



STATE SCIENTIFIC CENTER –
RESEARCH INSTITUTE OF ATOMIC REACTORS



70 лет атомной
отрасли России

ROSATOM STATE ATOMIC ENERGY CORPORATION ENTERPRISE



ANNUAL REPORT

2015



STATE SCIENTIFIC CENTER –
RESEARCH INSTITUTE OF ATOMIC REACTORS

ROSATOM STATE ATOMIC ENERGY CORPORATION ENTERPRISE



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отрасли России

ANNUAL REPORT

2015 JSC "SSC RIAR"

Approved by the Annual General Meeting of Stockholders
of JSC "SSC RIAR" (Protocol #42 as of June 15, 2016).
Pre-approved by the Resolution of Board of Directors
of JSC "SSC RIAR" (Protocol #364 as of May 13, 2016).

Director of JSC "SSC RIAR"

Alexander A. Tuzov

Dimitrovgrad
2016

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The Report covers the key financial, economic and production results of JSC "SSC RIAR" activities for the year of 2015 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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"State Scientific Center —
Research Institute of Atomic Reactors"
(JSC "SSC RIAR"), 2016

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Nuclear industry is of exceptional importance for Russia. It is a reliable basis of the national defense capability, one of key strategic branches of the Russia's economy

Vladimir Putin

JSC "SSC RIAR"

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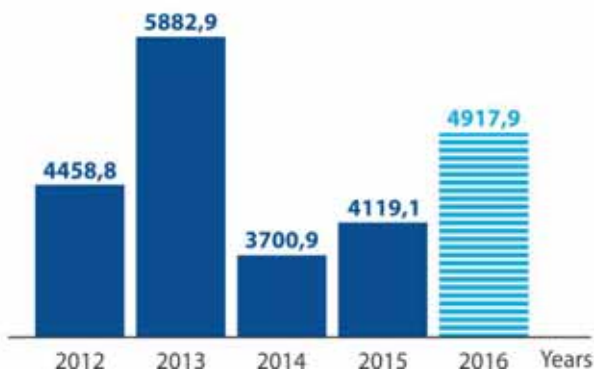
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Key performance indicators

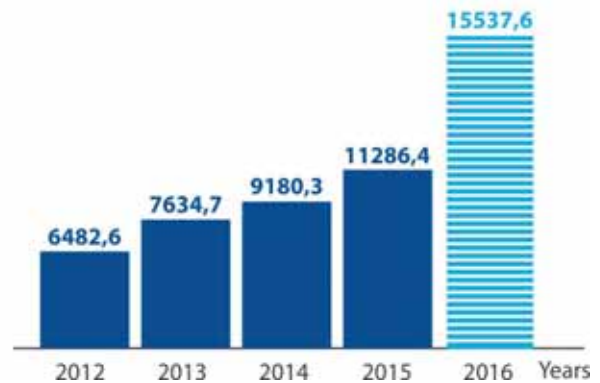
difference between indicators in 2015 and 2016

+418,2



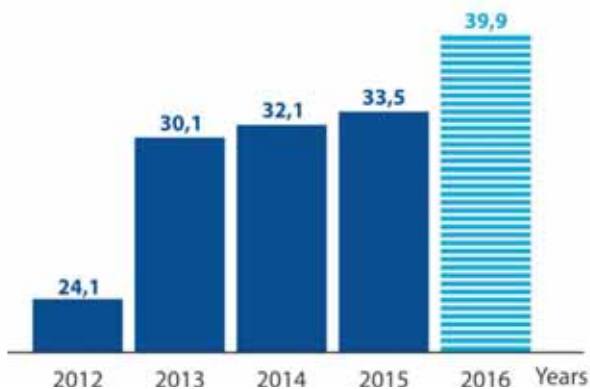
Sales revenue, M RUB

+2106,1



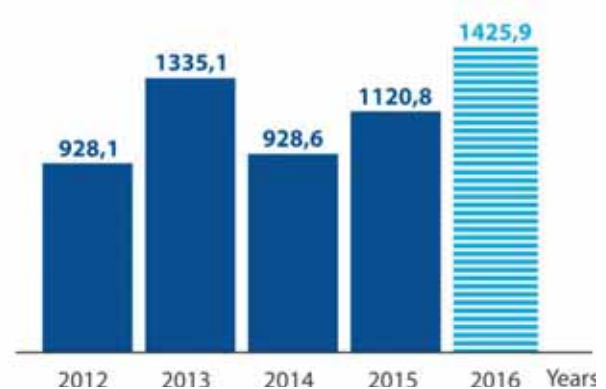
Net assets, M RUB

+1,4



Average monthly salary budget,
K RUB/month

+192,2

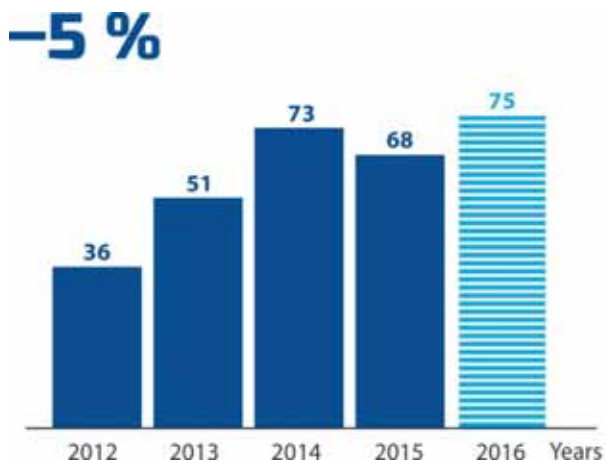


Labor capacity,
K RUB/persons



**Nuclear power engineering
takes the leading position
and will hold the ground**

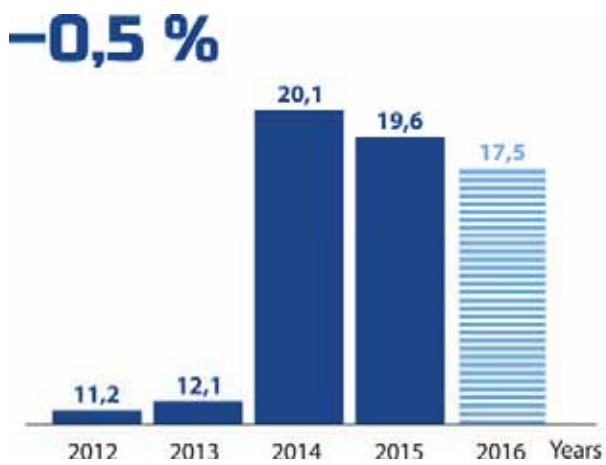
Sergey Kiriyenko



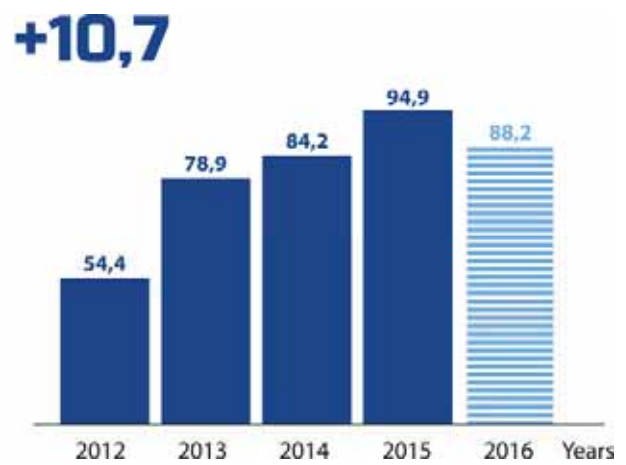
Personnel involvement level, %



Average staffing number, persons



Ratio of the administrative expenses in the revenue, %



Social expenses, M RUB

RIAR is one of the largest scientific nuclear centers and the experimental base of the Russia's nuclear engineering

Sergey Kiriyenko

Appeal of Directors



DEAR FRIENDS AND COLLEAGUES!

JSC "SSC RIAR" is one of the key enterprises of the ROSATOM State Corporation as well as an industrial research and development center that produces high-tech innovation outputs being in demand in different branches of industry. This is the largest in Russia research center carrying out a wide range of reactor experiments and post-irradiation examinations and providing science-intensive and high-tech services.

A high level of service provided by RIAR is confirmed by the constant extension of the international cooperation, namely in the growing number of foreign contracts. The scientific collaboration becomes wider: more and more foreign partners visit RIAR to implement joint projects.

In 2015, the Institute confirmed once again its status of the State Scientific Center. Further development of the scientific and technical capabilities to meet the status of SSC RF is one of the priority goals of the enterprise and industry as a whole.

RIAR's R&D divisions meet successfully the challenges related to the implementation of the important state-level contracts on R&D activities to the benefit of nuclear industry and with the aim to sustain safety of nuclear power engineering and defense potential of our country. In September 2015, there has been started the construction of the multi-purpose research reactor MBIR that is the basis of the future International Research Center.

Though the participation in the Federal Target Programs, ROSATOMS's projects and research grants programs takes great efforts from the RIAR's staff, these activities will open up fresh opportunities and perspectives for the development.

G4-1

Sergey P. Kashlev

Director General
of JSC "Science and Innovations"

**Development
of science at ROSATOM
is hardly possible
without JSC "SSC RIAR"**

DEAR FRIENDS, COLLEAGUES AND PARTNERS!

In the reporting period JSC "SSC RIAR", being justly the key experimental site of the Russian nuclear engineering, proceeded with achieving the ROSATOM's strategic goals in the framework of state-level and business targets.

In September 2015, RIAR's site was the scene of the event, of which importance for its future can hardly be overestimated: a new leader of the Russia's research reactor fleet, multi-purpose fast research reactor MBIR, was laid in the presence of the Governor of Ulyanovsk region Sergey Morozov, representatives of the ROSATOM Administration and nuclear-innovative cluster of Dimitrovgrad.

I strongly believe that the MBIR construction is a first step in establishing at the JSC "SSC RIAR" site a unique up-to-date research center with powerful capabilities to hold reactor experiments and post-irradiation examinations.

Being aware of the priority sustainable development of the human, scientific and production capabilities in the current challenging financial and economical environment, in the year of 2015 we focused on the effectivization of our activities, optimization of business processes, reduction of stocks and saving of costs paying also a special attention to our activities at the international market.

This activity has already yielded favorable results. For instance, the labor capacity increased by more than 20% by value. However, to be always one step ahead, we'll have to meet many scientific, organizational and managerial challenges.

Our mid-term goal is to establish an effective scientific-and-production center to carry out science-intensive research, try out innovative technologies, develop and output various high-tech marketable products.



Alexander A. Tuzov G4-1

Director of JSC "SSC RIAR"

**I strongly believe RIAR team
will successfully solve
the challenging tasks!**

A handwritten signature in blue ink, appearing to read 'A. Tuzov', located in the bottom right corner of the text box.

Key Events



The Federal Service for Ecological, Technological and Nuclear Supervision issued a 10-year license for construction of the multi-purpose fast research reactor.



The "first concrete" was poured at the construction site of reactor MBIR, which will significantly enlarge the experimental capabilities of Russia's nuclear industry.



RIAR Team successfully took part in the play-off of the All-Russian Brain Quiz "What? Where? When?"



Seven RIAR employees became the awardees of the regional contest "The Best Engineer in the Year of 2015".



JSC "SSC RIAR" and Korea Atomic Energy Research Institute signed Contract on irradiation of experimental fuel rods in the fast test reactor BOR-60.



The construction objects to be commissioned in 2016 were successfully accepted: rehabilitation of the storm sewage system and reconstruction and safety provision for solid radwaste storage facility.



The Government Executive Order re-conferred the status of State Scientific Center upon JSC "SSC RIAR".



RIAR went through QMS re-certification audits to meet standards ISO 9001:2008 and GOST RV 0015-002-2012 as well as through the environmental management audit to meet standard ISO 14001:2004.



Reactor VK-50 got a license to extend its operation till December 25, 2020. This is the only world's operational vessel-type boiling reactor with the natural coolant circulation.



RIAR's employees got keys from their new apartments in a new block of flats. Young and highly-skilled specialists were financially supported in the form of interest-free loan for mortgage borrowing.

Awards Received by JSC "SSC RIAR"

1



2



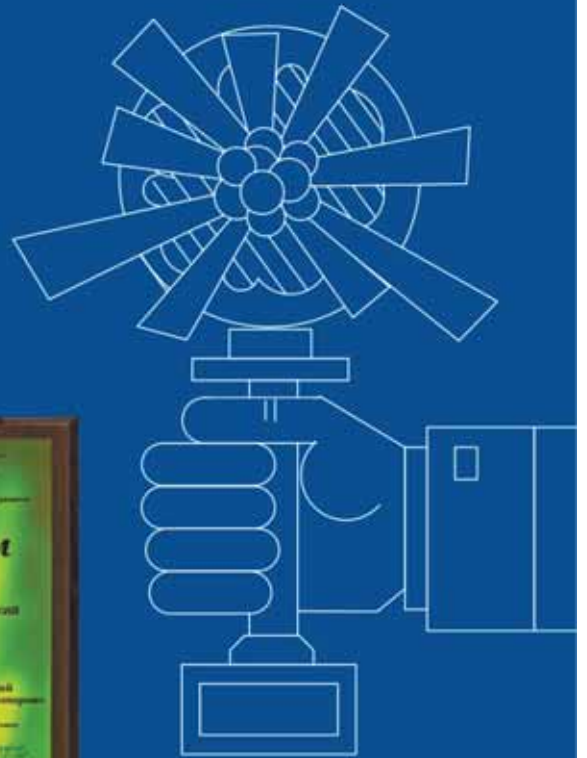
3



4



5



1

The Awardee of Public Reporting Contest among ROSATOM's organizations in 2015

2

The Laureate of the Contest "Russia's Hundred Best Organizations. Ecology and Ecological Management"

3

The Laureate of the XII Contest of Annual Reports 2014 among Joint Stock Companies

4

The Diploma Winner in the RF Government Award Quality Competition

5

The Awardee of the Contest "The Customs Olympus-2015", nomination: "The Best Exporter"

Awards received by employees of JSC "SSC RIAR" during the reporting period:



403
RIAR's awards



73
local government awards

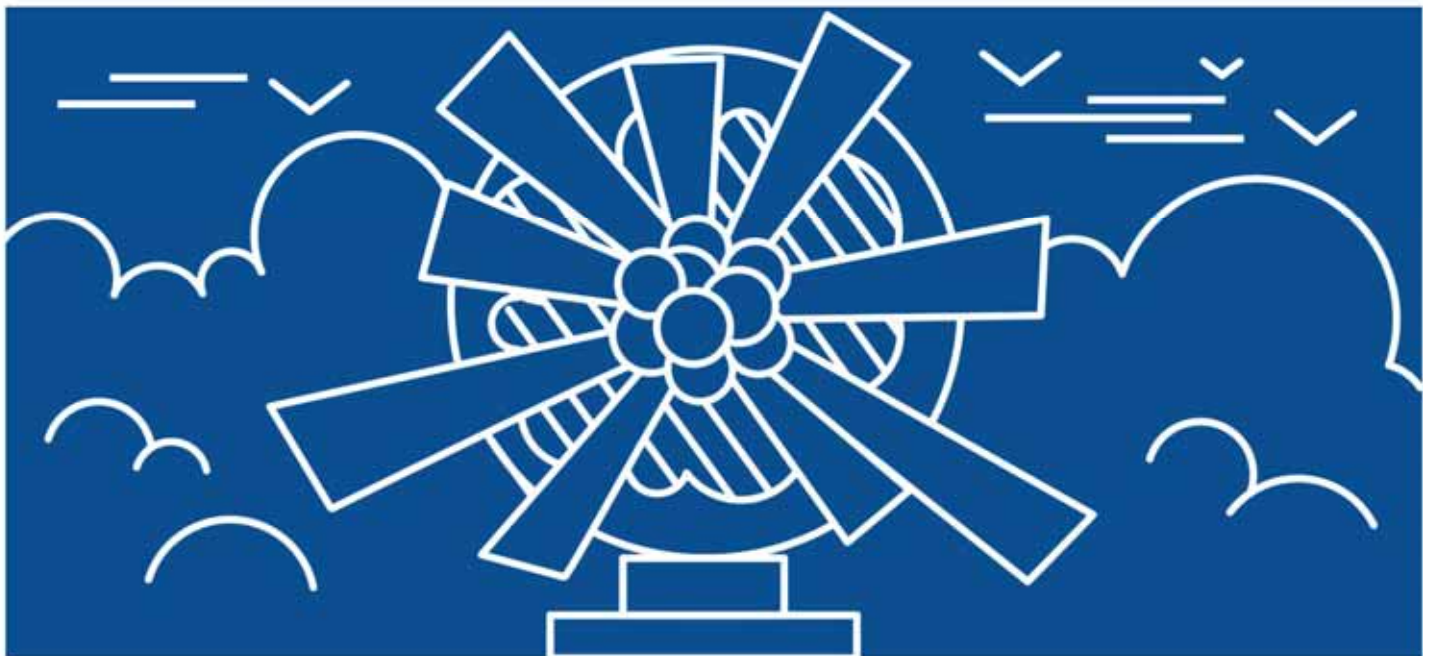


66
nuclear industry awards



35
federal and regional government awards

GENERAL INFORMATION



1.1. General Information

Table 1.1 gives the essential information about the Institute

Table 1.1

Essential information about JSC "SSC RIAR"

Full name	
In Russian	Акционерное общество «Государственный научный центр — Научно-исследовательский институт атомных реакторов»*
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	
433510, Russian Federation, Ulyanovsk region, Dimitrovgrad, Zapadnoye Shosse, 9.	
Contacts	
E-mail	niiar@niiar.ru
Website	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.

Registrar's requisites:	OGRN 1027739216757; TIN 7726030449.
Short name:	JSC "R.O.S.T. Registrar".
Postal address:	18/13 Stromynka St., 107996, Moscow.
Tel./fax:	+7 (495) 771-73-36; +7 (495) 771-73-34.
E-mail:	rost@rost.ru
The date since when the Registrar has maintained the register of issuer's inscribed stock:	January 11, 2009.

Auditor

The Annual Meeting of JSC "SSC RIAR"
Stockholders (protocol #38 as of June 30, 2015)
approved Nexia Pacioli, LLC as the auditor

for the mandatory annual audit
of JSC "SSC RIAR".

Postal address:	119180, Moscow, Malaya Polyanka St., 2,
Tel.:	+7 (495) 640-64-52.
Website:	http://www.pacioli.ru .
E-mail:	pacioli@pacioli.ru

Stockholders (Table 1.2.)

Table 1.2

Key information about JSC "SSC RIAR" stockholders

Stockholders	Legal/postal address	Number of shares		Share in the charter capital, %	
		by 31.12.2014	by 31.12.2015	by 31.12.2014	by 31.12.2015
Joint Stock Company "Atomic Energy Power Corporation"	24 Bolshaya Ordynka St., 119017, Moscow	6 320 505 675	6 320 505 675	64,7367	49,8235
Russian Federation represented by ROSATOM State Atomic Energy Corporation	24 Bolshaya Ordynka St., 119017, Moscow	12 200 000	0	0,1250	0
ROSATOM State Atomic Energy Corporation	24 Bolshaya Ordynka St., 119017, Moscow	3 430 700 000	6 365 286 800	35,1384	50,1765

Subsidiary Companies and Joint Ventures (Table 1.3)

Table 1.3

Subsidiary companies and joint ventures of JSC "SSC RIAR"

Company	Activities
NIIAR – GENERATSIYA Ltd.	Generation and supply of energy: electricity, heat, steam, hot water, drinking and general-use water, water discharge
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
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

Background

The origin of Research Institute of Atomic Reactors dates back to March 1956 when it was decided to build a pilot plant in the town of Melekes, Ulyanovsk region to provide R&D support for the development of a wide range of nuclear reactors for the nuclear industry according to a Decree of the USSR Council of Ministers. By the time the Decree was issued, a unique high-flux research reactor with super high neutron flux density had been nearly developed. The development work was led by Academician Igor V. Kurchatov. Under his initiative, it was decided to locate at a new pilot

plant a reactor with a large research complex to perform work in the field of reactor materials science, solid-state physics, nuclear physics, accumulation of remote transuranium elements and radiochemistry. In 1959 in accordance with the Decree of the USSR Council of Ministers Research Institute of Atomic Reactors was established at the base of research and test reactors, facilities and labs under construction.

Figure 1.1 represents schematically the history of the Institute development. More detailed information can be found at (<http://niiar.ru/?q=history>).

The Institute was founded as a plant to test nuclear reactors, and eventually it became a world's scale research center



Dmitry Medvedev

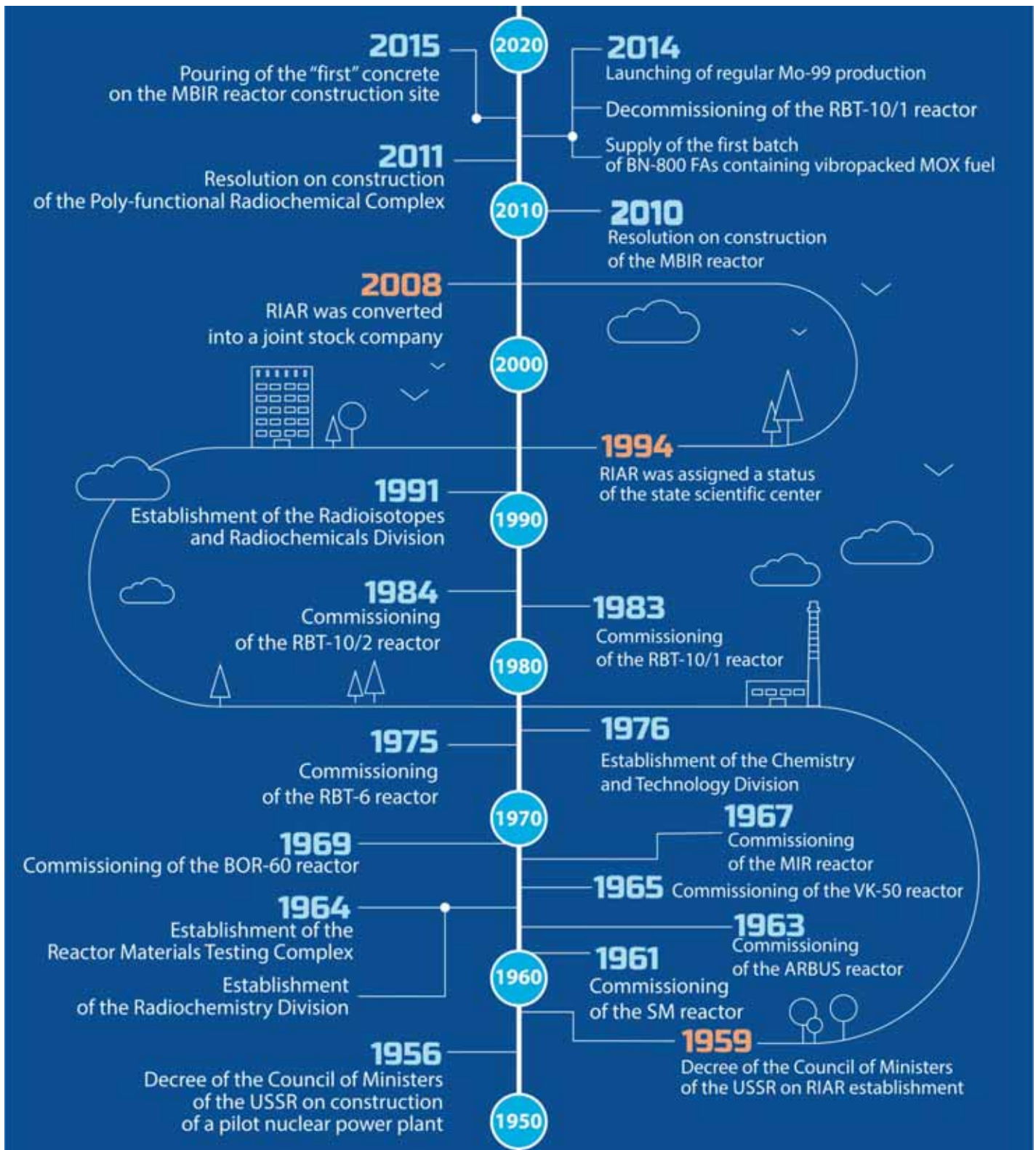


Fig. 1.1. RIAR's history

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 and were already described in detail in the previous Reports

(http://www.niiar.ru/?q=annual_report). Below, one may find a brief description complemented with information about key consumers of the RIAR's products and services (Fig. 1.2).

G4-4

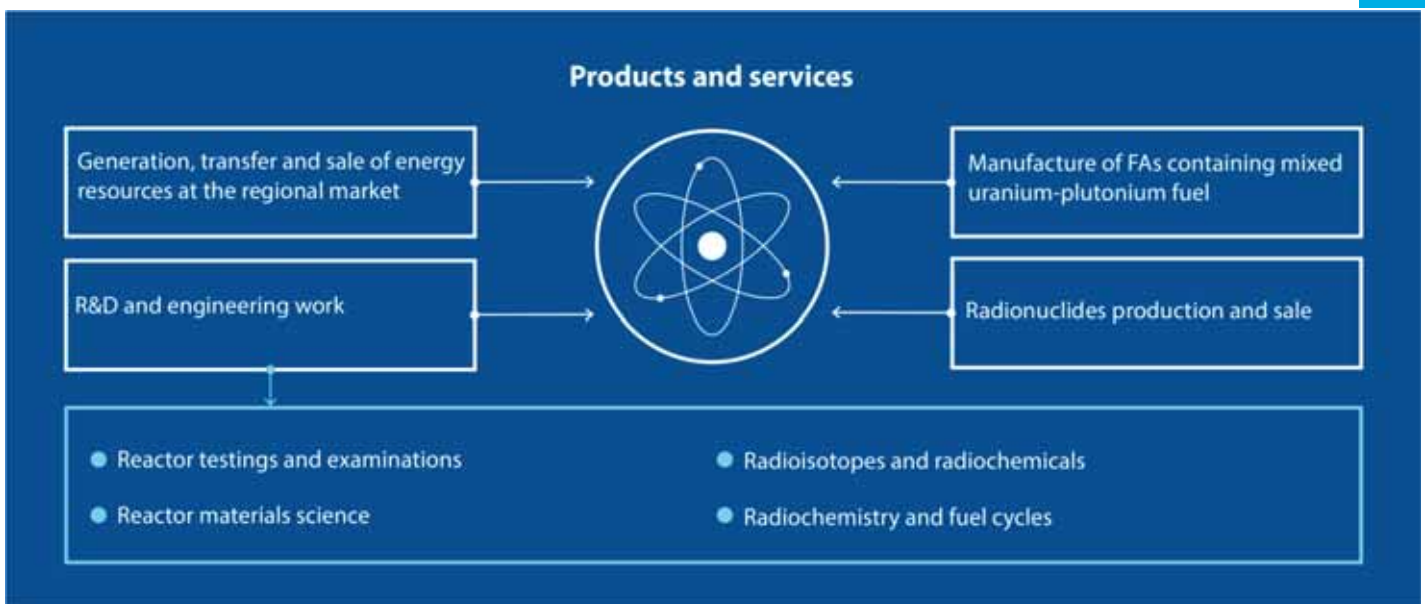


Fig. 1.2. Products and services produced and rendered by JSC "SSC RIAR"

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.

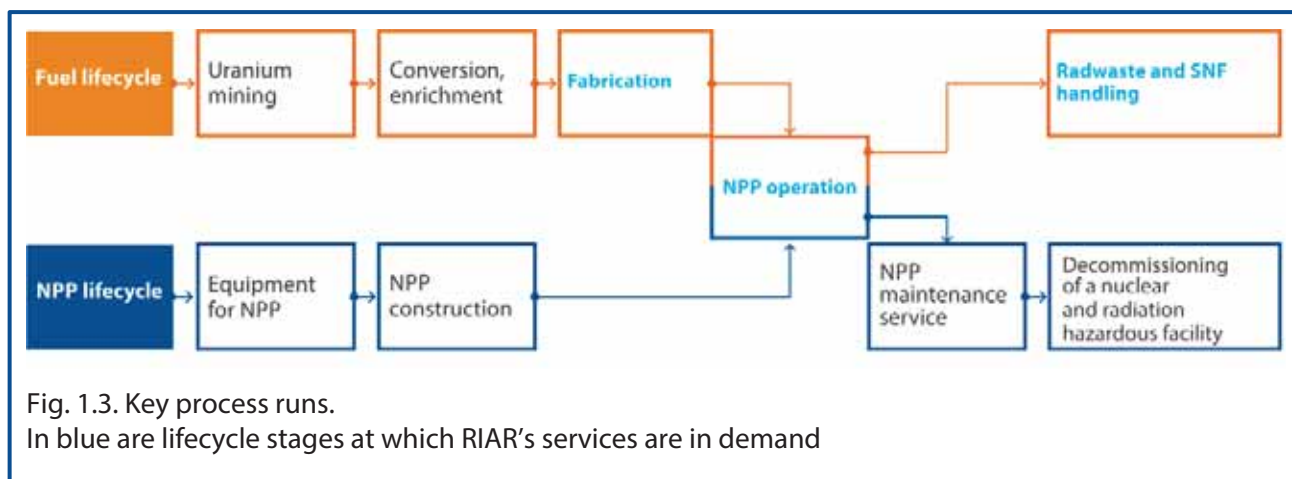
The consumers of the power resources produced by RIAR are not only the site facilities but also different industrial companies,

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 2015 can be found in [Section 4](#).

1.3. Position in the Industry

As is known, the ROSATOM's enterprises implement two full process runs described in Fig. 1.3 that are related to the development, construction, operation and decommissioning of NPP, production and use of nuclear fuel and handling of generated waste.

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.



The Institute, being an important experimental base, contributes to the achievement of the ROSATOM's strategic goals (Public Annual Report of the ROSATOM State Corporation, 2010) 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.

Figures 1.4 and 1.5 demonstrate the position of JSC "SSC RIAR" in the industry: structure of supplies and countries consuming RIAR's products and services.

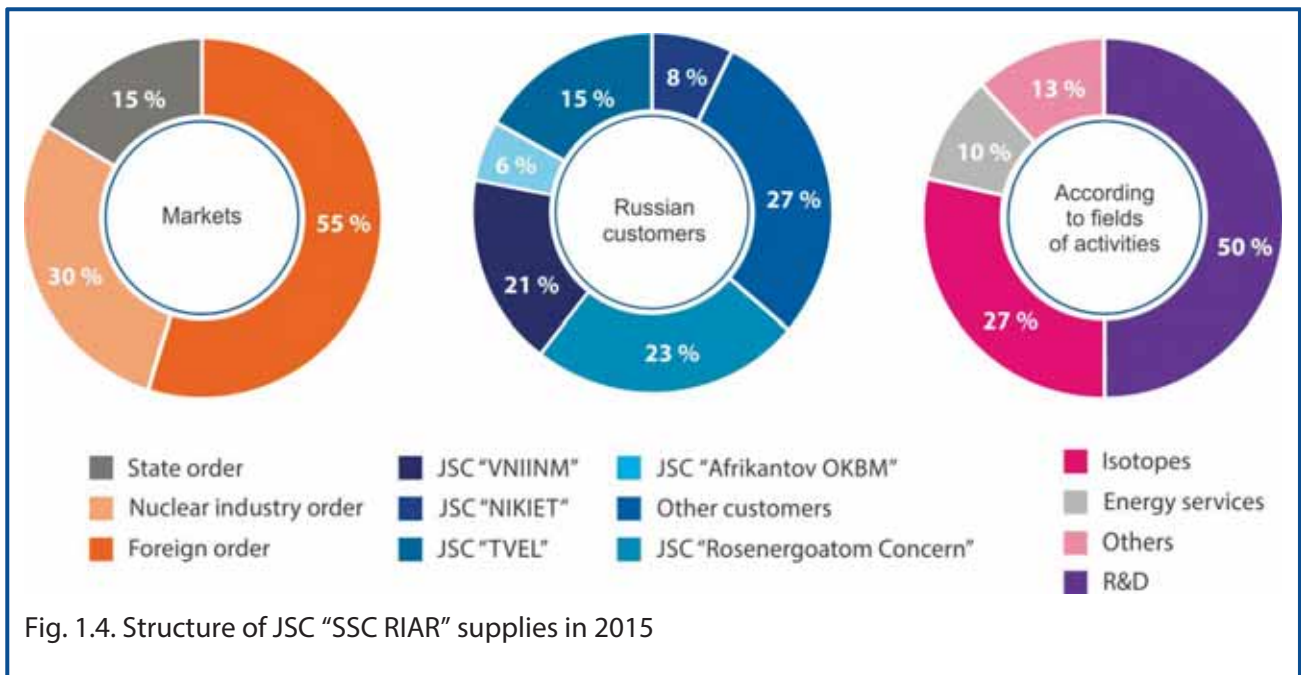
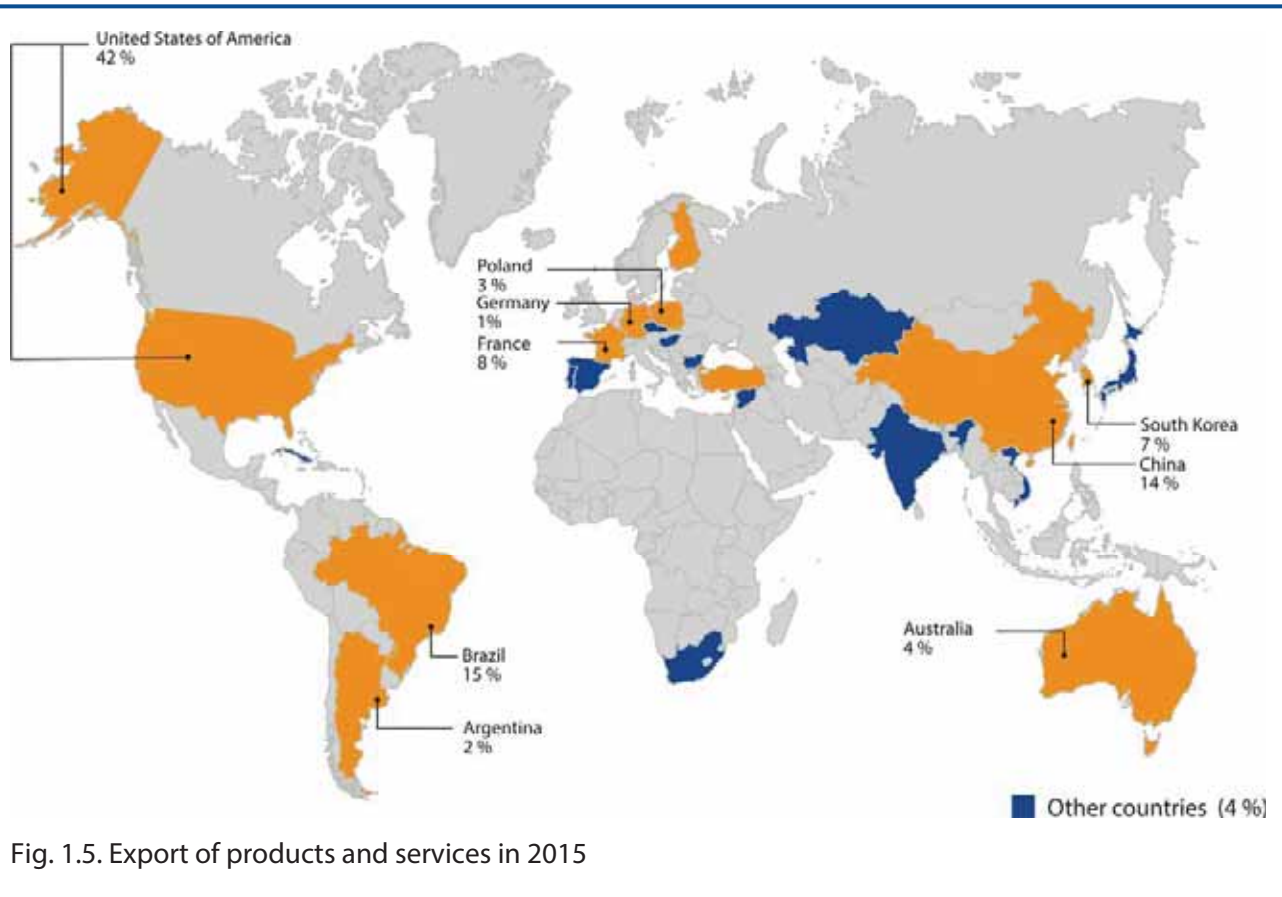


Fig. 1.4. Structure of JSC "SSC RIAR" supplies in 2015

G4-8

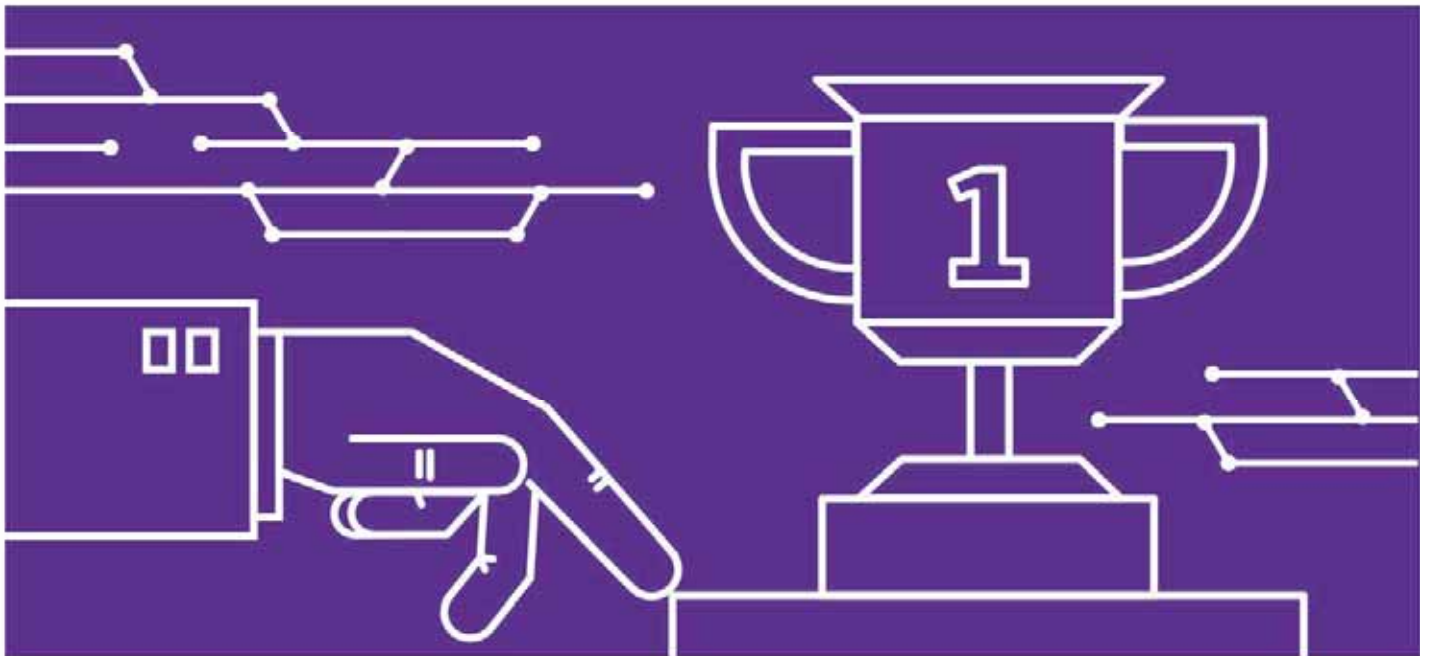


Nuclear industry is rightfully considered to be one of the key strategic branches of national economy, a reliable basis of the national defense capability and safety. It is important today to engage this high potential into the modernization of national economy and consolidation of Russia' positions on the world's markets and in global competition



Vladimir Putin

STRATEGY



2.1. Mission, Strategy and Prospects

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 (Table. 2.1, Figures 2.1 and 2.2).

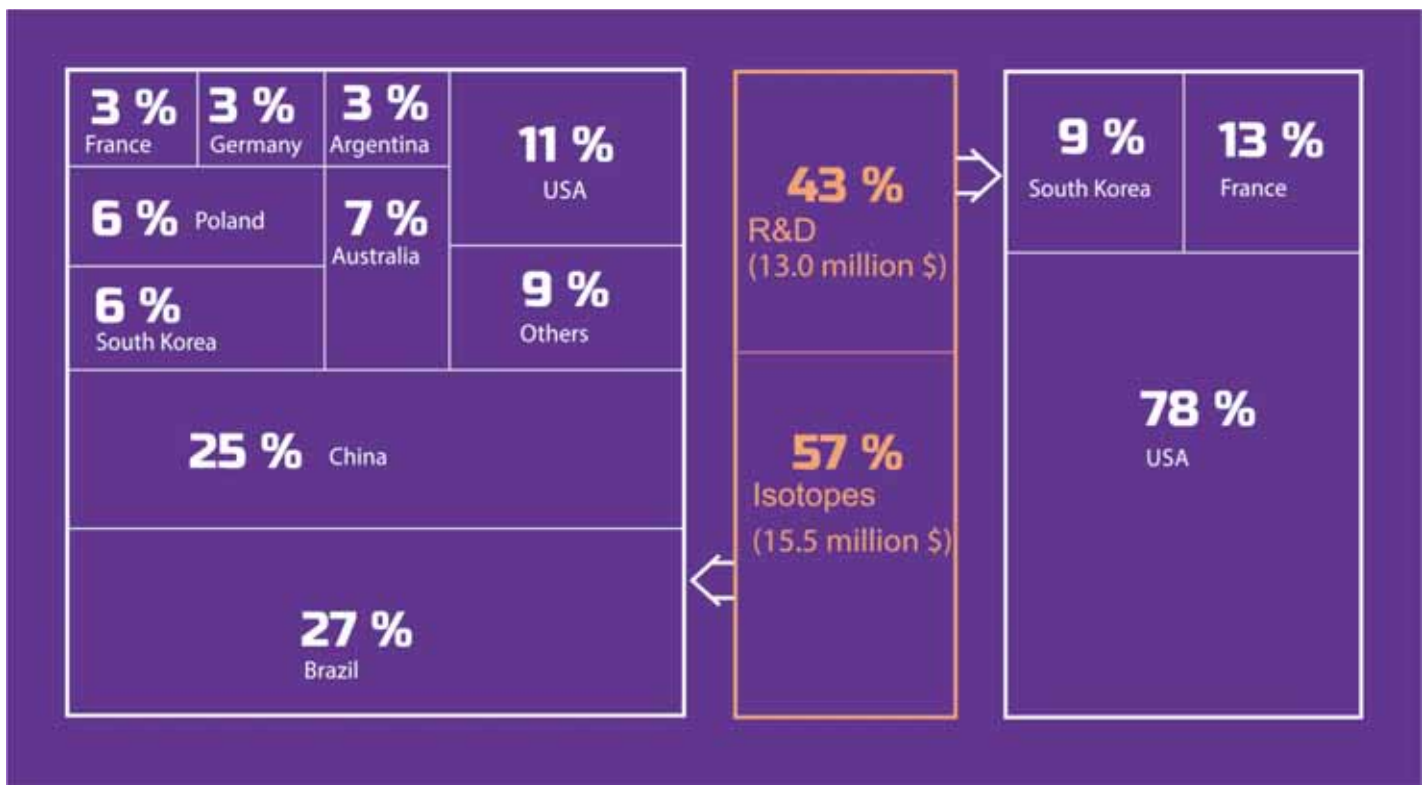


Fig. 2.1. Structure of JSC "SSC RIAR" export in 2015

Table 2.1

Achievement of strategic goals and key results for the year of 2015

Strategic goals	Tasks to solve	Results achieved
<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • State Contracts were fulfilled under the Federal Target Programs: <ul style="list-style-type: none"> - R&D in justification of technical decisions related to the MBIR reactor systems and equipment (29 mln RUB); - R&D in justification of design and technical decisions to establish the poly-functional radiochemical complex (194 mln RUB); - Technical upgrade of a 60MW fast test reactor (46 mln RUB); - Reconstruction and safety provision for solid radwaste storage facility (9 mln RUB). • Portion of the outside orders made up 55% that is 21% higher as compared to the year of 2012 • R&D results made up a half of output in 2015. • Portion of the export income from the total one increased from 7% (2012) up to 40%, including revenues from isotopes supply increased from 8% up to 27%

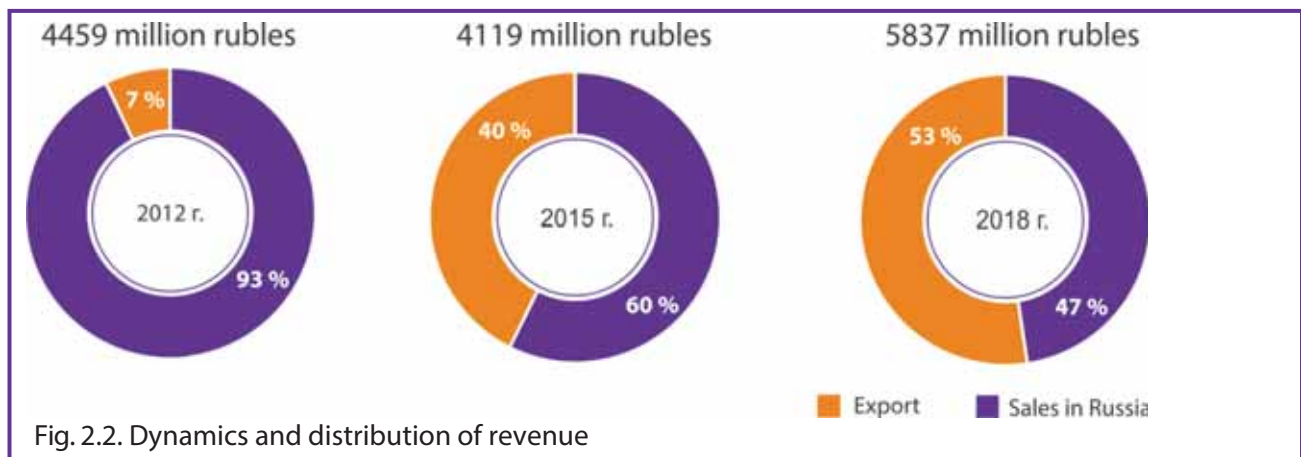


Fig. 2.2. Dynamics and distribution of revenue

2.2. Business Model

JSC "SSC RIAR" business model (Fig.2.3) reflects a system of activities related

to the value creation and achievement of strategic goals using resources available.

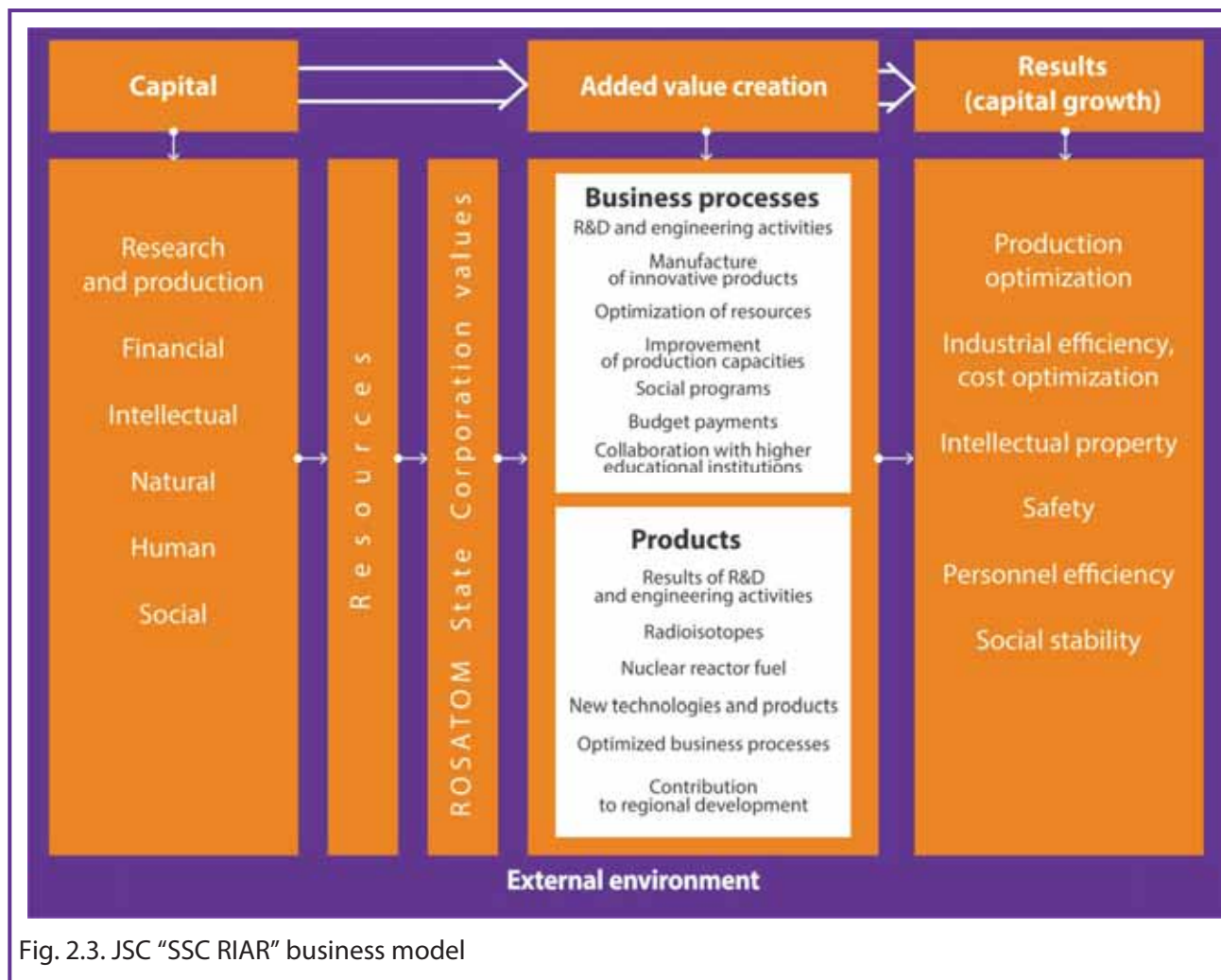


Fig. 2.3. JSC "SSC RIAR" business model

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 2.2). 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.

Table 2.2

Capital assets of JSC "SSC RIAR" and their efficiency in 2015

Capital asset	Resources	Capital gain*
R&D and production	R&D and production infrastructure	Gain of net assets made up 23%. Investment projects allocation made up 3.8 bln RUB.
Financial and economic	Financial resources	Revenue growth made up 11 %, labor efficiency made up 21 %. Net profit (loss) made up –677 960 K RBU. (loss reduction made up 36 %)
Intellectual	Ideas and developments, results of intellectual activity	Number of registered patents for invention and useful models made up 8 pcs., know-how made up 17 pcs.
Natural	Environment, natural resources	Costs for the environmental protection made up 107.3 mln RUB. Consumption of thermal energy decreased by 21 %
Human	Personnel, knowledge and skills gained	Average monthly salary growth made up 4%, social expenditures made up 13%. LTIFR made up 0. 1428 employees were trained
Social	Social relations, reputation of the organization at the domestic and international target markets	Gross tax charges to the different-level budgets made up 543 mln RUB.

* Capital gain compared to the year of 2014.

2.3. Relevant Aspects of Activity

As per the GRI, version G4, a procedure was developed and implemented to estimate the relevance of JSC "SSC RIAR" activities. The purpose was to highlight activities important for the Institute's Administration and stakeholders.

The procedure (Table 2.3) includes a questionnaire (http://www.niiar.ru/sites/default/files/anketa_opredeleniya_soderzhaniya_godovogo_integrirovannogo_otchyota_ao_gnc_niiar_za_2015_god_0.pdf) for site-level experts

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(top-management and employees) and off-site stakeholders (representatives of target regions authorities, Russian and foreign partners, local population, public organizations, etc.). Once more than 80 questionnaires were processed, stakeholders were addressed and annual reports of the ROSATOM's enterprises were analyzed, a map of relevant aspects was elaborated and specified

after the discussion of the annual report with the stakeholders. Thus analysis enabled a base to be specified for further activities in the area of corporate social responsibility. It also helped to understand what directions to take in order to improve managerial processes. In addition, the analysis results are of importance to specify the report contents so as to make it more challenging and targeting the informational needs of the stakeholders.

Table 2.3

Milestones of relevant aspects estimation

Milestone	Tasks	Techniques	Results
Highlighting important topics	To analyze a wide scope of institute-related topics and highlight relevant ones to be introduced into the report.	Analysis of GRI and IIRC standards and best reports	List of potentially relevant topics (61 topics)
Estimation of relevant aspects	The analyze the highlighted aspects with respect to their relevance	Questionnaire of interested parties representatives, including 17 Institute's top-managers	Diagram of relevant topics
Confirmation	To estimate the highlighted topics regarding their completeness and harmony to reflect both positive and negative effects	Estimation of the highlighted aspects by the RIAR's public reporting committee	List of important GRI aspects to be broken out in the report (38 topics)

A rank map of the relevant aspects of activity (GRI / G4 and IIRC) is given in Fig. 2.4.

Topics marked in pink are recommended by the RIAR's public reporting committee and described in detail in the report.

In bold are RIAR's aspects to compliment the GRI / G4.0 list.

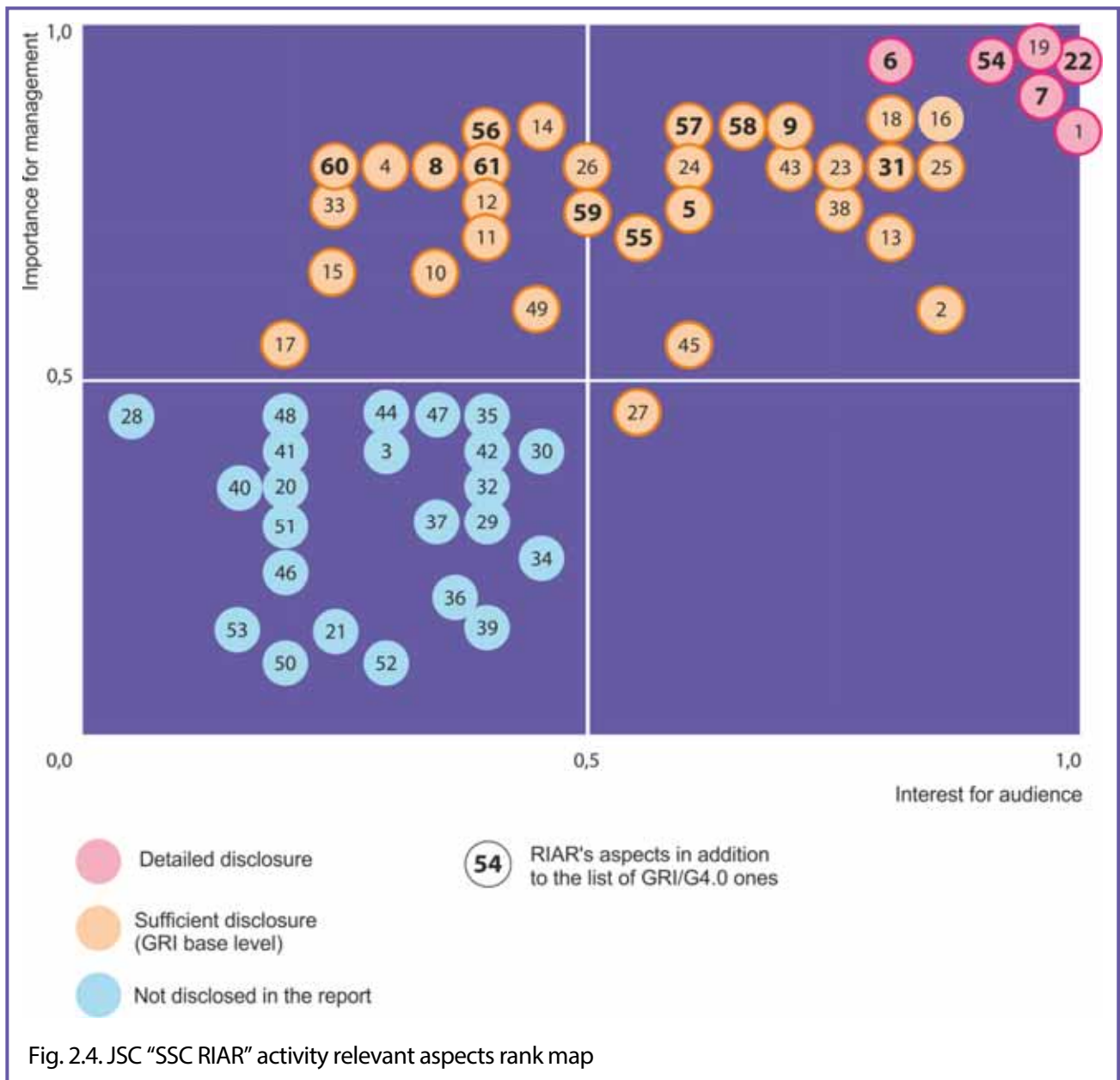
In blue are non-relevant aspects that are not broken out in the report. Figures correspond to the following topics:

- 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 is 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 since this is the first integrated annual report issued in the conformity with version G4 (GRI). Further the JSC "SSC RIAR" activities will be analyzed and reported on a regular basis regarding the selected aspects.

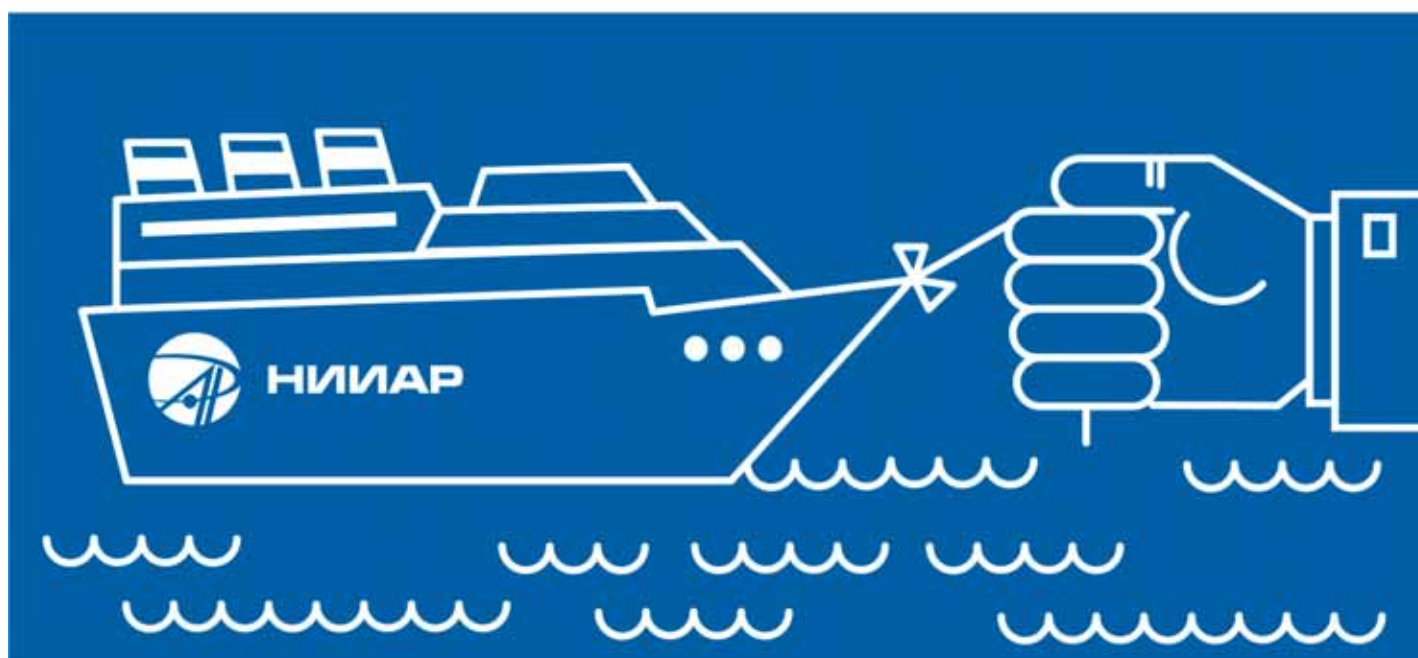


—“Would you tell me, please, which way I ought to go from here?”
Alice speaks to Cheshire Cat

—“That depends a good deal on where you want to get to,”
said the Cat.

Lewis Carroll “Alice in Wonderland”

CORPORATE GOVERNANCE



3.1. Members and structure of the governance bodies

The structure of governance bodies for JSC "SSC RIAR" is shown in Fig. 3.1



in accordance with its Charter. 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 2015 eight General Shareholders Meetings were held: one Annual Shareholders Meeting and seven Extraordinary Shareholders Meetings.

The Board of Directors is collegial managing body that is in charge of overall management, 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. 3.2) 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, the Charter of JSC "SSC RIAR" and the Statute of the Board of Directors. In 2015 eighty two meetings of the board of Directors were held to discuss two hundred eighty two topics (the attendance rate was 98 %). The Board of Director's Report is given in [Attachment 2](#).

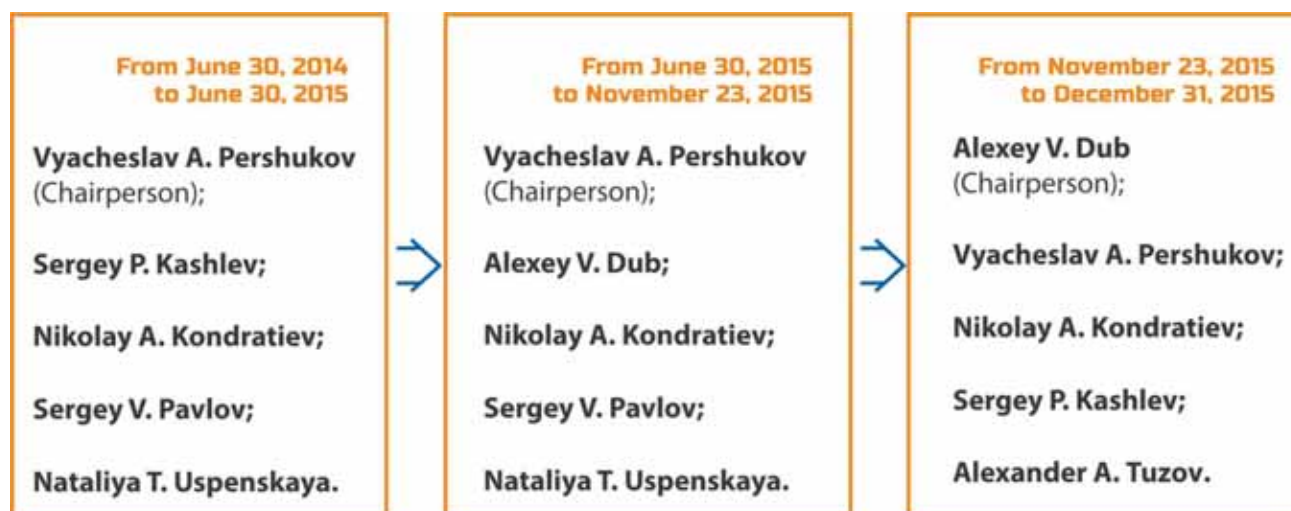


Fig. 3.2. The members of the Board of Directors and the dates of their election

There are no independent members in the Board of Directors in the meaning stipulated by the *Code of Corporate Governance* and recommended to be implemented by the letter of the Bank of Russia No. 06-52/2463 as of April 10, 2014 "Concerning the Code of Corporate Governance".

The ongoing activities of JSC "SSC RIAR" were managed during the period under report (until 01 October, 2015) by the **Sole Executive Body** that is the managing organization Joint Stock Company "Science and Innovations". Following the decision of the General Meeting of Shareholders (Protocol No.39 as of 01 October 2015), the powers delegated to the Sole Executive Body of the JSC "SSC RIAR" (Joint Stock Company "Science and Innovations") were terminated earlier since the first of October 2015. In accordance with the resolution

of the General Shareholders Meeting (Protocol No.39 as of 01 October .2015), sole executive bodies of JSC "SSC RIAR" have been appointed since 02 October 2015: Alexander A. Tuzov, Director of JSC "SSC RIAR" and managing organization Joint Stock Company "Science and Innovations" (Primary State Registration Number 1117746621211). For some information about the Director of Joint Stock Company "SSC RIAR", see Section 3.2 "[Corporate governance system](#)" of this Chapter.

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Information about the managing organization

Full name:	Joint Stock Company "Science and Innovations".
Acronym:	JSC "Science and Innovations".
Director General:	Sergey P.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.

The Executive Bodies of JSC "SSC RIAR" did not make any decisions on paying remunerations during the reporting period. Therefore, no remuneration was paid to the members of the Board of Directors. Ms. Nataliya T. Uspenskaya, the member

of the Board of Directors, was paid remuneration while she was employed by JSC "SSC RIAR" pursuant to the terms and conditions of her employment contract.

The Sole Executive Body of JSC "SSC RIAR" does not hold any shares in the Company and has not made any transactions with them during the period under report. A collegial executive body was not formed at JSC "SSC RIAR" during the period under report.

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The criteria used for determining the amount of remuneration payable to the members of the Sole Executive Body are set forth in the Agreement on delegation of authorities of the Sole Executive Body No. 20 dated of 02 December 2011 and addendums to it as well as in Agreement No.313/626-Д dated of 02 October 2015. In 2015 the services rendered for exercising authorities of the Sole Executive Body amounted to RUB 24142,942 per month for the period from 01 January 2015 to 30 September 2015 and RUB 23954 per month for the period from 02 October 2015 to 31 December 2015.

3.2. Corporate governance system

For the corporate governance system, JSC "SSC RIAR" adheres to the policy of observing recognized Russian and international standards

as well as corporate governance principles of the ROSATOM's State Atomic Energy Corporation (Fig. 3.3, Table 3.1)

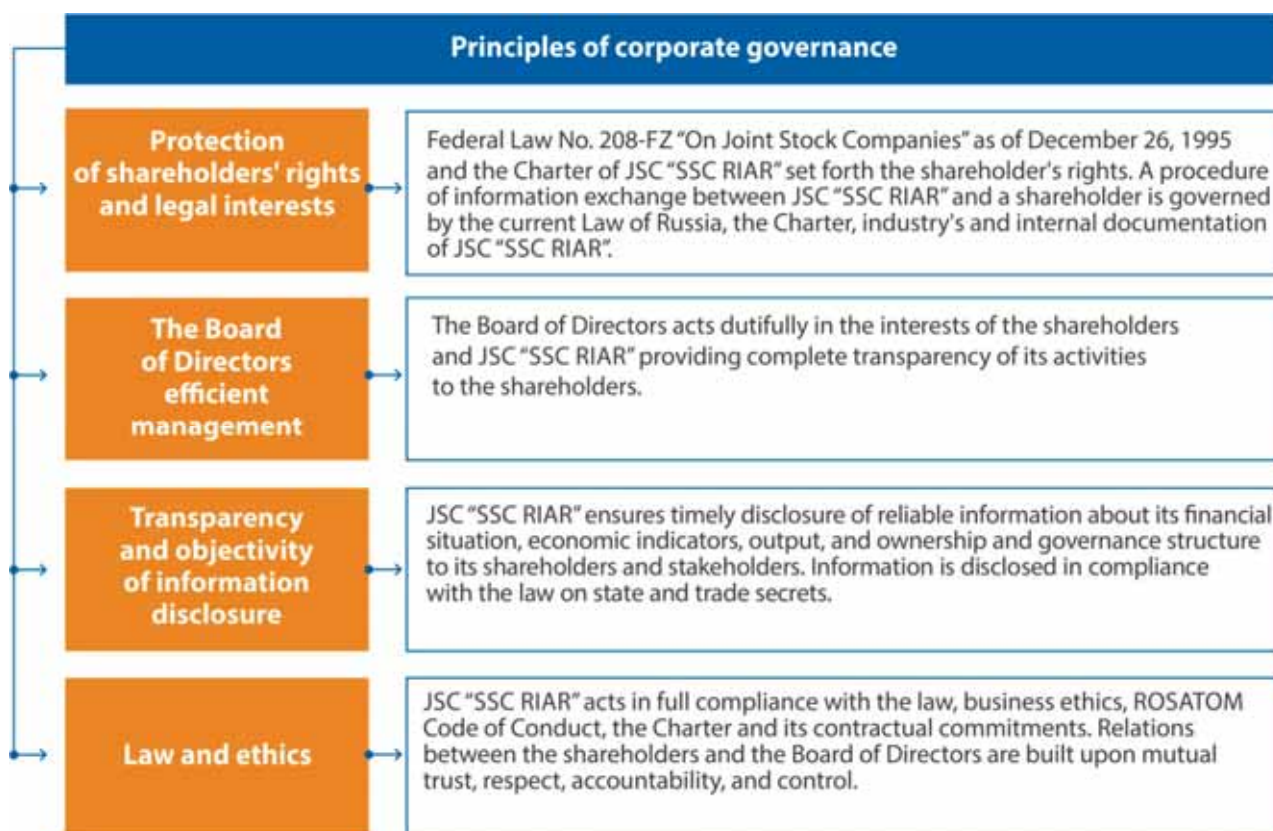


Fig. 3.3. Basic principles of corporate governance

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
(as of 31 December 2015)



Alexey V. DUB

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: from 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; from October 2015 and to the present day—
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 P. 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;
from 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 A. KONDRATIEV

Chief Executive Officer,
JSC "Science and Innovations"

Date of birth: 19 October 1960

Academic background: higher, graduate
from Tomsk Polytechnic Institute named
after S. Kirov (1982)
majoring in engineering electronics

- "Oil Company ROSNEFT", LLC — Science and Technology 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;
from 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
(as of 31 December 2015)



Sergey V. PAVLOV

Head of Research Activities,
R&D Company SOSNY

Date of birth: 22 December 1958
Academic background: higher, graduate
from Moscow Engineering Physics Institute (1982)
majoring in nuclear power plants and facilities

- JSC "SSC RIAR": from October 2010 until March.2011 — Deputy Director for Nuclear Fuel and Nuclear Core Components; from March 2011 until October 2012 — Director of the Materials Testing Complex.
- JSC "Science and Innovations": from October 2012 until April 2015 — Director.
- R&D Company SOSNY: from April 2015 and to the present day —Head of Research Activities.

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



Vyacheslav A. PERSHUKOV

Deputy Director-General,
Head of the Block for Innovation
Management for 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; from June 2011 and to the present day — Deputy Director-General, Director of the Block for Innovation 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 A. TUZOV

Director,
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 r — Project Manager; Deputy Director of the Block for Innovation Management — Head of Department for Technological Development.
- JSC "Science and Innovations": from May 2015 and to the present day — Director.
- JSC "SSC RIAR": from October 2015 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

A member of the Board of Directors

Place of employment and positions held over the last five years (as of 31 December 2015)



Nataliya T. USPENSKAYA

Department for Strategic Development and Public Relations, JSC "SSC RIAR"

Date of birth: 21 April 1977
 Academic background: higher, graduate from All-Russian State Distant Learning Institute for Finance and Economics (2000) majoring in finances and credit; Russian Academy of Entrepreneurship (2012) majoring in law

- JSC Registrar R.O.S.T.: from 2010 until June 2012— Head of the VIP-Client Unit.
- JSC "Science and Innovations": from July 2012 until August 2013— Advisor of the Department for Corporate Management and Judicial Support; from August 2013 until August 2015 — Project Manager for Legal and Corporate Administration; from November 2014 until August 2015 — head of Proprietary Interests Department.
- JSC "SSC RIAR": from September .2015 to the present day — Head of Department for Strategic Development and Public Relations.

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

Regulatory system

Charter of JSC "SSC RIAR"
 Civil Code of the Russian Federation
 Statute of the Board of Directors
 Regulation on mandatory information disclosure
 Federal Law No. 208-FZ "On Joint Stock Companies" as of December 26, 1995

Table 3.1

Disaggregated data of 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	1	1	2
Aged 51 and over	5	0	5
Total	6	1	7

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 of their rights that is to say prevention of actions aimed at affected redistribution of corporate governance

and to submission of the best available information about the General Meeting of 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-ФЗ "On Joint Stock Companies", Federal Law dated 22 April 1996 No.39-ФЗ "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. The Report for conformity with the principles and recommendations of the *Corporate Governance Code* is given in [Attachment 4](#).

Reporting of the Board of Directors on developing the business priorities

Following the decision of the Board of Directors (Protocol No.22 dated 3 March 2010) priority areas of the Company's business were identified with the focus on fulfilling the needs of the Physics and Power Engineering Unit for ROSATOM State Atomic Energy Corporation:

- Engineering development of a multi-purpose fast research reactor;
- Technical retrofitting of the fast research reactor with a thermal power output of 60 MW;

- Elaboration of production processes including establishment of mixed oxide fuel production for fast reactors ;
- Advancement of non-aqueous methods of spent nuclear fuel processing.

[Chapter 4 "Capital Management and Output"](#) provides an overview of outcomes for 2015 concerning the above listed areas of business.

Stakeholder transactions and mechanism for managing the conflict of interests

Stakeholder transactions to be subject to the approval of the Company's Governing bodies were carried out based on the market values. In order the Board of Directors and General Meeting of Shareholders can come to a decision and approve an stakeholder transaction Pursuant to Article 83, Clause 7

of the Federal Law No. 208-ФЗ "On Joint Stock Companies" dated 26 December 1995, a value of property (goods) or services is set by the Board of Directors in accordance with Article 77 of the same Federal Law. The stakeholder transactions concluded by JSC "SSC RIAR" and to be subject to the approval of the Board

of Directors or the General Meeting of Shareholders were implemented in full conformity

with the applicable Corporate procedures pursuant to Section XI of the Federal Law (see Attachment 3).

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

Changes in the size and structure of ownership

Share capital of the Company comprises the nominal amount of the Company's shares purchased by its shareholders. As on 01 January 2015 the share capital of the Company amounted to RUB 9 751 205 675 (nine billion seven hundred fifty-one million two hundred and five thousand six hundred seventy five) or 9 751 205 675 (nine billion seven hundred fifty-one million two hundred and five thousand six hundred seventy five) ordinary registered shares (hereinafter to be referred to as shares) with one share nominal value amounting to RUB 1 each. All the shares of the Company were issued in the non-documentary form. Every ordinary registered share of the Company confers on the shareholder owing it the same scope of rights secured.

The General Meeting of Shareholders (Protocol No. 32 dated 27 November 2014) resolved to increase the share capital of JSC "SSC RIAR" by issuing additional 5 277 412 360 (five billion two hundred seventy seven million four hundred twelve thousand three hundred sixty) ordinary registered shares in the non-documentary form, which were distributed via closed subscription. The Board of Directors for the Company (Protocol No. 262 dated 20 January 2015) approved

the Decision on the New Share Issue.

The additional issue of securities was registered by the Bank of Russia on the 19th of February 2015 under state registration number 1-01-55411-E-007D). In 2015 the Company placed 2 934 586 800 (two billion nine hundred thirty four million five hundred eighty six thousand eight hundred) shares of additional issue.

Therefore, the share capital of the Company amounts to RUB 12 685 792 475 (twelve billion six hundred eighty five million seven hundred ninety two thousand four hundred seventy five) as of 31 December 2015. The Company placed its ordinary registered shares with a par value of 1 (one) ruble each in the number of 12 685 792 475 (twelve billion six hundred eighty five millions seven hundred ninety two thousand four hundred seventy five).

All the shares of the Company were issued in the non-documentary form.

During the period under review Joint Stock Company "Nuclear Power Generation Complex" decreased its shareholding in JSC "SSC RIAR" but ROSATOM State Atomic Energy Corporation increased its percentage of shares. The Russian Federation divested itself from its shareholding interests (Table 3.2).

Table 3.2

Distribution of issued shares, %

Shareholder	distribution	
	As on 01 January 2015	As on 31 December 2015
Joint Stock Company "Nuclear Power Generation Complex"	64,7367	49,8235
The Russian Federation legally represented by ROSATOM State Atomic Energy Corporation	0,1250	–
ROSATOM State Atomic Energy Corporation	35,1384	50,1765

Projects aimed at promoting communication between management and employees

An elaborate internal communication system plays a crucial part in running the enterprise. In order to make management process efficient, the enterprise performance achieves a level of initial expectations and make it consonant with the needs, it is necessary to put in place such a communication system that enables timely and exact convey of communicated information.

JSC "SSC RIAR" has got a well-organized communication and feedback system promoting strengthening of communication between the top management team and the employees. In 2015 the key objective of communication promotion was to expand the openness of the top management. The internal corporate website has a new special section in Questions & Answers format to facilitate communication of employees and top management team. This section was daily updated.

At least three days were allocated to provide the response to the questions raised. Employees expressed high appreciation of such communication channel.

Improvement of internal communication.

To promote further advancement in internal communication a public opinion poll was conducted in 2015 to reveal the most efficient channels of communication. More than 50 % of employees from all the JSC "SSC RIAR" units were under the public opinion poll coverage. In addition to the assessment of communication channels, respondents were kindly asked to specify the most interesting topics and identify existing challenges. They were also encouraged to submit their proposals to enhance communication among the employees.

Results of public opinion poll

73 % of employees keep up with the latest milestone events of the enterprise

60 % of respondents are satisfied with their interaction with the top management of the enterprise

Thematic projects. In 2015 some targeted communication projects were carried out to mark the anniversary year for the nuclear industry and the entire country. Particular attention was focused on establishing communication between honored long-service

employees of the nuclear industry and top management of RIAR. RIAR's employees were actively engaged in these projects. The audience could reach 50 000 people as the information was appropriately presented in the business, urban and regional mass media.

Nuclear industry mass media. To promote positive image of the enterprise in the regions where it is active and keep wider public informed about the priorities and focal projects, JSC "SSC RIAR" pursues fruitful collaboration with nuclear industry information resources such as newspaper and radio program STRANA ROSATOM. In 2015 года more than 20 audios on demand were broadcasted and 150 information releases were published in the outside media.

Personnel attendance days. The enterprise entirely participates in the communication events

of the nuclear industry. These are the personnel attendance days first and foremost. It has now become a good tradition to hold regular meetings of RIAR's employees with the top management in the presence of ROSATOM State Atomic Energy Corporation to share with important company-wide information with the employees as well as to give employees a chance to talk directly with the top management. Altogether in 2015 more than 90 % of top managers and more than 80 % of functional managers took part in such communication events.

3.3. Auditing of financial and business activities

Financial and business activities of JSC "SSC RIAR" are supervised by an independent auditor and Department for Internal Control and Audit of JSC "SSC RIAR" (it was a Unit for Internal

Control and Audit until October). There is no Internal Audit Commission at the Institute.

Independent auditor

Following the decision of the General Meeting of Shareholders Nexia Pacioli LLC was designated as an Independent Auditor of JSC "SSC RIAR"

(see [Section 1.1 "General Information" Chapter 1 "General Information about JSC "SSC RIAR" in the present Report](#)).

Department for Internal Control and Audit

The internal control and auditing system is a combination of organizational arrangement, methods and procedures of audit and monitoring adopted by the management of economic entity as the mechanisms for consistent and efficient conduct of its business targeted at identifying, correcting and preventing significant errors and accounting

information distortion. This system is one of the risk management essential components associated with business activities. In JSC "SSC RIAR" the system is represented by the Department for Internal Control and Audit (see [Section 3.5 "Internal Control and Auditing Systems" of this Report](#)).

3.4. Key performance indicators. Appraisal and remuneration of personnel

In 2009 the Company adopted performance management process. Performance appraisal is one of the integral parts of the performance management process (Fig. 3.4). It is conducted by setting key performance indicators for the employees and appraising achievement level of key performance indicators (KPI).

The key performance indicators are specified based on the anticipated dynamics as to basic performance indicators, which are targeted at pursuing strategic goals of the ROSATOM State Atomic Energy Corporation, managing organization and the Company.

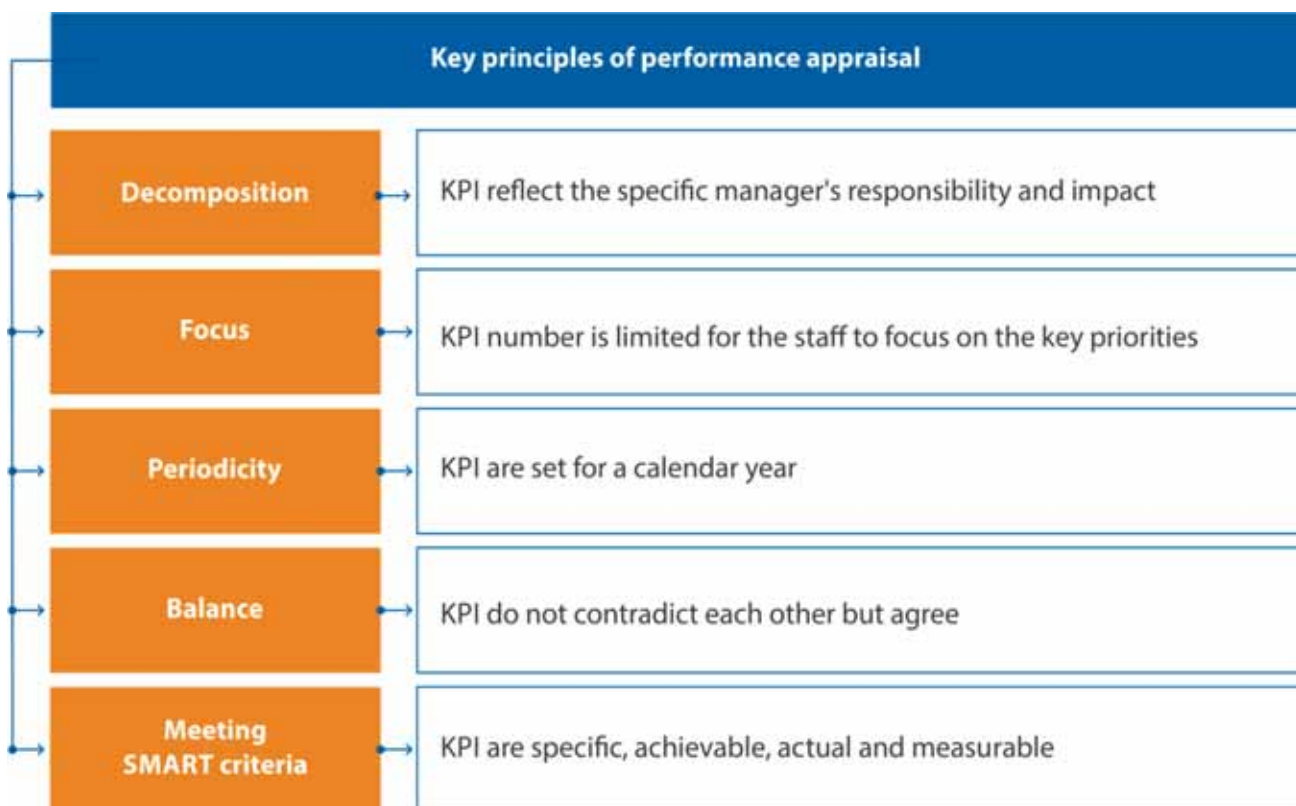


Fig. 3.4. Governing principles of performance appraisal

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"*. Annual bonus payouts depend on performance appraisal. The amount of remuneration is based on the position held, assigned grade, actual level of KPI fulfillments and hours worked (Tables 3.3 and 3.4).

Table 3.3

Details about the employees involved in performance appraisal

Grade	A number of employees
4	9
5	35
6	98

The actual level of KPI fulfillment is evidenced by ROSATOM State Atomic Energy Corporation, managing organization and by Company itself in the format of statistical, accounting and management reporting and can be verified as a matter of choice in conformity

with the regulations and internal control procedures put in place by the ROSATOM State Atomic Energy Corporation. SAP-built personnel management system was adopted to enhance effectiveness of KPI setting. An average coefficient of KPI achievement is 87.84%.

Table 3.4

**Strategy map with the key performance indicators
of JSC "SSC RIAR" Director for 2015**

Key performance indicator	Fulfillment	Strategic goal
Free adjusted cash flow, RUB bn.	120	Increased share on the global market
Labor productivity, RUB mln/individuals per hour	60	
Accomplishment of revenue plan, RUB mln	47	
Global revenues, \$ mln	73	
Total unit costs, %	76	Lower costs of production and shorter time of production processes
Revenue from new products on the basis of competitive bidding outside and inside ROSATOM, RUB mln	120	Creation of new products for the Russian and international markets
Plan for intellectual property commercialization, RUB mln	45	
Personnel staffing plan, %	74	Staff capacity enhancement
Engagement rate, %	120	Improvement of staff motivation and loyalty
LTIFR	accomplished	Operational conditions
Reduction in falling from elevations		
No events rated at level 2 of INES scale when the personnel is exposed to radiation doses more than 50 mSv/h		
No events with safety relevance higher than 2 according to the INES scale		
Fulfillment of government orders, including state defense contracts and contracts made with other State customers and governmental entities, %		
Budget return of costly projects, %		

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 raising remuneration of labor and improving career

opportunities for professionals. There are also another key performance indicators targeted at energy efficiency 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 3.5 provides some information about the main occupational categories of the personnel disaggregated by sex and age.

Table 3.5

Main occupational categories of the personnel disaggregated by sex and age, %

Category		Senior executives	Professionals	Workers
Sex	Men	17.83	32.48	49.69
	Women	9.42	63.85	26.73
Age	Aged 30 and under	4.03	56.71	39.26
	Aged 31 and through the age of 50	15.38	42.73	41.89
	Aged 51 and over	18.95	38.03	43.03

Motivation of top management

A motivation system of top management 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. The key performance indicators are developed to address the needs of the national policy in the field of nuclear energy use, considering the competitive principle of business running, strategy and programs focused on the JSC "SSC RIAR" development and provide for economic, environmental and social performance.

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. The Department for Internal Control and Audit of JSC "SSC RIAR" (it was a Unit for Internal Control and Audit until October)

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).

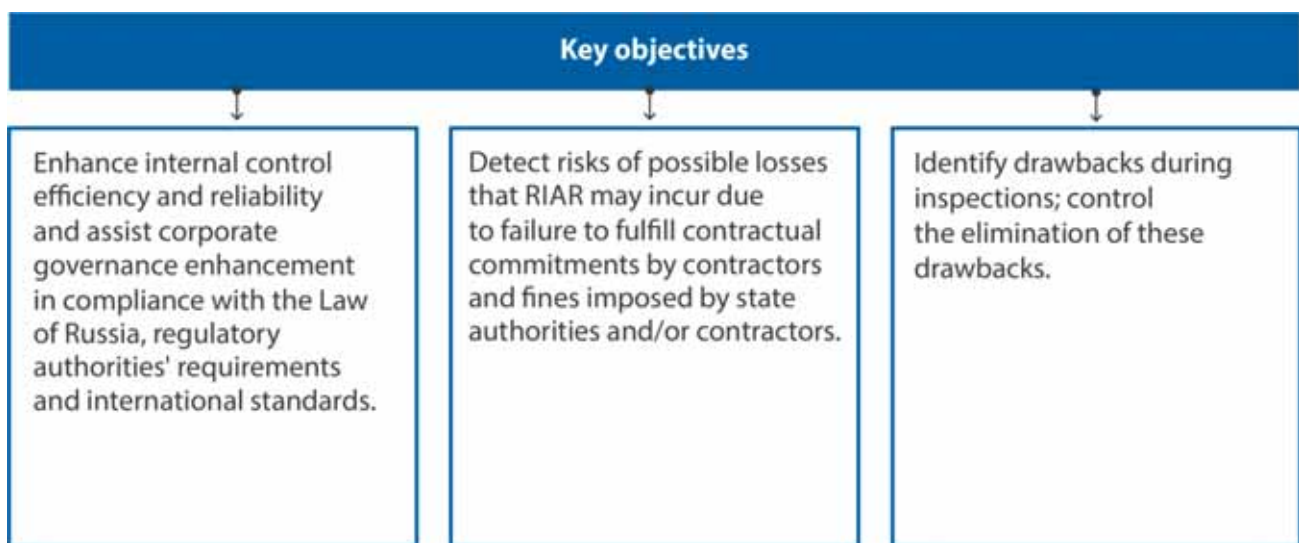


Fig. 3.5. Primary targets of the Department for Internal Control and Audit

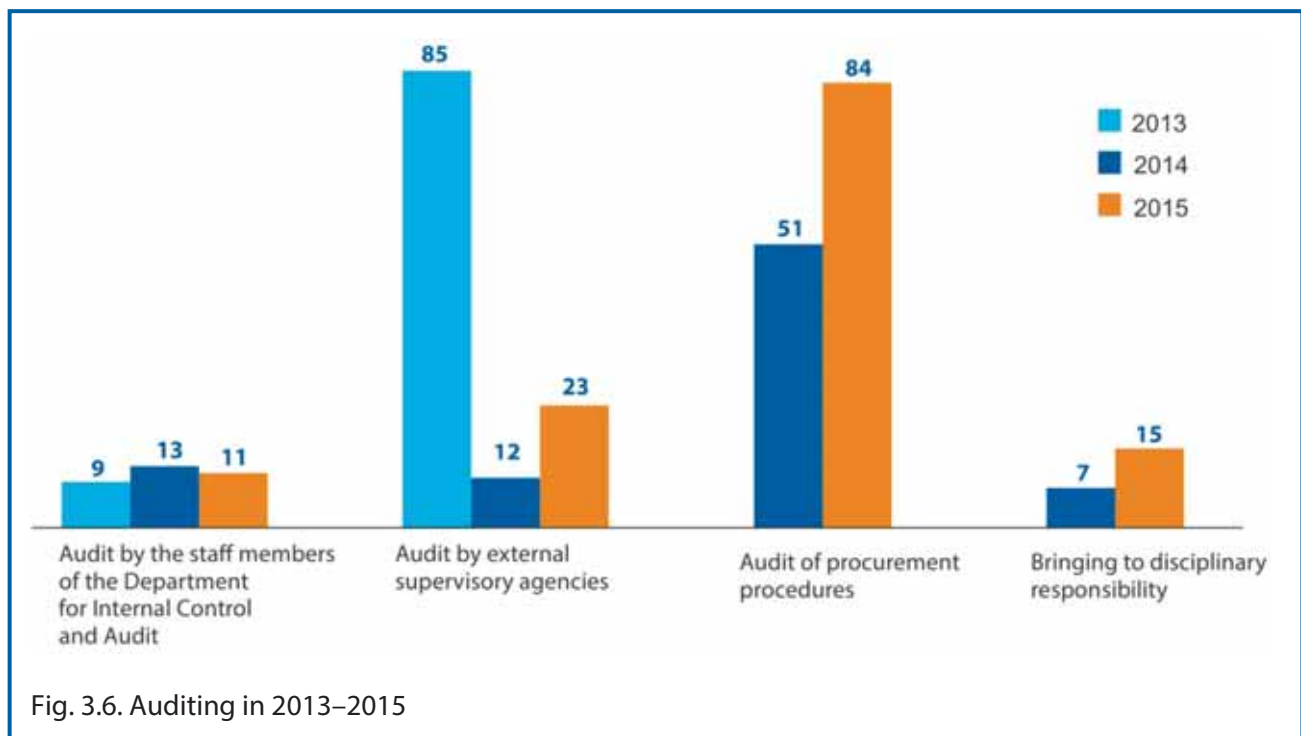
In 2015 the staff members of the Department for Internal Control and Audit undertook eleven inspections (there were thirteen inspections in 2014). Seven inspections out of eleven were routine inspections but the other four inspections were undertaken for the needs of the ROSATOM State Atomic Energy Corporation. Following the conducted inspections, action plans were worked out to address identified drawbacks under an obligation to prevent them in the future. The audit made seven recommendations. In order to reduce the risks of business processes, the Department for Control and Audit exercises control over implementation of the action items to eliminate identified drawbacks. When financial and business processes are audited, procurement and contract-related activities are reviewed on a mandatory basis

including fulfillment of purchase orders and delivery contracts (in 2015 eighty four procurement procedures were reviewed during auditing of financial and business processes). Particular attention is given to the procurement contracts concluded with a single supplier.

In 2015 twenty audits were conducted by external supervisory agencies against JSC "SSC RIAR". Among these Agencies were the Federal Oversight Service for Supervision over Natural Resources Management of Ulyanovsk Region, Territory Regional Directorate of Federal Agency for Finance and Budget Supervision of Ulyanovsk Region, Ministry of the Russian Federation for Civil Defense, Emergencies and Disaster Response, Federal State Budgetary Institution "Special Office of the Federal Fire Safety # 87" under the Ministry of the Russian Federation

for Civil Defense, Emergencies and Disaster Response, Administration of the Federal Security Service for Ulyanovsk Region, The Volga Interregional Territorial Department for Nuclear

and Radiological Safety Oversight, Finance and Accounting Consultants, LLC, and ROSATOM State Atomic Energy Corporation (Fig. 3.6).



Special work is done in accordance with the plan approved by the ROSATOM State Atomic Energy Corporation for combating corruption and fraud in the nuclear industry sector with the focus on prevention, detection and documenting the acts of corruption. One of the essential trends of anti-corruption work is to prevent and detect procurement breaches. In order to get that done, the procurement –related procedures are checked for compliance with *Unitary Industry-Specific Procurement Standard*, functions and positions prone to the risk of corruption are put in the list as their substitution implicates the risk of corruption. According to the anti-corruption laws in force, the alternates appointed to the positions from the list shall provide

information declaring their income, spending, property status and liabilities including the same information about other family members. In order to prevent commitment of corruption offences or other acts involving corruption by the top executives of the company, the following actions stipulated in the anti-corruption legislation are undertaken:

- Internal control over the duties performed by the top executives via auditing initiated in response to the fact of corruption manifestation, including complaints and information concerning the facts of theft or fraudulence transferred via dedicated communication channel "Hotline", publications about corruption practices

by the senior executive officers in mass media;

- Awareness campaigns, educational work with the staff members with the focus on reducing the possibility of corrupt conduct in discharging duties prone to corruption.

JSC "SSC RIAR" has a special group in charge of economic security to implement the system for preventing unlawful acts and abusive practices. There are four people in the economic security group. The main objectives of work done by this group are as follows:

- Enforcement economic and assets security at JSC "SSC RIAR";
- Detection and prevention of threats aimed against economic interests and business standing of JSC "SSC RIAR";
- Enforcement of business confidentiality regime.

SO4

The Department for Internal Control and Audit supervises the 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.

Plans for 2016:

- Internal audit of the most essential business processes to monitor reliability and performance efficiency of the internal auditing system at JSC "SSC RIAR";
- 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.

Business mastery has much in common with proficiency of a general. I believe that one should rely upon military history in running business. Campaign and strategy needs to be worked out in advance.

Jean Paul Getty

3.6. Risk management

The risk management policy of JSC "SSC RIAR" is targeted at enhancing sustainability of the Company's development. It is governed by relevant regulatory documents of the ROSATOM State Atomic Energy Corporation including *Unified Industry-Specific Guidelines for Risks Analysis Associated with Budgeting, Budgetary Performance and Medium-Term Plans of ROSATOM State Atomic Energy Corporation and its Subordinate Institutions*. These documents are used as a basis to put in place unified requirements for analysis of risks affecting achievement of the financial and business performance indicators. Analysis of risks provides for identification of risks, their assessment and elaboration of risk management plan, assessment of risk readiness and implementation of monitoring. One of the key instruments the Company uses to realize its strategy and achieve relevant objectives is establishment an effective risk management and internal control systems.

The primary goals and objectives of the risk management process are as follows at JSC "SSC RIAR":

- Identification and prioritization of risks, their control and response to them, 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, prioritization, assessment and mitigation of threats which can affect the performance of the Company;
- Allocation of risk management responsibility area for Company's employees at an appropriate level of management.

The risk management policy of the Company is based on the principles and methods described in the corporate risk management system. It provides for consistency of management processes that was shown schematically in the Annual Report of JSC "SSC RIAR" published for the year of 2014

(http://niiar.ru/sites/default/files/pgo2014_in_29_062015_c_ssytkami_0.pdf). These activities are aimed at timely identification of the events which could have an undesirable influence 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 Company within the assigned area of every responsible.

Operational risks

Internal business processes are among the targets of operational risks as they bring influence to sustainable development of the Company. Summarized in Table 3.6 are the risks affecting the activities of the Company and associated with the current activities of the Company (fulfillment of work and rendering of services). Described here are also the risk management activities.

In 2015 a great deal was done to determine the exposure of the Company to risks associated with the budgeting and medium-term planning as well as to reveal their impact on the targets of financial and economic activities. Analyzed was also divergence of the targeted financial and business indicators under the overall impact of all the risks being assessed.

Table 3.6

Risk management practice of JSC "SSC RIAR"

Risk	Risk factor	Risk management activities
Risk of exchange losses	Volatility of exchange rate	<ul style="list-style-type: none"> • Analysis of the contracts concluded and future possible contracts • Cost 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.)	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Financial and industrial support of innovative products during the market slump; • Increased production and sales of industrial grade products
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
Risk associated with the increase in the cost of services	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Implementation of programs targeted at energy saving and energy efficiency enhancement; • Integration of the ROSATOM industrial system; • Optimization of production areas; • Headcount optimization
Risk associated with movements in market prices for procured materials and 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	<ul style="list-style-type: none"> • Invention of new market segments; • Expansion of the range of products and services rendered

Note: ■ — higher impact of the risk compared to 2014.

Legal risks

JSC "SSC RIAR" undertakes its business in conformity with the standards and 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 legal office at JSC "SSC RIAR". Independent consultants are engaged in some cases also.

Social risks

JSC "SSC RIAR" places particular importance on social sustainability and addresses the social risks as one of the key risks. Outcomes of the Company's dominant undertakings are directly related to the required number of personnel who has the required professional competences but they also depend on sustained implementation of special programs with particular attention to social, economic and cultural development of people. Failure of one of these programs could have a destabilizing effect on a staff member and on the development of the Company. To guarantee and promote the normal labor-management relations at JSC "SSC RIAR", a Trade Union Agreement has been concluded and is updated on a regular basis. A number of factors associated with 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.).

Most of potential social risks could be provoked and could lead to rise in social tensions due to dissatisfaction of the personal with a motivation and social support system. To ensure management of social risks, JSC "SSC RIAR" implements a program for financial incentives and non-financial rewards of its employees puts in place social policy

that is pursued in accordance with the Unified industry-specific social policy of ROSATOM within the framework of corporate social programs for: voluntary medical insurance, voluntary medical insurance against accidents and diseases, medical and physical rehabilitation, housing improvements and financial assistance, social assistance to unemployed retirees, organization of leisure time and recreation for employees' children, cultural and sporting events.

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. For instance, it undertakes campaigning and occupational guidance programs for high schoolers with a view to inform them about prospects of higher and intermediate vocational education with the specialties in demand at the Company (Welcome days, technical visits to the site, Nuclear Medicine Academy for Children). The Company also undertakes a cooperative interaction with twenty five leading higher education institutions (see [Sections 4.2 "Intellectual Capital" and 4.5 "Human Capital" of Chapter 4 "Capital Management and Output"](#) in the present Report).

Risks related to labor protection

Rates of work-related injuries and occupational diseases have a significant effect on both the economic and social component 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 the enterprise. Since 2010 JSC "SSC RIAR" has in place its own occupational safety management system under the system of occupational health and safety management of the ROSATOM State Atomic Energy Corporation. The occupational safety management system of JSC "SSC RIAR" is targeted at preventing work-related injuries and occupational diseases as well as at improving working conditions for the employees (Fig. 3.7). In 2013 JSC "SSC RIAR" adopted the *Unified industry-specific labor protection policy of the ROSATOM State atomic Energy Corporation and its subordinate institutions* that sets goals, tasks and main course of actions for JSC "SSC RIAR" to ensure occupational health and safety of the personnel.

The seconded staff and personnel of Contractors' entities who are involved in activities at radiation hazardous areas and facilities 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. Details of these activities can be found in Section 4.7 "Occupational Health and Safety", Chapter 4 "Capital Management and Output" in the present Report.



Fig. 3.7. Occupational safety management system of 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. JSC "SSC RIAR" conducts performance monitoring and undertakes engineering arrangements to ensure trouble-free operation of research reactors and nuclear hazardous sites. All the activities are carried out in full compliance with the relevant regulations and with due consideration for changes in the RF legislation in force. JSC "SSC RIAR" developed and has been operating the radiological safety system in order to manage radiation hazard risks incurred by local residents and personnel because of operation nuclear facilities at its site. It is operated in conformity with legislative,

regulatory legal acts of the Russian Federation currently in force, sanitary regulations and standards, specifications, rules, guidelines and instructions (Fig. 3.8). 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.

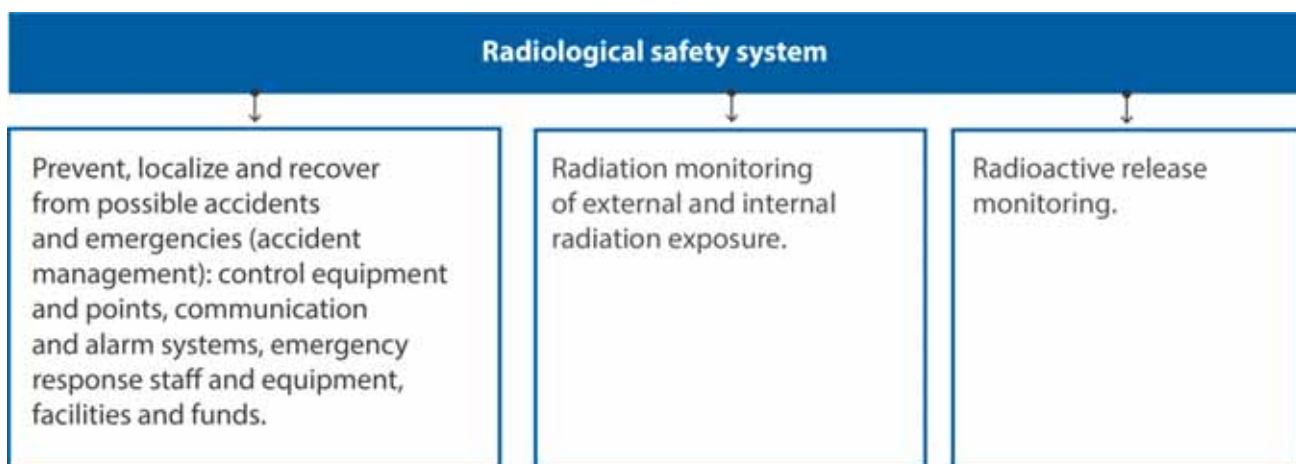


Fig. 3.8. Functions of radiological safety system

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 are not exceeded; adherence to specified limit values for radioactive emissions; there are no events attributable to operation of nuclear facilities rated at level 1 and higher on the INES scale. The Company issues an annual report that provides data on individual and collective doses

of internal and external radiation exposure of the personnel and the public, radioactive release monitoring data as well as other related information. The resultant report is used as basis to work out necessary arrangements targeted at nuclear and radiological safety enhancement. In 2015 there were no accidents at nuclear hazardous sites at JSC "SSC RIAR". All the research reactors were also operated without any accidents. New technological regulations and standards quantifying radioactive

atmospheric releases with due consideration for new facilities under development (the MBIR reactor and poly-functional radiochemical complex) were worked out, agreed with Regional Medical Setting No. 172 under the Federal medical and Biological Agency and approved by the Volga Interregional Territorial Department for Nuclear and Radiological Safety Oversight during the year under report. Moreover, the appropriate authorization was issued. As evidenced with the draft standard for radioactive atmospheric releases, resultant radiation exposure of residents in Dimitrovgrad was lower

than threshold radiation exposure limiting value specified in radiation safety standards NRB-99/2009. It implies that additional arrangements targeted at decreasing absolute values of radioactive atmospheric releases were not required. The new standards for permissible radioactive atmospheric releases will stay in force until 31 December 2019.

The achieved level of nuclear and radiation safety is satisfactory as evidenced by the nuclear safety commission of the Company and commission of General Inspectorate under the ROSATOM State Atomic Energy Corporation.

Risks associated with investment projects

The ROSATOM State Atomic Energy Corporation provides its risk assessment methodology off

investment projects to assess a degree of exposure to risk of one or another project (Fig. 3.9).



Fig. 3.9. Major risks attributable to investment projects of JSC "SSC RIAR"

Insurance

JSC "SSC RIAR" is widely employs insurance practice to conduct the risk management practice. A number of different insurance

contract were concluded during the period under report to ensure sustainable functioning of the Company (Fig. 3.10 and 3.11).



Fig. 3.10. Types and extent of insurance in 2015 RUR000's



Fig. 3.11. Types of insurance against civil liability at JSC "SSC RIAR"

Arrangements of JSC "SSC RIAR" targeted at risk management / mitigation are in full compliance with the short-, medium-, and long-term plans for the Company's development and main directions of its financial policy (Fig. 3.12).

In order to take decisions concerning necessary arrangements attributable to risk management, the risks were classified by their materiality and probability (Fig. 3.13).

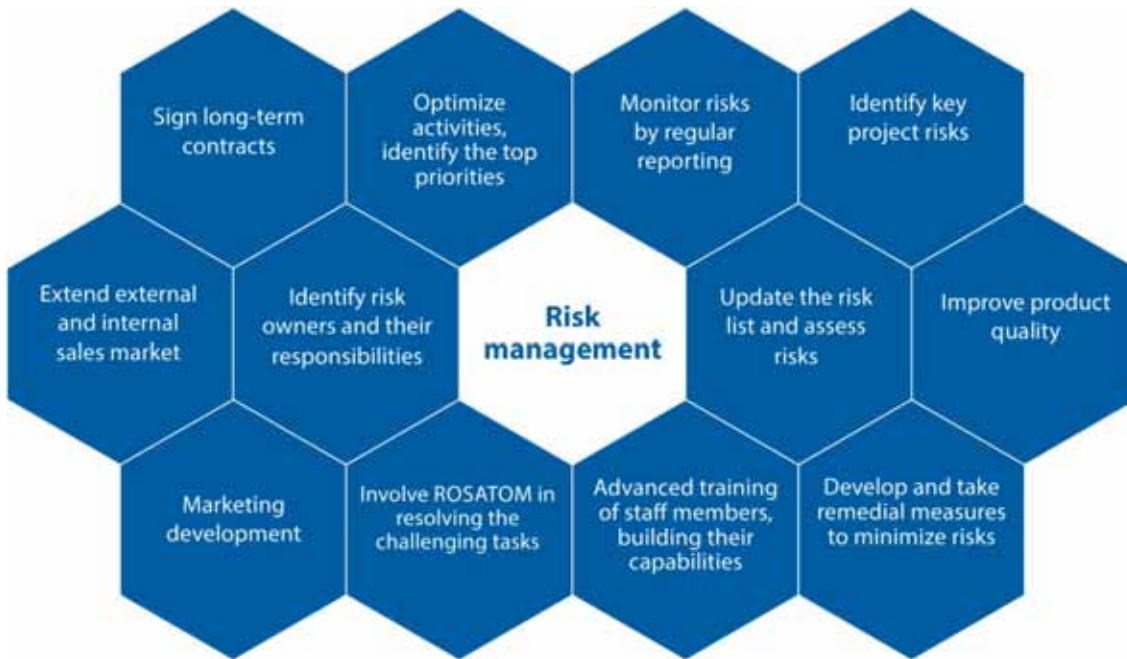


Fig. 3.12. Major risk management actions

Risk probability	High			
	Medium	Operational risks	Risks associated with investment projects	
	Low	Legal and social risks	Risks associated with occupational health and safety	Risks associated with nuclear and radiation safety
		Low	Medium	High
				Impact

Fig. 3.13. Assessment of risk impact on the Company's performance

In 2016 JSC "SSC RIAR" is going to continue its work with the focus on further development of the risk management system and its integration into the existing

management processes as well as on identification, assessment and monitoring of risks in relation to the "Budgeting" and "Medium-term planning".

3.7. Quality management

The quality management system is intended to ensure management of organizational performance, scientific work, business concept, and technological work at the Company and is aimed at meeting the Customer's requirements (Consumer) to the full extent providing for the desired quality and within the fixed timeframes as well as at safe performance.

Quality management at JSC "SSC RIAR" is based on the quality management concept stated in International Standards ISO (9000 family of international standards) and in National Military Standard GOST PB 0015-002-2012. The integrated quality management system of JSC "SSC RIAR" is under the direct supervision of the Chief Engineer, i.e. the representative of the company's management who is in charge of quality and ecology. As to the management system implementation and guidance, it is provided by the Quality and System Engineering Department that is subordinate to the Chief

Engineer of the Company. In 2015 JSC "SSC RIAR" implemented the integrated management system (quality management system, environmental management system) that complies with the requirements of international standards ISO 9001 "Quality management systems. Requirements" (State standard Specification ISO 9001-2011) and with ISO 14001:2004 "Environmental management systems. Requirements with guidance for use" (GOST R ISO 14001-2007).

Further development and improvement of the quality management system in conformity with the requirements of international standards ISO 9001 (GOST ISO 9001) and GOST PB 0015-002 as a basis for implementing integrated quality management system will contribute to improving quality of production at JSC "SSC RIAR" (services) and adding boost of confidence for the Customers in their chosen area.

An excerpt from the quality management policy of JSC "SSC RIAR"

Quality assurance policy

Senior executive officers of JSC "SSC RIAR" worked out and approved quality management policy. The Company has implemented and maintained the quality management system as an instrument to embody the policy in relation to engineering development for research and development work in the field of nuclear energy application, production and supply, services rendering to provide timely response to the needs and expectations of its customers. Its timely applicability is verified annually

when performance of the quality management system is analyzed. The quality assurance policy was made up to date in 2015 (Order No. 64/350-П from JSC "SSC RIAR" as of 20 May 2015). The integrated quality management system is applicable to design engineering, fabrication and delivery of fuel rods, 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), ISO 14001 (GOST P ISO14001). The Company continues its work targeted at proper maintenance and further improvement of the certified quality management system in conformity with the requirements of International Standard ISO 9001 and State Military Standard GOST PB 0015-002. Implementation of the integrated management system made it possible to resolve some issues arising most often in concurrent or consistent independent implementation of several standards. These issues are as follows:

- Duplication of processes, documents, positions and functions at the subdivisions;
- Complexity of perceptual unity of the management system on the part of Company's management team and therefore, low efficiency of planning, control and management in general;
- Complexity of relations between the quality management system and environmental management system if they are implemented autonomously;
- A long term implementation of standards at the enterprise;
- High labor intensity and high need in resources when a group of standards is implemented autonomously.

The following standards were put in place during the period under report:

- ISO 14001:2004 "Environmental management systems. Requirements and guidance for use" (GOST P ISO 14001-2007).
- GOST PB 0008-001-2013 "State System of Standardization and Ensuring Traceability of Measurements. Ensuring the unity of measurements for State Defense Contracts. General requirements for arrangement and performance of metrological activities.

Plans for 2016:

- Supervisory audit of the certified quality management system at JSC "SSC RIAR" against the requirements of the national military standard GOST PB 0015-002-2012;
- Supervisory audit of the certified integrated quality management system against the requirements of international standards ISO 14001:2004 (GOST P 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 the view to put in place unified quality assurance policy of ROSATOM State Atomic Energy Corporation, update and implement quality management regulations;
- Elaboration and enforcement of quality assurance programs under the operator's responsibility including those pertaining to lifetime prolongation of nuclear facilities in conformity with the requirements of NP-090-11 "Requirements for Quality Assurance Programs Applicable to Nuclear Facilities".

Customer satisfaction

Management of work, data acquisition methods and frequency as well as a data analysis method are explained in the Company Standard STO DP 086-410-2015 "Integrated Quality Management System of JSC "SSC RIAR". Customers' Satisfaction Monitoring and Assessment".

To assess customers' satisfaction, questionnaires of two types were distributed following the results of 2015: quality assessment of services (R&D) and quality assessment of products (Fig. 3.14 and 3.15).

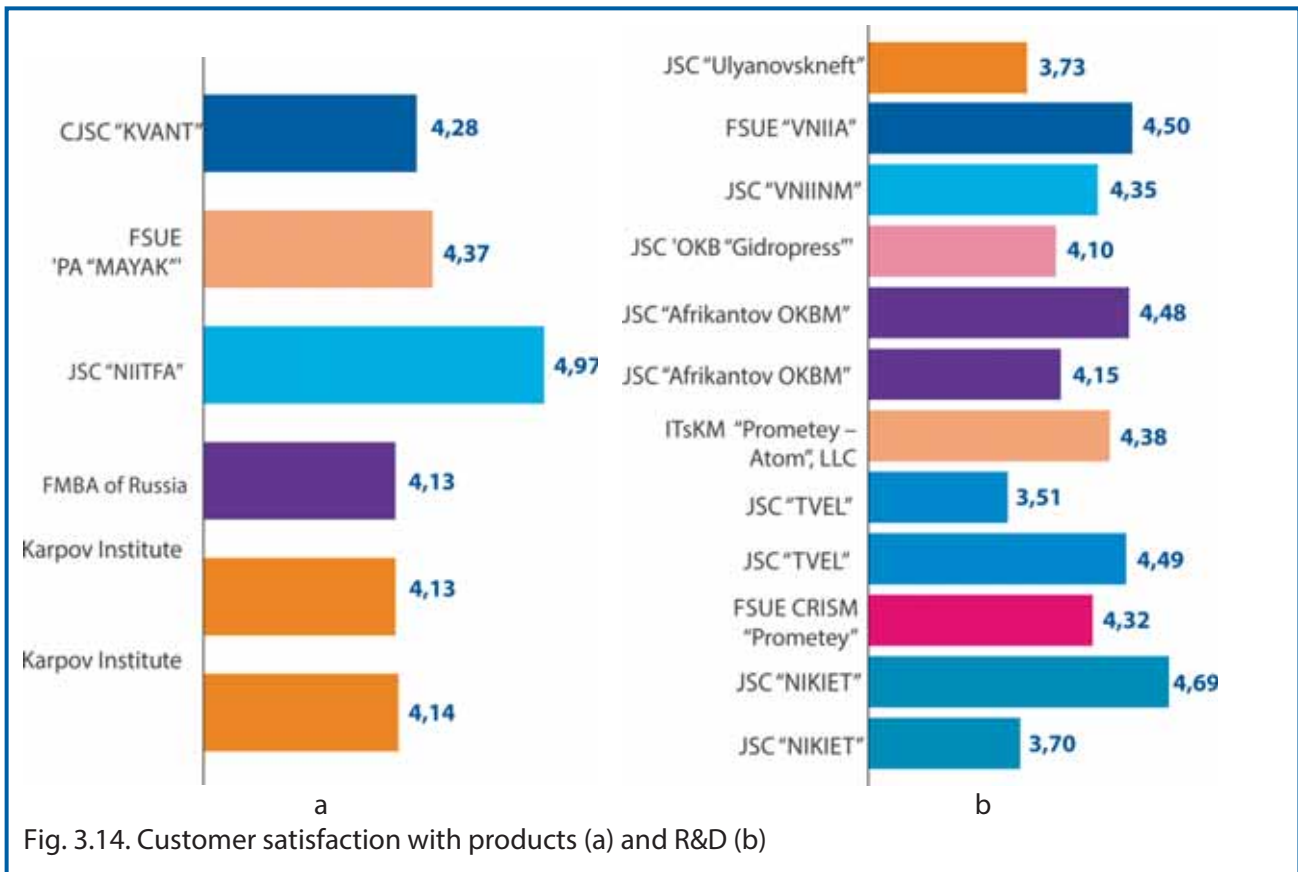


Fig. 3.14. Customer satisfaction with products (a) and R&D (b)

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, during visits of foreign delegates and oversees business trips assignment procedures (Fig. 3.16 and 3.17).

82,7%

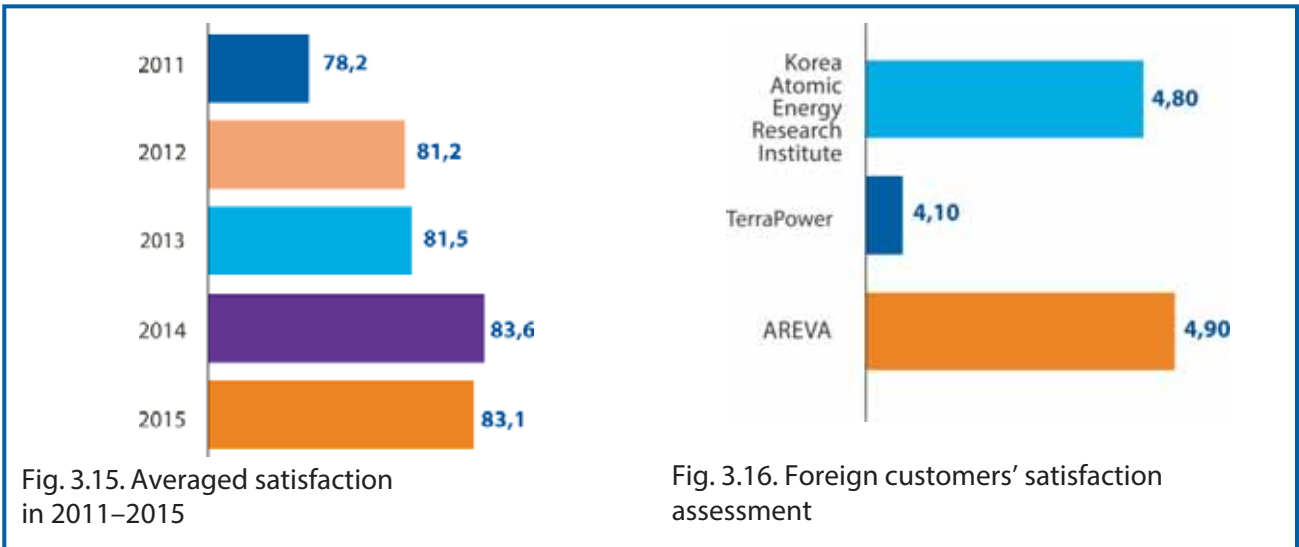
Averaged customer satisfaction with services

83,5%

Averaged customer satisfaction with products

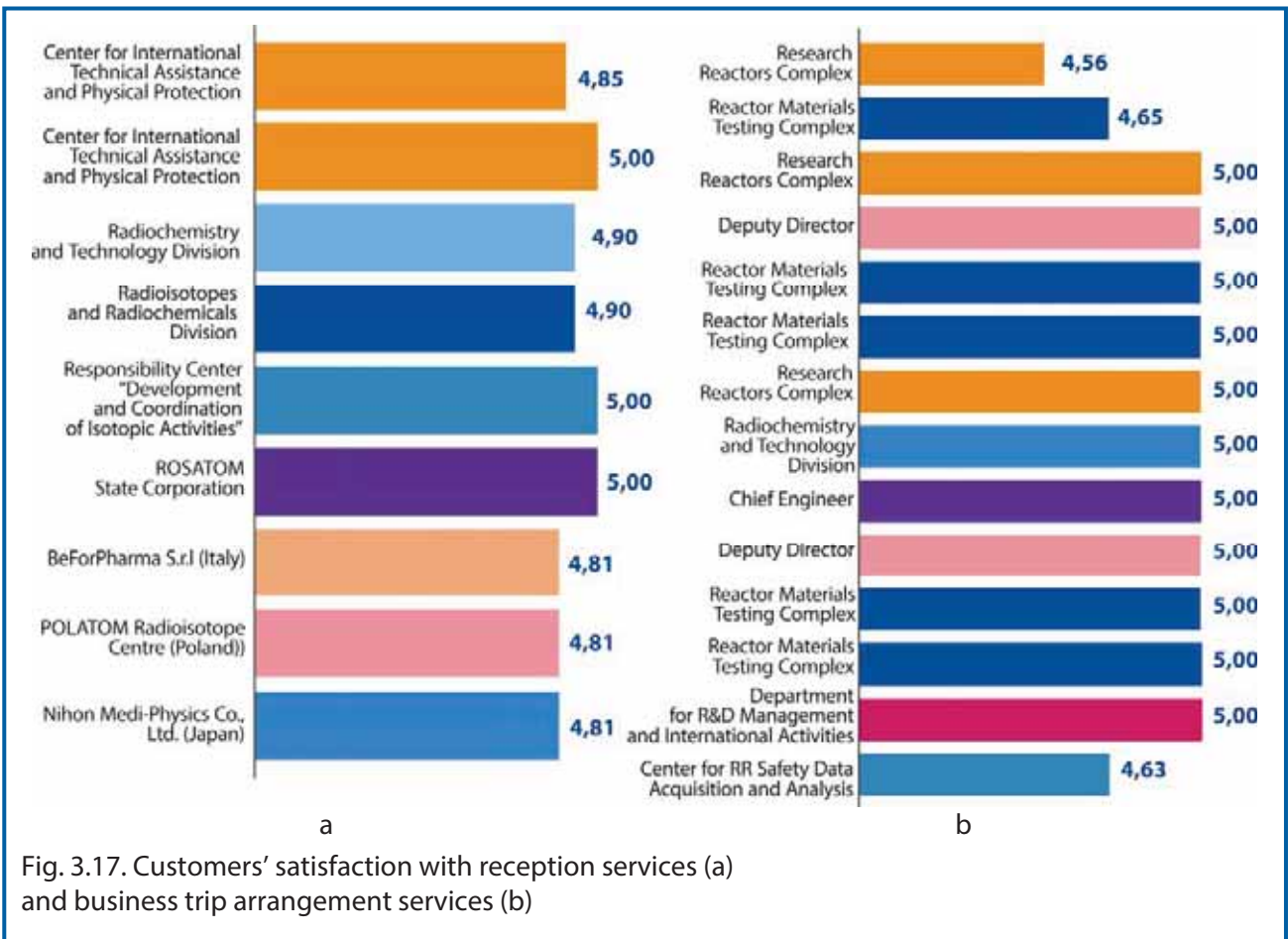
83,1%

General averaged customer satisfaction level



Over the past five years the customers are satisfied with the R&D services

rendered and products delivered.



3.8. Procurement management

Procurement activities of the Company at its own costs and expense and with the use of extrabudgetary resources are governed pursuant to 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 *Single 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>).

EC6

The key 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_in_29062015_c_ssytkami_0.pdf). To promote openness and transparency of procurement activities, the Company provides information about procurement on the official websites on the Internet: government *site of the Unified procurement information System* (www.zakupki.gov.ru) and dedicated website for placing purchase orders for goods, work

EC9

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".

In 2015 a rate of electronic procurement made up 100%. As a result of open competitive bidding RUR 82957.56 was saved in 2015 making up 7.2% of the planned price. In 2015 a share of the contracts made between the company and small and medium business entities for delivery of goods, work and services was equal to 18.2% of the total number of contracts entered. A local purchase rate was equal to 15.8% (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 procedures in the year of 2015.

Plans for 2016:

- 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 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 business entities.

In 2015 JSC "SSC RIAR" entered into 323 contracts within the framework of annual procurement plan for a total amount of RUR 1 900212.239 thousand

3.9. Production Management

Improvement of the production management system

The key projects to improve the management system started at JSC "SSC RIAR":

- Re-certification of the QMS system to comply with State Standards GOST RV 0015-002-2012 and ISO 9001:2008 (ГОСТ ISO 9001-2011);
- Certification of the Ecological Management system to comply with ISO 14001:2004 under integrated management system;
- Further development and improvement of the management system to implement the unified quality policy, updating

and integration of the regulatory documents related to the management system;

- Development and implementation of the operator's QMS, including the nuclear facility lifetime prolongation as per NP-090-11 "Requirements to QMS of nuclear facilities".

In 2016, the integrated management system was improved according to the action plan on the functioning and improvement of the integrated management system of JSC "SSC RIAR".

Developed and upgraded standards:

- STO KP 086-413-2015 "Integrated Management System of JSC "SSC RIAR". R&D. Reactor Materials Science»;
- STO KP 086-414-2015 "Integrated Management System of JSC "SSC RIAR". Nuclear Fuel Production";
- STO KP 086-415-2015 "Integrated Management System of JSC "SSC RIAR". Operation of nuclear facilities";
- STO KP 086-424-2015 "Integrated Management System of JSC "SSC RIAR". Communications";
- STO KP 086-418-2015 "Integrated Management System of JSC "SSC RIAR". Radionuclides production";
- STO KP 086-421-2015 "Integrated Management System of JSC "SSC RIAR". R&D. Reactor-Related Research;
- STO KP 086-419-2014 "Integrated Management System of JSC "SSC RIAR". Mid-Term Planning. Budgeting";
- STO KP 086-412-2014 "Integrated Management System of JSC "SSC RIAR". Strategic Management";
- STO KP 086-422-2013 "Integrated Management System of JSC "SSC RIAR". R&D. Radiochemistry";
- STO KP 086-423-2013 "Integrated Management System of JSC "SSC RIAR". Purchasing Activity";
- STO KP 086-416-2012 "Integrated Management System of JSC "SSC RIAR". HR management"».

Implementation of process management methodology and tools

JSC "SSC RIAR" is constantly improving the management and activities systems to carry out research and design works and render services and satisfy timely the consumers' expectations. As per ISO 9001:2008 (GOST ISO

9001-2011) and GOST RV 0015-002-2012, JSC "SSC RIAR" has defined and identified the processes needed for the QAS to function and developed new and updated the previous standards of organization.

Enhancement of the production activity efficiency

The implementation of a production system of ROSATOM State Corporation — the industry project which purposes are creation on the basis of the best models of domestic and foreign experience of a universal control system of complex optimization of production and administrative processes of the ROSATOM's enterprises and increase overall performance of the enterprises of branch, including reduction of expenses and increase of labor productivity to the level of the Russian and foreign competitors.

In reporting year JSC "SSC RIAR" implemented the project on introduction of production systems of ROSATOM at an industrial site. For example, in the BOR-60 reactor workshops, the replacement of the obsolete equipment was made: six new workbenches were installed instead of old ones as well as new cases for storage of expendables (Fig. 3.18) that allowed increasing the convenience of service and repair of electric equipment, safety of working conditions when carrying out various operations.



Fig. 3.18. BOR-60 workshops before (a) and after (b) the ROSATOM production system implementation

Within the industry project, the methodical base also gained the development: audit of the title and right certifying documents

(in total 1247 documents) was carried out. The collation sheet of technical documentation, accounting of objects and marking of real estate

(in total more than 500 objects) was issued. Work on this project will be continued in 2016.

During the XVII Russian Conference "Safety of Research Nuclear Installations of Russia" held in 2015, the presentation "Development of a production system of ROSATOM in JSC "SSC RIAR" was made representing detailed report about development of this system since 2012 and the nine implemented industry projects, including

the one on increasing the efficiency of use of research reactors, production of isotopes, introduction of 5C system, production analysis. Information containing in the report became a subject of hot discussions. Following the conference results, a decision was taken on studying of influence of a production system of ROSATOM on safety of research nuclear installations within the projects under implementation.

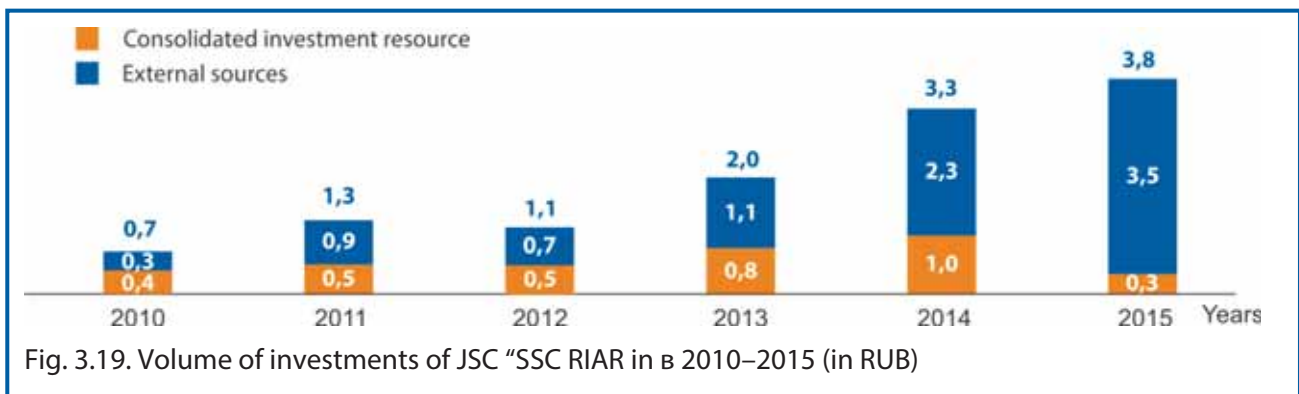
3.10. Investment Management

Main goal of the investment management activity is ensuring the performance of the main strategic objectives of institute on a long-term period at a limited investment resource and regularly changing external conditions. Main objectives are:

- deduction of the current market positions of institute and development of activity in the new markets on an average and long-term period;
- maintenance and updating of infrastructure of institute in the field of radiation, ecological and industrial safety, scientific infrastructure.

Control of investment activity is exercised by managing the implementation of investment projects at all their life cycle stages, including initiation, approval, implementation, monitoring, control over the executions of the project and its end. These processes, as well as issuing of passports and reports under projects are carried out according to the normative documents of ROSATOM State Corporation which are put into operation at institute by local normative documents.

The volume of investment of JSC "SSC RIAR" is presented in Fig. 3.19 and 3.20.



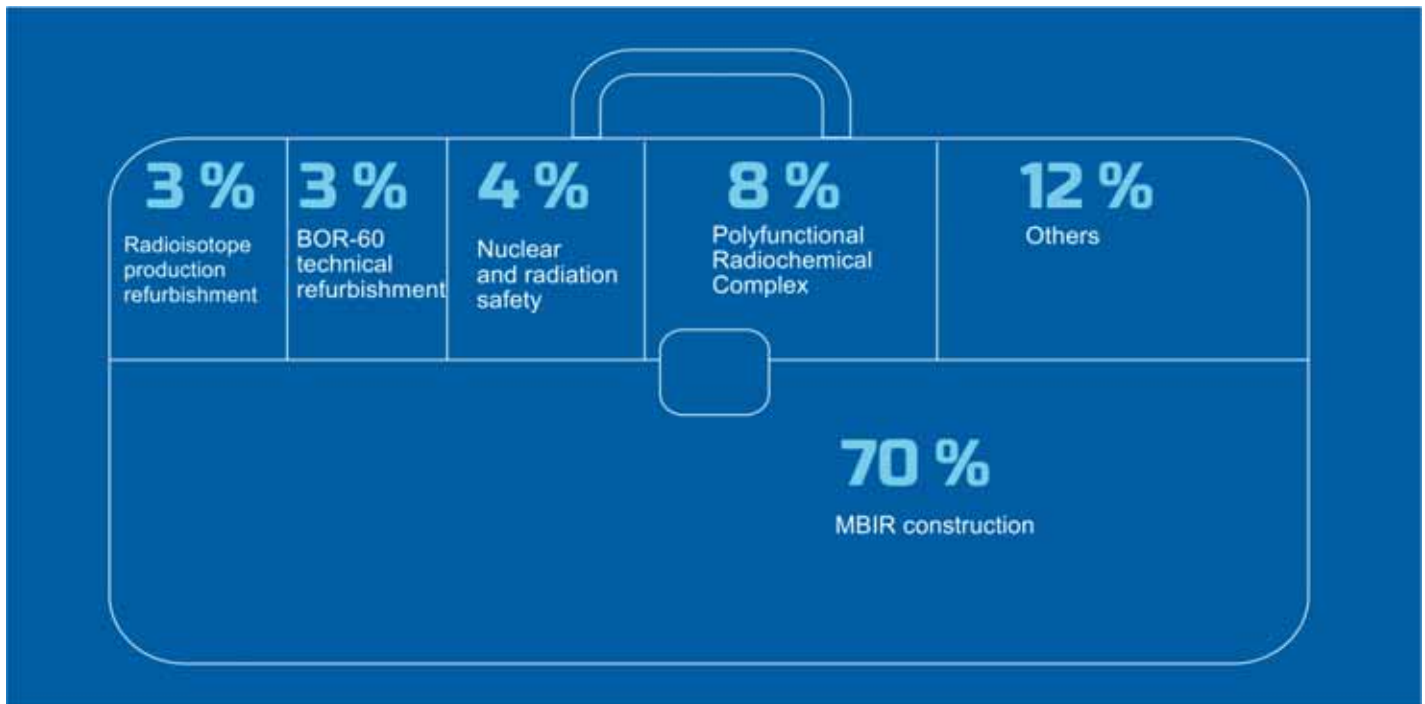


Fig. 3.20. Volume of investments of JSC "SSC RIAR" in 2015 per projects

3.11. Property Management

Main objectives of the Company in the field of property management are presented in Fig. 3.21.

As of December 31, 2015 the Company had 108 land plots with a total area of 3155.76 hectares, from which in the actual land use:

- 92 land plots with a total area of 242.29 hectares belonged to Society on the property right;
- 16 land plots with a total area of 2913.46 hectares were in use of Society on a leasehold basis and continuous (term-less) use.

During 2015, two land plots are acquired in property of Society. Four land plots are formed at the expense of the section of earlier considered sites.

As of December 31, 2015, the Company had the property right for 1250 objects of real estate; the property right of the Company is registered for all objects of real estate.

The following non-core property is sold at the auction: hotel for 162 places, one-room apartment.

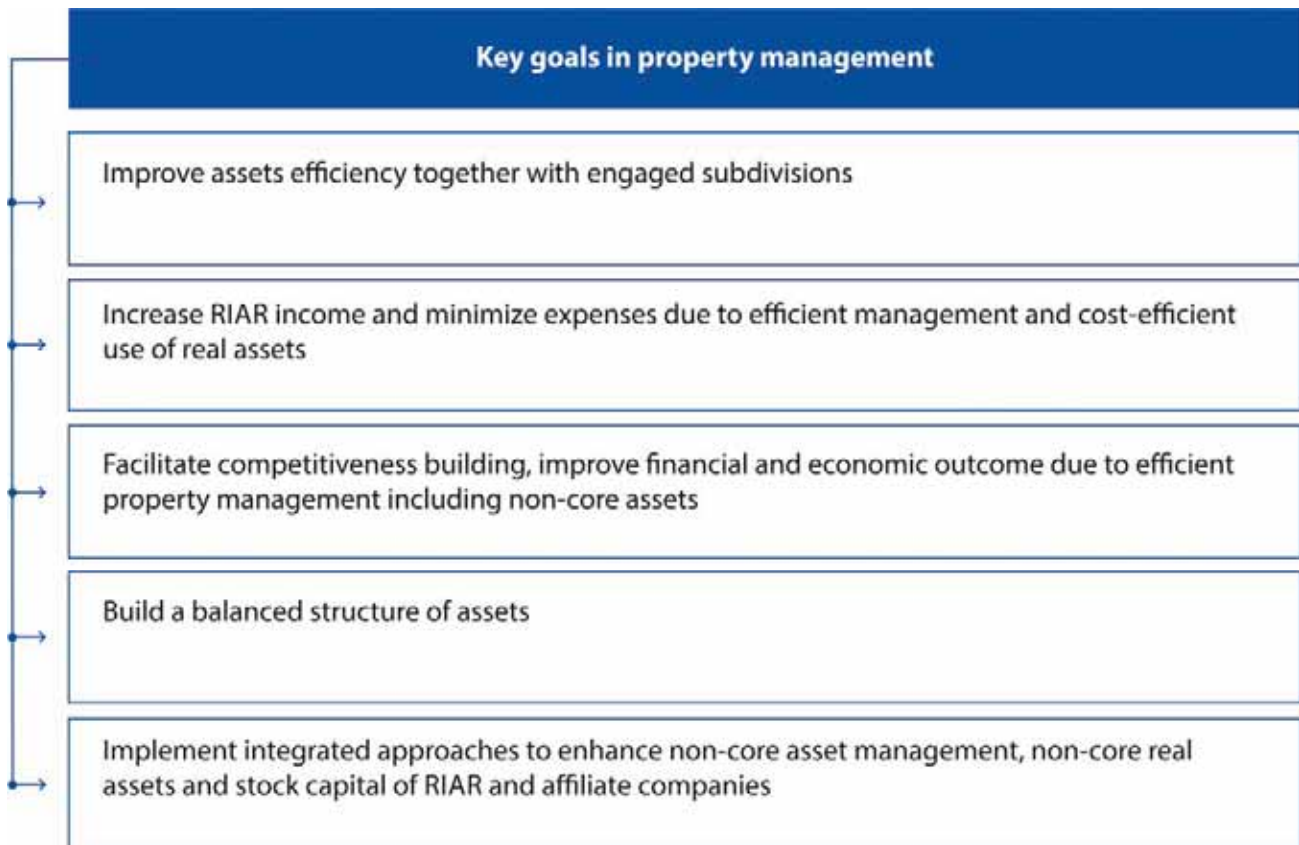


Fig. 3.21. Key goals of JSC "SSC RIAR" in the property management area

3.12. Public Stance in the Area of Sustainable Development

Under a sustainable development of JSC "SSC RIAR" is understood a system of consecutive works of economic, social and ecological nature (in more detail about it is in [Chapter 4 "Capital Management and Output"](#)), which promotes the achievement of strategic objectives of institute and development of the society in general.

The economic component of the steady development, in addition to the optimal use

of limited natural resources and application of eco-friendly natural-, power- and the material-saving technologies, is also defined by key efficiency indicators. The main reference points for definition of key indicators of efficiency are safe functioning and growth of efficiency of the company, provision of social guarantees to the staff. Key indicators of efficiency are established by functional departments

of the State Corporation and Managing Company and cover all kinds of activity of the organization. The main aspects are nuclear, radiation and industrial safety, ecology, operational efficiency, increase in a share in the Russian and international markets. Key indicators of efficiency are focused on the growth of financial performance and production results of the organization and branch, but there are also non-financial indicators of efficiency, for example:

- reduction of cases of falling from height (branch enterprises and contractors);
- lack of level 2 violations as per the INES scale, including radiation burden for the personnel over 50 mSv/year.

The list of key indicators of efficiency of top management there also contains indicators related to the ecological impact.

The responsibility for ecological indicators of the enterprise activity is conferred on the director of the organization.

The responsibility of the high-level management for the minimization of impact on environment it is also distributed between the chief engineer and deputy directors. The chief ecologist

of the organization is responsible for the observance of all requirements of the ecological legislation.

In 2015 some profitable business indicators were executed, which entailed notable advantage for the organization, such as "The free corrected cash flow" and "Revenue from new products out of a contour and in a contour on a competitive basis". By results of performance of these indicators, the amount of own means which can be spent for investments is defined.

The map of key efficiency indicators of Director of JSC "SSC RIAR" is presented in [Section 3.4 "Key Performance Indicators. Appraisal and Remuneration of Personnel"](#).

The social component of a sustainable development is directed on the preservation of stability of the existing social and cultural systems and reduction of the number of destructive conflicts between people.

From the ecological point of view, the sustainable development has to provide an integrity and viability of biological and physical natural systems.

Region of Presence Development

Activity of JSC "SSC RIAR affects essentially the region of presence. The solution of the major strategic tasks set for institute by the ROSATOM State Corporation is integrally connected with the increase in the competitive advantages of the region in the Russian market that, in its turn, demands efforts and attention both from the management of the Institute and from the administration of Dimitrovgrad city and Ulyanovsk region. As the similar situation is typical for many enterprises located in different regions of the country, the ROSATOM State Corporation carries out consecutive work on the support and development of territories of presence

that allows solving strategic problems and increasing competitive advantages of the Corporation in the Russian and international markets. The interaction with the region of presence is built on the basis of active work with authorities and the public, generation and financial support of the social and humanitarian orientation projects focused on achievement of specific goals in specific territories.

A cooperation agreement is signed between ROSATOM State Corporation and the Government of the Ulyanovsk region. Thanks to this agreement, the region has new

large-scale opportunities of the additional target financings of socially significant projects due to use of potential of tax assignments of JSC "SSC RIAR" to the budget of the constituent entity of the Russian Federation. The action program for development of the municipal infrastructure was developed and its implementation was started at the expense of additional inter-budgetary transfers from the regional budget of the Ulyanovsk region. This program is scheduled for 2013–2016. ROSATOM State Corporation pays much attention to the development of territories of presence of JSC "SSC RIAR" as the ambitious tasks the institute faces regarding its development demand a significant improvement of infrastructure of the city of Dimitrovgrad and scaling it up to the advanced international standards.

Input into healthy lifestyle. Actions in the field of a healthy lifestyle are focused on development of sports infrastructure of the city for the purpose of increase in coverage of the population playing sports. Annually, sports contests are held among employees of institute, in which not only the staff of institute participate, but also members of their families.

The institute sports contest makes a huge contribution to promotion of a healthy lifestyle.

Input into education and culture. During 2015, the network of interaction between educational institutions of all types was established and developed for ensuring the development of personnel potential, creation of the modern library center for the purpose of increase of the informational support of society and ensuring its sustainable intellectual development, development of objects of culture. On the basis of the Slavsky Conference Center, numerous cultural events of city, regional, branch and all-Russian levels were held: city tournament "What? Where?

When?"; Festival of opera stars fund "Talents of the World"; III Interregional Festival "Theatrical Atom City"; The International Musical Festival "World. Era. Names"; The All-Russian Jazz Festival within the ROSATOM's program "Territory of Culture"; numerous exhibitions and concerts devoted to the professional and branch holidays.

Input into local roads construction and repair. During 2015, after carrying out emergency recovery operations on heating mains, repair of more than 125 m² of an asphalt concrete covering of sidewalks and the carriageway was carried out.

Input into the housing and utilities infrastructure development and beautification. In 2015, a number of actions was carried out aimed improvement of water provision for residents of the western district of Dimitrovgrad, development of engineering infrastructure and city space, support of preferential categories of citizens, provision of safety of the population, modernization of the available base and increase of its capacity for collecting, export and utilization of municipal solid waste and large-size garbage from an urban area; ten transformer substations were repaired in the territory of the western part of the city. Some of the institute employees became the first happy owners of new housing in a new residential district. Minister of Construction and Housing and Utilities of the Russian Federation Mikhail Men, Governor of the Ulyanovsk region Sergey Morozov and Director of JSC "SSC RIAR" Alexander Tuzov took part in the opening ceremony of the new residential district. The low-rise comfortable apartment complex will be located on the territory of 8 hectares, where it is planned to build 26 houses for more than 2000 inhabitants.

Input to the creation and distribution of economic value. The overall picture of economic productivity of JSC "SSC RIAR"

in reporting year is presented in Table 3.7: the created economic value is distributed between suppliers and contractors (within operational expenses), suppliers of the capital (in the form of percentage payments

to creditors), the personnel of institute (compensation and social assignments), the state (in a type of tax), local communities and bodies of regional and municipal authority (in the form of investments into communities and taxes).

Table 3.7

EC1

Creation of economic value and its distribution among stakeholders per years

Index, mln RUB	2013	2014	2015
Created economical value (revenue from sales, financial investments and assets sale)	6 676.0	4 426.4	4 999.6
Distributed direct economical value:	6 837.9	5 222.6	5 356.2
Operational costs	4 654.4	3 069.1	2 983.5
Wages and other payments and support payments to the employees	1 598.5	1 546.9	1 492.3
Payments to the capital suppliers	33.8	91.9	287.2
Gross tax payment	472.7	449.0	543.0
Investments to communities	78.6	65.7	50.2

Input into the regional energy security.

JSC "SSC RIAR" provides electric power, cold and hot water, and also thermal energy to the western part of the city of Dimitrovgrad. Unconsumed electric power goes to the integrated power grid of the Ulyanovsk region.

Interaction with suppliers and subcontractors.

Construction of the MBIR reactor and multi-functional radiochemical research complex stimulates creation of new workplaces (300 and 98 people are directly engaged in the construction, respectively), a part of workers is employed from among the locals living in the territory of the Ulyanovsk

region and Dimitrovgrad. Each workplace related to the above construction actually promotes for the creation of 10–12 more workplaces in the related industries of economy (metallurgy, mechanical engineering, etc.) and this is in total from 4 000 to 5 000 people.

Tax payments to all-level budgets. JSC "SSC RIAR" makes a considerable influence on the formation of revenues of budgets of the territory of presence. In 2015, 543 million rubles are paid in budgets of all levels, including contributions to off-budget funds, that is 21 % more, than in 2014.

Nuclear Innovative Cluster in Dimitrovgrad

The Nuclear Innovative Cluster of the city of Dimitrovgrad, Ulyanovsk region, created in 2010 with assistance of local governments, and also the federal ministry and the commercial

organizations is one of effective instruments of development of Dimitrovgrad and the Ulyanovsk region in general (<http://cluster-dgrad.ru/rus/>). The main idea of the Nuclear Innovative Cluster is

to create favorable conditions for formation of the complex infrastructure aimed at the development and commercialization of innovative projects in the sphere of nuclear technologies, medicine and other branches of economy. JSC "SSC RIAR" is the center of this cluster. The cluster includes 42 organizations: large state and private companies, educational institutions, representatives of small and medium business, public authorities (<http://cluster-dgrad.ru/rus/uchastniki-klastera>). Cooperation of the cluster key participants

increased interest in the cluster cooperation and expanded cluster geography, thereby having established the research and production basis for agglomeration of Ulyanovsk and Dimitrovgrad. In 2015, the Nuclear Innovative Cluster) implemented successfully the educational program — a forum seminar (discussion platform) of territorial innovative clusters.

Center for Nuclear Innovative Cluster Development: <http://cluster-dgrad.ru/rus/>. –
 Internet portal "Map of Russia's Clusters": <http://map.cluster.hse.ru/cluster/27>.
 Cluster in social media: <https://www.facebook.com/crk.dgrad>.

Key projects of Nuclear Innovative Cluster

1. Establishment of a high-tech center of medical radiology (<http://cluster-dgrad.ru/rus/proekty-klastera/9-pages-ru/55-federalnyj-vysokotekhnologichnyj-tsentr-meditsinskoj-radiologii-fmba-rossii>).

2. Establishment of scientific-production complex for radio-pharmaceuticals and medical-purpose (<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>

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3. Mo-99 production (<http://cluster-dgrad.ru/rus/proekty-klastera/9-pages-ru/49-molibden-99>).

4. Construction of a multi-purpose fast reactor (<http://cluster-dgrad.ru/rus/proekty-klastera/9-pages-ru/47-mbir-iyau-mbir>).

5. Construction of a poly-functional radiochemical research complex (<http://cluster-dgrad.ru/rus/proekty-klastera/9-pages-ru/51-polifunksionalnyj-radiokhimicheskij-issledovatel'skij-kompleks>).

More information about the key projects of the Nuclear Innovative Cluster can be found at (<http://cluster-dgrad.ru/rus/proekty-klastera>) and in the JSC "SSC RIAR" Annual report 2014 (http://niiar.ru/sites/default/files/pgo2014_in_29062015_c_ssytkami_0.pdf).

Public stance in the area of sustainable development

In the reporting year, JSC "SSC RIAR" continued to develop a public stance on the corporate social responsibility to form channels to broadcast trust through stakeholder engagement taking into account the requirements of the international AA 1000 SES standard. The Institute, trying to provide the highest level of openness and the transparency activity, interacts actively with stakeholders (more details in [Chapter 5 "Stakeholder Engagement"](#)) by providing in due time the essential information on all aspects of RIAR activity with urgent response

to inquiries and wishes of stakeholders, implementing consistently the principles of information policy (Fig. 3.22), observing reasonable balance between openness and availability of information and commercial interests. All forms of communications available today are applied to successfully implement the policy of transparency: public integrated annual report, Internet resource, questioning, press conferences, public dialogues and consultations, visits of representatives of stakeholders to the enterprise and others.

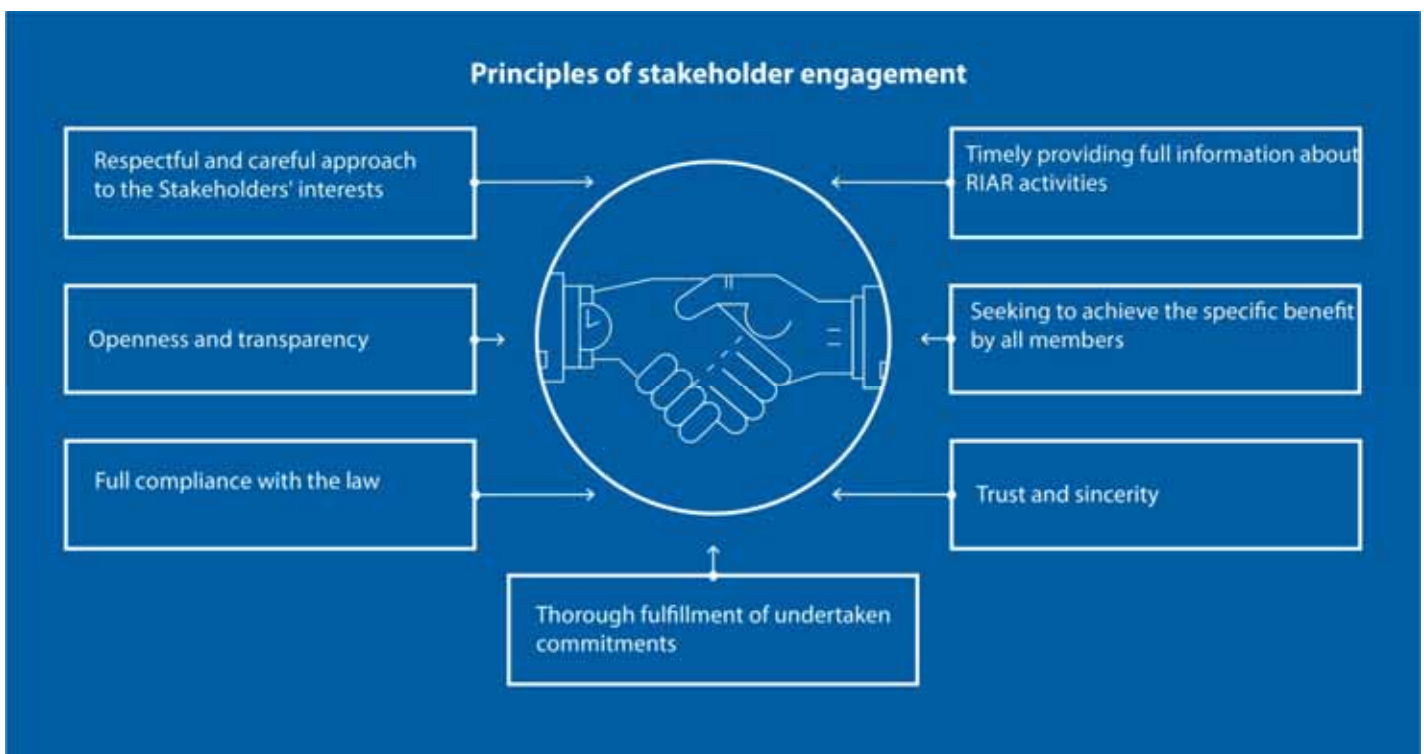


Fig. 3.22. Basic principles of stakeholder engagement

CAPITAL MANAGEMENT AND OUTPUT



4.1. Financial Capital



**IGOR A.
KNYAZKIN**

Deputy Director for Economic and Financial Activities

The reporting year was the year of RIAR's major involvement in corporate-wide projects related to creating shared information space. Since January 1, 2015 RIAR has been utilizing the 1C platform, and during this year RIAR has moved to SAP HCM. Today one can see the benefits from business process automation solutions. These systems have a wide range of capabilities to create efficient management accounting and high potential for development.

According to the development dynamics of JSC "SSC RIAR" this year can be described as a turning point: for the first time in three years there was growth in the key economic and financial indicators.

Compared to 2014, there was 11 % revenue growth, 21 % performance growth, and 60 % export sales growth.

In 2015 special emphasis was placed on cost optimization (–10 %) and reduction of stocks (–11 %). The staff became more concentrated on performing the key economic and financial indicators thanks to the integrated revenue and cost management systems and existing key performance indicators management.

In 2015 investment projects were implemented to refurbish the I-131 production facility and associated areas for producing medical-purpose sources based on Co-60, Cf-252 and other isotopes of transplutonium elements. A contract was signed for Mo-99 supply to Brazil and Argentina. The above factors give a fruitful ground for the growth in the key economic and financial indicators in 2016.

Financial capital management

Financial stability of a company is largely ensured by efficient management of economic performance. JSC "SSC RIAR" has a system to manage the key performance indicators that makes it possible to affect the achievement of its objectives through creating and overseeing these indicators by the top management.

The target values of these performance

indicators are set depending on strategic objectives, forecast of the external environment condition, and assessment of possible risks. This system is targeted both at preparing data related to planned, estimated and actual economic and production performance indicators, and doing a plan/actual analysis of the given indicators to find out discrepancies

and identify activities to achieve the required rate of development.

Economic performance management in JSC "SSC RIAR" is centered on a system of budget management of financial and business activities regulated by the integrated management system standards. This system is based on economic data acquisition, systemization, processing, and review in terms of construction projects, income items and expenses of RIAR's departments. A budgeting system sets the target values of economic indicators with respect to strategic objectives through a regular plan/actual analysis, and timely provides the latest data related to deviations

from the target values necessary to take solutions by the management of JSC "SSC RIAR" and RIAR's departments.

Financial management efficiency is ensured by the financial policy of JSC "SSC RIAR", nuclear power industry and company's regulations and standards for financial risk management, which make it possible to establish the bank-company relationships that enable optimizing the bank account structure and minimizing expenditures for bank servicing; perform operating planning; optimize cash flows in order to allocate funds inside RIAR; invest free cash in an efficient manner, and manage financial risks.

Financial and economic results

Shown in Tables 4.1 and 4.2 are key performance indicators implemented in 2015 approved by ROSATOM. The performance indicator dynamics depends directly on a change in the sales revenue. Compared to 2014, the indicators showed a growing trend in 2015: net income (loss) in 2015 grew by 385 million rubles compared to 2014 and by 93 million rubles compared to 2015 plans. Growth in these indicators was achieved due to activities to improve operating performance (cost reduction, performing the work using RIAR's own resources and efforts, staffing level and non-core property management).

Estimated indicators for 2016 generally show a positive trend as well. However, net income (loss) in 2016 is estimated to be

decreasing by 145.5 million rubles compared to 2015.

This can be explained by the fact that the forecast was based on a pessimistic scenario that did not consider a possibility of growth in the dollar rate, prices for products and services above the inflation rate, etc. The financial results also depend on paying the interest on the loans (+ 73 million rubles by 2015) and depreciation charges taking into account basic assets.

Efforts on improvement of operating performance as well as a possible increase in the sales of radioisotopes and USD exchange rate can lead to considerable growth in these indicators in 2016 compared to 2015 (Fig. 4.1 and Fig. 4.2).

Table 4.1

Key performance indicators of JSC "SSC RIAR"

Indicator	Year		
	2014	2015	
		Predicted*	Actual
Adjusted free cash flow, billion rubles	-0.542	-0.709	-0.177
Labor efficiency, million rubles / person per year	0.93	1.29	1.12
Implemented sales revenue plan, million rubles	3,783	4,665	4,119
Total unit costs, %	-	104	108
Revenue from new products outside and inside the consolidation perimeter on a competitive basis, million rubles	-	313	536
Revenue at the global market, million USD	17.8	36.5	28.5
LTIFR, %	0.13	Base period	0
Falling from height (nuclear enterprises and contractors)		No cases	
Level 2 INES events accompanied by personnel exposure over 50 mSv/year		No events	
Above level 2 INES events		No events	
Fulfillment of state tasks including State Defense Order and other tasks of state customers and organizations, %	100	100	100

* 1st quarter 2015.

Table 4.2

Key economic indicators of JSC "SSC RIAR"

Indicator	Year				
	2012	2013	2014	2015	2016
Revenue from sales of goods, products, work, services, million rubles	4,458.8	5,882.9	3,700.9	4,119.1	4,917.9
Cost of sold goods, products, work, services, million rubles	4,433.1	5,617.7	3,862.2	4,185.4	4,525.7
Gross profit (loss), million rubles	25.7	265.2	-161.3	-66.3	392.2
Management expenses, million rubles	499.3	710.4	743.1	805.6	861.9
Share of management expenses in the revenue, %	11.2	12.1	20.1	19.6	17.5
Profit (loss) from sales, million rubles	-525.4	-502.7	-972.2	-884.6	-604.5
EBITDA, million rubles	-230.0	-48.8	-877.2	-448.3	-110.3
NOPAT, million rubles	-336.2	-175.7	-825.9	-335.6	-438.4
Net profit (loss), million rubles	-411.2	-190.1	-1063.4	-678.0	-823.5

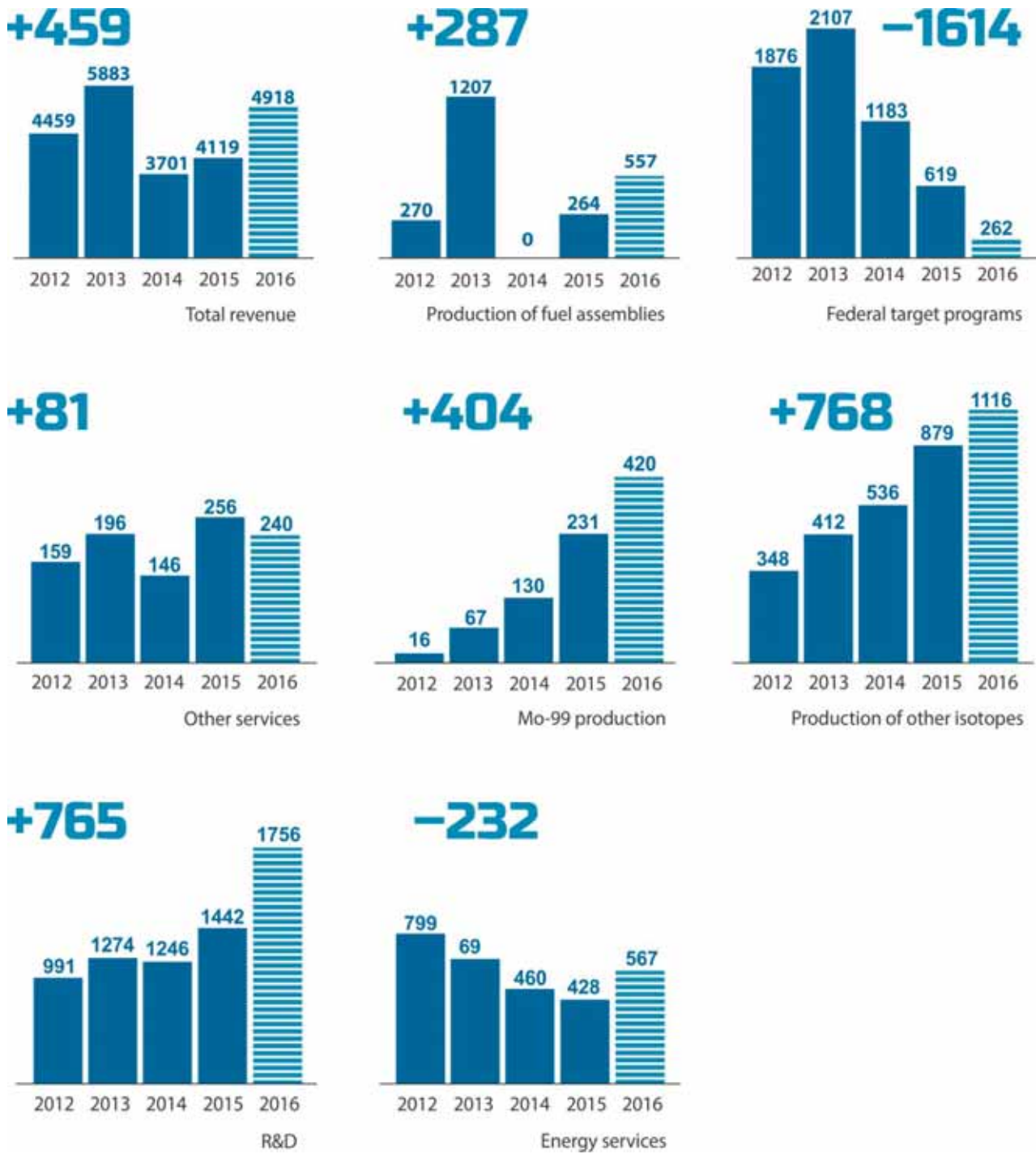
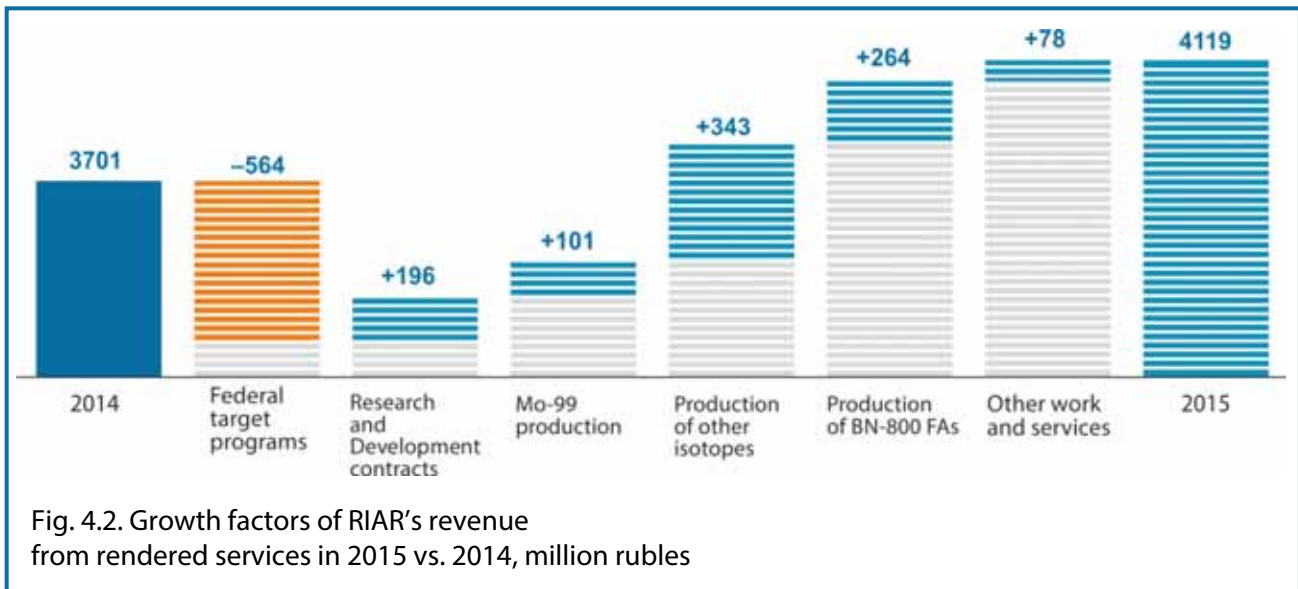


Fig. 4.1. Dynamics of RIAR's revenue from rendered services over the period of 2012–2016 showing deviations of 2016 indicators from 2012 indicators, million rubles



A decrease in the revenue can be explained by reduced R&D funding from the Federal Budget under the federal target programs (Fig. 4.3) and reduced scope of energy services transferred to an outsider due to making RIAR's Production and Energy Complex its daughter affiliate company "NIIAR-GENERATSIYA".

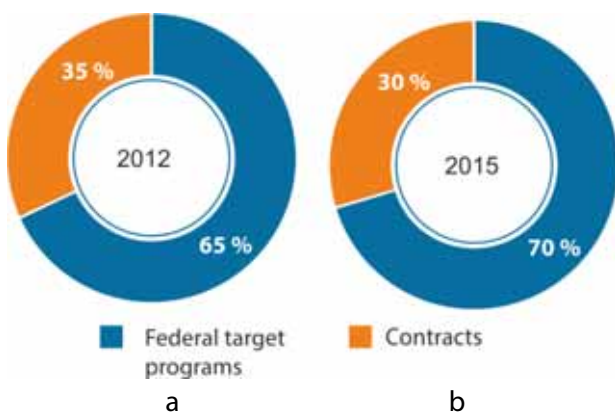


Fig. 4.3. Revenue from R&D over 2012 (a) and 2015 (b) under the federal target programs and contracts

As a result of corrective measures to improve the "Revenue" indicator, the share of export

revenues increased from 7 to 39 %, including an increase in those under contracts by 656 million rubles (10.7 million USD), and an increase in production of radionuclides by 746 million rubles (6.9 million USD).

The R&D scope depends on funding under federal target 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 65% to 30%.

During 2012-2015 the R&D scope under the contracts increased by 451 million rubles (+46 %), including an increase in exported R&D by 11.4 times making up 719 million rubles (+ 656 million rubles).

The share of the contracts signed with the foreign partners increased from 6 to 50 % (Fig. 4.4). In 2016 RIAR is planning to increase the revenue from R&D under the contracts up to 1,757 million rubles (+ 22 % to the value achieved in 2015).

During 2012–2015 the scope of isotope production and sales (Fig. 4.5) increased by three times, and specifically due to production of Mo-99 for medical use.

In 2016 RIAR is planning to increase its revenue from production and sales of isotope products up to 1,536 million rubles (+38 % to the value achieved in 2015).

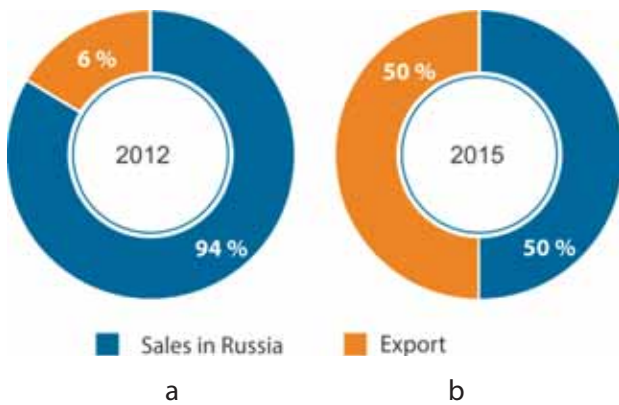


Fig. 4.4. Revenue from R&D (excluding federal target projects) over 2012 (a) and 2015 (b)



Fig. 4.5. Revenue from sales of isotope products over 2012 (a) and 2015 (b) by geographic segments

The geographic segment of sold products shows steady growth in demand of foreign customers (Table 4.3). A decrease in the sales in Russia was affected by the funding from the federal

budget under the federal target programs. The share of work carried out by contractors in total revenues of RIAR made up 12 % (Fig. 4.6).

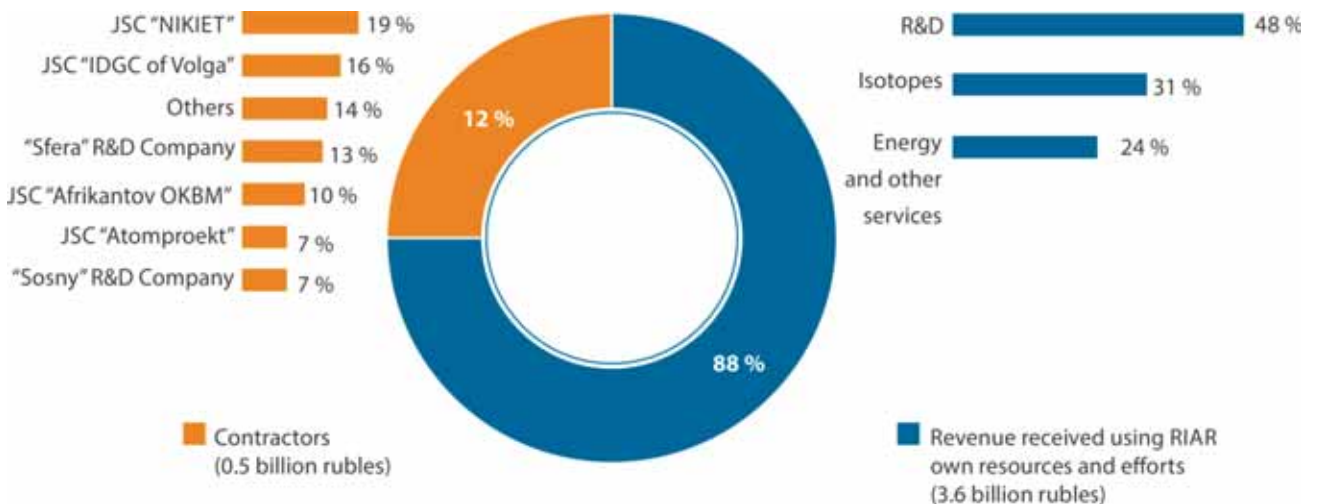


Fig. 4.6. Revenue in 2015 and share of the key contractors

Table 4.3

**Revenue by geographic segments
and activities, million rubles**

Indicator	Year, value				
	2012	2013	2014	2015	2016
Revenues (sold products, work, services)	4,459	5,883	3,701	4,119	4,918
Including internal group turnovers	1,222	2,514	1,180	1,239	1,680
By geographic segments:					
Russian Federation	4,128	5,466	3,014	2,465	2,647
CIS	35	20	22	34	26
Non-CIS states	296	397	665	1,620	2,245
By activities:					
Manufacture of BN-800 FAs	270	1,207	0	264	557
R&D	2,867	3,381	2,429	2,061	2,018
Production of radioisotopes	364	479	666	1,110	1,536
Energy services	799	620	460	428	567
Others	159	196	146	256	240

RIAR shows steady growth in the sales volume of the products and services at the foreign market due to an increase in volume of existing and new isotope products,

and number of R&D contracts, which almost fully balance reduced funding under the federal target programs.

**A comfortable environment
for those involved in the economic life
is the most common formula of the model
to ensure the new growth quality.**



Dmitry Medvedev

4.2. Intellectual Capital

Knowledge management is a background of strategic success.

Vladimir Putin

Intellectual capital management

The necessity to develop and implement effective mechanisms of intellectual capital management is explained by updated innovative economics requirements for high-tech organizations. Using these mechanisms it is possible to convert intellectual capital into the added value for the products and services, thus making knowledge a measurable financial result of RIAR's activities.

Intellectual capital is of key importance in developing innovative activities by an organization and achieving its strategic objectives. Intellectual capital of JSC "SSC RIAR" is intangible assets, e.g.: knowledge, information

technologies, intellectual property, and people with their competencies (1908 (52.4 %) out of 3642 RIAR employees have higher education, including 448 (23.5 %) employees who have vocational higher education). In RIAR there are eighty-four professionals with academic degrees, including twelve professionals with a Sc.D. degree. Highly-qualified staff keeps RIAR's science and technology capabilities and carries out research at a satisfactorily high level. This fact is confirmed by publications of RIAR professionals and their participation in the conferences, symposiums, and workshops (Table 4.4).

Table 4.4

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

Indicator	Value
Total publications in peer-reviewed scientific periodicals	57
Published articles in scientific journals:	57
international	12
Russian	45
Participation in the conferences, symposiums, workshops, etc.:	80
Russian	57
international	23
Including those held in CIS	3
Reports (presentations) at the conferences, symposiums, workshops, etc.:	60
Russian	30
international	30
Including those held in CIS	5

Knowledge management system

An enterprise should use the gained knowledge in its activity. A knowledge management system, which includes development and patenting new knowledge and accumulation of intangible assets should fit smoothly into the enterprise management system and contribute to intellectual capacity building. 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 and plannable. For JSC "SSC RIAR" it is highly important to keep the scientific and technical competencies needed for the 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 2015 the system was enhanced along three key trends. These trends are provided in Annual Report 2014 (Section 2.10 "Knowledge Management" of Chapter 2 "Corporate Governance": http://niiar.ru/sites/default/files/pgo2014_in_29062015_c_ssytkami_0.pdf).

Keeping critical knowledge

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. Critical knowledge management assists in identifying risks in a timely manner, and supports the basic and secondary manufacturing processes; therefore, it indirectly affects the company efficiency and production. 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_in_29062015_c_ssytkami_0.pdf).

In 2015 RIAR fulfilled the following activities under the project on keeping critical knowledge:

- The model, map and list of critical knowledge were updated;
- Knowledge-loss risks were assessed by four risk factors for those employees who hold critical knowledge;
- Five programs on keeping critical knowledge to be implemented in 2016 were identified; a schedule was developed and approved;
- Programs on keeping critical knowledge were implemented; based on these programs media modules were developed and placed

on information portals of RIAR Scientific Library and ROSATOM for each of the following areas: Strength calculations for the NPP equipment; Justification of radiation safety at nuclear facilities; History of development of steels for fast reactor FAs. A way to innovative solutions; Ensuring and keeping water chemistry in research reactors; Accumulation of radionuclides in a reactor.

In order to keep and share critical knowledge as well as provide the continuity in developing

research in JSC "SSC RIAR", our company annually arranges contests, forums, conferences and technical tours for students, post-graduates and young researchers.

In 2015 RIAR arranged the annual contest among young professionals aged up to 35, and *Energy of Generations* Youth Forum (in cooperation with Dimitrovgrad Engineering and Technological Institute, a branch of NRNU MEPhI). RIAR experts provided lectures as well. The information presented at these lectures is placed on the information portal of RIAR Scientific Library.

Plans for 2016:

- To annually update the knowledge map and list of critical knowledge;
- 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 provide media modules on five topics and place them on R&D information portals of RIAR and ROSATOM:
 - Nuclear physics and engineering, irradiation testing and research methods;
 - Radioactive waste management including pyro-electrochemical and gas fluoride reprocessing methods;
 - Radiation material science of zirconium alloys;
 - Fabrication of fast fuel elements using vibropacking technology;
 - Analytical support of production activities and quality control of granulated MOX fuel for fast reactors.

Intangible assets

Intellectual capital management covers a wide range of R&D issues. It cannot exist separately from legal protection of intellectual property assets, their application in own or newly established production and use in national or global technology exchange (Fig. 4.7).

The current position of JSC "SSC RIAR" in the nuclear industry (see [Section 1.3 on Position in the Industry, Chapter 1 "General Information" of this Report](#)) specifies the main trends of its activities in intellectual property management and near-term goals to meet

the strategic objectives set by ROSATOM in engineering leadership. Development of the intellectual property management policy is in progress. It is targeted at introducing intellectual assets into commercial turnover and commercializing the technology developed in RIAR. A system is being developed to manage identification

and consideration of the optimal protection method, legal and other protection of intellectual property, and booking it as intangible assets (Fig. 4.8). This system is intended to meet legal and industry's requirements and ensure fruitful work with intellectual property (Table 4.5).



Fig. 4.7. Intellectual capital management

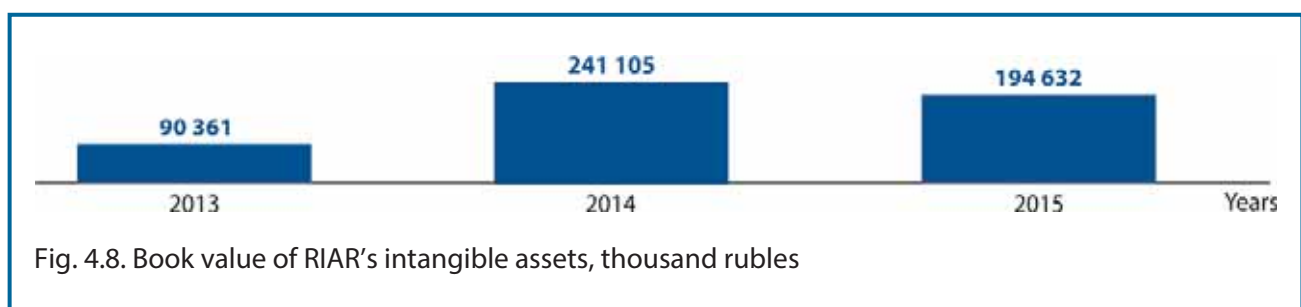


Fig. 4.8. Book value of RIAR's intangible assets, thousand rubles

Table 4.5

Inventive activities in RIAR

Indicator	Year, value		
	2013	2014	2015
Applications for an invention and utility model	13 (RF holds the rights for 4 out of 13)	8 (RF holds the rights for 1 out of 8)	14 (RF holds the rights for 12 out of 14)
Patents for an invention and utility model	13 (RF holds the rights for 2 out of 13, and the rights for 1 out of 13 are owned together with JSC "SverdNIKhimmash")	19 (RF holds the rights for 4 out of 19)	8 (RF holds the rights for 5 out of 8)
Know-how legal protection	26	23 (RF holds the rights for 1 out of 23)	17 (RF holds the rights for 11 out of 17)
Supported inventions and utility models; know-how	153	181	198
Applied inventions and utility models	54	38	42

Providing scientific and technical information

Scientific and technical information is provided to improve the effectiveness of R&D activities through availability and handy use of scientific and technical information by the employees of ROSATOM and its organizations. This is achieved by formalizing and recording knowledge, regular data acquisition, and storage. In 2015 the scientific and technical information portal of ROSATOM was updated to include the following thematic sections: Nuclear industry's publications, Proceedings of scientific and technical conferences, Publications, and Consolidated scientific library catalogue. The content was also updated with relevant scientific and technical information

and data related to digitized archives of scientific and technical documentation of RIAR. In 2016 it is planned to continue the updates by introducing new topics: Online scientific information resources of RIAR and Catalogue of digitalized documentation archives. In the reporting year RIAR employees were provided with access to scientific and technical information (including remote access), thus making available the Scopus international citation database and Elsevier electronic database (more than 2000 scientific journals and magazines containing about 250,000 scientific articles annually).

Staff training and development

People and their competencies are the most important component of the knowledge management system. The Department of Radiation Technology has been established at the Faculty of High Technology Physics and Engineering of Ulyanovsk State University in accordance with the program

of the science, education and innovative technology consortium of higher educational institutions and scientific organizations of the Ulyanovsk region under the auspices of RIAR. In 2015 nine post-graduates employed by RIAR attended post-graduate courses at this Department to be trained

in *Condensed Matter Physics and Materials Science (Nuclear Power Engineering)*.

Five RIAR experts are part-time lecturers at the Department including four Doctors of Science and one Master of Science. RIAR in collaboration with DETI NRNU MEPhI established the Department of Nuclear Reactors and Materials where the students are trained in the following specialties: *Chemical Technology of Modern Power Engineering Materials, Nuclear*

Reactors and Materials, Radiation Safety of People and Environment, and Nuclear Physics and Technology. Twenty-six RIAR experts are part-time lecturers at this Department including five Doctors of Science and four Masters of Science (for details about cooperation in staff training see [Section 4.5 on Human Capital](#) of this Chapter).

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. In RIAR the mentorship is carried out 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 (Table 4.6).

Table 4.6

Number of students who received hands-on training in RIAR

Educational institution	Year, value		
	2013	2014	2015
Ulyanovsk State Technical University	–	5	3
Ulyanovsk State University	5	6	2
NRNU MEPhI including its branches in Dimitrovgrad, Obninsk, and Seversk	172	270, including 240 students from DETI NRNU MEPhI	342, including 327 students from DETI NRNU MEPhI
Lomonosov Moscow State University	10	19	–
Tomsk Polytechnic University	7	11	4
Nizhny Novgorod State Technical University n.a. R.E. Alekseev	46	–	49
Moscow State University of Civil Engineering	–	–	30
Others	12	57	19
Total	253	368	449

2. Mentorship for young employees.

The key objective of on-the-job training

for young employees is their occupational and psychosocial adaptation, learning theoretical

aspects and acquiring skills needed to fulfill their job duties. In compliance with the Section on Work with Young Employees of RIAR's *Collective bargaining agreement* the employer shall provide social and occupational adaptation for its young employees. For example, for young workers who are hired for the first time a mentor is appointed for up to six months, and for young professionals with core education that are hired for the first time a mentor is appointed for up to one year.

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 2015 thirty-five RIAR young employees attended post-graduate

courses in seven core specialties in higher educational institutions. Eleven highly-qualified scientific supervisors of RIAR were designated for these employees. To create conditions attractive for young employees 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 activity of the scientific and production section 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 career growth.

Total mentors — 323:

201 — for students

30 — for hired young employees

73 — for the transfer of key knowledge and skills

15 — for appointed bottom managers

4 — for HR managers

Knowledge exchange

Periodicals and books on RIAR research activities authored by RIAR professionals are a knowledge management component. RIAR seeks to make its publications official: the publications are assigned an ISBN and UDC and edited. It ensures high quality of the information published and compliance with all editing standards. In 2015 the Editorial and Publishing Group

of RIAR edited and released the following publications:

- Collection of scientific articles written by RIAR scientists and researchers on the relevant topics;
- Report on key research performed in the reporting year and targeted at 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 addressed to a wide audience that provides key results of financial, economic and production activities, as well as sustainable development activities.

Multiple exhibitions and forums also contribute to knowledge exchange and promotion of technology. In the reporting year RIAR participated in seven Russian and international exhibitions and forums: NDExpo 2015; ATOMEXPO 2015; ATOMEXPO-Belarus-2015; Health Care, Medical Equipment and Pharmaceuticals; and Open Innovations. At these events RIAR demonstrated dummy sources of ionizing radiation and radiopharmaceuticals, books and periodicals, as well as information and poster stands showing the key trends of RIAR activities. In 2015 Russian nuclear power industry celebrated its 70th anniversary, and RIAR participated in the exhibition "ROSATOM. 70-Year Anniversary of the Nuclear Industry. Chain Reaction of Success". Traditionally JSC "SSC RIAR" attends regional

events. Peculiar attention is paid to young audiences. Presentation stands were demonstrated in exhibition venues of numerous youth forums of the Ulyanovsk region and Volga federal district. RIAR in collaboration with the Ulyanovsk Nuclear Power Information Center held the exhibition "Russia's submarine fleet: Past, Present, Future." This exhibition was dedicated to the 70th anniversary of Victory in the Great Patriotic War.

In order to increase loyalty of the region population and visitors to nuclear power industry, provide the relevant information to the population and attract new employees RIAR arranges technical tours and visits to its site (Table 4.7). Five years ago the Museum of RIAR was established, and since then it has been exhibiting the history of JSC "SSC RIAR", information about its relevant activities, and numerous exhibits. The visits to the Museum are headed by experienced professionals of the PR Office. In addition, technical and press tours are arranged including visits to laboratories and production facilities. Over the last three years more than a thousand visitors toured the Museum of RIAR (Table 4.8).

Table 4.7

Number of RIAR visitors

Visitors	Year, value		
	2013	2014	2015
Schoolchildren	420	253	245
Students	395	357	301
Others	269	553	992
Total	1084	1224	1538

Table 4.8

Number of visits to the Museum of RIAR

Year	Number	
	visits	visitors
2013	63	257
2014	75	378
2015	81	405
Total	219	1040

Innovation activities

MBIR reactor construction

The project on MBIR (multipurpose fast research reactor) 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 (Figures 4.9 and 4.10) rests on proven and reliable technologies of the BOR-60 reactor.

The General Design Contractor carried out all the preparatory work including the development and arrangement of the pit, bed and piping drainage of the main building, pouring concrete under the foundation slab, and horizontal

waterproofing of the foundation slabs.

RIAR has obtained license #GN-02-108-3021 on construction of the MBIR reactor from Rostekhnadzor (the Federal Environmental, Industrial and Nuclear Supervision Service of Russia), and it became the final step in the licensing and approval procedures. This license (expires in ten years) allowed construction to begin. In December the fundamental slab of the reactor and secondary units of the main building were finished. At present, reactor unit wall reinforcement is in progress.



Fig. 4.9. MBIR construction site

MBIR project data

General Customer	ROSATOM
Project Manager - Developer	JSC "SSC RIAR"
General Design Contractor	JSC "ATOMPROEKT"
Chief Reactor Designer	JSC "NIKIET"
Scientific Adviser	JSC "SSC RF IPPE"
General Contractor (civil work)	Company "Uralenergostroy"
Thermal capacity	150 MW
Electric capacity	Up to 55 MW
Peak neutron flux density	$5.3 \times 10^{15} \text{ cm}^{-2} \text{ s}^{-1}$

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



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 the closed fuel cycle

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

Fig. 4.10. Main applications of MBIR

In 2015 a wide range of R&D activities was performed under the project including signature and implementation of the state contract in support of MBIR design and engineering solutions.

In 2016 MBIR R&D activities will be completed; a drainage pumping station and physical

protection system will be commissioned. 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. 4.11).

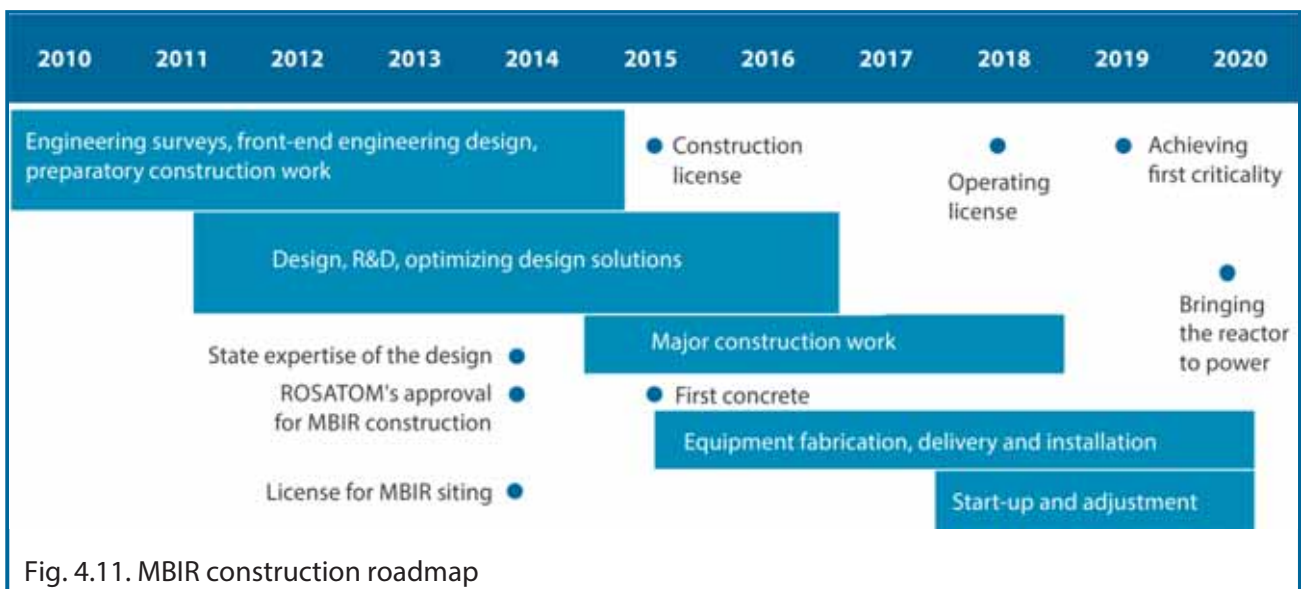


Fig. 4.11. MBIR construction roadmap

Establishment of a Polyfunctional Radiochemical Research Complex

In 2015 R&D activities on construction of a unified technological module were completed, and design documentation was developed. The module is intended for handling high-level radioactive waste and other radiation hazardous substances and media. Protective and secondary equipment components were further developed; optimized were hydrometallurgical processing flow chart and equipment arrangement as well as engineering solutions on a fully automated intermediate tank canyon; application options for a remote tool intended for electrohydraulic equipment were analyzed;

a test bench was developed and fabricated to test remote operations using electrohydraulic equipment; control and instrumentation equipment was developed for handling high-level radioactive solutions based on capillary-type impulse lines. In the reporting year design documentation for a multichannel sampling and dilution equipment was developed. This equipment will allow reducing the number of relevant equipment by seven times. It will prevent transportation of liquid samples in the facility, thus providing safe and reliable analytical control.

BOR-60 reactor refurbishment

BOR-60 is a sodium-cooled fast research reactor. It has been in operation since 1969, and its operating lifetime was extended up to December 31, 2019.

BOR-60 is used to test technologies related to long-term operation of similar-type reactors.

Such technologies are necessary in developing commercial-type reactors. BOR-60 is also utilized for high-dose irradiation of structural, fuel and absorbing materials of advanced fast reactors as well as structural materials of thermal-neutron reactor cores. In addition, irradiation testing of single equipment of the fast reactor primary and secondary circuits is performed.

Obsolete equipment and removable core components are to be replaced for safe and reliable operation of BOR-60 in the future. To do this, under the federal target program "Nuclear Power Technologies of the New Generation for the Period of 2010–2015 and till 2020" the sum of 555.9 million rubles is allocated. To further extend BOR-60 operating lifetime technical refurbishment is planned under the same federal target program. The above-mentioned activities 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, in 2015 the following R&D activities were performed:

1. Calculation in support of remaining lifetime was performed to assess the condition of the buffer capacity of the air heat exchanger, deaerator, vent

and high pressure heater.

It was done using the licensed ANSYS software; 3D models were built using computer-aided design system KOMPAS-3D V14 in accordance with the PNAE G-7-002-86 requirements. The data obtained from this calculation confirmed that this equipment can be used during the extended lifetime of BOR-60, and these data can be applied in support of extending its operating lifetime over 2020.

2. BOR-60 process monitoring system of the third circuit was refurbished: 133 sensors and secondary equipment were replaced with new ones. New equipment enables storing in nonvolatile memory both measured data and data on the condition of relay, discrete inputs, and current time, which is displayed in the digital data processing system of BOR-60. BOR-60 refurbishment will enhance reliability of monitoring the equipment hall and safety of reactor operation. After the refurbishment the operating lifetime of the process monitoring system will expire in 10 years.

3. The imperfections of the reactor building design were removed. The building confirms its good technical condition, thus enabling its further utilization.

4. The third section of a reverse steam generator was dismantled; non-destructive testing of the generator section welds and vessel was performed; a materials testing program was developed to test this generator section. The steam generator has been in operation for about 197,300 hours, including 187,750 operating hours in a steam generating mode.

No failures occurred. Over its operating lifetime there have been 247 startups and stops. No defects in the materials and design of the steam generator

section were observed.

The obtained data clearly shows that the steam generator can be further operated.

Overall refurbishment and growth of radionuclide production

The analysis of radionuclide production in recent years shows that there can be almost no further growth in production volumes and sales taking into account the existing production pattern, which is mainly based on available reactor and process (radiochemical) capabilities. It is clear that the SM reactor core needs to be refurbished in order to increase the number of irradiation channels. In doing so, there should be no significant reduction in the neutron flux values. Undoubtedly, there is a high relevance of enhancing the existing methods and production to improve their efficiency, including an increased range of sold products.

The refurbishment issue was addressed in 2015 under the project on the overall refurbishment and growth of radionuclide production in RIAR to ensure the development of nuclear medicine and radiation technology.

The information about the project objectives, developed processes and newly established production lines is provided in Annual Report 2014 ([Section 3.2 on Innovative Activities, Chapter 3 "Annual Results"](#)). RIAR is targeted at growth of radionuclide production to ensure the implementation of the programs on the development of nuclear medicine and radiation technology in Russia. The implementation of this project

will make it possible for RIAR to increase its sales of cobalt-60, iodine-131, strontium-89, yttrium-90, lutetium-177, and californium-252.

In addition, new market sections will be introduced due to an increased range of products including radium-223, radium-224, thorium-228, actinium-227, actinium-225, bismuth-212, and bismuth-213.

In 2015 R&D activities were completed in support of developed radionuclide production processes. Acceptance testing of these processes was performed, and trial batches of strontium-89, lutetium-177, yttrium-90, actinium-227, thorium-228, radium-223, and radium-224 were certified. They have the quality of good world's products and fully comply with the technical specifications.

A new method of producing I-131 (6-day calibration) in a reactor was developed and tested in 2015. It enabled producing 1.85 TBq per week in early 2016.

Prototypes of in-cell equipment (Fig. 4.12) were designed, fabricated and tested for the production process of high-dose Co-60 sources. In 2016 the work on making new production line for Co-60 sources will continue.

As part of renovation work, prototypes of in-cell equipment (Fig. 4.13) were fabricated for the process line of transplutonium targets.



Fig. 4.12. Equipment to open round vials with irradiated cobalt

In addition, a full package of design and operating documentation was finalized.

In June 2016 this process line will be completely refurbished, and trial targets will be fabricated.

The Sr-89 production method developed in 2015 is being commercialized. The scope of delivery of the product exceeded 1.85 TBq/year, which was equal in fact to the scope of earlier produced Sr-89 by irradiation of yttrium in the fast neutron flux. A radiopharmaceutical based on this product was registered in the Ministry of Health of the Russian Federation and approved for clinical applications in Russia. In 2015 the product was supplied both to the Russian and foreign markets.

A method of producing medical-purpose alpha-emitting radionuclides was tested. The first batches of actinium-227, thorium-228, radium-223, and radium-224 were produced and tested. These are new products, and their applications in medicine are at the very early stage of development. The supply of these radionuclides will begin in 2016, thus enabling RIAR to step up on a fast developing market sector.



a



b

Fig. 4.13. Welding equipment (a) and transplutonium target assembling equipment (b)

4.3. Output



**ALEXEY L.
IZHUTOV**

Deputy Director — Scientific Manager

In 2015 in order to meet the strategic objectives and ensure its sustainable development JSC "SSC RIAR" continued to keep and develop its experimental capabilities including reactors safe operation, refurbishment and operating lifetime extension, broadening experimental capabilities of the reactors, enhancing their utilization efficiency, etc.

RIAR professionals performed a considerable volume of R&D under the Federal Target Program "Nuclear Power Technologies of the New Generation for the Period of 2010–2015 and till 2020" and several sector and cross-sector projects on establishing new reactors and enhancing the existing reactors and technology. These activities were primarily

targeted at enhancing fuel and structural materials of the existing and advanced reactors, introducing new spent nuclear fuel reprocessing and treatment methods in the closed nuclear fuel cycle, research in support of propulsion reactor components, reducing research reactor fuel enrichment, and developing production methods of radioisotopes.

It should be noted that all R&D activities under the federal and sector programs were completed on schedule. A large scope of work was performed to enhance safety and reliability of RIAR's reactors and nuclear hazardous facilities. R&D was carried out under the contracts with foreign customers.

Nuclear reactor physics and engineering, irradiation testing methods and reactor safety

The Research Reactors Complex of JSC "SSC RIAR" renders a wide range of services to outside companies including foreign ones. The Complex includes five operating reactors (Fig. 4.14. and Table 4.9.)

For more detailed information about experiments performed in 2015 using research reactors MIR, RBT-10/2, BOR-60, SM, RBT-6 and critical test facilities of SM and MIR please refer to the JSC "SSC RIAR" Report on key research carried out in 2015: http://niar.ru/annual_report.

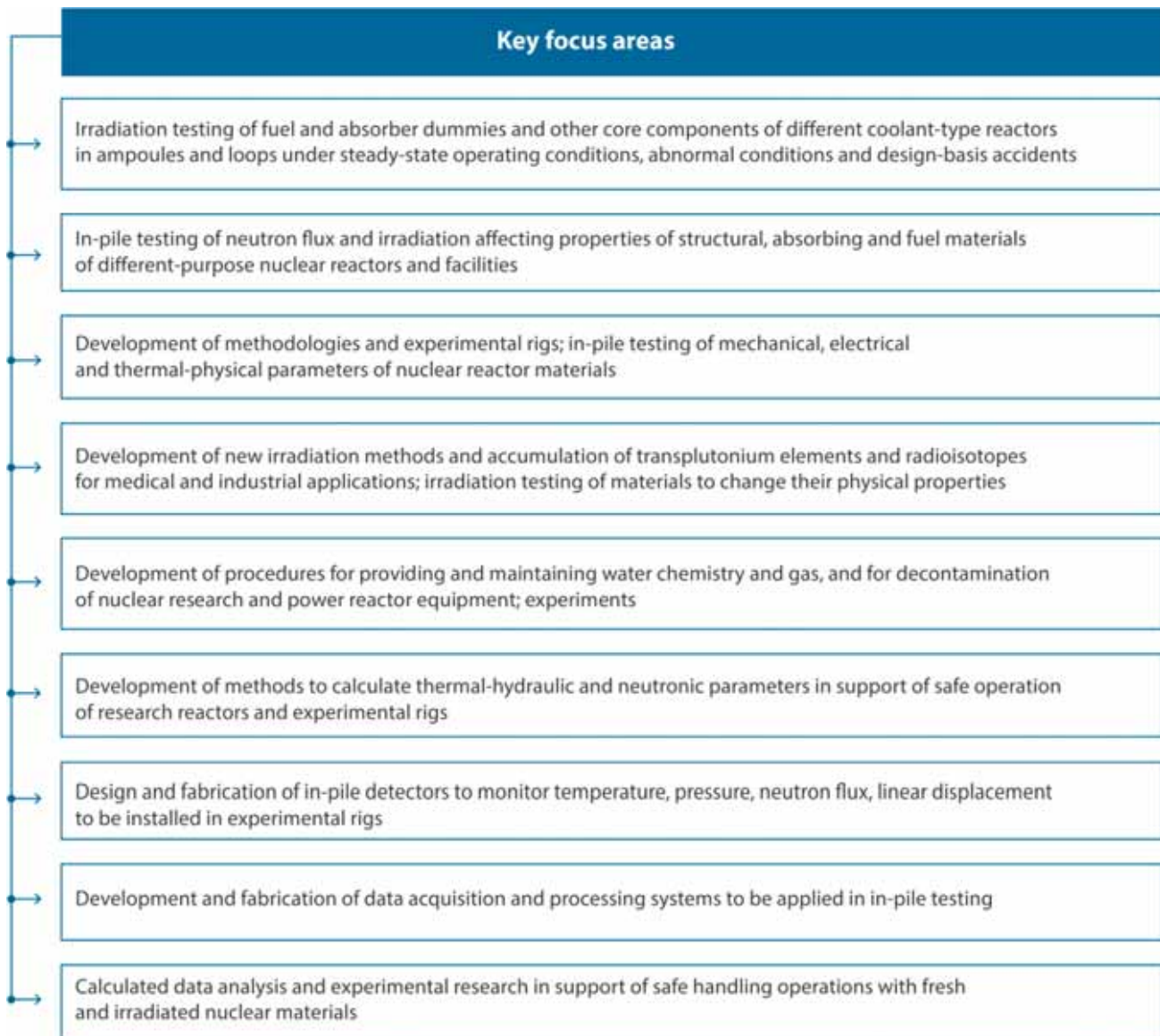


Fig. 4.14. Key applications of RIAR's research reactors in 2015

**Our research makes civil nuclear power
a today reality.**



Alexander Tuzov

Table 4.9

Key reactor output in 2015

Parameter	SM	RBT-6	MIR	RBT-10/2	BOR-60
Peak power, MW	90	6	41	10	50
Utilization factor, relative units:					
scheduled	0.69	0.69	0.65	0.64	0.64
actual	0.72	0.69	0.69	0.64	0.66
Reactor operation time, days:					
scheduled	252	252	239	235	234
actual	264	252	252	235	240
Shutdowns	27	29	17	41	8
Including unscheduled	1	1	—	1	1

ARBUS (AST-1) decommissioning. The ARBUS reactor (after refurbishment being referred to as the AST-1 nuclear heat plant) with an organic coolant in the primary circuit was a research reactor designed for research in support of science and engineering solutions on small nuclear power plants and nuclear heat plants to supply electricity and heat for industrial enterprises and residential areas in the Far North of Russia. The ARBUS reactor was constructed and commissioned in 1963. Since 1963 ARBUS was operating as a two-circuit NPP (5 MW thermal power, 750 kW electric power). The generated electric power was used by RIAR's subdivisions. In 1979 the reactor was refurbished to be utilized as a three-circuit nuclear heat plant up to 1988. The produced heat was also used by RIAR's subdivisions. Due to a lack of funding in May 1988 ARBUS was shut down. By Decision #GZh-788 of the Ministry of Medium Machine-Building Industry of the USSR dated April 05, 1989 the AST-1 reactor was to be put into the temporary conservation mode on January 1, 1989. A range of activities was

performed to immobilize its equipment and ensure nuclear and radiation safety. By Decision # S-01-3639 of the Atomic Energy and Industry of the USSR as of December 12, 1990 AST-1 reactor decommissioning began on January 1, 1991. Since 2008 reactor decommissioning is carried out and funded under the Federal Target Program on Nuclear and Radiation Safety Assurance for the Period 2008-2015. The main objective of reactor decommissioning is its complete elimination. After decommissioning process is completed, it is planned to construct a storage facility for high-level solid waste generated during reactor operation and decommissioning (for more details see JSC "SSC RIAR" Report on key research: http://niiar.ru/annual_report). As a result of the work performed the ARBUS building was refurbished and made a solid radioactive waste storage (Fig. 4.15). Upon completion of decommissioning-related activities an acceptance certificate was issued by ROSATOM's Acceptance Committee.

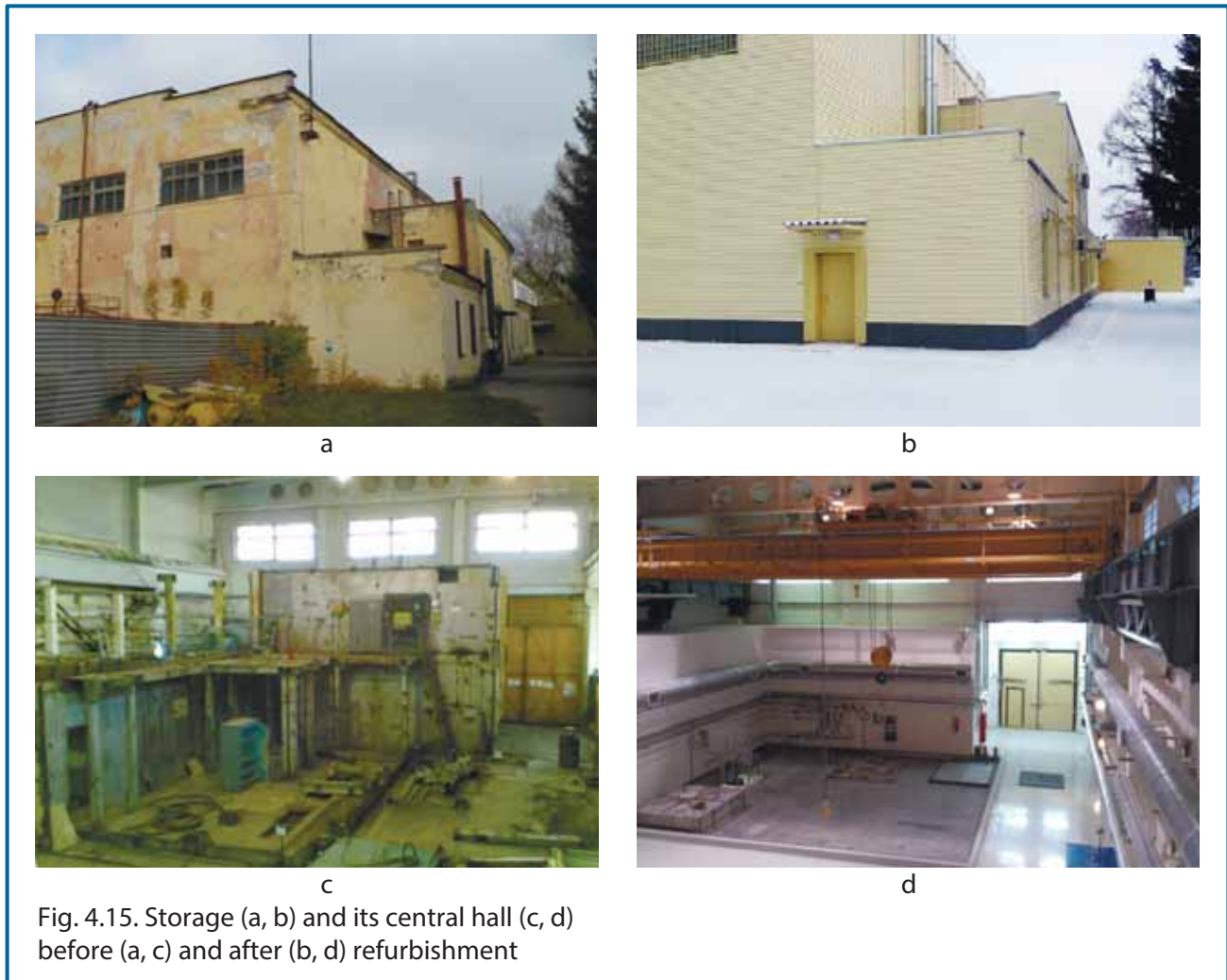


Fig. 4.15. Storage (a, b) and its central hall (c, d) before (a, c) and after (b, d) refurbishment

Electricity generation

Today, VK-50 is the oldest nuclear power reactor operating at power and the world's only boiling water vessel-type reactor with coolant natural circulation. VK-50 operates as a nuclear heat and power plant following a direct cycle (Fig. 4.16, Table 4.10). In December 2015 RIAR, being a reactor operator, decided to extend its operating lifetime up to December 31, 2025. This decision was approved by ROSATOM. At present, VK-50 has an upgraded core containing 18 fuel assemblies in the sixth

row (for more details please refer to RIAR Annual Report 2014: http://niiar.ru/sites/default/files/pgo2014_in_29062015_c_ssytkami_0.pdf). The upgraded core meets the requirements for safety assurance of nuclear power facilities in accordance with the verified and certified programs (for more details please refer to "SSC RIAR" Report on key research carried out in 2014: http://niiar.ru/sites/default/files/go_2014_nauchn_sayt_0.pdf)



Fig. 4.16. VK-50 output in 2015

Plans for 2016:

- Comply with remarks provided in the expert report on VK-50 operational safety issued by the Scientific and Engineering Center for Nuclear and Radiation Safety;
- Further enhance the fuel cycle due to an advanced FA design option using higher fuel enrichment in U-235 and new fuel compositions and absorbing materials;
- Prepare VK-50 spent nuclear fuel for shipment to FSUE "Mayak" PA for reprocessing.

In 2015 VK-50 celebrated its 50th anniversary since its commissioning



Table 4.10

Key output of VK-50 in 2015

Indicator	Value
Max thermal power, MW	Up to 200
Electric power, MW	Up to 45
Operating pressure, MPa	5.5
Number of fresh FAs inserted at the beginning of a reactor run	16
Core power density, kW/l	Up to 40
Average linear thermal flux density, MW/m ²	0.29
Fuel burnup, MWd/kg	24–28
Max operating lifetime of a FA, years	6
Heat load of fuel elements, W/cm:	
– average	180–220
– max	290
Reactor operating time, days:	
– scheduled	291
– actual	282
Reactor shutdowns (outages)	
– scheduled	7
– unscheduled	0
Generated power, MWh	1177717
Generated power:	
– thermal, Gcal	25097
– electric, MWh	189839

Reactor materials science, methods to test materials and nuclear components

In 2015 the scope of work increased significantly under the Federal Target Program "Nuclear Power Technologies of the New Generation for the Period of 2010–2015 and till 2020". In order to implement an irradiation plan of testing mixed nitride uranium-plutonium fuel, design and engineering documents were developed. Four experimental

fuel assemblies (EFA) were fabricated to irradiate BREST OD-300 and BN-1200 fuel pin dummies in the BOR-60 reactor. Post-irradiation examinations (PIE) of one EFA were performed after it was irradiated in BOR-60. In accordance with the program on calculations and experiments in support of dense fuel, in 2015 the first mixed nitride U-Pu EFA was

delivered to RIAR after trial operation in the BN-600 reactor. The PIE were targeted at obtaining comprehensive experimental data in support of fuel composition performance to verify computational codes. These experimental data show that all fuel pins are in satisfactory condition in terms of their performance to be operated for a longer period. The data were used in support of safe testing of such fuel pins in the BN-600 reactor to achieve a higher burnup.

During three years RIAR has performed out-of-pile corrosion testing of fuel cladding materials to obtain comparative data related to their resistance in different corrosive environments containing chemical elements that simulate fuel fission products. In 2015 the effect of tensile mechanical stress on cladding materials corrosion was under examination in media containing iodine and tellurium gas. Out-of-pile examinations show influence of different factors on corrosion, which makes it possible to obtain comparative data related to resistance of different steels in similar conditions.

The work was continued in assessing radiation resistance of steel ЭП302-Ш (EP302-Sh) to be used for BREST-OD-300 intervessels. The objective of this work was to obtain data related to the effect of irradiation on steel mechanical properties under operating temperature.

The examination results will be used to specify the admissible parameters for irradiating intervessels design components made of this steel.

Corrosion cracking phenomenon was studied, which occurred in steel spacer grids as a result of long-term operation in the RBMK-1000 reactor.

The mechanism and reasons of such cracking were identified.

In 2015 experiments were continued in support of VVER-1000 major design components and core materials. Fuel elements of two FAs were examined containing higher amount of uranium after three-year operation during five reactor runs. Their cladding was made of zirconium-sponge steel Э110 (E110). The examination data show that in terms of major performance parameters (dimensions, corrosion state of claddings, gas release) fuel elements can be further operated. Examined were changes in the geometry of two FAs and skeleton components under operation to enhance VVER-1000 FA design options. A failed FA of VVER-1000 was examined. A fuel element was identified with some loss-of-integrity evidence. Such loss of integrity resulted from debris-like damage of the cladding by a wire stuck in the spacer grid. The fuel and cladding condition data were obtained. Bench testing was continued to justify safety of dry fuel storage intended for fuel elements of the basic and new VVER-1000 design options. The new VVER-1000 design used an increased amount of uranium with a burnup ranging from 19 to 72 MWd/kgU.

For the first time absorber rods of new design were tested after operation in the VVER-1000 reactor for ten calendar years. The obtained data prove high performance of these absorber rods. No evidence that they have reached the end of its operating lifetime was observed.

After all examinations are completed, recommendations will be provided to increase their lifetime.

Analyzed were the data for irradiated steel 08X18H10T (08Kh18N10T) and its welded joints under examination. This steel is intended to be used for the VVER-TOI reactor intervessels. The data confirmed the dependencies used in calculation of VVER-1000 intervessels strength and remaining lifetime in view of their lifetime extension up to 60 years. The calculations can be used in assessing the integrity and performance of the VVER-TOI intervessels.

For the first time changes in zirconium alloy texture and structure occurred in the course of FA zirconium components operation in VVER-1000 reactors were examined using the X-ray software. It was demonstrated that deformation of E110 alloy cladding accompanied by its irradiation damage lead to changed texture parameters. The texture parameters of E635 alloy components were compared before and after irradiation during 6 years.

Experimental fuel elements of different design with alloy 42XHM (42KhNM) claddings were examined after irradiation testing in the MIR reactor. This alloy is planned to be used as a promising structural material for VVER cores, particularly for fuel elements of propulsion and small reactors. The PIE data confirmed high

performance of this alloy. They can be used, for example, in developing brand new fuel elements with enhanced resistance in case of an accident.

Materials testing was performed for a guiding tube operated in the MIR reactor for 37 years. The results of examinations including microstructure and transmutation data obtained by electron microscopy show that the operating lifetime of the guiding tube can be significantly extended.

Under the plan on upgrading experimental capabilities of the Materials Testing Complex in 2015 two pieces of equipment were put into operation: the LFMZ-50 mechanical testing machine and NexION 300D mass spectrometer. The LFMZ-50 machine is intended for compression tests, tensile tests, creep tests, stress relaxation tests, and low-cycle fatigue tests in a vacuum at a temperature ranging from room temperature to 1700 °C.

The NexION 300D is designed to solve a wide range of tasks. Its priority purpose is to obtain the burnup and isotopic composition of irradiated fuel by inductively coupled plasma mass-spectrometry (ICP-MS).

Spent nuclear fuel reprocessing and radioactive waste conditioning

In 2015 the Radiochemical Technology Division focused its efforts on enhancement of technologies and equipment for spent nuclear fuel reprocessing and radioactive waste management. A test bench was designed to make an inert atmosphere of argon. At present, there are three main pieces of equipment to remove fuel

cladding by liquid zinc dissolution, metal removal and electrolytic refining.

Electrochemical and chemical behavior was studied of Tc-U and Tc-Pu intermetallic compounds and their alloys with cadmium in chloride. Obtained were U-Tc alloy samples with different weight percentage of technetium (20 %–80 %).

The samples were examined by scanning electron microscopy, electron microprobe analysis, and X-ray. Using the obtained data two electrode samples were made of U-Tc alloy (U_2Tc), and two samples were made of Pu-Tc alloy with the Tc weight percentage equal to 20 % and 80 %.

RIAR together with VNIINM, Sosny R&D Company, and V.G. Khlopin Radium Institute carried out work on making an experimental bench to verify spent uranium-plutonium mixed nitride fuel reprocessing methods. This bench will enable a full range of experiments to begin with fuel cutting and up to making mixed uranium-plutonium and purified uranium fuels and high-level waste fractioning for extracting and burning americium, separate curium storage and safe radioactive waste management. The bench consists of voloxidation and heat treatment equipment, equipment to try out the extraction process, and a control system based on capillary

impulse lines. In 2016 it is planned to complete bench equipping with sampling and dilution equipment.

A direct nitration process was checked when making powder of mixed actinide nitrides during removal of cadmium, which is promising liquid cadmium for precipitation of actinides during electrolytic refining. Direct nitration prevents additional hydrogenation/nitration and carbothermal preparation of nitrides. It is confirmed that the UN and U_2N_3 phases are formed depending on the process parameters. In December 2015 an experiment was conducted in an inert atmosphere hot cell where powder was produced of which a pellet (U, Pu, Np, Am, Cm)N was made by direct nitration.

More than 50 fuel cladding samples were analyzed after dissolution of MOX fuel. Obtained was residual content of uranium and plutonium and their radionuclide composition. These experimental data will enable optimizing nuclear materials extraction process in the course of fuel reprocessing.

MOX fuel fabrication

The Chemistry and Technology Division of RIAR is mainly focused on producing vibropac oxide fuel for fast nuclear reactors. The R&D activities carried out in recent years made it possible to create an up-to-date engineering platform for all three trends of fuel fabrication:

- Pyroelectrochemical process of fabricating uranium and U-Pu mixed oxide fuel granulate (Fig. 4.17, a);
- Fabrication of fuel assemblies (Fig. 4.17, b);
- Fabrication of fuel elements by vibropacking fuel slug directly in the cladding (Fig. 4.17, c).

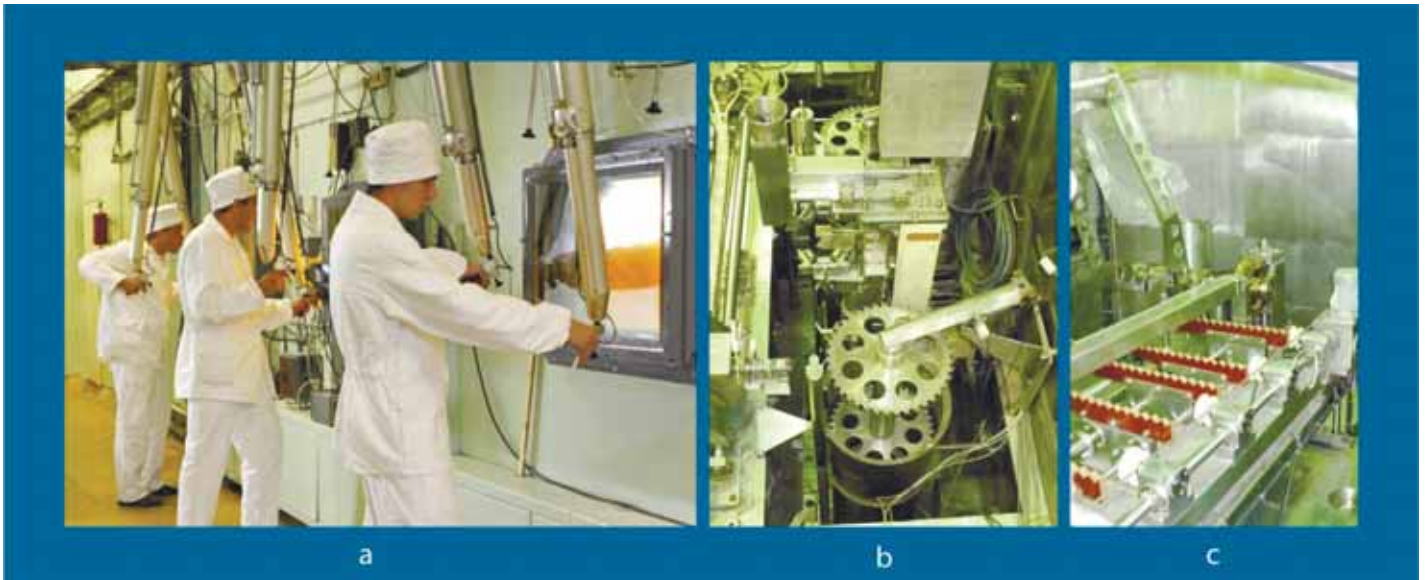


Fig. 4.17. (a) Hot cell operator's room, (b) FA assembling equipment, and (c) fuel decontamination equipment

Under the state contract on R&D in support of MBIR equipment design solutions a report was issued on tryout of a process for producing uranium metal powder by plasma sputtering. The report provides

the process tryout results and experience in using some fractions of produced powder to fabricate and irradiate fuel elements for initial loading of the MBIR reactor.

In 2015 the fabricated FAs were accepted by the Customer

18 vibropac MOX FAs of the BN-800 reactor

8 uranium oxide FAs of the BOR-60 reactor

Production of radionuclide sources and radiochemicals

In 2015 there were no major changes in production processes. Products were made and supplied under 141 contracts including 58 contracts signed with the Russian customers, and 83 contracts signed with foreign customers. Export contracts were signed both directly (37 contracts) and via JSC "Isotope" (46 contracts). Under ROSATOM's Order #1/541-p as of June 05, 2016 on approval of the uniform regulations for managing turnover and promotion of isotope products made by ROSATOM's enterprises the earlier signed export contracts were revised to comply with these regulations.

As before, absolute bestsellers were iridium-192, selenium-75 and californium-252, which made up over 55 % sales (Fig. 4.18). Californium-252 sources showed considerable growth in sales and production by more than 60 %, and iridium-192 discs by 10 % in physical terms. However, the number of the contracts for iridium-192 and selenium-75 supplied to the Russian customers in 2015 was reduced by more than 10 %, which is obviously affected by economic crisis resulted in decreasing demand for non-destructive testing services.

Strontium-89 sales remained nearly at the same level as they were in 2015 (there was approximately 3 % growth). In 2015 RIAR in fact moved to a new Sr-89 process flow (irradiation of strontium-88 in the SM reactor). This radionuclide was produced in small quantities using the previous method (yttrium irradiation in the BOR-60 reactor) in first, second and third quarters 2015. It was necessary to meet the demands of Russian hospitals

in this radiochemical approved by the Ministry of Healthcare of the Russian Federation for clinical applications. In 2015 an activated Sr-89 radiopharmaceutical was tested. In November 2015 this radiopharmaceutical obtained a marketing authorization approval of the Ministry of Healthcare of the Russian Federation. This will allow RIAR to fully shift to a new process for producing this radiochemical in 2016.

An important outcome of 2015 was supply of I-131 trial batches to Brazil. Following the test results RIAR was a successful bidder to win the tender for supplying up to 74 TBq (2000 Ci) I-131 in 2016. This will make it possible to enhance greatly the performance of the I-131 production line where the upgrades were implemented under an investment project of ROSATOM.

In 2015 the first stage of upgrading the I-125 production line was completed. Critical equipment components that reached the end of its serviceable lifetime were replaced. The control system was moved. In the fourth quarter 2015 I-125 production was relaunched since the demand for this product increased greatly in 2015. The production output for I-125 exceeded twice the level achieved in 2014 during only four months.

In 2015 Mo-99 production continued to grow. In terms of sales, Mo-99 took the second place. The important outcome of 2015 was regular simultaneous reprocessing of two irradiation rigs and tryout of simultaneous reprocessing of three irradiation rigs. When two irradiation rigs are reprocessed in parallel

the activity per batch makes up 11.1–11.84 TBq (300–320 Ci) 6-day calibration Mo-99. Over 30 product batches were produced this way. When three irradiation rigs were simultaneously reprocessed (the process was applied twice), the total (calibrated) activity of Mo-99 was equal to 16.65–17.39 (450–470 Ci). All in all, there were 112 Mo-99 batches supplied both to the Russian customers (13 batches), and to three foreign customers

(96 batches). In addition, three trial batches were delivered to potential customers. Following the test results preparatory work has begun for Mo-99 supplies in 2016. In all cases, radionuclide and radiochemical purity were in compliance with the European Pharmacopoeia. There were no deviations in the product activity from the required one.

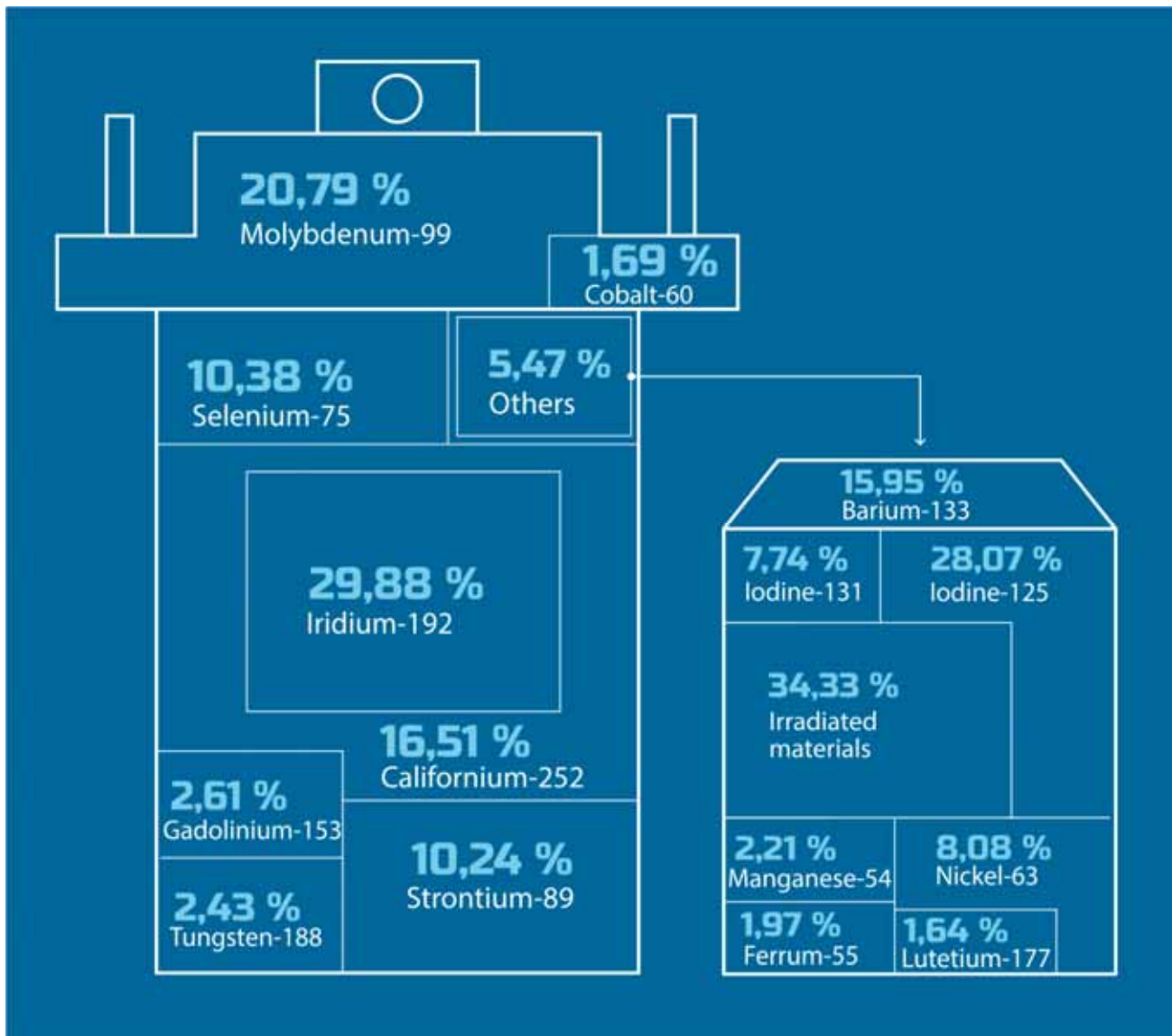


Fig. 4.18. Sales of radionuclides

The data analyzed in recent years show that further growth in the output and sales of radionuclides can occur only due to increased accumulation and sales of Mo-99. It is clear that there is a necessity in the SM reactor refurbishment and enhancement of the existing processes to optimize and increase the sales.

Under the program on developing new irradiation methods to increase accumulation of iridium-192 in RIAR's reactors, calculations and experiments were carried out related to optimizing SM reactor utilization for accumulation purposes. The optimized option of iridium loading into the reactor channels ensures the required specific activity. The average loading of iridium per channel was increased by 10 %, and the channel capacity was improved by 15 %. Enhanced iridium loading made it possible to vacate several high-flux channels in the reflector and use

them for Co-60 accumulation.

In doing so, the suggested loading plan ensures an increased accumulation rate of Co-60 to achieve 17.76 GBq (0.48 Ci/g) daily, which by 1.9 times exceeds the earlier achieved values.

In the reporting year the work was done under the project on the overall refurbishment and growth of radionuclide production in the reactor to ensure the development of nuclear medicine and technologies (see [Section 4.2. "Intellectual Capital" of this Chapter](#)).

In 2015 major equipment components were fabricated intended for radionuclide production. Process equipment was pre-tested, and production was arranged in the upgraded and newly established lines.

This work will be completed in 2016.

Shipping services

Considering radioisotope shipments to be 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, RIAR arranges shipment of Russian radioisotope products (both RIAR's own products and products made by other Russian companies) not only in Russia and CIS, but in the EU Member States — Germany, Czech Republic, Poland, Spain, France, etc.

JSC "SSC RIAR" has a great number of special-purpose shipping containers that have international certificates for the transport of radioactive goods and special-purpose vehicles equipped in accordance with the European Agreement concerning the International Carriage of Dangerous Goods by Road.

In 2015 new trucks joined the road transport fleet of RIAR. And now, three new SCANIA 15.8 t trucks were involved in carriage of radioisotope products (Fig. 4.19). Currently, RIAR's road fleet includes more than ten trucks of different load capacity. In 2015 there were over 230 shipments of radioisotopes. The number of road shipments of radioisotopes to the near

and far abroad increased by more than three times compared to 2014.



Fig. 4.19. RIAR's trucks for shipping radioisotopes

In addition to shipment of radioisotopes, RIAR's logistics departments render services on arranging and ensuring site delivery

and return of other products involved in research and production (for example, nuclear fuel samples and structural materials and natural minerals processed by irradiation).

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

For more information about experiments carried out in 2015 in research reactors MIR, RBT-10/2, BOR 60, SM, RBT-6, VK-50 and critical test facilities, as well as research in fuel elements and reactor materials, nuclear fuel and nuclear fuel cycle components, transuranium elements, radionuclides and ionizing sources; radiation and environmental safety, spent nuclear fuel and radioactive waste management see the Report on key research performed in 2015: http://niiar.ru/annual_report

4.4. International Activities



**FEDOR A.
GRIGORYEV**

Head of Department
for R&D Management and International Activities

As before, one of RIAR's top priorities is to develop foreign economic activities and international R&D collaboration. Radioisotope products of RIAR are supplied to more than 20 countries worldwide. At present, our Institute has over 15 long-term R&D contracts with the companies from the USA, France, South Korea, etc. Long-term arrangements with foreign partners and annually growing export sales are both the evidence of internationally recognized RIAR's R&D capabilities and the tool to improve the utilization efficiency of the unique reactor capabilities under limited internal orders.

RIAR's employees attend the biggest international scientific conferences as well-known experts acting on behalf of the Institute and Russia's nuclear power industry to participate in working groups, at technical meetings and workshops held under the auspices of international organizations.

To meet the ambitious objectives set by the top management of RIAR on further development of international activities, R&D collaboration and growth of foreign customers the work is targeted at developing and enhancing the company's export control system, better quality of public reporting on RIAR's experimental capabilities, signature of new contracts, increased number of joint research and publications in collaboration with leading scientific centers outside Russia, and building the necessary capabilities of researchers including mastering their skills in foreign languages.

Step-by-step implementation of these and other initiatives allows us to make confident statement that RIAR being the largest experimental site of Russia's nuclear power will still grow its presence at high-tech and innovative markets, thus contributing to ROSATOM's technological leadership worldwide.

We are interested in a wide business collaboration with foreign partners welcoming investors who seek long-term activity at the Russian market, despite the current circumstances, which are sometimes challenging...



Vladimir Putin

In 2015 to improve the utilization efficiency of unique experimental and reactor capabilities under limited internal orders RIAR was ambitiously building R&D collaboration and developing international activities. In terms of research under international contracts RIAR is focused on signing and implementing long-term contracts. In accordance with such contracts a full range of knowledge-intensive services is provided. They are calculations, development of experimental rigs, irradiation testing and post-irradiation examinations, customer's hands-on training on innovative testing methods, shipping and logistics of supplies.

In 2015 RIAR carried out work both under the existing contracts and new long-term R&D contracts. The major foreign customers are R&D companies from the USA (TerraPower, ANL, LLNL), France (AREVA, CAE) and South Korea (KAERI). In addition, research was performed at the request of the companies of Japan and Ukraine.

One of major international contracts was a long-term contract signed in Daejeon on October 20, 2015 with KAERI to perform irradiation testing of experimental fuel elements in the BOR-60 reactor. These fuel elements are intended to be operated in a Gen IV SFR reactor being developed by KAERI (Fig. 4.20)



Fig. 4.20. Official signing ceremony between RIAR and KAERI

For more information about research trends for foreign customers please refer to a section devoted to RIAR's activities under international programs of the Report on key research carried out in 2015 (http://niar.ru/annual_report)

Current international contracts

16 R&D contracts

52 radioisotope supply contracts

In addition to supply of high-tech radioisotope products outside Russia and scientific research on behalf of foreign customers, JSC "SSC RIAR" being a company with international expertise is greatly involved in R&D events acting on behalf of Russia's nuclear power industry in different working groups, at technical meetings and workshops held under the auspices of international organizations including as follows:

- European Working Group "Hot Laboratories and Remote Handling". It was established in 1963 to build cooperation and exchange best practices in radioactive materials. Since 2004 RIAR has been a member of the Steering Committee in this working group. Besides RIAR being the only representative from Russia, the Committee includes two members from France, Belgium, Germany, the USA, one member from Norway, Switzerland, the Netherlands, England, Sweden, and an IAEA member;
- NEA/OECD High-Level Group of Experts on medical isotope delivery reliability. This group was established in 2009 to develop conditions and mechanisms for uninterrupted supply of medical radioisotopes to the world's market, particularly Mo-99. JSC "SSC RIAR" being one of the key Mo-99 suppliers acts on behalf of Russia as a guarantor

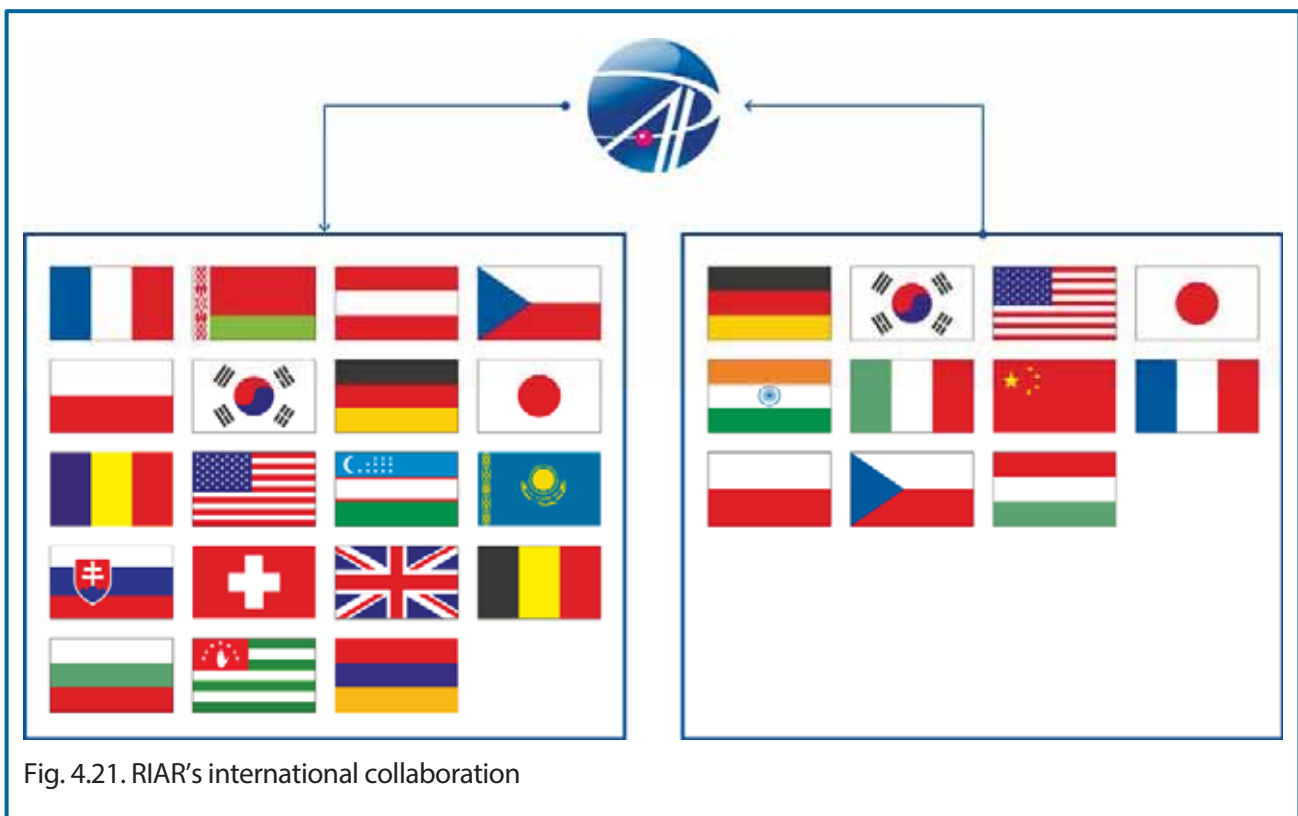
in isotope supplies bearing in mind potential shutdown of reactors in Canada and France in the near future where radioisotopes are currently accumulated;

- IAEA Technical Working Group on Fast Reactors. It was established in 1967 to coordinate fast reactor innovative and R&D activities of the IAEA Member States, NEA/OECD members, Gen IV Forum participants;
- Consultative Board of the CIS base organization on information exchange in operation and safety enhancement of nuclear facilities. JSC "SSC RIAR" is a scientific organization with unique research reactor (RR) operation experience where as early as in 1998 an industry's data acquisition and analysis center on safety of nuclear facilities was established. By the decision of the CIS Council of Heads of States in March 2013 RIAR was assigned a status of the CIS base organization in RR safety assurance. The Consultative Board members are official representatives authorized by the CIS Heads of Government. More than 20 experts acting on behalf of Russia, Kazakhstan, Belarus, Kyrgyzstan, Armenia and others, among them are

four RIAR experts headed by Director of RIAR Alexander Tuzov;

- Working Group "Cooperation in the Field of Production, Use and Promotion of CIS Isotope Products" under the CIS Intergovernmental Commission on Peaceful Uses of Nuclear Power;
- CIS RR Coalition established in 2013 under the auspices and coordination of IAEA to unite organizations operating CIS research reactors.

In 2015 about 130 RIAR's representatives attended more than 100 international scientific and research events in and outside Russia including 16 international scientific forums and conferences and more than 25 international working group meetings and technical workshops. RIAR's representatives had over 30 visits to foreign customers to review the work progress under the current contracts and discuss promising research contracts (Fig. 4.21).



Traditionally, RIAR's infrastructure and experimental facilities attract great attention of foreign professionals (both current customers and those who consider our Institute to be a potential partner for future research): in 2015 more than 90 professionals from 17 countries visited

the RIAR's site including IAEA representatives, Ambassador Extraordinary and Plenipotentiary of the Republic of Korea to the Russian Federation Park Ro-byug (Fig. 4.22), Director of South Korea's Fast Reactor Development Agency Park Won Seok and other high-ranking officials.



Fig. 4.22. Visit of Ambassador Extraordinary and Plenipotentiary of the Republic of Korea (17 November 2015)

JSC "SSC RIAR" is targeted at further development of international activities and R&D collaboration, growing number of international contracts and building an image of RIAR as a reliable partner to carry out high-tech irradiation testing and post-irradiation examinations. To achieve the above objectives RIAR's management and professionals of the Department for R&D Management and International Activities (established in 2015 to coordinate and enhance the efficiency of RIAR's activities at the world

stage) carry out the work to develop and enhance the incompany's system of export control; improve the quality of public reporting on experimental capabilities of RIAR (for example, RIAR's designation an International Center based on Research Reactors under the auspices of IAEA); sign bilateral collaboration contracts in order to increase the number of joint research and publications with leading foreign scientific centers; and build necessary capabilities of researchers.

4.5. Human Capital



**TATIANA V.
BOGATOVA**

Deputy Director
for HR Management and Social Development

Human resources are the most precious wealth and asset of JSC "SSC RIAR". Without them there can be no further safe development and growth of our Institute. Today, the top priority is to keep and develop human capital in the nuclear power industry.

Human-related issues refer to a highly sensitive matter that can hardly be calculated, described in numbers and estimated in a long-term perspective. Despite all those challenges, the numbers say it all: staff turnover in 2015 decreased to make up 1.54 %, 323 employees out of mentors for young and newly employed professionals. The average age of employees reached 45.7, which is the most "fruitful" age. An important component in keeping human resources is comprehensive engagement of higher educational institutions in training, which implies joint R&D in addition to RIAR's involvement in major educational programs. At present, there are 48 current contracts signed with 27 Russia's higher educational institutions. Students get acquainted with our Institute by gaining experience and learning traditions,

thus becoming "full members" of the staff. For example, in 2015 449 students received hands-on training in RIAR.

One of the important achievements in 2015 was a launched housing program: 122 families of young and highly-qualified RIAR's employees now have flats in a new residential area with a beautiful name "Akademgorodok" ("Academic Town"). In 2016 this program will continue.

Another thing should be noted as well: HR management functions were partially transferred to the shared service center "Greenatom". This project enables the HR management service to focus all its major efforts on developing and broadening its functions in performance management.

This year was very challenging. RIAR's team achieved the set objectives. However, they will never stop at what they have achieved. There is the future for RIAR as it has high potential; therefore there will be new ambitious tasks and new achievements.

**Human resources are
the most precious wealth and asset
contributing to ROSATOM's breakthrough**



Sergey Kiriyyenko

Human capital management

The most precious RIAR's value is a team of highly-expertized professionals who help us to achieve good results. That is why one of the critical components of RIAR's social policy is to ensure HR quality, training, development, motivation, arrangement of social programs

and social responsibility. All these aspects are provided in a collective bargaining agreement which is applicable to all employees of the Institute.

The human capital management strategy complies with the top priorities of ROSATOM (Table 4.11).

G4-11

Table 4.11

Human capital management strategy of JSC "SSC RIAR"

Aspect	Activities
Human resourcing in compliance with the HR Policy of JSC "SSC RIAR"	<ul style="list-style-type: none"> 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 introduced and motivation is provided to keep and transfer the key knowledge to young professionals using the mentorship system.
Enhancement of HR management efficiency	<ul style="list-style-type: none"> The HR Management System is introduced, thus 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. HR management functions are transferred to the industry's service center (Greenatom), which enables computer-aided HR records keeping, minimizing the time of making management solutions, and focusing the efforts on resolving strategic objectives, such as staff selection, training and development. RIAR is involved in five projects on introducing the ROSATOM Production System (recruiting, transfer, dismissal, time keeping and bonuses). As a result, the HR services are improved, and the work of the HR service is arranged in a more efficient way.
Development of corporate culture targeted at outcomes, self-enhancement and innovations	<ul style="list-style-type: none"> Common principles and approaches on HR management are ensured in all presence regions taking into consideration local peculiarities. ROSATOM values are a criterion to attract professionals and build their career. Updated is the <i>Code of Conduct of JSC "Science and Innovations" and organizations under its supervision</i>. 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 employees agree that they accept the Code provisions by personal signature on an acceptance sheet kept on a personal data file. RIAR conducts surveys on ROSATOM's staff involvement.

HR management regulating documents:

- Labour 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 086-416-2012 "Quality Management System of JSC "SSC RIAR". HR Management";
- Provision on performance appraisal of JSC "SSC RIAR" employees;
- Labor bargaining agreement between JSC "SSC RIAR" and its employees (effective 2014–2017);
- Main provisions on work arrangement of JSC "SSC RIAR";
- Staff training in JSC "SSC RIAR"

Social policy and HR management outcomes

As at December 31, 2015 the total number of RIAR employees was 3642 including 3603 full-time employees and 39 part-time employees. Compared to 2014, the number of employees decreased by 8 %, which resulted from selling non-core assets and staff optimization. The average age of staff members is 45.7; the percentage of staff members aged 35 or less is 26 %; 1908 (52.4 %) employees out of 3642 have higher education degrees including 448 (23.5 %) employees who have industry-specific education. Figures 4.23–4.29 provide a more detailed staff overview. In 2015 staff turnover made up

1.54 %, which is by 1.37 % less than the value achieved in 2014.

In 2015 127 employees had the right for maternity and parental leave and took this benefit; 48 staff members returned to work after maternity and parental leave; 45 staff members continue 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 no less than one month.

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LA4

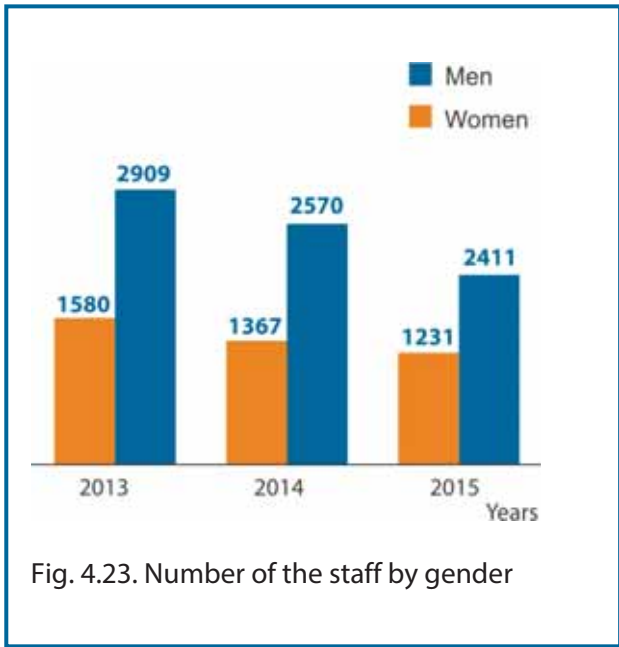


Fig. 4.23. Number of the staff by gender

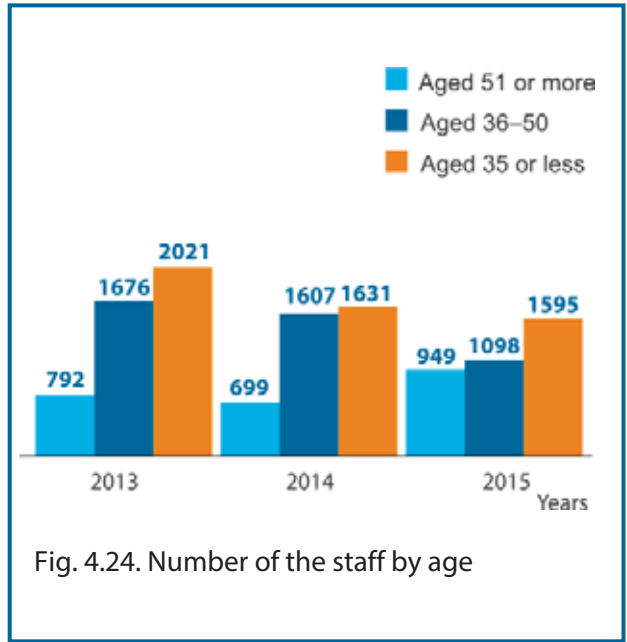


Fig. 4.24. Number of the staff by age

LA1

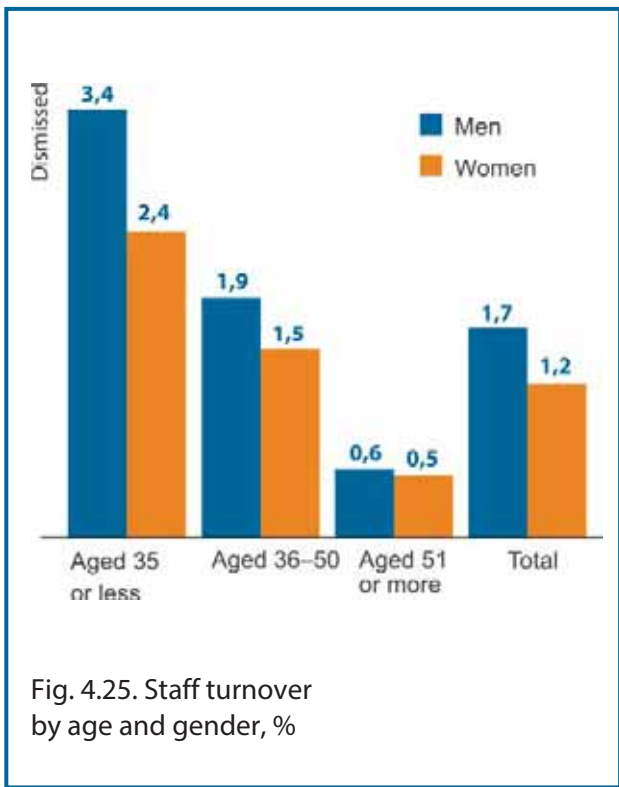


Fig. 4.25. Staff turnover by age and gender, %

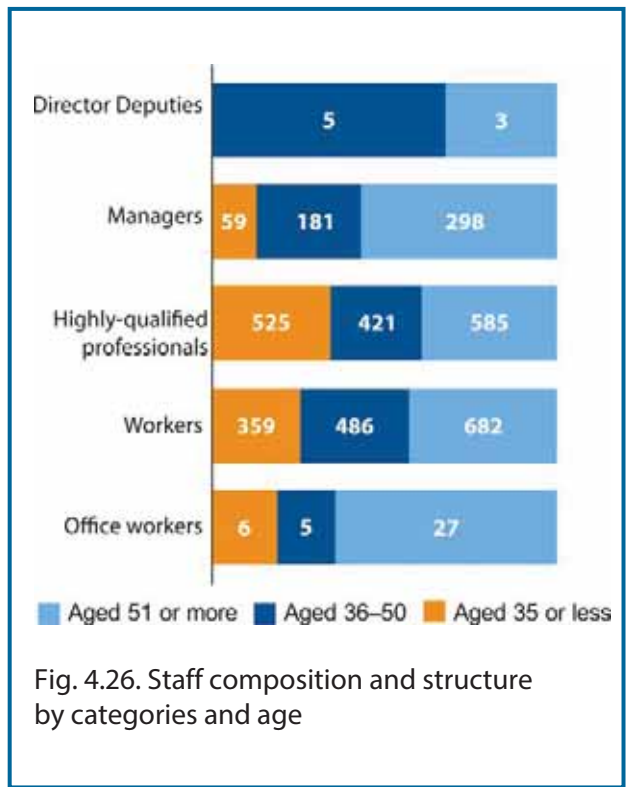
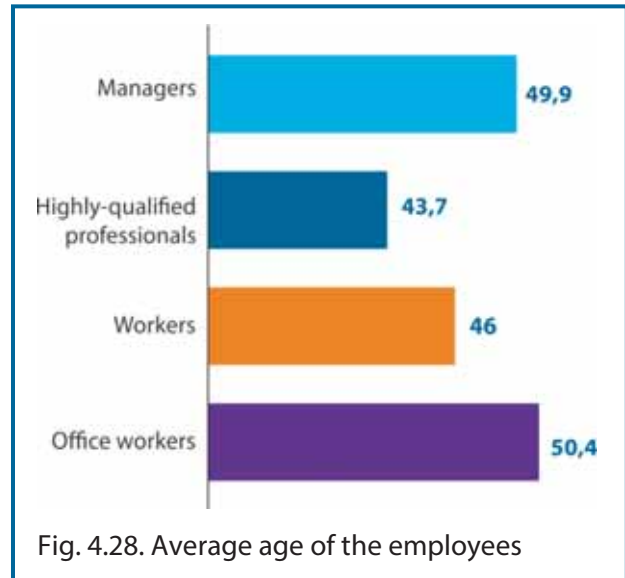
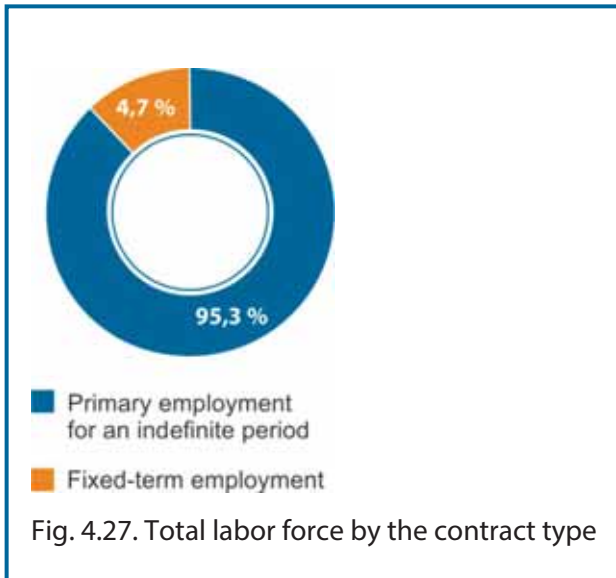


Fig. 4.26. Staff composition and structure by categories and age

LA12



LA12 Fig. 4.29. Staff number by categories

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)*. Salaries of the staff members depend on their position, professional capabilities and outcomes (Fig. 4.30). 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 1.25 living wage and higher (Table 4.12). By late 2015 the minimum wages made up 13 100 rubles. One of the remuneration principles in RIAR is providing equal opportunities for different age-gender groups.

Table 4.12
EC5

Minimum wages averaged

Job	Average, thou. rubles	
	RIAR	Dimitrovgrad
Cleaning manager	13–15	9–12
General worker	15–16	10–12

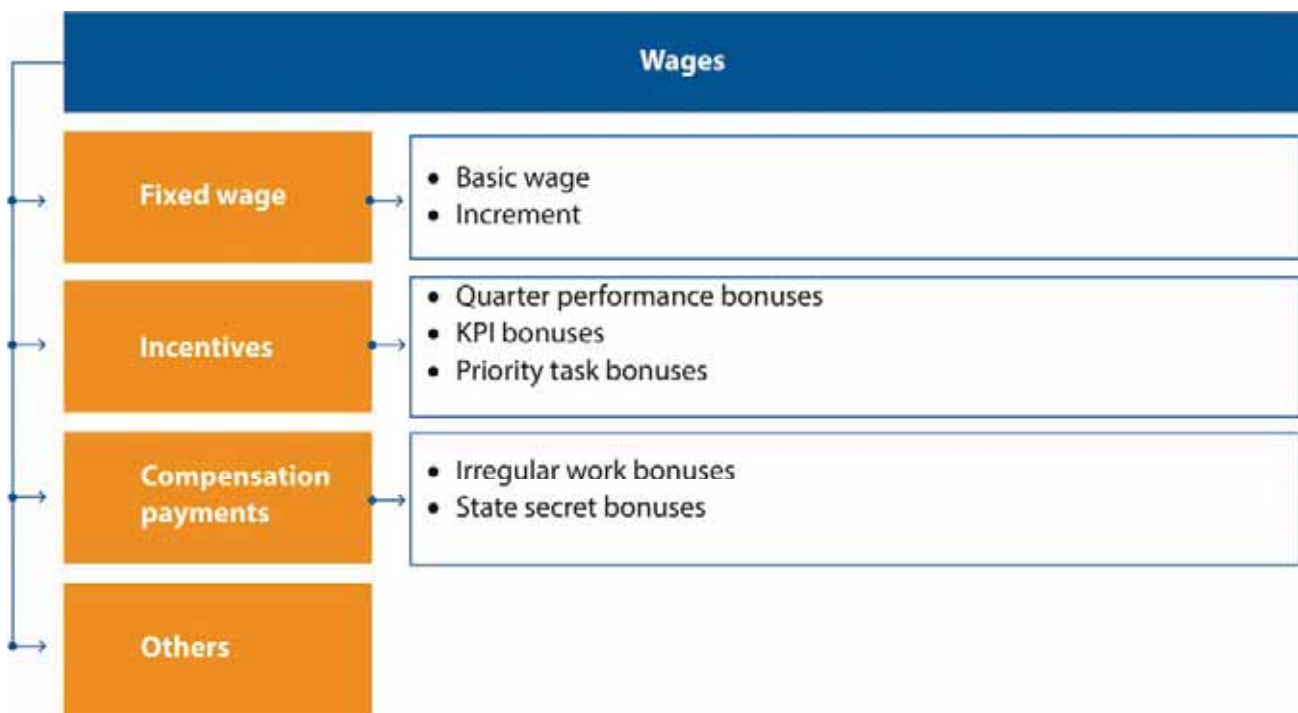


Fig. 4.30. RIAR wage structure

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. 4.31).

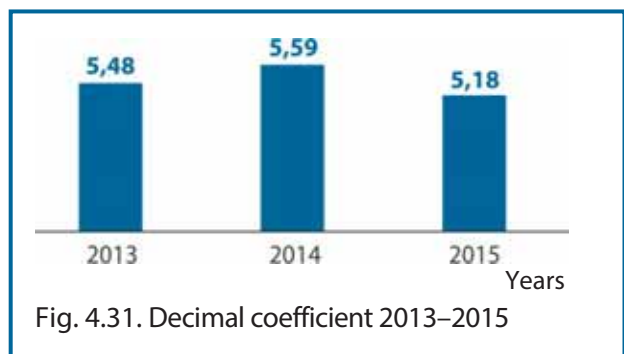


Fig. 4.31. Decimal coefficient 2013–2015

The reporting year shows a growing trend in terms of labor productivity and average wage compared to 2014 (Fig. 4.32).

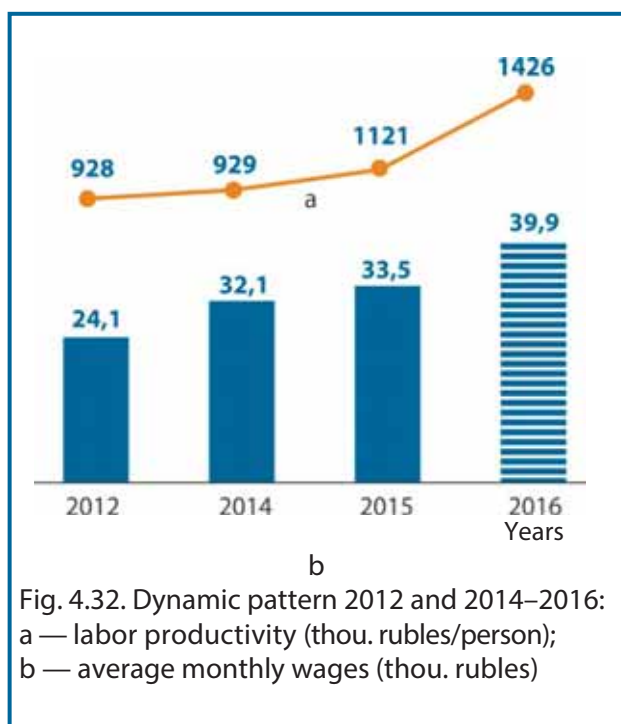


Fig. 4.32. Dynamic pattern 2012 and 2014–2016:
a — labor productivity (thou. rubles/person);
b — average monthly wages (thou. rubles)

Labor productivity growth compared to 2014 made up 21 %, and average monthly wage growth was equal to 4.3 %.

In 2015 RIAR's staff expenses were 2, 041 million rubles (Table 4.13).

Table 4.13

Staff expense structure

Name	Value years, million rubles		
	2014	2015	2016
Staff expenses	2, 125	2, 041	2, 247
Including Payroll	1, 547	1, 492	1, 662
Social expenses	84*	37	33
Staff recruitment and development expenses	6.5	2.6	4.5
Taxes (insurance)	488	509	548

*Including healthy meals (56 million rubles).

Social policy

The common social policy of ROSATOM sets forth social commitments that are implemented successfully to improve the living standards of RIAR employees. These commitments are provided in the *Collective bargaining agreement for the period of 2014–2017*.

To fulfill the commitments RIAR increases annually social expenses on financial assistance for its employees and retirees; attracting young professionals; improved housing; voluntary insurance services; partial payment for children's holiday camp vouchers; social and sport events, etc. (Table 4.14).

Housing program. In 2015 RIAR launched a housing program to attract young professionals and improve their living conditions. This program is intended for 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 m².) 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 2015 interest-free loans were given to 81 RIAR employees including 48 loans for young professionals and 33 loans

for highly-qualified professionals totaling to 19 950 thousand rubles. Thus, in 2015 under this program 122 professionals bought flats in this new housing area. (Fig. 4.33).

Table 4.14

Social expenses in 2015

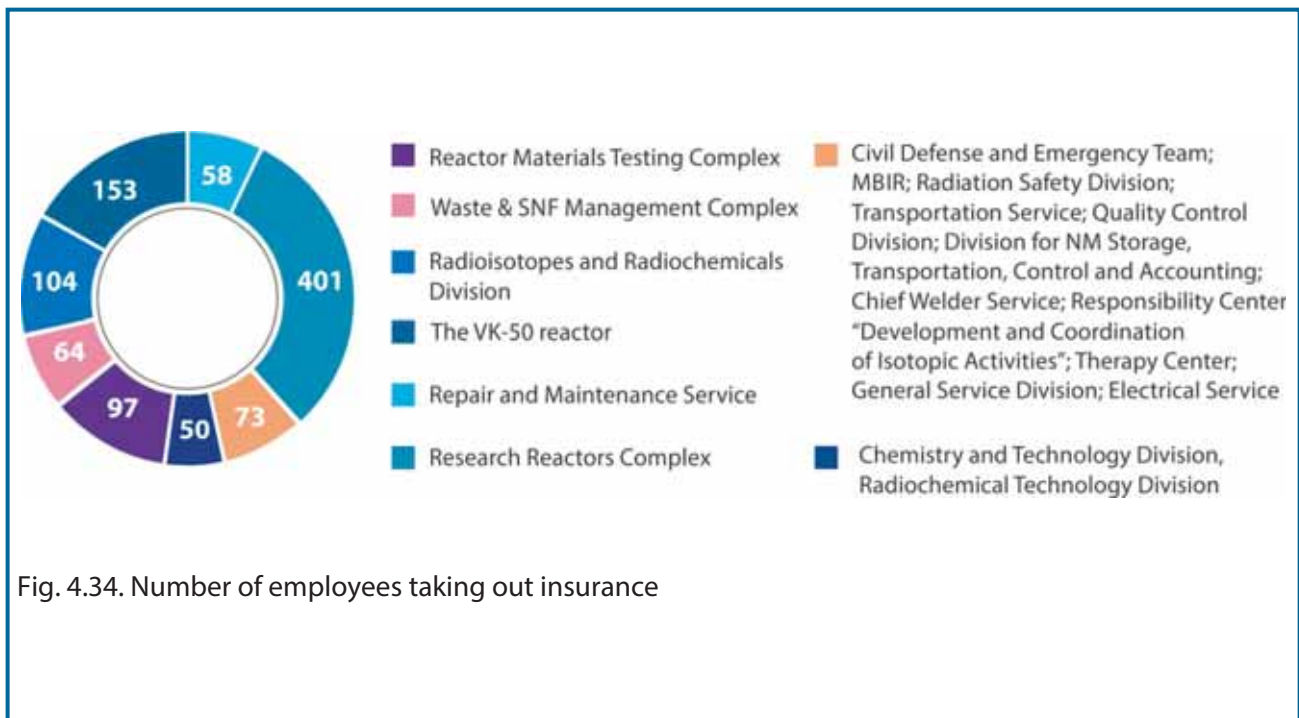
Indicator	Actual expenses, thousand rubles
Lump payments (holiday and retirement payments)	6,396.0
Financial assistance:	
employees	16,510.0
retirees	4,417.0
Holiday camps	1,383.6
Cultural and social events	1,823.0
Social infrastructure	17,823.6
Housing	19,950.0
Renting flats	1,361.0
Social taxes	6,628.9
Voluntary insurance	1,440.0
Trade union	733.0
Extra leaves	977.0
Total:	
Social expenses per employee	37,435.0 10.4



Fig. 4.33. New residential area

Health enhancement. Annually, RIAR provides rehabilitation activities for its staff members including retirees in a health resort center. In 2015 438 RIAR employees and 182 retirees improved their health condition in this center. In addition, 162 RIAR employees were partially paid for vouchers in children health holiday

camp. In 2015 1000 RIAR employees who work in extra hazardous and hazardous conditions had free healthcare services in Dimitrovgrad, Ulyanovsk, Samara, Kazan, and Moscow under voluntary insurance agreements signed with company "SOGAZ" (Fig. 4.34).



Corporate culture

To engage staff members in developing and analyzing the HR structure, policy and plans focus groups are arranged. In 2015 there were two-stage focus groups on building values of RIAR and nuclear industry and assessing the involvement rate. The survey was conducted among 150 RIAR employees. One of approaches to enhance interaction with the staff is so-called Information days, i.e. quarterly meetings between management and employees

of JSC "SSC RIAR" to inform the latter how things are in RIAR and industry, provide response and feedback. To support innovations and creative attitude to work, and provide opportunities motivating staff involvement RIAR arranges annual conferences for young professionals. At these conferences young professionals make presentations on different trends of RIAR activities. Best presentations are awarded diplomas and bonuses.



In 2015 we celebrated the 70th anniversary of Victory in the Great Patriotic War 1941–1945

Anniversary. Dimitrovgrad authorities and RIAR arranged events to celebrate the 70th anniversary of Victory in the Great Patriotic War. A group of RIAR employees visited 25 veterans, former RIAR staff members. They conveyed congratulations from RIAR and gave memorable gifts to the veterans. On May 6th RIAR staff members laid flowers to memorials and obelisks in Dimitrovgrad and visited graves of the World War II veterans' who worked in RIAR. Annually, RIAR's management joins such events (Fig. 4.35).



Fig. 4.35. Alexander Tuzov and Tatiana Bogatova lay flowers on the Veterans Walk of Honor

On that very day eleven young employees of RIAR were participated in the 70th town relay race in honor of Vladimir Kanashkov, the war

and labor veteran and a sportsman. In a dramatic struggle RIAR's team was the second (Fig. 4.36).



Fig. 4.36. RIAR team

On May 7th there was a ceremony of opening a walk dedicated to the 70th anniversary of Victory in the Great Patriotic War. The war and labor veterans, RIAR management

and young professionals planted thirty trees and placed a memorable plate. After it, the visitors tried soldier's meal and tea (Fig. 4.37).



Fig. 4.37. Planting trees (a), laying a memorable plate (b), and treating soldiers' meal (c)

On the same day there was a festive show where town's on-stage groups and the veterans choir performed.

The show was attended by the veterans and their relatives. They were given memorable gifts (Fig. 4.38).



Fig. 4.38. Veterans

To celebrate the 70th anniversary of Russia's nuclear power and Nuclear Industry's Employee Day RIAR arranged a race (Fig. 4.39), and this is how ended the Spartakiad 2014–2015.

The race was joined by sixty people including RIAR staff members, sport fans from different companies and Dimitrovgrad citizens. These people have different jobs,

they are of different age and physical abilities, and still they are all common in that they love sport. The veterans also attended this

event. After the race was ended, all the attendees were given diplomas.



Fig. 4.39. Race participants eager to start (a) and racing (b)

Cultural and scientific collaboration.

RIAR employees are actively involved in regional and town's events and special campaigns, and attend different scientific conferences. On November 6–8 the youth forum "Energy of Generations" was held, which is a good illustration of an event to increase involvement of young employees (Fig. 4.40). Annually, this forum is arranged under scientific, cultural and sport collaboration between RIAR and DETI NRNU MEPhI. It is also supported by the Government of the Ulyanovsk region and Development

Center of Dimitrovgrad Nuclear Innovative Cluster. The forum's objective is to create fruitful ground for young individuals' complete fulfillment in terms of their work, creativity and social aspects. This year forum was dedicated to the 70th anniversary of Russia's nuclear power industry. All participants were divided into three educational flows and nine working groups. Each group consisting of students and young specialists was headed by a mentor, a RIAR's professional. The working groups were developing projects on different topics.



Fig. 4.40. Youth forum

In addition to project development, the participants had busy educational program: lectures, tutorials, business and team building games. The forum was attended by 120 students and RIAR young professionals. RIAR staff members of different age made

every effort to revive the famous game show "What? Where? When?" involving RIAR professionals. RIAR in cooperation with the Development Center of Nuclear Innovative Cluster arranges town and regional games (Fig. 4.41).



Fig. 4.41. Winners of the game show *What? Where? When?*

The essential of RIAR's corporate social policy is corporate events, gala evenings and award ceremonies arranged and held by RIAR to honor best professionals. In 2015 among such corporate events were the 70th anniversary of Russia's nuclear power, Nuclear Industry's Employee Day, RIAR's birthday, and Power Engineers' Day. More than 3,000 RIAR employees with their families attended these events, including charity events arranged by RIAR together with the Ulyanovsk Philharmonia. These events are targeted at creating favorable social environment among RIAR staff members. RIAR in cooperation with the Veterans Union annually arranges events dedicated to the Victory Day, International Day of Older Persons with gala dinners where the veterans receive memorable gifts (Fig. 4.42).

RIAR's managers always encourage veterans to be involved in life of our Institute and respect their rich expertise and life experience.

Staff involvement. Annually, RIAR conducts an involvement survey, which is the key indicator of how staff members perceive their work in RIAR. In 2015 questionnaires were distributed among 786 employees from 15 RIAR subdivisions. Tables below show the survey data referred to staff involvement and satisfaction indicators over three years (Tables 4.15, 4.16). The results obtained from these questionnaires and focus groups are used by the RIAR management to compile annual plans on improving the involvement rate. When compiling these plans RIAR managers make best efforts to take into consideration all feedback and suggestions of RIAR staff members.



Fig. 4.42. RIAR veterans choir performing

Table 4.15

Involvement survey data

Factor	Value by years, %		
	2013	2014	2015
Top managers	28	48	47
Line managers	62	70	69
Colleagues	62	74	75
Staff value	25	48	49
Scope of work	59	75	74
Satisfaction with results	61	76	76
Independence	43	62	64
Resources	26	44	48
Processes	33	50	52
Wage	19	35	29
Fringe benefits	33	48	47
Acknowledgement	37	48	41
Career opportunities	27	47	50
Training and development	40	57	55
Feedback	54	68	65
Employer reputation	44	60	54
Employer image concurrence	36	58	54
Work/personal life balance	53	68	65
Working conditions	52	73	70
Policies and procedures	26	73	47

Your opinion is very important!



Table 4.16

Survey data

Indicator	Value by years, %		
	2013	2014	2015
Involvement	51	73	68
Satisfaction	53	64	62

To improve staff incentives RIAR annually gives awards to its employees. They are RIAR awards, Dimitrovgrad awards, Ulyanovsk region awards, ministerial and state awards.

There is an efficient system of interaction with the Trade Union, which contributes a lot to the common balanced policy

of providing and protecting the rights and interests of RIAR employees. Employees' representatives are greatly involved in the work of different commissions and committees. They offer and advocate the employees' social guarantees following the principles of parity.

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. Attracting highly-qualified young professionals in RIAR is a comprehensive issue, which takes long-term thorough efforts of different RIAR subdivisions. In our Institute there are current programs on interaction with young people and mentorship development, as well as *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 by DETI NRNU MEPhI, UISU, UISTU, Kazan State Power Engineering University, etc. RIAR managers, HR Office and PR Office professionals are greatly involved in such campaigns. Such interaction

with young people will provide further staffing of RIAR with local population. Bearing this objective in mind, RIAR arranges regular technical visits to its site: annually 600–700 schoolchildren and students of Dimitrovgrad, Ulyanovsk and neighboring regions like Samara and Penza region, and the Republic of Tatarstan visit our Institute. The Nuclear and Innovative Cluster Information Center established on the basis of DETI NRNU MEPhI in 2013 is focused on enhancing the efficiency of career-orientation campaigns and activities.

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.

The Academy lessons enable students to broaden their horizons by moving beyond school curricula, involve schoolchildren in research, and adapt lessons to modern technologies and research methods. Lecturers at the Academy are RIAR researchers, leading Russian scientists and university professors from Dimitrovgrad, Ulyanovsk, and Moscow.

The key indicator describing RIAR work 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 2015 results 43 school leavers enrolled eight higher educational institutions of Russia, and other employer-sponsored

target referrals were made for 36 school leavers of Dimitrovgrad and Ulyanovsk region. Employer-sponsored training of RIAR employees is performed in accordance with the *Collective bargaining agreement for the period of 2014–2017* signed at the meeting of RIAR employees in 2014 and approved by the Board of Directors of JSC "Science and Innovations". At present, among employer-sponsored trainees there are thirteen RIAR employees fully or partially paid for training depending on their performance. By late 2015 Russia's higher educational institutions had 259 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 trends 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 2015 results more than 30 graduates of secondary vocational and higher educational institutions including 17 RIAR-sponsored graduates were employed by RIAR (27 out of 30 graduates were trained in higher educational institutions). 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 2015 makes up 106, 514.48 rubles per person.

2. Engagement of leading RIAR professionals in training. In 2015/2016 47 RIAR professionals were engaged in training in DETI NRNU MEPhI and Ulyanovsk State University (UISU).

To enhance the efficiency and perform RIAR-sponsored training there are basic departments established in these universities headed by Alexander Tuzov, RIAR Director (DETI NRNU MEPhI) and Vladimir Kalygin, an expert of the Department for R&D Management and International Activities (UISU).

3. Involvement in higher educational institution management. Besides Mr. Tuzov and Mr. Kalygin, the members of the DETI NRNU MEPhI Academic Board are researchers

Vladimir Risovany, Deputy Director General and Scientific Manager, Physics and Power Engineering Unit, "Science and Innovations"; Rostislav Kuznetsov, Head of Radioisotopes and Radiochemicals Department, RIAR; Vasily Krasnoselov, Principal Adviser.

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 system.

In 2015 1423 managers and professionals were trained under different training programs (Tables 4.17, 4.18).

Table 4.17

LA9

Average training hours by employee categories

Category	Men	Women
Managers:		
top-level	65.6	16
middle-level	57.9	104.8
bottom-level	52.8	47.3
Professionals:		
Capacity building under compulsory training	61.9	54.9
training	61.7	61.7
Workers	69.5	69.5

Performance of the staff is assessed regularly to find out how well the employees match their positions, enhance their performance, business capacities, and financial incentives, and to further improve staff selection and appointment.
Provision on RIAR staff appraisal procedure

Table 4.18

Training expenses

Expenses	Value
Training expenses, thousand rubles	2689
Share of training expenses in total staff expenses, %	0.132

defines the appraisal procedure 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 of 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 (Tables 4.19, 4.20).

Table 4.19

Building and development of talent pool

Indicator	Value
Share of talent-pool employees appointed to vacant positions, %	100
Talent pool, persons	15

The talent pool is a priority source for appointment to vacant or newly established management positions in any organization. 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 2015 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 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. RIAR professionals are highly-motivated for professional and personal growth.

Table 4.20

Regularly assessed and developed staff by gender and categories, %

LA11

Category	Men	Women
Managers	12	3
Professionals	21	21
Workers	33	9
Office workers	0,2	1
Total	66	34

HR development is the top priority, on which success in the nuclear power industry depends



Sergey Kiriyyenko

4.6. Natural Capital



**ANDREY O.
VOROBEY**

Chief Engineer

Ensuring environmental safety is a key condition for the nuclear industry's evolution and top priority for the JSC "SSC RIAR" activities. In 2015, the efforts of the engineering services were aimed at implementing this provision of the RIAR's environmental policy.

In the reporting period, RIAR's nuclear facilities were operated with no violations of the nuclear and radiation safety parameters; radiation doses to personnel did not exceed the set levels; conducted administrative and technical measures allowed the scientific and production activities to be performed in time; parameters of the radiation effects on the population and environment were hundreds and more times lower than the limits and permissible levels determined by the regulations and sanitary rules of the Russian Federation. A high level of safety is acknowledged by the license to conduct activities in the field of atomic energy use issued by the state nuclear safety regulatory authority Rostekhnadzor. In 2015, RIAR was granted six new licenses, one of which is to operate nuclear research facility VK-50.

A key aspect of the safety-related activities is an improved management system. In 2015, an integrated quality and environmental management system was established. The system successfully passed the recertification audit of the quality management system and certification audit

of the environmental management system to certify conformity with the provisions of ISO 9001:2008 and ISO 14001:2004 International Standards. The audits were conducted by an independent certification body, Certification Association "Russian Register". The certified management system provides good conditions to improve JSC "SSC RIAR" business reputation and offers advantages for the work with state-owned enterprises and large Russian and foreign companies.

The most important event of the year 2015 was the completion of work under the Federal Target Program "Provision of Nuclear and Radiation Safety for the year 2008 and up to 2015". Under the Program, JSC "SSC RIAR" accepted the construction sites under two important projects: "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 2016–2017. 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 as a result of advanced technological solutions (automation of technological processes, reductions in waste, reuse of resources).

Environmental Policy

In terms of the environment, the sustainable development of JSC "SSC RIAR" results from its low impact on biotic and abiotic constituents of the environment.

The environmental activities of JSC "SSC RIAR" are conducted with regard to the following aspects: energy, water, biodiversity, emissions, discharge and waste, products and services.

The environmental performance indicators disclosed hereinafter reflect the RIAR's impact on biodiversity in the area of its activities as well as compliance with sanitary regulations and requirements existing in Russia and RIAR's environmental indicators, environmental costs and payments for environmental impact of products and services.

The aim of the Environmental Policy is to ensure the safety level of the enterprise so that the impact on the environment, staff and population would for the short and long terms ensure preservation of natural systems, their integrity and life-supporting function. To achieve its goals in the environmental activities, JSC "SSC RIAR" assumed responsibilities to implement and maintain the best methods of the environmental management in accordance with international and national standards in the field of the environmental management. The RIAR's environmental management system is kept in force, develops in accordance with the concept of continuous improvement and corresponds to the ISO 14001 criteria.

In accordance with the requirements of ISO 14001:2004, in 2015, the procedure for identifying the environmental aspects of JSC "SSC RIAR" was done; the most significant aspects were selected and environmental objectives for the years 2015–2016 were approved. The environmental objectives were formulated on the basis of the RIAR's Environmental Policy and identified significant

environmental aspects. In the reporting period, the work was done in RIAR to perform a certification audit of the environmental management system to verify its compliance with the provisions of ISO 14001:2004 Standard.

Based on the audit results, the certification scope of the management system was confirmed with regard to the key activities of JSC "SSC RIAR". An appropriate certificate was granted to certify that production and management processes in terms of RIAR's impact on the environment and compliance with the existing laws, rules and other environmental requirements are brought into compliance with international and national standards. The enterprise policy is determined by the Environmental Policy and Action Plan as well as by action plans to achieve the environmental objectives and conduct environmental activities.

The implemented integrated approach to managing the environmental impact involves complete accountability and transparency of all indicators of environmental activities (Fig. 4.43).

The Environmental Policy is available at the official website of the Institute (<http://niiar.ru/?q=ecologicalpolicy>).

The environmental action plans can be found in the JSC "SSC RIAR" annual environmental report for the year 2014 (http://niiar.ru/?q=annual_report). The highest official responsible for the environmental aspects is the Director of RIAR.

In the Top Management, the responsibility for minimizing the environmental aspects is placed on Chief Engineer and Deputy Directors. The person responsible for meeting the requirements of the standards is Chief Environmental Specialist of JSC "SSC RIAR".

The example of RIAR's successful activities in protecting the environment is the fact that

JSC "SSC RIAR" was recognized as one of a hundred environmentally top organizations in Russia and the Leader in the environmental protection activities.

The Chief Engineer and Chief Environmental Specialist of JSC "SSC RIAR" were awarded a distinguished title "Environmental Specialist of the Year 2015".



Figure 4.43. Key initiatives to implement the Environmental and Quality Policies in JSC "SSC RIAR"

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 2015, 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. Total expenditures by purpose of the environmental activities carried out in 2015 are shown in Fig. 4.44.

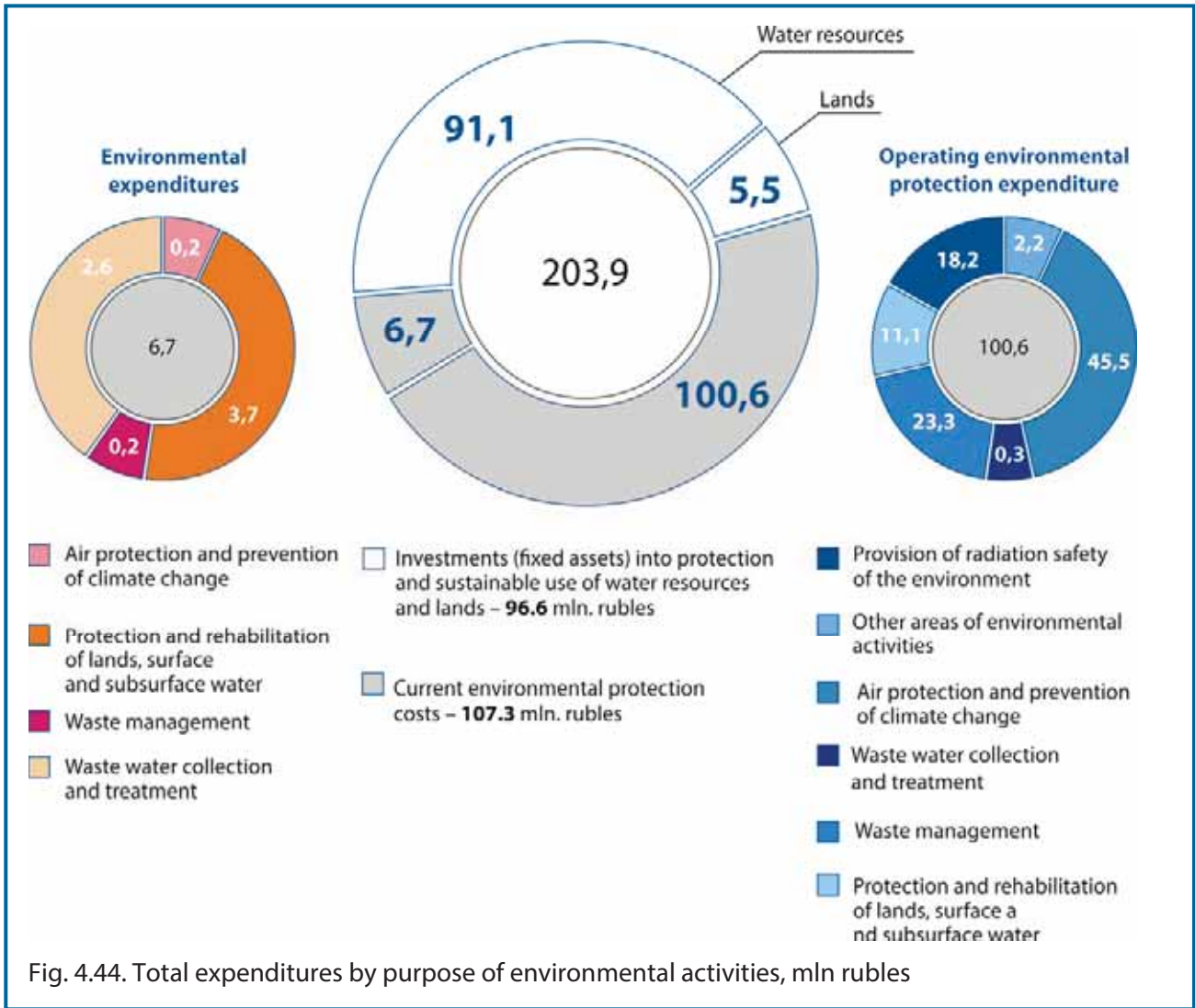


Fig. 4.44. Total expenditures by purpose of environmental activities, mln rubles

EN31

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. The waste is mostly low-hazardous (class IV) and virtually non-hazardous (Class V) waste. In 2015, 23 types of waste generated are Class I, III, IV and V waste (Table 4.21).

In 2014, the percentage of Class IV and V waste from the total waste was 17 per cent

and 79 per cent, respectively.

In 2015, the percentage of Class IV and V waste from the total waste was 18.44 per cent and 76.78 per cent, respectively (Table 4.22). 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 4.21

Dynamics of Production and Consumption Waste Generation

Waste hazard classes	Amount of waste generated per year, t			Annual waste generation norms, t*	Reduction of waste amount, t
	2013	2014	2015		
I	1.208	0.630	1.048	6.909	0
II	2.297	15.762	0.000	–	15.762**
III	10.854	6.600	4.850	38.001	1.75***
IV	222.924	96.457	112.044	385.875	0
V	1668.508	450.733	466.450	1135.176	0
Total	1905.791	570.182	584.392	1565.961	0

*Annual waste generation norms were calculated for the generated waste only

** Amounts to 100 per cent.

*** Amounts to 27 per cent.

Table 4.22

Waste Amounts by Hazard Classes and Type of Management

Waste management methods	Waste amounts by hazard classes, t					
	I	II	III	IV	V	Total
Transfer to other organizations for disposal	0	0	2.400	14.696	68.305	87.901
Transfer to other organizations for decontamination	0.000	0.000	2.500	0.280	0.000	2.780
Transfer to other organizations for emplacement at waste landfills (waste emplacement limits)	–	–	–	97.628 (220.536)	398.645 (696.059)	496.273 (916.595)
Accumulation at RIAR facilities as of the end of the year	1.048	0	6.100	0	0	10.918

RIAR has no imported, exported or reprocessed waste deemed hazardous under

the terms of Annex I, II, III и VIII to the Basel Convention. Waste transported between countries is also absent. JSC "SSC RIAR" neither manages hazardous waste covered by the Basel Convention on the Control of Transboundary Movements of Hazardous Waste and Their Disposal nor performs transboundary movements of RIAR-owned hazardous waste. In 2014 and 2015, the waste was

transported by special-purpose transport vehicles within the Ulyanovsk region. In 2015, 4.9 t of Class III waste was handed over to other organizations for disposal (spent mineral oils, technical and cooling liquids), including 2.4 t for use and 2.5 t for decontamination. In 2015, the amount of the materials that are recycled or reused waste totaled to 0.1 t (used petroleum products (waste oils)). Data on the consumed materials, their weight and volume are presented in Table 4.23.

EN25

EN2

Table 4.23

Amount of the Materials Consumed

EN1

Product type	Indicator value	Product type	Indicator value
Rolled steel, t	164	Filter elements, pcs.	325
Tubes, m	2655	Commercial gas, m ³	11134
Overalls, pcs.	7737	Liquid chlorine, t	2.2
Protective means, pcs.	302600	Paper, sheet	4305950
Industrial fuel oil, t	190	Chemical agents, t	141
Diesel fuel, t	160	Starting materials, g	40305
Oils and lubricants, kg	20777	Ion exchange resins: homemade, t	8
Petrol, l	84497	imported, m ³	3.2

Energy Consumption

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 2015 was 125933 thou. kWh, equivalent to 4.534×10^5 GJ. In the reporting period, the numerical value of the energy capacity indicator is 1698.279 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 4.24, 4.25).

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 4.26).

EN5

Table 4.24

Total Fuel Consumption from Non-renewable Sources

Type of fuel	Fuel consumption, tr	Energy, $\times 10^5$ GJ
Nuclear fuel	2.133	52.442
Industrial fuel oil	588.142	0.2362
Diesel fuel	43.55	0.019
Petrol	79.2	0.035
Total	713.025	52.732

Table 4.25

Total Energy Consumption

EN3

Type of energy	Amount of energy, $\times 10^5$ GJ
Bought for consumption	1.614
Generated by RIAR facilities	11.377
Sold to other organizations	4.534
From non-renewable sources	52.732
Total	61.189

Table 4.26

EN6

Energy Resources Consumption

Energy resource	Energy resource consumption by years		Amount of expenses for the energy resource by years, thou. rubles	
	2009	2015	2009	2015
Thermal energy, × 10 ⁵ GJ	7.15	4.23	43 955.25	26 016.00
Electricity, × 10 ⁵ GJ	5 984.71	4 770.00	83 952.20	66 912.50
Water, m ³	8 365.40	9 408.22	11 066.10	6 669.33
Sewage water, m ³	5 114.90	2 676.44	6 306.96	1 743.23
Total	–	–	145 280.51	101 341.06

The base period and target indicators for reduction of energy consumption were adopted in accordance with the Rosatom's Order # 1/676-P as of August 9, 2011 "On approving the target reduced energy consumption indicators for industry enterprises relative to 2009 for the years 2011-2015".

EN7

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 4.27. 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 4.27

Reductions in Energy Consumption

Electric power	Consumption by years, × 10 ⁵ GJ		
	2013	2014	2015
Produced	11.482	10.089	10.156
Consumed	4.309	4.256	4.229
Without losses	3.770	3.306	3.322
Reduced energy consumption, %	–	0.1	0.3

Water Intake and Waste Water Discharge

The JSC "SSC RIAR" water management system implies multiple use of water in production. Volume of the reused water is 219 thou. m³ 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

EN9

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. It should be noted that in 2015 intake water volumes decreased by 7.8 per cent as compared to the similar indicator of the year 2014 (Table 4.28). 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 4.28

Water Intake

EN8

Water source	Location	Water consumption by years, thou. m ³	
		2014	2015
Surface water used for technical water supply and cooling	Cheremshan Bay of the Kuibyshev Reservoir	10 620.73	9 191.99
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	248.0638	216.232
	Suburban command point "Fakel" (Flame)	3.44	0
Sewage from other organizations	"NIIAR-Generatsiya" Company	Not available	610
Total		10 868.7938	10 018.222

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. In 2015, the amount of domestic and sewage water discharged to the city's treatment facilities was 208.767 thou. m³, which was 794.313 thou. m³ less than in 2014. In 2015, the total amount of water which was used multiply or reused was 267799 thou. m³, that corresponds to more than 2800 per cent of the total amount of water. In 2014 this indicator was more than 2000 per cent.

RIAR's industrial storm water using sewage wells is discharged to the open hydrographic network which is a part of the Volga River Basin. In 2015, there were no accidental discharges (spills) of hazardous substances (oils, fuel, waste, chemicals and others) which could have a negative impact on the environment resulted from the fault of JSC "SSC RIAR". The overall

amount of scheduled and unscheduled discharges to surface water bodies is presented in Table 4.29. The data are given with a breakdown by destination and pertain to the year 2015.

EN10

Table 4.29

Overall Wastewater Discharge

Receiving water body,	Overall discharge, thou. m ³
Cheremshan Bay of the Kuibyshev Reservoir	2 665.00
Stream Erykla	11.44
River Bolshoy Cheremshan	0.00
Total	2 676.44

EN24

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 (Table 4.30).

Table 4.30

EN22

Average Pollutant Concentration in Water Bodies

Indicator	Place to carry out control					Maximum allowable concentration**, mg/dm ³
	Cheremshan Bay		Stream Erykla		River Bolshoy Cheremshan *	
	Background section	Discharge section	Background section	Discharge section	Background section	
Concentration, mg/dm ³ :						
Suspended substances	12.00	22.00	8.500	12.00	25.00	10.250
Dry residues	518.0	422.0	240.0	499.0	515.0	1000
Ammonium ions	0.810	0.420	0.310	0.094	0.480	0.5
Nitrate ions	3.900	0.310	6.000	1.680	1.100	40
Nitrite ions	0.095	0.000	0.062	0.000	0.012	0.08
Sulfates	114.0	41.00	0.000	68.00	119.0	100
Chlorides	16.30	30.00	0.000	53.00	11.70	300
Iron (total)	0.109	0.215	0.360	0.040	0.153	0.1
Copper	0.001	0.0005	0.0005	0.004	0.002	0.001
Zinc	0.000	0.000	0.000	0.016	0.000	0.01
Chrome (total)	0.000	0.000	0.000	0.030	0.000	–
Synthetic surfactant anions	0.008	0.014	0.007	0.024	0.008	0.5
Phosphates (for P)	0.193	0.240	0.063	0.057	0.120	0.065
Oil products	0.061	0.041	0.040	0.050	0.031	0.05
Dissolved oxygen	9.100	7.300	8.700	7.500	8.200	–
Hydrogen value, ea. pH	8.0	7.6	7.9	8.0	8.1	6.5–8.5
Oxidation, mgO ₂ /dm ³	5.100	10.00	7.600	1.600	5.400	7.0
Biochemical oxygen demand, mgO ₂ /dm ³	3.500	5.000	3.800	0.800	3.500	3.0
Chemical oxygen demand, mg/dm ³	22.00	39.00	21.00	21.00	25.00	–
Water temperature, °C	10.5	20.9	9.5	29.5	18.1	–

*Discharge section data are absent as a result of the conservation of the suburban command point "Fakel" (Flame)

**For water bodies of the fish economy

The total area of RIAR land is 3251.195 ha of which 104.87 ha are owned, 1.67 ha are under lease, 3144.65 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 2902 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

EN11

EN26

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 μ R/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.

A significant impact on underground drinking waters could only be within the subsoil area leased by "NIAR-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"". The amount of wastewater discharged in this area during the year is 2665 thou. m³. The discharged water contains 105.2667 t of pollutants.

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

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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.

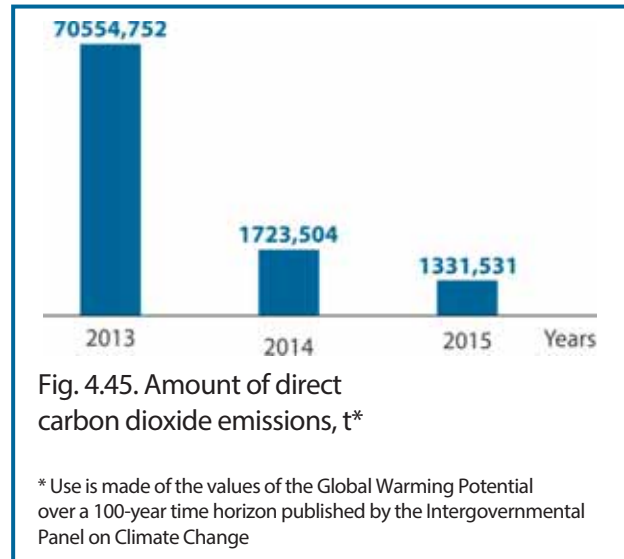
Emissions of Hazardous Substances into Atmosphere

The *Kyoto Protocol* ratified by the Federal Law No. 128-FZ of 4 November 2004 "On ratification of the Kyoto Protocol to the United Nations Framework Convention on Climate Change" lists greenhouse gases the emissions of which should be controlled. Greenhouse gases (GHG) include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride.

In JSC "SSC RIAR", direct GHG emissions are possible when liquid fuel (fuel oil and diesel fuel) is combusted in boiler facilities to generate heat for RIAR needs. Indirect GHG emissions in JSC "SSC RIAR" result from electricity and heat generation by "NIIAR-Generatsiya" Company. Other indirect emissions resulted from RIAR's activities come from sources managed by "Alyanstransatom" JSC which carries out automobile transportation of RIAR staff and cargo. To quantify direct GHG emissions, JSC "SSC RIAR" uses methods prescribed for stationary fuel combustion sources by "Methodological guidelines for quantifying GHG emissions by organizations performing economic and other activities in the Russian Federation". The calculation technique is based on the application of emission factors and direct measurements of the energy source, i. e. fuel. The CH₄ and N₂O emissions potentially occurred during stationary fuel combustion are not counted.

The amount of carbon dioxide emission decreased in 2015 as compared to 2013 and 2014 by 98 and 20 per cent, accordingly (Fig. 4.45). The changes are explained by the fact that the thermal station was split from RIAR and handed over

for operation to "NIIAR-Generatsiya" Company as per the lease contract. The fuel consumption in the boiler facility used by RIAR was decreased, too.



As for the list of ozone-depleting substances under the *Montreal Protocol on Substances that Deplete the Ozone Layer* approved by the Decree of the USSR Council of Ministers No. 1108 of 22 September 1988 and by RF Government Resolution No. 228 of 24 March 2014 "On Measures of State Regulation of Consumption and Sale of Substances that Deplete the Ozone Layer", JSC "SSC RIAR" emissions contain tetrachloromethane (carbon tetrachloride) and freons: dichlorodifluoromethane (CFC-12) and difluorochloromethane (HCFC-22). The sources of freon emissions are compression-condensation units (refrigerating plants) in which ozone-depleting substances are used. The CFC-12 amount contained

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in the refrigerators is 14 kg, the HCFC-22 amount is 51.4 kg. In 2015, the emissions of tetrachloromethane totaled 0.005726 t or 0.006299 t of CFC-11 equivalent and resulted from the engineering procedures such as equipment cleaning and degreasing. Pollutants covered by the *Stockholm Convention on Persistent Organic Pollutants* are absent in RIAR emissions. In 2015, there were no burst and accidental atmospheric emissions.

A quantification of the emissions is based on the calculation techniques via use of the specific indicators and balance method.

On the average, in 2015, 96 per cent of RIAR atmospheric emissions received at gas cleaning and dust-capturing units was cleaned from pollutants. Volume of RIAR emissions into atmosphere as well as amounts of significant pollutants for the year 2015 and previous years are given in Table 4.31.

Table 4.31

Pollutant Emissions into Atmosphere

EN21

Names of substances	Hazard class	Amount of emissions per years, t		
		2013	2014	2015
Gaseous and liquid:	–	226.142	34.503	25.354
including:				
Sulfur dioxide	III	48.463	22.487	16.837
Carbon oxide	IV	49.191	4.025	2.762
Nitrogen oxides (in NO ₂ equivalent)	III	118.893	3.257	2.526
Volatile organic compounds	–	7.945	3.375	1.873
Ozone	–	0.001	0.001	0.001
Hexavalent chromium (in chromium trioxide equivalent)	–	0.003	0.003	0.003
Solid:	–	13.596	12.682	11.810
including:				
Suspended substances	III	0.069	0.042	0.013
Oil ash from thermal stations (in V equivalent)	II	0.159	0.037	0.028
Dust:	–		3.300	
inorganic (20–70 % of silicon dioxide)	III	0.010	0.008	0.008
Abrasive	–	1.943	1.933	1.931
Timber	–	2.108	1.278	1.271
Textolite	–		0.002	
Total	–	239.738	47.185	37.164

We need a perspective when choosing between nuclear and other power sources. Renewable energy and storage aren't enough to meet the real world demands. And burning fossil fuels will only worsen global warming.



Sergey Kiriyyenko

EN29 Fines and Penalties for Breaching Environmental Legislation and Regulatory Requirements

In 2014, administrative penalties for breach of environmental legislation and regulatory requirements were imposed on JSC "SSC RIAR" once and totaled to 13 thousand rubles. In 2015, for breaching environmental legislation and regulatory requirements, RIAR was ordered to pay 30 thousand rubles once for one breach. In 2014 and 2015, nonfinancial sanctions were

not imposed on JSC "SSC RIAR" for breach of environmental legislation and regulatory requirements. In 2015, fees for adverse environmental impact increased (by 7.16 per cent) with growing fees for discharge in water bodies and emplacement of production and consumption waste (Table 4.32).

Table 4.32

Fees for Adverse Environmental Impact

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

Note. JSC "SSC RIAR" does not emplace waste into the subsoil.

4.7. Occupational Health and Safety

The number of occupational injuries is reduced in the last few years in JSC "SSC RIAR". Five occupational accidents occurred in 2012; one occupational accident was in 2013 and one was in 2014. The accidents were

classified as minor occupational accidents. In 2015, occupational accidents did not happen. Since 2002, there are no fatalities in RIAR. In 2014, no cases of occupational accidents or disease were reported among

representatives of contracting and subcontracting organizations that work at RIAR site.

At present, RIAR accepted to execution an integrated action plan to prevent personnel injuries during construction and installation work at Rosatom State Corporation sites which requirements apply to all Rosatom's enterprises. The purpose of implementing the integrated action plan is to ensure a high level of operating culture, minimize employment injuries, professional diseases; keep workers health;

enhance productivity, motivation and work attractiveness.

RIAR elaborated its own Action Plan to prevent personnel injuries during construction and installation work in RIAR divisions and territory. The data presented in Table 4.33 characterize positively the effectiveness of RIAR's activities towards ensuring safe and healthy working conditions and preventing occupational injuries in RIAR.

Table 4.33

Occupational Injury Data

Injury rate	Injury arte for organizations by years			
	JSC "SSC RIAR"		Contractor's Organizations	
	2014	2015	2014	2015
Occupational injury rate	0.027	0	0	0
Professional disease rate	0	0	0	0
Lost days rate	0.99	0	0	0
Absence rate	7.42	0	0	0

In 2015, as part of RIAR programs aimed at education, training, counseling, preventing and controlling the risks of injuries, 260 employees underwent safety training. The training cost amounted to 381.2 thousand rubles. Health and safety issues are given great attention in RIAR. They are reflected in both the *Industry-Specific Agreement on Nuclear, Energy, Industry and*

Science for 2015–2017 (http://www.pub.niar.ru/system/files/sites/soglashenie_2015-2017.pdf), and *Collective Bargaining Agreement of JSC "SSC RIAR"* that was approved at the Conference of RIAR employees (Protocol # 1 of July 25, 2014 http://niar.ru/sites/default/files/pgo2014_in_29062015_c_ssytkami_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"

Employee 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 4 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 2015, 3113 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.

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

Activities include:

- 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.

I personally believe that mankind needs nuclear energy. It must be developed with absolute guarantees of safety



Andrey Sakharov

Personnel Exposure Control

In 2015, personal dosimetry covered 2312 RIAR employees. A comparison can be made with the years 2014 and 2013: 2414 and 2454 employees, respectively.

In the reporting period, the average annual effective dose of the personnel is 2.55 mSv. The effective dose dynamics starting from 2001 is presented in the JSC "SSC RIAR" annual report for the year 2014

(http://niiar.ru/sites/default/files/pgo2_014_in_29062015_c_ssytkami_0.pdf).

As compared to 2014, we can see an increase of the average effective dose of the RIAR personnel resulted from the increased amount of work performed by the reactor staff. RIAR has plans to implement the Dose Optimization Program in 2016.

In 2015, there were no cases where the dose limits specified by the Radiation Safety Standard NRB-99/2009 and equal to 20 mSv were exceeded: 51 per cent of the group A personnel received less than 1 mSv, 17 per cent received from 1 to 2 mSv, 16 per cent — from 2 to 5 mSv, 16 per cent — from 5 to 20 mSv. These data are in compliance with the similar ratios across the industry. Based on the results of the personal dosimetry of the RIAR personnel, the personal lifetime risk associated with the occupational exposure was calculated using the ARMIR-5 software. The absolute majority of the employees (99.05 per cent) have the radiation exposure risk less than 10^{-3} . When compared to NRB-99/2009 values, an increased personal

lifetime risk is seen for 22 employees only or 0.95 per cent of the RIAR staff. In 2015, these employees underwent a special-purpose

medical examination which results did not show radiation-induced illnesses.

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 2015. The information regarding the risks related to nuclear and radiation safety is given in [Section 3.6 "Risk Management" of Chapter 3 "Corporate Governance"](#). 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 2015, the following equipment was purchased under the project:

- special-purpose gamma-spectrometer and reference source for calibration;
- equipment for the process control system of the facility to produce highly-purified distillate;
- transformer and disconnecting devices to replace equipment of the substation bays;
- equipment for the RBT-10/2 control and protection system;
- mechanical testing equipment: a contour measuring station-profilograph and force gauges.

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 2016:

- to bring the systems to ship containers with nuclear materials, radioactive substances and waste in the buildings of the Materials Testing Complex in compliance with the NP-043-11 requirements and Rostekhnadzor regulations;
- to procure a tightening ring for the VK-50 main joint;
- to procure equipment for gaseous waste collection and emission into atmosphere for the RIAR Ventilation Center;
- to purchase equipment to upgrade the compressor cryogenic air separation plant;
- to procure beryllium blocks for the SM and MIR cores.

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 "Capital Management and Output"](#).

STAKEHOLDER ENGAGEMENT



5.1. Enhancement of the Public Reporting System

In 2011 RIAR set forth its public stance on sustainable development to provide transparency of its activities and purposes to stakeholders. For more details see Public Reports 2011–2014 (http://www.niiar.ru/?q=annual_report) on the official RIAR website. During these years

an efficient sustainable public reporting system has been developed (Fig. 5.1), and since 2013 RIAR's own regulatory system of public reporting has been functioning (see Annual Report 2013: http://niiar.ru/sites/default/files/report_2013.pdf).

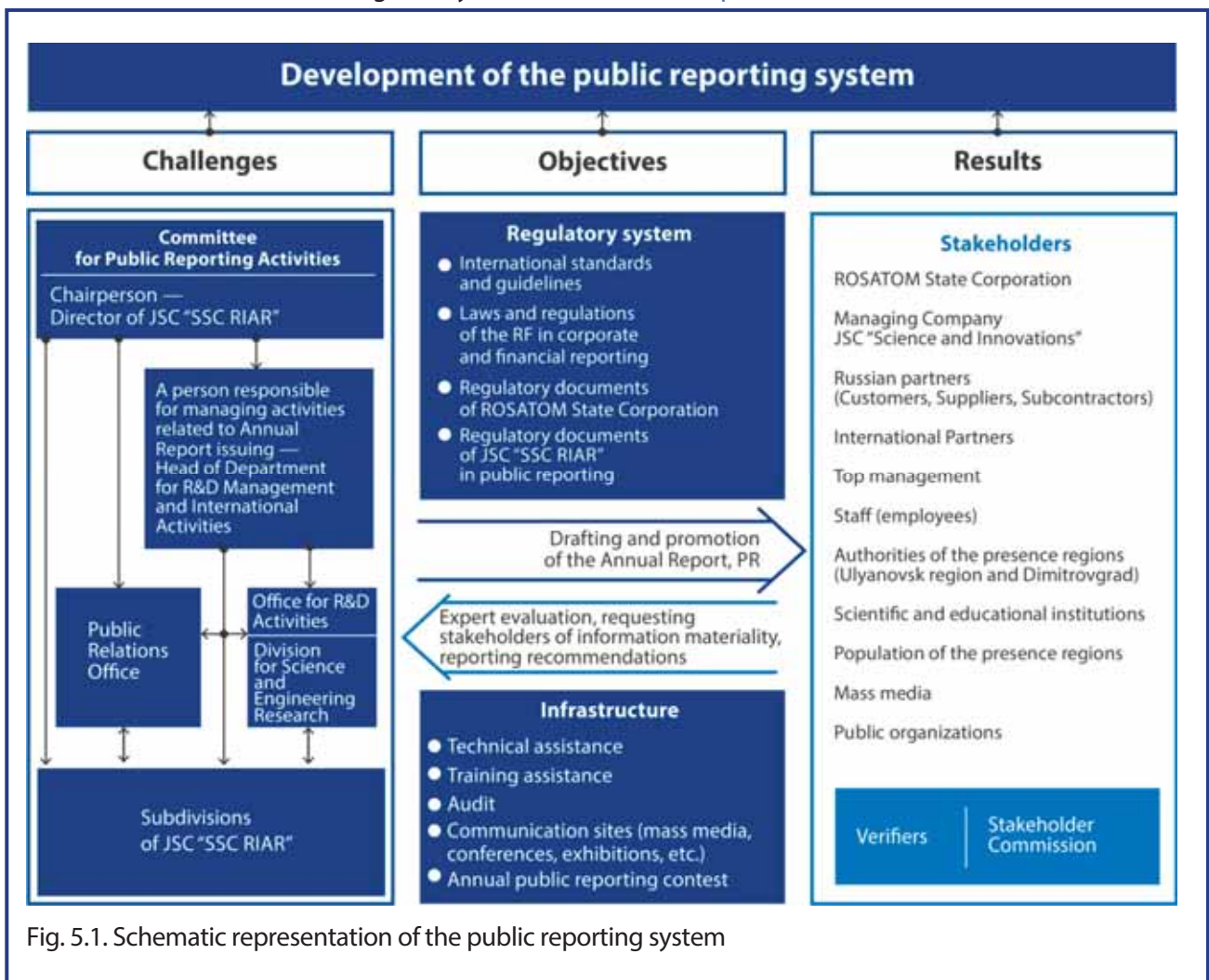


Fig. 5.1. Schematic representation of the public reporting system

Functioning of the public reporting system is provided by a number of RIAR subdivisions. The main functions are distributed between 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_in_29062015_c_ssytkami_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.

Table 5.1 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

Enhancement of the public reporting system

Trend	2015 results	2016 plans
Enhancement of the regulatory and methodology system	<ul style="list-style-type: none"> • Increased membership and competencies of the Committee for Public Reporting Activities. • Updated Stakeholder Commission membership. • Issued Provision on the Committee for Public Reporting Activities (updated and broadened Committee membership, objectives and responsibilities, clarified functions). • Issued Order on activities for drafting Annual Report 2014 that approved the concept of Annual Report 2014, work plan, schedule, and terms of reference. • Updated Standard of Enterprise STO 086-202-2014 "Quality Management System of JSC "SSC RIAR". Annual Report Drafting Procedure". • Revised Provision on the Stakeholder Commission in Public Reporting of JSC "SSC RIAR"; • Approved work plan on the development of RIAR's system of public reporting for 2015–2016. • Issued Order on approval of the Stakeholder Commission membership and schedule of activities involving stakeholders for 2015. 	<ul style="list-style-type: none"> • Update corporate documents in public reporting taking into account new international and corporate standards. • Improve the quality of information in accordance with international integrated reporting standards. • Draw up rules for drafting annual reports; • Approve STO 086-202-2016 "Integrated Management System of JSC "SSC RIAR". Annual Report Drafting Procedure". • Approve a Provision on the Stakeholder Commission in Public Reporting of JSC "SSC RIAR". • Develop a source data acquisition and processing system. • Issue a work plan for the development of the public reporting system for 2016–2017.

Table 5.1 (continued)

Trend	2015 results	2016 plans
Advanced training course for the staff	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Take part in public reporting workshops arranged by ROSATOM and webinars arranged by different organizations under ROSATOM, study best practices, etc.
Report drafting	<ul style="list-style-type: none"> • Switch from G3:1 to basic GRI G4 Sustainability Reporting Guidelines. • Introduced comments of RIAR top managers. • Increased involvement rate of the stakeholder representatives in drafting the Report. • Improved utility of the information presented in the Report. 	<ul style="list-style-type: none"> • Start earlier the reporting campaign (August — October). • Introduce new reporting formats (short presentations, electronic formats).
Broadening the range of stakeholders involved in Report drafting	<ul style="list-style-type: none"> • The Report has been used as a reference and analytical information source for the stakeholders. • A range of stakeholders has been broadened including foreign stakeholders involved in the surveys and questionnaires (identification of significant aspects of RIAR activities). • Long-term partnerships have been established with major stakeholders. 	<ul style="list-style-type: none"> • Increase the rate of stakeholder involvement in Report drafting activities. • Further develop stakeholder engagement. • Update a list of major stakeholder groups.
Surveys and questionnaires	<ul style="list-style-type: none"> • Survey has been conducted among stakeholders to identify significant aspects of RIAR activities to be disclosed in the Report, as well as reciprocal influences between RIAR and stakeholders. • Questionnaire has been distributed among top managers to identify significant aspects of RIAR activities to be disclosed in the Report, as well as reciprocal influences between RIAR and stakeholders, and select the priority topics of the Report. 	<ul style="list-style-type: none"> • Conduct surveys on utility and quality of the information contained in the Report among the staff, top managers, and external stakeholders. • Conduct questionnaires and surveys on updating important and expected priority topics for the next report. • Conduct surveys among the staff to identify the Report readability index. • Conduct questionnaires to identify expectations and wishes of stakeholders.
Promotion	<ul style="list-style-type: none"> • The Annual Report has been distributed among the major groups of stakeholders (addressed mailing, distribution at forums, exhibitions, meetings with business partners, etc.). • RIAR and its Annual Report has been participated in Russian public reporting contests: 	<ul style="list-style-type: none"> • Participate in international and Russian corporate reporting competitions (improvement of the positions gained). • Improve Report promotion methods (addressed mailing, distribution at scientific conferences,

Table 5.1 (end)

Trend	2015 results	2016 plans
	<ul style="list-style-type: none"> ○ The winner of the 12th Annual Report Contest held among joint stock companies at the International Investment Forum Sochi–2015 (http://agnc.ru/news/6855); ○ The winner in the category Best Annual Public Report of Division Organizations and ROSATOM of the Industry's Annual Report Rating; ○ Included in a shortlist in the category Best Annual Report of a Non-Public Company at the 18th Annual Report Contest held by Moscow Exchange and Regional Central Bank (http://konkurs.micex.rts.ru/ru/short.aspx); ○ Took the 7th place of the first level in Disclosure of Information at the International Best Practices Level in a corporate transparency rating of the major Russian companies following the results of the annual survey held by the Russian regional network of integrated reporting (http://transparency2015.downstream.ru/#/ru/1410); ○ Entered Top-5 Expert RA Annual Reports Rating. 	<p>exhibitions, meetings with business partners, etc.).</p> <ul style="list-style-type: none"> ● Report promotion (printed version, memory cards) in the regions of presence. ● Media coverage of the Report-related information.

5.2. Stakeholder Engagement in Report Drafting

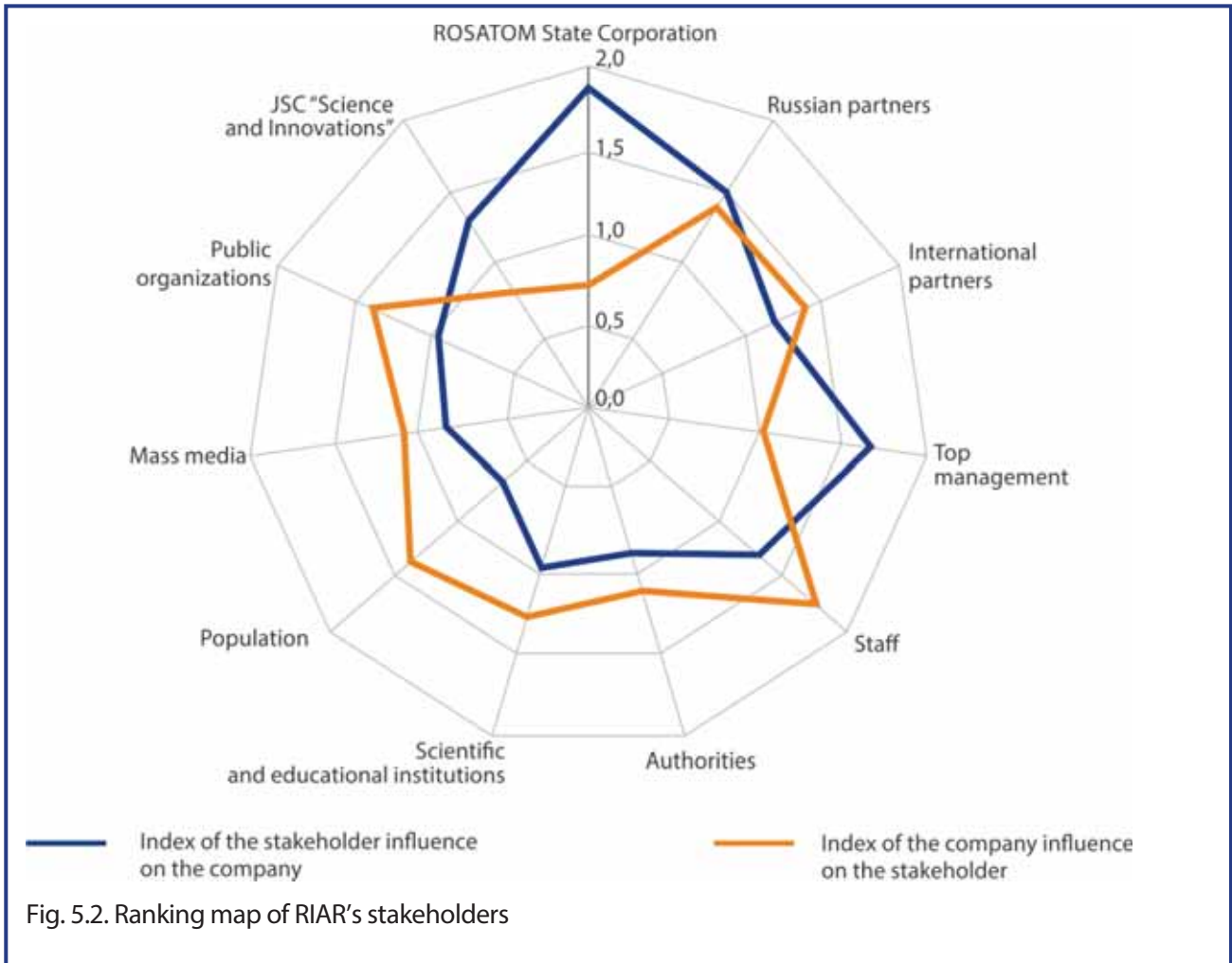
The system of engagement with each group of stakeholders has and will have a great influence on RIAR development. Therefore, taking into consideration their interests in strategic planning is highly important in terms of sustainable development.

G4-24

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,

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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_in_29062015_c_ssytkami_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).



Figures 5.3 and 5.4 give the analysis of a change in the reciprocal influence between the stakeholders

and RIAR conducted in the course of Reports drafting.

Leading companies assess stakeholder engagement as a tool to help innovations in creating products and arranging processes, and enhance the focus of strategic decisions on sustainability both inside and outside the company.

**T. Creek, M. Forsteyter, F. Monaghan, and M. Silanpa
Stakeholder Engagement**

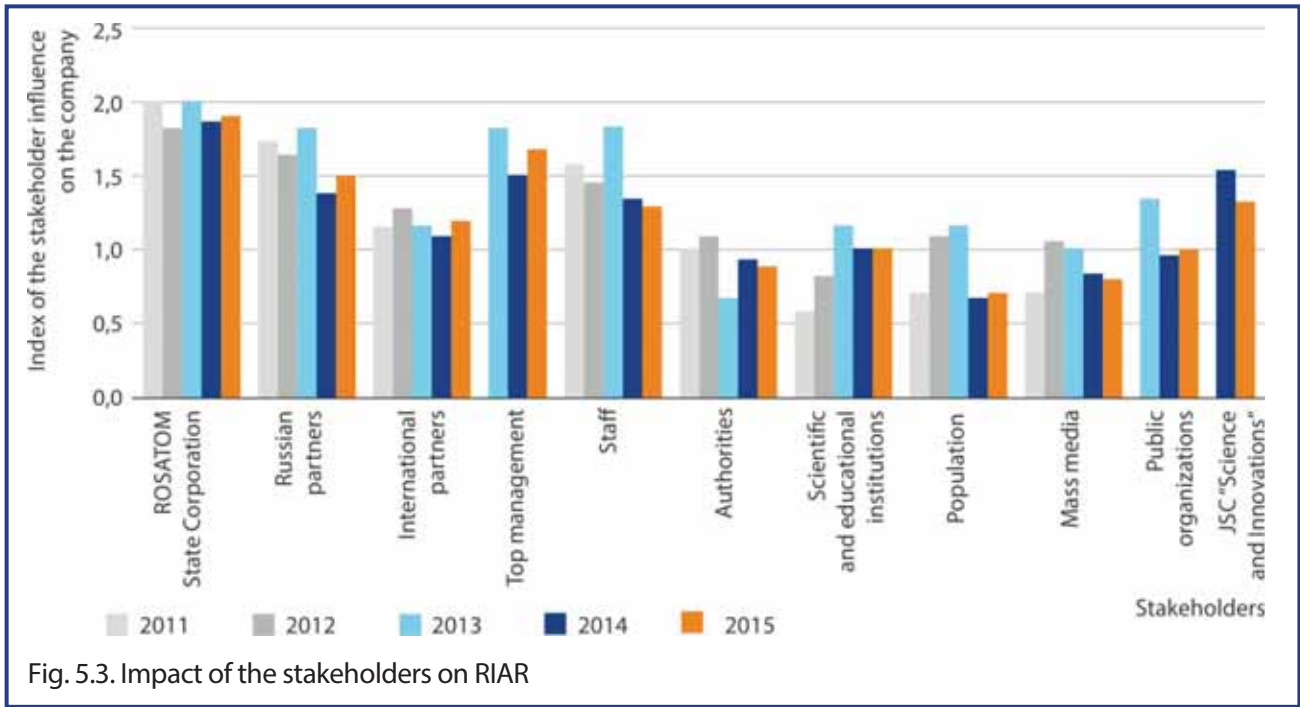


Fig. 5.3. Impact of the stakeholders on RIAR

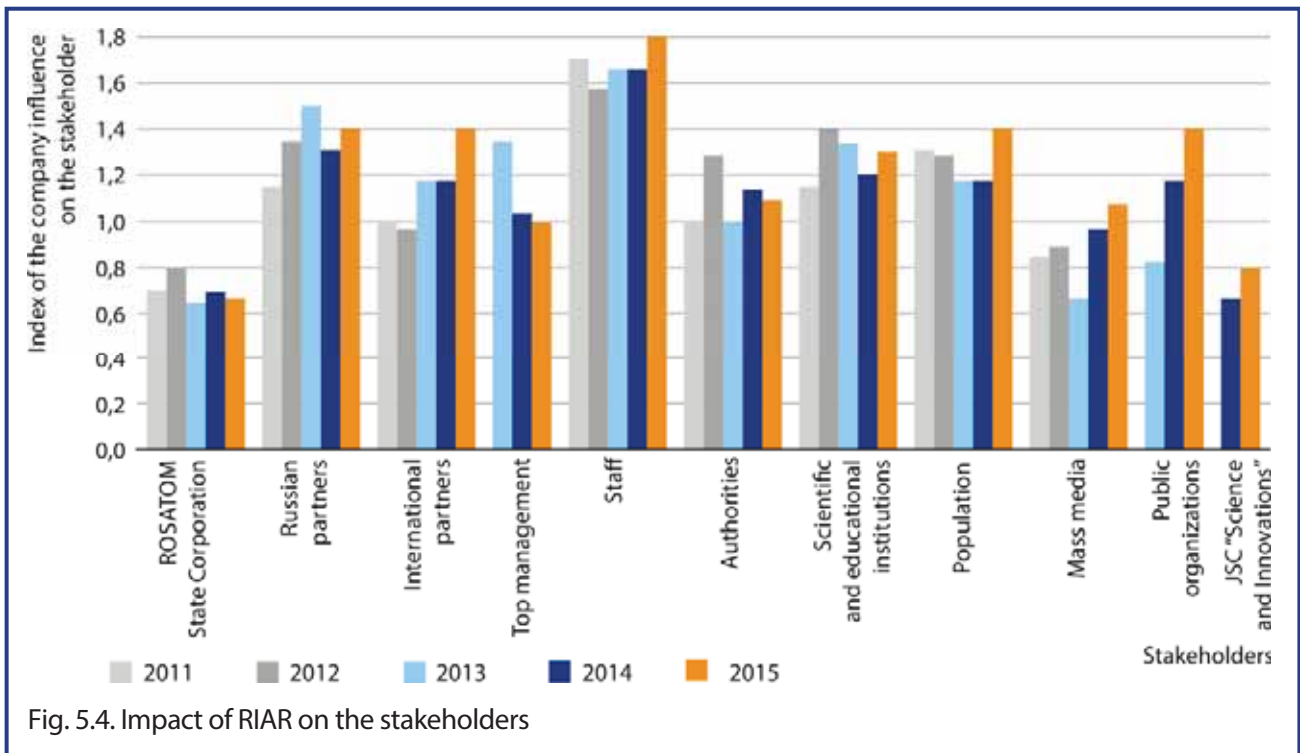


Fig. 5.4. Impact of RIAR on the stakeholder

Growing impact of RIAR on several groups of stakeholders such as population, mass media and public organizations

is explained by improved transparency, openness and public acceptance of RIAR activities.

Stakeholder engagement activities in Report drafting

The stakeholders were involved in all milestones of Annual Report 2015 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:

- Discussion of the Report concept (in absentia, 23 participants);
- Public consultations on the Report 2015 draft (in absentia).

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.



Concept of Annual Report 2015

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 2.3 "Relevant Aspects of Activity"](#), [Chapter 2 "Strategy"](#)), 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.

Public consultations on the Report draft

The Report draft was distributed on June 10, 2016 among the stakeholder representatives for them to introduce their proposals.

There were no comments or proposals related to the Report contents.

5.3. Report Assurance Statement

The management of JSC "SSC RIAR" offered us to verify integrated Annual Report 2015 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) and public consultations on the Report draft during December 2015 — June 2016, and freely express our opinion on the issues under discussion.

Report assessment

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 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. Every participant of the public hearings 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 2015, 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 believe that RIAR's management seeks constructive stakeholder engagement. We are not aware of any facts that would question the reliability and accuracy of the information given in the Report.

We believe that during the public consultations and other events related to the Report's stakeholder assurance procedure RIAR has provided detailed information about its strategic objectives and development guidelines, results of its activities over the reporting period, as well as involvement in town Dimitrovgrad development by reflecting all trends of its activities in a comprehensive manner.

The Report has an indisputable advantage that lies in applying international standards

(GRI G4 Sustainability Reporting Guidelines, AccountAbility's AA1000 series), and its integrated nature makes it possible to comprehensively disclose the information related to the key RIAR activities, sustainable development, strategy, and future plans. We have a positive attitude towards the RIAR's management decision to continue issuing annual reports both in Russian and in English. 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 applying international public reporting standards and 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. The priority topic of the Report is *Scientific, production and staff capacity building*.

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

We believe that the information provided in the Report is complete for a better understanding of the current state and development prospects of JSC "SSC RIAR". In our viewpoint, 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 of JSC "SSC RIAR" to offers and recommendations of the stakeholders

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We believe that RIAR has shown major progress in arranging stakeholder engagement and establishing the public reporting system. In the course of Report drafting two events have been held involving the stakeholders. In addition, questionnaire surveys have been conducted to identify the priority topics. We consider it a good practice 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.

RIAR responded to proposals of the stakeholders by updating and providing additional information in the final revision of the Report.

For instance, based on these requests and recommendations the following sections were revised and specified: "Social Policy and HR Management", "Enhancement of the public reporting system", "Public Stance in the Area of Sustainable Development", etc.

In addition, RIAR is committed to further enhance the public reporting system. 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 2015 assurance statement approvals page

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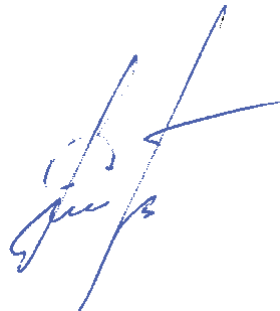
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APPENDICES

ACCOUNTING

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REPORT

TRANSACTIONS



LIST OF ABBREVIATIONS

AE — an absorber element.

ARBUS — an arctic reactor unit-type facility.

BIGR — a fast pulse graphite reactor.

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".

EFA — an experimental fuel assembly.

FA — a fuel assembly.

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".

FSUE — Federal State Unitary Enterprise.

FSUE "VNIIA" — Federal State Unitary Enterprise "All-Russia Research Institute of Automatics".

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

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

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

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

IAEA — International Atomic Energy Agency.

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

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

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

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

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

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

JSC 'SPb "Isotop"' — Joint Stock Company "Saint Petersburg Isotope".

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

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

JSC "SverdNIkhimmash" — Joint Stock Company "Sverdlovsk Research Institute for Chemical Engineering".

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

JSC "TVEL" – Joint Stock Company "TVEL".

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

JSC "VNIIPromtehnologii" — Joint Stock Company "Leading Research and Development Institute for Industrial Technology".

LLC – Limited Liability Company.

LRW — liquid radioactive waste.

MBIR — a multi-purpose fast reactor.

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"'.

NP-043-11 — Design and safe operation requirements for cranes at nuclear facilities.

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 — nuclear- and radiation-hazardous facility.

OSPORB 99/2010 — Principal sanitary radiation safety rules.

OST — a set of industry-specific standards.

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

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

PNAE G-7-003-87 — Certification rules for welders of nuclear power plants equipment and pipelines.

PRC — the People's Republic of China.

RBMK — a high-power channel-type reactor.

RBT — a pool-type reactor.

R&D — Research and development.

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.

TIN — a taxpayer identification number.

VAT — a value added tax.

"SESNa", LLC — Limited Liability Company "Sibirsk Energy Sales Company".

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.

SNF — spent nuclear fuel.

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

SPS — a shipping package set.

SRW — solid radioactive waste.

USSR — the Union of Soviet Socialist Republics.

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.

VK-50 — a boiling water reactor.

VVER — a water-water energy reactor.

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

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

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 manufacture of pieces and units of power engineering equipment.

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.

Becquerel (Bq) — the activity of a quantity of radioactive material in which one nucleus decays per second.

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.

Classes of hazardous substances — a conventional degree intended to simplify the classification of potentially hazardous substances. The hazard class is set according to industry-oriented regulatory documents. In the Russian Federation there are five hazard classes of industrial and bio waste by its environmental impact and harmful effect: *Class I* — extra hazardous waste: the harmful effect on the environment is estimated as extra high; accumulation of such waste results in irreversible damages of the ecosystem with no recovery period; *Class II* — highly hazardous waste: the harmful effect is estimated as high, the balance of ecosystem is greatly disturbed, and the period for system and its components recovery is not less than 30 years after the entire elimination of the exposure source; *Class III* — moderately hazardous waste: a medium degree of the harmful effect with a period of self-recovery at least 10 years after the exposure level is reduced; *Class IV* — low-hazard waste: the low

degree of harmful effect on the environment with the minimal period of recovery to be three years; *Class V* — virtually non-hazardous waste: the exposure effect is very low, ecological system and its components are not violated.

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

Conversion of research reactors — a process to convert research reactors to low-enriched uranium fuel.

Depleted uranium — uranium containing a lesser mass percentage of uranium-235 than in natural uranium. (e.g. uranium in spent fuel of reactors operating at natural uranium).

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.

Engagement (involvement) — the state of emotional and intellectual commitment to an organization that induces an employee to do their work as well as possible in accordance with the enterprise objectives, tasks and values in order to achieve the best results.

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.

European Pharmacopoeia — a guiding document applied in most European countries when producing pharmaceuticals.

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.

Fuel pellet — a pellet made from compacted uranium dioxide, the essence of nuclear fuel and located inside a fuel element.

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.)

Neutron flux density — the number of neutrons passing through a section $1 \text{ cm}^2/\text{s}$.

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.

Power startup — commissioning of a nuclear facility, when it starts producing power and its performance is checked at different power levels.

Radiation burden — the total of emission individual doses obtained or to be obtained in the course of operation, maintenance, repair, replacement or dismantling of nuclear facility equipment (e.g. NPP)

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.

Reactor startup — commissioning of a reactor including its fuelling, achievement of criticality and performance of experiments at a power, at which heat is removed due natural heat loss.

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.

FEEDBACK QUESTIONNAIRE

Your opinion about the Public Annual Report of JSC "SSC RIAR" is very important for us. Please, fill in the questionnaire below.

1. What group of interested parties do you refer to?

- ROSATOM, JSC "Atomenergoprom"
- Partners (customers, suppliers, subcontractors)
- Personnel of JSC "SSC RIAR"
- Federal, regional and local authorities
- Regulatory bodies
- Educational Institutions
- Resident population
- Mass media

2. Did you find out anything new about JSC "SSC RIAR"?

- Yes
- No

Your comments
.....

3. Could you get information you were interested in?

- Yes
- No

Your comments
.....

4. What section was the most interesting for you?

Your comments
.....
.....

5. How satisfied or dissatisfied are you with the objectiveness and reliability of data presented in the Report?

- Very satisfied
- Satisfied
- Dissatisfied
- No opinion

6. How satisfied or dissatisfied are you with the Report exposition?

- Very satisfied
- Satisfied
- Dissatisfied
- No opinion

7. How satisfied or dissatisfied are you with the Report design?

- Very satisfied
- Satisfied
- Dissatisfied
- No opinion

8. How satisfied or dissatisfied are you with the Report significance?

- Very satisfied
- Satisfied
- Dissatisfied
- No opinion

9. What do you find the most prominent advantage of the Report?

Your comments

.....

.....

10. What is the most prominent disadvantage of the Report ?

Your comments

.....

.....

11. What information should the Report be added with?

Your comments

.....

.....

Please, send the filled questionnaire to:

- by post: Russian Federation, 433510, Ulyanovsk region, Dimitrovgrad, Zapadnoye Shosse, 9;
- by fax: +7 (84-235) 3-58-59;
- by e-mail: adm@niar.ru

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