STATE SCIENTIFIC CENTER —
RESEARCH INSTITUTE
OF ATOMIC REACTORS

ROSATOM STATE ATOMIC ENERGY CORPORATION ENTERPRISE

ANNUAL REPORT
2016

60 ЛЕТ НИИАР

STATE SCIENTIFIC CENTER —
RESEARCH INSTITUTE
OF ATOMIC REACTORS

ROSATOM STATE ATOMIC ENERGY CORPORATION ENTERPRISE

ANNUAL REPORT 2016

JSC "SSC RIAR"

Approved by the Resolution of Board of Directors,
JSC "SSC RIAR" (Protocol # 448 as of May 26, 2017).

Director of JSC "SSC RIAR"  Alexander Tuzov

Dimitrovgrad
2017

UDC 621.039=161.1

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The Report covers the key financial, economic and production results of JSC "SSC RIAR" activities for the reporting period as well as the results of the sustainability-related activities (economic, ecological and social impact on the world around us). The Report has been prepared in conformity with the GRI standards, version G4. The Report focuses on the strategy and perspectives of JSC "SSC RIAR" as well as on the activities targeted at enhancing the effectiveness of corporate management and nuclear and radiation safety. The Report has been issued on a voluntary basis and is addressed to a wide audience.

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2 Strategy

3 Strong Corporate Governance

4 Management of Capital and Performance

5 Stakeholder Engagement

Enhancing the efficiency of production and investigation performance is the key to success in solving government and business challenges

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G4-31

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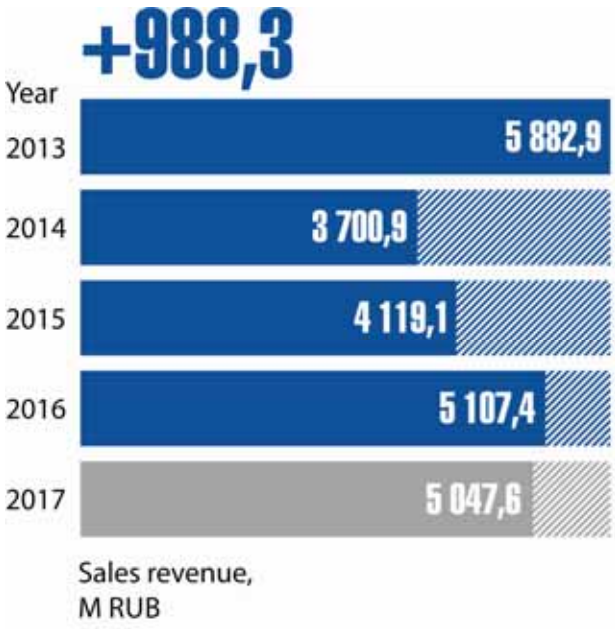
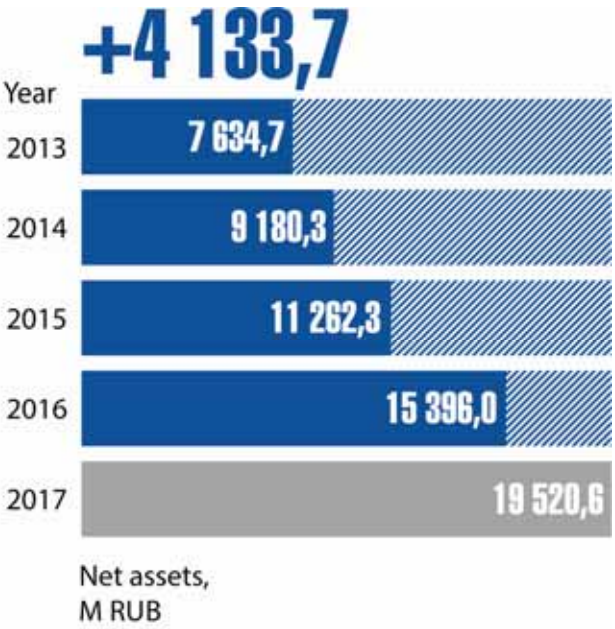
KEY PERFORMANCE INDICATORS

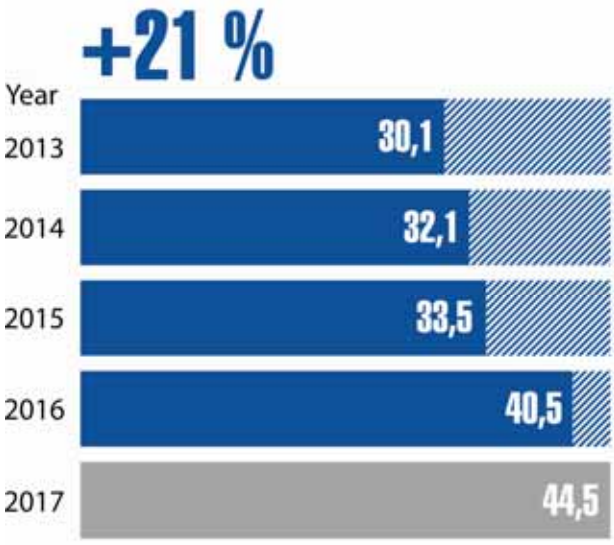
Difference between indicators in 2016 and in 2015



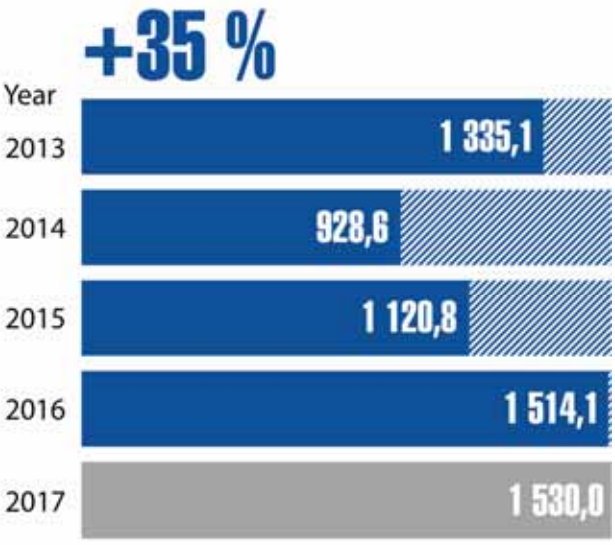
Sales revenue,
M RUB



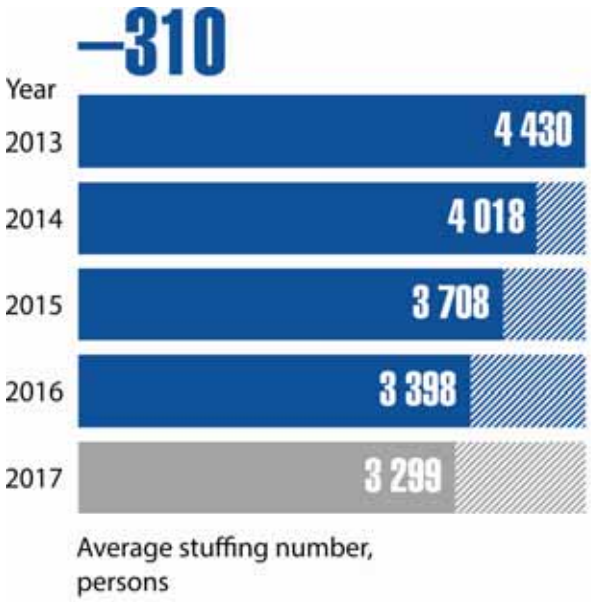
Net assets,
M RUB



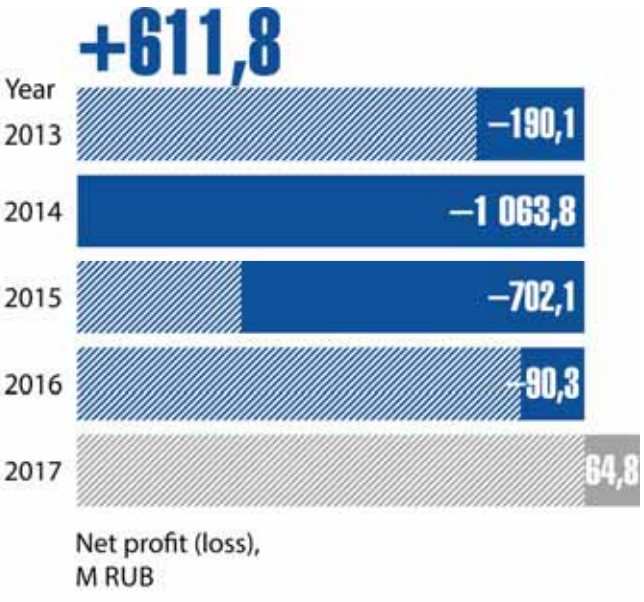
Average monthly salary budget,
K RUB/month per person



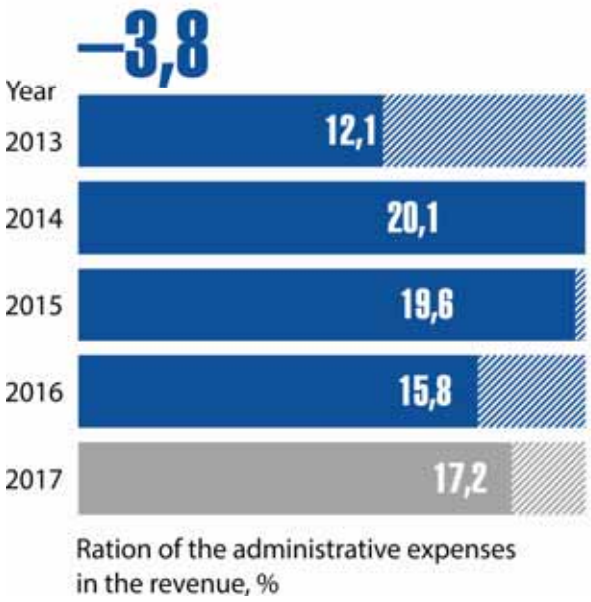
Labour capacity,
K RUB/persons



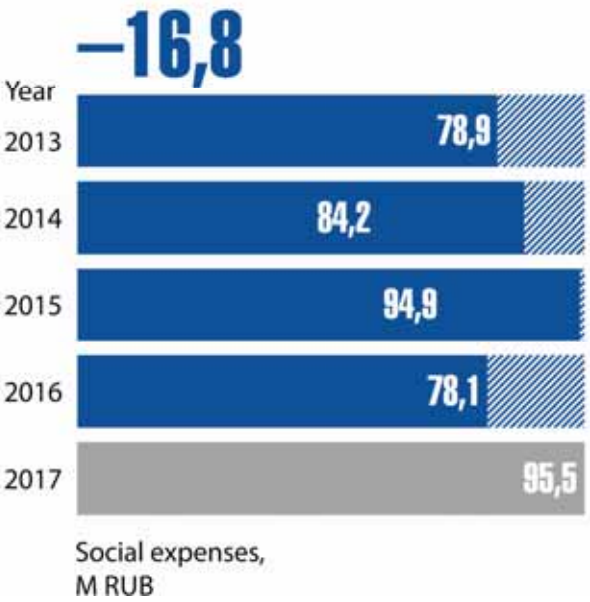
Average stuffing number, persons



Net profit (loss), M RUB



Ration of the administrative expenses in the revenue, %



Social expenses, M RUB

Actual value

Estimates

APPEAL OF DIRECTORS

G4-1

Dear Colleagues and Partners!

In 2016, an important step in the sustainable development was made by establishing the ROSATOM's Scientific Division as an industry expertise center for scientific competencies able to create new breakthrough innovative technologies not only for Russia but also for the world's market. RIAR, being the largest Russia's research center of civil nuclear engineering is rightly seen one of the key enterprises of the Division and branch on the whole.

By the results of the reporting period, the Institute demonstrated a quantum growth in some indicators: the research and production plans were fulfilled in full scope, significant financial and economic results were achieved, as well as rise in labor productivity, and international cooperation was extended.

The Institute continues implementing key projects of Russia's nuclear engineering. In particular, a wide range of research in new fuels is carried out, including activities under the "Breakthrough" Project. The construction of a multi-purpose fast test reactor and poly-functional radiochemical complex is on schedule.

In 2016, JSC "SSC RIAR" fulfilled its obligations under the contracts signed in the frame of the Federal Target Program on nuclear power technologies of new generation. A high level of performance discipline was also confirmed by successful fulfillment of obligations under more than 50 agreements with both Russian and foreign customers.

Taking into account a high importance of high-tech material-and-technical upgrade of the enterprise and re-targeting of its production and scientific capabilities according to the current market demand, the short-term strategic task is to bring certain investment projects to the implementation stage. We have to issue commercially viable products and, by setting new strategies, we go toward an expected outcome.

The tasks set to JSC "SSC RIAR" by the management of the ROSATOM Scientific Division are complicated indeed. Based on the approach of professional competence and responsibility, including the interaction with stakeholders, we are able to provide the long-term sustainable development of the enterprise.

I hope that knowledge, competence and experience of the RIAR's employees will allow us to meet ambitious challenges and remain the leading enterprise of nuclear engineering taking a rightful place in the Russia's economy!

G4-1

Dear Friends, Colleagues and Partners!

I am pleased to present you the 2016 Annual Report of JSC "SSC RIAR" that provides extensive coverage of production, financial, social and ecological aspects of our activities.

The year of 2016, the 60th Anniversary of JSC "SSC RIAR", was marked with strong challenges and landmark achievements. Despite tough economic conditions our Institute faced at the beginning of the reporting period, we managed to make decisive progress. As for the R&D activities, the scope of orders from Russian enterprises increased nearly twice; a successful fulfillment of the production plan turned a profit of 3.1 million rubles that is 55% higher as compared to the previous year of 2015.

We managed to increase the output of radioisotopes thus providing the top line growth up to 1.8 billion rubles. In 2017, we will continue its promotion by upgrading the production lines, improving logistics and quality and developing new technologies to produce promising radioisotopes.

Over the reporting period, we proceeded implementing our strategy aimed at strengthening RIAR's positions in the international market of high-tech products and services. Thanks to the effective use of our reactors and research infrastructure, the index of the ten-year portfolio of foreign contracts achieved 60 million USD. One of the important events in 2016 was the designation of RIAR as the IAEA International Centre based on Research Reactors (ICERR) that once again confirmed the worldwide recognition of JSC "SSC RIAR" as a reputable research organization.

The professional competence and ambitions of RIAR's personnel contributed greatly to the high production and finance indicators achieved.

Our specialists put in great efforts to optimize purchase procedures, reduce costs for non-core activities, etc. This year made it clear that the effectiveness of the enterprise's activities depends not only on the dynamic R&D but also on cost-based budged reduction measures.

It is important to mention that the reporting period showed a rise in labor efficiency (by more than 30% as compared to 2015) as well as in salary. We are undoubtedly aimed at a further increase in these indicators as well as at the implementation of social programs, costs for which are increasing every year. In 2017, we are going to sign a two-year collective labor agreement that will be approved by the RIAR's Trade Union.

The jubilee year of 2016 was yet more proof of the importance of preserving and transferring knowledge. All that was created by our long-service employees takes application and development. Once again I would like to express my gratitude for their selfless labor and great contribution to the nuclear engineering.

In conclusion, let me gratefully acknowledge our partners for the fruitful cooperation and trust and RIAR's staff for their high professionalism. I hope that the results of this reporting period will become a solid ground for further sustainable development of the enterprise.

KEY EVENTS

JSC "SSC RIAR" and a Swiss company from the international group of companies "Gamma-Service Group" signed the contract on transport and logistics services for the shipment of Russian radioisotope products to European customers

870 million rubles — the possible economic benefit from the implementation of the project developed by the enterprise team

JSC "SSC RIAR" team in cooperation with the students from Dimitrovgrad branch of MEPhI took the third place in the large-scale industrial project of ROSATOM State Corporation — TeMP–2016 Tournament of Young Professionals

March

Our Institute celebrated its 60th anniversary. Representatives of the leading nuclear industry enterprises took part in more than 20 different events as a part of the festivities. The book "RIAR — 60th anniversary: people, years, achievements" was published specially for that anniversary

April

Young researchers from the largest enterprises of ROSATOM State Corporation and specialized institutions of higher education discussed the topical issues of scientific support for the development of new generation nuclear technologies in the course of All-Russian Youth Conference, held in Dimitrovgrad on April 5–7, 2016

May

JSC "SSC RIAR" was accredited in the national accreditation system, which is an official confirmation of its competence in the field of atomic energy use in the part of implementing radiation monitoring of the environmental conditions

June

JSC "SSC RIAR" launched investigations of the new Russian experimental nuclear REMIX fuel in the MIR reactor

JSC "SSC RIAR" was recognized as a sound scientific organization with stable indexes according to the results of a comprehensive analysis of the activities of the state scientific centers of the Russian Federation performed by the Ministry of Education and Science of the Russian Federation

25 employees of the Institute became the awardees of the regional contest during four years of RIAR participation

July

JSC "SSC RIAR" and Korea Atomic Energy Research Institute signed the Memorandum of Understanding on the issues of cooperation in science and technology

September

JSC "SSC RIAR" was designated as the IAEA International CEntre based on Research Reactors (ICERR). The plaque of the IAEA ICERR status was handed over to RIAR in Vienna on September 26, 2016 during the IAEA's 60th General Conference

November

Three RIAR employees became the awardees of the regional contest "The Best Engineer in the Year of 2016", which is held annually by the Ministry of Economic and Competition Development of the Ulyanovsk region in cooperation with the regional government and the regional Union of Scientific and Engineering Public Associations

December

Two employees of the Institute received industry awards conferred to the best young researchers of ROSATOM State Corporation enterprises according to the results of the annual open contest

150 thousand rubles — the annual award to ROSATOM young researchers

AWARDS


СОВЕТ ПО ПРИСУЖДЕНИЮ ПРЕМИЙ ПРАВИТЕЛЬСТВА РОССИЙСКОЙ ФЕДЕРАЦИИ В ОБЛАСТИ КАЧЕСТВА
ДИПЛОМ
ЗА ДОСТИЖЕНИЕ ЗНАЧИТЕЛЬНЫХ РЕЗУЛЬТАТОВ В ОБЛАСТИ КАЧЕСТВА
Акционерное общество «Государственный научный центр – Научно-исследовательский институт атомных реакторов»
Ульяновская область, г. Димитровград
1
ДИПЛОМ
КОНКУРС ЛИДЕРОВ ВНЕШНЕЭКОНОМИЧЕСКОЙ ДЕЯТЕЛЬНОСТИ «ТАМОЖЕННЫЙ ОЛИМП – 2016»
НАГРАЖДАЕТСЯ
2
ГУБЕРНАТОР УЛЬЯНОВСКОЙ ОБЛАСТИ
ДИПЛОМ
НАГРАЖДАЕТСЯ
Акционерное общество «Государственный научный центр – Научно-исследовательский институт атомных реакторов»
«Российская организация высокой социальной эффективности» в 2016 году
3
БЛАГОДАРНОСТЬ ЗА ДОСТИЖЕНИЕ 2016 ГОДА
Коллективу АО «ГНЦ НИИАР» и Тузову Александру Александровичу, директору АО «ГНЦ НИИАР»
РОСАТОМ
Лучший результат 2016 года
Коллектив АО «ГНЦ НИИАР»
НАУКА И ИННОВАЦИИ
4
ДИПЛОМ
Награждается
АО «ГНЦ НИИАР»
За победу в номинации «Лучший публичный годовой отчет организации дивизионов и Госкорпорация «Росатом»
5

1

The Diploma Winner of the RF Government Award Quality Competition

2

The Diploma Winner of the regional stage of the Contest "The Customs Olympus-2016" in the nomination "The Best Exporter"

3

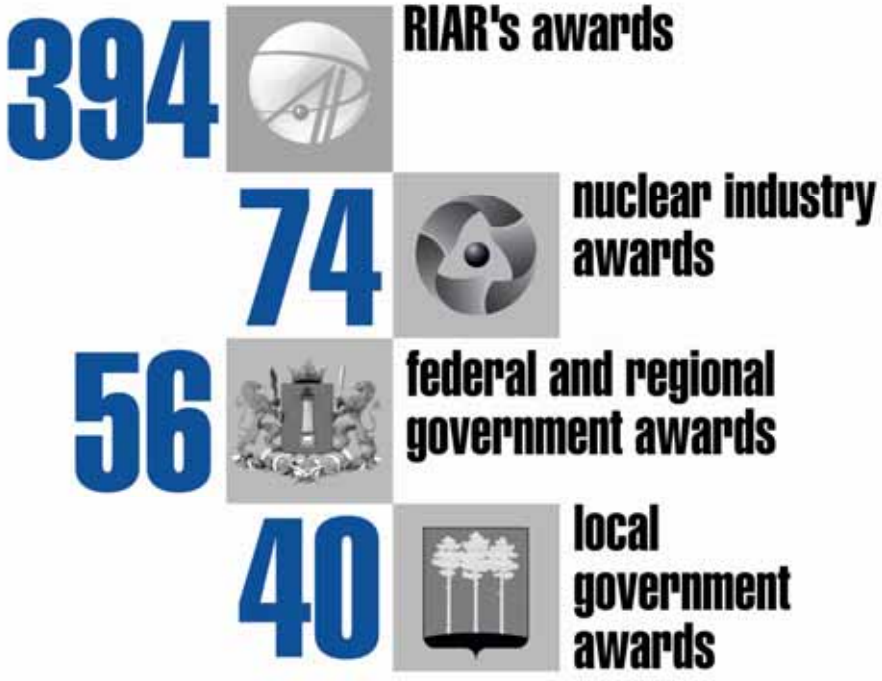
The Winner of the regional stage of the All-Russian Contest "Russian Company of High Social Efficiency" in the Ulyanovsk region in the nomination "For reducing the industrial injury and occupational disease level at industrial organizations"

4

The Division Award "For the Best Result in the Year of 2016"

5

First place in the Public Reporting Competition in the nomination "The Best Annual Public Report of the Organization of Divisions and ROSATOM State Corporation" and fourth place in the General Top List of Reports and in the nomination "The Efficiency of Public Reporting and Stakeholder Engagement". The contest experts also noted the RIAR report in the special nomination "For the Quality of the Russian Language and the Functional Text Design in the Annual Public Report"



60 ЛЕТ НИИАР

The Research Institute of Atomic Reactors was established in 1956 at the initiative of academician Igor Kurchatov for engineering studies and research activities in the field of nuclear power industry

1

GENERAL INFORMATION

1.1. General Information

Table 1.1.1 gives the essential information about the Institute

Table 1.1.1

	Full name	
G4-3	in Russian	Акционерное общество «Государственный научный центр — Научно-исследовательский институт атомных реакторов»*
G4-7	in English	Joint Stock Company "State Scientific Center — Research Institute of Atomic Reactors"
	Short name	
	in Russian	АО «ГНЦ НИИАР»
	in English	JSC "SSC RIAR"
	Location and postal address	
G4-5	433510, Russian Federation, Ulyanovsk region, Dimitrovgrad, Zapadnoye Shosse, 9	
	Contacts	
	E-mail	niiar@niiar.ru
	Web-site	http://www.niiar.ru
	Phone	+7 (84-235) 3-27-27
	Fax	+7 (84-235) 3-58-59

* Hereinafter referred to as JSC "SSC RIAR", Institute, Organization.

Registrar

Joint Stock Company "R.O.S.T. Registrar" was approved as a Registrar of JSC "SSC RIAR" in accordance with Resolution No.4 of the Board of Directors of JSC "SSC RIAR" as of December 30, 2008. This Company is a professional participant of the securities market that carries out its activities on the basis of License No. 10-000-1-00264 as of December 03, 2002 issued by the Federal Commission on Securities Market of the Russian Federation.

Information about Registrar

Requisites:	OGRN 1027739216757; TIN 7726030449.
Short name:	JSC "R.O.S.T. Registrar".
Postal address:	18/13 Stromynka St., 107996, Moscow.
Phone / Fax:	+7 (495) 771-73-36 / +7 (495) 771-73-34.
E-mail:	rost@rrost.ru
The date since when the Registrar has maintained the register of issuer's inscribed stock:	11.01.2009

Stakeholders (Table 1.1.2)

Table 1.1.2

Key information about JSC "SSC RIAR" stakeholders

Stakeholders	Legal/ postal address	Number of shares		Share in the charter capital, %	
		by 31.12.2015	by 31.12.2016	by 31.12.2015	by 31.12.2016
Joint Stock Company "Atomic Energy Power Corporation"	24 Bolshaya Ordynka St., 119017, Moscow	6 320 505 675	8 953 605 675	49,8235	52,7803
Russian Federation represented by ROSATOM State Atomic Energy Corporation		0	1 645 035 900	0	9,6972
ROSATOM State Atomic Energy Corporation		6 365 286 800	6 365 286 800	50, 1765	37,5225

Subsidiary Companies and Joint Ventures (Table 1.1.3)

Table 1.1.3

Subsidiary companies and joint ventures of JSC "SSC RIAR"

Company	Activities	Stake, %
NIIAR — GENERATSIYA Ltd.	Generation and supply of energy: electricity, heat, steam, hot water, drinking and general-use water, water discharge	100
Belorussian-Russian Joint Stock Company "Isotope Technologies"	Production, storage, receipt, usage, transportation of radioactive materials and products; design engineering, fabrication, assembling, adjustment, failure assessment, operation, repair and maintenance of radioisotope-based devices and facilities	51
Chinese-Russian Joint Venture "Beijing CIAE — RIAR Radioisotope Technology Co. Ltd."	Production of Cf-252 neutron sources and other sources, their integration in devices and equipment, selling at the territory of the People's Republic of China, promotion of Cf-252 sources and other sources for their use in the industry of the People's Republic of China, rendering services for consumers	50

Background

Figure 1.1.1 represents schematically the history of the Institute development.

More detailed information can be found at http://niiar.ru/?q=history.

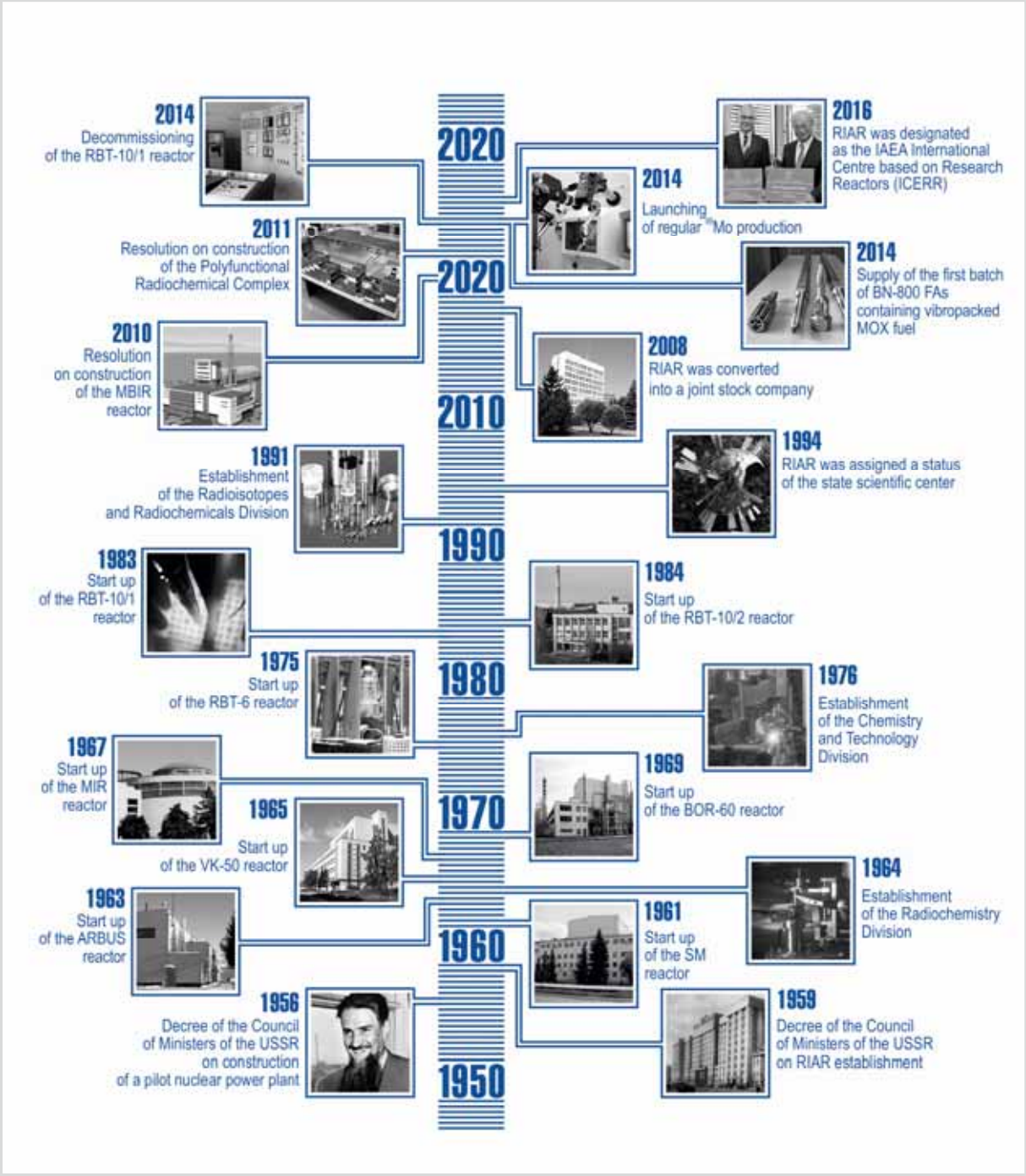


Fig. 1.1.1. RIAR's history

RIAR celebrated its anniversary

1.2. Key Competencies. Products and Rendered Services

The key competencies as well as key products and services produced and rendered by JSC "SSC RIAR" are related to areas of its activity (Fig.1.2.1) and were already described in detail in the previous Reports (http://niiar.ru/annual_report).

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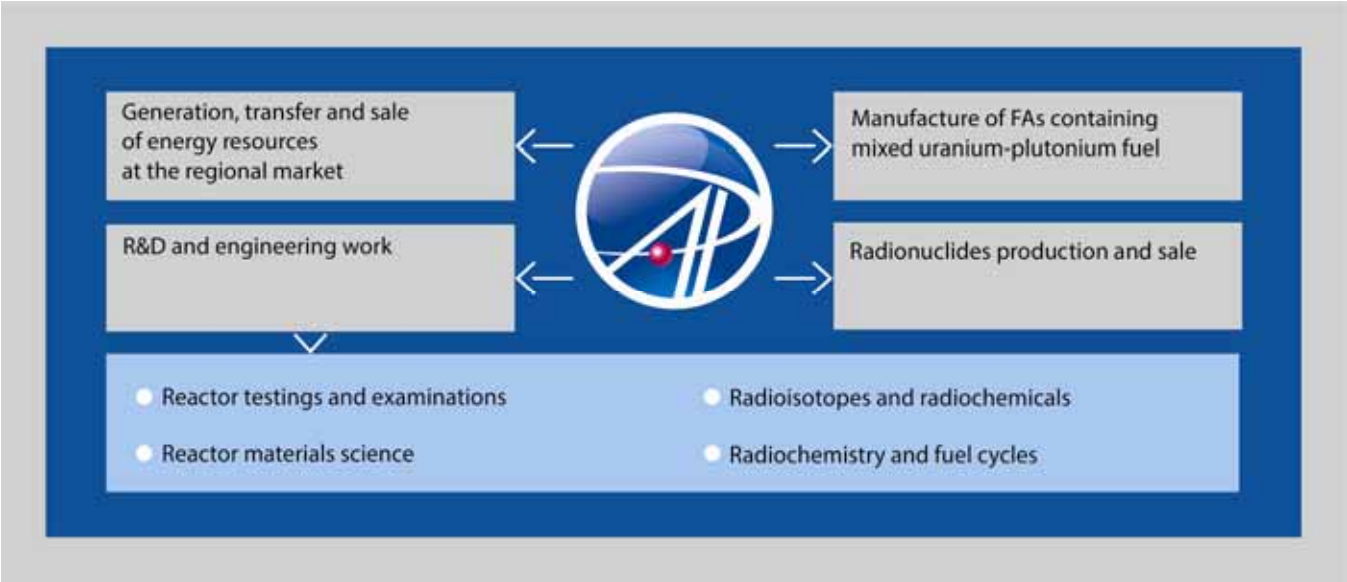

Fig. 1.2.1. Products and services produced and rendered by JSC "SSC RIAR"

The key consumers of the R&D products and services are ROSATOM's enterprises: research and design organizations developing materials, fuels and components for nuclear facilities; operators of NPPs and their maintenance sub-contractors, some industrial and scientific organizations from other industries: ROSATOM State Corporation, JSC "FC NRS", JSC "TVEL", JSC "Rosenergoatom Concern", JSC "VNIINM", JSC "Afrikantov OKBM", JSC "NIKIET", JSC "Gidropress" as well as customers from the USA, South Korea, Japan, China and France.

A wide range of radionuclides and ionizing sources developed by JSC "SSC RIAR" is supplied to both Russian and foreign markets. The key consumers of RIAR's radioisotopes are not only radiopharmaceutical companies, healthcare providers and medical equipment manufacturers but also educational institutions and research institutes carrying out ionizing sources-based research (e.g. Moscow Engineering and Physical Institute, JSC "NIITFA", Kurchatov Institute, JSC "SNIIP"), enterprises manufacturing ionizing sources-based equipment (e.g. JSC "NIITFA", JSC "SNIIP", "EMI", Ltd.) and joint ventures (JSC "Isotope Technologies", Chinese-Russian Joint Venture "Beijing CIAE — RIAR Radioisotope Technology Co. Ltd.").

The full mixed uranium-plutonium fuel fabrication cycle has been implemented at the RIAR's pilot facility from the generation of the initial uranium and plutonium oxides to as-built fuel assemblies. In addition to the fabrication of the pilot batches of fuel assemblies for the domestic fast reactors, the pilot facilities are used to carry out research on the non-aqueous methods for the spent nuclear fuel reprocessing, to fabricate

vibropacked fuel pins, to master closed fuel cycle technologies and to carry out transmutation of minor-actinides to involve them into the fuel cycle.

The consumers of the power resources produced by RIAR are not only the site facilities but also different industrial companies, population and other consumers of the city of Dimitrovgrad. The utilities consume not only all thermal energy produced by RIAR, but also 100% of cold and hot water supply. More detailed information about the RIAR' s achievements in 2016 can be found in Section 4.

1.3. Position in the Industry

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The ROSATOM's enterprises are known to implement two full process runs that are related to the development, construction, operation and decommissioning of NPP, production and use of nuclear fuel and handling of generated waste.

G4-8

The key activities of JSC "SSC RIAR" are focused on the R&D provision of the ROSATOM's enterprises in the field of the NPP fuel lifecycle at the stages of its development, fabrication, operation and handling of SNF and radwaste (Fig. 1.3.1)

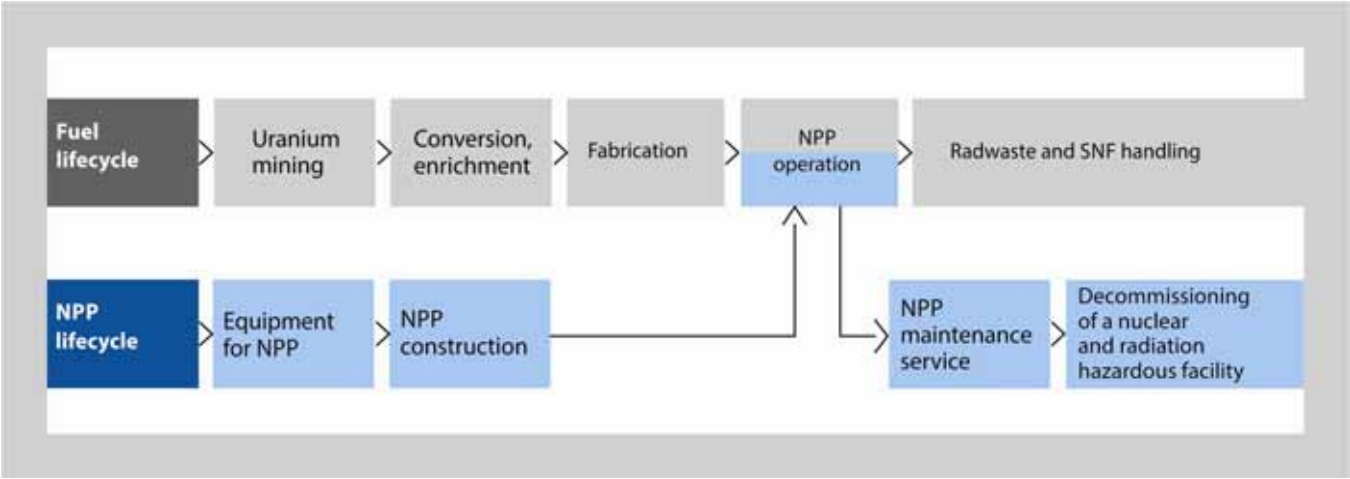

Fig. 1.3.1. Key process runs.
In blue are lifecycle stages at which RIAR's services are in demand

The Institute, being an important experimental base, contributes to the achievement of the ROSATOM's strategic goals related to the development of fuel technologies such as: effective provision of the national economy with electrical energy produced at NPPs; provision of the national geological interests and achievement of the leading positions for the national companies at the world's market of nuclear technologies and services; maintenance of national nuclear arsenals at the level required to provide the nuclear deterrence policy and nuclear and radiation safety of nuclear facilities, personnel, population and environment; development of innovative nuclear technologies and broadening their application areas. RIAR's contribution to the achievement of the ROSATOM's strategic goals:

- justification of materials and design components of various reactors, their performance and lifetime; new technical decisions aimed at the improvement of their

characteristics important for the NPP effective operation, including licensing abroad;

- development and tryout of the closed fuel cycle technology; development of fuel fabrication technologies for fast and low-power reactors; generation of experimental data on the properties of structural materials for innovative power conversion facilities; development of technologies and arrangement of production of radioisotopes for scientific, technical and medical purposes;
- scientific and experimental justification of technological and design decisions for the refurbishment, upgrading, lifetime management and decommissioning of nuclear facilities, including the development of conventional technologies for handling generated waste and reprocessing spent nuclear fuel from nuclear ice-breakers; standards for monitoring and interpretation of facility conditions values at all stages of its lifetime.

In 2016, JSC "SSC RIAR" demonstrated a stable dynamics in development holding a firm place in the industry (Fig. 1.3.2 and 1.3.3). At a time when the number of government contract decreased twice, the Institute increased supplies of products and services by about 10 % as compared to the previous year. The share of isotopes supplies is increasing as well: in 2016 the increase in this activity made up 9 % from the total scope of supply as compared to 2015.

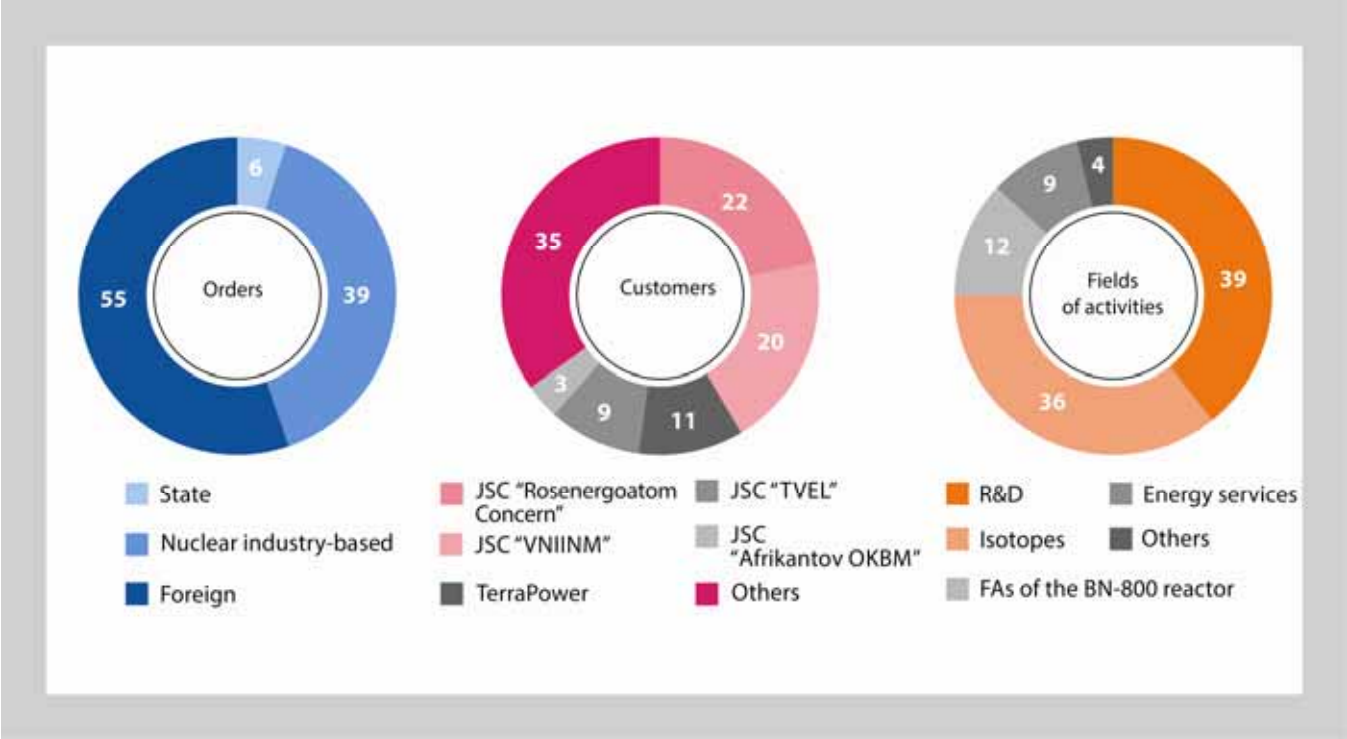

Fig. 1.3.2. Structure of JSC "SSC RIAR" supplies in 2016, %

The supply chain of JSC "SSC RIAR" is a system of relationships with counterparties (suppliers, contractors and consumers), which is an integral component of the business model of the institute and has a direct impact on the value added in the short, medium and long term. The interaction with counterparties is carried out within the framework of a single policy related to the ROSATOM's reporting and procurement systems (Fig. 1.3.4). The added value of an enterprise is the aggregate of products, results of production activities and implementation

of projects aimed at achieving strategic goals, increasing efficiency and competitiveness, as well as economic, environmental and social mutual influence of the institution and stakeholders. The process of creating value added is based on the mission, values and strategic objectives of JSC "SSC RIAR". This process is provided by internal resources (capital) and is influenced by external factors (resources, risks and opportunities).

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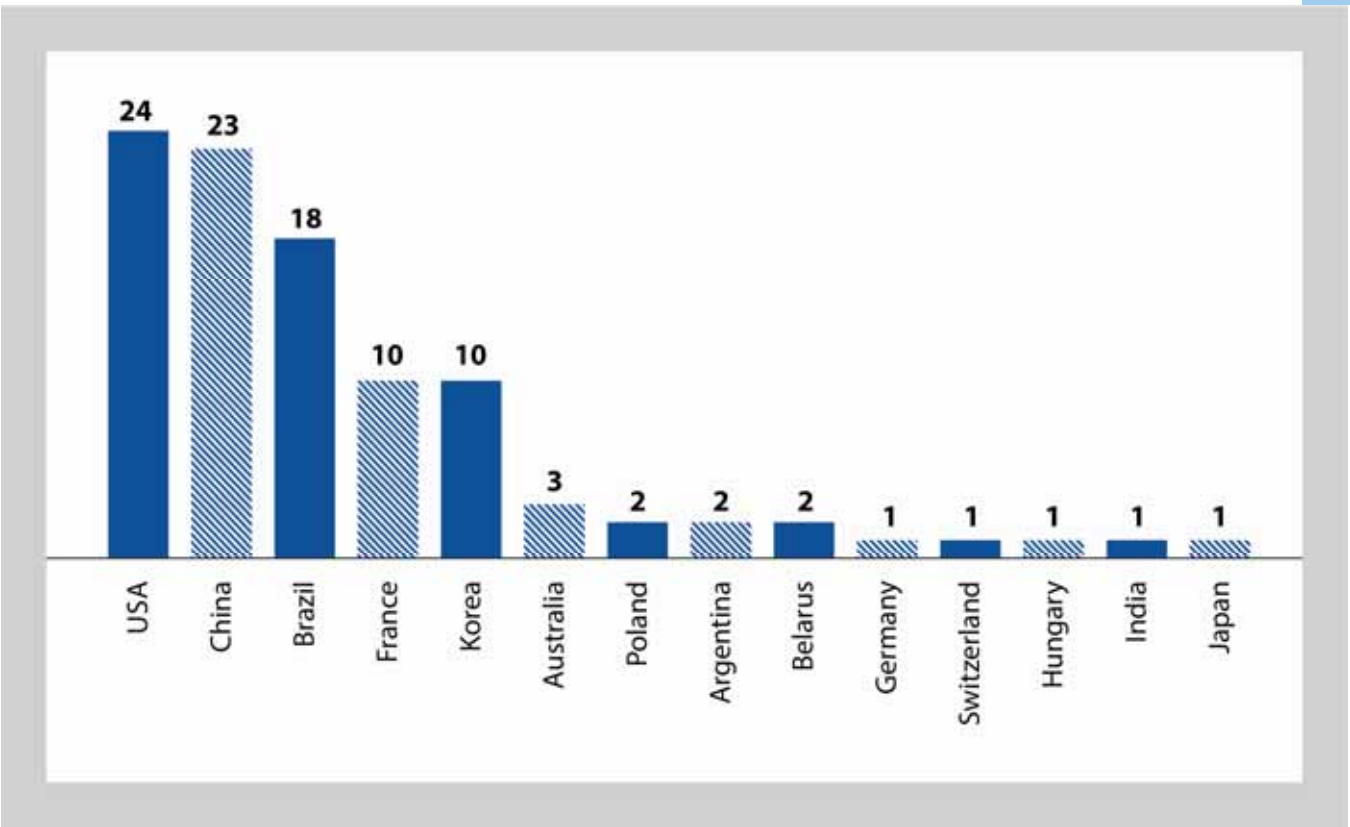

Fig. 1.3.3. Export of products and services in 2016, %

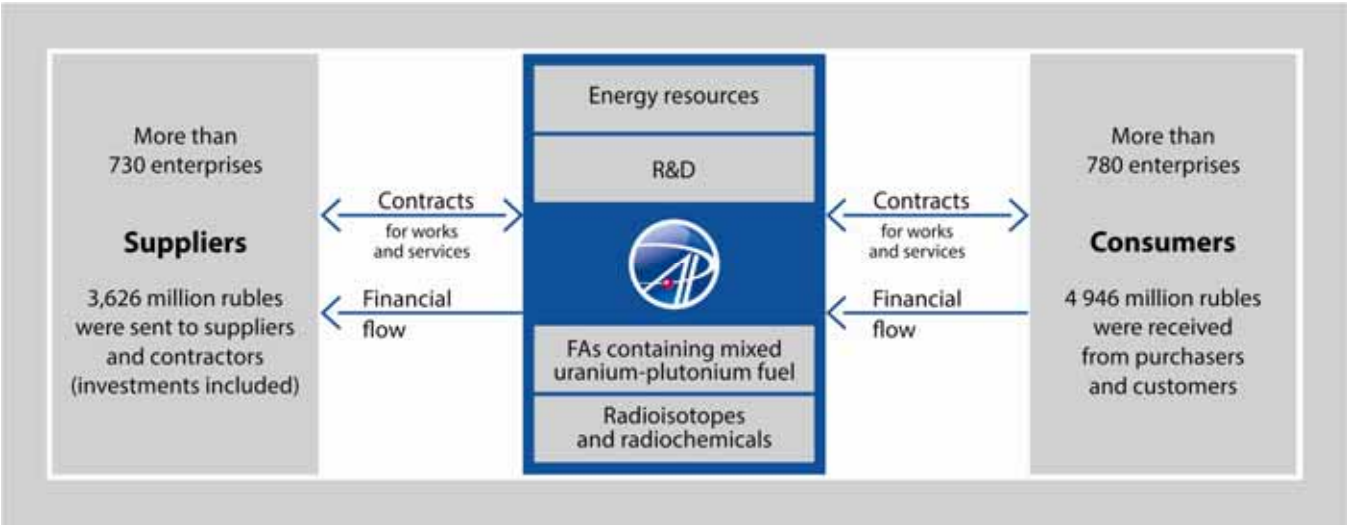

Fig. 1.3.4. Chain of JSC "SSC RIAR" supplies

60 ЛЕТ НИИАР

On December 30, 1968 the State commission accepted for operation the start-up complex of the first phase of the reactor facility with the experimental fast neutron reactor with a capacity of 60 MW (BOR-60)

2

STRATEGY

2.1. Mission and Values

Mission of JSC "SSC RIAR" is to enhance marketability and effectiveness of ROSATOM's activities in provision of sustainable development of Russia's nuclear power engineering and economy

JSC "SSC RIAR", being nowadays the largest in Russia and in the world research center, provides science-intensive high-tech services on a wide range of irradiation and post-irradiation experiments. It is also a key ROSATOM's center producing high-tech innovative products being in demand in different branches of industry and will remain as it is in the long-term. The basis of RIAR's operational activity is its participation in the industrial projects aimed at the development of Russia's and global nuclear technologies as well as the implementation of the self-development projects. The main way for RIAR to achieve its strategic goals is to solve a number of strategic issues on the development and strengthening of key competences as well as on increasing the economic efficiency of the Institute (Fig. 2.1.1 and 2.1.2). Values global for ROSATOM are extremely important for JSC "SSC RIAR" (Fig. 2.1.3).

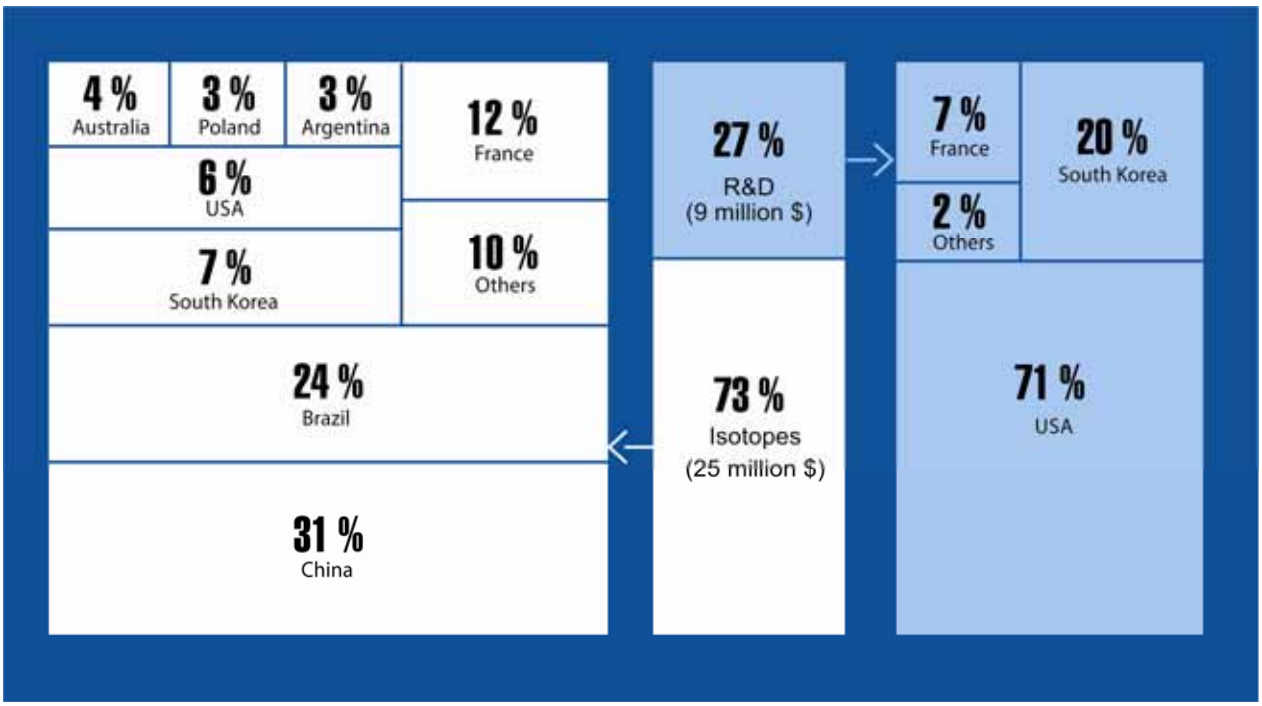

Fig. 2.1.1. Structure of JSC "SSC RIAR" export in 2016

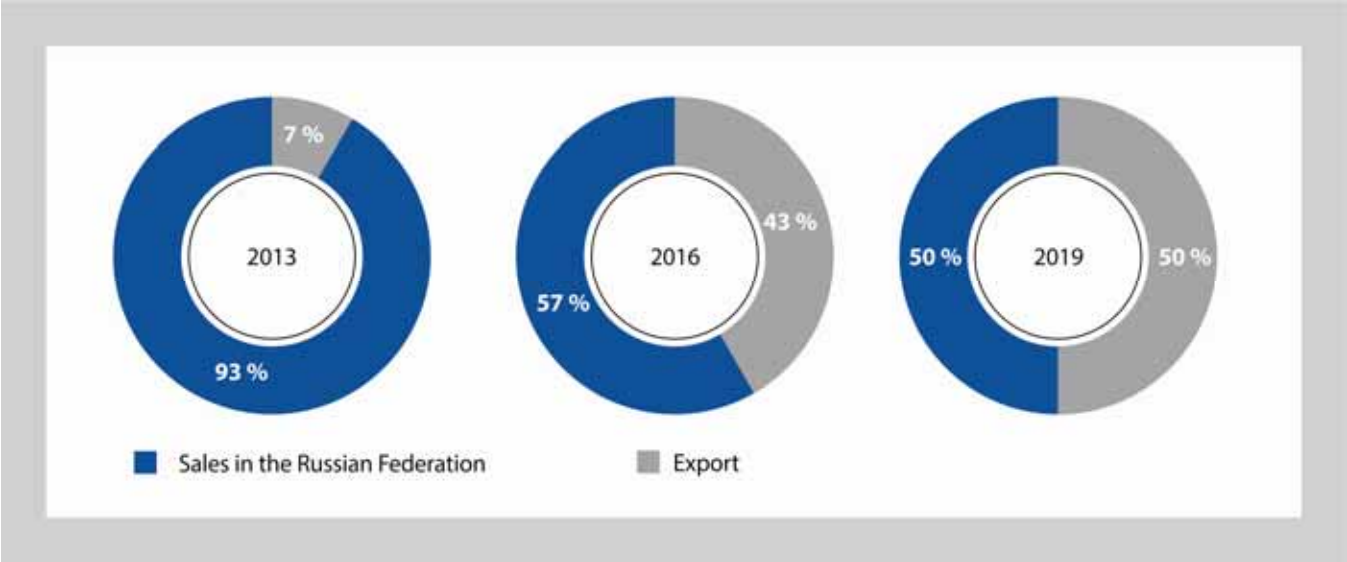

Fig. 2.1.2. Distribution of revenue

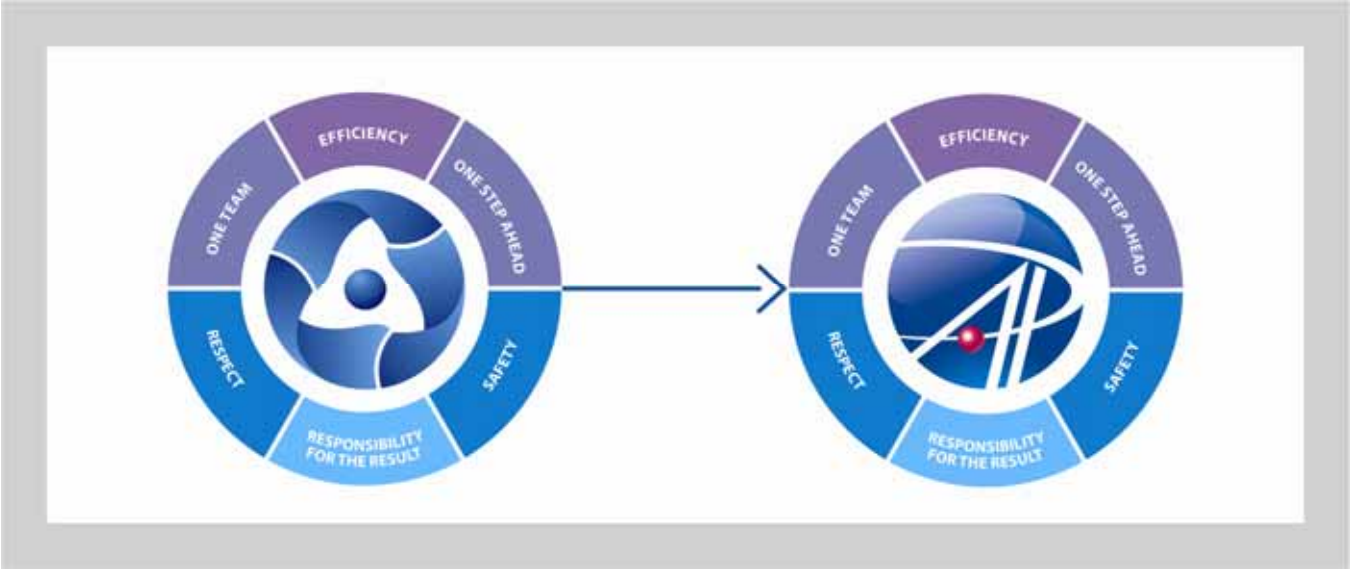

Fig. 2.1.3. ROSATOM's values are RIAR's values

2.2. Strategic Tasks

(Table.2.2.1)

Table 2.2.1

Achievement of strategic goals and key results for the year of 2016

Strategic goals	Tasks to solve	Results achieved
• Research and experimental support of defense procurement. • Research and experimental justification of technical decisions aimed at the enhancement of safety and performance of nuclear reactors of different types to provide a sustainable development of Russia's nuclear engineering. • Development of technologies and research and experimental justification of technical decisions aimed at the enhancement of nuclear and radiation safety of nuclear facilities and effective management of SNF and radwaste. • Development of technologies and research and experimental justification and establishment of production of science-intensive unique innovative output. • Development and strengthening of key competencies, improvement of the economic output of the current activities of the Institute on the global market and provision of sustainable long-term development	• Provision of nuclear and radiation safety at all facilities, enhancement of the production culture level as well as the labor efficiency. • Provision of financial stability and efficiency of the enterprise activities. • Development of the experimental potential of the RR fleet, facilities and research infrastructure. • Development of the production infrastructure for a full fuel supply cycle, SNF and radwaste management. • Development of the production infrastructure to provide the innovative high-tech output. • Development of the scientific, marketing, financial-economical and production potential to increase the high value added output. • Development of human resources to provide the fulfillment of promising research tasks faced by the Russia's nuclear industry, assistance in the regional development and arrangement of the conditions to engage highly-qualified employees	• State Contracts were fulfilled under the Federal Target Programs: - R&D in justification of technical decisions related to the MBIR reactor systems and equipment (26 mln RUB); - R&D in justification of design and technical decisions to establish the poly-functional radiochemical complex (196 mln RUB); - Technical upgrade of a 60MW fast test reactor (40 mln RUB). • Portion of the outside orders made up 55 % that is 33% higher as compared to the year of 2013. • R&D results made up 39 % of output in 2016. • Portion of the export income from the total one increased from 7 % (2013) up to 43 %, including revenues from isotopes supply increased from 8 % up to 36 %. • Revenues from sales production for the first time exceeded 3 billion rubles, while the volume of proceeds from the R&D sale amounted to 2 billion rubles

2.3. Business Model and Capitals

JSC "SSC RIAR" business model (Fig.2.3.1) reflects a system of activities related to the value creation and achievement of strategic goals using resources available. This is an overall description of the value added creation disclosing the processes and results of capitals transformation and their impact on the stakeholders.

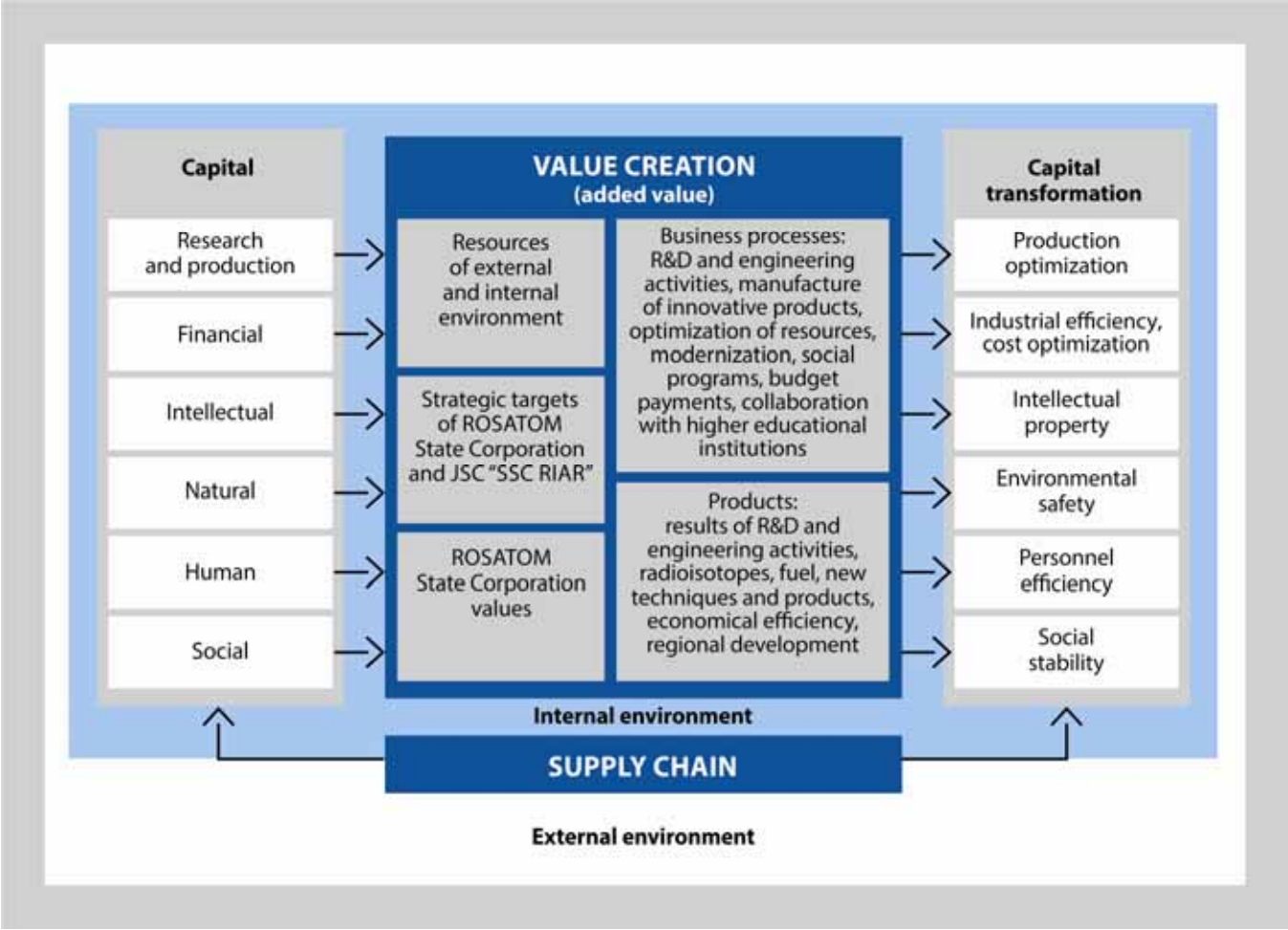

Fig. 2.3.1. JSC "SSC RIAR" business model

To achieve its strategic goals, the Institute possesses all the required reactor and non-reactor experimental facilities, equipment, administration and amenity buildings, territory, skilled personnel to carry out world-level experiments (Table 2.3.1). The Institute also has

logistics structure and suppliers to provide the site with all technical and natural resources required for its activity. The Institute activities are based on the industrial-level nuclear technologies development projects, in which the Institute participates to provide new knowledge. Activities in the interest of Russian enterprises as well as self-development projects are usually financed in the frame of industrial-scale and federal target programs. Activities for foreign customers are done under signed commercial contracts. In addition to research activities, RIAR produces radioisotopes, fuel assemblies for fast reactors, and supplies heat, electricity and water to Dimitrovgrad. By improving its experimental capabilities and engineering infrastructure, JSC "SSC RIAR" implements self-development projects to achieve the strategic goals.

JSC "SSC RIAR" successfully uses both its internal and external capitals thus demonstrating the effectiveness of its business model and high level of its integration into the environment and active interaction with the stakeholders.

Table 2.3.1

Capital assets of JSC "SSC RIAR" and their efficiency in 2016

Capital	Internal resources	External resources	Capital gain*
R&D and production	R&D and production infrastructure	R&D and production infrastructure of subcontractors	Gain of net assets made up 37 %. Investment projects allocation made up 1.2 bln RUB
Financial and economic	Financial resources	Consolidated investment resource, Federal Target Programs assets, borrowed funds	Revenue growth made up 24 %, labor efficiency made up 35 %. Net profit (loss) made up –90,3 mln RUB (loss reduction made up 612 mln RUB)
Intellectual	Ideas and developments, results of intellectual activity	Intellectual property, experience and knowledge	Number of registered patents for invention and useful models made up 16 pcs., the increase is 100 %
Natural	Environment, natural resources	Environment and consumed environmental resources	Costs for the environmental protection made up 15.3 mln RUB. Consumption of thermal energy decreased by 9 %
Human	Personnel, knowledge and skills gained	Personnel, gained knowledge and experience of subcontractors	Average monthly salary growth made up 21 %. LTIFR made up 0. 815 employees were trained
Social	Social relations, reputation of the organization at the domestic and international target markets	Public acceptance of industry, effective interaction with subcontractors, chain of supplies (Fig. 1.3.4)	Gross tax charges to the different-level budgets made up 797 mln RUB

* Capital gain compared to the year of 2015.

2.4. Relevant Aspects of Activity

G4-18
G4-19
G4-20
G4-21
G4-23

In accordance with the guidelines in the field of public reporting, the Global Reporting Initiative (GRI, version G4), the process of preparing the concept of the report included questionnaires (November 2016) for stakeholder representatives and top-management (Fig. 2.4.1) of JSC "SSC RIAR" for the purpose of correcting and determining the essential aspects of the organization's activities for the subsequent determination of the contents of the report and disclosure of information on the actualized aspects. The initial list of significant aspects of the JSC "SSC RIAR" activities was first determined in 2015 in accordance with the methodology of relevance assessment and is used in this annual report (http://www.niiar.ru/sites/default/files/riar_annual_report_2015small_0.pdf, P. 27–30).

Fig. 2.4.1. Representatives of stakeholders and top-management

A rank map of the relevant aspects of activity (GRI / G4 and IIRC) is given in Fig. 2.4.2. Topics having a rank higher 0.5 for the stakeholders and top-management of JSC "SSC RIAR" were admitted relevant and are reflected in the report. Topics marked in pink are recommended by the RIAR's public reporting committee and described in detail in the report. Topics located in a square with coordinates from 0 to 0.5 on both matrix scales were not recognized as significant and according to GRI guidelines are not mandatory for disclosure. Unlike last year, the aspect of "Optimization of production processes" is recognized not only substantive, but also subject to disclosure in detail. The figures in bold type highlighting the own aspects of JSC "SSC RIAR" and supplementing the list of GRI G4.0 aspects correspond to the following topics:

1 — economic efficiency;

2 — market presence;

3 — indirect economic effects;

4 — purchase practice;

5 — **investment activities**;

6 — **key activities results**;

7 — **quality and safety**;

8 — **optimization of production processes**;

9 — **innovative activities**;

10 — materials consumption;

11 — energy consumption;

12 — water consumption;

13 — discharges;

14 — effluent and waste;

15 — transport;

16 — conformity to ecological requirements;

17 — bio-diversity;

18 — products and services;

19 — ecology;

20 — ecological assessment of suppliers;

21 — mechanisms to settle ecological disputes;

22 — **labor remuneration**;

23 — employment;

24 — relations between employees and administration;

25 — health care and safety at a workplace;

26 — training and information;

27 — diversity and equal opportunities;

28 — assessment of the supplier's HR practice;

29 — mechanisms to settle labor disputes;

30 — equal labor remuneration for men and women;

31 — **personnel training**;

32 — consumer's privacy;

33 — investment practice;

34 — no discrimination;

35 —freedom of associations and collective bargaining;

36 — employment of children by a company or subcontractor;

37 — forced and compulsory labor used by a company or subcontractor;

38 — safety provision approaches;

39 — assessment of human rights observance;

40 — assessment of human rights observance by suppliers;

41 — mechanisms to settle human rights observance disputes;

42 — local community;

43 — anti-corruption practice;

44 — competitive barriers;

45 — conformity to community requirements;

46 — assessment of suppliers' community interaction practices;

47 — mechanisms to settle disputes related to community interaction;

48 — labeling of products and services;

49 — conformity to products requirements;

50 — infringement of native and low-numbered peoples' rights;

51 — state policy;

52 — consumer's health and safety;

53 — marketing communications;

54 — **international cooperation**;

55 — **interaction during the report issuing**;

56 — **interaction with suppliers**;

57 — **corporative communications**;

58 — **board of directors**;

59 — **organizational management model**;

60 — **inside monitoring and audit**;

61 — **risk management**.

The aspect relevance boundaries were defined based on the rank map and with the account of the JSC "SSC RIAR" top-management's opinion. No new verbiage of aspects given in the previous reports. All the given data match the previous ones. No changes in the scope and boundaries of aspects as compared to the previous reports.

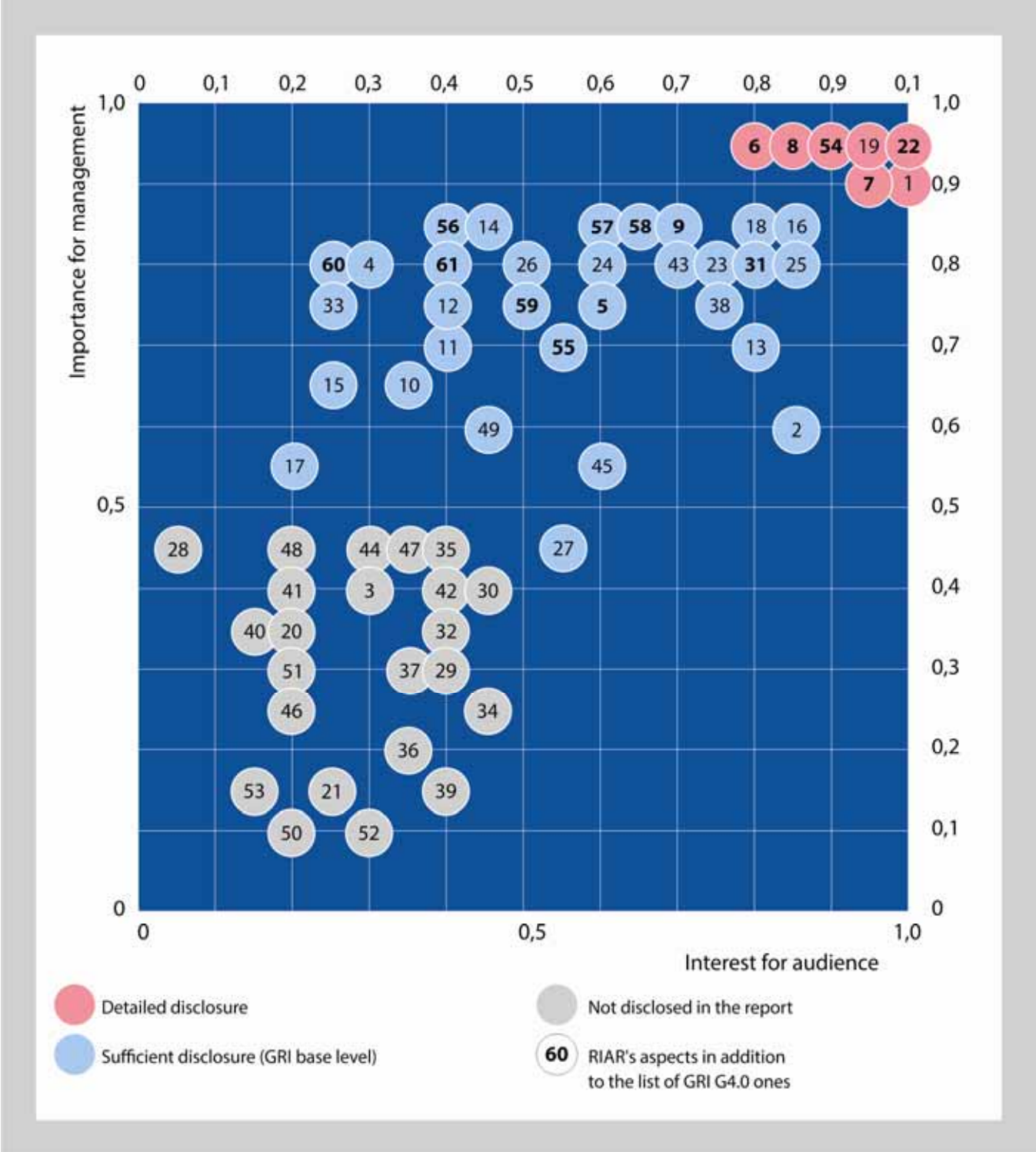

Fig. 2.4.2. JSC "SSC RIAR" activity relevant aspects rank map

60 ЛЕТ НИИАР

Built in the mid-1960s, the multi-loop test reactor MIR is the world's most powerful and equipped research reactor in terms of its experimental capabilities

3

MANAGEMENT EFFICIENCY

3.1. Members and Structure of the Governance Bodies

The supreme governance body of JSC "SSC RIAR" is the **General Shareholders Meeting**. The Charter of JSC "SSC RIAR" and the Federal Law No. 208-FZ "On Joint Stock Companies" as of 26 December 1995 govern the powers, the procedure for convocation and holding the general Shareholders Meeting. In 2016 six General Shareholders Meetings were held: one Annual Shareholders Meeting and five Extraordinary Shareholders Meetings.

The Board of Directors is a collegial managing body (Fig. 3.1.1) that is in charge of overall management, corporate development strategy, and exercises control over financial and economic activities and over the Sole Executive Body for JSC "SSC RIAR". The Board of Directors occupies a central position in the corporate management system. The number of members for the Board of Directors is specified in the Charter of JSC "SSC RIAR". The Board of Directors of JSC "SSC RIAR" (Fig. 3.1.2, Tables 3.1.1 and 3.1.2) acts in compliance with the scope of its competence stipulated by the Federal Law No. 208-FZ "On Joint Stock Companies" as of 26 December 1995 and by the Statute of the Board of Directors. In 2016 eighty eight meetings of the Board of Directors were held in absentia (every member of the Board of Directors sent the absentee feedback so there was a 100 per cent attendance rate) to discuss two hundred ninety nine topics. The Board of Director's Report is given in Attachment 2.

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Fig. 3.1.1. Structure of the corporate governance bodies

25.11.2015 — 15.06.2016	15.06.2016 — 31.12.2016
Alexey Dub (Chairperson);	Vyacheslav Pershukov (Chairperson);
Vyacheslav Pershukov;	Sergey Kashlev;
Nikolay Kondratiev;	Nikolay Kondratiev;
Sergey Kashlev;	Ilya Cheremukhin;
Alexander Tuzov	Alexander Tuzov

Fig. 3.1.2. The members of the Board of Directors and the dates of their election

Table 3.1.1

Biographic profile of the Board of Directors for JSC "SSC RIAR"

A member of the Board of Directors	Place of employment and positions held over the last five years
 **Alexey DUB** First Deputy Director General, JSC "Science and Innovations" Date of birth: 25 July 1960 Academic background: higher, graduate from Moscow Institute of Steel and Alloys (1983) majoring in study of physical and chemical aspects of metallurgical processes	• FSAEI NUST MISIS: since 2005 and to the present day — Head of Department (external secondary job). • JSC NPO TSNIITMASH: from 2005 until October 2014 — Director General. • JSC "Science and Innovations": from 2013 until October 2015 — Director General; since October 2015 and to the present day — First Deputy Director General. Share in the share capital of JSC: 0 %. Equity share in the ordinary nominal shares of JSC: 0 %. There were no transactions related to acquisition and alienation of shares in the reporting year
 **Sergey KASHLEV** Director General, JSC "Science and Innovations" Date of birth: 23 February 1960 Academic background: higher, graduate from Novosibirsk State University (1982) majoring in economic cybernetics	• JSC "YUKOS EP" (Moscow): from May 2007 until September 2011 — Vice President for Economics and Finance. • JSC "Science and Innovations": from March 2012 until January 2013 — Advisor; • From January 2013 until December 2015 — Deputy Director General for economics and Finance; Since December 2015 and to the present day — Director General. Share in the share capital of JSC: 0 %. Equity share in the ordinary nominal shares of JSC: 0 %. There were no transactions related to acquisition and alienation of shares in the reporting year
 **Nikolay KONDRATIEV** Chief Executive Officer, JSC "Science and Innovations" Date of birth: 19 October 1960 Academic background: higher, graduate from Tomsk Polytechnic Institute (1982) named after S. Kirov majoring in engineering electronics	• "Oil Company ROSNEFT", LLC — Science and Engineering Center: from February 2006 until August 2011 — Director General. • ROSATOM State Atomic Energy Corporation: from August 2011 until November 2011 — First Deputy Head of the Block for Innovation Management. • JSC "Science and Innovations": from November 2011 until October 2013 — Director General; since October 2013 and to the present day — Chief Executive Officer. Share in the share capital of JSC: 0 %. Equity share in the ordinary nominal shares of JSC: 0 %. There were no transactions related to acquisition and alienation of shares in the reporting year

A member of the Board of Directors	Place of employment and positions held over the last five years
 **Vyacheslav PERSHUKOV** Deputy Director General, Head of the Block for Innovation Management at ROSATOM State Atomic Energy Corporation Date of birth: 20 May 1958 Academic background: higher, graduate from the Lomonosov Moscow State University (1980) majoring in mechanics	• ROSATOM State Atomic Energy Corporation: from January 2011 until June 2011 — Deputy Director General — Director of Directorate for Science and Engineering; Since June 2011 and to the present day — Deputy Director General, Director of the Block for Innovations Management. • JSC "Science and Innovations": from October 2015 until December 2015 — Director General Share in the share capital of JSC: 0 %. Equity share in the ordinary nominal shares of JSC: 0 %. There were no transactions related to acquisition and alienation of shares in the reporting year
 **Alexander TUZOV** Director of JSC "Science and Innovations" and JSC "SSC RIAR" Date of birth: 9 April 1971 Academic background: higher, graduate from Nuclear Power Engineering Institute (1994) majoring in power generation performance and automatic control engineering	• ROSATOM State Atomic Energy Corporation: from November 2010 until April 2015 — Project Manager; Deputy Director of the Innovation Management Unit — Head of Department for Technological Development. • JSC "Science and Innovations": since May 2015 and to the present day — Director. • JSC "SSC RIAR": since October 2015 and to the present day — Director. Share in the share capital of JSC: 0 %. Equity share in the ordinary nominal shares of JSC: 0 %. There were no transactions related to acquisition and alienation of shares in the reporting year
 **Ilya CHEREMUKHIN** Head of Agency for Legal and Corporate Performance, JSC "Science and Innovations" Date of birth: 23 March 1975 Academic background: higher, graduate from Yaroslavl State University (1997) majoring in jurisprudence	• "ENERGOPROMSBYT" LLC: from February .2008 until November 2011 — Head of Legal Office. • Moscow Office JSC "TGK-14": from December 2011 until January 2013 — Head of Legal Office. • "ENERGOPROMSBYT" LLC: from February 2013 until April 2015 — Head of Legal Office. • "ENERGOPROMSBYT" LLC: from February 2013 until April 2015 — Chief Expert, Government relations Department. • JSC "Science and Innovations": since July 2015 and to the present day — Head of Agency for Legal and Corporate Performance. Share in the share capital of JSC: 0 %. Equity share in the ordinary nominal shares of JSC: 0 %. There were no transactions related to acquisition and alienation of shares in the reporting year

Table 3.1.2

The Board of Directors

Age	Members of the Board of Directors		
	Men	Women	Total
Aged 30 and under	0	0	0
Aged 31 and through the age of 50	2	0	2
Aged 51 and over	4	0	4
Total	6	0	6

JSC "SSC RIAR" does not have independent members in the Board of Directors in the meaning stipulated by the Code of Corporate Governance and recommended to be implemented in accordance with the letter of the Bank of Russia No. 06-52/2463, as of 10 April 2014 "Concerning the Code of Corporate Governance".

There are no committees within the Board of Directors.

The collegial executive body has not been formed at JSC "SSC RIAR" during the period under report.

The ongoing activities of JSC "SSC RIAR" were managed during the period under report by the ***Sole Executives Bodies***: by Alexander A. Tuzov, Director of JSC "SSC RIAR" and the managing company that is Joint Stock Company "Science and Innovations". There is some information about the Director of JSC "SSC RIAR" in this Chapter. G4-35

Information about managing company

Full name:	Joint Stock Company "Science and Innovations".
Acronym:	JSC "Science and Innovations"
Director General:	Sergey Kashlev
Head office and legal address:	24 Bolshaya Ordynka St., Moscow, 119017, Russia
Primary State Registration Number:	1117746621211.
Individual Taxpayer Identification Number:	7706760091.
Industrial Enterprise Classification Code:	770601001.
Date of registration:	11 August 2011
Share in the share capital of JSC:	0 %.
Equity share in ordinary nominal shares:	0 %.

There were no transactions related to acquisition and alienation of shares in the reporting year.

Some information about the Director General of JSC "Science and Innovations" is given in this Chapter.

Remuneration payable to the Director and to the members of the Board of Directors

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The principle of forming remuneration and salaries for the top management is similar to the principle of forming compensation to other employees of JSC "SSC RIAR" (see Section 4.5. "Human Capital Management"). The amount of remuneration payable to the Director of JSC "SSC RIAR" is determined in accordance with the terms and conditions of employment contract, which are subject of approval by the Board of Directors.

The general shareholders meeting may resolve to pay remuneration to the members of the Board of Directors and / or reimburse expenses arising out of discharging their duties as the members of the Board of Directors at JSC "SSC RIAR". The general meeting of JSC "SSC RIAR" shareholders did not resolve to pay remunerations during the period under report. Therefore, no remuneration was paid to the members of the Board of Directors.

3.2. Corporate Governance System

For the corporate governance system, JSC "SSC RIAR" adheres to the policy of observing recognized national and international standards as well as corporate governance principles of the ROSATOM State Atomic Energy Corporation (Fig. 3.2.1). The corporate governance framework should recognize rights and interests of all the parties involved and contribute to the success of the Company.

Regulatory framework

1. Civil Code of the Russian Federation.
2. Federal Law dated 26 December 1995 No. 208-FZ "On Joint Stock Companies".
3. Charter of JSC "SSC RIAR".
4. Statute of the JSC "SSC RIAR" Board of Directors.

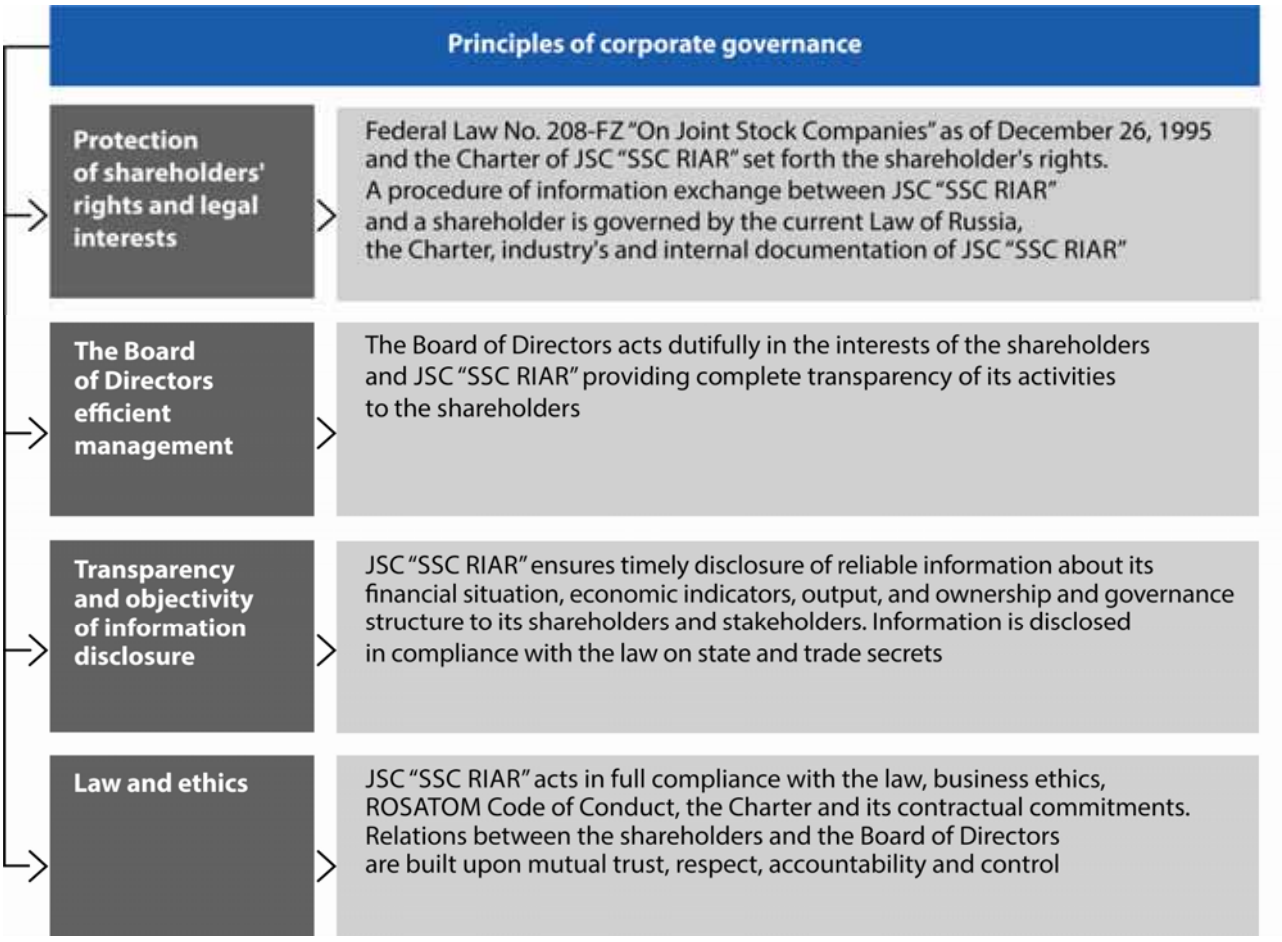

Fig. 3.2.1. Basic principles of corporate governance

Plans for enhancing the corporate governance system. Enhancement of the corporate governance system is primarily attributable to the protection of shareholders' rights and achieving equality of opportunities in exercising their rights that is to say prevention of any actions aimed at affected redistribution of corporate governance and submission of the best available information about the general meeting of the JSC "SSC RIAR" shareholders. By enhancing the corporate governance system, the Institute closely monitors all the changes in the applicable laws and advanced standards hereto.

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Principles and recommendations of the Corporate Governance Code

The Company has not yet formally adopted the Corporate Governance Code or any other similar documents but JSC "SSC RIAR" provides every opportunity to Shareholders to participate in governing the Company and to receive some information about the company's activities under the Federal Law dated 26 December 1995 No. 208-FZ "On Joint Stock Companies", Federal Law dated 22 April 1996 No. 39-FZ "On Securities Market" and in accordance with statutory regulations of the bank of Russia. The Company is committed to undertake its business in conformity with the basic principles and recommendations of the *Corporate Governance Code* that was recommended to be implemented by the letter of the Bank of Russia No. 06-52/2463 as of 10 April 2014 "Concerning the Corporate Governance Code". Some provisions of the Corporate Governance Code are implemented by the Company with due consideration for the legal status of the ROSATOM State Atomic Energy Corporation stipulated with the laws and regulations of the Russian Federation providing for the concept of the unity of governance for all the nuclear enterprises. They are also stated in some local regulations pertaining to the corporate governance.

Reporting of the Board of Directors on developing the business priorities

High-priority areas of the JSC "SSC RIAR" business were presented in the previous Annual Reports (http://www.niiar.ru/sites/default/files/riar_annual_report_2015small_0.pdf) with the focus on fulfilling the needs of the Physics and Power Engineering Unit for ROSATOM State Atomic Energy Corporation. Chapter 4 "Management of Capital and Performance" provides an overview of the enterprise performance for 2016 concerning all the areas of its business.

Transactions between interested parties and mechanisms for managing the conflict of interests

Transactions of JSC "SSC RIAR" which involved interest of the parties and are subject to the approval of the Board of Directors or the general meeting of shareholders pursuant to Article XI of the Federal Law No. 208-FZ 26.12.1995 On Joint Stock Companies" dated 26 December 1995 were entered into in full conformity with the applicable Corporate procedures (see Attachment 3). Transactions which involved interest of the parties and are subject to the approval of the Company's Governing Bodies were made based on the market values. In order the Board of Directors and general meeting of shareholders can come to a decision and approve such a transaction Pursuant to Article 83, Clause 7 of the Federal Law No. 208-FZ ", a value of property (goods) or services is set by the Board of Directors in accordance with Article 77 of the same Federal Law.

There were no dividends paid or attributed to the shares of JSC "SSC RIAR" in the year under report and over the last five years.

Changes in the size and structure of ownership

Share capital of the Joint Stock Company comprises a nominal amount of its shares purchased by its shareholders. As on 1 January 2016 the share capital amounted to RUB 12 685 792 475 (twelve billion six hundred eighty-five million seven hundred ninety-two thousand four hundred seventy-five) and was divided into 1 268 579 247ordinary registered shares with a par value of RUB 1 each. All the shares of the Company were issued as uncertified registered shares. Every ordinary registered share of the Company confers on the shareholder owing it the same scope of rights secured. The charter capital of the Company did not change during the period under report.

The general meeting of shareholders (Protocol No. 41 dated 28 November 2015) resolved to increase the charter capital of JSC "SSC RIAR" via issuing 6 932 394 550 (six billion nine hundred thirty two million three hundred ninety four thousand five hundred fifty) additional shares through a closed subscription. The Board of Directors approved the decision regarding additional issue of securities (Protocol No. 334 dated 30 November 2015). The additional issue of securities was registered by the Bank of Russia on the 15th of December 2015 under state registration number 1-01-55411-E-008D). In 2016 the Company placed 4278135900 (four billion two hundred seventy eight million one hundred thirty five thousand nine hundred) shares coming out from the additional issue of securities. The total number of shares placed by the company 16963928375 (sixteen billion nine hundred sixty three million nine hundred twenty eight thousand three hundred seventy five) (Table 3.2.1).

Table 3.2.1

Distribution of issued shares, %

Shareholder	Distribution	
	As of 1 January 2016	As of 31 December 2016
Joint Stock Company "Nuclear Power Generation Complex"	49,8235	52,7803
The Russian Federation legally represented by ROSATOM State Atomic Energy Corporation	50,1765	9,6972
ROSATOM State Atomic Energy Corporation	—	37,5225

So during the period under report Joint Stock Company "Nuclear Power Generation Complex" increased its shareholding but ROSATOM State Atomic Energy Corporation decreased its shareholding. The Russian Federation acquired shares of the Company with an ownership interest of 9.6972 %.

Projects aimed at promoting communication between top management and employees

Further work is under way to improve communication and feedback between the top management team and employees. Such a system was presented in detail in the 2015 Annual Report (http://www.niiar.ru/sites/default/files/pgo2015_links_0.pdf). A website, radio, TV panels

and announcement boards are currently active means of communication at the Institute. A radio station (thematic radio programs are broadcasted three times a week, there are more than1 000 room speakers at the RIAR's site) and website make it possible to extend the coverage up to 80 %. The JSC "SSC RIAR" website makes it possible to address a question to the Director in a special section. It also runs a forum that is an additional way to ask a direct question to the top management and remain unidentified among the others. Personal appointments are regularly conducted by the management team. Personnel attendance days are organized on a regular basis to keep the employees informed about the business performance and development prospects of the nuclear industry, nuclear engineering division and enterprise as well as to as well as to give employees a chance to talk directly with the top management first and foremost. Altogether in 2016 more than 90 % of top managers and functional managers took part in such communication events (Fig. 3.2.2).

Fig. 3.2.2. Personnel attendance days at JSC "SSC RIAR"

The overall PR-support of the RIAR's sixtieth anniversary commemoration was one of the key objectives of the communication program for 2016. The 60th Jubilee was a good occasion for a series of image-building and publicity campaigns and events targeted at forming public loyalty to the nuclear power engineering as well as it was a good occasion to implement some projects with the aim to promote development of corporate culture and the spirit of cooperation and to strengthen communication between the top, middle management and the staff. Honored retired employees, representatives of the top management and interested parties took an active part in these events (see Section 4.5. "Human Capital").

3.3. Auditing of Financial and Business Activities

An independent auditor and Department for Internal Control and Audit at JSC "SSC RIAR" are responsible for oversight of financial and business activities. Pursuant to the resolution of the general meeting of JSC "SSC RIAR" shareholders (minutes of extraordinary general meeting of shareholders No. 45 dated 20 September 2016), Limited liability Company "Financial and Accounting Consultants" was designated and approved as **Independent Auditor** for statutory annual audit of JSC "SSC RIAR" for the reporting period.

There is no audit commission (Internal Auditor) at JSC "SSC RIAR".

Information about independent audit company

The head office and legal address:	Myasnitskaya street 44/1, Bldg. 2 AB, Moscow, 101990, Russia
Phone:	(495) 737-53-53.
Official website:	http://www.fbk.ru.
E-mail:	fbk@fbk.ru

The internal control and auditing system is a combination of organizational arrangement, methods and procedures for audit and monitoring adopted by the management of economic entity as the mechanisms for consistent and efficient conduct of its business (business processes), which are implemented in order to reveal, correct and prevent substantial misdeeds (errors) and accounting data distortion. The internal control and auditing system is one of the essential elements of the risk management system at the enterprise which are attributable to the business transactions. JSC "SSC RIAR" has such a system in place and it is made available by the Department for Internal Control and Audit (see Section 3.5. "Internal Control and Auditing System").

3.4. Key Performance Indicators

The Improving performance management process has been successfully implemented at JSC "SSC RIAR" since 2009. The key performance indicators (KPI) system is an up-to-date management tool. Its fundamental principle is decompose strategic goals of ROSATOM State Atomic Energy Corporation and managing company into financial and economic, business performance, staff and other indicators of the enterprise business efficiency and individual goals of top management for a year term. The key performance indicators ensuring economic, environmental and social performance are formalized into the key performance indicator matrix of JSC "SSC RIAR" Director and и cascaded down or decomposed for lower level staff members in conformity with the key goals and relevant to functional burden. The key performance indicators are assigned to the managers at all levels in a mandatory manner. The SAP based personnel management system was adopted to improve effectiveness of KPI setting and to evaluate their achievement. Performance appraisal is one of the integral parts of the personnel remuneration policy at the enterprise (Fig. 3.4.1). The approved KPI data record is essential for bonus payment. Bonus payments are effected once a year upon the fulfillment of key performance indicators but within the limits of payroll budget and with due consideration for the annual business performance of the enterprise. The amount of remuneration payable and its relevance to performance are clear and transparent. The established remuneration procedure of the Company's employees is based on the *Regulation on Remuneration of Labor in JSC "SSC RIAR"*. The amount of remuneration is based on the position held, actual level of KPI fulfillments and hours worked (Table 3.4.1, Fig. 3.4.2).

Table 3.4.1

Strategy matrix with the key performance indicators of JSC "SSC RIAR" Director for 2016

Key performance indicator	Fulfillment against the target level, %	Strategic goal
Free adjusted cash flow	120	Increased share on the global market
Labor productivity	102	
Integrated index of foreign trade revenue	120	
Revenue from sale of innovative products	106	
Total costs	100	Reduction of production cost
Integrated index of new products	150	Creation of new products
Personnel staffing plan	100	Staff capacity enhancement
Engagement rate	120	Improvement of staff motivation and loyalty
LTIFR and nonoccurrence of incidence of falling from elevations	Accomplished	Operational conditions
No events with safety relevance of 2 and higher and accidents at hazardous production facilities according to the INES scale	Accomplished	
Fulfillment of government orders, including state defense contracts and contracts	Accomplished	

Each key performance indicator is assigned with a specific numeric value in the KPI matrix as to the total amount of bonus payment. In its turn the total amount of bonus payment is based on the annual amount of fixed salaries and target amount of remuneration. Bonus payments are effected upon fulfilling the KPI threshold level. The KPI threshold levels are also specified in the appropriate matrix. When noticeable and significant achievements are made beyond the target level of performance, bonus payments can be effected at a higher rate. Higher bonus factor can be additional motivational tool (150 %) to achieve the upper level of performance indicators which are approved by the Strategic Board at the ROSATOM State Atomic Energy Corporation The Institute does not have any information about remuneration to the Director and to the members of the Board of Directors. The total amount of remuneration paid in 2016 to the key management personnel such as deputy directors as well as other executives delegated with authority and enabled to take responsibility for planning, administration and management at the Institute amounted to RUB 55.69 million. An average KPI completion rate makes up 97.6 % (it was 87 % in 2015).

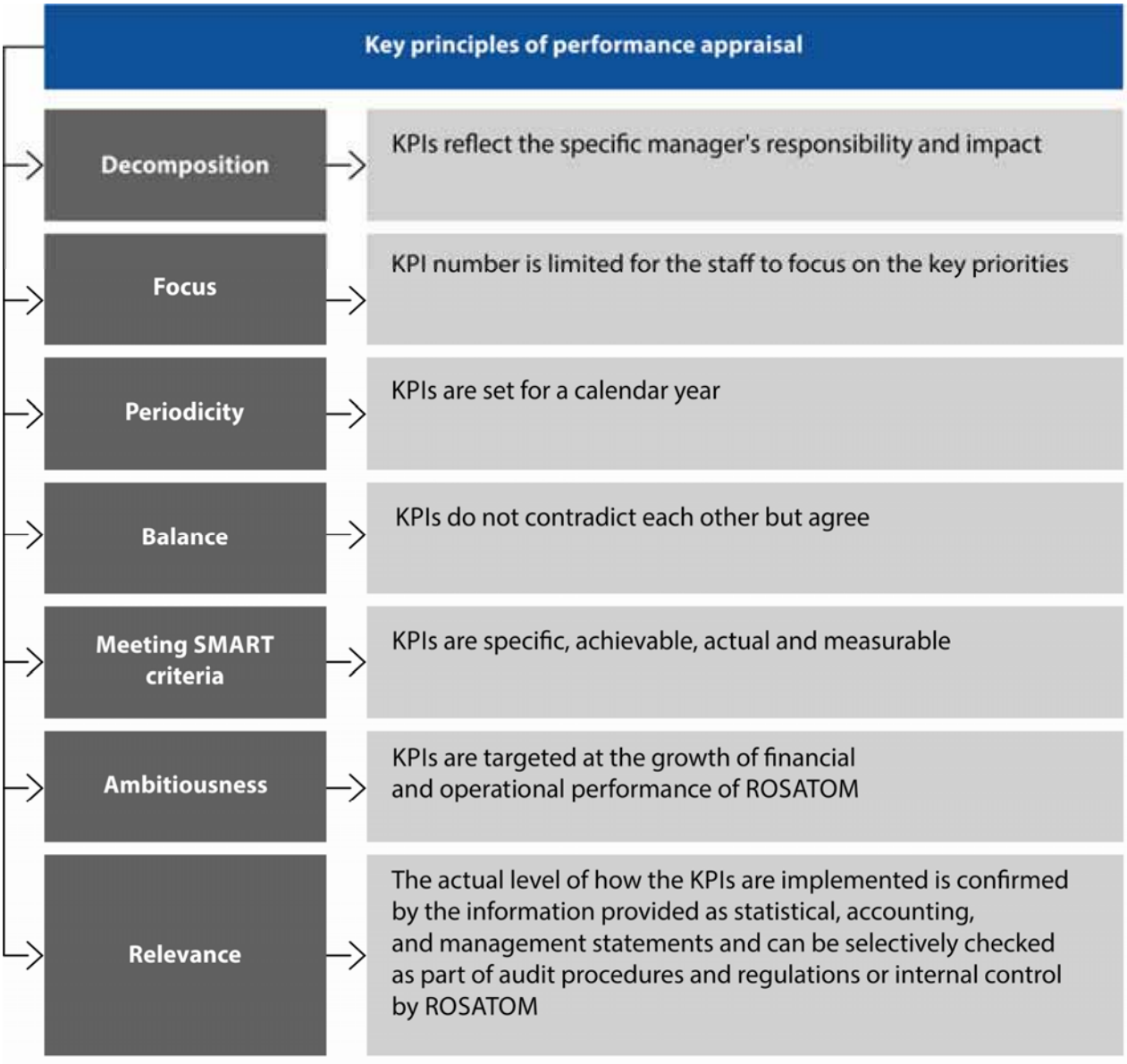

Fig. 3.4.1. Governing principles of performance appraisal

Sustainable development goals are addressed in the key performance indicators of the supreme governing body and top management team. Sustainable development of the Company calls for high financial and production performance as well as for high social and environmental performance. One of the key performance indicators of the top management is to enhance human resources. It provides for implementing several projects which are targeted at improving career opportunities for professionals. There are also key performance indicators targeted at energy performance and development of innovative products. The release of Annual Report of JSC "SSC RIAR" is included in the matrix of key performance indicators for the Head of R&D Department. Table 3.4.2 provides some information about the main occupational categories of the personnel disaggregated by sex and age.

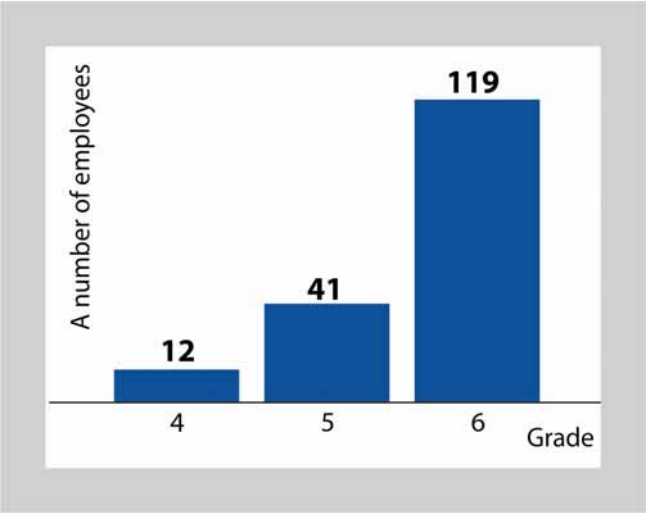

Fig. 3.4.2. Data on employees engaged in performance assessment

Table 3.4.2

Main occupational categories of the personnel, %

Category		Senior executives	Professionals	Workers	Office staff
Sex	Men	18.04	32.41	49.33	0.22
	Women	8.70	61.79	27.35	2.15
Age	Aged 30 and under	4.78	55.38	39.64	0.20
	Aged 31 and through the age of 50	15.63	42.15	41.55	0.67
	Aged 51 and over	17.93	37.33	43.41	1.33

Motivation of top management

A motivation system of top management to the effective work, improved business and economic is based on the *ROSATOM's Unified Standard Remuneration System*. An annual bonus payment depends on the fulfillment of key performance indicators. The amounts of bonuses to be paid are agreed by the managing organization. Bonus payments are mainly used as a reward. Key performance indicators provide a basis for making decisions. They are based on the assessment of the Company's performance and targeted at pursuing its strategic goals (Fig. 3.4.3).

Fig. 3.4.3. Mr. Alexander Tuzov, Director together with the Heads of Divisions Ms. Elena Zvir and Mr. Alexey Petelin

3.5. Internal Control and Auditing System

JSC "SSC RIAR" put in place the internal control and auditing system in order to enhance effectiveness of the corporate governance system. Since 2015 the Department for Internal Control and Audit has been undertaking control. It currently employs seven staff members. The Department for Internal Control and Audit of JSC "SSC RIAR" undertakes inspections and auditing in conformity with the plan of control activities agreed with the ROSATOM State Atomic Energy Corporation, as directed and ordered by the Sole Executive Body of JSC "SSC RIAR" (Fig. 3.5.1).

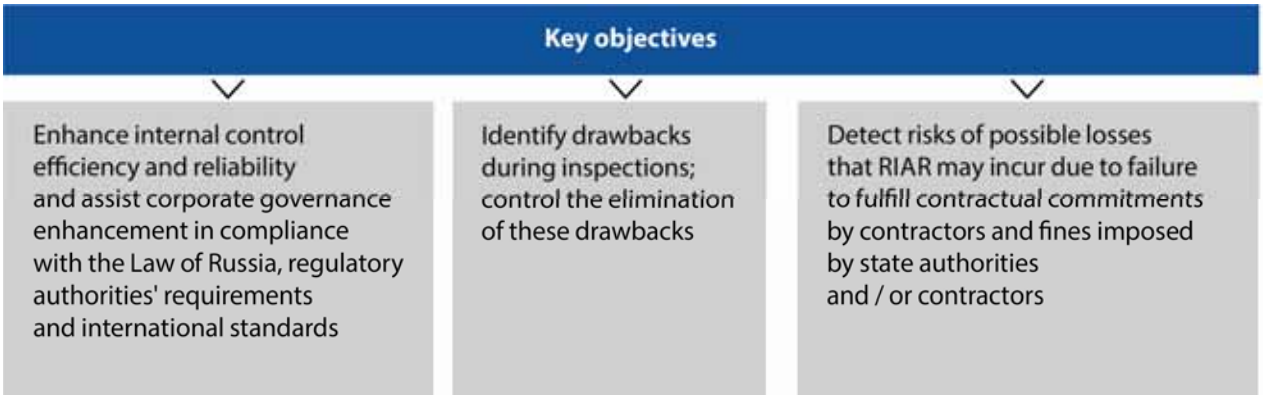

Fig. 3.5.1. Primary targets of the Department for Internal Control and Audit

In 2016 the staff members of the Department for Internal Control and Audit undertook twenty scheduled inspections. There were thirteen inspections conducted in the format of expert analysis and analytical oversight, four of them were routine inspections and another three were audits. The staff members of the Department for internal Control and Audit participated in two internal investigations pursuant to special orders of RIAR's Director and in four centrally-managed audits initiated by the ROSATOM State Atomic Energy Corporation against the companies, which come under the ROSATOM governance ("Dimitrovgradskiy" Branch FSUE "National Operator for Radioactive Waste Management", JSC "NIIAR — Generatiya", JSC "Scientific Research Institute of Chemical Technology", JSC "SSC RF TRINITI") (Fig. 3.5.2).

S03

Plans for 2017:

- Internal audit of budget resources allocation within the framework of the federal targeted programme "Development of nuclear-weapon complex in the Russian Federation for the years 2007–2015 and for the period until 2020";
- Auditing of financial and business operations, procurement and contract-related activities in accordance with the approved plan of arrangements agreed with the ROSATOM State Atomic Energy Corporation as well as under the decision of the governing board, as ordered and directed by the Sole Executive Body of the Company;
- Further introduction of regulatory documents elaborated by the ROSATOM State Atomic Energy Corporation within the framework processes "Internal control and internal auditing" and "Auditing activities";
- Enhanced training of the staff employed in the Department for Internal Control and Audit, exchange of professional experience and expertise with the associated departments at the ROSATOM State Atomic Energy Corporation and its subordinate institutions (Table 3.5.1);
- Internal audit of public reporting process for compliance with the requirements applicable to the public reporting policy of ROSATOM State Atomic Energy Corporation and internal regulatory documents of JSC "SSC RIAR" for public reporting followed by issuing the expert summury report (see Attachment 7).

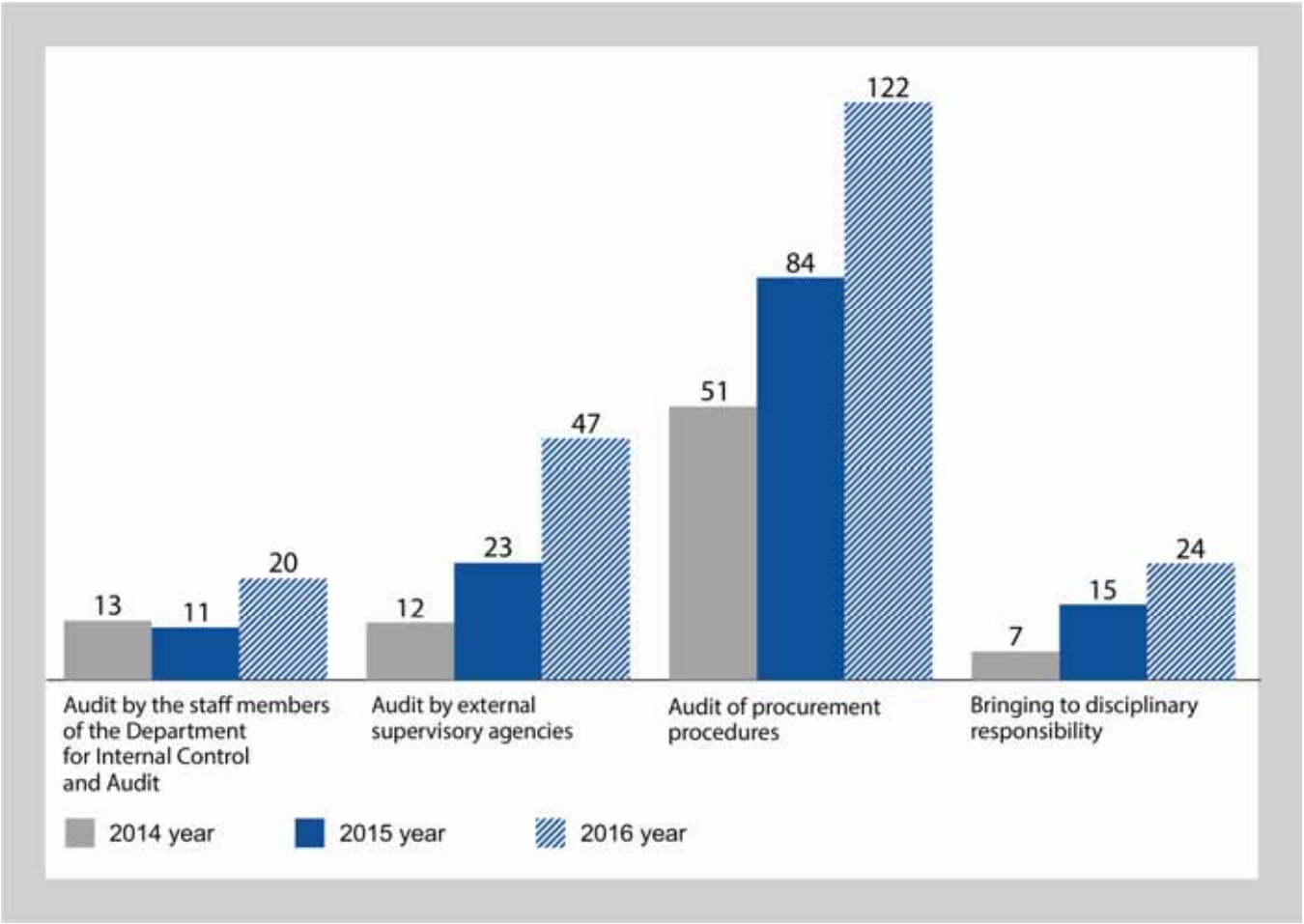

Fig. 3.5.2. A number of audits and their outcomes for the years 2014–2016

Table 3.5.1

Enhanced training and development of the staff employed in the Department for Internal control and Audit in 2016

Training course	A number of staff trained
Administration of procurement process in compliance with the requirements of Federal laws	2
Compliance officer	5
Contracting for Federal and municipal Procurement	2

Anti-corruption

There is a special office at JSC "SSC RIAR" that is in charge of assets security (Fig. 3.5.3) in order to enforce a range of measures to prevent unlawful actions within the Company, minimize the risk of harm and damage, the risk of assets loss and prevent the leakage of business privileged data. The actual staffing is five people.

Internal regulations, policies and procedures were worked out as part of the Unitary Industry-Specific Anti-Corruption Policy pursued

by the ROSATOM State Atomic Energy Corporation and its subordinate institutions and as part of standard procedural recommendations on the corruption risk assessment for the ROSATOM institutions. These documents are available on the RIAR's website in the section entitled "Anti-corruption efforts":

1. Anti-bribery and anticorruption policy of JSC "SSC RIAR".
2. Regulation on establishing relationship with contracting parties in the course of foreign economic activities.
3. Procedure for coordination of actions between the JSC "SSC RIAR" employees with the law-enforcement agencies for combating and preventing corruption.
4. Procedure for employees of JSC "SSC RIAR" to inform the employer about the address facts for the purpose of inducement to make corruption, consideration and verification of such complaints and their filing.

Fig. 3.5.3. Main directions of the Assets Security Office

The same section of the website has addresses and other details of contacts where any employee of ROSATOM State Atomic Energy Corporation and its affiliated companies who has knowledge of fraud and theft can communicate this information via communication channel "Hotline" to prevent corruption and fraud in nuclear .

A major part of work against corruption and its prevention is to exercise control over management of procurement activities. The staff members of the Assets Security Office are entitled to check the veracity of information declaring earned income, property status and related commitments that is submitted by certain categories of officials, carry out an expert appraisal of trustworthiness and business reputation for some staff members involved in procurement in order to reveal affiliation of persons and entities as well as potential conflicts of interest. The following regulations, rules and requirements were worked out by the Assets Security Office to ensure safe keeping and to safeguard knowledge, data and documents constituting the Company's trade secret:

1. Guidance document on registration, recording, retention and keeping of data carriers with the information constituting the RIAR's trade secrets.
2. The list of knowledge, data and documents constituting the RIAR's commercial secret.
3. Guidance document on ensuring protection of knowledge, data and documents constituting the RIAR's trade secrets.
4. Guidance document of the expert committee on the trade secret protection.
5. Regulation on conducting security inspections with a view to ensuring maintaining the regime of business confidentiality for inside intelligence (official information of restricted circulation classified as restricted access information) at JSC "SSC RIAR".

The staff members of the Assets Security office approved three hundred fifty nine (359) procurement procedures and three hundred sixty eight (368) existing procurement contracts during the reporting year. However, one procurement procedure and its related contract amounting to RUB 56, 9 million were disapproved due to the procurement irregularities revealed. Disciplinary measures were taken against nine staff members for unsatisfactory administrative performance and violation of labor discipline as a result of these inspections.

3.6. Risk Management

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The risk management policy of the Institute is targeted at enhancing sustainability of its development. It is governed by relevant regulatory documents of the ROSATOM State Atomic Energy Corporation. They are used as a basis to put in place unified requirements for analysis of risks affecting achievement of financial and business performance indicators. Analysis of risks provides for their identification, assessment, preparedness evaluation and elaboration of risk management plan including monitoring. One of the key instruments the Institute uses to realize its strategy and achieve relevant objectives is to establish effective risk management and internal control systems. The primary goals and objectives of the risk management process are as follows:

- Identification of risks and their mitigation, provision of information and reporting about risks to make managerial decisions with a view to responding the strategic objectives of the Company;
- Promotion of process continuity (stability) through identification, assessment and mitigation of threats which can affect the performance of the Institute;
- Allocation of risk management responsibility area for Institute's employees at an appropriate level of management.

The risk management policy of the Institute is based on the principles and methods described in the corporate risk management system. It provides for consistency of management processes commencing with review procedures that encompass risk factors including further elaboration and implementation of risk management procedures with the focus on minimization of risks and completing with their testing. These activities are aimed at timely identification of the events which could impact adversely on the achievement of objectives and at adequate responding to them. The existing measures of risk mitigation are assessed as to each of the identified risks, including procedures of internal control and their adequacy for restraining a residual risk level. In order to neutralize some risks, protection measures are put in place as they are more directly related to the production plan. Possible algorithms of actions are available if any risk arises. Risk management is done and supervised in the divisions and units of the Institute within the assigned area of every responsible.

Operational risks

Internal business processes are among the targets of the operational risk as they affect the sustainable development of the enterprise (Table 3.6.1). In 2016 responsibility was assigned for implementation of financial improvement plan in accordance with the action plan for financial stabilization at JSC "SSC RIAR" to mitigate such risks. The risk management or risk mitigation activities are consistent with the objectives of short-, medium- and long-term planning in support of enterprise development and with the main lines of fiscal policy at the Institute (Fig. 3.6.1). The risks were classified according to their significance (materiality) and likelihood (Fig. 3.6.2) with a view to take decisions on necessary risk management activities. The risks attributable to business activities of the Company mostly do not require elaboration of additional measures to mitigate them.

The medium-term plans are as follows:

- Work targeted at developing the risk management system and its integration in the existing management process is to be continued;
- Identification, assessment and monitoring of risks in the process groups "Budgeting" and "Medium-term planning" in order to analyze the impact of unmanageable risks (both manageable and unmanageable risks)

on the financial figures, control over risk management activities;

- Assessment of risks as a part of measures under the financial improvement plan at the enterprise.

Fig. 3.6.1. Key risk management activities

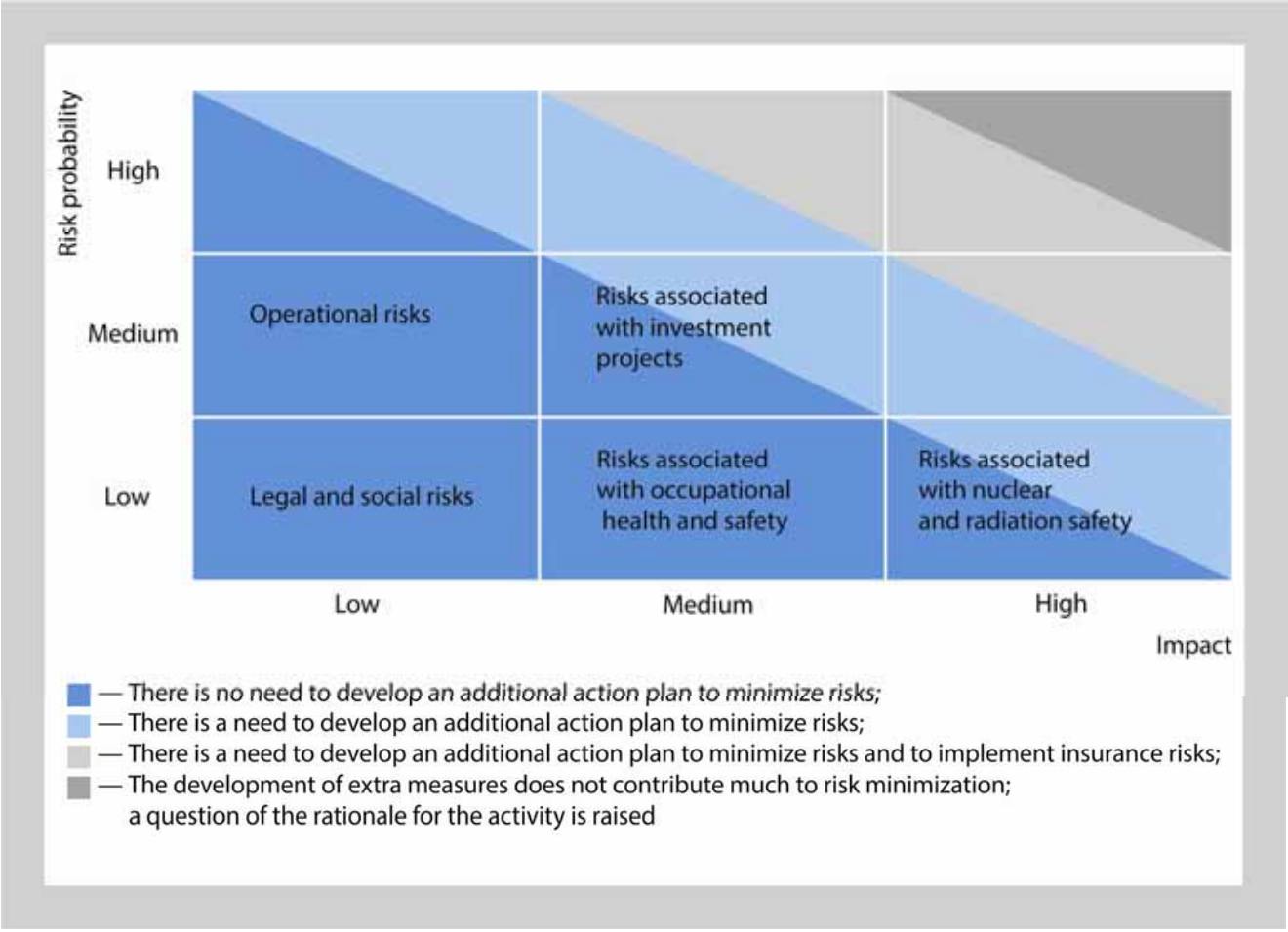

Fig. 3.6.2. Risk impact assessment

Table 3.6.1

Risk management practice at JSC "SSC RIAR"

Risk	Risk factor	Risk management activities
Risk of exchange losses	Volatility of exchange rate	• Analysis of contracts concluded and future possible contracts. • Costs optimization (reduction)
Operational risk	Uncertain and unforeseen difficulties in the work process (for instance, technological risks, risks of failures, accidental risks, risks associated with the repair time prolongation etc.)	• Introduction of the state-of-the-art production methods. • Modernization and technical retrofitting of radiation hazardous facilities. • Mitigation (elimination) of hazards
Risk of underemployed capacities	Employment of production facilities is directly related to the demand of the Customers: a decrease in demand leads to the risk of underemployed capacities and underemployment of the personnel	• Financial and industrial support of innovative products during the market slump. • Increased production and sales of industrial grade products. • Sale of non-core property
Risk of quality	Unconformity of quality to the assigned quality standards or quality specifications as to products, accomplished work and services rendered	• Maintenance of the quality management system. • Evaluation of the Customer's satisfaction
Risk associated with the increase in the cost of services	• Setback of the worldwide / Russian financial and monetary system. • Changes in the charge rates for public utilities and services, of shipping companies etc. • Increase of the minimal subsistence wage etc. • Failures in the work processes. • Lower level of equipment capacity utilization. • Technological obsolescence	• Identification of risk owners and defining areas of their responsibility. • Implementation of programs targeted at energy saving and energy efficiency enhancement. • Integration of the ROSATOM industrial system to improve processes. • Optimization of production areas. • Headcount optimization
Risk associated with movements in market prices for procured materials and output products due to changes in economic situation	Changes in the pricing policies of Contractors provided that the contracts concluded for input supplies enable reconsideration: escalation in prices for any particular resources leads to incidental expenditures	• Invention of new market segments. • Expansion of the range of products and services rendered

Note — higher impact of the risk compared to 2015.

Legal risks

JSC "SSC RIAR" undertakes its business in conformity with the regulations and standards as well as with due consideration for changes in the Russian legislation in force. With this objective in view, JSC "SSC RIAR" constantly monitors changes in the RF legislation in force and jurisdiction of its presence in the field of the nuclear energy use, marketing, export control and nonproliferation of mass destruction weapons. It also observes related recommendations of supervisors and regulators at the international and national levels. All the contracts to be entered are subject to the approval by law compliance and enforcement office at JSC "SSC RIAR". Independent consultants are engaged in some cases also.

Social risks

Adhering to the principle of high corporate social responsibility, JSC "SSC RIAR" places particular importance on social sustainability. That is why identification and reduction of social risks impact to the maximum extent possible constitute a priority direction of the Institute's strategy. In order to put in place unified approaches to social protection of the personnel, the enterprise has been successfully pursuing the *Unified industry-specific policy of ROSATOM and its subordinate companies*. The fundamental principles of social policy in the nuclear sector are its transparency, availability and openness. The priority activities of social policy have been incorporated in the corporate social programs of the Institute (Fig. 3.6.3).

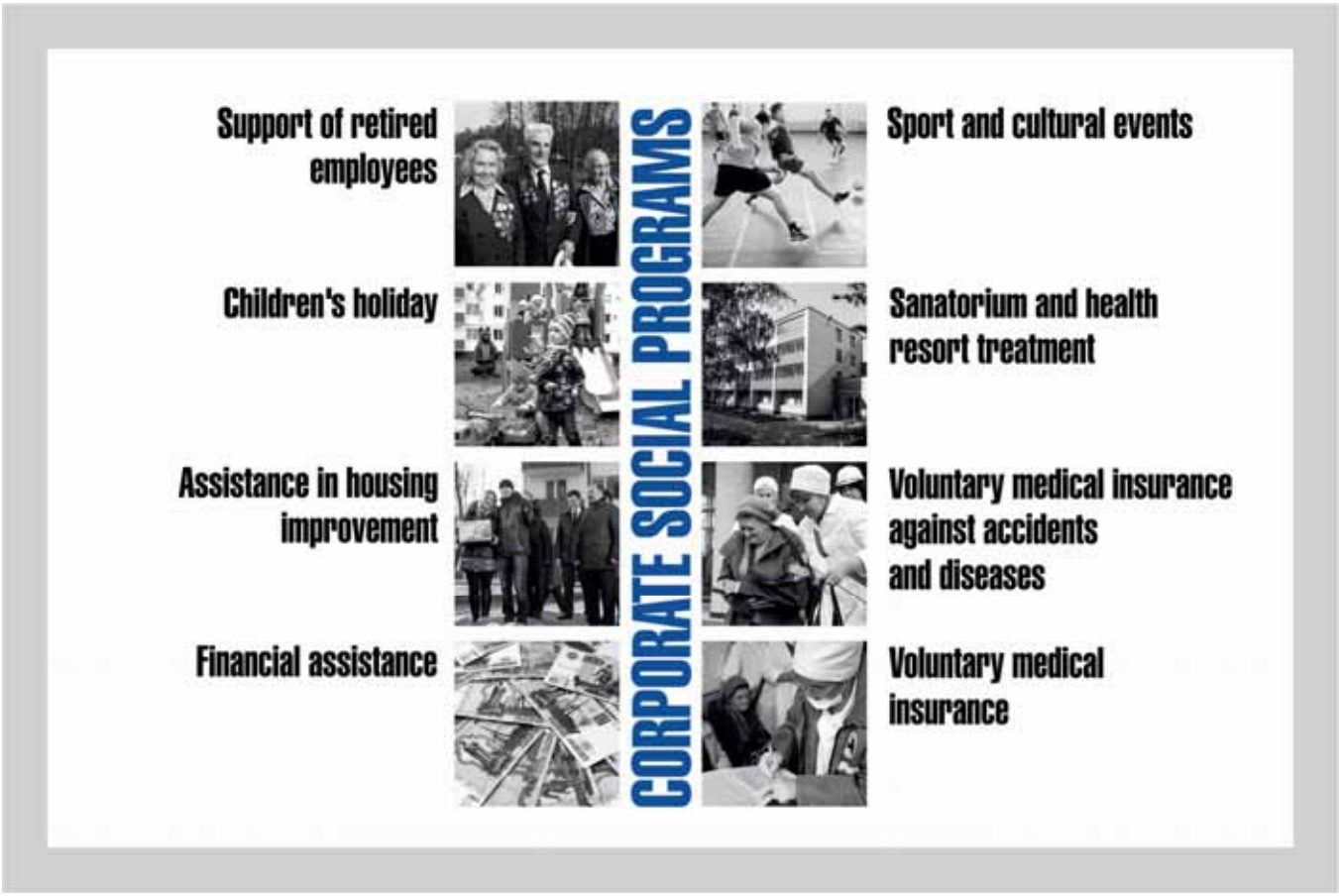

Fig. 3.6.3. Corporate social programs pursued by JSC "SSC RIAR"

Most of potential social risks could be provoked and could lead to rise of tensions due to dissatisfaction of the personnel with a motivation and social support system. To ensure management of social risks and sound administration of the ongoing corporate social programs, a Trade Union Agreement has been concluded between the Company and the trade union organization. It is a subject of regular modification and updating.

A number of factors attributable to the human resource risks are beyond the area of the Company's influence (for instance, decrease in a number of graduates from schools and higher education institutions and, respectively, in a number of recent graduates; location of the Company in the single-industry town where there are serious restrictions in making optimal decisions on staffing etc.). A short-coming of high-skilled and experienced personnel and impossibility to involve them in new projects including innovative ones could have an undesirable effect on the achievement of strategic objectives of JSC "SSC RIAR". In order to prevent occurrence of such a risk, the Company consistently pursues programs oriented towards youth and mentorship (Fig. 3.6.4) (see Sections 4.2 "Intellectual Capital" and 4.5 "Human Capital").

Fig. 3.6.4. Parade dedicated to one of the social projects

Insurance

JSC "SSC RIAR" widely employs insurance practice to conduct the risk management practice. A number of different insurance contracts were concluded during the period under report to ensure sustainable functioning of the enterprise (Fig. 3.6.5 and 3.6.6).

Fig. 3.6.5. Types and extent of insurance in 2016 RUR000's

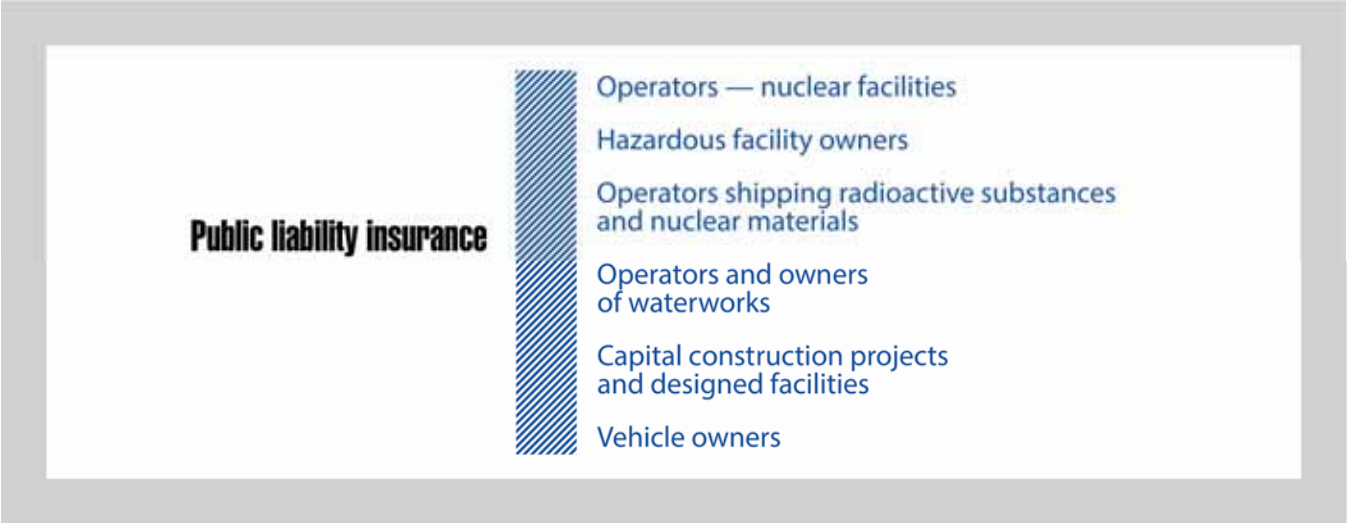

Fig. 3.6.6. Types of insurance against civil liability at JSC "SSC RIAR"

Risks related to labor protection

Rates of work-related injuries and occupational diseases have a significant effect on both the economic and social components of the JSC "SSC RIAR" business. The measures aiming at prevention of work-related injuries and occupational diseases make it possible to increase labor productivity efficiency and all these measures in their entirety contribute to higher economic benefit of JSC "SSC RIAR" (Fig. 3.6.7). The Institute has in place *Unified industry-specific labor protection policy of the ROSATOM State Atomic Energy Corporation and its subordinate institutions* that sets goals, tasks and the main course of actions for RIAR to ensure occupational health and safety of the personnel. There is also the occupational safety management system targeted at preventing work-related injuries and occupational diseases as well at improving working conditions for the employees. The seconded staff and the personnel of Contractors' entities who are involved in activities at radiation hazardous areas and facilities could undergo individual radiation exposure control. When JSC "SSC RIAR" enters into subcontracts, obligations and commitments of subcontractors in terms of compliance with occupational health and safety standards

are specified. These subcontracts also provide for formalizing relevant agreements. Occupational safety questionnaires are also filled up. The Company together with the representatives of Contractor undertakes regular inspections to ensure the compliance with the occupational safety requirements at the worksites.

The purposeful and goal-oriented activities targeted at occupational health and safety show evidence for reduction of risks associated with labor protection and occupational safety of the enterprise during the recent years (see Section 4.7. "Occupational Health and Safety").

Fig. 3.6.7. Primary objectives and tasks
of the occupational safety management system at JSC "SSC RIAR"

Nuclear and radiation safety risks

The primary goal of JSC "SSC RIAR" is to ensure trouble-free, safe and sustainable operation of its nuclear and radiation-hazardous facilities. It conducts performance monitoring systematically and undertakes engineering arrangements to ensure trouble-free operation of research reactors and nuclear hazardous sites. All activities are carried out in full compliance with the relevant regulations and with due consideration for changes in the RF legislation in force. In there were no accidents at nuclear hazardous sites at JSC "SSC RIAR". All the research reactors demonstrated accident-free operation also.

The radiological safety system was developed and has been operated by JSC "SSC RIAR" to manage radiation hazard risks incurred by local residents and personnel because of nuclear operations and facilities located at the site. It is operated in conformity with laws, codes, regulations and requirements of the Russian Federation currently in force, sanitary regulations and standards, specifications, rules, guidelines, instructions and other related documents:

- External and internal radiation exposure monitoring of the personnel is carried out in accordance with National Radiation Safety Standards NRB-99/2009, Basic Sanitary Regulations for Radiation Safety OSPORB-99/2010, and procedural guidelines MU 2.6.5.028-2016;
- Radioactivity discharge monitoring is conducted in compliance with the *Standards for radioactive discharge control* subject to unexceptional non- exceedance of atmospheric emission limits;
- Preparedness of special units of response force is maintained to prevent, confine

and mitigate accidents and emergencies with the involvement of command authorities, command centers, communication and announcing systems, emergency response forces and equipment, goods and financial reserves.

The radiological safety system is constantly being improved. For instance, JSC "SSC RIAR" adopted new guidelines for radiation safety in 2016 which had been worked out by the Federal Medical and Biological Agency. The following criteria can be a good evidence that activities undertaken by JSC "SSC RIAR" do not produce any strong impact on the personnel, local residents and environment:

- Main occupational radiation exposure limits were not exceeded in 2016;
- Adherence to specified limit values for radioactive emissions (in 2016 radioactive emissions of nuclear facilities were reduced; radiation exposure of the personnel, local residents and environment as a result of activities undertaken by the enterprise was almost three times lower compared to natural exposure);
- There were no events attributable to operation of nuclear facilities rated at level 1 and higher on the INES scale.

Every year RIAR publishes its annual report comprising data on individual and collective doses of internal and external radiation exposure of the personnel and the public, radioactive release monitoring data and other related information. The resultant report is used as basis to work out necessary arrangements targeted at nuclear and radiological safety enhancement. The following special arrangements are undertaken to mitigate the risks attributable to operation of nuclear facilities:

- Projects focused ion retrofit and upgrading of process equipment;
- Adherence to existing regulatory documents related to production processes and operational procedures specific to operation of nuclear facilities, storage of nuclear and radioactive materials, and radioactive waste management (Fig. 3.6.8).

The achieved level of nuclear and radiation safety is satisfactory as evidenced by the nuclear safety commission of the Company, commission of General Inspectorate under the ROSATOM State Atomic Energy Corporation and medical inspection of Regional Medical Setting No. 172 under the Federal Medical and Biological Agency.

Fig. 3.6.8. Solid radioactive waste storage facility

In 2016 the radioactive release monitoring data showed evidence for a 6 % reduction of radioactive releases as compared to the same data for 2015.

Risks attributable to investment projects

Guidelines and regulations on risk management worked out by the ROSATOM State Atomic Energy Corporation are applied by RIAR to activities related to investment projects and their attributable risks (Figure 3.6.9 and 3.6.10).

Fig. 3.6.9. Major risks attributable to investment projects of JSC "SSC RIAR"

Fig. 3.6.10. Risk management / risk mitigation activities

3.7. Quality Assurance

The quality management system of JSC "SSC RIAR" is intended to ensure management of administration performance, scientific work, business concept and engineering work at the Institute and is targeted at meeting the Customer's requirements (Consumer) to the full extent with a view to provide the desired quality within the fixed timeframes as well as safe performance. Quality management at the enterprise is based on the quality management concept stated in International quality management standards. The integrated quality management system is under the direct supervision of the Chief Engineer who is RIAR's tom management representative in charge of quality and ecology. As to the quality policy guidance, it is provided by the Quality and System Engineering Department that is subordinate to the Chief Engineer.

Quality assurance policy

Senior executives of RIAR worked out the quality management policy. The institute has implemented and maintained the quality management system as an instrument to embody the policy as to design engineering and development for research and development work in the field of nuclear energy use, production and supply, and service rendering to provide timely response to the needs and expectations of its customers. Its timely applicability is verified annually when the performance of the quality management system is analyzed. The quality assurance policy was made up to date in 2015. The integrated quality management system is applicable to the design engineering, fabrication and supply of fuel elements, fuel assemblies, radiochemicals and radionuclide sources. It also extends to research and development work in the field of nuclear energy application and complies with the requirements of ISO 9001 (GOST ISO 9001) and ISO 14001 (GOST R ISO 14001).

RIAR continued its work targeted at proper performance and further improvement of the certified quality management system in 2016 (quality management system, environmental management system) to bring it in conformity with the requirements of International Standards ISO 9001:2008 "International Requirements to Quality Management Systems" (GOST ISO 9001-2011), ISO 14001:2004 "Environmental Management Systems. Requirements and Guidance for Use" (GOST R ISO 14001-2007) and State Military Standard GOST RV 0015-002-2012 "System for Military Equipment Development and Launching into Manufacture. Quality management Systems. General Requirements". This work resided in the following:

- Measures focused on the proper performance and further enhancement of the integrated quality management system for 2016;
- Internal auditing of the integrated quality management system;
- Supervision audit of the quality management system for compliance with the requirements of Standard GOST RV 0015-002-2012»;
- Supervision audit of the integrated quality management system for compliance with the requirements of International Standards ISO 9001:2008 and ISO 14001:2004;
- Audit of the quality management system on the part of JSC "TVEL".

Standard GOST RV 0008-002-2013 "State System of Standardization and ensuring Traceability of Measurements. Certification of test equipment intended for conformity assessment of national defense products. Organization and procedure for the conduct" was put in place during the period under report.

In 2017 RIAR shall continue replacing and implementing recent versions of Standards ISO 9001:2015 (GOST R ISO 9001:2015), ISO 14001:2015 (GOST R ISO 14001:2016) including the work done under the projects targeted at the management system enhancement which were launched in the year under Report (see Section 3.9 "Production Management").

Customer satisfaction

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Activities relating to assessing customer satisfaction, methods and frequency of data acquisition as well as the data analysis method are governed in conformity with the Institute's Standard STO DP 086-410-2015 "Integrated Quality Management System of JSC "SSC RIAR". Monitoring and Assessment of Customers' Satisfaction". To assess customers' satisfaction, questionnaires of two types were distributed following the results of 2016: R&D quality assurance assessment and quality assessment of products (Figure 3.7.1 and 3.7.2).

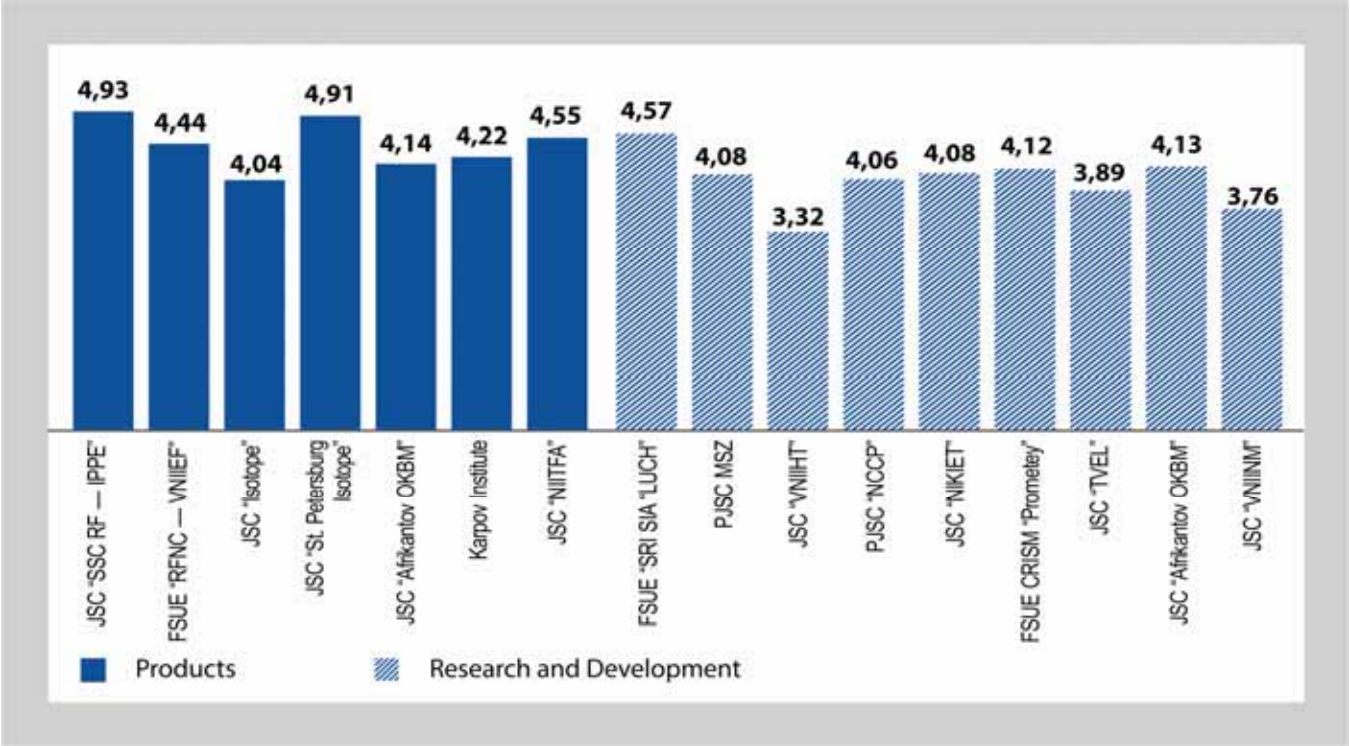

Fig. 3.7.1. Customer satisfaction with products and R&D

Averaged customers' satisfaction with services **80 %**

Averaged customers' satisfaction with products supplied **85 %**

General averaged customers' satisfaction level **82.5 %**

As evidenced by the questionnaire survey, 100 % of the Companies who use services and products of JSC "SSC RIAR" consider RIAR a reliable supplier and they have plans to continue cooperation under the contracts. Moreover, they are ready to refer other consumers to RIAR. In their opinion, the information about services rendered by the Company and its products is available. Apart from the Russian customers, the questionnaire survey was conducted to assess satisfaction of foreign customers' within the frameworks of R&D projects (Fig. 3.7.3).

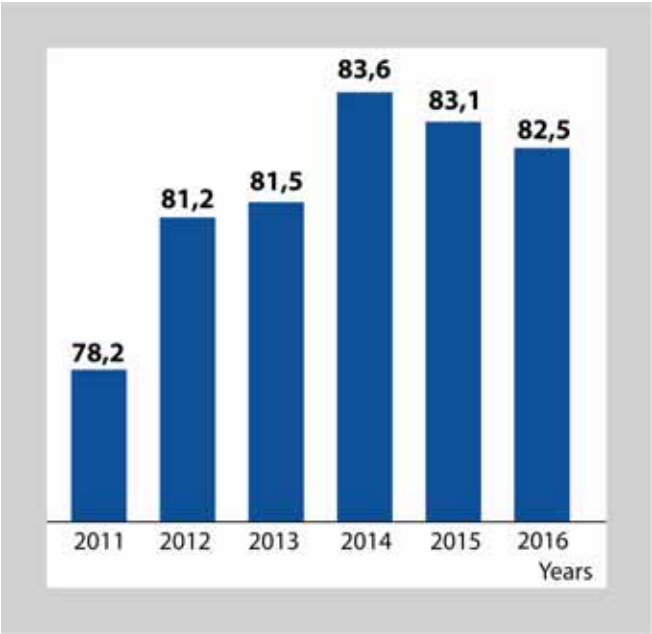

Fig. 3.7.2. Averaged customers' satisfaction, %

Fig. 3.7.3. Assessment of foreign customers' satisfaction

3.8. Procurement Management

EC6

Procurement activities of the Institute at its own costs and expense and with the use of extra-budgetary funding are governed pursuant to the Federal Law #223-FZ "On Procurement of Goods, Works and Services by Certain Legal Entities" as of 18 July 2011. The ROSATOM State Atomic Energy Corporation approved *Unified Industry-Specific Procurement Standard* under this Federal Law. The Procurement standard was adopted by JSC "SSC RIAR" as Procurement Regulations. The details can be found at the official website of the Company (http://niiar.ru/?q=postavshikam). The fundamental principles of procurement activities at JSC "SSC RIAR" are given In Section 2.8 "Procurement management" in Annual Report for the year of 2014 (http://niiar.ru/sites/default/files/pgo2014_ln_29062015_c_ssylkami_0.pdf). To promote openness and transparency of procurement process, the Company provides information about procurement on the official websites on the Internet: government *website of the Unified procurement information system* (www.zakupki.gov.ru) and dedicated website for placing purchase orders for goods, work and services for the needs of ROSATOM State Atomic Energy Corporation (www.zakupki.rosatom.ru). The information regarding the competitive procurement procedures as well as the results of procurement procedures is posted by the Company at the electronic market place dedicated and authorized by the ROSATOM State Atomic Energy Corporation that makes it possible to engage a maximum number of bidders. The majority of competitive procurements are available on the electronic trading platforms of LLC "Fabrikant".

EC9

In 2016 a share of competitive bidding via e-procurement made up 100 %. A share of the contracts made between the Institute and small- and medium-sized business entities for supply of products, work execution and rendering services was equal to 38.95 % of the total number of contracts entered in 2016 of which a share of contracts to which parties were small- and medium-sized business entities only made up 22.3 %. A local purchase rate was equal to 13.6 % (procurement orders for goods, work and services which are entered with the suppliers geographically located in the administrative district of the Company) according to the results of procurement process in the year of 2016 in relation to the total value of the contracts entered.

In 2016 JSC "SSC RIAR" entered into 368 contracts within the framework of annual procurement plan for a total amount of RUB 1 399 830.320 thousand.

As a result of open competitive bidding RUB 47 860.433 thousand were saved in 2016 making up 7.75 % of the planned procurement price.

Plans for 2017:

- To increase the rate of open competitive bidding by reducing a single supplier purchase rate;
- To increase the rate of timely competitive bidding procedures up to 95 %;
- To keep small- and medium- size business entities in procurement at the level no less than 18 % of the total annual value of contracts entered of which at least 10 % are the contractors representing small- and medium-size business entities.

3.9. Production Management

Enhancement of production management system

The major projects launched by JSC "SSC RIAR" in the year under report to enhance the management system were as follows:

- Supervisory auditing:
  - Certified quality management system of JSC "SSC RIAR" for compliance with the requirements of State Military Standard GOST RV 0015-002-2012;
  - Certified integrated quality management system for compliance with the requirements of International standards ISO 14001:2004 (GOST R ISO 14001-2007) and ISO 9001:2008 (GOST ISO 9001-2011);
- Further development and enhancement of the integrated quality management system at JSC "SSC RIAR" with a view to implement a unified quality policy of the ROSATOM State Atomic Energy Corporation, to update and integrate regulations and requirements relevant to the management system;
- Elaboration and enforcement of quality assurance programs under the operator's responsibility including the programs on NPP life extension in conformity with Safety Rules and Regulations NP-090-11 "Requirements for Quality Assurance Programs of Nuclear Facilities".

In 2017 JSC "SSC RIAR" will continue to enhance integrated quality management in conformity with the plan of actions targeted at its proper performance and improvement.

Implementation of process management methodology and tools

JSC "SSC RIAR" is consistently improving the production management system in order to perform research and development, render services as well as to provide timely response to expectations of its customers. In accordance with the requirements of ISO 9001:2008 (GOST ISO 9001-2011) and GOST RV 0015-002-2012, RIAR has identified the processes that should be put in place for the proper performance of the quality management system (management, primary and supporting processes), worked out and modified its existing standards:

- STO KP 086-413-2015 "Integrated Quality Management System of JSC "SSC RIAR". R&D. Reactor Materials Science";
- STO KP 086-414-2015 "Integrated Quality Management System of JSC "SSC RIAR". Nuclear Fuel Fabrication";
- STO KP 086-415-2015 "Integrated Quality Management System of JSC "SSC RIAR". Operation of Nuclear Facilities";
- STO KP 086-416-2016 "Integrated Quality Management System of JSC "SSC RIAR". Human Resources Management";
- STO KP 086-418-2015 "Integrated Quality Management System of JSC "SSC RIAR". Production of Radionuclides";
- STO KP 086-419-2014 "Integrated Quality Management System of JSC "SSC RIAR". Mid-Term Planning. Budgeting";
- STO KP 086-421-2015 "Integrated Quality Management System of JSC "SSC RIAR". R&D. Irradiation Testing";
- STO KP 086-422-2016 "Integrated Quality Management System of JSC "SSC RIAR". R&D. Radiochemistry".

Enhancement of production efficiency

The production system of ROSATOM State Atomic Energy Corporation is an industry-specific project targeted at developing a multi-purpose management system for integrated optimization of production and management processes at ROSATOM enterprises based on the best national and foreign practices. It is also intended for enhancing performance at nuclear enterprises, including cost reduction and for increasing productivity to achieve the level of Russian and foreign competitors. To enhance efficiency of the processes, improve their transparency and get economic benefit in the finance and economics sector of JSC "SSC RIAR", a list of projects was approved for a time period of 2016–2017. A half of a total of thirteen selected projects was fully accomplished in 2016 and their targets were attained. These projects were focused on optimization of the following processes:

- Payroll cards are provided by the Institute and salaries are paid out to the employees by loading payments onto them;
- Allocation of value-added tax on the acquired property, plant & equipment assets;
- Input of data on certification and assessment of workplaces according to working conditions;

- Liquidity management and cash flow budgeting;
- Depositing cash in deposits of JSC "AtomEnergoProm" and in bank accounts of trade banks;
- Budgeting of capital expenditures and medium-term forecasting of investment activities.

It is expected that some projects will have further development in 2017. To ensure higher level of production safety in the year under report, JSC "SSC RIAR" has launched a new project to optimize collection of low-level solid radioactive waste at its site. This project is targeted at shorting timing of the process, enhancing its quality and safety, ensuring regulatory compliance with requirements and documents governing solid radioactive waste management. This project will allow avoiding punitive duties and reducing expenditures on payment of charge rates attributable to the resultant waste management (more than 8 million rubles), their removal from the storage facilities and further processing.

3.10. Investment Management

Investing activities of the Institute are conducted in conformity with the unified industry-specific policy of ROSATOM State Atomic Energy Corporation and its subordinate companies. The primary goal is to maintain and enhance productive capacities as well as to strengthen scientific expertise at the Institute (Fig. 3.10.1). RIAR's investing activities are maintained by managing the investment programs throughout their life cycle (Fig. 3.10.2 and 3.10.3). These activities involving planning, implementation, motivation, control and management of the investment program are targeted at the expected output of investment challenge within a limited time frame, budgeting and in the presence of risks. In 2017 the processes of investing are expected to be improved within the regulatory framework. Automation and management accounting have been also envisaged among these tasks.

Fig. 3.10.1. Major tasks and objectives of investment management

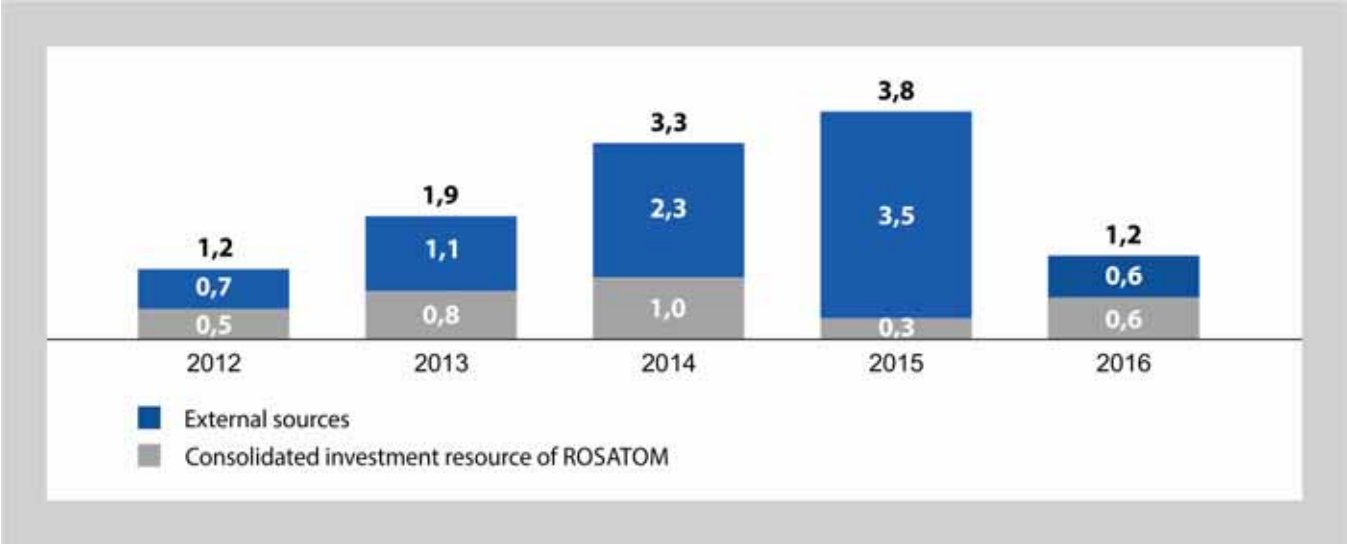

Fig. 3.10.2. Volume of investments of JSC "SSC RIAR" made in billion rubles

Fig. 3.10.3. Volume of investments of JSC "SSC RIAR in 2016 per projects

3.11. Property Management

(Fig. 3.11.1)

As of December 31, 2016 RIAR had 105 land plots with a total area of 3 155.76 76 hectares, from which in the actual land use are:

- 92 land plots with a total area of 242.29 hectares belonged to the Institute on the property right;
- 13 land plots with a total area of 2899 hectares were in use of the Institute on a leasehold basis and continuous (term-less) use.

In 2016 the lease of three land plots was terminated due to the sale of real property facilities located on them.

The income of the Institute from the property transferred into lease amounted to 126.7 million rubles in the year under report including 71.6 million rubles charged against the debtor for the property rented out in 2014–2015.

The non-core property such as a storage building was sold at the auction. The income received amounted to 2.2 million rubles. The ownership of non-core property such as

deadhead asset (greenhouse ground) was transferred to municipal authorities of Ulyanovsk region. The indirect economic benefit amounted to 1 million rubles at an annualized rate. JSC "SSC RIAR" received US$ 1.28 million and RUB 7.28 as a share of profit where it has the co-ownership share.

As of 31 December 2016, eight hundred thirty nine (839) real estate objects belonged to RIAR under the property right. Its property right to all the objects of real estate has been registered.

Fig. 3.11.1. The main objectives of the property management policy

3.12. Public Stance as to Sustainable Development

The sustainable development of JSC "SSC RIAR" is understood to mean consistent work of economic, social and environmental implications contributing to the strategic objectives of Institute and its further overall development.

The economic pillar of sustainable development in addition to efficient utilization of scarce natural resources and application of the latest environmental, low impact, energy and the material-saving technologies depends on the key performance indicators. Safe operation of the Institute's business and its enhanced performance, social benefits and guarantees for its employees are the main reference points to identify the key performance indicators (see Section 3.4 "Key Performance Indicators"). The key performance indicators are set up by the relevant departments of the ROSATOM State Atomic Energy Corporation and managing company and embrace the entire range of RIAR' activities. The major areas of its business concentration include nuclear, radiation, industrial

and environmental safety, operating performance and financial viability, increase of its share on the national and global markets. The key performance indicators are targeted at growing financial and business performance of the enterprise and industry. However there are also non-financial performance indicators (for instance, requirements to the occupational safety and health standards are not violated, no events with safety relevance of 2 and higher according to the INES scale). In 2016 they were included for the first time in the KPI matrixes of all the employees. RIAR adheres to the principle of equal opportunities and is notable for a lack of gender-based discrimination: a rate of fixed salary ratio is one to one for men and women for all categories of staff. The KPI matrixes of top management have performance indicators attributable to the environmental impact: RIAR"s Director is fully in charge of its environmental performance. The top management of the enterprise was entrusted with responsibility for mitigation of adverse environmental effect. These duties were shared among the Chief Engineer and Deputy Directors. The Chief Ecologist is fully liable for observing environmental laws and regulations. From an environmental perspective, sustainable development should provide for the integrity and viability of biological and natural systems, environmentally sound development without any harm being done to the environment, health of the employees and public (see Chapter 4 "Management of Capital and Performance").

Such revenue-generating business indicators as "Free adjusted cash flow", "Integrated index of foreign trade revenue", "Integrated index of new products", "Revenue from sale of innovative products", which could bring tangible benefit, were achieved in the year under report. The amount of internal funds which could be used for investing is estimated following the fulfillment of the aforesaid indicators. The strategy matrix with key performance indicators of RIAR's Director is given in Section 3.4 "Key Performance Indicators". The orders RIAR booked provides for a total employment of 3000 in the city, an adequate level of pay, social benefits and guarantees, engagement of Contractors within the framework of existing cooperation and thus contributing to better development of their geographical regions.

JSC "SSC RIAR is a major taxpayer and an enterprise with a high level of social responsibility. Particular attention is traditionally given to development of corporate culture, human resources and to interaction with educational institutions (see Section 4.5 "Human Capital").

The social pillar of sustainable development is targeted at preserving stability of existing social and cultural frames and reducing the number of personal conflicts. The available research and production capacities, optimization of business processes, efficiency enhancement as well as extension of business range and expertise contribute to a long-term stable and sustainable development of JSC "SSC RIAR" and thus being a good evidence of high-level social responsibility.

Public stance as to sustainable development

In the reporting year, JSC "SSC RIAR" continued working out the public stance with the focus on corporate social responsibility to establish trust channels through interactions with shareholders in conformity with the requirements and basic principles of the AA1000-series international standards (Table 3.12.1). Adherence to these standards guarantees active engagement of all the shareholders and parties concerned, respect and consideration of their views and opinion for analysis and management of the enterprise business. In accordance with Standard AA1000 APS (The AA1000 AccountAbility Principles Standard) JSC "SSC RIAR" demonstrates a systematic approach

to managing cooperation with the shareholders and parties concerned as it is considered to be an important factor of management performance enhancement and reporting quality. Its adoption led to identification of the most important challenges for sustainable development and thereby enabled timely response to them. Standard AA1000 SES (The AA1000 Stakeholder Engagement Standard) made it possible to engage shareholders to the maximum extent and thus to consider their views and ideas for analysis of RIAR's business performance.

Table 3.12.1

Principles set forth in the AA1000 Standards

Principle description	Specification
Engagement	Participation of shareholders in elaboration of crucial strategic decisions with a view to attain sustainable development (see Chapter 2 "Strategy")
Importance	Evaluation with a view to determine timeliness and significance of the information disclosed to the Company and its shareholders (see Section 2.4. "Relevant Aspects of Activity" and Chapter 5 "Stakeholder Engagement")
Responding	Responsive measures taken by the Company responding to requests of shareholders as to its business activities and effecting sustainable development performance (see Chapter 5 "Stakeholder Engagement")

The Institute being targeted at ensuring a high level of openness and transparency in its activities, more predictable and sustainable public reporting, interacts with its shareholders purposefully (see Chapter 5 "Stakeholder Engagement"), provides information on all the aspects of its business in a timely manner, responds to the demands and wishes speedily, implements consistently the principles of corporate information policy (see Annual Report 2015: http://niiar.ru/sites/default/files/pgo2015_links_0.pdf) by maintaining a proper balance between openness and accessibility of information and its commercial interests.

JSC "SSC RIAR" pursues systematic and results-oriented interaction with its shareholders (Fig. 3.12.1) for each business direction as well as communication and public awareness-rising campaigns (see Section 4.5 "Human Capital"). For the purpose of successful implementation of transparency policy, all currently available form of communication such as publication of reports (Annual Report, Environmental Compliance Report, Annual Scientific Report (report describing the major R&D work accomplished in the year under report (http://niiar.ru/annual_report))), internet, websites, questionnaires, press conferences, public dialogues, consultations, arrangement of shareholders' on-site visits, distribution o promotional brochures etc. are used (Fig. 3.12.2).

Fig. 3.12.1. General meeting with the media

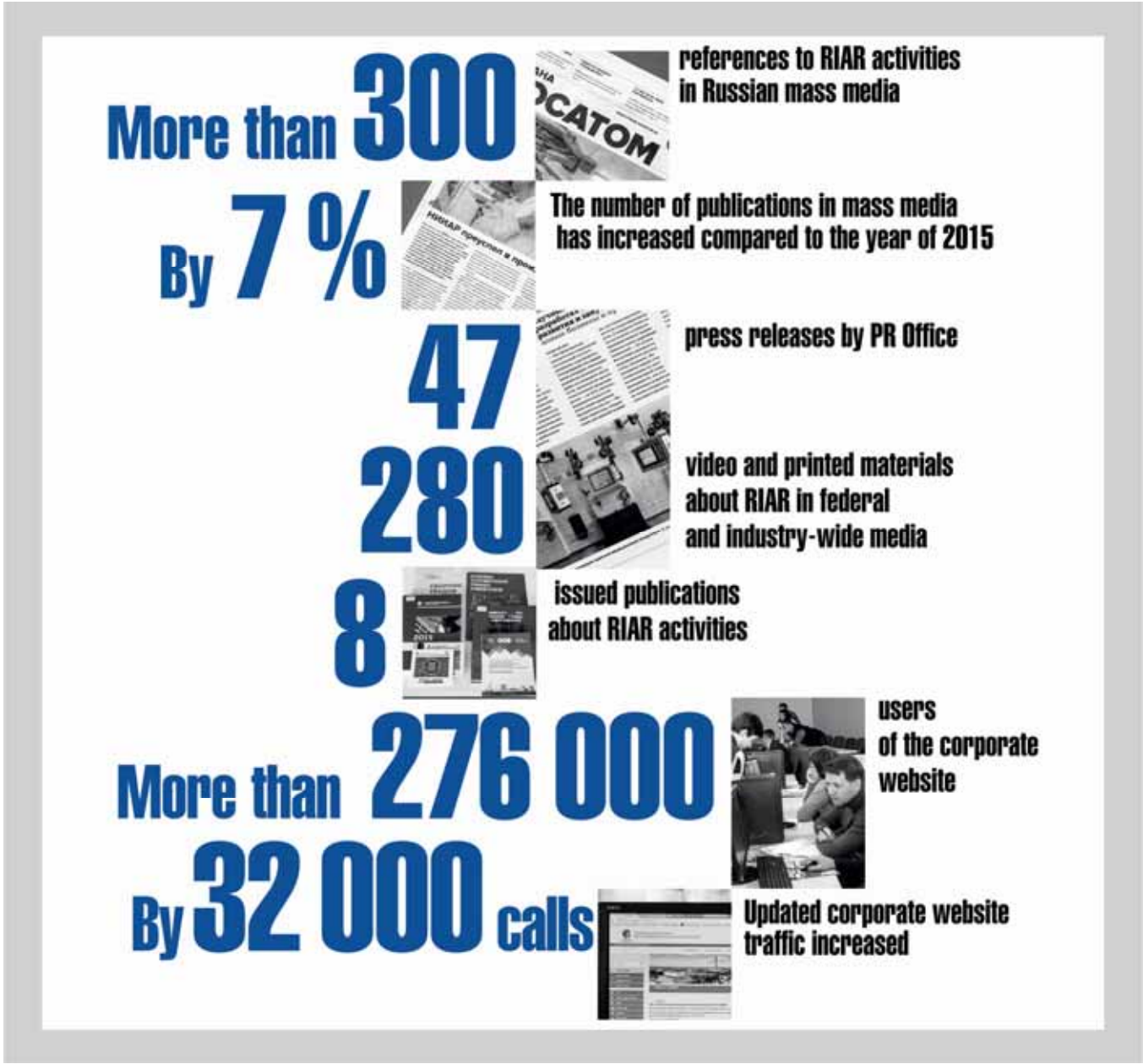

Fig. 3.12.2. Communication activities of JSC “SSC RIAR”

Development in the region of RIAR's operation

JSC "SSC RIAR" puts great importance to the development in the region of its operation because the challenging tasks the Institute has been faced up with call for substantial improvement of the infrastructure in Dimitrovgrad and bringing it to conformity with the highest standards known in the world. Relations with the region where RIAR undertakes its business activities are established through the intensive work with the local authorities and the general public, elaboration and financial backing of projects with social and humanist response and with the focus on specific goals and given territories. The ROSATOM State Atomic Energy Corporation and the government of Ulyanovsk region entered into the cooperation agreement. This agreement opens up new extensive opportunities for additional targeted financial backing of socially important projects using tax resources of JSC "SSC RIAR" to the RF subject consolidated budget (Table 3.12.2).

The economic value generated is distributed between Suppliers and Contractors (within operational expenditures), providers of funds (in the form of interests payments to creditors), RIAR"s staff members (payroll payments of employees and social charges), the RF government (in the form of taxes), local communities and agencies of the regional and municipal authorities (in the form of investments in communities and taxes).

At the year-end 2016, the total amount of charges payed by the Institute to all level budgets and non-budgetary funds equaled 797 million rubles that was 15 % higher than in 2015.

Table 3.12.2

Economic value generation and its distribution among the shareholders on an annual basis

EC1

Criterion, mln. RUB	2014	2015	2016
Generated economic value (sales revenue, investment revenue assets revenue)	4 426.4	4 999.6	5 727.7
Direct economic value generated and distributed:	5 222.6	5 356.2	5 499.9
Operational expenditures	3 069.1	2 983.5	3 058.7
Payroll payments and other employee benefits	1 546.9	1 492.3	1 652.2
Payments to the providers of funds	91.9	287.2	154.8
Gross tax payments	449.0	543.0	578.1
Investing to communities	65.7	50.2	56.1

Dimitrovgrad entered into the I-st category of single-industry municipalities in the Russian Federation (single-industry town) with the most complicated social and economic status. In accordance with the Resolution of the Governor of the Ulyanovsk Region, the Council

for development of single-industry municipalities in Ulyanovsk Region was set up in order to promote interaction among executive and legislative bodies of State government authorities with local self-government bodies of municipal entities in order to foster elaboration and implementation of special measures to support development of single –industry municipal entities. Two representatives of JSC "SSC RIAR" as it is the backbone enterprise in the town became the members of this Council. One of them is the Head of the Department for R&D Management and International Activities and the second is the Head of the Department for Reginal Government Relations and Social Infrastructure Facilities.

Healthy way of life. Healthy lifestyle activities are targeted at further development of municipal sports infrastructure to increase the number of public going in for sport and access to sports facilities. Every year the Institute holds corporate Olympics for its employees but their family members can take part in them also. Such a sporting event contributes greatly to promoting health lifestyle. In 2016 more than fifty employees aged between 24 and 76 reached qualifying standards within the All-Russia sporting festival "Ready for Work and Defense" for labor associations and more than 80 employees and their family members took part in the mass bike ride marathon devoted to celebration of the Day of Athlete and to the sixtieth jubilee of the Institute.

Contribution to education and culture. In 2016 the Institute made every effort to advance in networking with educational establishments of all types to ensure adequate staffing; setting up the advanced library-based center to enhance informational support and IT penetration as well as intellectual potential of people; development of cultural property. JSC "SSC RIAR" collaborates with 27 higher education institutions in the Russian Federation in an integrated way in order to educate and train competent specialists (see Section 4.5 "Human Capital"). A lot of students studying in Russian universities (primarily the students of Dimitrovgrad Engineering & Technology University — a branch of Federal State Budgetary Educational Institution of Higher Professional Education "National Research University — Moscow power Engineering Institute") had vocational practice of all types at RIAR: trained practice, production-oriented practice, research practice and pre-graduation practice.

In 2016 JSC "SSC RIAR" joined a large-scale project "RUSNANO School League" with the purpose to support and promote the ideas of modern science education in the Russian schools.

Different workshops, conferences, negotiations, meetings, business meetings were held in 2016 at Slavsky Conference Center with the participation of JSC "SSC RIAR", ROSATOM State Atomic Energy Corporation, Federal Medical-Biological Agency of Russia, public organizations from the town and region, as well as a executive bodies of State government authorities and local authorities. Various scientific programs and cultural events initiated by the ROSATOM State Atomic Energy Corporation were organized: "Territory of ROSATOM Culture", "Outdoor Museum" etc. Numerous social events of city-, region-, industry-specific relevance including events of all-Russia importance were organized. Among them were also youth leadership forums, professional days etc. Some events were devoted to the sixtieth jubilee of the Institute. More than 60 thousand people attended performance, concerts, meet-the-artist events, exhibitions and festivals.

Contribution to improvement of public utilities and living environment in the city. JSC "SSC RIAR" provides electrical power, supplied cold and hot water as well as heat to the western district of Dimitrovgrad. Redundant electric energy is supplied to the unified energy grid of Ulyanovsk Region. In 2016 году a large scope of work was done to achieve proper functioning of the energy infrastructure in the western district of Dimitrovgrad. The territory nearby the Marriage Registration Hall was landscaped and redecorated. Asphalt surface course was improved on pavements and motorways.

The ongoing housing program implemented by the Institute in cooperation with the Investment and Construction Company "Zapad" made it possible to improve living standards of Dimitrovgrad inhabitants including the RIAR's employees and to buy apartments in the residential area "AcademGorodok" at a preferential price. This residential area is located in the forestall area and covers an area of 8 ha. It complies with the toughest demands now placed on the modern districts. The construction project provides for its

comprehensive development, construction of social-importance and commercial facilities, vegetation, children's playgrounds and sportsgrounds, cycling and walking lines. A new school and kindergarten are going to be constructed nearby the residential area in the nearest future. In 2016 34 families became happy owners of apartments. One hundred fifty six (156) families moved into new apartments in total since the program had been implemented.

Professional engagement and interaction with suppliers and contractors in the region of the RIAR's operation

The construction of multi-purpose fast research reactor MBIR (Fig. 3.12.3) and multifunctional radiochemical research complex stimulates the creation of new jobs (600 and 86 people were employed, respectively). Some workers are hired from the local residents who live in the Ulyanovsk Region and in Dimitrovgrad. Each job in the construction of the aforesaid facilities actually provides opportunities for creating another 10 to 12 jobs in the allied industry (metallurgy, machine-building industry etc.) and thus the total number is 6 500 to 7 500 people.

Fig. 3.12.3. At the MBIR-reactor construction site

Nuclear Innovation Cluster in Dimitrovgrad

The Nuclear Innovation Cluster in Dimitrovgrad, Ulyanovsk Region was established as one of the most effective tools for Dimitrovgrad and Ulyanovsk Region development. The Cluster was developed with the active cooperation and support of Dimitrovgard municipal administration, the Government of Ulyanovsk region, ROSATOM State Atomic Energy Corporation, Federal Medical and Biological Agency under the RF Ministry of Health and Social Development. Nowadays the main purpose of the Nuclear Innovation Cluster is to work out and enhance "R&D and innovation territory of presence" in Dimitrovgrad. The fundamental idea behind the Cluster is to concentrate unique research infrastructures and expertise of its participating parties at one place. As of the end of 2016, the Cluster consisted of 52 organizations: large state-owned and private companies, educational institutions, small and medium scale enterprises, governmental authorities (http://cluster-dgrad.ru/rus/uchastniki-klastera). There were more than 120 projects within the Cluster amounting to approximately 65 bln rubles.

Official website of Independent Non-Profit Organization "Center for Nuclear Innovative Cluster Development", Dimitrovgrad, Ulyanovsk Region: http://cluster-dgrad.ru/rus/

Internet portal "Map of Russian Clusters": http://map.cluster.hse.ru/cluster/27

Cluster in social media: https://www.facebook.com/crk.dgrad

The Research Institute of Atomic Reactors forms the core of the Cluster. A close cooperation among the participating parties creates favorable investment climate to implement the program on the Nuclear Innovation Cluster Advancement with the focus on three major trends of activity: implementation of large-scale cluster projects (http://cluster-dgrad.ru/rus/proekty-klastera) with guaranteed federal financing within the scope of federal task-oriented programs; establishment of social, engineering and transport infrastructure inside the territory of Cluster projects implementation to create favorable and comfortable conditions for living and optimal climate for business doing as well as for beginning small-sized innovative business and its promotion. There is another project under development in Dimitrovgrad to set up the industrial park through cooperation of the Government of Ulyanovsk Region, JSC "SSC RIAR" and Nuclear Innovation Cluster. This project will make it possible to allocate at least ten high-tech large-scale enterprises in the city. The Nuclear innovation Cluster is in the list of Pilot Innovation Territorial Clusters. It is supported by the Center for Nuclear Innovative Cluster Development under the program of the RF Ministry for Economic Development targeted at small- and medium-size businesses support.

Major projects of Nuclear Innovative Cluster

1. Construction of the Federal High-Tech Center of Medical radiology (http://cluster-dgrad.ru/rus/proekty-klastera/9-pages-ru/55-federalnyj-vysokotekhnologichnyjtsentr-meditsinskoj-radiologii-fmba-rossii).
2. Set up of research and production complex for radio-pharmaceuticals and medical-purpose products (http://clusters.monocore.ru/file/708/%D0%98%D0%BD%D0%B2%D0%B5%D1%81%D1%82%D0%B8%D1%86%D0%B8%D0%BE%D0%BD%D0%BD%D1%8B%D0%B9%20%D0%BF%D1%80%D0%BE%D0%B5%D0%BA%D1%82%20%D0%9D%D0%9F%D0%9A%20%D0%A0%D0%A4%D0%9F.pdf).
3. Molybdenum-99 sustainable production (http://cluster-dgrad.ru/rus/proektyklastera/9-pages-ru/49-molibden-99).
4. Construction of Multipurpose Fast Research Reactor (рис. 3.12.4) (http://cluster-dgrad.ru/rus/proekty-klastera/9-pages-ru/47-mbir-iyau-mbir).
5. Construction of multifunctional radiochemical research complex (http://cluster-dgrad.ru/rus/proekty-klastera/9-pages-ru/51-polifunktsionalnyj-radiokhimicheskijissledovatelskij-kompleks).

The cooperation among the main participating parties arose interest to cooperation and expanded the geographic scope and thus promoting the formation of research and production basis for agglomeration of Ulyanovsk and Dimitrovgrad. In 2016 the management principle of Nuclear Innovation Cluster was analyzed by the leading experts of the European Secretariat for Cluster Analysis (http://www.cluster-analysis.org/). Its structure,

financing, management principles, contacts, cooperation with relevant players and achievements were subjected to thorough analysis. They were analyzed in comparison with the similar clusters in Europe of the same level and technical performance in the same technical field. Bronze Certificate of the European Cluster Excellence Initiative was awarded based on the results of analysis. Moreover, the Independent Non-Profit Organization "Center for Nuclear Innovative Cluster Development" in Dimitrovgrad, Ulyanovsk Region in cooperation with "National Cluster Association" (Czech Republic) put in place an educational program-forum — workshop (discussion platform) for Innovation Territorial Clusters successfully in the same year. The experts representing the participating countries advance their skills in project management through participation in the educational program of the German Academy for Economics and Management (Bad Harzburg, Germany).

Fig. 3.12.4. Participants of the International Scientific Workshop Meeting devoted to MBIR-based International Research Center establishment

Foreign Participating Countries of the Nuclear Innovation Cluster

- France Clusters (http://www.franceclusters.fr).
- INTER-MEDICO GmbH (http://www.intermedico.de).
- NANOPROGRES (http://www.nanoprogres.cz).
- National Cluster Association (http://www.nca.cz).
- RAMON Science & Technology Co. (http://www.ramon.com.cn).
- Slovak Innovation and Energy Agency (http://www.siea.sk).

60 ЛЕТ НИИАР

In 1991 the Radioisotopes & Radiochemicals Division was established that united experts in the field of accumulation and extraction of reactor radionuclides, as well as physicists and radiochemists engaged in the development and production of radiochemicals and ionizing radiation sources

4

MANAGEMENT OF CAPITAL AND PERFORMANCE

4.1. Financial Ñapital

The investment projects implemented by RIAR (refurbishment of production facilities intended for production of cobalt-60 sources of medical application, californium-252 radionuclide as well as other isotopes of transplutonium elements, iodine-131 radiochemical) made it possible to increase production of isotopes by 64% in 2016 and compensate for shortfall in revenue resulted from a decline in revenues under the federal task-targeted programs. Due to the gaining of profit with taxes allowed for in accordance with the results of 2016, there are plans to transfer the tax on profits into the federal budget in 2017 for the first time over a long period.

The year under report was known for such an important event as the approval of financial recovery program for the term 2016–2018 by the responsible officials of the ROSATOM State Atomic Energy Corporation: K.B. Komarov, the First Deputy Director General, Block for Management and International Business Activities and V.A. Pershukov, Deputy director General, Block for Innovation Management. The financial recovery program aims at increase in revenue including but not limited to indexation of prices for the BN-800 fuel assemblies and the cost of irradiation tests in the research reactors; conservative management of costs; working capital optimization at the expense of inventory level reduction; and headcount optimization. All the measures specified in the action plan under the financial recovery program for 2016 were implemented in full. They leave ambitious prospects for proceeding with these activities during the current year with the focus on the break-even operation.

The measures targeted at conservative management of costs were implemented on a large scale beginning with the work with the suppliers to obtain cutting of prices and ending with PSR-projects. The costs were reduced by 603 mln rubles relative to the budget.

In 2017 the Institute intends to pursue further automation of financial and economic processes (medium-term planning, budgeting) as a part of work on reduction of process term.

Financial capital management

Financial stability of JSC "SSC RIAR" greatly depends on the efficient management of its economic performance. The budget management system is the backbone of economic performance management. The budget management system is governed by the standards of integrated management system and is based on economic data acquisition, classification, processing, and analysis in reference to construction projects, income items and expenses of RIAR's departments. The budgeting system assigns the target values of economic performance with due consideration for strategic objectives by means of a regular plan-fact analysis. It provides the timely and immediate data on deviations from the target values which are necessary for the top management of RIAR and line managers of its departments to make decisions. Financial management efficiency is achieved owing to the financial policy of JSC "SSC RIAR", implementations of industry-specific and internal regulations and standards attributable to the financial risk management. Thus it is possible to establish the bank-company relationships enabling optimizing the bank account structure and minimizing costs for bank servicing, operational planning optimizing cash flows in order to allocate funds inside RIAR and invest free cash in an efficient manner and managing financial risks.

Financial and economic performance

Positive dynamics of the JSC "SSC RIAR" performance in 2016 (Tables 4.1.1 and 4.1.2) is a result of measures undertaken by the Institute to enhance its business performance in conformity with the approved plan of actions under the financial recovery program of JSC "SSC RIAR" for the term of 2016–2018. Owing to these actions, the Institute could increase a revenue (+988 mln rubles compared to 2015) and reduced losses attributable to the ongoing activities (by 612 mln rubles compared to 2015 and by 733 mln rubles as compared to the expected level for 2016 (90 mln rubles)). Financial backing amounted to 2.6 bln rubles that was provided by the ROSATOM State Atomic Energy Corporation as well as measures targeted at optimization of costs in the amount equal to 0.6 bln rubles made it possible to reduce the Institute's debt burden by 3.5 bln rubles including the borrowed assets and debts to the suppliers. As a result, saving amounting to 205 mln rubles could be achieved at the expense of interest payable on loans and borrowings. Among the measures directed towards the cost reduction, it is worth mentioning optimization of the performance schedule for ordinary periodic repair and overhaul maintenance, restraining of rising prices for raw materials and products to be procured, savings from competitive bidding, work without subcontracting, and optimization of non-core assets. Working capital optimization at the expense of inventory level reduction was also undertaken in 2016 as a part of measures targeted at enhancement of operational efficiency. Inventory decumulation amounted to 973 mln rubles compared to 2015.

The targets for 2017 are indicative of positive dynamics despite an insignificant shortfall in revenue because of completion of the BN-800 fuel assembly fabrication but there are plans for compensating such a shortfall at the expense of increased earnings from R&D contracts and radioisotopes. The financial recovery program shall be continued with the focus on escalating the prices for products and services rendered, headcount optimization and cost cutting. If the targets are achieved, the Institute can close 2017 with a net profit amounting to 65 mln rubles (Fig. 4.1.1 and 4.1.2),

Table 4.1.1

Key performance indicators of JSC "SSC RIAR"

Performance indicator	Indicator values on an annual basis		
	2015	2016	
		Target	Actual
Adjusted free cash flow, billion rubles	–0.177	0.226	0.353
Labor efficiency, mln rubles / person per year	1.12	1.49	1.51
Total cost, billion rubles	–	3.173	3.176
Integrated index, % Revenue from new products	–	100	137.3
Foreign trade revenue	–	100	164
Revenue from sale of innovative products, bln rubles	–	3.55	3.602
Personnel staffing plan, %	Unaccomplished	100	100
LTIFR and nonoccurrence of incidence of falling from elevations, including Contractors, %	0	0.1	0
No events with safety relevance of 2 and higher and accidents at hazardous production facilities according to the INES scale	Accomplished	0	Accomplished
Fulfillment of government orders, including state defense contracts and contracts, %	Accomplished	100	Accomplished

Table 4.1.2

Key economic indicators of JSC "SSC RIAR"

Economic indicator	Indicator values on an annual basis				
	2013	2014	2015	2016	2017
Revenue from sales of goods, products, work, services, mln rubles	5 882.9	3 700.9	4 119.1	5 107.4	5 047.6
Cost of sold goods, products, work, services, mln rubles	5 617.7	3 862.2	4 185.4	4 055.6	3 977.9
Gross profit (loss), mln rubles	265.2	–161.3	–66.3	1 051.8	1 069.7
Management expenses, mln rubles	710.4	743.1	805.6	807.5	867.5
Share of management expenses in the revenue, %	12.1	20.1	19.6	15.8	17.2
Profit (loss) from sales, mln rubles	–502.7	–972.2	–884.6	110.7	3.2
EBITDA, mln rubles	–48.8	–877.2	–448.3	241.1	429.9
NOPAT, mln rubles	–175.7	–825.9	–335.6	2.3	224.7
Net profit (loss), mln rubles	–190.1	–1 063.4	–702.1	–90.3	64.8

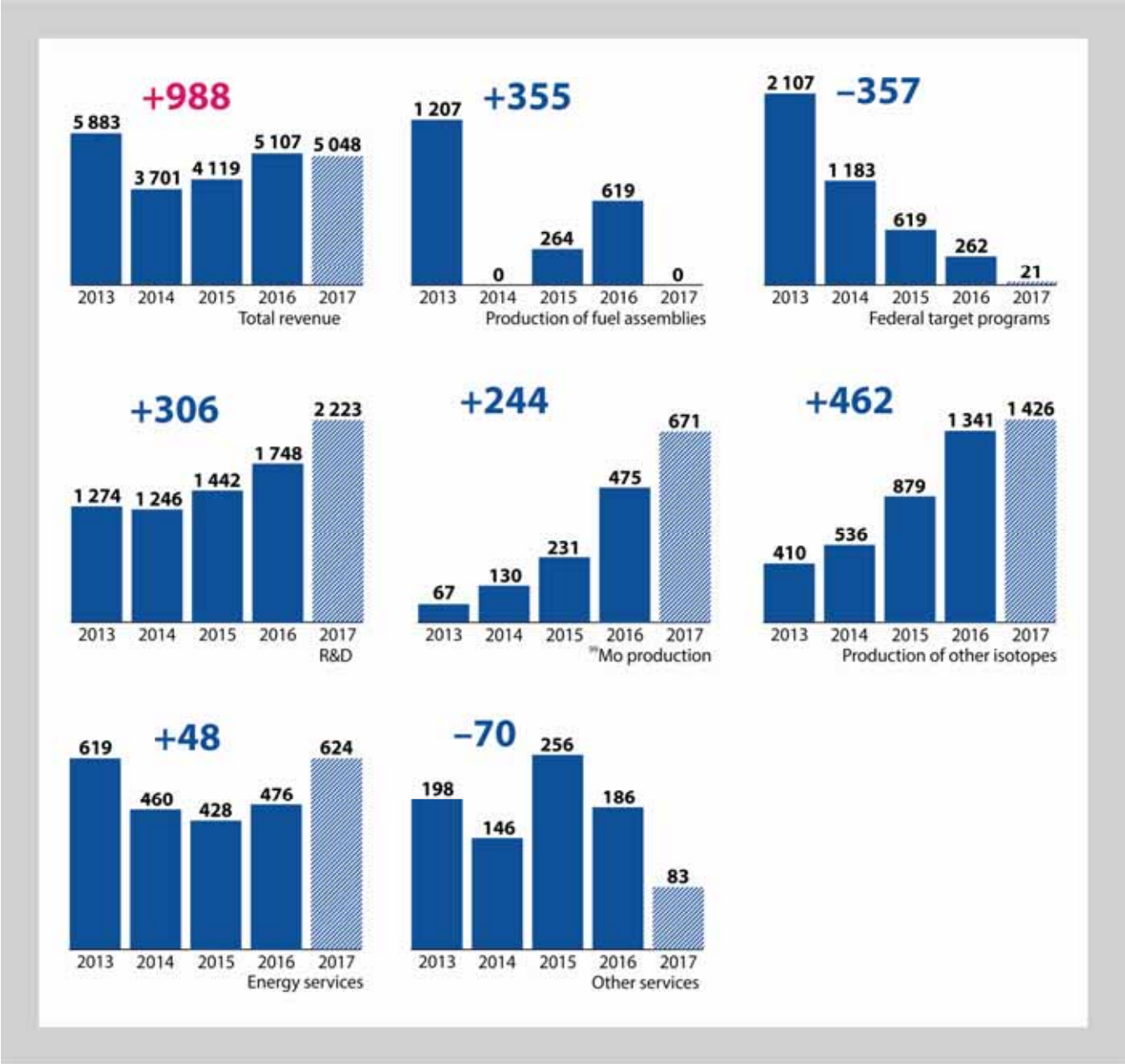

Fig. 4.1.1. Dynamics of RIAR's revenue from services rendered for the term of 2013–2017 showing deviations of 2016 indicators from 2015 indicators, mln rubles

The growth in revenue was the gain of production volumes of radioisotopes including molybdenum-99 and californium-252 as well as fabrication of the BN-800 fuel assemblies. Additional revenue was a result of research and development work including R&D done within the framework of industry-specific project "PRORYV" (Fig. 4.1.3, a). The undertaken remedial measures targeted at "Revenue" index improvement made it possible to increase the share of exports from 7 up to 43 %, including the revenue attributable to contractual work amounting to 496 mln rubles ($ 6.7 mln) and to radioisotope production amounting to 1 337 mln rubles ($ 14.5 mln). The R&D scope depends on funding under federal target-oriented programs "Nuclear Power Technologies of the New Generation for the Period of 2010–2015 and till 2020" and "Nuclear and Radiation Safety for 2008 and for the Period till 2015". Most of the funds intended for R&D were allocated in 2013. The share of the funds from the federal budget decreased from 62% down to 13% in total but the enterprise managed to compensate such a shortfall. Between 2013 and 2016 the

R&D scope under the contracts increased by 474 mln rubles (+37 %) including 7 times increased scope of R&D done under the contracts with foreign customers that amounted to 578 mln rubles. (+496 mln rubles). The share of foreign contracts increased from 6 up to 33 % within the total amount of contracts (Fig. 4.1.3, b).

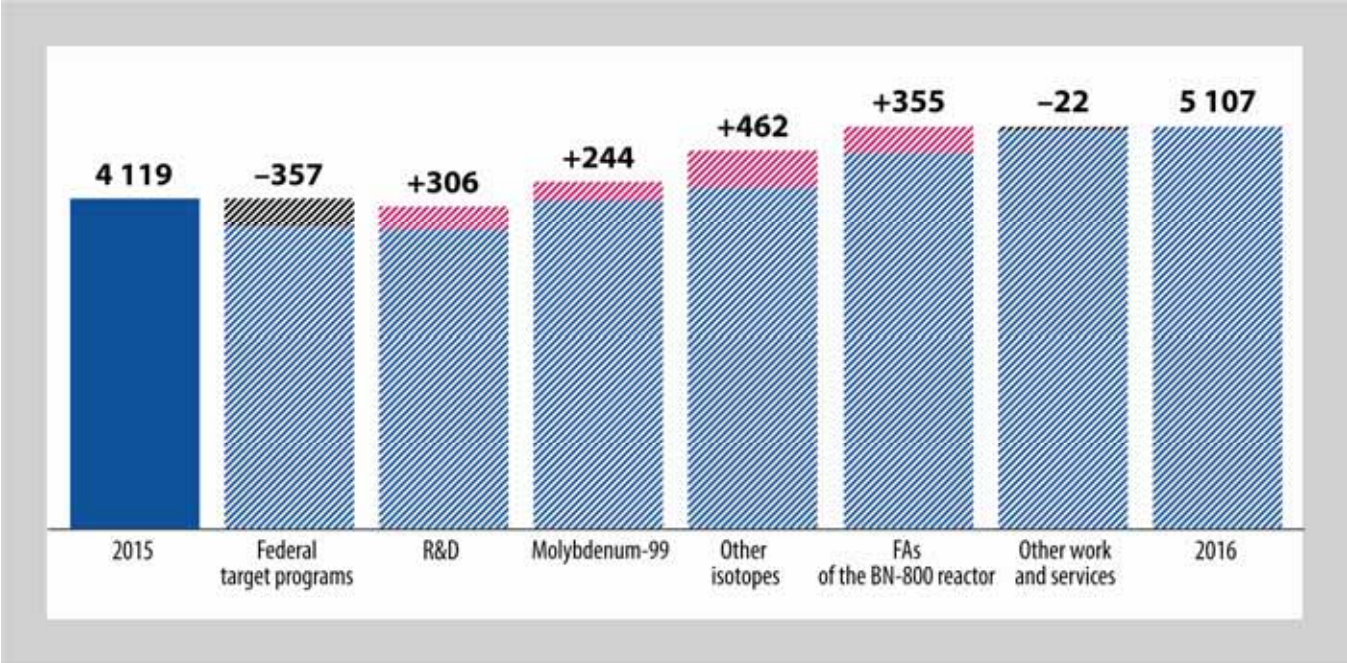

Fig. 4.1.2. Growth factors of RIAR's revenue from services rendered in 2016 vs. 2015, mln rubles

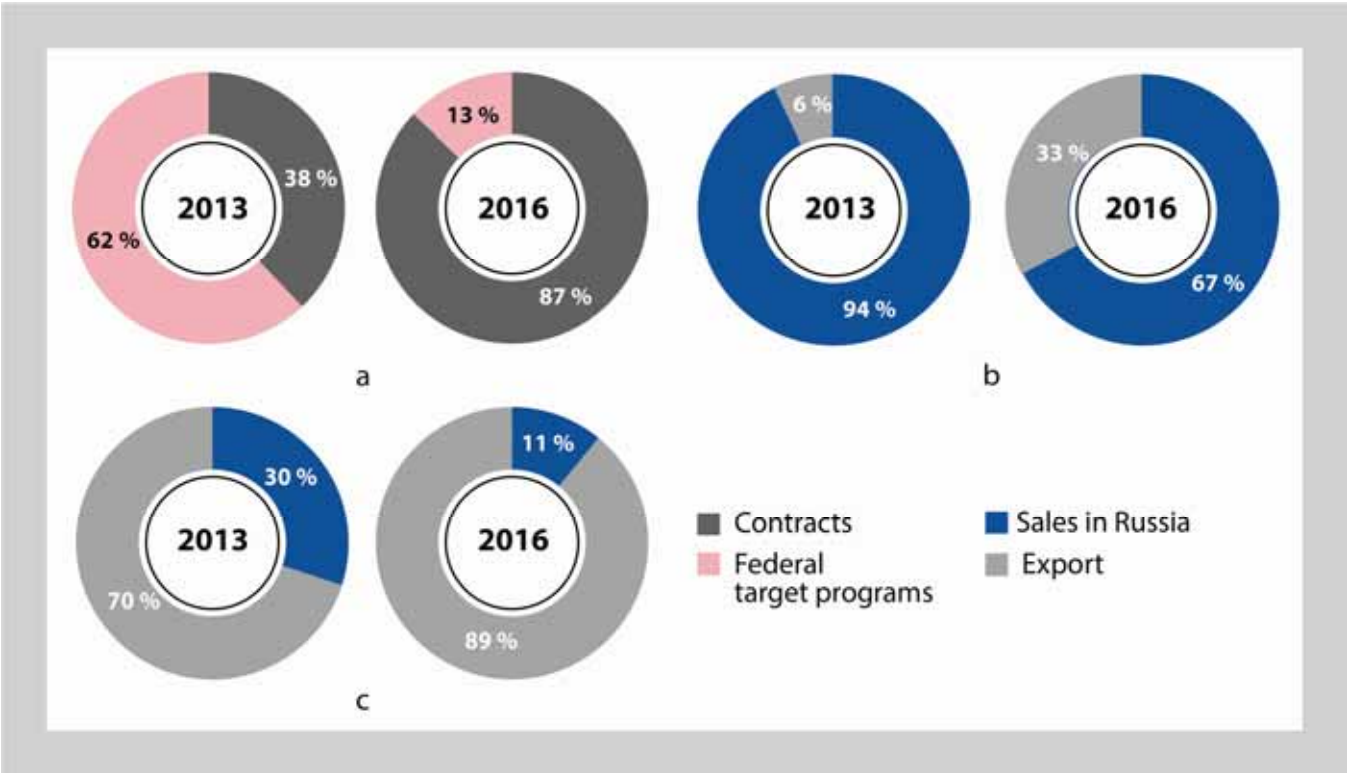

Fig. 4.1.3. Revenue mix attributable to R&D with due consideration for work done under the federal target-oriented programs (a) and without them (b), revenue from sales of isotope products (c) on an annual scale basis

In 2017 RIAR is planning to increase the revenue from R&D done under the contracts up to 2223 mln rubles (+ 27 % to the level attained in 2016). Between 2013 and 2016 the scope of isotope production and sales (Fig. 4.1.3, c) increased three times amounting to 408 mln rubles and especially owing to production of molybdenum-99 of medical application. In 2017 RIAR is planning to increase its revenue from production and sales of radioisotopes up to 2097 mln rubles (+15 % to the level attained in 2016).

The geographic segment of sold products shows a steady growth in demand of foreign customers (Table 4.1.3). A share of work performed by the subcontractors made up 3 % in the total volume of revenue for 2016. The major amount of costs attributable to subcontractors (Fig. 4.1.4) was the electricity transmission services (80 %).

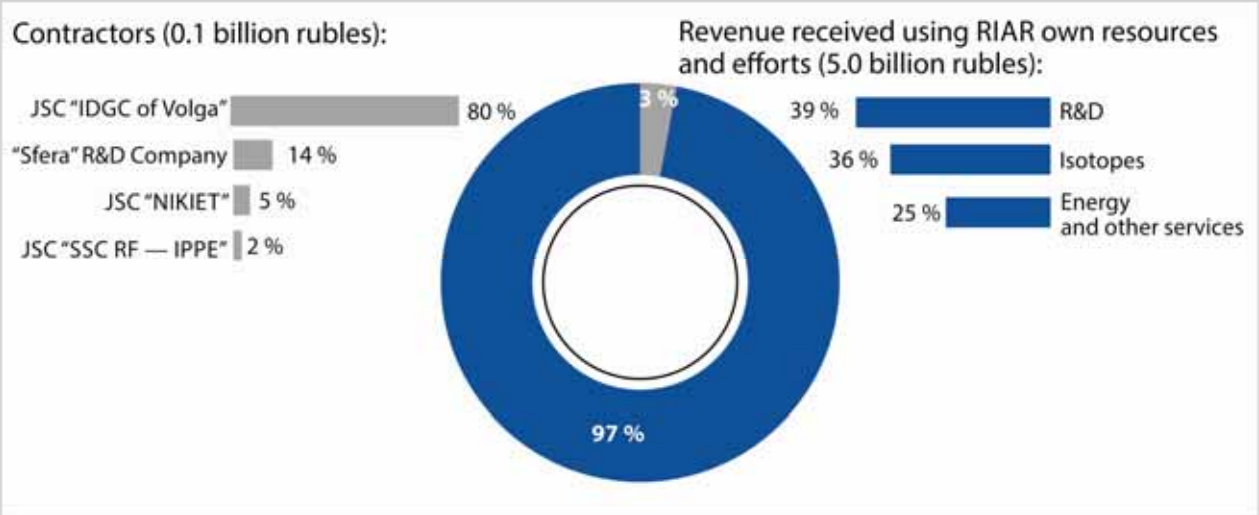

Figure 4.1.4. schematic representation of revenue in 2016 and the share of principal contractors

Table 4.1.3

Revenue distribution relevant to geographic segments and business activities, mln rubles

Economic indicator	Indicator values on an annual basis scale				
	2013	2014	2015	2016	2017
Revenues (sold products, work, services)	5 883	3 701	4 119	5 107	5 048
Including internal group turnovers	2 514	1 180	1 239	2 015	1 072
By geographic segments:					
Russian Federation	5 466	3 014	2 465	2 882	2 449
CIS	20	22	34	38	34
Foreign countries	397	665	1 620	2 187	2 565
Relative to business activities:					
Fabrication of the BN-800 fuel assemblies	1 207	0	264	619	0
R&D	3 381	2 429	2 061	2 010	2 244
Production of radioisotopes	479	666	1 110	1 816	2 097
Electricity transmission services	620	460	428	476	624
Others	196	146	256	186	83

As evidenced by the analysis of Institute's financial and business performance (Table 4.1.4), its financial standing improved significantly as a result of gain in highly liquid assets in the balance of foreign currencies (cash assets) and of reduction in short-term liabilities (borrowings and payables to suppliers and contractors). As the share of borrowed funds decreases and equity capital increases, the Institute has improved the situation with external borrowings and enhanced its financial viability (the tasks the Institute is faced with are fulfilled at its own cost and expense). The increase in turnover of the current assets occurs because the growth in revenue is ahead of current assets.

Table 4.1.4

Business solvency, liquidity and financial stability of JSC "SSC RIAR"

Indicator	Indicator value on an annual basis scale			Recommended value
	2014	2015	2016	
Financial stability indices				
Leverage ration (capitalization rate)	48	49	13	Lower than 1002
Ratio of borrowed and own funds	53	49	31	
Equity ratio	67	67	88	40–80
Equity plus long-term debt to total assets ratio	74	73	91	60–90
Long-term debt ratio	9	7	3	–
Current liquidity and solvency ratios				
Absolute liquidity ratio	26	18	143	20–50
Quick liquidity ratio	41	36	165	70–80
Current liquidity ratio	117	86	250	100–200
Solvency ratio	307	305	849	200–250
Current assets turnover ratio	49	57	75	–

Net assets

The dynamics of aggregate net assets shows a steady growth trend at JSC "SSC RIAR": the increase of 37 % compared to the 2015 level and 68 % compared to the 2014 level (Table 4.1.5). The excess of net assets over the charter capital in 2016 is in conformity with the RF legislation in respect to their ratio and is a good evidence of RIAR's business performance enhancement.

Table 4.1.5

Net assets dynamics

Indicator	Indicator value on an annual basis scale, thousand rubles		
	2014	2015	2016
Charter capital	9 751 206	12 685 792	12 685 792
Net assets	9 180 254	11 262 257	15 396 049

4.2. Intellectual Capital

Intellectual capital management

Intellectual capital is of key importance for JSC "SSC RIAR" to enhance its innovative activities and achieve its strategic objectives. Intellectual capital of JSC "SSC RIAR" is its intangible assets, e.g.: knowledge, information technologies, intellectual property, and people with their competencies 1806 (53.9 %) out of 3398 RIAR's employees have higher education, including 443 (24.5 %) employees who have higher education in nuclear engineering). There are seventy eight professionals with academic degrees at RIAR, including eleven professionals with a Sc.D. degree. Highly-qualified staff keeps RIAR's science and technology capabilities and carries out research at a high level. This fact is confirmed by publications of RIAR professionals and their participation in the conferences, symposia, and workshops (Table 4.2.1).

Table 4.2.1

Publications of RIAR's professionals and their involvement in different events

Indicator	Value
Total publications in peer-reviewed scientific periodicals	54
Published articles in scientific journals:	37
International	9
Russian	28
Participation in the conferences, symposia, workshops, etc.:	91
Russian	73
International	18
Including those held in CIS	2
Reports (presentations) at the conferences, symposia, workshops, etc.:	120
Russian	99
International	21
Including those held in CIS	2

Knowledge management system

The process of knowledge generation, keeping, transfer and use is one of the cornerstones of innovation management and enterprise growth. Like any other business process, it should be manageable, plannable and regulated process. It is highly important for JSC "SSC RIAR" to keep the scientific and technical competencies needed for safe operation of the existing nuclear reactors and effective implementation of new developments. In 2012 RIAR launched a project on the knowledge management system. Its milestones are provided in detail in Annual Report 2013 (Section 4.3. "Knowledge Management System Development", Chapter 4 "Sustainable Development Results": http://niiar.ru/sites/default/files/report_2013.pdf).

In the reporting year the knowledge management system was enhanced with the focus on three key trends as it was before (see Annual Report 2014, Section 2.10 "Knowledge Management" of Chapter 2 "Corporate Governance": http://niiar.ru/sites/default/files/pgo2014_ln_29062015_c_ssylkami_0.pdf).

Critical knowledge keeping

Critical knowledge covers both the knowledge that becomes a priority in JSC "SSC RIAR" under limited resources and the knowledge that is particularly important to ensure successful ongoing operation of the Institute including its innovation activities. The objectives and tools of keeping critical knowledge are provided in Annual Report 2014 (Section 2.10 "Knowledge Management" of Chapter 2 "Corporate Governance": http://niiar.ru/sites/default/files/pgo2014_ln_29062015_c_ssylkami_0.pdf).

In the reporting year JSC "SSC RIAR" accomplished the following activities under the project on keeping critical knowledge:

- The plan and schedule of critical knowledge keeping for 2017 including updated map and list of critical knowledge, knowledge-loss risk assessment and programs on critical knowledge keeping was worked out and approved;
- Media modules were developed and placed on information portals of RIAR Scientific Library and ROSATOM for each of the following areas: "Radioactive waste management including pyro-electrochemical and gas fluoride reprocessing methods for spent nuclear fuel reprocessing", "Radiation material science of zirconium alloys", "Nuclear physics and engineering of irradiation tests. Irradiation test methods", "Analytical support and quality control of granulated MOX-fuel fabrication for fast reactors", "Science behind strontium-89 production";
- Survey course lectures are held on a regular basis with the focus on major trends of the Institute's business activities to assist in interaction of recent graduates and experienced highly skilled professionals, provide a positive environment for interaction with experienced highly skilled professionals, dissemination of knowledge among recent graduates and PHD-students (the lecture materials are made available on the intranet site).

Twenty one survey course lectures have been given with the focus on the major trends of the RIAR's business activities.

In order to ensure continuity in research and development at JSC "SSC RIAR", the Institute annually arranges contests, forums, conferences and technical tours for students, post-graduates and young researchers (see Section 4.5 "Human Capital" and this Section too).

Plans for 2017:

- To update the knowledge map and list of critical knowledge on an annual basis;
- To compile a list of RIAR employees who have critical knowledge (including the cumulative risk factor);
- To hold lectures and workshops under the project on keeping critical knowledge;
- To prepare media modules and make them available on R&D information portals of RIAR and ROSATOM with reference to the following topics: Fast reactor fuel", "Production of radionuclides in research reactors", "Absorber materials and control rods for nuclear reactors", "Destructive post-irradiation examinations: selection, test methods, equipment", "Spectrometric and dose measurements of neutrons in research reactors".

Intangible assets management

In 2016 the ROSATOM State Atomic Energy Corporation worked out and approved the Program on innovative development and technical modernization until 2030 that is targeted at achieving strategic objective "Global leadership on the worldwide market of hi-tech products and services". The aforesaid program calls for developing and putting in place new effective intellectual property management system by JSC "SSC RIAR" as it is one of the backbone Research Institutes in the nuclear industry. Such a system will make it

possible to transform technological innovations into the main factor of economic growth and social development both for the Institute and nuclear industry in entirety. Such a system should enable identifying the intellectual property effectively, reviewing and analysis, finding and implementing the optimum protection, and its entering on the balance sheet as intangible assets. The intellectual property management at the Institute is governed by the requirements of prevailing laws, regulatory and guidance documents of ROSATOM State Atomic Energy Corporation and local regulatory instruments.

In 2016 infringement search of technologies under development with the focus on the major trends of the Institute's business activities was carried out with the following outcomes:

- Twelve intellectual products (three inventions and nine computer software related inventions) were prepared and submitted for State registration of ownership under the project for polyfunctional radiochemical research complex construction;
- Three applications for an invention in the form of intellectual product and three applications for computer software related inventions were prepared and submitted for State registration of ownership under the project for the MBIR reactor construction;
- An application for an invention was prepared and submitted for State registration of ownership under the project for the BOR-60 reactor upgrade.

Overall eighteen documents protecting items of intellectual property (patents for inventions and utility models), certificates of state registration of ownership for computer software related inventions were obtained in 2016 (Fig. 4.2.1 and 4.2.2, Table 4.2.2).

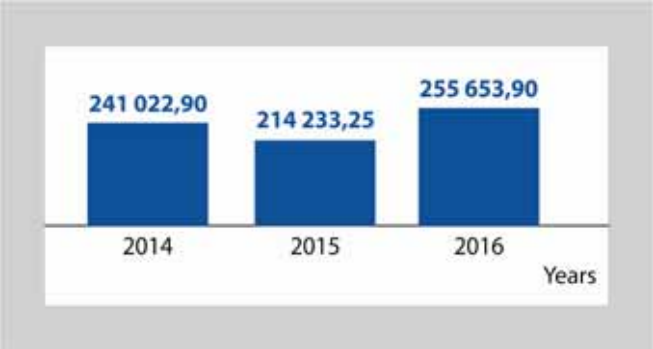

Fig. 4.2.1. Book value of the RIAR's intangible assets, thousand rubles

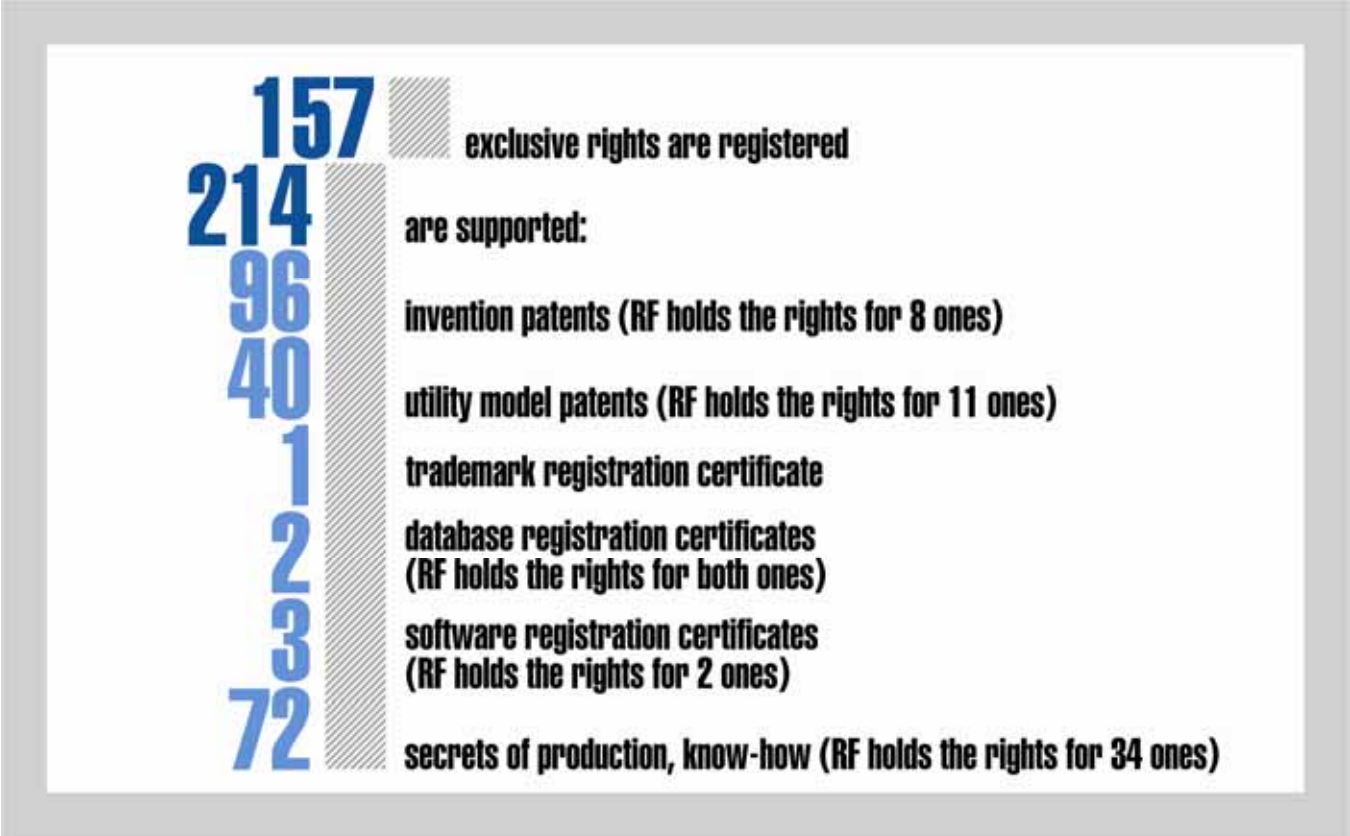

Fig. 4.2.2. Portfolio of the RIAR's intellectual property (as of 31 December 2016)

Table 4.2.2

Inventive work at JSC "SSC RIAR"

Indicator	Indicator values on an annual basis		
	2014	2015	2016
Applications for an invention and utility model	8	14	9
Granted patents for an invention and utility model	19	8	16
Know-how legal protection	23	17	0
Supported inventions and utility models; know-how	181	198	214
Applied inventions and utility models	38	42	48

Scientific and technical information support

JSC "SSC RIAR" organizes its work on R&D scientific and technical information support addressing the following fronts: identification of information needed, generation of scientific and technical information content, distribution of information among users and potential users, access to different sources of information, study and adoption of best practices for the content management. Users are informed about new editions, revisions and information products on a common and individual basis. In 2016 the test access was provided to information management system "TechExpert" based on professional documentation system "Kodex". One of the topical and practically important courses of activity is maintenance of bibliographic database comprising publications of the RIAR's employees. The second one is the access to digital Russian and international libraries. In order to keep scientific heritage, the scientific and technical library is involved in digitization of proprietary archive records and making the collection of digital data to be placed on the ROSATOM unified industry-specific portal of scientific and technical information. The scope of the following collections was expended during the year under report: "Consolidated catalogue of scientific and technical libraries", "Catalogue of digitized archive documents", "Industry-specific publications", "Publications", and "Proceedings". The Institute provides subscription for more than 60 series of scientific and technical periodicals and publications. RIAR made a contract with the State Public Scientific and Technical Library to get an access to the national library stocks through the inter-library exchange system. Major efforts are undertaken to give a chance for the RIAR's employees to attend different scientific events, increase a number of their publications in the flagship Russian and foreign journals.

Staff training and development

People and their competencies are the most important component of the knowledge management system. In accordance with the Work Program of the Scientific-Education-Innovation Consortium engaging higher education institutions and scientific establishments in Ulyanovsk region, JSC "SSC RIAR" assisted in establishing an industry-oriented department "Irradiation Technologies" at the faculty of High Technology physics and Engineering in Ulyanovsk State University. In 2016 eight post-graduates employed by RIAR undertook post-graduate courses at this Department to be trained in "Condensed atter

Physics" and "Material Science (Nuclear power Engineering)". Four RIAR's Doctors of Science combine their work at RIAR with their position of lecturer at this department. In 2016 twenty four post-degree students hired by RIAR attended educational courses in the following faculties: Nuclear Reactors and Materials, Radiation Chemistry, General and Medical Physics, Reactor Material Science, and Radiation Safety at DETI NRNU MEPhI. RIAR in collaboration with this University established the Department of Nuclear Reactors and Materials. Nineteen RIAR's experts are part-time lecturers at DETI NRNU MEPhI including five Doctors of Science and five Masters of Science (for details about cooperation in staff training see Section 4.5 on Human Capital).

English language courses. In 2016 JSC "SSC RIAR" provided annual English courses for its employees. The main purpose is to develop competencies of researches and engineers and give them a chance to perform their duties successfully as well as to promote international and scientific collaboration. One of the major expectations is their attendance of international scientific events which are held in English, including but not limited to writing presentations in English, making report in English, reading scientific articles in English. In 2016 the English courses were attended by 45 staff members. Training was given in three levels such as basic, advanced and the course for management. The English teachers were interpreters of JSC "SSC RIAR". The trainees were selected following the results of their placement tests. They lasted nine months. At the end they took an exam to the Commission headed by the Director. The employees who completed the English course successfully will have a chance to attend international scientific events and have priority in their further promotion (Fig. 4.2.3).

Fig. 4.2.3. English course trainees

Mentorship

From the very first days of RIAR establishment there has been a mentorship system functioning, and this system is still relevant. Highly-qualified experts are appointed mentors (Fig. 4.2.4). In RIAR the mentorship is given in the following trends:

1. **Mentorship for students and trainees**. The Human Resources Department of RIAR signs contracts to collaborate with industry-oriented and regional higher educational institutions, secondary vocational educational establishments, and schools of Dimitrovgrad, Ulyanovsk region. RIAR conducts hands-on training which is focused on involving students in the federal target programs, individual approach to every trainee, and close collaboration between RIAR and training departments (Fig. 4.2.5).

2. **Mentorship for recent graduates.** The key objective of on-the-job training for recent graduates is their occupational and psychosocial adaptation, learning theoretical aspects and acquiring practical skills needed to fulfill their job duties. In compliance with the RIAR's *Collective Labor Agreement,* Section Work with the Youth, the employer shall provide social and occupational adaptation for its young employees. For example, for recent graduates who are hired for the first time a mentor is appointed for up to six months, and for young professionals with the major in industry-oriented specialties a mentor is appointed for up to one year.

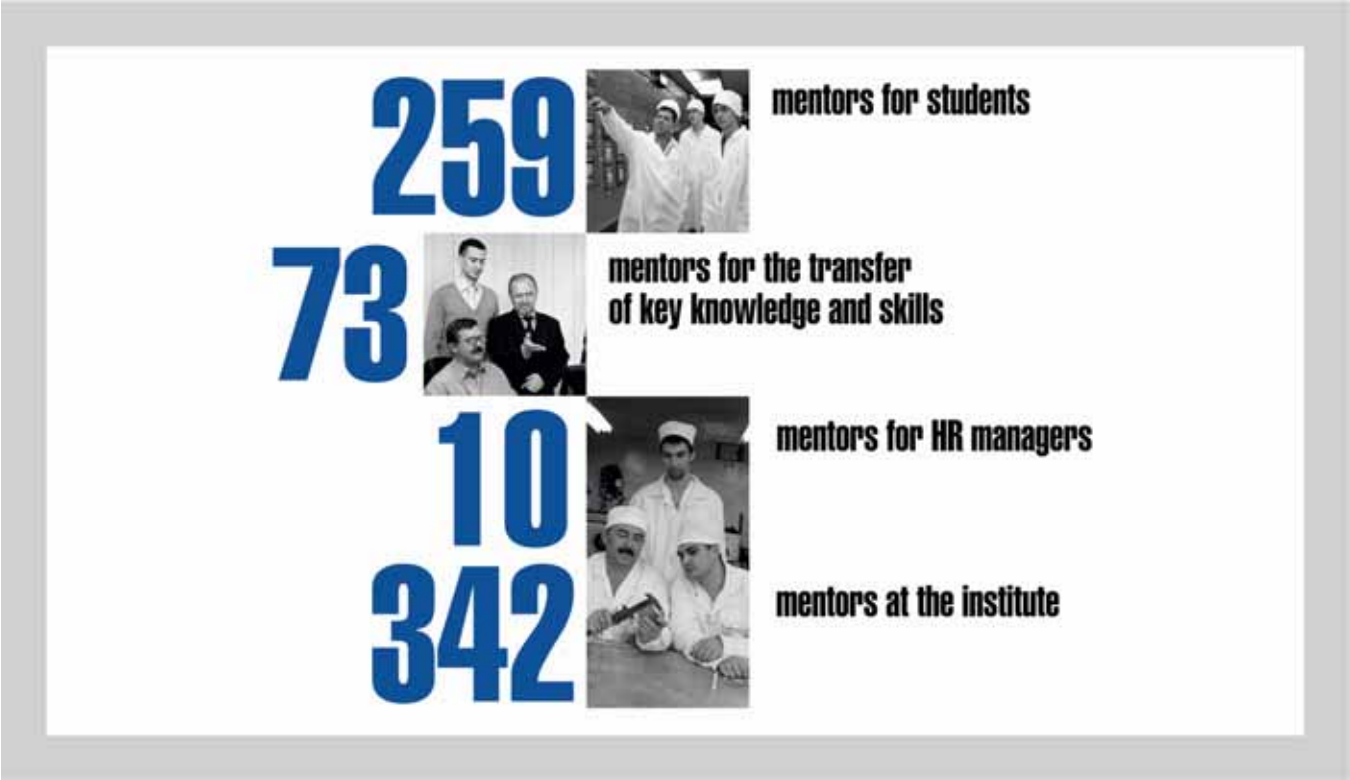

Fig. 4.2.4. Number of mentors at JSC "SSC RIAR"

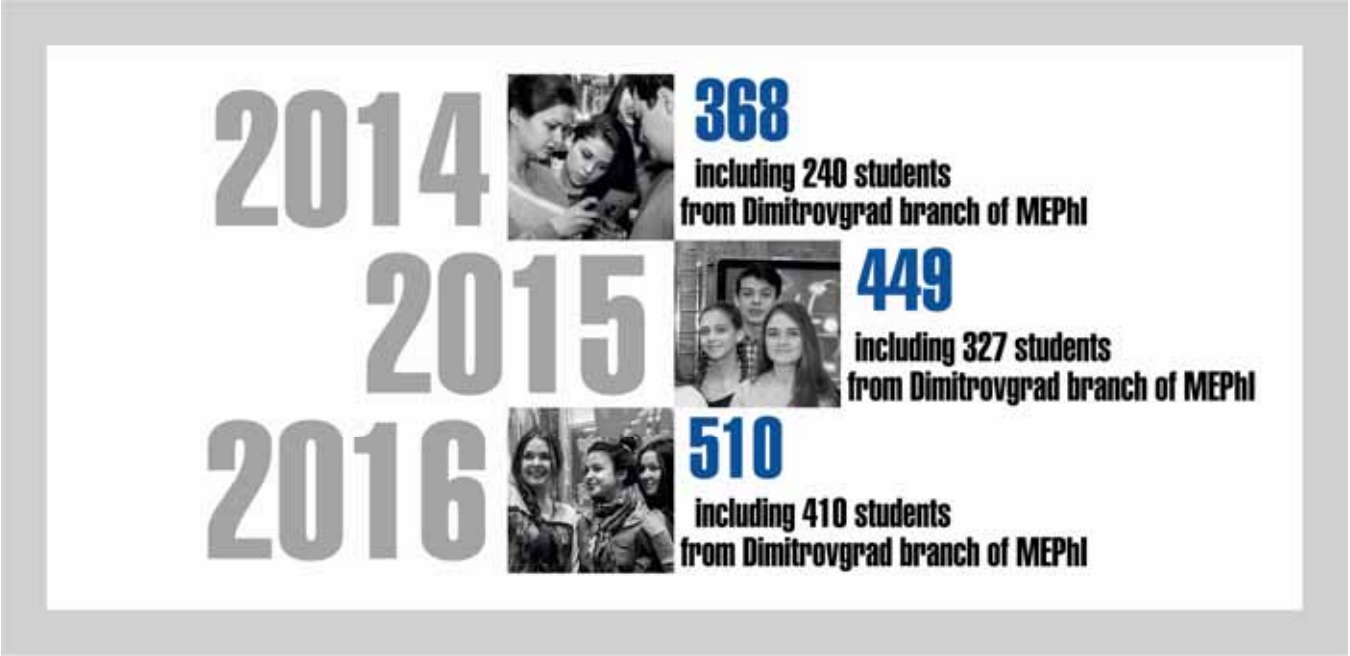

Fig. 4.2.5. Number of students who did practical training at JSC "SSC RIAR"

3. **Mentorship for the transfer of key knowledge and skills.** Such mentorship includes scientific management of the post-graduates making it possible to keep and transfer the key knowledge and skills. In 2016 thirty-three recent graduated hired by RIAR attended post-graduate courses in five industry-scpecific specialties in higher educational institutions. Seven highly-qualified scientific executives were appointed for these employees at RIAR.

To create conditions attractive for recent graduates including advanced training

and mastering skills, transfer of knowledge and experience by leading professionals RIAR has an established and successfully functioning Board of Young Professionals that represents the interests of young employees. The scientific and engineering unit under this Board is targeted at providing assistance to the young employees in mastering their job, and acquiring hands-on experience that contribute to fast technical and business career growth.

Knowledge exchange

The major components of the knowledge management system are both publications and books devoted to the key areas of research performed at RIAR. The authors of books are the employees. RIAR is eager to make all publications official. So, the publications are assigned with ISBN and UDK codes. Materials are subject to editorial preparatory work that guarantees high quality of the materials to be published and their full compliance with the editorial and publishing standards. In 2016 JSC "SSC RIAR" edited and released the following publications:

- Collection of scientific articles and papers written by RIAR scientists and researchers on the relevant topics;
- Scientific Annual Report of JSC "SSC RIAR" (Report on key research programs performed in the reporting year) — it is intended for professionals of scientific and research organizations, design bureaus, nuclear power enterprises, university professors, students of relevant specialties, and senior schoolchildren;
- JSC "SSC RIAR" Annual Report — it is an integrated report addressed to a wide audience. It describes the major financial, economic and production activities, environmental performance in the reporting year as well as sustainable development;
- English version of JSC "SSC RIAR" Annual Report that is adopted version of JSC "SSC RIAR" Annual Report intended for foreigners;
- Collection of abstracts, All-Russian Youth Conference "Research and Development in Support of Next-Generation Nuclear Technologies Development";
- Commemorative publication "RIAR is Sixty: People, Years, Achievements";
- Brochure "RIAR is the Largest Site for Nuclear Research";
- Collected book "Nuclear Research Installations of CIS Member Countries".

One can find more information about the publications edited and released by RIAR in the relevant sections of Scientific Annual Reports (Report on key research programs performed in the reporting year), which are available on the RIAR's website (http://niiar.ru/annual_report).

As the Institute attends different international and regional exhibitions, it is another obvious and informative way to tell the public about the business activities of the enterprise, promising projects and reactor safety. In 2016 the enterprise and its business activities were represented at four international exhibitions: "High Technologies for Sustainable Development (NDExpo)», "AtomExpo–Belarus", "AtomExpo" and "Health Care". There was a special exhibit about RIAR at the inter-industry specialized exhibition that took place in Tula in September 2016 and was attended by the RF President Vladimir Putin. As usual, JSC "SSC RIAR" appeared as a partner of different regional-level events. For instance, RIAR's exhibit was displayed at the V-th Regional Youth Innovation Forum. In 2016 the Institute continued its fruitful collaboration with the Nuclear Information Center in Ulyanovsk. Such a collaboration resulted in the joint engagement in the industry-oriented project "Teachers and health professionals attend nuclear power facilities" (it gave a chance for 407 people to visit RIAR) and in the federal project "RUSNANO School League" (RIAR prepared a set of tasks for gifted children, gave lectures and arranged technical visits to the site), Festival of Science, the II-nd International Medical Students

Tournament, "FANK" science film festival (assistance in organizational arrangements in Dimitrovgrad, training of experts, and informational support), and "ScienceSlam" project.

Promo and exhibition activities as well as museum are considered by JSC "SSC RIAR" as an essential part of educational work. In 2016 more than 1700 people (Table 4.2.3) could see RIAR's expositions devoted to its history and relevant activities. In its five years of existence, a number of visitors to the museum increased two times. In addition, technical and press tours are arranged including visits to laboratories and production facilities. A special press tour was organized for representatives of regional, federal and industry-oriented mass media as well as for bloggers devoted to the 60th anniversary of RIAR establishment to promote image-making and communication activities targeted at public awareness and trustiness regarding nuclear industry. The tour program also included technical visits to research reactors, visit to the on-site Science Museum and participation in press-conference with the RIAR's Director. The jubilee exhibition "RIAR is sixty" that took place at Slavsky Conference Center was attended by 1 800 people.

Table 4.2.3

Number of visitors to JSC "SSC RIAR"

Visitors	Year, value		
	2014	2015	2016
School children	253	245	317
Students	357	301	558
Others	553	992	842
Total	1224	1538	1717

Table 4.2.4

Number of visitors to on-site Science Museum at JSC "SSC RIAR"

Year	Number	
	Visits	Visitors
2014	75	378
2015	81	405
2016	75	721
Total	231	1504

Innovation Activities

MBIR construction

The project on the MBIR reactor construction is implemented under the federal target program "Nuclear Power Technologies of the New Generation for the Period of 2010–2015 and till 2020". The MBIR project (Fig. 4.2.6 and 4.2.7) resides on proven and reliable technologies of the BOR-60 reactor. In the year under report 43294 m3 of concrete were poured and 7 563 t of reinforcing bars were mounted under the MBIR construction. In January 2016 the reactor building walls were mounted at an elevation level –10.800 m but in December the pouring of concrete were accomplished at an elevation level+0.900 m. A large scope of R&D work was accomplished under the MBIR construction project. The State Contract for the MBIR design justification was fulfilled.

At the end of 2016 drainage tanks for sodium coolant were delivered to the RIAR site.

In the mid- and long-term perspective major construction work will be continued, and equipment will be fabricated, delivered, installed, started up and adjusted (Fig. 4.2.8).

Production of radioisotopes and irradiation testing to change material physicochemical properties

Use of neutron beams in neutron radiography and activation analysis

Generation of electric power and utilization of thermal power for heating

General Customer	ROSATOM State Corporation
Project Manager – Developer	JSC "SSC RIAR"
Design Contractor	JSC "GSPI"
Chief Reactor Designer	JSC "NIKIET"
Scientific Adviser	JSC "SSC RF — IPPE"
General Contractor	Management Company "Uralenergostroy"
Thermal capacity	150 MW
Electric capacity	Up to 55 MW
Peak neutron flux density	$5.3 \cdot 10^{15}$ $cm^{-2} \cdot s^{-1}$

High-dose irradiation and testing of fuel and structural materials for advanced Gen IV nuclear reactors with different coolants

Irradiation testing of recycled fuel with minor actinides, performing experiments in support of closed fuel cycle

Testing of nuclear fuel behavior under transient conditions and design-basis accidents of advanced nuclear reactors

Fig. 4.2.6. The MBIR purpose and employment

a

b

Fig. 4.2.7. Overall view of the MBIR area at the beginning of (a) and by the end (b) of 2016

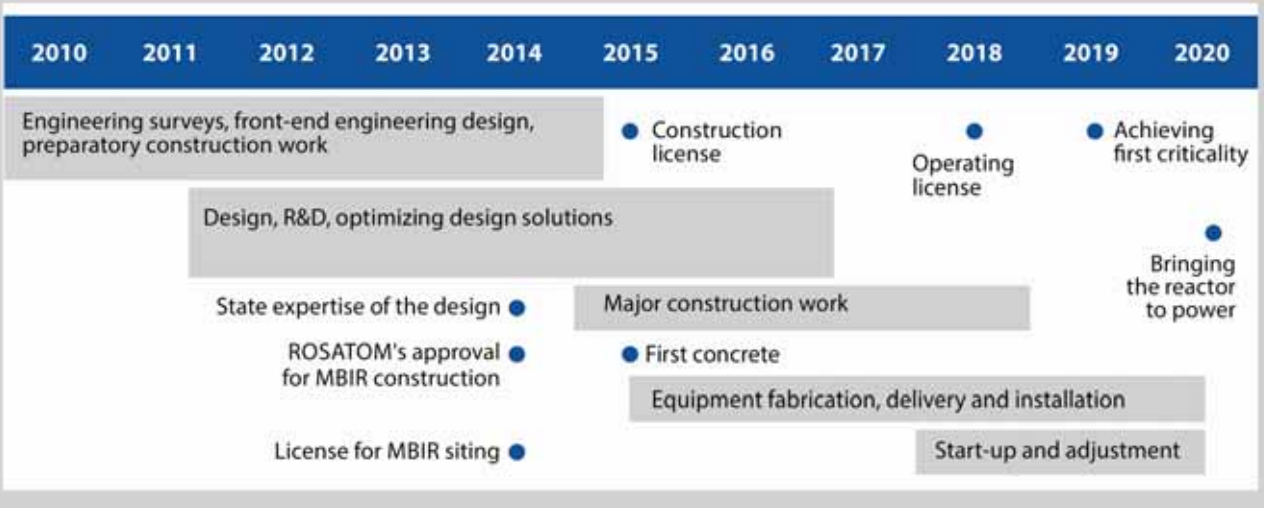

Fig. 4.2.8. MBIR construction roadmap

Plans for 2017:

- Positive final expertise and affirmative State expert review of updated design documents by Federal Autonomous Establishment RF Glavgosexpertiza";
- Reactor building construction up to an elevation level of + 34.800 m;
- Commissioning of the drainage pumping station and physical protection system.

Establishment of polyfunctional radiochemical research complex

The research and development work in support of polyfunctional radiochemical research complex design was continued in the year under report: design engineering of equipment, elaboration of analytical control methods, manufacturing of prototype and pilot equipment, testing of radioactive waste management processes. The unified process module was manufactured and completed with relevant support systems. To be more exact, cooling and inert atmosphere reproduction system was developed, docking fitting for prototype inter-module container was accomplished, and a prototype inter-module travelling platform was manufactured. In 2016 the design engineering of intra-module computer-based service system was continued: its prototype was manufactured, unified operator's work station was developed for module control system. The local control system became available for the module also. The integrated software for the control system is still under development for the polyfunctional radiochemical research complex. Evaporation equipment was developed and manufactured for medium level waste. High-level waste vitrification plant is also available. A special research project was initiated within the radioactive waste management framework. Its major idea is to use lower level radioactive waste as matrices to incorporate higher level radioactive waste. The outcome of the first stage is the samples of melted murataite ceramics obtained from the dry residue resulted from evaporation of simulated decontamination solutions that incorporated iron salts which were formed after coagulation of low-level waste. A set of test methods are ready for application at the radiochemical research complex. Their technical readiness was implementation was assessed. Two applications for inventions have been prepared. A concept of analytical methods have been worked out and prepared for metrological certification: "Plutonium dioxide. Mixed oxide uranium-plutonium fuel. Quantitative transfer into solution through melting with sodium bisulfate", "Transition elements and platinum-group metals. Quantitative analysis of transition elements and platinum metals impurities in the dissolved samples of irradiated nuclear fuel with the use of chemical and atomic emission spectral analysis", "Mixed oxide uranium-plutonium fuel. Measurement of uranium and plutonium mass fractions with the use of coulometric titration", "Rare-earth elements. Quantitative analysis of RRE mass fractions in the dissolved molten salt chloride- based samples with the use of atomic emission spectral analysis", "Irradiated nitride fuel. Tritium analysis method". Decontamination methods were tested with the use of solutions and film-forming coatings. Given were also recommendations for their application. Decontamination waste management methods were developed. Application for their patenting has been prepared. As to films resulted from decontamination, their handling methods have been developed. Hydrated solution-based cement was formed after their dissolution. Low–level radioactive waste management methods were developed with reference to different compositions. Demonstrated was also their purification allowing their drainage into the sewerage. Candidate materials were studied for absorption of trace amounts of oxygen and moisture vapor from the inert atmosphere.

Technical requirements and technical specifications are ready for all the equipment required for radiochemical research complex:

tilt mechanism for spent fuel assemblies, sealing equipment for radioactive waste canisters, weld joint leak tightness tester, decontamination bath, vented storage place for canisters. When the storage place for canisters was developed, one of the design-basis accidents such as loss of power in the storage chamber of high-level solid radioactive waste had been proved to be impossible because the storage place could passive cooling of canisters by convection. New outcomes:

- Robotized arm of the intra-modular computer-based service system can be a ready-made independent equipment;
- Sorption hysteresis method has been elaborated and it enables for more accurate planning of sorbent agent life cycle;
- It seems possible to obtain ceramics similar to melted murataite ceramics based on structural materials waste at the stage of liquid zinc removal with the use of combined methods of pilot spent nuclear fuel processing methods.

Technical retrofitting of the BOR-60

Fast sodium-cooled fast reactor BOR-60 is a unique multipurpose reactor. It is widely employed for irradiation testing of structural materials, fuel, absorbing materials which are in use including candidate absorbing materials for different nuclear reactors including fusion-type reactors. Some primary- and secondary circuit equipment intended for fast reactors is also subjected for irradiation testing in the BOR-60 reactor. The reactor materials under irradiation cover almost the entire range of existing reactors as well as reactors under development moving from fast reactors (BN-800, BN-1200, BREST, SVBR, MBIR) to thermal ones (VVER-TOI, VVER-1500, GT-MHR, VGTR) including fusion-type reactor among the others (ITER) as well as special-purpose reactors. The BOR-60 has been in operation for over forty years and it needs technical retrofitting. For this purpose an investment in the amount of 555.9 mln rubles has been allocated under the program "Design engineering of new test facilities and special equipment, modernization and development of test facilities to demonstrate feasibility of physical approaches, design concepts, perform safety analysis and safety assessment with a view for safe adoption of scientific and engineering ideas of innovative nuclear power engineering" and the federal target program "Nuclear Power Technologies of the New Generation for the Period of 2010–2015 and till 2020". Technical retrofitting of the BOR-60 reactor is planned under the same federal target program in order to extend BOR-60 operating lifetime. Planned retrofit will enhance reactor safety and extend its experimental capabilities to provide testing in support of the main parameters of Gen IV reactors, their nuclear safety and fuel cycle. For this purpose the following work was done in 2016:

- Technical design document for re-enforcement of the buffer tank footing;
- Technical design document for electrical parameters control of converting units in circulating sodium pumps with the data output to the data acquisition and measurement system;
- Strength analysis of the III circuit pumping;
- Post-irradiation examinations of structural materials from the dismantled section of the reverse steam
- generator to justify its service life extension;
- Instrumentation of the reactor control and protection system is replaced with ASUZ-22P instrumentation.

4.3. Output

The key management objective of our Institute in 2016 was to develop and implement a financial rehabilitation program. It might be said with satisfaction that the primary targets of this program were achieved. The budgeted scope was fully met for R&D, manufacture and sales of radionuclide products and radioactive sources for medical and industrial applications. For the first time in many years, 85 % R&D was completed by RIAR's own efforts to show the feasibility of engineering and design solutions for the Polyfunctional Radiochemical Complex. The work is carried out under the government contract within the scope of the Federal Target Program titled "Nuclear Power Technologies of the New Generation for the Period of 2010–2015 and till 2020".

The nuclear research reactors, experimental installations and equipment of the Reactor Materials Testing Complex and Radiochemical Technologies Division were operated under the designed parameters with no abnormalities occurred. The program to ensure safe and reliable operation of the experimental base was fully implemented covering technical re-equipping of the BOR-60 reactor and development of cutting-edge digital equipment for the RBT-10/2 control and protection system. It is encouraging to see an approved concept of the SM reactor core upgrading project after many efforts have been made by ROSATOM's Innovation Management, and now the project is ready for investments. The preparatory work is scheduled for the next two years, and the SM modernization itself will be done from April 2019 through February 2020. This project will enable improving greatly the reactor experimental capabilities and extending its operational lifetime at least until 2030.

Nuclear Reactor Physics and Engineering, Irradiation Technologies and Reactor Safety

The Research Reactors Complex of JSC "SSC RIAR" renders a wide range of services to outside companies including international ones. There are five research reactors under operation (Fig. 4.3.1, Table 4.3.1).

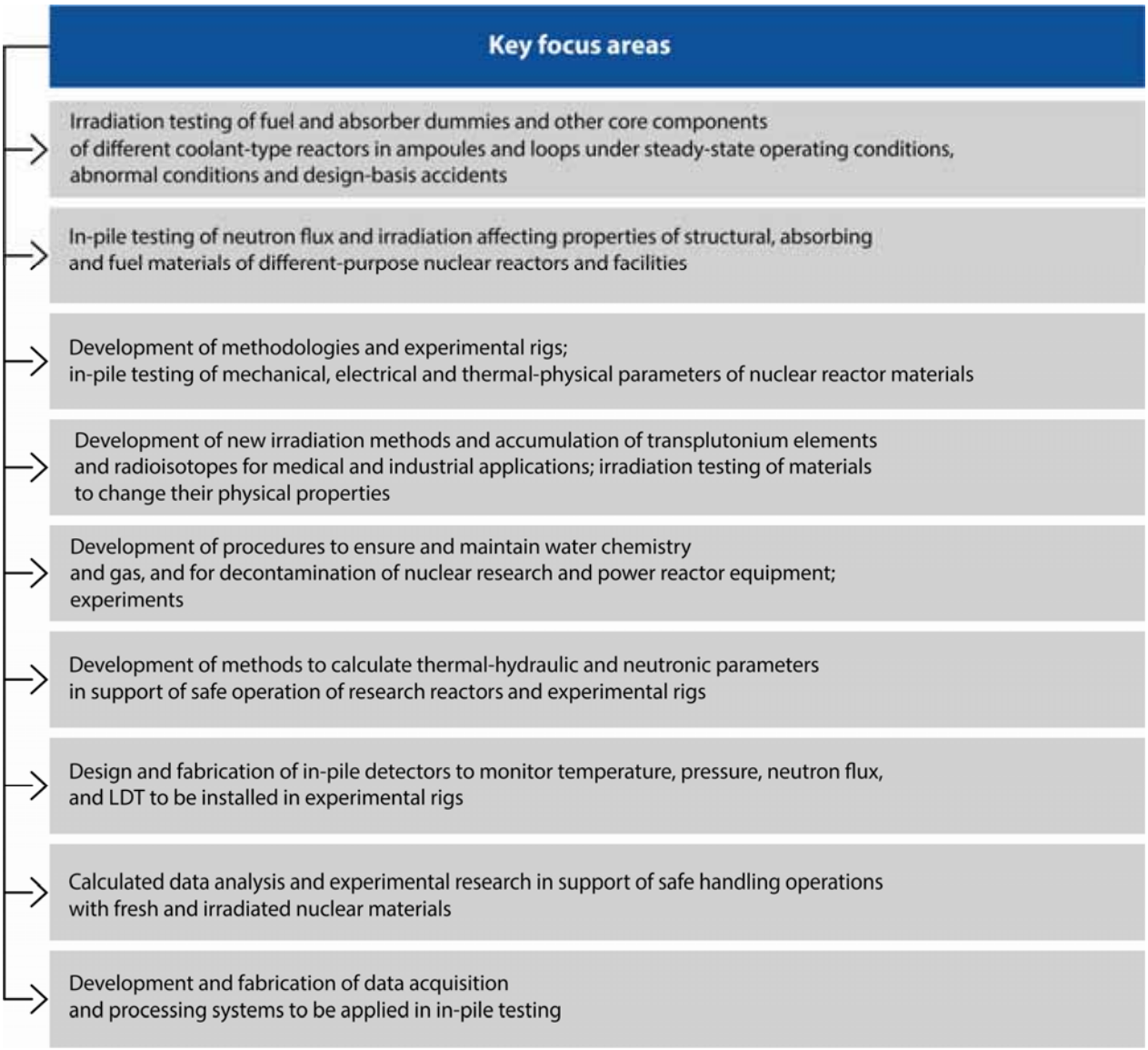

Fig. 4.3.1. Key applications of RIAR's research reactors in 2016

Table 4.3.1

Key reactor performance in 2016

Parameter	SM	RBT-6	MIR	RBT-10/2	BOR-60
Max power, MW	90	6	41.5	10	50
Utilization factor, relative units:					
scheduled	0.65	0.68	0.66	0.58	0.64
actual	0.69	0.68	0.66	0.58	0.61
Reactor operation time, days:					
scheduled	239	250	243	211	234
actual	251	250	243	211	224
Shutdowns	26	38	21	43	8
Unscheduled shutdowns	1	–	–	–	–

VK-50 reactor output

In 2016 the VK-50 reactor celebrated the 51st anniversary since its commissioning (Figures 4.3.2, 4.3.3 and Table 4.3.2).

Fig. 4.3.2. Key applications of VK-50 in 2016

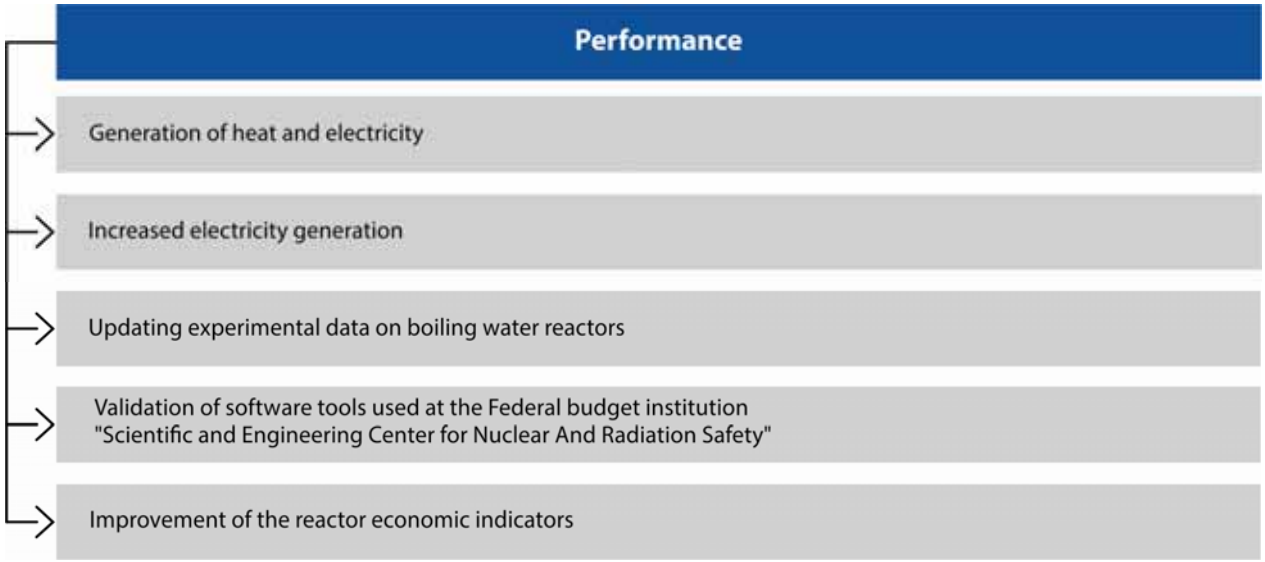

Fig. 4.3.3. VK-50 output in 2016

Table 4.3.2

Key performance of VK-50 in 2016

Parameter	Value
Max thermal power, MW	Up to 200
Electric power, MW	Up to 48
Operating pressure, MPa	5.5
Number of fresh FAs inserted at the beginning of a reactor run, pcs.	15
Core power density, kW/l	Up to 40
Average linear thermal flux density, MW/m^2	0.29
Burnup in discharged FAs, MWd/kg	24–28
Max operating lifetime of a FA, years	6
Heat rate (fuel elements), W/cm: average max	 180–220 290
Reactor operation time, days: scheduled actual	 324 309
Number of reactor shutdowns Unscheduled shutdowns	5 0
Generated power, MWh	1 152 334
Generated power: thermal, Gcal electric, MWh	 31 694 189 391

Plans for 2017 and future:

- To perform a calculation study on the fuel burnup criterion for the core additional sixth row FAs;
- To join innovation projects for the promising vessel-type boiling reactors;
- To carry out preparatory work for the VK-50 reactor decommissioning.

Reactor Materials Science, Methods to Test Materials and Nuclear Components

In 2016 research was continued in support of mixed nitride U-Pu fuel pins for the new generation fast reactors, such as lead-cooled BREST-OD-300 and sodium-cooled BN-1200 reactors. The work is carried out under the Federal Target Program titled "Nuclear Power Technologies of the New Generation for the Period of 2010–2015 and till 2020" and integrated program of calculation and experiments in support of dense fuel. The post-irradiation examinations (PIE) of fuel elements from a combined experimental FA after pilot operation in the BN-600 reactor were completed. The PIE objective was to obtain the most complete range of experimental data related to the state of irradiated fuel elements containing mixed nitride U-Pu fuel to validate the operational parameters and justify the performance of the fuel composition. PIE of the BREST-OD-300 dummy fuel pin with the same fuel and ЭП823-Ш (EP823-Sh) steel cladding were completed after the second cycle of irradiation in the dismountable irradiation rig in the BOR-60 reactor up to the maximal burnup 3.2 % h. a. The experimental data were obtained on the state of fuel and cladding after high-temperature irradiation with observed swelling. The examination results were needed to verify the fuel swelling and gas release model at the initial stage of irradiation. The initial examinations were completed for the fuel elements containing mixed nitride U-Pu fuel and standard fuel elements of the combined experimental fuel assembly after irradiation in the BN-600 reactor core during 290 effective days up to the maximal burnup of 3.8 and 5.2 % h. a., correspondingly, and the damage dose in steel of 37 dpa. The examination results show that during operation all fuel elements kept their integrity. Their state in terms of the key parameters, such as diameter, fuel condition, fission product distribution, gas release, is satisfactory, and they have not reached the end of their operational lifetime. In 2017 the examinations will be continued with the destructive ones.

The radiation resistance of electrical materials to be used in windings of standard electromagnetic pumps and electromagnetic pumps-throttles of the BN-1200 reactor was examined. The objective was to obtain the necessary experimental data on a change in the conductor material mechanical properties in order to justify the wire performance and to assess the wire isolation condition after irradiation under the design parameters. Tensile testing at 290 °C was performed for the reference samples and samples with stress raisers made of X18H10 (Kh18N10) steel. They were cut out from the hexagonal shroud of the BOR-60 reactor blanket assembly E-65 irradiated up to the maximal damage dose of about 150 dpa. The mechanical properties of these samples were determined. A range of impact bending tests was carried out for non-irradiated and irradiated samples made of 0X18H10T (0Kh18N10T) steel after treatment using the equal channel angular strain method. The obtained data show increased (compared to the as-delivered condition) radiation resistance of steel in the ultra-fine grade condition. Different titanium alloy samples were tested after irradiation in the MIR reactor loop channel. The most radiation resistant and structurally stable compositions were obtained. It was determined how the alloying element composition and concentration affect a change in the short-term mechanical properties of titanium alloys under the neutron irradiation.

In April 2016 two TVS-2M operated in the VVER-1000 reactor at the fourth power unit were delivered to JSC "SSC RIAR" from Balakovo NPP: the untight one used during one fuel campaign (24.36 MWd/kgU), and the reference one (57.17 MWd/kgU), as well as an absorber rod from the control and protection system operated during two and a half years in the automatic control mode containing absorber elements with a height-arranged absorber pellets stack. As for the first FA, the examinations show that there was an untight gadolinium fuel element in the third row of the bundle. It had a cladding defect under the twelfth spacer grid. It was debris damage that caused the loss of integrity and blind-end cladding damage of the neighboring fuel rod and grid cells where they were located. In July under the industry-based project titled "Zero Fuel Failure" three VVER-1000 TVSA were delivered for post-irradiation examinations from the Kalinin NPP's third power unit to find out the cause of fuel failure. Examinations of one leaky TVSA (40.07 MWd/kgU) were completed. A failed fuel element was detected in the outer row. It lost its integrity due to debris damage of the cladding with some foreign object located between the fuel element and the wall of the anti-vibration grid cell.

Thermal testing was performed for irradiated dispersion-type fuel elements with claddings made of high-nickel alloy 42XHM (42KhNM) of different design developed in JSC "VNIINM" for promising reactors. The test objective was to obtain experimental data to determine the maximum admissible temperature of fuel element operation with claddings made of this alloy.

Under the science project of the Russian Foundation for Basic Research it was examined how annealing affects the thermal conductivity coefficient of GR-280 graphite irradiated in the BOR-60 reactor. The obtained experimental data on the thermal conductivity coefficient as a function of temperature and time of annealing enable improving the accuracy in calculating the stressed-strained state of the RBMK graphite stacks under an increased operating temperature during long-term operation and under abnormal conditions accompanied by core overheating.

Radioisotope Production

In 2016 the key objective in radioisotope production was to increase the production output and sales. While keeping up traditional radioisotopes, this objective was met by increasing the production output of molybdenum-99, cobalt-60, iridium-192, californium-252, selenium-75 and strontium-89, making up 90 % of the sales (Fig. 4.3.4).

Molybdenum-99 production made the biggest contribution to the radioisotope sales (26 %). This radioisotope was delivered to Karpov Scientific Research Institute of Physics and Chemistry (NIFKhI), the National Nuclear Energy Commission of Brazil, and Argentina's Bacon Laboratories. The total calibrated activity of the products supplied to the customers made up 477.3 TBq (12,900 Ci). During the whole year except for the outage period of the reactor and process facilities, the products were delivered weekly, and during some months even twice a week. The weekly supplied products (6 day calibration) made up 17.39–18.5 TBq (470–500 Ci). The feasibility was shown to achieve the designed weekly output of 31.45–33.3 TBq (850–900 Ci) taking into account the necessary backup (10–15 % activity). Such production output required certain changes in the logistics clearly showing the necessity to optimize the supply logistics.

During the whole year improvements were continuously introduced into the process of irradiated target reprocessing, thus ensuring the necessary quality of the product, there were no claims from the customers. The number of non-conformities with the specifications and delivery dates did not exceed 3 % of the total supplies, which corresponds to the generally accepted standards and confirms the fact that our Institute is acting properly at a rather sophisticated and sensitive market in terms of reliability of medical-purpose short-lived radioisotope supplies.

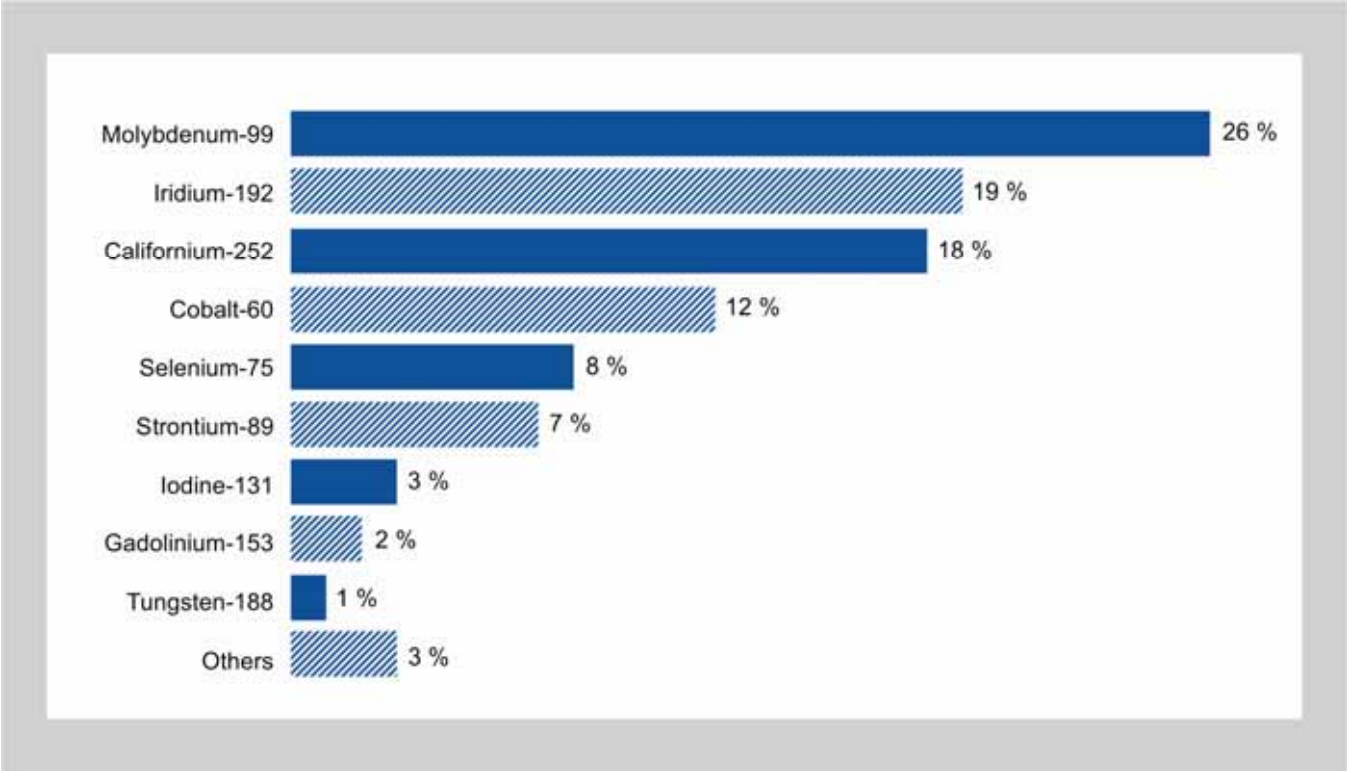

Fig. 4.3.4. Radioisotope sales pattern (2016)

To extend molybdenum-99 supplies, in 2016 three trial batches were delivered in special-purpose packages, which required working out non-standard logistics options. The results of trial batches certification and methods to inspect the product parameters were agreed with the end user. On request of a Japanese customer, another trial batch is going to be delivered in 2017, and after that the commercial supplies will start. For this purpose, certification of the special-purpose casks used by our Institute to ship molybdenum-99 was completed in Japan by Marubeni Utility Services, Ltd. efforts. The use of these casks was authorized in December 2016. One of the key conditions for molybdenum-99 supply to the European and U.S. markets is certification of the manufacturing process for compliance with the GMP requirements. In cooperation with JSC Isotope a project was launched on GMP certification of the JSC "SSC RIAR" manufacturing process and further issuance of authorization for product supply to the EU countries. Pre-audit of the molybdenum-99 manufacture process was performed by BeForPharma experts (Italy), based on which a plan was developed to prepare the manufacture for GMP certification. The certification is scheduled for 2017.

As for the sales, iridium-192 took the second place. In 2016 a new irradiation plan was implemented. It enabled a considerable increase in the amount of iridium loaded in the reactor, and for the very first time in June 2016 the iridium mass in the targets was about 465 g. This plan confirmed the feasibility both to improve the performance and keep to the product parameters for the customers to have at least 6.65 TBq/g (450 Ci/g) specific activity. It also improved the flexibility in response to a changing market condition, e.g., a dramatic increase in the iridium-192 demand. Should there be no increased demand, the suggested plan ensures accelerated accumulation of cobalt-60 in the same irradiation positions.

An important outcome of 2016 was fabrication and transfer of startup sources for Taishan NPP under construction (China) to our customer AREVA (France). The customer audited the neutron source manufacture process and quality management system of our Institute. During this audit, it was confirmed that the current quality management system complies with the international nuclear standards. Thus, this contract gave a precedent for RIAR-produced neutron sources to enter the international nuclear reactor construction market, which will greatly boost the export positions of our Institute. In addition to this contract, the neutron sources were supplied to Beloyarsk NPP, the sources were fabricated for Beijing CIAE-RIAR Radioisotope Technology. Co., Ltd. (China), and a great amount of sources was made for Source Radiographics (Aust.) Pty Ltd. (Australia) and some other customers.

Cobalt-60 was supplied to Beijing CIAE-RIAR Radioisotope Technology. Co., Ltd. This is an important achievement as the irradiated targets were processed under non-typical conditions using a specifically-made temporary manufacturing area, since a new neutron source manufacturing area is going to be commissioned only in 2017.

Despite a relatively small contribution to the total radioisotope sales revenue, the iodine-131 manufacturing process was among the important achievements of 2016. Iodine-131 was supplied weekly. It was produced at a manufacturing facility (modernized in 2013–2015) with the use of a new target area and a new multipurpose target design option that can be irradiated in the RBT reactors and SM reactor. The designed annual capacity of 92.5 TBq (2 500 Ci) was achieved, and the feasibility was shown to increase it. This was the first time since its establishment in 2000 when the iodine-131 manufacturing facility was operated under such conditions.

Refurbishment of the target fabrication area to accumulate transplutonium elements was completed. A curium target to accumulate californium-252 was fabricated. Its irradiation started in November 2016. The preparatory work is under way to fabricate targets with heavy isotopes of plutonium to accumulate curium. The commissioning of this area will enable reviving capabilities to produce transplutonium elements.

Twenty sealed alpha sources intended for space research were supplied to the Physical Research Laboratory of the Department of Space, Government of India (Ahmedabad, India). After successful U.S. and EU space missions to Mars and Churyumov-Gerasimenko comet where RIAR-produced alpha sources were used, our Institute carried on being involved in the international space programs and confirmed that it kept the earlier developed capabilities in developing special-purpose ionization sources.

There was steady demand in strontium-89, gadolinium-153, and tungsten-188. In 2016 trial batches of lutetium-177 were supplied, since the European market became more active. In 2017 commercial supplies of this radioisotope will start. Objectives for 2017 cover activities to develop the manufacturing capabilities. Among them are commissioning of the cobalt-60 sources manufacturing area, refurbishment of the iodine-125 manufacturing facility to increase the performance capacities, and revival of the large-scale lutetium-177 production as well as cesium-131 production. The next year key objective is to increase production and sales of molybdenum-99,

which requires corrective actions for the imperfections detected during regular large-scale production, and what is most important, certification of the production process to comply with the GMP requirements. This will make it possible for our Institute to enter the large European and U.S. markets.

MOX Fuel Fabrication

The main activity of the RIAR's Fuel Technologies Division is fabrication of vibropac oxide fuel for fast nuclear reactors (Fig. 4.3.5). The earlier performed R&D enabled establishment of a cutting-edge engineering base at this Division to fabricate granulated uranium or mixed U-Pu oxide fuel using pyro-electrochemical methods as well as FAs and fuel elements using vibropac method when the fuel slug is vibropacked directly in the cladding.

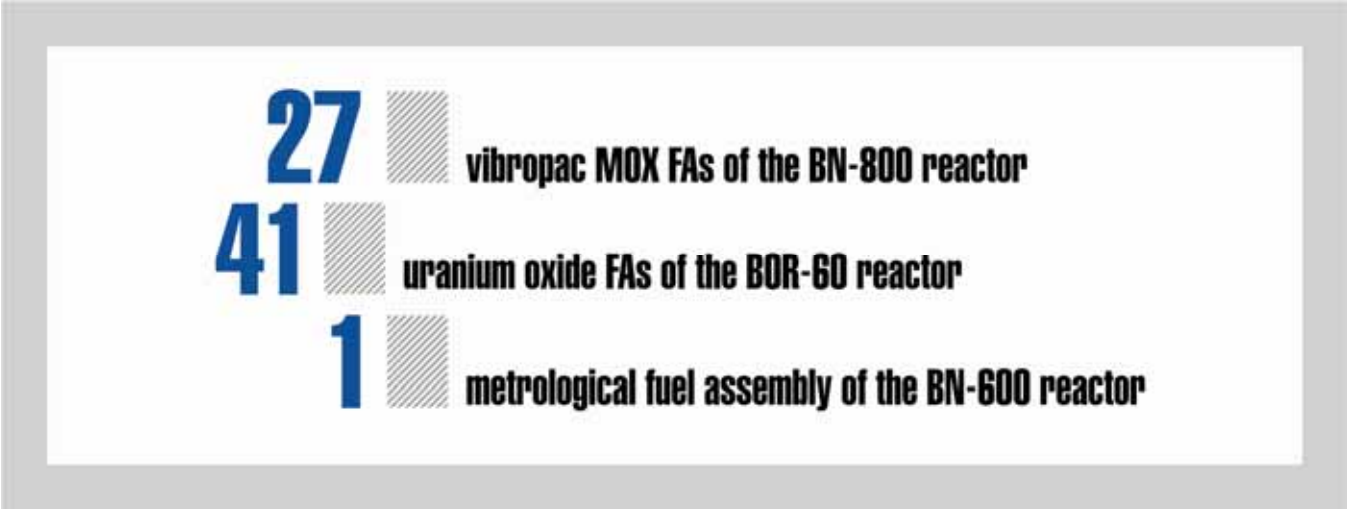

Fig. 4.3.5. Fabricated and customer-accepted fuel assemblies

Spent Nuclear Fuel Reprocessing and Radioactive Waste Conditioning

In 2016 spent nuclear fuel (SNF) reprocessing and radwaste conditioning operations were tried out under the Proryv (Breakthrough) project. Under the contract

for post-irradiation radiochemical examinations of the mixed nitride fuel, experimental data were obtained on the nuclide composition and mass fraction of uranium, plutonium, curium, neodymium, europium, cesium, cerium and tritium, as well as platinum group elements and transition metals in the mixed nitride U-Pu fuel irradiated with the use of a combined experimental FA in the BN-600 reactor. Investigations were carried out in support of the methods to determine the mass fraction of tritium, molybdenum, zirconium, rhodium, and palladium in this spent fuel solution. To enhance hydrometallurgical processing of high-burnup spent nuclear fuel after short-term storage, extraction systems were checked for internal alpha irradiation stability to evaluate their performance under high dose exposure. Alternative extraction processes were tried out to separate transplutonium elements from the PUREX first cycle raffinate. During the experiment no third phase, precipitate or interphase film was observed. It was continued to experimentally check refabrication of mixed nitride fuel with minor actinides. Carbothermal synthesis was performed for the mixed nitride (U, Pu, Am)N. To produce the given nitride composition, the conditions and modes to mix and sinter the initial dioxides of uranium, plutonium and americium were selected. The initial oxide powders were dispersed with soot and heat-treated under extra pure nitrogen. Ceramic pellets were later fabricated using heat-treated pressed-powder bricks, which were sintered under the extra pure argon-hydrogen (8 %) mixture. In these ceramic pellets produced by the carbothermal synthesis of the mixed nitrides (U, Pu, Am)N, plutonium and americium content was obtained. Their phase composition was examined as well. The plutonium-americium ratio was constant in the initial (Pu, Am)O_2 and in the produced mixed nitride U-Pu fuel powder and sintered pellet. It confirms that americium is fully kept in the fuel composition after sintering. To succeed in homogeneous inclusion of americium into the fuel compositions based on mixed nitride U-Pu fuel and to implement a concept of homogeneous additional burning of americium in nitride fuel of fast reactors, heat treatment, sintering and gas monitoring conditions were comprehensively tried out in fabricating fuel pellets. Laboratory experiments were continued to develop advanced pyrochemical reprocessing of dense SNF. To ensure that no residual UNCl occurred in anodic dissolution of nitride pellets at potentials below the uranium (IV) chloride potential, experiments on anodic dissolution of uranium nitride pellets were conducted. In electrolysis of nitride pellets it was experimentally validated that no residual UNCl occurred. Experiments were carried out to fuse zinc, uranium nitride and ЭП823 (EP823) steel. It was shown that zinc "wet out" uranium nitride pellets, and an additional process not covered by the current technology was necessary to remove traces of zinc from the pellets surface. Uranium nitride pellets were stable in molten media, and their destruction in the experiments conducted before by Siberian Chemical Combine (JSC "SKhK") and the Institute of High Temperature Electrochemistry of the Ural Branch of Russian Academy of Science (IHTE UB RAS) was associated with low quality of the used dummies. The process to prepare electrolyte using "soft"* chlorine treatment of uranium metal was checked experimentally. The average rate to dissolve uranium metal with cadmium chloride was more than 0.6 g/(hcm^2) with obtaining 15.1 % mass fraction of uranium in salt. To enhance the methods for online analytical monitoring of SNF pyrochemical reprocessing parameters, experiments were carried out on application of the laser-induced breakdown method. It was experimentally shown that this method could be used for ongoing in-process monitoring of dissolution.

* A process to dissolve actinides in molten salt by chemical exchange of a more electropositive element with chloride or electrolytic refining of nitride fuel in a hot cell.

To develop an innovative process for reprocessing of spent nuclear fuel in molten molybdate, a method to remove excessive molybdenum oxide was checked experimentally in order to reduce residual concentration of nuclear materials in electrolyte. The latter is the key challenge in introducing molten molybdate as a promising medium for reprocessing. A way was found to remove excessive molybdenum oxide with ensuring low content of residual actinides in electrolyte.

Thus, in 2016 research was successfully continued in support of all stages of SNF reprocessing and radwaste management. The near-term plans are to continue research in promising trends and verify the results of laboratory experiments with real spent nuclear fuel.

Shipping Services

Keeping in mind that radioisotope shipments are an integral aspect of the production cycle, JSC "SSC RIAR" pays particular attention to building logistic capabilities, updating special-purpose equipment, optimizing logistics setups and improving the quality of the rendered services in full compliance with the safety requirements. At present, JSC "SSC RIAR" arranges shipment of Russian radioisotope products including RIAR's own products and products made by other Russian companies not only to Russia and CIS, but also to the EU Member States, such as Germany, Czech Republic, Poland, Spain, France, etc. Our Institute has a great number of special-purpose shipping casks that have international certificates for the shipment of radioactive goods and special-purpose vehicles equipped according to the European Agreement concerning the International Carriage of Dangerous Goods by Road (Fig. 4.3.5).

Fig 4.3.5. Special-purpose vehicles of JSC "SSC RIAR"

At present, RIAR's vehicle fleet includes ten trucks of different capacity. In 2016 there were about 300 shipments of radioisotopes. A considerable number of road shipments were done to the near and far abroad.

Along with shipment of radioisotopes, RIAR's logistics departments render multiple services to the Russian and international customers on arranging and ensuring site delivery and return of other products involved in research and production. For example, nuclear fuel samples, structural materials and natural minerals treated by irradiation. JSC "SSC RIAR" is a member of the EORI. It has the unique code assigned to the companies involved in transit of goods and filing customs declarations to the EU Member States. JSC "SSC RIAR" has a permanent license of the National Atomic Energy Agency of Poland for the transit and carriage of radioactive materials in Poland and a license for the carriage of high-level radioactive materials in the Czech Republic expiring on December 31, 2020.

JSC "SSC RIAR" is targeted at further building logistics capabilities to enhance its performance and render a full range of services to meet Russian and international customers' requirements.

The **ANNUAL SCIENCE REPORT OF JSC "SSC RIAR"** gives more details about 2016 activities carried out in nuclear research reactors MIR, RBT-10/2, BOR-60, SM, RBT-6, and VK-50 and critical test facilities of reactors SM and MIR, as well as research in fuel elements and reactor materials, fuel and nuclear fuel cycle components, transuranium elements, radionuclides and ionizing sources, SNF and radwaste management, radiation and environmental safety. This Report covers the key research performed at RIAR in 2016: http://niiar.ru/annual_report

4.4. International Activities

In line with efforts to enhance the effectiveness of utilization its unique experimental capabilities and increase the portfolio of overseas orders, JSC "SSC RIAR" is ambitiously building international R&D and developing relationships with international customers. In 2016 the earlier research was continued and new contracts were signed. Fifteen technical reports in paper and electronic versions were issued and handed over to our customers under more than ten long-term contracts in full compliance with the export control requirements based on licenses issued by the Federal Service for Technical and Export Control.

The international customers of JSC "SSC RIAR" have traditionally been companies and national labs from France (AREVA, CEA), the USA (TerraPower, ANL), the Republic of Korea (KAERI), Ukraine, Japan, etc. During 2016, RIAR experts held active dialogue with international partners and performed pre-contractual activities on preparing new long-term contracts to perform irradiation, PIE, research in materials science, radiochemistry and minor actinides handling.

Among the key 2016 achievements confirming that JSC "SSC RIAR" is a recognized world's center for research in support of sustainable development of the world's nuclear power are as follows:

- Signing of the memorandum of understanding on scientific and technical cooperation between JSC "SSC RIAR" and KAERI on June 2, 2016 in Dimitrovgrad*. (Fig. 4.4.1).

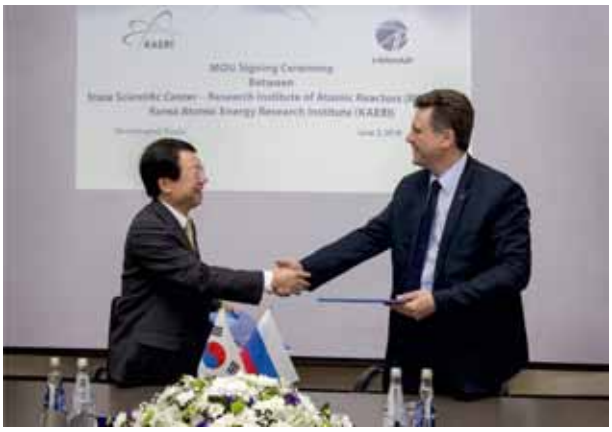

Fig. 4.4.1. Memorandum signing ceremony

- JSC "SSC RIAR" became an IAEA designated International CEntre based on Research Reactors (ICERR) to implement joint research and development projects**. The plaque designating RIAR as an IAEA International CEntre based on Research Reactors was handed over in Vienna on September 26, 2016 (Fig. 4.4.2). The official ceremony was preceded by great preparatory work done by RIAR and ROSATOM experts in cooperation with the IAEA representatives. The ICERR audit mission team was led by Andrea Borio di Tigliole, Head of the IAEA's Research Reactor Section at the Department of Nuclear Energy. During the visit to the RIAR's site in July 2016, he noted wide experimental capabilities of our Institute, its great expertise and high level of motivation of its employees.

* For more details check the official website of JSC "SSC RIAR": http://niiar.ru/node/4307.

** For more details check the official website of JSC "SSC RIAR": http://niiar.ru/node/4374.

Fig. 4.4.2. IAEA Director General Yukiya Amano and Rosatom CEO Sergey Kirienko at the official ceremony during the IAEA's 60th General Conference

- The OECD Nuclear Energy Agency team led by Jim Gulliford, Head of the Data Bank visited JSC "SSC RIAR" on October 17–18, 2016 (Fig. 4.4.3). The RIAR's Management and NEA's experts outlined the promising cooperative venues and agreed on the efforts to utilize the research capabilities of our Institute in implementing international projects and encourage RIAR's experts to join international project teams and expert groups.

Fig. 4.4.3. OECD NEA representatives during their visit to RIAR

In 2016 RIAR's scientists and experts joined different working groups, technical meetings and workshops held under the auspices of international organizations. RIAR's professionals attended more than 20 international scientific and technical conferences making presentations on the key outcomes and promising trends of RIAR's activity, including well-regarded events, such as:

- International Sci-Tech Workshop on Experience in Operating Russian-Produced Nuclear Fuel at VVER-1000 NPPs (Nesebar, Bulgaria);
- 9th International Conference on Nuclear and Radiochemistry (Helsinki, Finland);
- 29th Annual Congress of the European Association of Nuclear Medicine (Barcelona, Spain);
- Fifth International Conference "Engineering of Scintillation Materials and Radiation. Technologies" ISMART 2016 (Minsk, Belarus);
- 37th International Workshop on Reduced Fuel Enrichment for Research Reactors (Brussels, Belgium).

During 1–3 June 2016 ROSATOM's Innovation Management Division held an international workshop at RIAR on establishment of the MBIR-based International Research Center*. This workshop (Fig. 4.4.4) was attended by Russian companies and enterprises of ROSATOM, the IAEA experts, as well as representatives from CEA, Institute for Energy Technology (Halden), Belgium Nuclear Research Centre (SCK•CEN), Korea Atomic Energy Research Institute (KAERI), Japan Atomic Energy Agency, South African Nuclear Agency Corporation, TerraPower (USA) and Nuclear Research Institute Rez (ÚJV Řež, a. s.).

* For more details check the official website of JSC "SSC RIAR": http:// niiar.ru/node/4303.

Fig. 4.4.4. Workshop on establishment of the MBIR-based International Research Center

JSC "SSC RIAR" being the basic organization of the CIS member states in ensuring safety of the nuclear research installations finalized and issued a book titled "Nuclear Research Installations of the CIS Member States"* with the financial support of the IAEA. The book presents updated complete data related to 80 research reactors, critical and subcritical facilities available at the experimental sites of 23 organizations from five member states (Fig. 4.4.5).

Fig. 4.4.5. Book on nuclear research installations of the CIS member states

Traditionally, the infrastructure and experimental facilities of our Institute attract great attention of the international experts. RIAR's site is visited both by our international customers to review the current work progress and discuss the outcomes and by our potential partners who seek to conduct research or radioisotopes supply.

In 2016 150 professionals from 17 countries from all over the world visited JSC "SSC RIAR".

To ensure sustainable development of the international R&D and encourage young employees to be engaged in collaboration with international customers, the English language courses are delivered for RIAR's scientists and engineers. In 2016 more than 30 RIAR's professionals attended the English language courses. The training was provided by RIAR's highly professional interpreters. The first outcomes were greatly appreciated by the RIAR's Management. In 2017 the English language courses will be continued.

In 2016 consistent efforts were made aimed at creating a sustainable platform and further building international activities and R&D collaboration with RIAR's international partners. Following the results of 2016, the portfolio of overseas orders was about USD 60 mln, and multiple international contracts clearly show that the experimental capabilities of our Institute, scientific expertise of its professionals and science-intensive products are in great demand and are competitive at the world's high-tech market.

* For more details check the official website of JSC "SSC RIAR": http://www.niiar.ru/node/3860.

4.5. Human Capital

HR management is one of the most labor-intensive processes in the organizational management affecting directly the integrity and effectiveness of the business processes at the Institute. The current HR management system serves a great number of functions, and every system process has many of its own subtasks. The HR team seeks to provide RIAR with highly-qualified and skilled staff and improve its performance.

Summarizing the 2016 outcomes, it should be noted that the staff turnover in 2016 decreased making up 1.21 %. The average age of the staff stood at 45.6, which is the most fruitful time in human life. Continuing the mentorship traditions, 323 staff members are mentors for young employees and newcomers.

Enhanced IT systems enable RIAR to keep statistics on HR processes, review and interpret the results. The HR management team deals mainly with the staff sourcing, recruitment, engaging, onboarding and training. RIAR collaborates with higher educational institutions in education and training, which suggests joint R&D activities besides RIAR's involvement in the basic educational programs. There are 48 current agreements with 27 Russia's higher educational institutions and cooperation agreements in different areas of activity. In 2016, 510 undergraduates received hands-on training at RIAR.

In 2016, RIAR's staff members and veterans of labor enjoyed benefits and guarantees under the current collective bargaining agreement. The housing program continued to be implemented to include 34 more staff members. Support was provided for retired employees, as well. A voluntary health insurance agreement was signed for the employees to undergo medical rehabilitation at Russian health resort and rehabilitation centers and get additional medical care.

Without any doubts, 2016 made a good start for our Institute to resolve complicated tasks in the future. Highly qualified staff, great potential and willingness to achieve the set goals will allow us to successfully meet all objectives.

Human Capital Management

The most precious RIAR's value is a team of highly-expertized professionals who help us to achieve good results over all these years. That is why the key components of RIAR's social policy are staff training, development, motivation, social programs and social responsibility. All these aspects are set forth in a collective bargaining agreement, which is applicable to all staff members of the Institute (Fig. 4.5.1). The human capital management strategy is based on the RIAR's mission and the top priorities of ROSATOM (Table 4.5.1). It is human resourcing to ensure viable business aiming at a maximized shareholder value of the Institute, its fully functional business model within the scope of strategic objectives, as well as a considerable growth in the business scope and profitability due to human capital augmentation, which implies both an increased number of the staff and capacity building, career and professional development, and better working conditions.

G4-11

Fig. 4.5.1. RIAR s staff co r c

HR management regulating documents

- Labor Code of the Russian Federation.
- Agreement on nuclear power, industry and science for the period of 2015–2017.
- Common procedure on performance management of ROSATOM and its organizations.
- Code of Conduct of JSC "Science and Innovations" and organizations under its supervision.
- Charter of JSC "SSC RIAR".
- Internal work regulations of JSC "SSC RIAR".
- Standard of Enterprise STO KP 086-416-2016 "Integrated Management System of JSC "SSC RIAR". HR Management".
- Provision on performance appraisal of JSC "SSC RIAR" staff members.
- Labor bargaining agreement between JSC "SSC RIAR" and its staff members (effective 2014–2017).
- Main provisions on work arrangement for JSC "SSC RIAR" staff members.

Table 4.5.1

Human capital management strategy of JSC "SSC RIAR"

Aspect	Activities
Human resourcing in compliance with the HR Policy of JSC "SSC RIAR"	• RIAR is provided with highly-qualified and skilled professionals through attracting best experts, staff efficient selection, training and development, implementation of the integrated assessment system and career planning. • The talent-pool development program is enhanced to make well-arranged selection and appointment of the candidates to the key positions using RIAR's own internal talent pool; compiled are succession plans for the critical positions. • A knowledge management system is implemented and motivation is provided to keep and transfer the key knowledge to young professionals using the mentorship system.
Enhancement of HR management efficiency	• The unified HR management system is operational making the following processes computer-aided: keeping the organizational structure and schedule; HR management; working time schedule and recording; payroll; employee performance management; analytics and statistical reporting; paperwork related to business travels, vacation schedule, financial aid to the staff members; preparing and approval of award documents. • Involvement in the projects on introducing the ROSATOM production system, thus enabling HR services to be improved, and the work of the HR service to be arranged in a more efficient way. • Reduction in the staff costs including reduced travel costs and healthy meal costs, decreased insurance amount as a result of assigning relevant subclasses of the working conditions to the staff working in harmful conditions.
Development of corporate culture targeted at outcomes, self-enhancement and innovations	• Common principles and approaches on HR management are ensured in all presence regions taking into consideration local peculiarities. • Use of ROSATOM values to attract professionals and build their career. • Updated is the *Code of Conduct of JSC "Science and Innovations" and organizations under its supervision*. This Code sets forth the rules and regulations of business communication. It describes the principles of ethical conduct serving a tool to prevent possible violations and disputes. New staff members agree that they accept the Code provisions by personal signature on an acceptance sheet kept on a personal data file. • Participation in the surveys on ROSATOM's staff involvement

Social policy and HR management outcomes

As at December 31, 2016 the total number of RIAR staff members was 3,349 including 3,317 full-time employees and 32 part-time employees. Compared to 2015, the number of employees decreased by 8 %, which resulted from the implementation of the financial rehabilitation program in 2016 to optimize the number of the staff members. The average age of the staff members is 45.6, the percentage of the staff members aged 35 or less is 26.2 %; 1,806 (53.9 %) staff members out of 3,349 have higher education degrees including 443 (24.5 %) employees who have industry-specific education. Figures 4.5.2–4.5.8 provide a more detailed staff overview. In 2016, staff turnover made 1.21 %, which is by 0.33 % less than the one in 2015. In 2016, 112 staff members had the right for maternity and parental leave and took this benefit; 30 staff members returned to work after maternity and parental leave; and 28 staff members continued working during 12 months after they returned from maternity leave. In accordance with the labor law, the minimum period to notify the employees about important changes in the company's activities is stated in the labor bargaining agreement making up at least two months.

G4-10

LA3

LA4

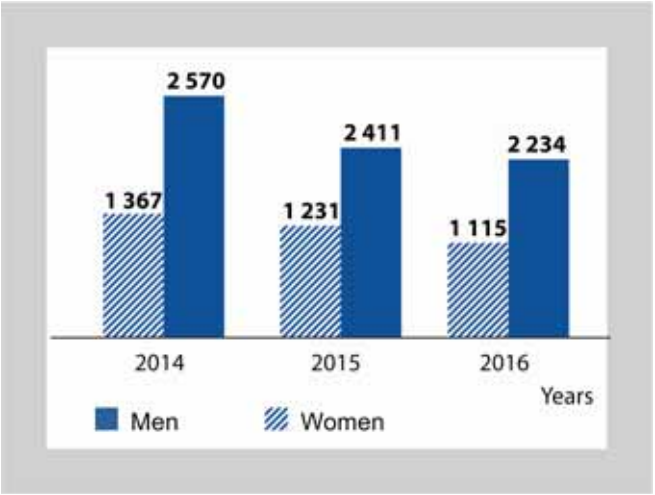

Fig. 4.5.2. Number of the staff by gender

LA1

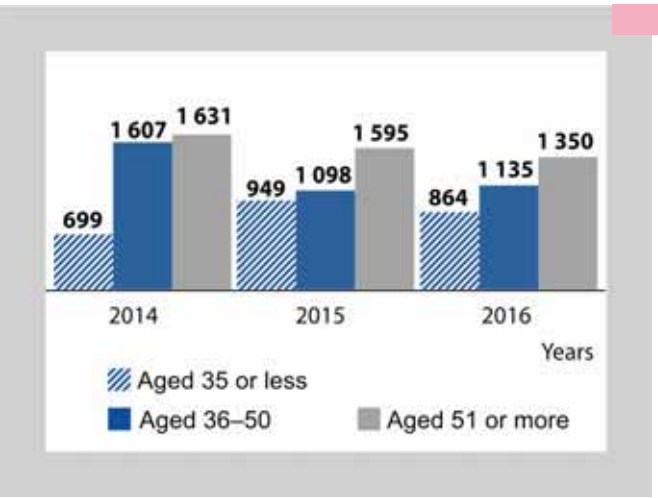

Fig. 4.5.3 Number of the staff by age

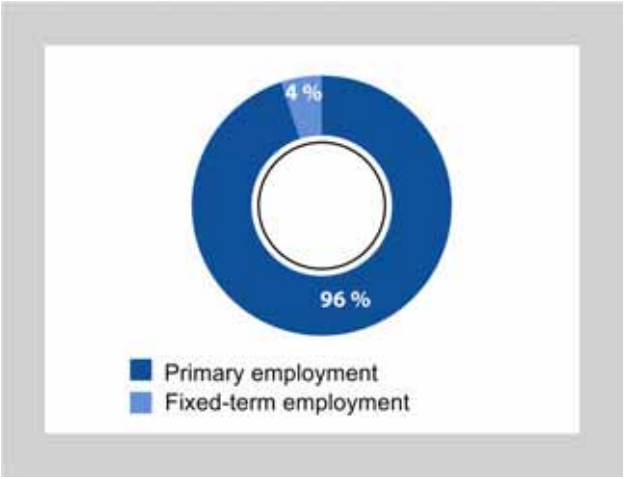

Fig. 4.5.4. Total labor force by the contract type

LA12

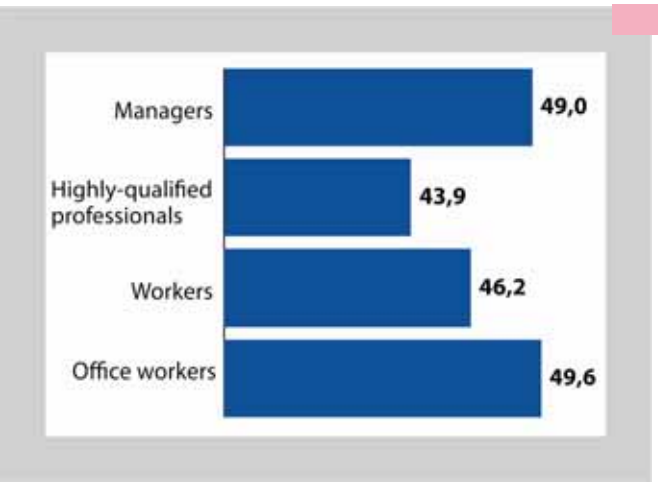

Fig. 4.5.5. Average age of the staff members

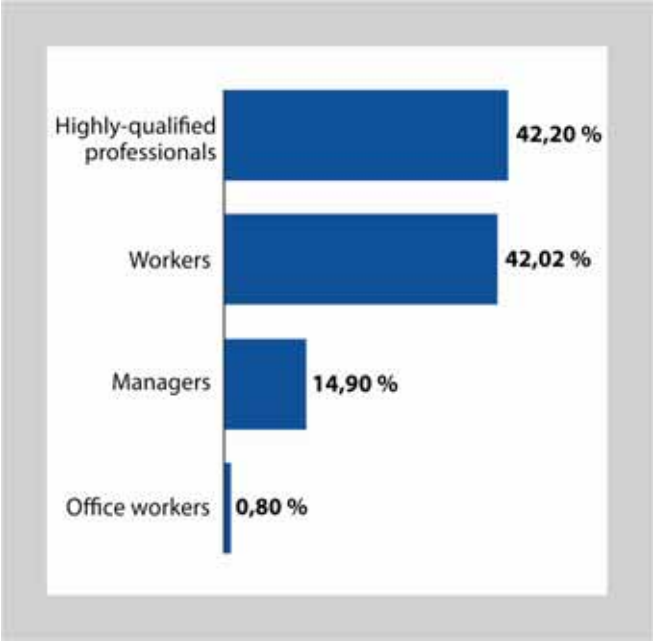

Fig. 4.5.6. Staff structure by categories

LA12

Fig. 4.5.7. Staff composition and structure by categories and age

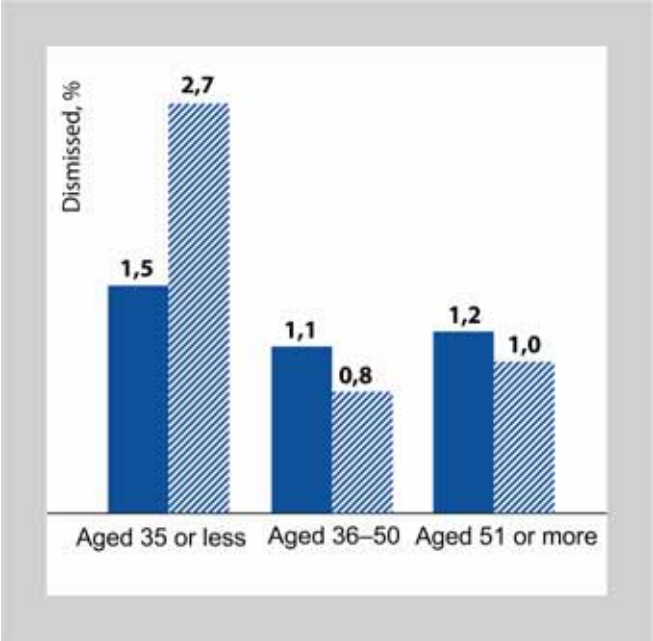

Fig. 4.5.8. Staff turnover by age and gender

Remuneration

The remuneration system of JSC "SSC RIAR" and employee benefits are targeted at compensation in exchange of good production and economic outcomes, performance enhancement and professional development. A provision on remuneration in RIAR is based on the *Unified remuneration system (URS)*. One of the remuneration basic principles in RIAR is providing equal opportunities for different age-gender groups. Salaries of the staff members depend on their position, professional capabilities and outcomes (Fig. 4.5.9). At that, there is no difference between the men's and women's basic salary. JSC "SSC RIAR" exercises its best efforts to assess the outcomes of its employees in a decent way. Our Institute offers competitive minimum and average wages. In accordance with the industry's agreement on nuclear power, industry and science for the period of 2015–2017, RIAR undertakes to set the minimum wages at the 1.3 living wage and higher (Table 4.5.2). By late 2016 the minimum wages made up 13,300 rubles.

LA1

According to economists and sociologists, one of the key components illustrating social tension among the staff members is a decimal coefficient that describes contrast in wages between 10 % high-paid and 10 % low-paid staff. The world's best practice considers this coefficient ranged from four to six to be

optimal. In recent years our Institute has the optimal decimal coefficient (Fig. 4.5.10).

The reporting year shows a growing trend in terms of labor productivity and average wage compared to 2015 (Fig. 4.5.11). Labor productivity growth made up 35 %, and average monthly wage growth was equal to 21 %. In 2016, RIAR's staff expenses were 2, 204 million rubles (Table 4.5.3).

Table 4.5.2

Minimum wages averaged

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Job	Average, thou. rubles	
	RIAR	Dimitrovgrad
Cleaning manager	13.5–15	9–12
General worker	15–16	10–12

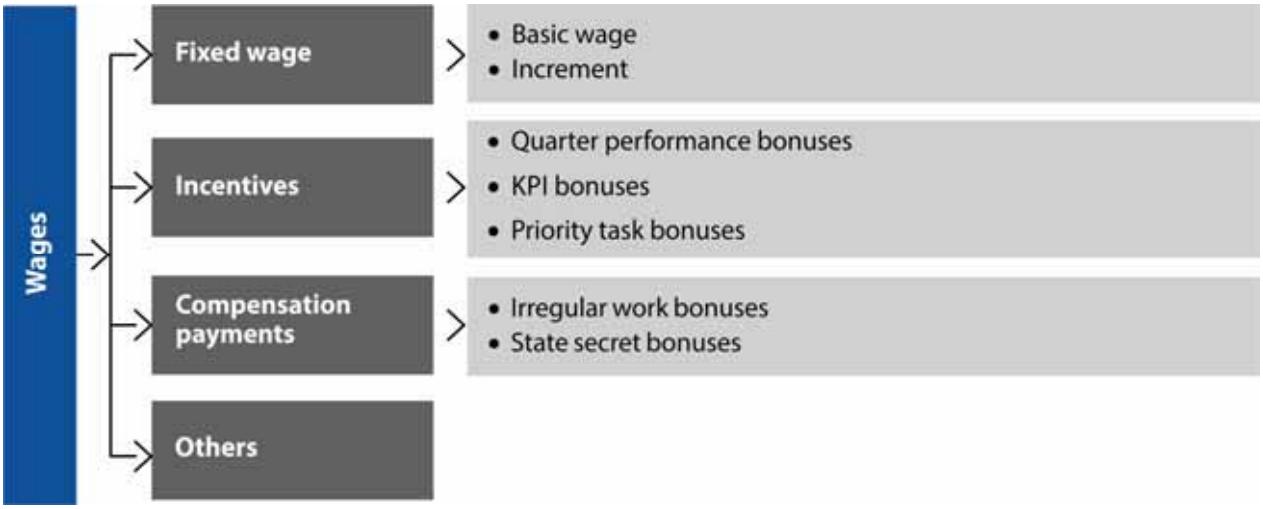


Fig. 4.5.9. RIAR wage structure

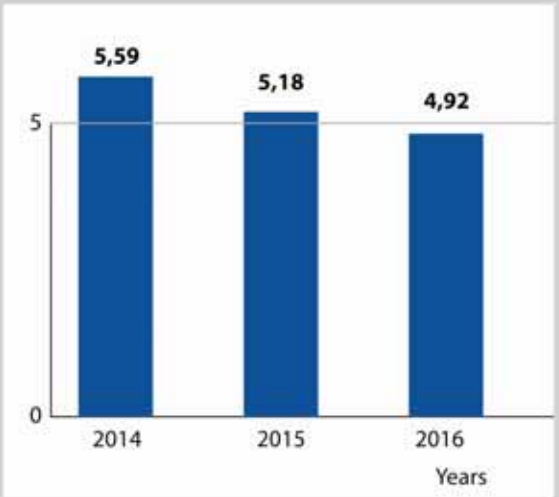


Fig. 4.5.10. Decimal coefficient 2014–2016.

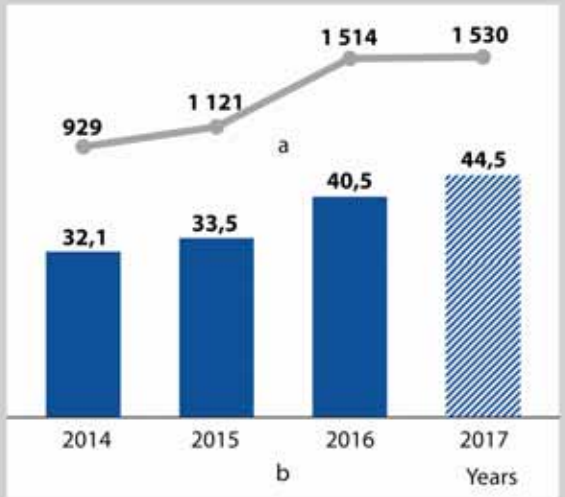


Fig. 4.5.11. Dynamic pattern 2014–2016 and future:
a — labor productivity (thou. rubles/person);
b — average monthly wages (thou. rubles)

Table 4.5.3

Staff expense structure

Name	Value by year, million rubles		
	2015	2016	2017
Staff expenses	2 041	2 204	2 372
Including Payroll	1 492	1 653	1 770
Social expenses	37	34	32
Staff recruitment and development expenses	2.6	1.8	4.5
Taxes (insurance)	509	515	566

Social Policy and Corporate Culture

In compliance with the labor laws, the labor relations at RIAR are regulated by a collective bargaining agreement intended for all staff members (Fig. 4.5.12).

Fig. 4.5.12. Purposes to regulate labor relations at RIAR

JSC "SSC RIAR" provides employment for each of its staff members under the employment contract and acts in accordance with the Russian law, the Charter of RIAR, industry's agreement and collective bargaining agreement to keep working positions. Any change in the activity of RIAR and its subdivisions including liquidation, change in ownership or legal form, full or partial suspension of production resulting in worse working conditions or reduced staff number, could only be possible after prior notice at least three months before such changes take place. Within the framework of the common social policy of ROSATOM and corporate social programs, RIAR annually increases expenses (Table 4.5.4).

Table 4.5.4

Social expenses in 2016

Indicator	Actual expenses, thou. rubles
Social expenses	28 580.0
Payments to retirees	4 499.0
Vouchers to recreation centers for children	1 639.0
Social payments	17 401.0
Financial assistance to the staff members	8 114.0
Financial assistance to young professionals when employed	184.0
Payment (partial compensation) for housing rent	2 229.0
Supplementary incapacity allowance exceeding the amount stated by the Russian law	0
Additional leave (above the standard value established by the Labor Code of the Russian Federation)	6 472.0
Childcare benefit for children aged 3 or less	402.0
Cultural and social events	2 546.0
Trade union	1 612.0
Sport events	791.0
Insurance	4 788.0
Healthcare	1 205.0
TOTAL*	34 481.0

* Excluding healthy meals and charity.

Housing program

In 2016, RIAR continued the implementation of a housing program launched in 2015 to attract young professionals and improve their living conditions. This program enables young professionals and highly-qualified experts to buy flats at reduced rates: 28,000 rubles per square meter (while the average rate in Dimitrovgrad is 36,000 rubles per m^2.) In addition, the program offers an interest-free loan to make initial payment for those who want to take out a mortgage to buy a flat. This loan amounts to 300,000 rubles for young professionals and 150,000 rubles for highly-qualified experts. The initial payments under the loan can be made in two years, and the whole loan can be paid during 10 years at most. In 2016, 12 interest-free loans were given to young professionals and 18 such loans were received by highly-qualified professionals. The total amount of such loans was 6 million rubles. During 2015-2016, 156 professionals bought flats under this program in this new housing area (Fig. 4.5.13).

Fig. 4.5.13. New housing area

Health enhancement

Annually, RIAR performs rehabilitation activities in a health resort center under its supervision for its staff members and retirees who need health resort and preventive treatment for medical reasons (Fig. 4.5.14). In 2016, 438 RIAR staff members and 148 retirees improved their health condition. For the first time under the health enhancement program, four health campaigns were arranged for RIAR's staff members and their children to include 91 children. As for children health holiday camps in Dimitrovgrad and Ulyanovsk region, 155 RIAR staff members were partially paid 1, 639, 000 rubles for vouchers.

In 2016, a deposit agreement was signed with the insurance company "SOGAZ" amounting to around 3 million rubles on rendering medical services to RIAR's staff members under voluntary health insurance agreements.

Fig. 4.5.14. Medical services rendered under voluntary health insurance agreements

Corporate culture

The key 2016 event was celebration of the 60th anniversary since RIAR establishment (Fig. 4.5.15). A great number of events were held in Dimitrovgrad attracting over 11 thousand people. The official ceremony to award nuclear professionals was held at the Slavsky Conference

Hall. Traditionally on that day the Scientific Board grand meeting took place attended by the representatives of ROSATOM companies, management of many public organizations, educational institutions, and nuclear experts. On that very day a ceremony of planting lilac walkway was held. The Youth Board and Veterans Board of RIAR, as well as RIAR's management and dear guests joined the time capsule burying event. The time capsule contained messages to the next generations of nuclear professionals. An intellectual quiz show dedicated to the RIAR's 60th Anniversary was held among secondary school teams. As for the sport events coinciding with the RIAR's jubilee celebration, a massive bike ride took place on Physical Education Day. The bike ride was joined by 47 families of the RIAR's staff members (Fig. 4.5.16).

Fig. 4.5.15. Official ceremony to celebrate the 60th anniversary since RIAR establishment

Fig. 4.5.16. Bike ride participants

Another key event arranged at the initiative of ROSATOM's Public Council was the municipal phase of an All-Russian creativity contest to perpetuate the living history of the emergence and development of the Russian nuclear industry. The contest main objectives were to transfer the knowledge and best practices from older generations to the younger ones and educate young people for allegiance to the country, respect for older generations, and pride in the Russian nuclear industry achievements. About 400 schoolchildren from Dimitrovgrad took part in this event. The video clips contained the information about more than 30 RIAR's veterans (Fig. 4.5.17).

Fig. 4.5.17. Participants of the creativity contest

On the eve of Nuclear Industry Day, a book titled "RIAR — 60th Anniversary: People, Years, Achievements" was presented. More than fifty RIAR's professionals were involved in making this book (Fig. 4.5.18). In 2016, the book copies were handed over to 105 RIAR's veterans.

Fig. 4.5.18. Handing over the books to RIAR's veterans

In 2016, a traditional Youth Forum was held through scientific, cultural and sports collaboration between JSC "SSC RIAR" and DETI NRNU MEPhI with the support of the Nuclear Innovations Cluster Development Center with a goal to create conditions for the youth professional, creative and public self-fulfillment. This forum was attended by 80 participants. All the participants were divided into two educational flows: RIAR's young professionals and students. The training course covered lectures and practical training on project management, integrated project risk management methods, innovative manufacturing process management, goal focus, etc. For the first time at this forum, an on-the-job training reports competition was held among the students. The students with the best reports won money certificates and souvenirs with corporate logos (Fig. 4.5.19).

Fig. 4.5.19. Participants of the traditional Youth Forum

In November 2016, Ulyanovsk and Dimitrovgrad welcomed a science film festival held by a network of the nuclear energy information centers with the support of ROSATOM. The festival covered several municipal areas where science films were shown, lectures and workshops took place.

In 2016, JSC "SSC RIAR" became the first among other companies in Ulyanovsk region to participate in the regional phase of the All-Russian physical culture campaign "Ready for Labor and Defense". Following the 2016 results, over 50 RIAR's staff members successfully reached the qualifying standard winning sixteen golden "Ready for Labor and Defense" marks, four silver and four bronze marks (Fig. 4.5.20).

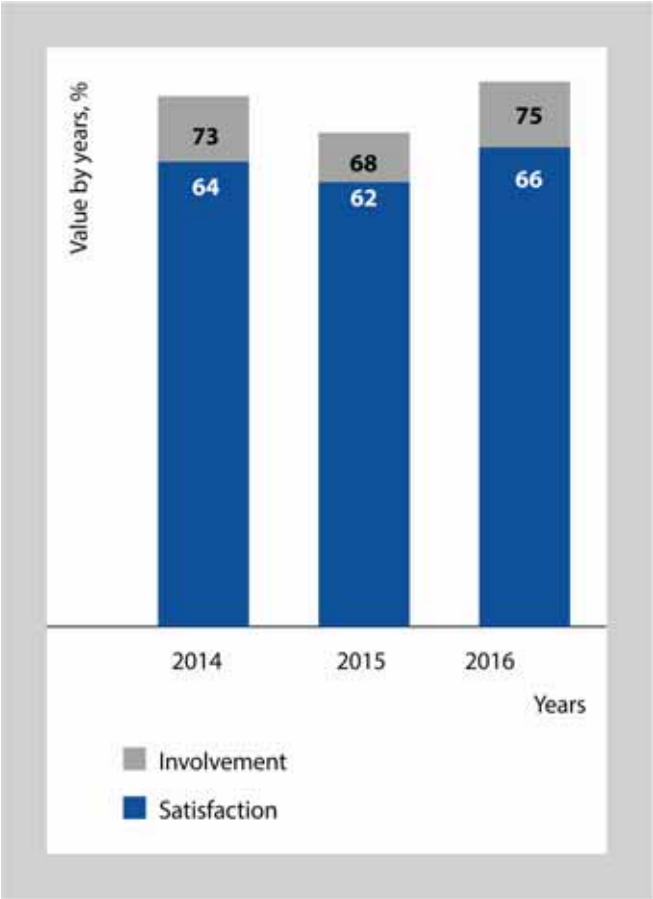
In 2016, activities were carried out targeted at creating and developing a networking system of educational institutions of all types to ensure HR development and establish a modern library center in order to improve public awareness and ensure sustainable intellectual and cultural development. Multiple wide-scale cultural events took place, such as quiz show; opera festival; theatre festival; international music festival; All-Russian jazz festival under the ROSATOM's "Territory of Culture" project; multiple exhibitions; on-stage performances; professional and industry's celebrations.

Fig. 4.5.20. Alexey Koshaev, Mayor of Dimitrovgrad, and Stanislav Donets, Swimming World Champion, giving the "Ready for Labor and Defense" marks to RIAR's staff members. Reaching the qualification standards

Staff involvement

Annually, RIAR conducts an involvement survey, which is the key indicator of how staff members perceive their work in RIAR. In 2016 questionnaires were distributed among 747 employees from 15 RIAR subdivisions (Figs 4.5.21, 4.5.22, Table 4.5.5). The results obtained from these questionnaires and focus groups are used by the RIAR management to compile annual plans on improving the involvement rate.

4.5.21. Staff survey



4.5.22. Questionnaire results

Table 4.5.5

Involvement survey data

Factor	Value by years, %		
	2014	2015	2016
Top managers	48	47	39
Line managers	70	69	71
Colleagues	74	75	72
Staff value	48	49	38
Scope of work	75	74	76
Satisfaction with results	76	76	78
Independence	62	64	62
Resources	44	48	43
Processes	50	52	51
Wage	35	29	31
Fringe benefits	48	47	40
Acknowledgement	48	41	39
Career opportunities	47	50	49
Training and development	57	55	55
Feedback	68	65	64
Employer reputation	60	54	55
Employer image concurrence	58	54	59
Work/personal life balance	68	65	65
Working conditions	73	70	71

HR Policy

Highly-qualified and skilled professionals

The key projects on RIAR development require involvement of highly-qualified professionals. Therefore, RIAR management pays much attention to sustainable staffing. In our Institute there are current programs on interaction with young people and mentorship development, as well as the *Provision on Hands-on Training of Students in JSC "SSC RIAR"*. Campaigns involving schoolchildren are targeted at their career orientation and understanding the prospects of training in RIAR-needed specialties. Such campaigns include, for example, open days and career fairs arranged in Dimitrovgrad, Ulyanovsk, and Kazan on the basis of DETI NRNU MEPhI, UlSU, UlSTU, Kazan State Power Engineering University, etc. RIAR management, HR Office and PR Office professionals are greatly involved in such campaigns. This interaction with young people will provide further RIAR staffing with local population. Keeping this objective in mind, RIAR arranges regular technical visits to its site: annually, schoolchildren and students of Dimitrovgrad, Ulyanovsk and neighboring regions like Samara and Penza region, and the Republic of Tatarstan visit our Institute (Fig. 4.5.23, Tables 4.2.4 and 4.2.5).

Fig. 4.5.23. Schoolchildren on a technical tour to RIAR

In 2009 the Children Nuclear Medical Academy was established in Dimitrovgrad, and since then it has been functioning successfully. The major Academy objective is in-depth learning of practical aspects in Physics, Chemistry, IT and foreign languages. The Academy aims at developing individual's motivation to learning and creativity, providing additional opportunities to meet educational needs of children and teenagers in out-of-school activities and leisure time. Lecturers at the Academy are RIAR researchers, leading Russian scientists and university professors from Dimitrovgrad, Ulyanovsk, and Moscow.

The key indicator describing RIAR interaction with young people is employer-sponsored target enrolment of school leavers in leading higher educational institutions to be trained in RIAR-relevant specialties. Following the 2016 results, 24 persons including 6 postgraduates enrolled eight higher educational institutions of Russia under the employer-sponsored education program. Employer-sponsored training of RIAR employees is performed in accordance with the *Collective bargaining agreement for the period of 2014–2017*. At present, among employer-sponsored trainees there are 30 RIAR staff members fully or partially paid for training depending on their performance.

In 2016 Russia's higher educational institutions had 317 RIAR-sponsored students.

An essential in resolving RIAR-sponsored training objective is engagement of higher educational institutions. In addition to RIAR's involvement in major educational programs, such engagement implies joint R&D. There are 48 current agreements on joint activities in different areas signed with 27 Russian higher educational institutions. Besides, there are long-term contracts with Dimitrovgrad schools implementing advanced educational programs and secondary vocational educational institutions. RIAR collaborates with higher educational institutions as follows:

1. Hands-on training: introductory, on-the-job, research, and undergraduate training. Following the 2016 results, seven graduates of higher educational institutions including four RIAR-sponsored graduates were employed by RIAR. The relation of expenses to support industry-oriented higher educational institutions to the number of young professionals graduated from these educational institutions and employed by RIAR in 2016 made up 52, 168.77 rubles per person.
2. Engagement of leading RIAR professionals in training. In 2016, 20 RIAR professionals were engaged in training in DETI NRNU MEPhI and Ulyanovsk State University (UlSU). To enhance the efficiency and perform RIAR-sponsored training there are basic departments established in these universities headed by RIAR Director (DETI NRNU MEPhI) and an expert of the Department for R&D

Management and International Activities (UISU).

3. Involvement in higher educational institution management. The members of the DETI NRNU MEPhI Academic Board are three RIAR's professionals.
4. Joint R&D. In implementing joint R&D projects there is a unique opportunity to involve students in joint research related to RIAR activities. Such projects enable RIAR to attract young professionals.

The above activities resolve the highly-qualified staffing objective.

Staff development

In 2016, 815 managers and professionals were trained under different training programs (Table 4.5.6). The training expenses made up 3,486 thou. rubles.

Table 4.5.6

LA9

Average training hours by employee categories

Category	Men	Women
Managers:		
top level	72	72
middle level	72	72
bottom level	72	72
Professionals:		
Capacity building	72	72
under compulsory education	42.6	42.6
Workers	35.2	35.2

Performance of the stuff is assessed regularly to find out how well the employees match their positions, to enhance their performance, business capacities, and financial incentives, and to further improve staff selection and appointment. *Provision on RIAR staff appraisal procedure* defines the process and due dates. A ROSATOM's corporate competence model and corporate criteria are used to annually assess the staff expertise. There are criteria for each staff category: managers, professionals, workers, and office workers.

Building and development the talent pool provide wider opportunities for career growth, expertise enhancement, and increase in motivation and involvement, thus helping RIAR to keep unique experts and gifted professionals in the nuclear industry and reducing the dependence on the job market (Figs 4.5.24, 4.5.25). The talent pool is a priority source for appointment to vacant or newly established management positions. Outside candidates are appointed only in cases when there is no right candidate in the talent pool. A multistage talent pool is being developed in RIAR to plan career of the key professionals considered for management and critical positions. Managers and professionals are involved in industry's educational and development programs. In 2016, three RIAR managers (middle-level) were included in the program "ROSATOM's Capital", and one manager (bottom-level) was included in the program "ROSATOM's Talents". Establishment of the talent pool development system resulted in a changed attitude towards the leader role in the nuclear industry. The talent pool development programs help those involved to increase their motivation to change consciousness and behavior models, and give tools to broaden the management portfolio.

LA11

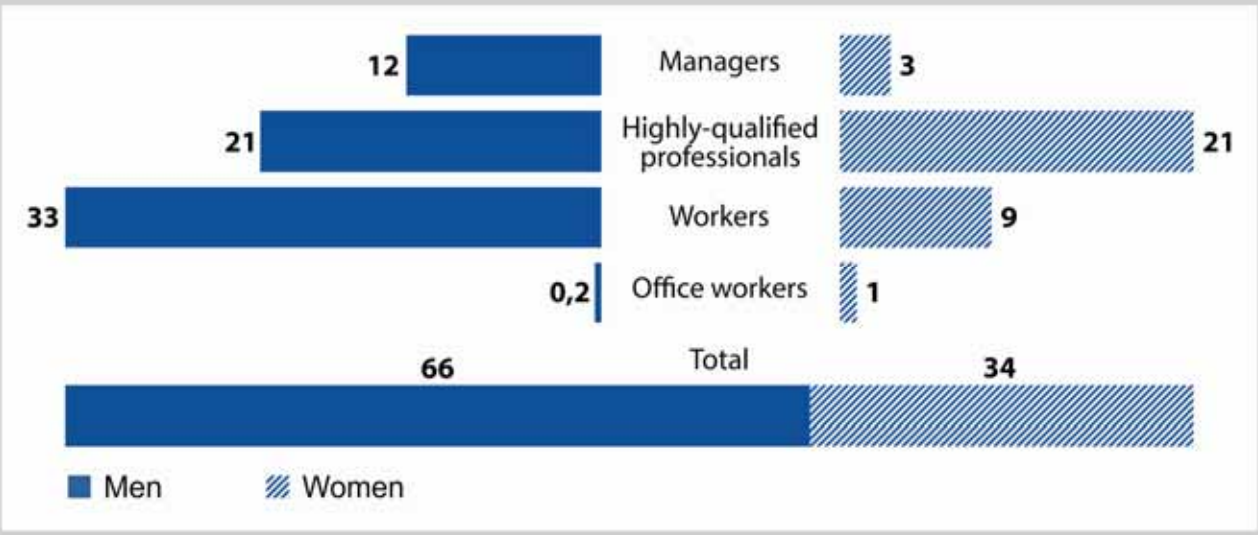


Fig. 4.5.24. Regularly assessed and developed staff by gender and categories, %

Fig. 4.5.25. Talent pool development

4.6. Natural Capital

The last year passed under the implementation of the financial rehabilitation program of the Institute. For engineering services, it primarily meant increasing the efficiency of all types of resources: human, natural, financial.

The implicit and main task was to ensure the safe functioning of all the facilities of the Institute. In order to assess the level of safety and to inform the public about the importance of events related to radiation sources from the safety point of view, JSC "SSC RIAR", as well as other ROSATOM's enterprises, uses the International Nuclear and Radiological Events Scale (INES). It covers all types of practical activities and is intended to assess the events occurring during the implementation of these activities. For the reporting period, no significant safety-related event (above level 0 on the INES scale) occurred at the radiation facilities of the Institute, which corresponds to the international safety criteria.

Another acknowledgment of the high level of safety culture is the designation to the Institute the status of the IAEA International Center based on Research Reactors (ICERR). This fact confirms the correctness of the chosen direction for the implementation of international management standards in the field of quality and ecology. Last year the Institute successfully passed through the QMS audit to comply with ISO 14001:2004 (GOST R ISO 14001-2007) and ISO 9001:2008 (GOST ISO 9001-2011).

The last year was marked by the initiation of the ecology-related management system and by the implementation of safety management tools based on environmental policy and identified significant environmental aspects. The results of the system implementation are more than encouraging: during the year, the amount of radioactive substances released into the atmosphere and the volume of generating low- and intermediate-level liquid radioactive waste has been reduced by no less than 12 %.

In the reporting period, the startup work was continued under the Federal Target Program "Provision of Nuclear and Radiation Safety for the year 2008 and up to 2015": "Renovation and Ensuring the Safety of the Solid Radioactive Waste Storage Facilities" and "Renovation and Rehabilitation of the RIAR's site Industrial Storm-Water Sewage". The facilities will be put into operation in 2017. The projects will greatly improve the RIAR's ability to manage radioactive waste and non-radioactive sewage as well as provide a better level of safety and reduce the impact on the environment.

The confirmation of greater attention to the issues of ensuring the safe functioning of all facilities of the Institute is the significant amount of funds invested by the enterprise in the implementation of environmental protection measures. For 2016, current costs and investments of JSC "SSC RIAR" for environmental protection amounted to about 152 million rubles.

Ecological Policy, Ecological Management System

Environmental policy is the driving force that ensures the implementation and improvement of the organization's environmental management system. It creates the basis for establishing the organization's goals and objectives and reflects the obligations of the top management to act in accordance with the applicable requirements of environmental legislation and principles of pollution prevention.

The ecological policy of JSC "SSC RIAR" developed on the basis of the corresponding policy of the ROSATOM State Corporation, approved and enforced by the order of the Director No. 64/600-P dated September 14, 2015 (the text of the environmental policy is available on the official website: http://niiar.ru/?q=ecological policy) defines the purpose, basic principles and obligations in the field of environmental protection and ensuring environmental safety. Its key provisions are:

- priority of nuclear and radiation safety in the short term and in the long term;
- limiting the company's impact on personnel, public and environment by the permissible impact standards;
- compliance with the norms of resource consumption and energy efficiency;
- implementation of industrial (environmental) control;
- education of managers and specialists of environmental culture and safety culture;
- continuous improvement of the integrated quality management system and ecology;
- constant improvement of the QMS and EMS.

The implementation of the environmental policy of JSC "SSC RIAR" is carried out in accordance with the plan for the period until 2018. The activities of the Institute are carried out in relation to the following environmental aspects: energy, water, biodiversity, emissions, discharges and waste, products and services, compliance with requirements transformed into the company's own environmental indicators (permissible emissions and discharges, generation and disposal limits, air and water quality indicators, standards for water disposal and water consumption).

Indicators of environmental efficiency of the enterprise demonstrate the achieved level of safety and compliance of the existing environmental management system with the requirements of GOST R ISO 14001 2007. The main achievement is the complete fulfillment of the environmental goals set in terms of reducing the level of radiation impact on the environment. It should be noted that the continuous improvement of the environmental management takes place on the basis of self-formulated goals and applicable legislative requirements.

Since 2017, the updated version of GOST R ISO 14001-2016 comes into force. The new version specifies the requirements for the environmental management system and introduces new concepts such as leadership, commitment, success factors, and the organization's environment. It is essential to introduce mandatory requirements to take risks and opportunities into account, apply the system approach. In the new reporting period, it is planned to analyze the acceptability of new requirements and adopt a decision on the environmental policy of the Institute. A systematic approach to environmental management can provide top management with information to succeed in the long term and promote sustainable development through:

- environmental protection by preventing or mitigating adverse environmental impacts;
- mitigating the potential adverse environmental impact on the organization;
- assisting in the implementation of commitments;
- improvement of environmental performance;
- management or influence on the methods of designing, manufacturing, supplying, consuming and disposing the organization's products using the life-cycle concept, which can prevent the environmental impact from accidental deviation at any stage of the cycle;

- bringing environmental information to the stakeholders;
- achieving financial and operational benefits that could result from the introduction of environmentally relevant decisions aimed at strengthening the position of the organization on the market.

Reports on the environmental activities of JSC "SSC RIAR" are available on the official website: http://niiar.ru/annual_report.

Total Environmental Protection Expenditures and Investments

JSC "SSC RIAR" carries out the environmental protection activities with the aim to decrease and prevent negative environmental impact and make the most efficient use of natural resources. In 2016, the environmental protection activities were focused on air protection, protection and sustainable use of water resources, waste water collection and treatment, waste management, rehabilitation of lands and surface water, and provision of radiation safety of the environment (Fig. 4.6.1).

EN31

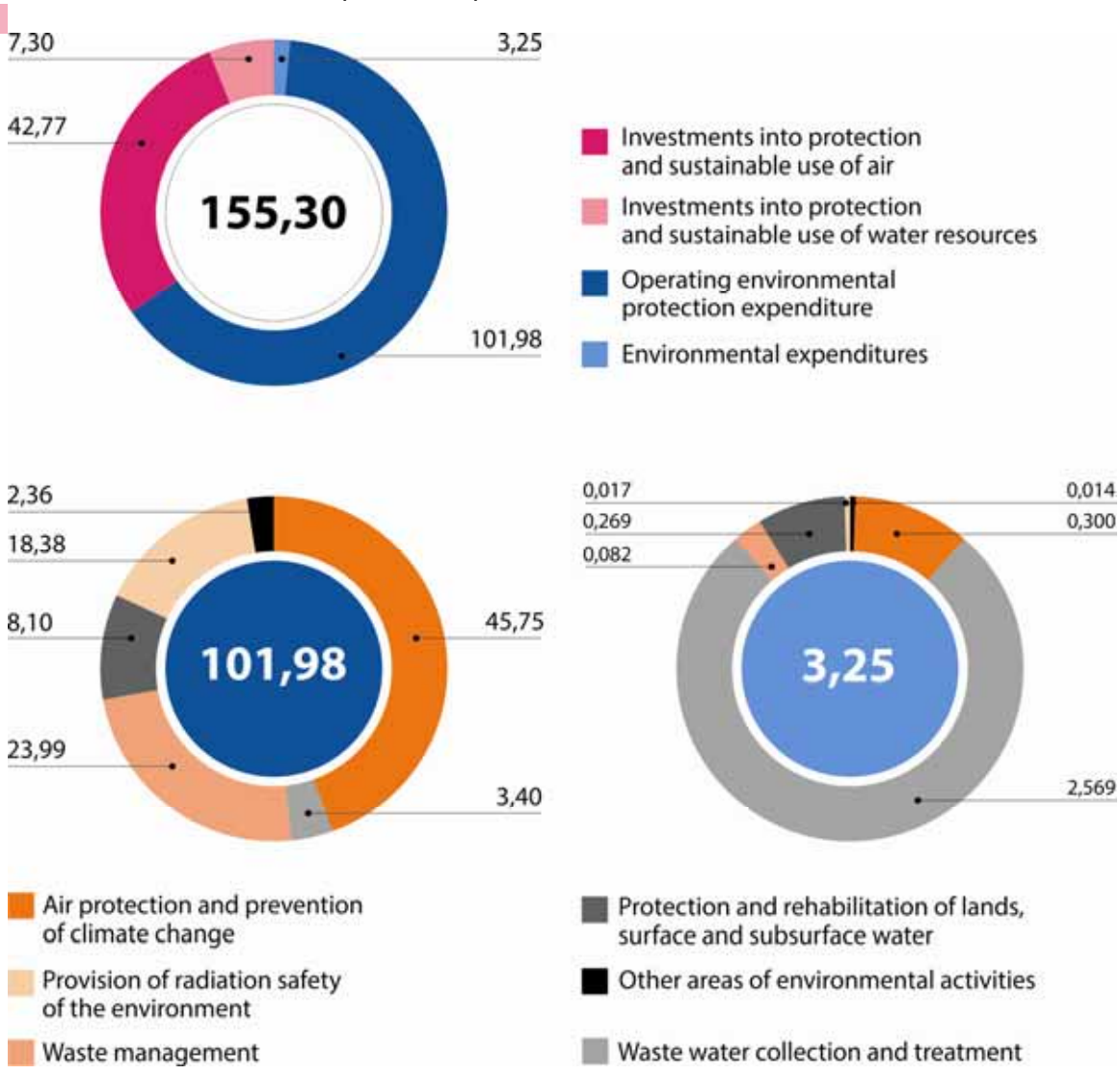


Fig. 4.6.1. Total expenditures by purpose of environmental activities, mln RUB

Waste Generation

As a result of RIAR production and economic activities, nearly 50 types of production and consumption waste generated are Class I-V waste (Table 4.6.1). The waste is mostly low-hazardous (class IV) and virtually non-hazardous (Class V) waste. (Table 4.6.2).

Table 4.6.1

Dynamics of Production and Consumption Waste Generation

Waste hazard classes	Amount of waste generated per year, t			Reduction of waste amount, t (%)
	2014	2015	2016	
I	0,630	1,048	2,312	–1,264 (120,61)
II	15,762	0,000	0,037	–0,037 (100)
III	6,600	4,850	1,255	3,595 (74,12)
IV	96,457	112,044	38,847	73,197 (65,33)
V	450,733	466,450	257,672	208,778 (44,76)
Total	570,182	584,392	300,123	284,269 (48,64)

Waste to be disposed, decontaminated or emplaced is sent to the organizations that hold a license to conduct waste management activities. The waste is emplaced at special-purpose facilities entered into the State Register of Waste Disposal Facilities. Delivery of waste to be handed over to special-purpose organizations is made using transport facilities of the organizations licensed to conduct waste transport activities.

Table 4.6.2

Waste Amounts by Hazard Classes and Type of Management

EN23

Waste management methods	Waste amount by hazard classes, t					
	I	II	III	IV	V	Total
Transfer to other organizations for disposal	0	0	0	0	1114,0	1114,0
On-site incineration	0	0	0,35	0	0	0,35
Transfer to other organizations for decontamination	4,514	0,037	1,001	3,35	112,976	121,878
Transfer to other organizations for emplacement at waste landfills	0	0	0	5,497	144,696	150,193
On-site storage	0	0	0	0	1114,0	1114,0
On-site accumulation	1,497	0	0,004	43,0	0	44,501

RIAR has no imported, exported or reprocessed waste deemed hazardous under the terms of Annex I, II, III and VIII to the Basel Convention. Waste transported between countries is also absent. JSC "SSC RIAR" neither managers hazardous

EN25

waste covered by the Basel Convention on the Control of Trans-boundary Movements of Hazardous Waste and Their Disposal nor performs trans-boundary movements of RIAR-owned hazardous waste. The total mass of waste transported per year (sent for disposal and decontamination to other organizations) deemed hazardous under the terms of Annex I, II, III and VIII to the Basel Convention makes up 4.387t (Table. 4.6.3).

Table 4.6.3

Mass of Waste Transported in the Region by Type and Groups

Waste type	Waste referring to Annex I to the Basel Convention	Waste mass, t
Spent accumulator alkali	Y35. Basic compounds or solid base	0,037
Industrial mineral oil waste	Y8. Unnecessary mineral oils non-suitable for initially planned application	1,0
Water-based lubricating fluid	Y9. Waste in the form of oil mixtures and emulsion (water), hydrocarbons (water)	3,35
Mercury, mercury-quartz, luminescent lamps, high-pressure sodium lamps, mercury thermometers waste	Y29. Mercury, mercury compounds	4,515
Industrial consumption waste similar to municipal waste	Y46. Municipal waste	147,741
Waste of class I–IV	Waste being hazardous according to the RF Legislation that were not introduced into i.1-5 of the table	1,197

Consumed Materials

EN2

Information on the materials consumed, indicating their mass, volume and quantity are presented in Table 4.6.4. The total mass of materials representing reprocessed or recycled waste used at JSC "SSC RIAR" in 2016 made up 0,35 t (waste of mineral motor oils). The percentage of recycled materials from the total number of all materials used in production in 2016 is not significant. The share of purchased or used materials, the stability of which was certified by a third party, is 100 %.

Table 4.6.4

EN1

Amount of Materials Consumed

Product type	Indicator value	Product type	Indicator value
Rolled steel, t	43	Filter elements, pc.	234
Pipes, t	16	Industrial gases, m^3	8 506
Protective means, pc.	139 279	Paper, sheet	2 250 000
Diesel fuel, t	163	Starting materials, g	3 932
Oil and lubricants, kg	41 571	Ion exchange resin imported, m^3	8,2
Petrol, l	59 943		

Energy Consumption

EN5

The power supply system in RIAR includes production and consumption of energy sources produced by the RIAR facilities and purchased from third parties. The amount of electricity sold by JSC "SSC RIAR" in 2016 was 127 862 thou. kWh, equivalent to 460 303 GJ. In the reporting period, the numerical value of the energy capacity indicator is 1 960 GJ per person. When calculating this indicator, the account was taken of the internal energy consumption: fuel, electricity, energy for heating, steam as well as the total amount of full-time employees. JSC "SSC RIAR" does not consume fuel from renewable sources (Tables 4.6.5, 4.6.6).

In comparison with the base period (2009), reductions in energy consumption were achieved thanks to such measures as conservation of unused buildings and constructions, transition to another heating system, change in the temperature schedule and adjustment of the heating network, and widespread window replacement (Table 4.6.7).

Table 4.6.5

Total Fuel Consumption from Non-renewable Sources

Fuel type	Fuel consumption, t	Energy, GJ
Nuclear fuel	2,103	5 169 597
Industrial fuel oil	181,95	7
Diesel fuel	172	7
Petrol	64,387	3
Total	420,44	5 169 614

Table 4.6.6

Total Energy Consumption

EN3

Energy type	Energy amount, GJ
Bought for consumption	289 122
Own generation	581 640
Sold to other organizations	460 303
From non-renewable sources	5 169 614
Total	6 500 679

Table 4.6.7

Consumption of Energy Resources

EN6

Energy resource	Consumption of energy resources per years		Costs for energy resources per years, k RUB	
	2015	2016	2015	2016
Thermal energy, GJ	422 305	384 142	134 848,13	124 449,64
Electrical energy, GJ	477 000	461 272	268 561,96	259 577,19
Water, m^3	5 352,88	4 629,54	30 481,14	29 944,43
Sewage water, m^3	2 263,77	2 014,6	5 220,16	4 604,31
Total	–	–	439 111,39	418 575,57

The base period and target indicators for reduction of energy consumption were adopted in accordance with the ROSATOM's order. The RIAR's program of energy saving and energy efficiency enhancement for 2013–2017 envisages administrative and technical measures that are currently implemented in JSC "SSC RIAR". Reductions in energy needs for production of goods and provision of services in JSC "SSC RIAR" are illustrated in Table 4.6.8. Reductions in energy consumption versus the energy produced by the reactor facilities were adjusted to the base period for which the year 2013 was taken.

Table 4.6.8

EN7 **Reduction in Energy Consumption**

Electric power	Consumption per years, × 10^5 GJ			
	2013	2014	2015	2016
Produced	11,482	10,089	10,156	10,06837
Consumed	4,309	4,256	4,229	4,74973
Without losses	3,770	3,306	3,322	3,21129
Reduction in energy consumption, %	–	0,1	0,3	2,8

Water Intake and Waste Water Discharge

EN9 EN10 The JSC "SSC RIAR" water management system implies multiple use of water in production. Volume of the reused water is 249.02 thou. m^3 per year. Recycling water supply systems as closed cycles where water is added periodically to compensate evaporation losses are used for some types of production activities. Some operating procedures that need water cooling use a flow-through system as follows: surface-water body (water intake) — cooled installation — surface-water body (water discharge). The recycling water supply systems and flow-through systems use service water from the surface-water body — the Cheremshan Bay of the Kuibyshev Reservoir. The water intake and delivery of drinking water is done by "NIIAR Generatsiya", LLC (the wells are in lease). It should be noted that in 2016 intake water volumes decreased by 16.25 per cent as compared to the similar indicator of the year 2015 (Table 4.6.9). To use the withdrawn natural water effectively and make up a water balance, RIAR has norms of water intake and discharge which determine water use norms per unit of product expressed in money terms.

Table 4.6.9

EN8 **Water Intake**

Water source	Location	Water consumption by years, thou. m^3	
		2015	2016
Surface water used for technical water supply and cooling	Cheremshan Bay of the Kuibyshev Reservoir	9 191,99	7 633,51
Underground water used for drinking, household and practical needs from another water supply system	Subsoil plots along the banks of the Cheremshan Bay of the Kuibyshev Reservoir, managed by "NIIAR–Generatsiya" Company	216,232	193,242
	Suburban command point "Fakel" (Flame)	0	2,04
Sewage from other organizations	"NIIAR-Generatsiya" Company	610	562
Total		10 018,222	8 390,792

Wastewater disposal of JSC "SSC RIAR" is carried out by separate sewerage: industrial-storm, household and special (for waters contaminated with radionuclides). Radwaste contaminated with radionuclides enter the repository of the experimental underground landfill for the isolation of liquid radioactive waste (FSUE "National Operator for Radioactive Waste Management"). The domestic wastewater is discharged by the "NIIAR-Generatsiya" LLC to the municipal sewerage system and in 2016 amounted to 222,631 thousand m^3. Discharge of sewage industrial storm water is carried out in the open hydrographic network, which is part of the Volga River basin, through the output wells. The overall volume of planned and unplanned discharge of water into surface water bodies in 2016 is shown in Table 4.6.10 with the breakdown by destination. The hydrochemical index of water pollution is 1.34 for the Cheremshan Bay of the Kuibyshev Reservoir and 1.25 for the Erykla stream which is indicative of water quality Class III and classified as moderately polluted.

Most water is discharged to the Cheremshan Bay of the Kuibyshev Reservoir. The discharged water is untreated. Treated wastewater is discharged to the Erykla Stream. Before discharging to the Bolshoy Cheremshan River, wastewater is treated with biological methods. The monitoring data obtained by the Accredited Radiation Control Laboratory attached to the Environmental Protection Office show the absence of radioactive contamination in wastewater discharged into the Cheremshan Bay of the Kuibyshev Reservoir. Tables 4.6.11 and 4.6.12 present data on the quality and mass of polluting substances in water discharge.

EN24

Table 4.6.10

Overall Wastewater Discharge EN22

Receiving water body	Discharge volume, thou. m^3
Cheremshan Bay	2 630,00
Stream Erykla	9,37
River Bolshoy Cheremshan	1,83
Total	2 641,20

Table 4.6.11

Amount of Polluting Substances in Discharges, t

Polluting substance	Location of discharge		
	Cheremshan Bay	Stream Erykla	River Bolshoy Cheremshan *
Organic compounds	11,4 481	0,0 076	0,0 043
Suspended substances	51,3 655	0,0 479	0,0 055
Dry residue	30,0 933	3,3 764	0,6 744
Ammonia ions	0,0 238	0,0 002	0,0 004
Chromium ions (III)	0,0 000	0,0 001	0,0 000
Chromium ions (VI)	0,0 000	0,0 000	0,0 000
Copper ions	0,0 032	0,0 000	0,0 000
Zink ions	0,0 000	0,0 001	0,0 000
Nitrate ions	0,0 258	0,0 058	0,0 126
Nitrite ions	0,0 000	0,0 000	0,0 001
Phosphate ions (by P)	0,0 076	0,0 003	0,0 000
Chloride ions	31,4 552	0,3 748	0,0 247
Sulfates	5,2 867	0,4 106	0,1 510
Iron (total)	0,3 052	0,0 003	0,0 002
Chromium (total)	0,0 000	0,0 001	0,0 000
SAS	0,0 427	0,0 002	0,0 000
Oil products	0,0 329	0,0 012	0,0 001
Total	130,0 900	4,2 256	0,8 733
Grand total	135,1 889		

Table 4.6.12

EN22 **Average Pollutant Concentration in Water Bodies**

Index	Place of control						Max acceptable concentration*, mg/dm³
	Cheremshan Bay		Stream Erykla		River Bolshoy Cheremshan		
	Back-ground traverse	Control traverse	Back-ground traverse	Control traverse	Back-ground traverse	Control traverse	
Concentration, mg/dm³ of: suspended substances	4,9	24,3	3,6	6,9	15,0	3,0	Background value + 0,75
dissolved oxygen	9,5	5,9	8,0	7,6	9,3	8,5	Более 4,0
dry residue	511	493	258	488	490	369	1 000,0
oil products	0,621	0,539	0,035	0,179	0,018	0,075	0,05
sulfates	102,0	87,0	Less than 50,0	59,0	69,0	83,0	100,0
SAS	0,007	0,023	0,021	0,036	0,008	Less than 0,01	0,50
iron (total)	0,147	0,260	0,39	0,045	0,206	0,09	0,100
chromium (total)	Less than 0,01	Less than 0,01	Less than 0,01	0,018	Less than 0,01	Less than 0,01	–
nitrate-ions	3,9	0,42	3,8	0,83	3,0	6,9	40,0
nitrite-ions	0,084	Less than 0,02	0,080	Less than 0,02	0,029	0,057	0,08
chloride-ions	17,7	29,2	Less than 10,0	54,0	11,1	14,0	300,0
phosphate-ions (by P)	0,151	0,12	0,075	0,038	0,074	Less than 0,016	0,065
ions of: ammonia	0,48	0,39	0,33	0,033	0,18	0,20	0,5
cooper	0,0003	0,0015	0,001	0,005	0,001	0,004	0,001
zinc	Less than 0,005	Less than 0,005	Less than 0,005	0,018	Less than 0,005	0,010	0,010
chromium (III)	–	–	–	0,013	–	–	0,07
chromium (VI)	–	–	–	0,005	–	–	0,03
Oxidability, mg O_2/dm³: permanganate	5,1	10,3	9,3	2,5	6,2	1,5	–
dichromate	16,6	37,7	24,0	18,0	17,0	5,7	–
Biochemical consumption of oxygen , mg O_2/dm³: for 5 days	1,5	2,8	2,1	0,46	2,1	0,90	–
for 20 days	3,4	7,6	4,4	1,10	4,1	2,4	3,0
pH index,	7,9	7,8	7,7	7,8	8,1	8,7	6,5–8,5
Water t, °C	10,0	20,9	12,8	27,9	16,1	20,0	–

*For water objects of commercial fishing importance.

EN11 The total area of RIAR land is 3 251.195 ha of which 104.87 ha are owned, 1.67 ha are under lease, 3 144.65 ha are in use. All lands are located on the territory of the town of Dimitrovgrad and Melekessky District, Ulyanovsk region. RIAR controls a water use area where the Cheremshan State Ichthyologic Reserve of the region importance is located. The total area of the Reserve is 2 902 ha. It is of high conservation status and serves to protect fish stocks. The Reserve is located in the north-east part of the Cheremshan Bay

waters of the Kuibyshev Reservoir in Melekessky District, Ulyanovsk region. The Reserve was created to preserve and recover commercial fish stock in the Kuibyshev Reservoir. The coordinates of its center are: 49°51'3 E and 54°14'9 N. The results of the long-term monitoring indicate that the impact of the RIAR's discharges and wastewater is insignificant and does not lead to the pollution of habitats and change of biodiversity. However, since wastewater is discharged directly to the water body which is under protection at the regional level and breeding and feeding areas for fish stocks, the Reserve is still vulnerable.

The ichthyofauna of the Reserve includes 50 species, of which 23 species are of commercial value. Some representatives of the ichthyofauna are listed in the Red Book of the Ulyanovsk region. The Cheremshan Bay fauna is also represented by 140 taxonomic groups of phytoplankton, 30 zooplankton species, 25 zoobenthos species. More than 360 species of higher vascular plants were found around the Institute within the impact area, including 12 species listed in the Red Book of the Ulyanovsk region. The animal world includes 400 species of vertebrate and invertebrate animals inhabiting ground and water environment. The reptiles and amphibians fauna includes 16 species, of which 2 species are listed in the Red Book of the Ulyanovsk region. The bird fauna includes 183 species, of which 32 species are listed in the Red Book of the Ulyanovsk region and 13 species are included into the Russian Red Book. Species included into the Red List of the International Union for the Protection of Nature were not found on the territory affected by RIAR activities. Based on the experience of the RIAR's longstanding activity, it may be stated that there are no threats to the species' existence. The gamma-radiation exposition dose from the ground surface is 4.644 nC/kgH (18 μR/h). The specific activity of radionuclides in plants, water and soil is in accordance with the sanitary standards. Water ecosystems are the Cheremshan Bay of the Kuibyshev Reservoir, stream Erykla and river Sosnovka. The list of fish inhabiting these pieces of water includes 30 species, of which 2 species are listed in the Red Book of the Ulyanovsk region. The invertebrate fauna is rather rich. One of the largest groups of the invertebrate animals is the insect group. The list of most widespread and frequent insects includes 207 species. Some species are listed in the Red Book of the Ulyanovsk region and two species of butterflies are in the Red Book of Russia (Fig. 4.6.2).

EN26 EN14 EN12 EN14

a b c

Fig. 4.6.2. Species of butterflies listed in the Red Book of Russia: Polyxena (a), Mnemosyne (b), Apollo (c)

A significant impact on underground drinking waters could only be within the subsoil area leased by "NIIAR-Generatsiya" Company. The greatest impact on biodiversity could be in the water use area meant for wastewater discharges. This area is a specially protected natural territory of the regional significance 'The State Ichthyologic Reserve "Cheremshanskiy"'.

EN12

The amount of wastewater discharged in this area during the year is 2 641.20 thou. m^3. The discharged water contains 135.19 t of pollutants.

EN13 RIAR implements various measures to manage the biodiversity impact. The measures aim at removing the unauthorized dumps, foresting, cleaning the protective sanitary zones of the Cheremshan Bay of the Kuibyshev Reservoir; other water bodies being included. The plan is to purchase farm-grown juvenile fish to put it into the Bay, to introduce mechanical sewage treatment and to lay up-to-date storm and wastewater drains to reduce the discharge of the polluted wastewater into the Bay. As for the nesting sites of the white-tailed eagles (pine wood of the RIAR's forest area in the Cheremshan Bay bottom), the work should be done to either arrange a specially protected area or perform protective measures to preserve the nests, for example, to stop woodcutting in this district. The RIAR's biodiversity management policy involves continuous monitoring of the environment and periodic assessments of the ecological risks and RIAR's impact on the environment. The ecological status of flora and fauna habitats is satisfactory, but the work on removing the unauthorized dumps and foresting is needed.

Emissions of Hazardous Substances into Atmosphere

The main greenhouse gases in the order of their estimated impact on the heat balance of the Earth are water vapor, carbon dioxide, methane, nitrous oxide and ozone. Contributing to the greenhouse effect are anthropogenic halogenated hydrocarbons and nitrogen oxides, perfluorocarbons, hydrofluorocarbon, sulfur hexafluoride and freon. The release of water vapor, which is formed in the cooling towers of the Institute's nuclear facilities, is about 600 thousand m^3. Emissions of freon-12 do not

EN20 exceed 10 kg when servicing industrial

EN15 refrigeration units, and freon-22 — 50 kg. Direct emissions of greenhouse gases into the atmosphere are possible when burning fuel oil and diesel fuel in boilers while generating heat for their own needs. Emissions of nitric oxide (in terms of nitrogen dioxide) are 1.298 t, carbon monoxide — 1.577 t.

EN16 Indirect greenhouse gas emissions are generated by the producer of electricity and heat

EN17 by NIIAR-Generatsiya, LLC. Other indirect greenhouse gas emissions originate from sources under the management of JSC "Alliances-transatom", which carries out transportation

EN19 of employees and cargoes. The volume of carbon dioxide emissions in 2016 compared to 2015 decreased by 100 %. The changes are due to the withdrawal of the CHP plant and the termination of the operation of the suburban boiler. To reduce greenhouse gas emissions, it is necessary to reduce energy consumption, transportation, uncontrolled leaks from refrigeration equipment and air conditioners, eliminate carbon tetrachloride from the processes of physical and chemical processing of nuclear fuel.

The location of the Institute in the settled land allows implementing rational methods of forest management and reforestation on a sustainable basis with a view to protecting and improving the quality of sinks and storage of greenhouse gases. In 2016, there were no salvo and emergency emissions of pollutants into the atmosphere. Average annual indicator of cleaning of atmospheric emissions of the enterprise received at gas-cleaning and dust-collecting installations, from polluting substances made up 96 % (Table 4.6.13). The quantitative determination of emissions is based on calculation methods using specific indicators and the balance method. Emissions of methane and nitric oxide, potentially arising from stationary combustion of fuel, were not taken into account.

Table 4.6.13

Pollutant Emissions into Atmosphere

EN21

Substances	Hazard class	Amount of emissions per years, t		
		2014	2015	2016
Gaseous and liquid:	–	34,503	25,354	4,496
Incl.:				
Sulfur dioxide	III	22,487	16,837	0,096
Carbon oxide	IV	4,025	2,762	1,577
Nitrogen oxides (in NO_2 equivalent)	III	3,257	2,526	1,298
Volatile organic compounds	–	3,375	1,873	1,421
Others	–	–	–	0,104
Solid:	–	12,682	11,810	3,356
Incl. suspended substances	III	0,042	0,013	3,356
Total	–	47,185	37,164	7,852

Fines and Penalties for Breaching Environmental Legislation and Regulatory Requirements

EN29

In the reporting year, the fines and penalties for the adverse environmental effect made up 496 k RUB (Table 4.6.14); the discharge of polluting substances into the atmosphere makes up 22 % from the total sum, discharge into water — 37 %, waste disposition — 41 %. JSC "SSC RIAR" does not dispose waste into underground horizons.

Table 4.6.14

Fees for Adverse Environmental Impact

Type of fees	Amount of fees per years, k RUB.		
	2014	2015	2016
Fees for allowable emissions (discharges) of pollutants and emplacement of production and consumption waste:	129,0	138	104
To water bodies	3,0	8	8
To air	6,0	2	–
For emplacement of waste	120,0	128	96
Fees for excess emissions (discharges) of pollutants and emplacement of production and consumption waste:	248,0	266	365
To water bodies	120,0	165	165
To air	127,0	94	103
For emplacement of waste	1,0	7	97
Total	377,0	404	469
including:			
To water bodies	123,0	173,0	173
To air	133,0	96,0	103
For emplacement of waste	121,0	135,0	193

In 2016, JSC “SSC RIAR” was only once brought to administrative responsibility for violating the requirements to the protection of a water body established by the Russian Federation water legislation, imposing an administrative fine on a legal entity in the amount of 10,000 rubles. Administrative fines for violation of environmental legislation were twice imposed on officials of the organization in the amount of 6 thousand rubles. There were no non-financial sanctions imposed on JSC “SSC RIAR” for not observing environmental legislation and regulatory requirements in 2016.

4.7. Occupational Health and Safety

Over the past few years JSC "SSC RIAR" has recorded a reduction in occupational injuries: in 2012 there were five accidents related to production, in 2013 and 2014 — for one accident categorized as light, and since 2015 there have been no accidents. Since 2002, there have been no fatal accidents. In 2016, no accidents and cases of occupational diseases were registered for the representatives of contractor and subcontractor organizations performing work at the sites of JSC "SSC RIAR".

At present, JSC "SSC RIAR" has adopted a comprehensive plan of measures to prevent personnel injuries during construction and installation works at the ROSATOM’s facilities, of which requirements apply to all enterprises of the corporation. The objectives of implementing a comprehensive plan of measures are to ensure a high level of production culture; minimize the incidence of occupational injuries and occupational diseases; preserve the health of workers; increase labor productivity, motivation and attractiveness of labor.

The Institute also developed its own plan of measures to prevent injuries of personnel during construction and assembly works in subdivisions and on the territory of JSC "SSC RIAR". Presented in Table 4.7.1, the data characterize positively the efficiency of the enterprise's activity in ensuring healthy and safe working conditions and preventing occupational injuries at the enterprise. In 2016, 177 people received training in OS&H, counseling, prevention and control of the risk of occupational injuries; 113.3 thousand rubles were spent on training. The Institute pays great attention to health and safety issues which are reflected in both the *Industry-Specific Agreement on Nuclear, Energy, Industry and Science for 2015–2017* (http://www.pub.niiar.ru/system/files/sites/soglashenie_2015-2017.pdf), and in *JSC "SSC RIAR" CBA for 2014–2017* (http://niiar.ru/sites/default/files/pgo2014_ln_29062015_c_ssylkami_0.pdf).

Based on the results of the regional phase of the All-Russian Competition “Russian Organization of High Social Efficiency”, JSC “SSC RIAR” became **the winner** in the category “For Hampering Industrial Injuries and Occupational Illness in the Production Companies“

Table 4.7.1

Occupational Injury Data

LA6

Injury rate	Injury rate for organizations by years					
	JSC "SSC RIAR"			Contractor's Organizations		
	2014	2015	2016	2014	2015	2016
Occupational injury rate	0,027	0	0	0	0	0
Professional disease rate	0	0	0	0	0	0
Lost days rate	0,99	0	0	0	0	0
Absence rate	7,42	0	0	0	0	0

Employees' Health Controls

Annually JSC "SSC RIAR" employees go through periodic medical examinations. Medical examinations are performed strictly in compliance with the Order of the Ministry of Healthcare and Social Development of the Russian Federation # 302n of 12 April 2011 "On approval of the lists of harmful and / or hazardous occupational factors and works which require mandatory pre-work and periodic medical examinations and the procedure for conducting mandatory pre-work and periodic medical examinations of the workers engaged in heavy work and work in harmful and / or dangerous labor conditions". In 2016, 2 611 RIAR employees who worked in contact with harmful and / or dangerous substances and occupational factors underwent medical examinations. Occupational safety activities in JSC "SSC RIAR" were implemented in compliance with the *Industry Agreement on Nuclear Power, Industry and Science for 2015–2017* and *Collective Bargaining Agreement* of the enterprise.

LA8

In accordance with the system of the three-stage administrative-public control, schedules of activities to control the state of occupational safety at the enterprise were developed:

- checks to examine compliance with the health, radiation, industrial and fire safety requirements;
- meetings with representatives of the RIAR divisions as a result of the above checks;
- inspections by occupational health and safety specialists.

Personnel's Exposure Control

In the reporting period, the average annual effective dose of the personnel is 2.78 mSv. In the year 2015, it was 2.55 mSv The effective dose dynamics starting from 2001 is presented in the JSC "SSC RIAR" annual report for the year 2015 (http://niiar.ru/sites/default/files/pgo2014_ln_290620 15_c_ssylkami_0.pdf).

In 2016 there is an increase in the average effective dose of the personnel, which is explained by the reduction in its number while maintaining the volume of radiation hazardous

work (collective dose of personnel exposure). No cases of exceeding the basic dose limit for personnel established by NRB-99/2009 and equal to 20 mSv were recorded among the Institute's employees in 2016: 48 % of the staff in Group A received an effective dose of less than 1 mSv, 16 % — an effective dose in the range from 1 to 2 mSv, 19 % — from 2 to 5 mSv, 17 % — from 5 to 20 mSv, which is consistent with the similar indicators for the industry as a whole. Based on the results of the individual dosimetric control of the personnel (Fig. 4.7.1), an individual life risk was calculated using the program complex ARMIR-5 related to occupational exposure of personnel. The absolute majority of workers (99.16 %) is in the radiation risk zone less than 10^{-3}. Individual lifelong risk increased in comparison with the value established in NRB-99/2009 is observed only in 18 employees (0.84 %). In 2016, a specialized medical examination of these employees was organized, the results of which showed that these employees had no radiation-induced diseases.

In 2016, as part of the implementation of the program to reduce the doses of RIAR personnel, radiation shielding mats have been purchased and used for radiation hazardous work, which allows reducing the impact of ionizing radiation on personnel in the work sites.

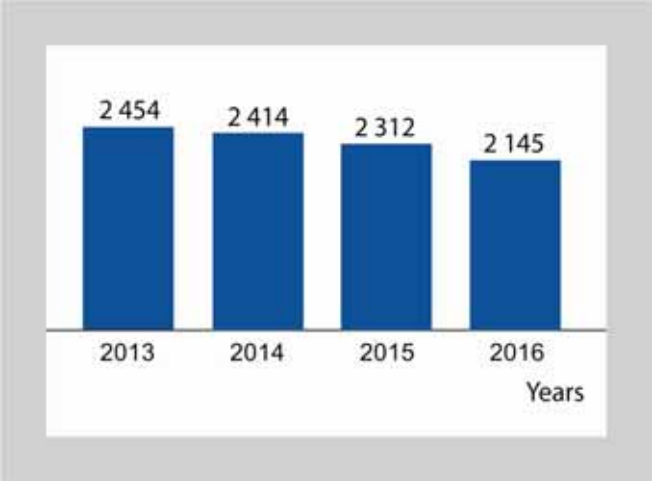


Fig. 4.7.1. Number of JSC "SSC RIAR" employees under the individual dosimetric control

Enhanced Safety and Efficiency of the Reactor Facilities

Reliability and safety of the RIAR reactor operation is provided by implementing special-purpose measures which include modernization of the RIAR process equipment and compliance with valid standards of production processes during nuclear reactor operation. For that purpose we systematically monitor the state of the nuclear facilities and take into account all the changes of the current Russian Legislation. The operation of JSC "SSC RIAR" reactors was accident-free in 2016. The information regarding the risks related to nuclear and radiation safety is given in Section 3.6 "Risk Management". The project "Enhanced Safety and Efficiency of JSC "SSC RIAR" Reactor Facilities" ensures continuous modernization of the RIAR reactor facilities which retrofits are needed not only because of the physical ageing of the equipment, but also because of the new requirements of the Federal Norms and Regulations in the field of safe operation of the facilities related to the use of atomic energy. In 2016, the following activities were done:

- systems to transport containers with nuclear materials, radioactive substances and radwaste were brought into compliance with the federal norms and regulations;
- backup diesel generators were installed in the radwaste storage facility;
- to support safe operation of the nuclear facilities, the following items have been purchased:
  - beryllium items for the SM and MIR reactor cores;

- units for the ventilation center to collect and discharge into the atmosphere gaseous waste;
- equipment to upgrade the cryogen facility;
- safety-related measurement systems;
- portable radiation monitors;
- portal monitor.

The implementation of the project allowed the level of nuclear, radiation and fire safety of the nuclear research facilities to be improved; the engineering processes to be updated and measuring tools to be renewed.

Plans for 2017:

- to upgrade:
  - RBT-10/2 control and safety system;
  - cryogen facility;
  - ventilation, water supply and heating system of the solid radwaste storage facility;
- to replace obsolete safety system equipment ;
- to replace electrical equipment and repair the converter at the electrical sub-station;
- to confirm the accreditation criteria of the radiation and chemical control laboratory of the environmental protection office and equip the points of control over the micro-biological parameters, acute hazard and chronic hazard to the aquatic environment within the JSC "SSC RIAR" area;
- to buildup the VK-50 reactor vessel sealing ring;
- to purchase:
  - three Be blocks for the MIR reactor;
  - rotary-type pump for the VK-50 cooling system;
  - compressed air equipment;
  - reference ionizing sources;
  - emergency alarm equipment.

Minimized Environmental Impact

To minimize the environmental risks resulted from the RIAR activities, *the Environmental Policy* was brought into force. More details can be found in Section 4.6 "Natural Capital" of Chapter 4.

60 ЛЕТ НИИАР

The most important projects for the long-term development of the experimental potential of the nuclear industry in Russia are as follows: construction of the Multipurpose Fast Research Reactor and establishment of the Polyfunctional Radiochemical Research Complex

5

STAKEHOLDER ENGAGEMENT

5.1. Public Reporting System

RIAR has set forth its public stance on all activity aspects to provide a high level of openness and transparency of its activities to stakeholders. For more details see Public Reports 2011–2015 (http://www.niiar.ru/?q=annual_report) on the official RIAR website. During these years a public reporting system has been developed (Fig. 5.1.1) and is still being enhanced.

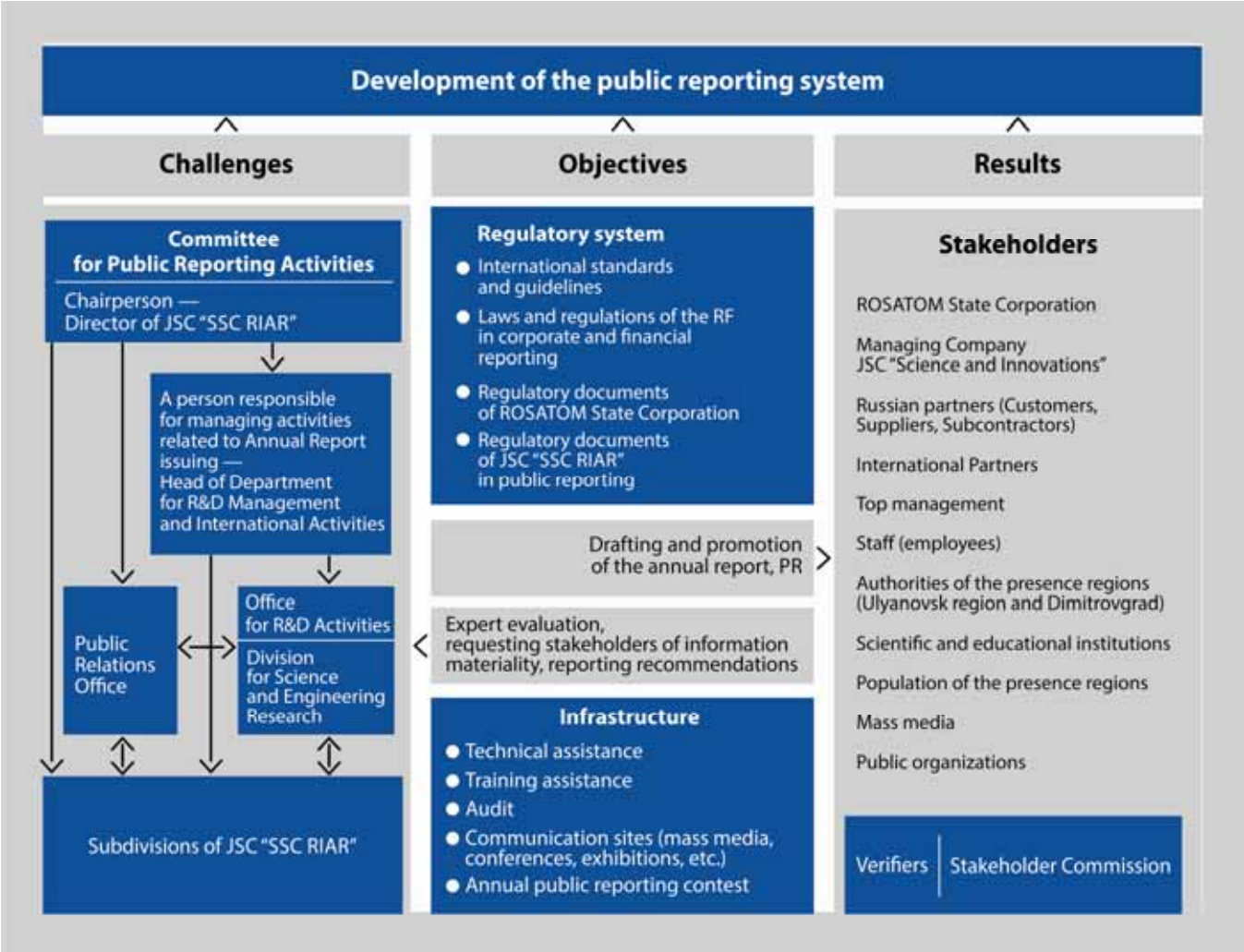


Fig. 5.1.1. Schematic representation of the public reporting system

Functioning of the public reporting system is generally provided by the Committee for Public Reporting Activities, Division for Science and Engineering Research under the Department for R&D Management and International Activities, and PR Office. The responsibility for drafting annual public reports is documented in the KPI maps of all division heads. More than sixty RIAR professionals are involved in the Report development including those who are responsible for source data release. For more detailed information about the activities and involvement of the Committee for Public

Reporting Activities, Stakeholder Commission and authorized RIAR subdivisions in the public reporting system development please refer to Annual Report 2014 (http://niiar.ru/sites/default/files/pgo2014_ln_29062015_c_ssylkami_0.pdf). In the course of Report drafting a great deal of work has been done both by RIAR professionals and stakeholder representatives. The members of the Committee for Public Reporting Activities express their gratitude to those who have shown their interest in RIAR activities and read the Report. RIAR communicates effectively with all stakeholders by providing in time important information about all activity aspects and responding to stakeholders' requests and wishes. Table 5.1.1 presents the results of the reporting period and near-term plans in enhancing the public reporting system.

Regulatory system of public reporting

1. Provision on the Stakeholder Commission in Public Reporting of JSC "SSC RIAR".

2. Provision on the Committee for Public Annual Reporting of JSC "SSC RIAR".

3. Standard of Enterprise STO 086-202-2016 "Integrated Management System of JSC "SSC RIAR". Integrated Annual Report Drafting Procedure."

Table 5.1.1

Enhancement of the public reporting system

Trend	2016 results
Enhancement of the regulatory and methodology system	• Corporate documents in public reporting have been updated taking into account new international and corporate standards. • The Provision on the Committee for Public Reporting Activities has been approved (Committee membership, members' objectives and responsibilities have been updated and broadened; functions have been clarified). • The revised Provision on the Stakeholder Commission in Public Reporting of JSC "SSC RIAR" has been approved. • An Order on activities for drafting JSC "SSC RIAR" Annual Report 2016 has been issued. It has been approved the Report concept for the reporting year, work plan, schedule, and terms of reference to provide information for the Report. • Company standard STO 086-202-2016 "Integrated Management System of JSC "SSC RIAR". Annual Report Drafting Procedure" has been updated and approved. • A work plan for the development of the public reporting system for 2016–2017 has been developed and approved. • An Order on approval of the updated (broadened) Stakeholder Commission membership and schedule of activities involving stakeholders for 2016 has been issued. • Activities to develop a system for information collection and treatment were carried out in order to file reporting data in accordance with the international integrated reporting standards
Advanced training course for the staff	• Best practices of Russian and foreign annual reports have been analyzed; analytical reports of the Russian regional network in public reporting have been used in report drafting. • RIAR has taken part in public reporting consultative workshops arranged by different ROSATOM's organizations involving other organizations' representatives engaged in public reports drafting, promotion and assessment

Table 5.1 (continued)

Trend	2016 results
Report drafting	• Switch to basic GRI G4 Sustainability Reporting Guidelines. • Conducted dialogue with stakeholder representatives on the Report key topics "in praesentia" • Increased involvement rate of the stakeholder representatives in drafting the Report. • Improved utility of the information presented in the Report. • Applied new reporting formats (short presentations of Russian and English Report versions). • Switch to earlier start of the reporting campaign (August — October)
Broadening the range of stakeholders involved in Report drafting	• The Report has been used as a reference and analytical information source for the stakeholders. • A range of stakeholders including foreign stakeholders has been broadened in the course of the questionnaire surveys (to identify significant aspects of RIAR activities) and the Report promotion. • Long-term partnerships have been established with major stakeholders. • The rate of stakeholder Commission involvement in Report drafting activities has been increased. • A list of major stakeholder groups has been updated
Surveys and questionnaires	• Survey has been conducted among stakeholders to identify significant aspects of RIAR activities as well as reciprocal influences between RIAR and stakeholders. • Questionnaire has been distributed among top managers to identify significant aspects of RIAR activities as well as reciprocal influences between RIAR and stakeholders. • Surveys on utility and quality of the information contained in the Report have been conducted among the staff, top managers, and external stakeholders including international partners. • Questionnaires and surveys on updating the Report priority topics have been carried out. • Surveys have been conducted among the RIAR staff to identify the Report readability index. • Questionnaires to identify stakeholders' expectations and wishes have been conducted
Promotion	• Methods of Report short and full versions promotion among stakeholder main groups (publication of information at RIAR's official website (http://www.niiar.ru/annual_report), addressed mailing, distribution at scientific conferences, exhibitions, meetings with business partners, etc.) have been improved. • Report-related information has been distributed through mass media. • RIAR and its Annual Report has been participated in Russian public reporting contests: o Industry rating of Annual Reports : – **The winner** in the category Best Annual Public Report of ROSATOM Division Organizations; – Took **the fourth place** in the overall rating; – Took **the fourth place** in the category Public Reporting and Stakeholder Engagement Efficiency; – Took **the fourth place** in the category Quality of Russian Language Use and Effective Text Design in the Annual Report; o Survey of Corporate Transparency of the Major Russian Companies 2016 – Took **the tenth place, transparency level I, information disclosure index A** (84.88 points)

5.2. Engagement in Report Drafting

The system of engagement with every group of stakeholders has and will have a great influence on RIAR development. Therefore, taking into consideration their interests in strategic planning is highly important in terms of sustainable development. The development of stakeholder engagement forms and methods, analysis and consideration of their requests enable timely feedback to any possible risk related to stakeholder engagement, particularly in view of social aspects and reputation. The major groups of stakeholders and their interests are provided in Annual Report 2014 (http://niiar.ru/sites/default/files/pgo2014_ln_29062015_c_ssylkami_0.pdf). In the reporting year a ranking map was updated based on the survey conducted among top and senior managers of JSC "SSC RIAR", and representatives of the major groups of stakeholders (Fig. 5.2.1). G4-24 G4-45

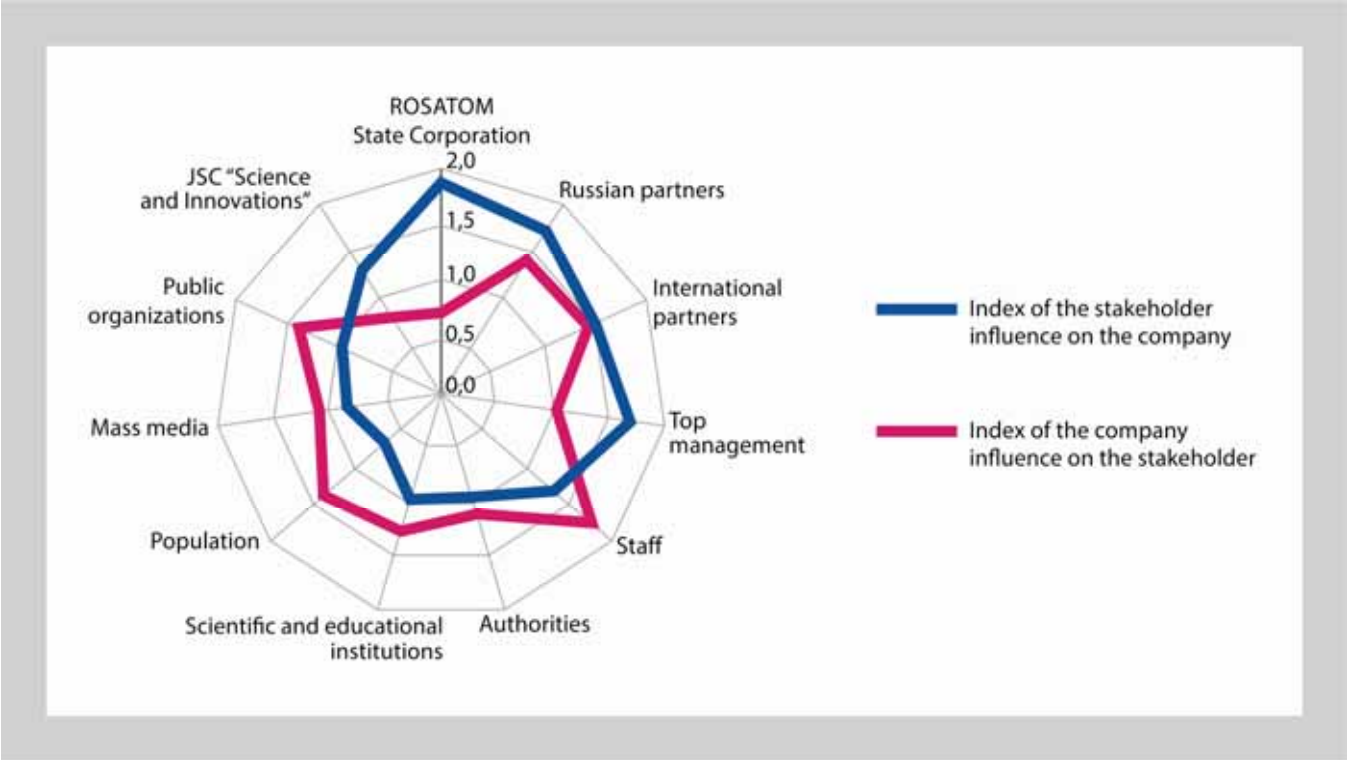


Fig. 5.2.1. Ranking map of RIAR's stakeholders

The analysis of a change in the reciprocal influence between the stakeholders and RIAR conducted in the course of three last years of integrated reports drafting (Fig. 5.2.2) has confirmed that the partners, including international partners, have a great influence on the directions of RIAR's activities (see Chapter 2 Strategy and Chapter 4 Management of Capital and Performance). Compared to the previous years, a growing impact of RIAR on several groups of stakeholders such as population, mass media, scientific and educational institutions and public organizations is observed. This is resulted from improved transparency, openness and public acceptance of RIAR activities.

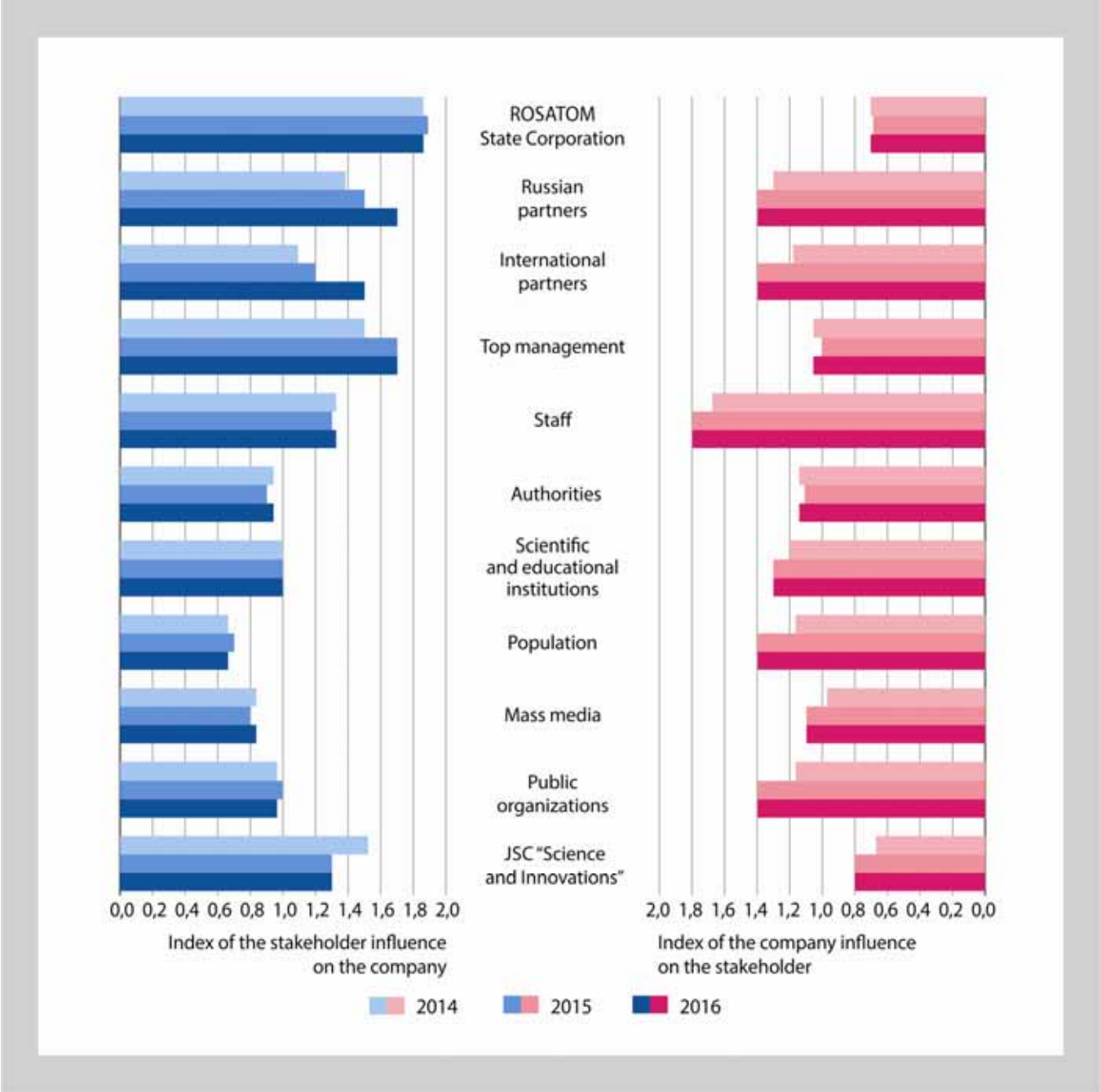


Fig. 5.2.2. Reciprocal influence between the stakeholders and JSC "SSC RIAR"

Stakeholder engagement activities in Report drafting

The stakeholders were involved in all milestones of Annual Report 2016 drafting from shaping its concept to discussions of the final draft. They had an opportunity to give their requests and recommendations as well as ask questions. In the course of Report drafting in accordance with the AA1000SES Stakeholder Engagement Standard the following activities were arranged

involving the representatives of all groups of stakeholders:

- Surveys:
  - to investigate the reciprocal influence between the stakeholders and JSC "SSC RIAR",
  - to identify significant aspects of RIAR activities,
  - to assess the Report with respect to criteria (Fig. 5.2.3);
- Discussion of the Report concept (in absentia, 21 participants);
- Dialogue in Report drafting (25 participants);
- Public consultations on the Report draft (in absentia, 16 participants).

RIAR regularly informs its target audiences about all important events related to its primary activities via RIAR's local and official websites, press releases to mass media, articles, and interviews with the management of RIAR in nuclear industry editions.

Fig. 5.2.3. Assessment of JSC "SSC RIAR" Report with respect to criteria

Concept of Annual Report 2016

During the reporting year RIAR continued discussions of the Annual Report concept in absentia. The members of the Committee for Public Reporting Activities and Stakeholder Commission participated in these discussions. The Report concept was introduced to the participants based on questionnaire surveys conducted among the external and internal stakeholders. The results of these questionnaires were used to compile a relevance matrix (see Section 2.4 "Relevant Aspects of Activity") and a ranking map that reflects the interrelationship between stakeholders and RIAR, and take into account wishes related to Report drafting and public reporting system enhancement of those who were polled. The discussants voiced their recommendations that contributed to specify and finalize the Report concept. The concept was approved by RIAR order issued on December 23, 2016.

Dialogue with stakeholders

The dialogue to discuss socially important aspects of RIAR activity and to reflect these aspects in the drafted Report was held on April 4, 2016 (Fig. 5.2.4) at the Slavsky Conference Center, Dimitrovgrad. The attendees of the dialogue were as follows: Dimitrovgrad and Ulyanovsk authorities, JSC "Science and Innovation" representatives, RIAR employees and trade union, representatives of scientific and educational institutions, population, public organizations, and mass media. The following presentations were made during the meeting: "JSC "SSC RIAR" Performance in 2016 and Development Plans" (Speaker: Alexander Tuzov, Director of JSC "SSC RIAR"), "Research activities in JSC "SSC RIAR". Current State and Perspectives" (Speaker: Elena Zvir, Head of Reactor Materials Testing Complex). In his presentation, the RIAR Director told about key works and achievements of the enterprise, focusing on the important stages of the financial rehabilitation program and topics that reflect most fully the research, production and human resources related activities of RIAR in the reporting year. He covered fully one of the Report priority topics "Optimization of business processes and efficiency improvement". During the discussion of these reports, the RIAR top management presented information on the social and ecological policy of the institute following the results of the reporting year and plans for the future. The members of the public highly appreciated the quality of the presented information and the level of the event organization. In addition, they voiced several recommendations to disclose particular information in the Annual Report and suggestions to enhance public reporting system and stakeholder engagement.

Fig. 5.2.4. Attendees of the dialogue with stakeholders

Public consultations on the Report draft

The Report draft was distributed on April 21, 2017 among the stakeholder representatives for them to introduce their proposals. There were no comments or proposals related to the Report contents.

Inclusion of stakeholders' proposals

In the course of the dialogue and Annual Report 2016 drafting (surveys and questionnaires, presentations for target audience at the exhibitions, Russian and international conferences, Universities) seven proposals and recommendations have been voiced (Table 5.2.1).

Table 5.2.1

Requests and proposals on information disclosure voiced by stakeholders

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Requests / proposals	Implementation
To disclose information about progress of Multipurpose Fast Research Reactor and Polyfunctional Radiochemical Research Complex construction	The information is provided in Section 4.2 Intellectual Capital
To provide more information about RIAR contribution in economic growth of the company habitat	The information is provided in Section 3.12 Public Position as to Sustainable Development and partially in Section 4.5 Human Capital
To explain the reasons of staff reduction	The information is provided in Section 4.5 Human Capital
To involve the representatives of foreign stakeholders in report drafting	Partially completed. A list of foreign stakeholders has been created, their ranking has been carried out, and pilot mechanisms for cooperation are being developed. When preparing the Report 2017, it is planned to involve a number of foreign stakeholders to investigate the major foreign companies best practices related to the stakeholder engagement
To provide more detailed information about the results of research and production activities of the Institute	The information is provided in Sections: 4.1 Financial Capital, 4.2 Intellectual Capital, 4.3 Output, 4.4 International Activities
To clarify the role of the public reporting system of JSC "SSC RIAR" in issuing the Annual Report	The information is provided in Chapter 5 Stakeholder Engagement
To provide more information about stakeholder engagement taking into account questionnaires analysis	The information is provided in Chapter 5 Stakeholder Engagement, Section 3.12 Public Position as to Sustainable Development and Chapter 4.5 Human Capital

5.3. Public Assurance Statement

The management of JSC "SSC RIAR" offered us to verify integrated Annual Report 2016 in terms of completeness and materiality of the disclosed information related to the most important issues for the stakeholders. In doing so, we and our representatives were given an opportunity to participate in discussions of the Report concept (in absentia), dialogue with stakeholders (in Dimitrovgrad on April 4, 2017) and public consultations on the Report draft during November 2016 — April 2017, and freely express our opinion on the issues under discussion. We also took part in identifying important aspects / topics to be disclosed in the Report. Our statement

is based on a comparative analysis of two Report revisions: Report draft and Report final revision, as well as comments made by RIAR managers and employees during the dialogue and assurance statement as well as provided information based on the results of the activities performed (dialogues protocols, the table containing stakeholders' proposals). During this assurance procedure we were not focused on checking the data acquisition and analysis system, nor did we study in a special way the data and management processes. The reliability of the actual data presented in the Report was not as well the subject of public assurance. All the undersigned persons had all opportunities to freely express their opinion, and did not receive from RIAR any reward for participation in the Report assurance procedure.

Assessments, comments and recommendations

We share a common positive attitude to Annual Report 2016, its format and scope of the information provided. RIAR has prepared an informative and well-arranged document that meets our expectations. It is particularly important that the Report has been issued on a voluntary basis, and is a good illustration of a transparency and openness principle of RIAR policy, thus showing both a high level of information disclosure and willingness to conduct an open dialogue with the stakeholders on different issues related to multiple activities including safe operation of research reactors and other facilities. We consider that due to more detailed study of RIAR business model, the Report could clearly reflect a complicated value chain, control system, management strategic objectives and approaches. A full picture of RIAR activities including socially important activity aspects, social, ecological and economic impact factors, challenges and mid- and long-term plans is presented to the Report readers.

The Report has an indisputable advantage that lies in applying Russian and international standards as well as ROSATOM's unified policy in public reporting. We have a positive attitude towards the RIAR's management decision to continue issuing annual reports in Russian and in English as well as in a short (presentation) version. It was highlighted that in contrast to public reports issued by different ROSATOM's enterprises, the Annual Report of JSC "SSC RIAR" is an official publication: it was assigned an ISBN and UDC; the information presented in the Report was edited, thus ensuring high quality of published information and fulfillment of all editing standards.

We believe that the information has been disclosed sufficiently both in terms of taking into consideration the recommendations made by the stakeholders during the Report drafting activities. In our opinion, it is an integrated Report that should present an official viewpoint of RIAR's management on all key issues and activities. The following conclusions can be drawn from our analysis.

Materiality of the information

We believe that RIAR has taken into consideration international standards to identify materiality of the information. After conducting a questionnaire survey

among top managers and Stakeholder Commission members, and identifying the material aspects of its activity, RIAR has fully and comprehensively disclosed the relevant information in the Report. The Report provides the information important both for RIAR and its stakeholders. We consider the priority topics of the Report "Optimization of business processes and efficiency improvement" and "RIAR: sixty years in nuclear industry" have been rightly chosen because they have been attracted the most stakeholders' interest in the reporting year. All material aspects related to the priority topic have been disclosed. The most important information to understand the prospects of RIAR development is provided in the Report sections on RIAR strategic development, its unique competitive advantages and growth prospects; enhancement of finance, risk and staff management efficiency; economic, social and environmental impact; and safety assurance in multiple projects. We are not aware of any other issues important for stakeholders to be included in the Report.

Completeness of the information

In our viewpoint, the information related to the key aspects and provided in the Report is complete and allows the readers to draw the conclusions on RIAR performance. We believe that the reduced Report scope in disclosing all material aspects complies with best international reporting practices and gives an opportunity to show a complete picture of RIAR activities. References to other information sources enable obtaining all the necessary data. At the same time, they do not unduly burden the Report with extra data presented both on RIAR's official website and in recent annual reports.

Response to requests, offers and recommendations of the stakeholders

We believe that RIAR has shown major progress in arranging stakeholder engagement and establishing the public reporting system. We consider it a good tradition that the stakeholders become engaged at the stage of concept development before Report drafting. The stakeholders had an opportunity to voice their proposals and recommendations on information disclosure and public reporting system development. Upon the stakeholders' request RIAR has updated and provided additional information in the final revision of the Report, or it has explained the reasons why the requested information can't be disclosed (see the present chapter of the Report). In Report drafting RIAR has shown its readiness to provide a constructive response to the stakeholders' requirements and proposals. We hope that RIAR will continue implementing the principles of good corporate conduct by developing the public reporting system and stakeholder engagement.

Annual Report 2016 assurance statement approvals page

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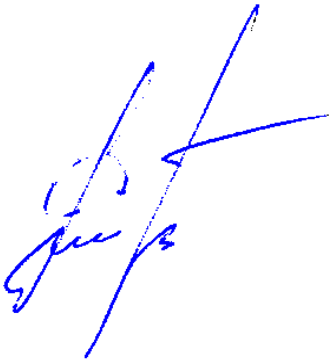
Deputy Director General — Director of the Block for Innovation Management, Rosatom, State Atomic Energy Corporation		Vyacheslav Pershukov
Director General Science and Innovations, JSC		Sergey Kashlev
Director SSC RIAR, JSC		Alexander Tuzov
Chief Engineer SSC RIAR, JSC		Andrey Vorobey
Deputy Director for Economics and Finance SSC RIAR, JSC		Igor Knyazkin
Deputy Director for Staff Management and Social Development SSC RIAR, JSC		Yulia Titova
Head of Department for R&D Management TVEL, JSC		Alexey Dolgov
Governor of Ulyanovsk region		Sergey Morozov
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LIST OF ABBREVIATIONS

AA1000 — AccountAbility Principles Standard.

AA1000 APS — AccountAbility Principles Standard.

AA1000 AS — Assurance Standard.

AA1000 SES — Stakeholder Engagement Standard.

AE — an absorber element.

ARBUS — an arctic reactor unit-type facility.

BN — a fast sodium-cooled reactor.

BOR-60 — a fast research reactor (60 MW).

BREST OD-300 — an inherently safe fast reactor (300 MW).

CIAE — China Institute of Atomic Energy.

CIS — the Commonwealth of Independent States.

CJSC — Closed Joint Stock Company.

CJSC "EMI" — Closed Joint Stock Company "Energomontage International".

CJSC "YuKOS EP" — Closed Joint Stock Company "YuKOS Exploration & Production".

E110 (Э110) — an alloy based on a mixture of electrolytic and iodide zirconium.

EBITDA — Earnings before Interest, Taxes, Depreciation and Amortization.

EFA — an experimental fuel assembly.

EP302-Sh (ЭП302-Ш) — chromium-nickel austenitic steel applied for production of semi-finished rolled products (sheets, rods, ribbons), tube work pieces, tubes and forgings designed for manufacturing pieces and units of power engineering equipment.

EP823-Sh (16Kh12MVSFBR-Sh) (ЭП823-Ш (16Х12МВСФБР-ш)) — heat-resistant high-alloy steel applied to manufacture extra thin-wall tubes, rods with special surface finish, special purpose equipment pieces.

FA — a fuel assembly.

FA-2 — a fuel assembly with a rigid frame made of twelve spacer grids welded on guide tubes.

FA-2M — FA-2 upgraded version containing shortened end pieces, extended core fuel column, enhanced spacer grids to reduce hydrodynamic resistance (the thirteenth grid in the bottom fixes the beam in the hydrodynamic instability area); it is intended for eighteen-month fuel cycle.

FAA — a fuel assembly of an alternative design with a rigid skeleton formed by six corners and spacer grids. It has an increased fuel burn-up, improved operational reliability and enhanced bending stiffness.

"FBK", LLC — Limited Liability Company "Financial and Accounting Consultants".

FE — a fuel element.

FSUE 'PA "Mayak"' — Federal State Unitary Enterprise 'Production Association "Mayak"'.

FSUE — Federal State Unitary Enterprise.

FSUE 'NII NPO "Luch"' — Federal State Unitary Enterprise 'Research Institute — Research and Production Association "Luch"'.

FSUE "NO RWM" — Federal State Unitary Enterprise "National Operator for Radioactive Waste Management".

FSUE "RFNC — VNIIEF" — Federal State Unitary Enterprise "Russian Federal Nuclear Center — All-Russian Research Institute of Experimental Physics".

FSUE CRISM "Prometey" — Federal State Unitary Enterprise 'Academician I.V. Gorynin Central Research Institute of Structural Materials "Prometey"'.

GMP — Good Manufacturing Practice.

GOST — a set of state standards of the Russian Federation.

GOST RV — a set of state military standards of the Russian Federation.

GRI — Global Reporting Initiative.

GT–MHR — gas turbine — modular helium reactor.

HTGR — a high temperature gas-cooled reactor.

IAEA — International Atomic Energy Agency.

ICERR — IAEA International CEntre based on Research Reactor.

IIRC —International Integrated Reporting Council.

INES — International Nuclear Event Scale.

International <IR> Framework — International Standard Integrated Reporting

ISBN — International Standard Book Number.

ISEA — Institute of Social and Ethical Accountability (AccountAbility).

ISO — International Organization for Standardization.

ITER — an international thermonuclear experimental reactor.

ITsKM "Prometey–Atom", LLC — Limited Liability Company 'Design Center for Structural Materials "Prometey–Atom"'.

JSC — Joint Stock Company.

JSC 'OKB "Gidropress"' — Joint Stock Company 'Experimental and Design Organization "Gidropress"'.

JSC 'SPA "TsNIITMASh"' — Joint Stock Company 'Scientific Production Association "Central Research Institute for Machine Building"'.

JSC 'SPb "IZOTOP"' — Joint Stock Company 'Saint Petersburg "IZOTOP"'.

JSC "Afrikantov OKBM" — Joint Stock Company "Afrikantov Experimental Design Bureau for Mechanical Engineering".

JSC "Atomenergoprom" — Joint Stock Company "Atomic Energy Power Corporation".

JSC "Atomproekt" — Joint Stock Company 'Research and Design Institute of Power Engineering Technology "Atomproekt"'.

JSC "DEZ" — Joint Stock Company "Consolidated NPP Equipment Procurement Directorate".

JSC "FC NRS" — Joint Stock Company "Federal Center for Nuclear and Radiation Safety".

JSC "Greenatom" — Joint Stock Company "Greenatom".

JSC "GSPI" — Joint Stock Company "State Specialized Design Institute".

JSC "IRM" — Joint Stock Company "Institute for Reactor Materials".

JSC "Isotope" — Joint Stock Company "Isotope".

JSC "L.Ya. Karpov NIFKhI" — Joint Stock Company "L.Ya. Karpov Research Institute of Physics and Chemistry".

JSC "NIITFA" — Joint Stock Company "Research Institute for Applied Physics and Automation".

JSC "NIKIET" — Joint Stock Company "N.A. Dollezhal Research and Development Institute of Power Engineering".

JSC "NIKIMT–Atomstroy" — Joint Stock Company 'Research and Design Institute for Assembly Technology "Atomstroy"'.

JSC "OTEK" — Joint Stock Company "Integrated Thermal Power Company".

JSC "PA Electrochemical Plant" — Joint Stock Company 'Production Association "Electrochemical Plant"'.

JSC "Radium Institute" — Joint Stock Company "V.G.Khlopin Radium Institute".

JSC "Rosenergoatom Concern" — Joint Stock Company "Concern for Generation of Electric and Thermal Power at NPPs".

JSC "Science and Innovations" — Joint Stock Company "Science and Innovations".

JSC "SKhK" — Joint Stock Company "Siberian Chemical Combine".

JSC "SNIIP" — Joint Stock Company "Specialized Research Institute for Instrumentation Engineering".

JSC "SSC RF — IPPE" — Joint Stock Company "State Scientific Center of the Russian Federation — Institute for Physics and Power Engineering named after A.I. Leypunsky".

JSC "SSC RF TRINITI" — Joint Stock Company "State Scientific Center of the Russian Federation — Troitsk Institute for Innovation and Fusion Research".

JSC "SSC RIAR" —Joint Stock Company "State Scientific Center — Research Institute of Atomic Reactors".

JSC "TsKBM" — Joint Stock Company "Central Design Bureau of Machine-Building".

JSC "TVEL" — Joint Stock Company "TVEL".

JSC "UEKhK" — Joint Stock Company "Ural Electrochemical Combine".

JSC "VNIINM" — Joint Stock Company "A.A. Bochvar High-Technology Research Institute for Inorganic Materials".

JSC "VNIKhT" — Joint Stock Company "Leading Research Institute for Chemical Technology".

JSC FCS&HT "SNPO Eleron" — Joint Stock Company 'Federal Center for Science and High-Technologies "Special Scientific & Production Enterprise "Eleron"'.

LLC — Limited Liability Company.

LRW — liquid radioactive waste.

LTIFR — Lost Time Injury Frequency Rates.

MBIR — a multi-purpose fast reactor.

'MC "UES"', LLC — Limited Liability Company 'Management Company "Uralenergostroy"'.

MIR — a multi-loop research reactor for material testing.

MOX-fuel — mixed uranium plutonium oxide fuel.

NK "Rosneft — Research and Engineering Center", LLC — Limited Liability Company 'Oil Company "Rosneft —Research and Engineering Center"'.

NOPAT — Net Operating Profit after Tax.

NP-090-11 — Quality assurance program requirements for nuclear facilities.

NPP — a nuclear power plant.

NRB—99/2009 — Radiation safety norms.

NRC "Kurchatov Institute" — National Research Center "Kurchatov Institute".

NRHF — a nuclear- and radiation-hazardous facility.

OGRN — primary state registration number.

OSPORB 99/2010 — Principal sanitary radiation safety rules.

OST — a set of industry-specific standards.

PJSC — Public Joint Stock Company.

PJSC "IDGC of Volga" — Public Joint Stock Company "Interregional Distribution Grid Company of Volga".

PJSC "MSZ" — Public Joint Stock Company "Mashinostroitelny Zavod".

PJSC "NCCP" — Public Joint Stock Company "Novosibirsk Chemical Concentrates Plant".

PR — Public Relations.

PRC — the People's Republic of China.

PUREX — Uranium and Plutonium Regeneration through EXtraction.

PUREX process — plutonium-uranium recovery by extraction; nuclear fuel recycling procedure.

R&D — Research and development.

RBMK — a high-power channel-type reactor.

RBT — a pool-type reactor.

REMIX *(regenerated mixture)* — Russian innovative nuclear fuel for the VVER type reactors; it is produced from a non-separated mix of regenerated uranium and plutonium obtained when reprocessing spent nuclear fuel.

RF — a reactor facility.

RF — the Russian Federation.

RIAR — Research Institute of Atomic Reactors.

RITM — a modular integral reactor.

Rostechnadzor — Federal Environmental, Industrial and Nuclear Supervision Service of Russia.

RW — radioactive waste.

SFA — a spent fuel assembly.

"Sfera" R&D Company", LLC — Limited Liability Company '"Sfera" Research and Development Company'.

SM — a high-flux vessel-type pressurized-water reactor; according to its name in Russian it is translated as *the most powerful* reactor due

to a high density of thermal neutron flux.

SMART:
S — *specific* ;
M — *measurable* ;
A — *attainable*;
R — *relevant*;
T — *time-bounded*.

SNF — spent nuclear fuel.

SPS — a shipping package set.

SRW — solid radioactive waste.

STO — company standard.

SVBR — a lead-bismuth fast reactor.

TIN – a taxpayer identification number.

UDC — universal decimal classification of books used worldwide; its index is an obligatory imprint element.

"Uralenergostroy", LLC — Limited Liability Company 'Managing Company "Uralenergostroy"'.

USA — the United States of America.

USSR — the Union of Soviet Socialist Republics.

VAT — a value added tax.

VK-50 — a boiling water reactor.

VVER — a water-cooled water-moderated energy reactor.

VVER-TOI — a design for a two-unit NPP with VVER-1300 reactor.

08Kh18N10 (08X18H10) — structural high-alloy heat- and corrosion-resistant austenitic steel applied to manufacture pieces from thin sheet and ribbon in car construction and machine manufacturing industries; also used to fabricate consumer goods, hardened articles, welding devices and reservoirs for chemical engineering, to work in the environment unprovoking intergranular corrosion.

08Kh18N10T (08X18H10T) — chromium-nickel austenitic steel applied for manufacture of welded articles; it has enhanced resistance to intergranular corrosion in a number of industrial environments.

42KhNM (42XHM) — nonmagnetic alloy applied for manufacture of special-purpose products, extra thin-walled tubes to fabricate reactor engineering components, fuel claddings, neutron sources, nuclear reactor core elements etc.

GLOSSARY

Absorbing element — a) an assembling unit of a reactor that has a strong sealed cladding, usually in the form of a cylinder or ball, and an absorbing material embedded into it to control the reactor reactivity; b) a key construction part of a shim rod that contains absorbing material.

Activity — the number of radioactive decays occurred in the given amount of a radioactive isotope per time unit.

Business model — an integrated organizational and financial chart of company activities related to performance of different functions and principal processes at stages of the product life cycle; a graphic presentation of material and money flows.

Closed nuclear fuel cycle — a nuclear fuel cycle, in which spent nuclear fuel is reprocessed to recover uranium and plutonium to refabricate nuclear fuel.

Discharge of radioactive substances — controlled discharge of radionuclides to tanks with liquid radwaste at a nuclear facility.

Division — a business entity that has an established procedure of relationships with the corporation; according to this procedure this entity is defined as a division managing other business entities within the management circuit of such division.

Enrichment — a) is a content of atoms of a specific isotope in a mixture of isotopes of the same element if it increases the fraction of this isotope in a mixture; occurs in nature (expressed in percentage); b) process resulting in the increase of a specific isotope in a mixture of isotopes.

Fast neutrons — neutrons with kinetic energy exceeding the given value. This value can vary in a big range. It depends on the area of application (reactor physics, protection or dosimetry). In reactor physics this value is usually equal to 0.1 MeV.

Fuel assembly — a set of fuel elements (rods, rodlets, plates, etc.) fixed together by a spacer grid and other components that are non-dismountable during the transportation and irradiation in a reactor. Fuel assemblies are inserted in the nuclear reactor core.

Fuel element — the smallest structural unit of a reactor or fuel assembly containing nuclear fuel and/or breeding material and located either in the reactor core or breeding zone to produce thermal energy and transfer it to coolant as well as accumulate secondary nuclear fuel.

Global Reporting Initiative, GRI — a reporting system accepted in international practice and concerning economic, environmental and social efficiency; it is based on Sustainability Reporting Guideline, technical protocols and sector-oriented appendices.

IAEA Safeguards — a system of inspection and verification of the peaceful uses of nuclear energy established under the international non-proliferation policy and supervised by the International Atomic Energy Agency.

International Standard Book Number (ISBN) — a unique identification number of an edition used worldwide in book business, publishing and librarianship. The same ISBN number

cannot be assigned to different editions. The ISBN has been used internationally since 1972 (ISO 2108 — 1972). The ISBN provides exact identification of editions, country of issuance, publisher and the book itself. The ISBN is used worldwide in more than 160 countries. In each member state there is a national agency responsible for arranging the international standard book numbering of its state editions. In Russia the Central Institute of Bibliography deals with it. Along with the library-bibliography classification indices, universal decimal classification and author's number the ISBN is a part of a so-called publishing package obligatory for book publishing.

Isotopes — variants of atoms and nuclei of a chemical element which have the same atomic (ordinal) number and different mass numbers.

Mission — one of the basic terms used in strategic management; the main objective of a company, reason for its existence from the viewpoint of meeting customers' needs, competitive advantages and motivation of company's employees.

MOX fuel — a nuclear fuel that contains several oxides of fissile materials. Generally this term is applied for mixture of plutonium oxides and natural uranium, enriched uranium or depleted uranium which behaves similarly (but not identically) to low-enriched uranium oxides used in fuel of most nuclear reactors. The advantage of MOX fuel is that when it is produced the surplus of weapons-grade plutonium is disposed, otherwise it is a nuclear waste.

Natural radiation background — ionizing radiation formed by space and ionizing radiation of natural radionuclides (on the top of the ground, in the air, food products, water, human body, etc.)

Nuclear fuel — a material containing fission radionuclides that allows a nuclear chain reaction loaded in a nuclear reactor.

Nuclear fuel cycle — a chain of operations to ensure nuclear reactor operation from mining of uranium to radwaste disposal.

Nuclear medicine — a branch of medicine involving the application of radioactive pharmaceuticals in diagnosis and treatment of a disease; methods of remote X-ray therapy.

Nuclear power engineering — a branch of power engineering concerned with the application of nuclear energy for heat and electricity supply purposes.

Nuclear safety — a general term describing the characteristics of a nuclear facility under normal operation and accidental conditions to minimize the radiation exposure on personnel, population and environment within the admissible limits.

Operator — an organization that has an approval from the regulatory authorities to operate a nuclear facility.

Radiation burden — the total of emission individual doses obtained or to be obtained in the course of operation, maintenance, repair, replacement or dismounting of nuclear facility equipment.

Radiation monitoring — obtaining data on radiation situation in an organization, environment and people irradiation levels (includes dosimetric and radiometric control).

Radiation safety — activities to minimize radiation exposure on personnel and population to the lowest possible values using the means acceptable to the public in order to prevent early radiation effects and minimize late radiation effects to the admissible level.

Radioactive waste — nuclear materials and radioactive substances for which no future is foreseen.

Radionuclide — an atom with a specific mass number, atomic number and nuclei energy state that has the lifetime sufficient for observations.

Release of radioactive substances — release of radionuclides in the atmosphere as a result of a nuclear facility operation (e.g. NPP).

Reprocessing of spent nuclear fuel — a set of chemical and technological processes to remove fission products from spent nuclear fuel and regenerate fissile material for re-use.

Reprocessing of radioactive waste — process operations to change the aggregate state and/or physical and chemical properties of radioactive waste to convert them to conditions acceptable for transportation, storage and/or disposal.

Research reactor – a nuclear reactor intended for generating data on physics and technology of reactors required to design and develop reactors of such type or their components.

Risk management — a process to make and implement management decisions focused on minimizing a probability of unfavourable results and potential losses caused by its implementation.

Safety of nuclear facilities — a property of nuclear facilities to provide radiation safety both under normal operation and in case of accident for the personnel, population and environment within the designed limits.

Stakeholder — physical and/or legal persons and groups of persons who affect or can be affected by organization's activities.

НИИАР

FEEDBACK QUESTIONNAIRE

60 ЛЕТ НИИАР

Dear Reader!

Your opinion about the Public Annual Report of JSC "SSC RIAR" is very important for us and will help improve the quality of next reports, the level of information content and relevancy. Please, fill in the questionnaire below and e-mail it to niiar@niiar.ru or send it to: 433510, Russian Federation, Ulyanovsk region, Dimitrovgrad, Zapadnoye Shosse, 9, JSC "SSC RIAR".

- ☐ ROSATOM, JSC "Atomenergoprom", JSC "Science and Innovations"
- ☐ Partners (customers, suppliers, subcontractors)
- ☐ Personnel of JSC "SSC RIAR"
- ☐ Federal, regional and local authorities
- ☐ Educational Institutions
- ☐ Resident population
- ☐ Mass media
- ☐ Public organizations

Could you get information you were interested in?

- ☐ Yes
- ☐ Yes, but partially
- ☐ No

What is the most prominent drawback of the Report?

What information should the Report be added with?

Please, estimate the Report by the following criteria:

Criterion	Excellent	Good	Satisfactory	Non-satisfactory
Relevance of the information persented				
Authenticity of informaiton presented				
How well the information is structured				
Design				

THANK YOU FOR YOUR FEEDBACK!

Information Edition

JSC "SSC RIAR" Annual Report 2016

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