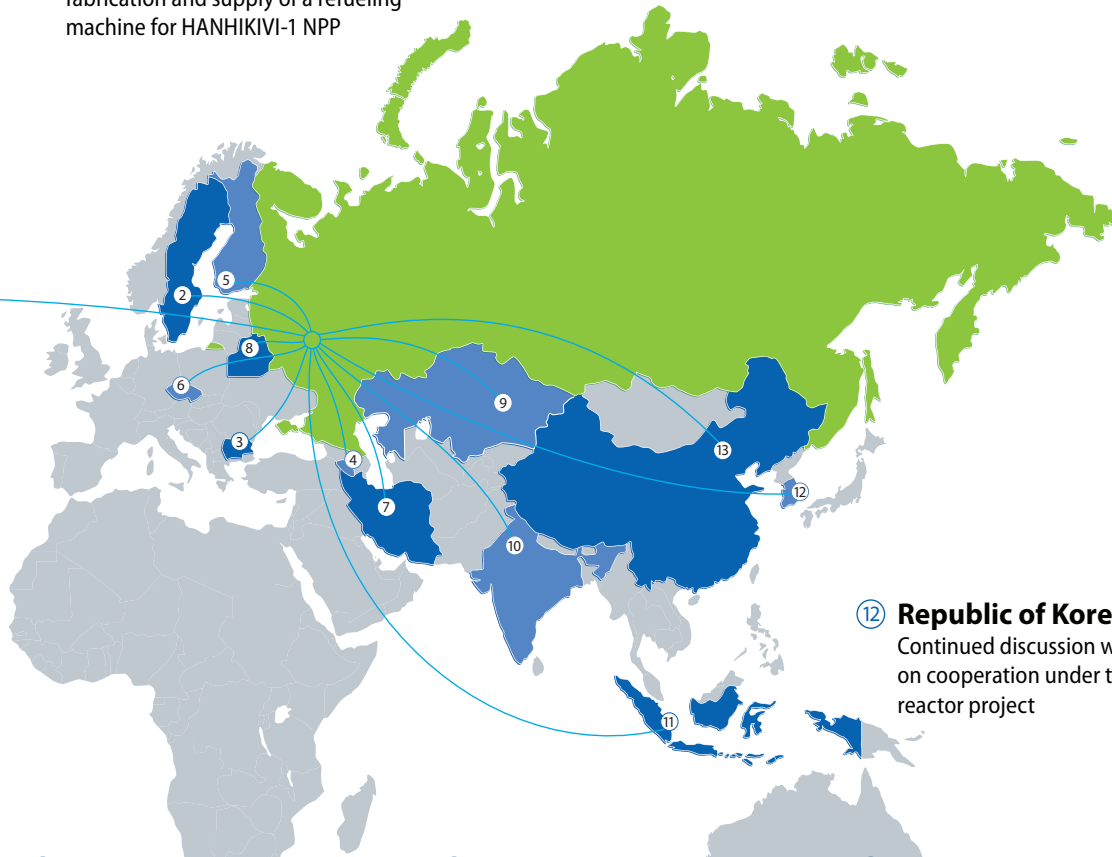
Audit of the Quality Management System of JSC "Afrikantov OKBM" under the contract between JSC "Afrikantov OKBM" and JSC Atomenergomash for the fabrication and supply of a refueling machine for HANHIKIVI-1 NPP

8 **Belarus**

- Acceptance tests of MPS-V-1200 refueling machine for Belarusian NPP Unit 2
- Supply of TsVA type pump units to Belarusian NPP Units 1&2

11 **Republic of Indonesia**

- Development of RDE reactor plant basic design materials
- Preparatory activities for further optimization of RDE reactor plant conceptual design



6 **Czech Republic**

Audit of the Quality Management System of JSC "Afrikantov OKBM" as the contractor of JSC TVEL by the representatives of CEZ a.s.

9 **Kazakhstan**

Signing of a contract with NCA of the Republic of Kazakhstan for accreditation of the Central Plant Laboratory of JSC "Afrikantov OKBM"

12 **Republic of Korea**

Continued discussion with KAERI on cooperation under the integral reactor project

7 **Iran**

Rendering of services of technical support and field supervision in the process of operation and repair activities of the integrated rotating equipment of Bushehr NPP Unit 1

10 **India**

- Participation in testing of prototypes Kudankulam NPP equipment at BARC test facilities
- Cooperation with HEC company under the PHWR-700 Project

13 **China**

- Manufacturing of SPTA for Tianwan NPP Units 1&2
- Supply of SPTA for CEFR equipment, technical support services in the course of preparatory activities aimed at repair and replacement of CEFR equipment
- Development of cooperation in terms of CEFR operation
- Cooperation in construction of Demonstration Fast Neutron Reactor CFR-600 on the territory of PRC



# KEY INDICATORS



## Examples of Efficiency

(2017 facts as compared with the 2016 ones)

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**18.25%**

Operating (gross) profitability

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**1.82**

Debt-equity ratio  
(financial leverage ratio)

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**12.77%**

Growth of average monthly salary  
(since 2008)

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**39.15%**

Internal performance  
(added value)

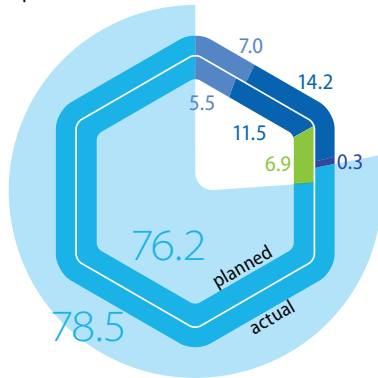
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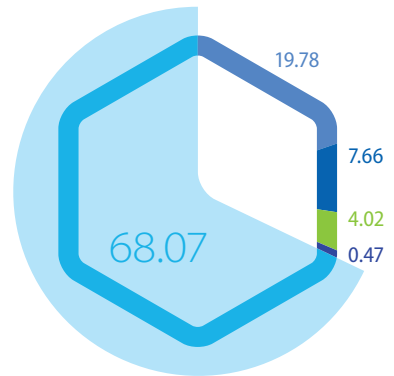


## Structure of activities of JSC "Afrikantov OKBM" by business areas, %

2017 planned/actual

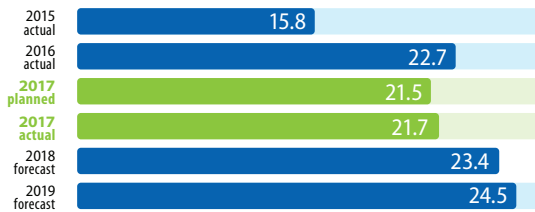


2018 forecast

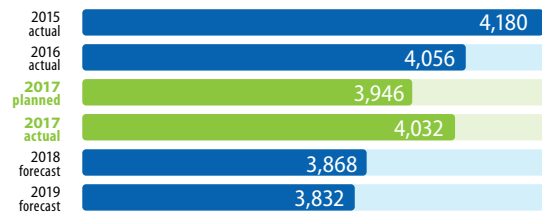


- Transport, marine and naval power engineering
- Nuclear power engineering
- Shipbuilding
- Gas and petrochemical industry
- Other activities

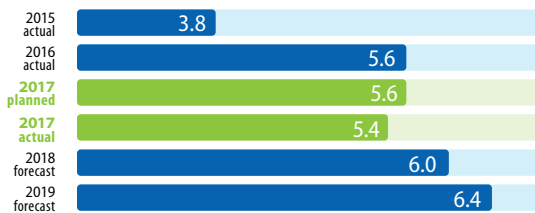
### 1. Sales revenue, RUB billion



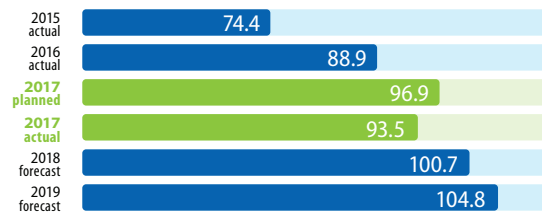
### 4. Average annual number of employees, persons



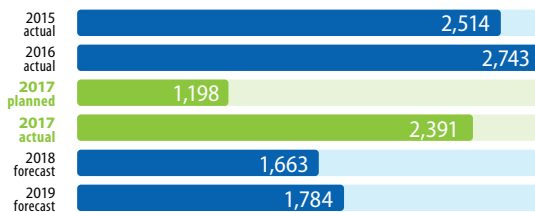
### 2. Labor efficiency, RUB million/man



### 5. Average monthly salary, RUB thousand



### 3. Net income, RUB million



# 71.75%

revenue  
(RUB15.5 billion) from  
COMPANY'S  
ACTIVITIES





# STRATEGY



## Strategic Goals

---

1. Securing and developing the Company's leadership and competitive advantages of the Company and of its products.
2. Development of employee core competencies and personnel social safety.
3. Compliance with sustainable development principles (provision of economic performance, social responsibility and environmental safety).



## Strategic Priorities

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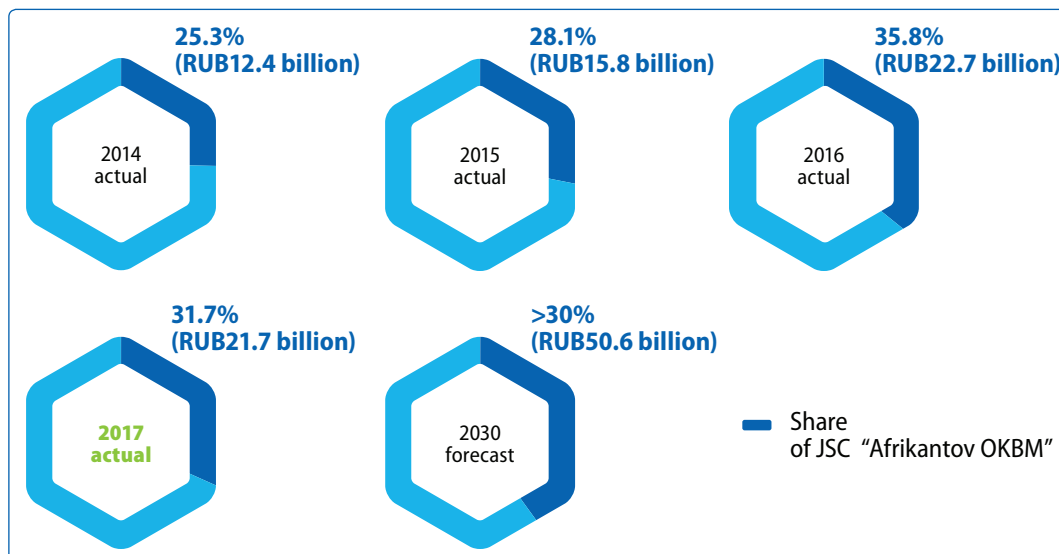
1. Increase portfolio of orders and volume of sales by developing and implementing new products.
2. Build up the portfolio of foreign orders.
3. Reduce prime cost, lead time, ensure specialization and innovative development of in-house production and of the cooperation pattern key participants' production.
4. Increase operational efficiency.
5. Assure safety.



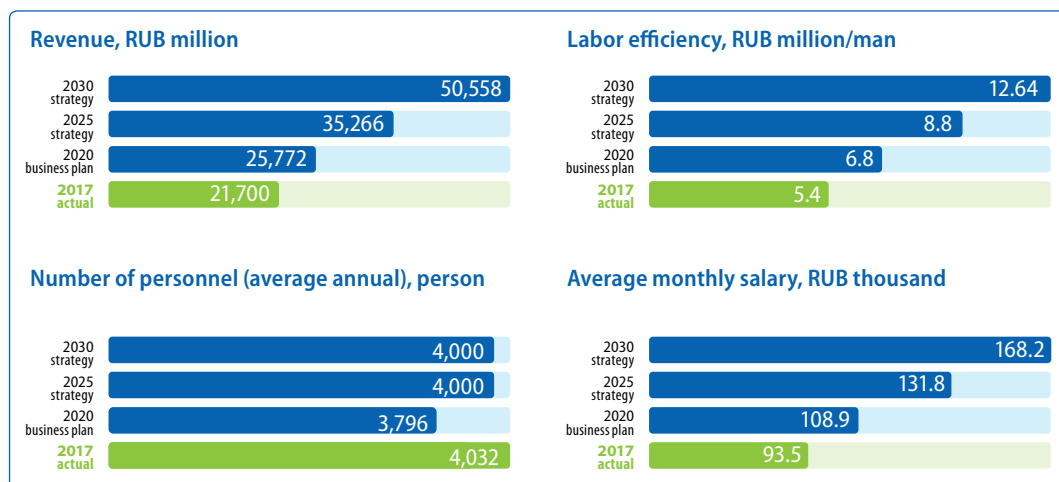
## Strategic vision:

High-technology, dynamically developing company which successfully implements corporate business and social partnership principles; scientific and production center aimed at creating innovative products ensuring strategic competitiveness of reactor technologies in the interests of the national security and leadership in civil reactor technologies.

## Share in the Revenue of JSC Atomenergomash



## Target Milestones till 2030



# Contribution of Activity Results Achieved by JSC “Afrikantov OKBM” to Strategic Goals in 2017

## STRATEGIC PRIORITIES OF JSC “AFRIKANTOV OKBM”:

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### Increase portfolio of orders and volume of sales by development and implementation of new products

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- 2017** Portfolio of orders for ten years for new products amounts to RUB23.41 billion.  
Development of a product strategy and implementation of an investment project aimed at developing pumping equipment for shipbuilding.  
Preparation of documents to participate in tender for supply of cryogenic pumps, modules of upper constructions and turbo-expanders.  
Completion of an expert review of BN-1200M investment project.  
Development of technical and commercial requirements for an optimized floating power unit (FPU) based on RITM-200M reactor plant, preparation of an investment project. Development of RITM-400 reactor plant final design.  
Development of equipment final design for a nuclear maintenance ship.
- 2018** Signing of a contract for R&D in validation of engineering solutions adopted in BN-1200M Project.  
Development of the optimized FPU conceptual design based on RITM-200M reactor plant.  
Winning the tender for supply of cryogenic pumps, modules of upper structures and turbo-expanders.

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## Growth of Foreign Order Portfolio

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- 2017** The foreign order portfolio for 10 years amounts to 51.68 US\$.  
Agreement of terms and conditions of cooperation with the Chinese enterprises under Frame Contract for Supply of equipment under CFR-600 Project, formulation of technical requirements for equipment development, Frame Contract and Intergovernmental Agreement.  
Development of documentation on reactor plant basic design for an NPP with HTGR.  
Provision of SPTA supply for CEFR equipment, technical support during preparation for CEFR equipment repair and replacement.  
Successful audit conducted by the representatives of JSC Atomenergomash, Fennovoima Oy (Finland), STUK (Finland) and RAOS Project Oy (Finland) on Supply of a Refueling Machine for HANHIKIVI-1 NPP.  
Manufacturing of SPTA for Tianwan NPP and for Bushehr NPP.  
Completion of pumping equipment supply to Belarusian NPP.  
Service life extension of pumping equipment at Kozloduy NPP Unit 6 (Bulgaria) and at Armenian NPP Unit 2.
- 2018** Signing of a Contract for Equipment supply under CFR-600 Project.  
Signing of a contract for SPTA and Equipment Supply for CEFR.

## STRATEGIC GOALS OF ROSATOM STATE CORPORATION UP TO 2030

- Increase the share at international markets.
- Reduce the cost of products and the lead time.
- Create new products for the Russian and International markets.

### Reduce products cost, lead time, ensure specialization and innovative development of both the Company's production and the cooperation pattern key participants' production

- 2017** Labor efficiency: RUB5.4 million/man.  
Inventory turnover period based on revenue: 96 days with account of uncontrolled factors.  
Implement large investment projects.  
Update and introduce into operation the Automated In-house Production System.  
Implement RPS-flows development strategy.  
Implement 102 RPS-projects aimed at reducing lead time and products cost.  
Develop and introduce into operation a system of primary documentation management using e-copies.  
Develop and introduce into trial operation Non-Conformance Database software.  
Transfer the processes of developing and handling data on the demand in commodities and materials into electronic format in 1C:ERP system.
- 2018** Increase the volume of investments in technical re-equipment and development of production facilities.  
Implement advanced technologies.  
Perform benchmarking and technology audit.  
Introduce barcoding in the shops of the main production units.  
Implement computer-aided step-by-step production planning system.  
Implement industrial equipment monitoring system.  
Develop two samples of the best practices.

### Increase Operating Efficiency

- 2017** System-level deployment of RPS.  
JSC «Afrikantov OKBM»: RPS–Leader based on 2017 results.  
Initiate a project aimed at development of project management system.  
Provide training and certification of the Company's employees compliant with the International Project Management Association (IPMA) standard (41 employees).  
Introduce Manager's Automated Workstation into pilot operation.
- 2018** System-level deployment of RPS.  
Implement Risk and Opportunity Management System.  
Provide training and implement project management system as per IPMA standard.  
Establish a Process Factory.  
Actively participate in the regional programme aimed at labor efficiency enhancement and employment support.  
Implement a set of measures aimed at developing enterprise management system.

### Safety Assurance

- 2017** Potentially prevented economic damage (from risks of material damage, theft and fraud): RUB64 million.  
Occupational safety costs: RUB98.8 million.  
LTIFR = 0.
- 2018** Complete upgrading of the critical test facility to achieve license-basis conditions and perform testing of reactor core designed for multipurpose nuclear icebreaker.  
Install video cameras at transformer substations and in places of nuclear-hazardous work performance.  
Implement a package of measures aimed at preventing violations and non-conformances.





# VALUES



## SAFETY

---

Safety is our top priority.  
Products safety. Labor safety.  
Well-being and safety  
of the society.

JSC "Afrikantov OKBM" confirmed compliance of the quality management system with ISO 9001:2015 requirements.

Accreditation of the Company's Central Laboratory by the National Center of Accreditation (NCA) of the Republic of Kazakhstan.

Victory in all-Russian competition *Russian Business Leaders: Dynamics and Responsibility-2017* in the category *For Achievements in Occupational Safety and Health Protection of Employees*.



## EFFICIENCY

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We apply system approach to improvements. We search for and find the maximum effective solutions.  
We improve technologies and processes.

The Company confirmed its status of RPS-Leader.

The Company took the seventh place among 5,424 organizations in the rating of the most efficient enterprises of Russia and Kazakhstan in terms of ecology and energy.



## A STEP AHEAD

---

We create and implement innovations. We are growing and learning. We are striving to leadership in competitive environment.

The First Prize of the international contest of scientific, technical and innovative solutions aimed at the development of the Arctic Region and the continental Shelf.

The Company's three employees became winners of the RF Government Prize in science and technology for their "Efficiency Enhancement of BN-600 Reactor Plant Operation and Radiation Safety and Application of the Experience Obtained in Advanced Projects of Sodium-Cooled Fast-Neutron Reactors" R&D work.



## RESPONSIBILITY FOR THE RESULT

---

We are expanding the scope of the results. We are improving the quality and competitiveness of our products.

100% fulfillment of SDO.

The Company became the winner in the contest of *Russia's 100 Best Organizations. Ecology and Eco-Management.*

JSC "Afrikantov OKBM" is included into the Unified Register of Employers of the Nizhny Novgorod Region, who ensure guaranteed observance of workers' labor rights.



## RESPECT

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We remain committed to traditions of the national science and engineering. We appreciate our veterans. We treat our customers, partners and suppliers with respect and care.

A total of 872 employees were granted awards of all levels, including an Official Letter of Commendation granted by the RF President, titles of honor *Distinguished Designer of the Russian Federation* and *Honored Worker of the RF Nuclear Industry* and medals of the *Order of Merit for the Motherland*, *Order of Merit for the Nuclear Industry* and *Order of Merit for Nuclear Energy Development*.



## UNITED TEAM

---

We all make ROSATOM. Enthusiastic labor and team spirit are the strongest impetus of progress.

The Company's employees are winners in such contests as: *ROSATOM's Person of the Year 2016*, workmanship contest, *Engineer of the Year 2017*, and *Professional Engineer of Russia*.

More than 30 young specialists became the winners of international, industry-wide, division, provincial, regional and city contests and conferences.

# BUSINESS MODEL

Strategic goals

Capitals

as of January 01, 2017

as of January 01, 2018

	FINANCIAL CAPITAL			
Operational Efficiency Enhancement	Equity capital	RUB14.03 billion	RUB17.4 billion	↑ 24%
	Profitability of EBITDA	17.57%	17.31%	↓ 1.5%
	Ratio of net debt to EBITDA	-2.17	-1.95	
	PRODUCTION CAPITAL			
Reduction of production costs and efficiency enhancement of production facilities	Utilization of production facilities	108.1%	110.3%	↑ 2%
	Process equipment	625 units	661 units	↑ 5.76%
	Number of submitted RPS projects and proposals for improvement	1,405	1,418	↑ 1%
	HUMAN CAPITAL			
Increase of labor efficiency and human resource development	Number of personnel	4,056 persons	4,032 persons	↓ 0.6%
	Labor efficiency	RUB5.6 million/man	RUB5.6* million/man	const
	Share of employees with higher education	63%	63.9%	↑ 0.9%
	Employees certified as per IPMA standard	—	41 persons	↑
	Engagement level	86%	86%	const
	INNOVATION CAPITAL			
Growth of order portfolio owing to development and implementation of new products. Enhancement of product competitiveness	Revenue share allocated for R&D work	17.7%	24.8%	↑ 7%
	IPI	875 items	908 items	↑ 3.8%
	Patents	90	99	↑ 10%
	Investments in intellectual capital	RUB61.6 million	RUB82.6 million	↑ 34%
	SOCIAL AND REPUTATION CAPITAL			
Enhancement of corporate social responsibility	Awarded employees	~ 330 persons	~ 870 persons	↑ by 2.6
	Occupational safety costs	94.6 million	98.8 million	↑ 4.4%
	Employee satisfaction	77%	84%	↑ 7%
	Expenditures for training	RUB11.11 million	RUB15.75 million	↑ 41%
	NATURAL CAPITAL			
Reduction of negative impacts on the environment	Water consumption	459.7 m <sup>3</sup>	451.7 m <sup>3</sup>	↓ 1.6%
	Environment protection	RUB36.5 million	RUB53.1 million	↑ 45%

\* with account of uncontrolled factors



## Core activity

# 9 BUSINESS AREAS



Naval reactor plants for nuclear submarines and surface cruisers



Sodium-cooled fast reactors



Reactor plants for nuclear icebreakers and other ships



Reactor plants for small- and medium-sized NPPs



High-temperature gas-cooled reactors



Production reactors



Reactor cores and nuclear fuel (FAs for VVER and BN reactors)



Pump and ventilation equipment



Nuclear fuel handling equipment (refueling machines)

Management System

13 Functional Systems

Corporate Governance

Risk Management

Efficiency Enhancement

## Generated Value

### FOR CONSUMERS

**100%**  
Of Timely Delivery under Contracts

**100%**  
SDO  
**4.84**  
Consumer Satisfaction

### FOR OKBM

**RUB21.7 billion**  
Revenue

**RUB567.6 million**  
Potential economic effect of RPS implementation

**> RUB500 billion**  
Market volume until 2030

### FOR THE SOCIETY

**> 4,000**  
Positions of employment

**RUB12.46 million**  
Contributions to charity

**↓ by 17%**  
Generation of production and consumption waste

**↓ by 18%**  
Mass of atmospheric emissions

**↓ by 4%**  
Volumes of waste water discharge

### FOR THE STATE

**RUB1.86 billion**  
Tax payments

### FOR THE PERSONNEL

**RUB93.5 thousands**  
Average wage

**RUB98.8 million**  
Volume of occupational safety costs

**RUB162.5 million**  
Expenditures for social needs

**0**  
LTIFR



# BUSINESS AREAS



## NAVAL REACTOR PLANTS FOR NUCLEAR SUBMARINES AND SURFACE CRUISERS

### EXPERIENCE:

Based on OKBM's documentation, 460 reactors for nuclear submarines and surface cruisers and 4 land-based prototype test facilities were manufactured; total operating time of naval reactors is more than 10,450 reactor-years.

### KEY EVENTS IN 2017

Keel-laying of the next nuclear submarines under projects where the Company was one of the participants involved as the Supplier of Complete Equipment. Well-timed delivery of the sets of reactor plant equipment for Generation IV nuclear submarines under construction, and upgrading activities performed for Generation III nuclear submarines, and a nuclear-powered cruiser.

A complete set of reactor equipment for a new nuclear submarine was manufactured. Completed activities aimed at scientific and technological groundwork development for advanced reactor plants intended for new facilities of the RF Ministry of Defence. Completion of the first stage of the Next Generation reactor plant final design. Service maintenance of four reactor plants at Generation IV nuclear submarines within their warranty service period. Completed design work aimed at upgrading surface cruiser reactor plant. Recovery of technical preparedness of reactor plants at Generation II nuclear submarines. Completed activities aimed at extension of service life of reactor plants at Generation II and Generation III nuclear submarines.

### PLANS FOR 2018

Comprehensive technical support of operation, repair and recovery of technical preparedness of reactor plants at operating Navy ships; extension of assigned service life and operation of reactor plants at Generation II and Generation III nuclear submarines and a surface cruiser. Service maintenance of reactor plants at Generation IV nuclear submarines within warranty service period. Design work aimed at upgrading the reactor plant of a naval surface ship and developing designs of advanced reactor plants for various Navy facilities and the RF Ministry of Defence. Delivery of reactor plant equipment for nuclear submarines under construction, upgradable nuclear submarines and surface cruiser. Commissioning of reactor plants of first-of-a-kind Generation IV nuclear submarines at the second construction stage.

### RECOGNITION AND AWARDS:

Ten National and Governmental awards.



## REACTOR PLANTS FOR NUCLEAR ICEBREAKERS AND OTHER SHIPS

### EXPERIENCE:

A total of 9 nuclear icebreakers, 20 reactor plants, more than 50-year operation of three generations of nuclear icebreakers in the Arctic Regions, total operating time is more than 400 reactor-years.

### KEY EVENTS IN 2017

Supply of the main RITM-200 reactor plant equipment for the first commercial multipurpose nuclear icebreaker *Sibir*. Launching took place on September 22, 2017.

Ahead-of-schedule equipment manufacturing for the second commercial multipurpose nuclear icebreaker *Ural*. Completed testing of equipment for the first loading of RITM-200 reactor plant for multipurpose nuclear icebreakers. Completed interdepartmental tests of the nuclear power facility Integrated Marine Automation System *Kotlin-220* for the first-of-a-kind multipurpose nuclear icebreaker *Arktika*. Completed activities aimed at extension of

reactor plants of nuclear icebreakers *Vaigach* and *Taimyr* up to 200 thousand hours and service life of 36 years.

### PLANS FOR 2018

Participate in transportation of a FPU to Murmansk (Atomflot FSUE), reactor core loading and physical startup. Complete activities aimed at mounting the steam generating unit into the tank of metal-water shielding. Complete equipment supply for the first commercial multipurpose nuclear icebreaker *Sibir*. Supply the main equipment for the second commercial multipurpose nuclear icebreaker *Ural*.

### RECOGNITION AND AWARDS:

Seven National and Governmental awards.





## REACTOR CORES AND NUCLEAR FUEL

### EXPERIENCE:

Based on OKBM's documentation more than 10,000 TVSA fuel assemblies and TVSA modifications for VVER NPPs; more than 420 complete sets of reactor cores for nuclear submarines and surface ships; more than 60 complete sets of reactor cores for marine reactor plants.

### KEY EVENTS IN 2017

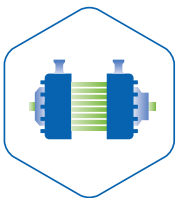
Completed development, fabrication and interdepartmental tests of two marine propulsion reactor cores.

Support in manufacturing of commercial reactor cores for the multipurpose nuclear icebreakers. Upgraded TVSA fuel assembly designed for VVER-1000 reactors. Completed pilot commercial operation of TVSA-PLUS for Kalinin NPP. Licensing of reactor core with TVSA-12 at power units of Kozloduy NPP (Bulgaria). Developed validation of TVSA-T.mod.2 aimed at implementation at Temelin NPP (Czech Republic). Successful audits of the Company's

quality management system performed under the contract between JSC "TVEL" and Vattenfall Nuclear Fuel AB (Sweden), as well as by representatives of CEZ a.s. (Czech Republic) in the frame of activities related to Temelin NPP.

### PLANS FOR 2018

Upgrading of marine propulsion reactor cores aimed at enhancing their technical and economic characteristics. Development and safety validation of nuclear fuel designs intended for NPPs with PWR based on the designs of TVS-K fuel assemblies. Development and safety validation of nuclear fuel designs intended for NPPs with VVER-1000 based on the designs of TVSA fuel assembly and its modifications.



## PUMP AND VENTILATION EQUIPMENT

### EXPERIENCE:

Based on OKBM's documentation, more than 3,000 pumps of various types and power ranging from 2 kW to 5,600 kW were manufactured and supplied. More than 700 pump units were manufactured in OKBM's production facilities. More than 140 items of ventilation equipment for NPPs and vessels with nuclear propulsion system were supplied by OKBM. Canned pumps produced by JSC "Afrikantov OKBM" are operated at the leading petrochemical enterprises such as: OOO Lukoil Nizhegorodnefteorgsintez, PJSC Nizhnekamskneftekhim, PJSC Tatneft, and JSC Ufa-Neftekhim.

### KEY EVENTS IN 2017

Completed supply of electric pumps to the Baltic NPP, and of pumping

units to the Belarusian NPP. Supply of the main volume of pumps for the Leningrad NPP Unit 2. Performed supply of spare parts, tools and accessories (SPTA) for pumps at the Beloyarsk NPP, Kursk NPP, Rostov NPP, Kalinin NPP, Leningrad NPP and the Balakovo NPP. The Company dispatched pumps NSO 250/15 and NSO 250/30 for shipbuilding needs. Completed activities aimed at service life extension of pumping equipment at the Kozloduy NPP Unit 6 (Bulgaria) and the Armenian NPP Unit 2. A range of measures were performed aimed at assigned lifetime extension of removable parts and sealing units of main circulation pumps TsVN-7 and TsVN -8 at the Smolensk NPP, Kursk NPP and Leningrad NPP. Final design of ball-type kingstone was developed for state-of-the-art nuclear

submarines aimed at their silencing. Interdepartmental tests of three nominal sizes of canned electric pumps were performed for shipbuilding which confirmed compliance with current requirements for vibration and noise characteristics.

### PLANS FOR 2018

Completion of pump units supply to NPPs under constructions. Production and supply of canned electric pumps for shipbuilding and non-nuclear market needs. Mastering of cryogenic pumps production. Follow-on activities aimed at service life extension of pumping equipment at Russian and foreign NPPs and supply of SPTA for operating equipment. Increased scope of supply of canned electric pumps produced in the frame of import substitution. Production and supply of new types of pump units for NPPs. Rendering of field supervision services for supplied items.



## REACTOR PLANTS FOR SMALL- AND MEDIUM-SIZED NPPS

### EXPERIENCE:

ABV-6M, KLT-40S, RITM-200M, VBER (modularity, maneuverability and reference experience). Power range is from 100 to 600 MWe.

### KEY EVENTS IN 2017

Optimized FPU Project: technical/commercial requirements developed for optimized FPU based on reactor plant RITM-200M; prepared design

passport as per "Development of Optimized FPU Preliminary Design". Conceptual design of a land-based small-sized NPP based on RITM-200 reactor plant: activities aimed at reactor plant concept definition, provided input data for the development of reactor plant systems (two options: vessel-based and traditional station-based), preliminary data on the reactor plant cost.

### PLANS FOR 2018

Optimized FPU Project: FPU preliminary design development based on RITM-200M reactor plant. Preparation of a certificate of revenue option of investment project jointly with JSC Atomenergomash. The conceptual design of a land-based small-sized NPP based on RITM-200 reactor plant. Completion of formalization and issuing of a package of documentation on RITM-200 reactor plant conceptual design for a small-sized NPP. A contract is expected to be signed for the development of the conceptual design aimed at refunding of production costs.



## PRODUCTION REACTORS

### EXPERIENCE:

A total of 9 PUGRs (Siberian Chemical Combine, JSC; Mining and Chemical Combine, FCUE; Mayak Production Association, FSUE), 7 heavy water reactors (including four of them at Mayak Production Association,

FSUE), total operating time is 500 reactor-years.

### KEY EVENTS IN 2017

Developed decommissioning programme and programme of *Comprehensive Engineering and*

*Radiation Examination.*

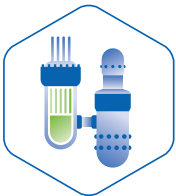
Performance of *Comprehensive Engineering and Radiation Examination.* In 2017, the Company jointly with JSC "RAOPROEKT" developed the project of *Research Heavy Water Reactor Decommissioning.*

### PLANS FOR 2018

Implementation of OK-187 decommissioning project before 2025.

### RECOGNITION AND AWARDS:

Fifteen National and Governmental awards.



## HIGH-TEMPERATURE GAS-COOLED REACTORS

### EXPERIENCE:

Developed key technologies on fuel, structural materials, and main equipment; created analytical base and experimental facilities in support of HTGR designs development. Power range is from 200 to 1,060 MWt.

### KEY EVENTS IN 2017

Developed documentation on the reactor plant basic design for an NPP with HTGR.

Analysis of engineering solutions made for HTGR reactor plant and definition of optimization areas aimed at cost reduction. The Company studied the possibility of creating a small-sized reactor plant with HTGR jointly with FSUE TsAGI. The Company developed a technical proposal for a power conversion unit in gas-turbine cycle for power unit with HTGR for the purposes of RESURS test complex.

### PLANS FOR 2018

Develop an optimized conceptual design of reactor plant for the NPP with HTGR. Prepare documents on the design of the reactor plant of the NPP with HTGR for expert review to be performed in ROSATOM State Corporation aimed at project go decision-making. Perform assessment of technical capabilities of using the existing test facilities for development work related to reactor plant equipment intended for the NPP with HTGR. Develop work scope and schedule of reactor plant activities for the NPP with HTGR under EPC-contract.



## SODIUM-COOLED FAST REACTORS

### EXPERIENCE:

BN-350, BN-600 and BN-800; total operating time is more than 60 reactor-years.

### KEY EVENTS IN 2017

Development of final designs of experimental facilities and material test assembly for BN-600 reactor. Beginning of activities aimed at replacement of fuel assemblies in BN-600 reactor. Performance of scientific and technical support and field supervision of BN-800 reactor plant commercial operation. Finalized final safety analysis report updating

for the Beloyarsk NPP Unit 4 based on the results of startup-and-adjustment activities. Performance of the first two refueling of BN-800 reactor. Updated BN-1200 final design and materials on power unit design. Beginning of top-priority R&D activities on the reactor plant basic equipment thereof engineering solutions depend on comparability of technical and economic indicators of BN-1200 and VVER-TOI. Supply of spare parts, tools and accessories (SPTA); scientific and technical consultations under CEFR project. Development

and supply of equipment for the new commercial reactor CFR-600. **Cooperation in the frame of IAEA Programmes aimed at assessment of BN-1200.** **BN-1200 power unit has been recognized compliant with the Generation IV requirements.**

### PLANS FOR 2018

Preparation of Intergovernmental Agreement with People's Republic of China and frame contract for the supply of equipment, computer codes for CFR-600 reactor. Optimization of technical and economic characteristics and of detailed validation of innovative solutions under BN-1200 Project.

**RECOGNITION AND AWARDS:** Seven National and Governmental awards.



## NUCLEAR FUEL HANDLING EQUIPMENT

### EXPERIENCE:

Based on OKBM's documentation, 10 refueling machines, 2 refueling complexes, more than 100 CRDMs for various types of reactor plants were manufactured and supplied.

### KEY EVENTS IN 2017

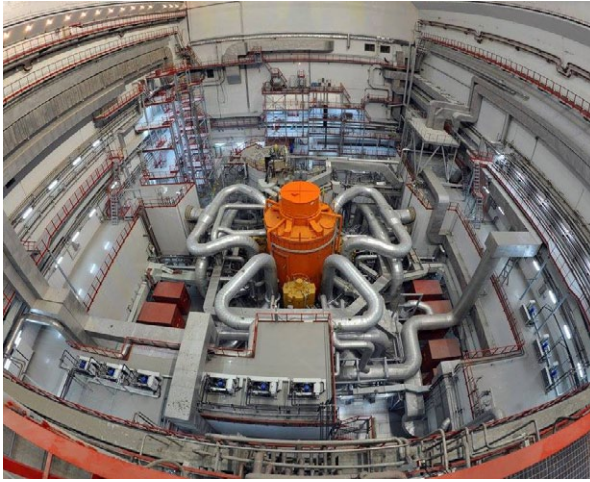
Supply of spare parts, tools and accessories (SPTA) for CEFR. Field supervision of CRDM manufacturing and testing for the multipurpose nuclear icebreaker with RITM-200 reactor plant. Development of final design of CRDM, Neutron Source Moving Mechanism and hopper gate drive for the RDE reactor plant. Development of repair documentation on the complete set of CRDMs and of check valve drive for CEFR reactor plant.

Performed acceptance tests of equipment for the first loading of the reactor cores in the multipurpose nuclear icebreaker. Completion of the first stage of mooring tests of the refueling complex KLT-40S reactor plant at the FPU under project 20870 *Akademik Lomonosov*. Preparation of documentation needed at the first stage of final design development of the main functional equipment meant for a multipurpose nuclear maintenance ship. Developed nuclear fuel handling system within conceptual design engineering of a small-sized NPP with RITM-200 reactor plant. Completion of acceptance tests of the refueling machine designed for Belarusian NPP Unit 1 under construction.

### PLANS FOR 2018

Develop detailed design of CRDMs for CFR-600 reactor plant. Participate in a tender for the supply of CRDMs for BN-600 reactor plant. Ensure field supervision of manufacturing and testing of CRDMs for multipurpose nuclear icebreaker with RITM-200 reactor plant. Develop final design of CRDMs for RITM-400 reactor plant. Mounting of CRDMs at the FPU with KLT-40S reactor plant. Complete mooring tests of the refueling complex for KLT-40S reactor plant at the FPU under project 20870 *Akademik Lomonosov*. Manufacture the refueling complex equipment for RITM-200 reactor plant at the multipurpose nuclear icebreaker and perform preliminary tests at the Company's test facility. Develop final design of the main functional equipment of the multipurpose nuclear maintenance ship. Supply of the refueling machine for Belarusian NPP Unit 2.









## STATUS OF RPS LEADER



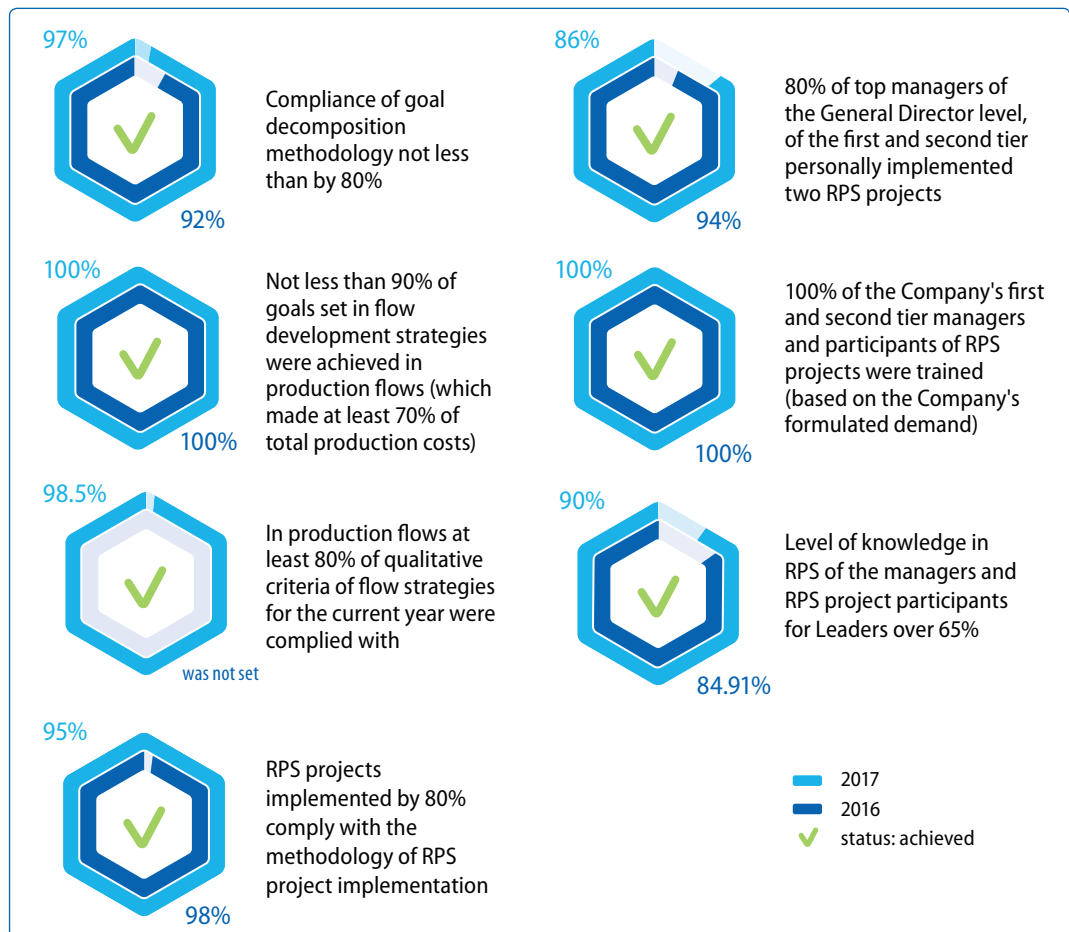
One of the key instruments of enhancing efficiency and competitive ability is Rosatom's Production System, which has been implemented and successfully developed in the Company at the system-level.

RPS has been implemented in JSC "Afrikantov OKBM" since 2009 as lean production culture and system of continuous improvement of processes aimed at providing competitive advantages on a world-wide level. Starting in 2015, within the frame of implementing the comprehensive project of forming an RPS-Enterprise, a system-wide approach is used for deploying RPS in the following areas: *Decomposition of Goals, RPS-Flows, Management of Projects and Changes, Training and Motivation.*

RPS Project *Optimization of the Document Management Process during Piping System Manufacturing* became the winner of the contest held in ROSATOM State Corporation in *The Best RPS Project Aimed at Labor Efficiency Enhancement* category.

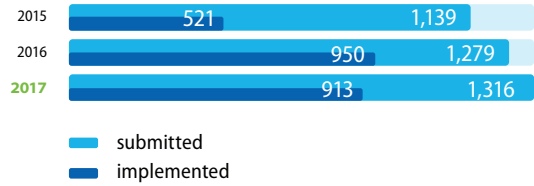


## Deployment Indicator





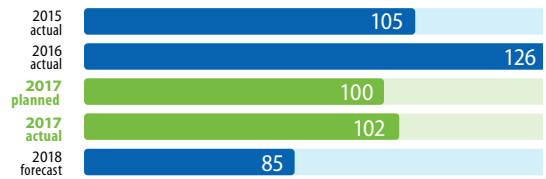
### Number of submitted and implemented proposals for improvement



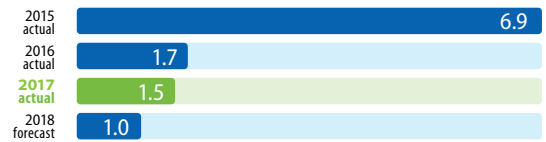
### Number of employees who submitted proposals for improvement



### Number of RPS projects



### RPS projects' implementation costs, RUB million



### Potential economic effect of RPS projects, RUB million





## 2017 Results

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**102 RPS projects**  
were implemented

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**4 RPS flows**  
were defined, accounting for **70%**  
of produced products

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**1,316 proposals for improvements**  
were submitted, **90%**  
of the accepted ones are introduced in due time

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**85%**  
of employees are engaged  
in RPS activities

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**> 500 employees**  
were trained to master the RPS tools

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**3 employees**  
undertook practical training  
at foreign enterprises

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**350 employees**  
undertook training in the *Process Factory* of Kovrov Mechanical Plant, PJSC

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**108 employees**  
undertook training in the *Process Factory* of Greenatom, JSC

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## Main Business Areas in 2018

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- The following shall be done to implement strategic initiatives of the Nizhny Novgorod region Governor and the regional programme aimed at enhancing labor efficiency:
  - Establish a Training Center for Lean Production, including a Process Factory as part of JSC “Afrikantov OKBM”;
  - Form a consortium on thermal-mechanical equipment;
  - Establish a Center of Competencies aimed at developing and implementing new technologies associated with nuclear power facilities designed for military applications for advanced types of military equipment.
- Successfully confirm RPS-Leader’s Status.
- Achieve qualitative criteria and quantitative indicators for RPS samples in compliance with the developed action plans.
- Continue activities on RPS projects and flow-samples.
- Update the development strategy of flow-samples.
- Perform post-project monitoring of the results achieved owing to implementation of RPS projects.
- Improve the Company’s employees training system.
- Continue activities aimed at implementing 5S system and proposals for improvements.
- Enhance engagement of the Company’s.



# PERSONNEL



## HUMAN CAPITAL CHARACTERISTICS

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**4,032** employees

Number of employees as of the end of 2017

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**~ 42** years

Average age of employees  
(71.98% of employees are under the age of 50 (inclusively))

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**34.8%**

Share of employees under 35

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**1.1%**

Personnel turnover rate with the target indicator not-exceeding threshold value of 5%

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**79%**

Share of employees working over five years (as of December 31, 2017)

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**RUB162.5** million

Social expenses per employee amounted to RUB40.3 thousand

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 **872** employees  
were honored by awards of  
all levels in 2017



 **1**  
employee  
was honored  
by a Letter of  
Commendation  
granted by the  
RF President





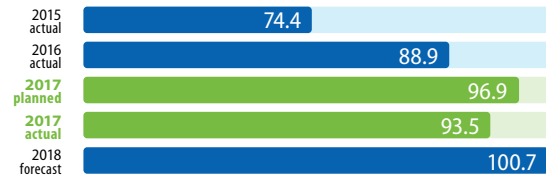
## Labor Remuneration

Average salary growth equaled 5% (for 2018 it is planned to be 8%).

**It is higher by a factor of 2.9** than the average salary in the region where the Company operates.

The rate of Company's minimum salary growth exceeds the rate of regional minimum subsistence growth level.

Average salary, RUB thousand

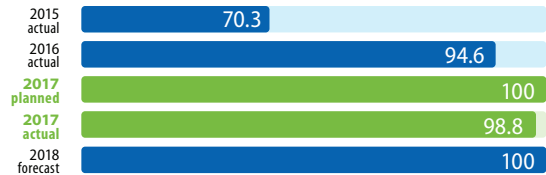


## Occupational Safety

In April 2017, based on declaration results JSC "Afrikantov OKBM" was included into the Unified Register of Employers of the Nizhny Novgorod Region, which ensure guaranteed observance of workers' labor rights.

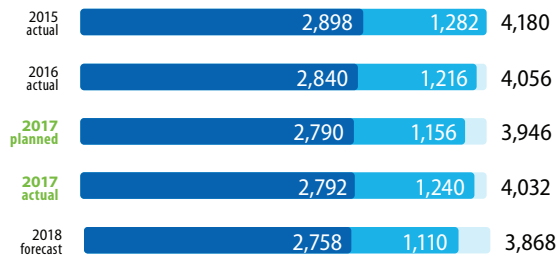
JSC "Afrikantov OKBM" became the winner in the nomination *For Achievements in Occupational Safety and Health Protection* of employees in all-Russian competition *Russian Business Leaders: Dynamics and Responsibility 2017*.

Occupational safety expenditures, RUB million



**LTIFR = 0**

Number of Personnel (average annual), persons



Structure of personnel by gender at the end of 2017, %



men

women





## Training

The Company's **40 managers and specialists** underwent training courses and gained certification demonstrating compliance with the requirements of ENISO 9712 international standard.

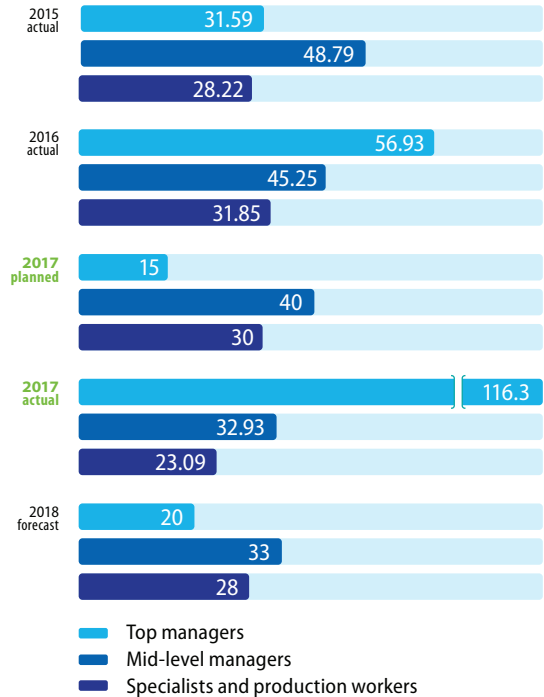
The Company's **59 managers and specialists** underwent training courses and gained certification in project management compliant with the requirements of IPMA international standard (including **37 employees** who achieved level D certification; and **4 employees** who achieved level C certification).

The Company's **412 employees** were trained in RPS programmes with the support of certified trainers of JSC "Afrikantov OKBM", while **159 employees** were trained by external providers.

The Company's **55 employees** upgraded their qualification in industry-wide academies of ROSATOM State Corporation.

**Over 600 employees** of the Company participated in remote training under programmes of Autonomous Nonprofit Organization ROSATOM's Corporate Academy.

### Average number of hours scheduled for training per employee per year by categories



## SCIENTIFIC POTENTIAL

**1**  
Academician of RAS

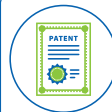
**21**  
Doctors of Sciences

**6**  
Professors

**90**  
Candidates of Sciences

**7**  
Assistant Professors

### Share of higher education specialists, %



**RUB82.6 million**  
INVESTMENTS INTO  
INTELECTUAL CAPITAL



# ENVIRONMENT PROTECTION

*2017 was declared by the RF President  
the Year of Ecology*

Ecological policy is being implemented in the Company (<http://okbm.nnov.ru/russian/ecopolicy>) based on the federal regulatory documents on environment protection.

**THE OBJECTIVE IS TO  
ENSURE THE COMPANY'S  
ENVIRONMENTAL SAFETY AND  
SUSTAINABLE DEVELOPMENT**

The following was ensured in 2017  
(as opposed to 2016):

- Reduced by **17%** generation of production and consumption waste.
- Reduced by **18%** mass of atmospheric emissions.
- Reduced by **4%** volumes of waste water discharge.
- Reduced by **68%** volume of payments for negative impact on the environment.
- JSC "Afrikantov OKBM" became one of the top ten enterprises included in fundamental efficiency ranking of the environmental and energy rating agency Interfax-ERA.



## Our victories

In 2017, JSC "Afrikantov OKBM" once again confirmed its status of environmentally responsible organization and won ranking in the contest of *100 Best Organizations of Russia. Ecology and Environmental Management*.

The Company's General Director, General Designer Dmitry L. Zverev was awarded with a Badge of Honor *Ecologist of the Year 2017* for achievements in sustainable use of natural resources.

The Head of the Industrial Safety and Power Supply Division Igor I. Zhuchkov won in individual nomination of the *Person of the Year* contest for contributions to environment protection, environmental safety and environmental impact reduction.

In May 2017, the Chief Ecologist and the Head of Environmental Safety Department Aleksey S. Denisov was awarded with a Medal of Non-governmental Ecological Fund named after V.I. Vernadsky dedicated to *150th Anniversary of the Birthday of V.I. Vernadsky* for environmental safety achievements in the frame of an industry-wide scientific workshop *Radiation Safety and Environment Protection in the Nuclear Industry*.

JSC "Afrikantov OKBM" ranked one of the top ten enterprises included in fundamental efficiency ranking of the environmental and energy rating agency Interfax-ERA. The list includes companies and enterprises of the real sector of economy in Russia and Kazakhstan. JSC "Afrikantov OKBM" ranked the seventh among 5,424 organizations.



The Chief Ecologist of JSC "Afrikantov OKBM" was awarded with a medal of Non-Governmental Ecological Fund named after V.I. Vernadsky





In 2017, there were no events in JSC "Afrikantov OKBM" rated on the INES scale, as well as abnormal situations and incidents having adverse effect on the environment.

The Company's team is making every effort to ensure that its activities do not have adverse impact on the environment, do not harm the health of the Company's personnel and the public. JSC "Afrikantov OKBM" continuously improves its activities along with maintaining and enhancing the level of environmental safety.

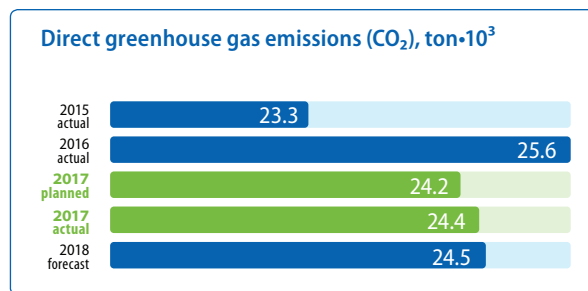
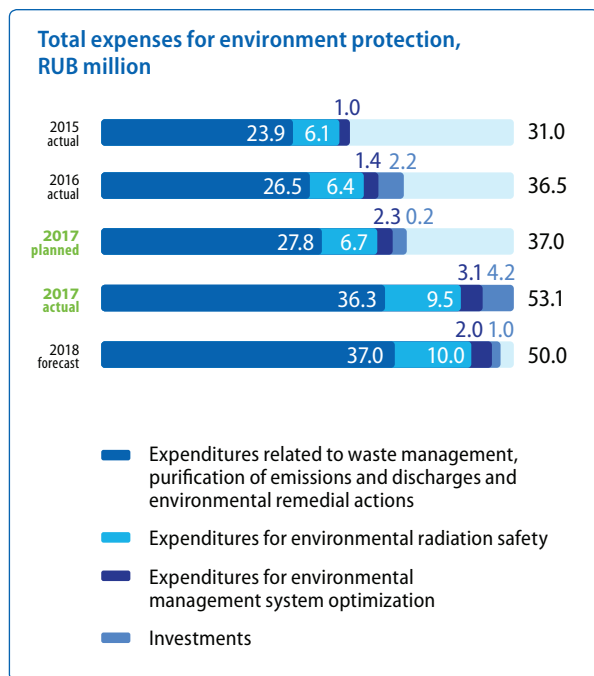
### Basic objective for 2018:

Further development and improvement of environmental management system.

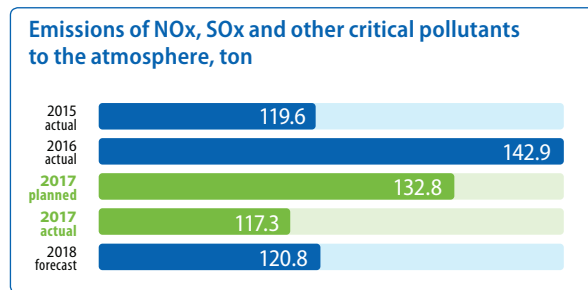
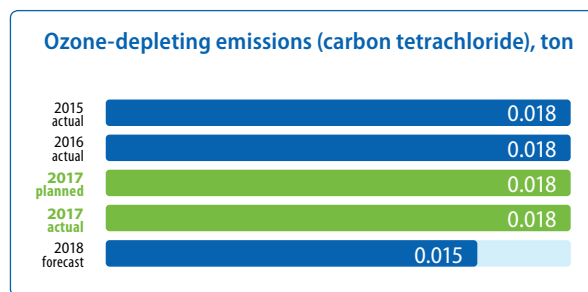
**It is planned to increase expenditures for environment protection in 2018-2020.**

**It is forecasted that waste generation will stabilize in 2018-2020.**

**Changes in volume and structure of emissions are not expected in 2018-2020.**



There are no indirect greenhouse gas emissions.







## **INITIATIVES (MEASURES) AIMED AT MITIGATING THE IMPACT OF PRODUCTS AND SERVICES ON THE ENVIRONMENT**

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**Certification audit of the Company's environmental management system against the requirements of ISO 14001:2015.**

**Setting of environmental objectives compliant with ISO 14001:2015 requirements and achievement thereof.**

Transfer of the Company's sanitary sewage and industrial waste water to water treatment network of JSC "Nizhegorodskiy Vodokanal".

Accumulation, storage and transfer of industrial and consumption wastes for handling, decontamination and burial.

Supply of the Company's storm and snow melt water to municipal drainage systems.

Performance of industrial environmental control.

Installation of new dust and gas collectors or replacement of existing cyclone collectors by multistage dust and gas collecting units which ensure efficiency of cleaning minimum of 90%.

Upgrading of the local treatment facilities of the carwash. Connection of some of machine tools to the newly installed filter at the sector where dust-producing materials are processed to increase the operating efficiency of dust and gas collectors.

Upgrading of ventilation system by installing additional air purification filters at the chemical polishing sector.



A more detailed information is provided in the full version of 2017 Public Annual Report of JSC "Afrikantov OKBM"



Joint Stock Company "Afrikantov OKB Mechanical Engineering";  
short name: JSC "Afrikantov OKBM"

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