FUEL COMPANY OF ROSATOM

TVEL

Annual Report

# 2017

## Efficiency improvement and sustainable development

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## Efficiency improvement and sustainable development

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# Message from the Chairman of the Board of Directors

**Over the course of its 20-year history TVEL JSC faultlessly delivered on all contractual commitments, which allowed the Company to acquire the global stature and sustainable goodwill of a reliable supplier of safe and effective nuclear fuel**

**Dear colleagues and friends,**

TVEL Fuel Company is one of the basic divisions of ROSATOM which is of key importance both for the Russian nuclear industry and for the development of international business. By strengthening its technological, manufacturing and financial potential, the Company continues to create new high-quality and reliable fuel products for the world nuclear power industry while serving the interests of its customers.

The priorities set by the Nuclear Fuel Division fully comply with the strategic areas of activity in ROSATOM State Corporation. Penetrating new markets and creation of new products, innovative development, operational efficiency growth, sustainable development, increasing transparency and expanding dialogue with stakeholders — all of these efforts clearly show the development vectors of the entire nuclear industry in the near future.

TVEL Fuel Company expands the geographical reach of its export supplies. In 2017, TVEL JSC concluded several major contracts for the whole operation period of the nuclear power plants under construction in Egypt, Turkey and Belarus. Along with the development of the traditional fuel market for Russian design reactors, the Company continues to promote fuel for Western design PWR reactors.

Technological leadership of the Company regarding front end of nuclear fuel cycle is traditionally associated with the creation of new types of nuclear fuel for the power and research reactor models. At the same time, strategically important for the whole nuclear industry is the Proryv or Breakthrough project being realized at the site of Siberian Group of Chemical Enterprises in Seversk: creation of the unique platform for closed nuclear fuel cycle and minor actinides afterburn will enable the Fuel Division to move to a new technological level.

TVEL Fuel Company is traditionally committed to high environmental stadards. The Company supports national and regional environmental events on a regular and proactive basis, demonstrating high corporate responsibility regarding environmental protection and conservation of the natural wealth of the country. The Company has unique competences for decommissioning of the nuclear facilities and rehabilitating the areas up to the environmentally acceptable level in Angarsk Electrolysis Chemical Complex, Novosibirsk Chemical Concentrates Plant, and Bochvar Institute.

TVEL Fuel Company shows steady progress allowing to expect successive achievement of its strategic goals while strictly preserving safety principles and following the sustainable development priorities.



**Yuri Olenin**
Chairman of the Board of Directors of TVEL JSC, Deputy Director General — Director of the Division for Innovation Management of ROSATOM State Corporation

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# Message from President

**10.8**
**USD billion**
**Foreign orders portfolio for products and services of FE NFC for a 10 year period (as of year-end 2017)**

**Dear colleagues,**

In 2017, TVEL Fuel Company of Rosatom showed solid financial and operational performance, continued to strengthen its positions in the global market, develop new business areas and improve operating efficiency.

Summarizing the 2017 results, TVEL Fuel Company's revenue amounted to RUB 180.7 billion, which is comparable to the previous year, while the net profit compared to 2016 increased by 19% up to RUB 55 billion. The ten-year export orders portfolio for traditional products increased up to USD 10.8 billion, including the fuel supply contracts for new foreign power units of Russian design: El Dabaa NPP (Egypt), Akkuyu NPP (Turkey), Ostrovets NPP (Belarus).

In cooperation with its traditional partners TVEL JSC continued transferring nuclear power units to the improved, more efficient and up-to-date fuel. The Company signed the contract for introduction of the newly modified second generation fuel assemblies for VVER-440 reactors at the four existing power units of Paks NPP (Hungary), which will increase the economic efficiency of the power plant.

The project of global market launch is ongoing for TVS-K fuel intended for PWR reactors of Western design. Power unit No.3 of NPP Ringhals (Sweden) successfully completed the regular operation cycle of TVS-K in the reactor core, with an agreement reached to expand the pilot operation program.

In 2017, the Company launched the projects of strategic importance aimed at improving the operational efficiency. One of such projects involves the concentration of mechanical enterprises of TVEL Fuel Company within the production sites of Tochmash VPA (Vladimir region) and Kovrov Mechanical Plant (Kovrov). All enterprises of the nuclear fuel division accomplish the projects aimed at reducing production sites areas and costs.

The year 2017 laid the foundation for the dynamic development of new business areas, TVEL Fuel Company started the process of creating industry-based integrators. Integrator companies were created in such areas as Additive Technologies and Power Storage Devices with the view of establishing the Oilfield Service integrators and in a number of other areas.

The Company continues its work on creation of new and modified products for our clients in our major business area — nuclear fuel fabrication. The key areas of scientific and technical activities for the near future include the creation of new designs and modifications of fuel assemblies for VVER type reactors, design improvement for TVS-K fuel, development and market launch of the products with mixed uranium-plutonium fuel for thermal and fast neutron reactors (MOX fuel, REMIX fuel, MNUP fuel), as well as the creation of accident tolerant fuel. Market launch of an efficient tolerant fuel based on the existing FA for Russian and foreign design reactors will open a new historical page in terms of reliability and safety improvement of the nuclear power industry worldwide.

TVEL Fuel Company gives traditional priority to the sustainable development of the cities and the regions where our enterprises are located. Along with charitable activities and implementation of social projects, our work in the regions is aimed at creating sustainable business partnerships. That means investment inflow, creation of new enterprises and jobs for the territories which will be a powerful impetus for social and economic development.

2017 was officially declared the Year of Ecology in Russia. In this regard TVEL Fuel Company developed and successfully implemented a series of organizational, scientific, technical, educational and industrial events to protect the environment. These projects were carried out in parallel with the traditional work to eliminate the nuclear "legacy" of the first Soviet atomic project, as well as to ensure radiation safety and reduce the impact of enterprises on the environment. TVEL Fuel Company spent RUB 2.2 billion for environmental protection in 2017.

In 2018 TVEL JSC and its subsidiaries will continue their dynamic work on implementation of all previously launched projects with the aim to introduce TVEL Fuel Company to a new efficy level, while improving current products and creating new types of products, diversifying its business and classically reliable fuel supply to NPPs both in Russia and abroad.



**Natalia Nikipelova**
President of TVEL JSC

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# Key results of TVEL Fuel Company



**In 2017, TVEL Fuel Company of Rosatom showed solid financial and operational performance, continued to strengthen its positions in the global market, develop new business areas and improve operating efficiency**

**Net income (RUB million)**

| 2015 | 2016 | 2017 |
|---|---|---|
| 55,734 | 46,212 | 55,008 |

**EBITDA margin**

| 2015 | 2016 | 2017 |
|---|---|---|
| 43.5% | 43.0% | 41.5% |

**Revenue (net) from the sales (RUB million)**

| 2015 | 2016 | 2017 |
|---|---|---|
| 189,017 | 180,073 | 180,683 |

**Adjusted free cash flow (RUB billion)**

| 2015 | 2016 | 2017 |
|---|---|---|
| 86.6 | 83.9 | 77.4 |

**Dividends paid in the reporting year (RUB million)**

| 2015 | 2016 | 2017 |
|---|---|---|
| 15,296 | 28,233 | 20,468 |

**Foreign orders portfolio for products and services of FE NFC for a 10 year period (USD billion)**

| 2015 | 2016 | 2017 |
|---|---|---|
| 10.3 | 10.1 | 10.8 |

**Labor efficiency* (RUB million/person)**

| 2015 | 2016 | 2017 |
|---|---|---|
| 8.40 | 8.25 | 8.46 |

**Average staff number (persons)**

| 2015 | 2016 | 2017 |
|---|---|---|
| 22,527 | 22,127 | 21,793 |

**Total costs for occupational safety and health measures (RUB billion)**

| 2015 | 2016 | 2017 |
|---|---|---|
| 1.69 | 1.97 | 1.90 |

**Gross tax liabilities (actually paid) (RUB million)**

| 2015 | 2016 | 2017 |
|---|---|---|
| 31,283 | 29,233 | 24,128 |

* Labor efficiency is calculated as revenue from sales + recognition of costs carried out by external financing / average number of employees.

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# MILESTONES 2017

## 01
**JANUARY**

Kovrov Mechanical Plant (KMZ PJSC) started batch production of the new generation gas centrifuges GC-9+.

## 02
**FEBRUARY**

A.A. Bochvar High-Technology Research Institute of Inorganic Materials (Bochvar Institute) completed the works in the framework of three governmental contracts under the project Proryv (Breakthrough) on processing technology for irradiated mixed uranium-plutonium nitride fuel, treatment of radioactive wastes generated after reprocessing of irradiated fuel, and mathematical process simulation of nuclear fuel fabrication, its processing and treatment of radioactive waste for new generation fast neutron reactors.

## 03
**MARCH**

The supply contract was ratified with the European distributor HermitH GmbH (Germany) for more than 1 thousand tons of various titanium production by Chepetski Mechanical Plant (CHMP JSC) with total value of RUB 2 billion.

## 04
**APRIL**

Gas centrifuges unit was successfully transferred from the site of Siberian Group of Chemical Enterprises (SGChE; Seversk, Tomsk region) to Electrochemical Plant (PA ECP JSC; Zelenogorsk, Krasnoyarsk territory). The previously shut down equipment was put into operation on the new production site and it now is effectively operated within the framework of design characteristics.

TVEL Fuel Company, China Nuclear Energy Industry Corporation and Jiangsu Nuclear Power Corporation signed the package of supply contracts for Russian nuclear fuel, zirconium components for fuel assemblies and provision of engineering services for Tianwan NPP power units for the amount of about USD 1 billion.

## 05
**MAY**

Start of the Lean Polyclinics project in Novouralsk aimed at improving the medical services quality in the cities of TVEL Fuel Company operations.

## 07
**JULY**

The Company signed a contract for additional supply of TVS-K for pilot operation at power unit No.4 NPP Ringhals (Sweden) starting from 2019.



## 08
**AUGUST**

PA ECP JSC shipped a large batch of germanium-76 isotope for the international scientific collaboration GERDA, which conducts a research in the field of neutrinoless double beta decay of an atomic nucleus.

## 09
**SEPTEMBER**

Natalia Nikipelova was appointed as President of TVEL JSC (previously she had been holding the position of Senior Vice-President for Finance, Economy and Corporate Governance since 2013).

## 10
**OCTOBER**

TVEL JSC launched the management processes restructuring project within the framework of the concept of “business and service functions interaction”.

## 11
**NOVEMBER**

TVEL JSC and Institute of Nuclear Physics of the Academy of Sciences of the Republic of Uzbekistan concluded the nuclear fuel supply contract regarding VVR-SM research reactor operated by specialists of Institute of Nuclear Physics.

Representatives of TVEL Fuel Company obtained three gold awards in IV National Championship of High-Tech Industries WorldSkills Hi-Tech-2017 (Ekaterinburg).

TVEL JSC and MVM Paks NPP Ltd. (Paks NPP, Hungary) signed the contract for engineering services related to introduction of the new generation fuel assemblies for VVER-440 reactors on the operating Paks NPP power units.

## 12
**DECEMBER**

TVEL JSC won the Grand Prix in the All-Russian Contest of the Russian Union of Industrialists and Entrepreneurs “Russian Business Leaders: Dynamics and Responsibility — 2017”, the nomination “For achievements in the field of occupational safety and health of workers”.

The Company signed a fuel supply contract for Akkuyu NPP (Turkey).

The Company signed a fuel supply contract for Ostrovets NPP (Belarus).

The Company signed a nuclear fuel supply contract for El Dabaa NPP (Egypt).

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**180,683** RUB mln

TVEL Fuel Company net revenue from sales

**17%**

share in the global market of fuel fabrication of TVEL Fuel Company

# 1 About TVEL Fuel Company

# TVEL Fuel Company

**The Company supplies nuclear fuel to 72 energy reactors in Russia, Europe and Asia (14 countries), to research reactors of Russian and foreign design in nine countries worldwide, marine energy power units of the Russian Nuclear Powered Fleet, as well as the world's first floating nuclear power plant. Today one out of every six power reactors in the world operates with fuel manufactured by TVEL Fuel Company**

Rosatom TVEL Fuel Company[1] (hereinafter referred to as TVEL Fuel Company, TVEL FC, the Company) is one of the major players on the global market of front end nuclear fuel cycle (FE NFC) and the only nuclear fuel supplier to Russian NPPs.

TVEL Fuel Company is a part of ROSATOM State Corporation and comprises the enterprises specialized in fabrication of nuclear fuel, uranium conversion and enrichment, production of gas centrifuges, as well as research, design and development organizations.

The core areas of activity of the Company is uranium enrichment; development and production of gas centrifuges and the associated equipment; development, fabrication and sale (including export) of nuclear fuel, and non-nuclear products manufactured at the enterprises of the fuel division.

TVEL Fuel Company provides the Russian and international market with the wide range of non-nuclear products: zirconium, lithium, calcium, magnets, thin-walled pipes, polishing powders, pinch rolls, zeolite catalysts, superconductor materials and other products.

The enterprises of TVEL Fuel Company have proprietary research and development design divisions that contribute to successful operation of hydrometallurgical, metalworking, machine-building and rolling facilities.

TVEL Fuel Company takes a central place in the structure of ROSATOM for the front end nuclear fuel cycle.

The enterprises of TVEL Fuel Company are located in 10 regions of the Russian Federation. Distribution of the Company's assets in different regions of Russia renders effective cooperation in a wide range of issues and aspects.

Specific nature of the social environment of TVEL Fuel Company is that three industrial enterprises of the Company are located within the Closed Administrative Territorial Units (CATU): Seversk, Novouralsk, Zelenogorsk and one is located within a so called mono-town (Glazov). These enterprises are town-forming organizations and major taxpayers.

Electronic versions of TVEL FC Annual Report 2017 and the preceding periods are available at:

***tvel.ru/finance/annual_report/***

[1] TVEL Fuel Company is the collective name for TVEL JSC and its subsidiary companies.

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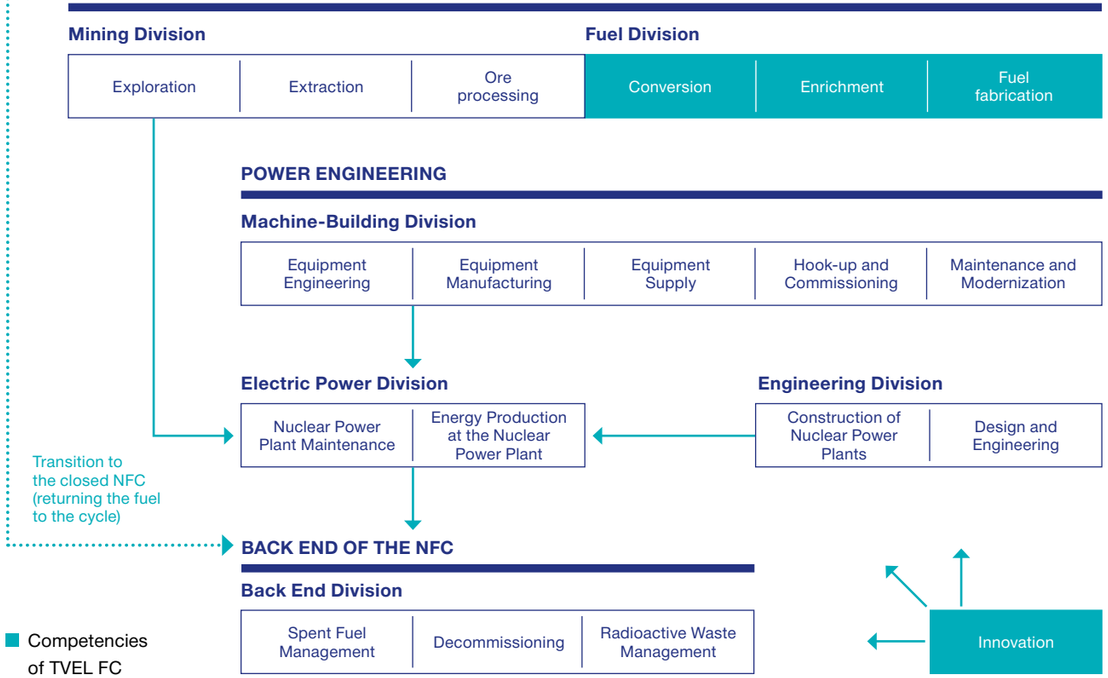
All stages of activity comply with the strict requirements regarding nuclear and radiation, industrial, fire, environmental safety, as well as labor safety, physical protection of nuclear facilities and nuclear materials, emergency preparedness

Table 1
**Competitive advantages of TVEL Fuel Company**

| Competitive advantages | Means of accomplishment |
|---|---|
| Cost optimization | ▸ Concentration of production<br>▸ Disposition of non-core assets<br>▸ Development of new and low waste technologies<br>▸ Production modernization |
| Package Supplies | ▸ TVEL Fuel Company's framework concentrates all technological stages of nuclear fuel production (possibility of improving the characteristics of nuclear fuel) |
| Continuous improvement of consumer properties of nuclear fuel | ▸ Provision of power cycling modes, possibility of increasing the nuclear reactor capacity<br>▸ Introduction of extended fuel life and cycles<br>▸ Achievement of high-level nuclear fuel burn-up |
| Use of various types of raw materials | ▸ Increase of commercial attractiveness of nuclear fuel<br>▸ Decrease the share of nuclear fuel share in power generation cost |
| Reference fuel | ▸ Proposal of reference solutions which have been tested and qualified in Russia |

Figure 1
**Position of TVEL Fuel Company in Nuclear Technological Chain**

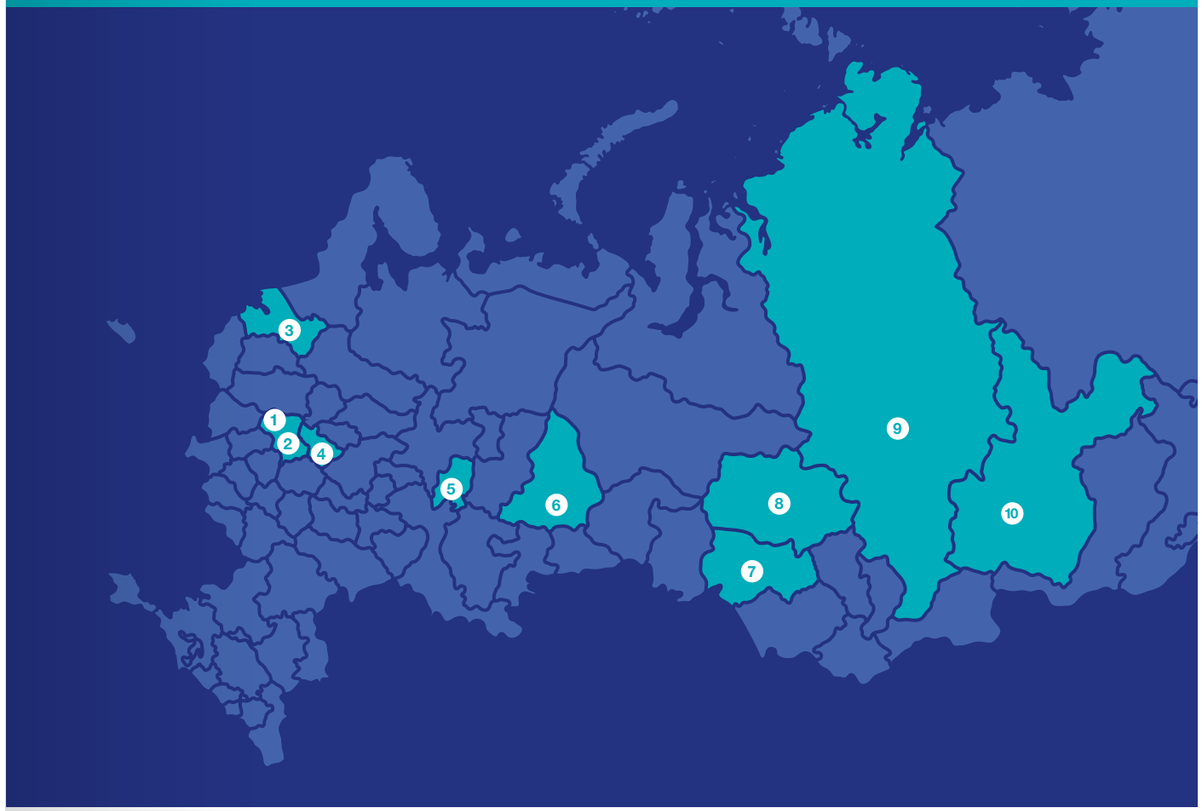





# Regions of presence of TVEL Fuel Company

**10** regions of the Russian Federation

1. **Moscow** TVEL JSC, VNIINM JSC, MZP JSC, CPTI JSC
2. **Moscow region** MSZ JSC (Elektrostal)
3. **Saint Petersburg** Centrotech SPA LLC
4. **Vladimir region** Tochmash VPA JSC (Vladimir), KMZ JSC (Kovrov)
5. **Udmurt Republic** ChMP JSC (Glazov)
6. **Sverdlovsk region** UEIP JSC, Centrotech SPA LLC (Novouralsk)
7. **Novosibirsk region** NCCP JSC (Novosibirsk)
8. **Tomsk region** SGChE JSC (Seversk)
9. **Krasnoyarsk territory** PA ECP JSC (Zelenogorsk)
10. **Irkutsk region** AECC JSC (Angarsk)

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# World Market of Front End Nuclear Fuel Cycle

**According to IAEA PRIS, as of the end of 2017 there were 448 NPP power units in operation worldwide, including 35 in the Russian Federation. 72 reactors are running on Russian fuel**

The majority of operating power units are located in Asia-Pacific region, North America and Western Europe. At the moment 57 power units are under construction in fifteen countries, including seven in Russia.

## FABRICATION MARKET

At the moment, more than 80% of the world reactor fleet consists of light water reactors (LWR) segment, including PWR, BWR and VVER reactors. It is expected that within the next 10 years LWR will amount to about 90% of new reactors put into operation.

Major foreign manufacturers of fuel for light water reactors are located in USA, Western Europe and Japan:

- Framatome (previously AREVA NP, 75% share belongs to EDF) — BWR and PWR;
- Global Nuclear Fuel (joint venture of GE и Hitachi) — BWR;
- Westinghouse (till the end of 2017 owned by Toshiba) — BWR, PWR and VVER.

TVEL Fuel Company is the main supplier of fuel for reactors of Russian design, as well as it is sufficiently competent to produce nuclear fuel for PWR and BWR reactors and its components from reprocessed uranium (in cooperation with Framatome), and pellets for PHWR and BWR reactors. TVEL JSC elaborated its own in-house design of FA for PWR reactors — TVS-K, which is under the pre-test assembly program.

Main events of the nuclear fuel fabrication market in 2017:

- transition of the reactor and fabrication business of AREVA Group under control of EDF, the energy company from France;
- restructuring of Westinghouse, conducted in accordance with Chapter 11 of the US Bankruptcy Code, as a result of which the company will focus on nuclear fuel fabrication and engineering services.

## URANIUM CONVERSION AND ENRICHMENT MARKETS

In 2017, the price for separative work unit (SWU) continued its decline which began in 2011. By the end of 2017, the spot market price dropped below USD 40 per SWU. This is due to the surplus capacity and presence of significant nuclear fuel reserves in various forms that resulted in excess of conversion and enrichment services over the current demand in the market.

In recent years because of the current market conditions most suppliers of conversion and enrichment services do not use the production capacity to the full, and



**72**

**Number of reactors running on Russian-made fuel**

**17%**

**TVEL share in the global market of fuel fabrication in 2017**

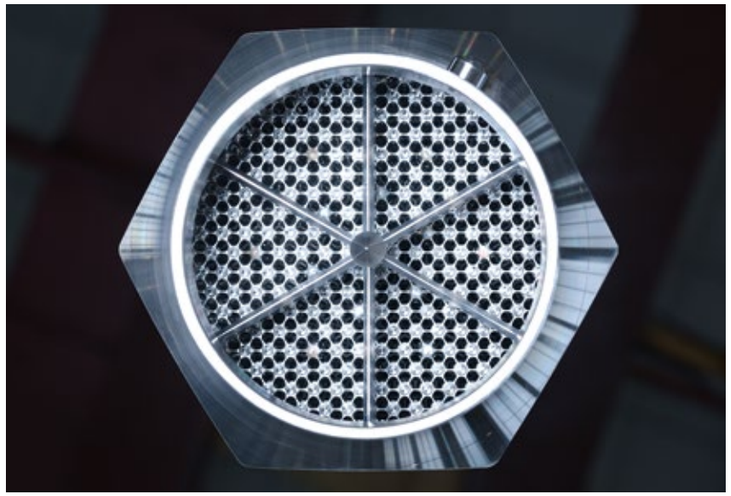
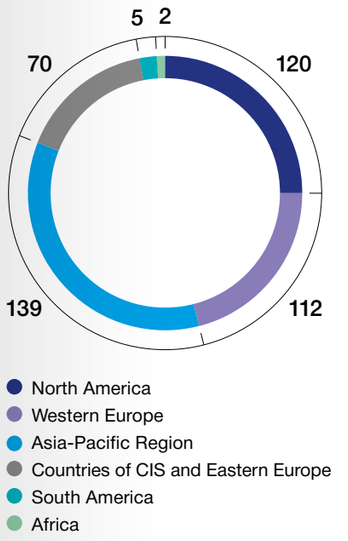


Diagram 1

**NPP units in operation as of the end of 2017, ea.**




Source: IAEA PRIS database

tend to reduce the volume of output or suspend the production completely.

At the beginning of 2017 the largest supplier of conversion services ConverDyn (USA) reported the closing of a number of production sites at the conversion plant Metropolis Works in USA, which led to a halving of production capacities of the enterprise, up to 7 thousand tons U in the form UF6/year. By the end of 2017, ConverDyn suspended completely its works on the production of uranium hexafluoride until “business conditions are improved”.

However, in anticipation of greater demand in a long-term perspective, several companies have chosen to modify their facilities and replace outdated plants with more modern and efficient ones:

- The French company Orano (known as AREVA NC until 2018), which consolidated the business of AREVA group in terms of uranium mining, conversion and enrichment, completed the construction of the new conversion plant Comhurex II and the new enrichment plant Georges Besse II.
- URENCO increased the capacity of its plant in USA and closed a series of outdated sites in terms of technology in its enrichment plants in Europe.

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- Striving for self-sufficiency in products and services throughout the entire nuclear fuel cycle, China is increasing its production capacity for conversion and enrichment with a focus on the development of the reactor fleet in the country: production capacities on the conversion exceeded 10 thousand tons U/year, enrichment – reached the value ~6 million SWU/year.

## FRONT END NUCLEAR FUEL CYCLE MARKET GROWTH OUTLOOK

Front end nuclear fuel cycle market outlook depends on the current state of the reactor fleet and periods of its operation, plans for construction of new units, as well as the reserves of FE NFC accumulated by various market players. According to different scenarios in 2030 outlook, the nominal capacity of the global reactor fleet will increase, the difference is in growth rate.

Table 2

**Key performance indicators of the global nuclear fuel market in 2017**

| Indicator | Value |
|---|---|
| Number of reactors running on Russian-made fuel, ea. | 72 |
| NPP units in operation, worldwide | 448 |
| NPP units under construction, worldwide | 57 |
| Countries with NPPs under construction | 15 |



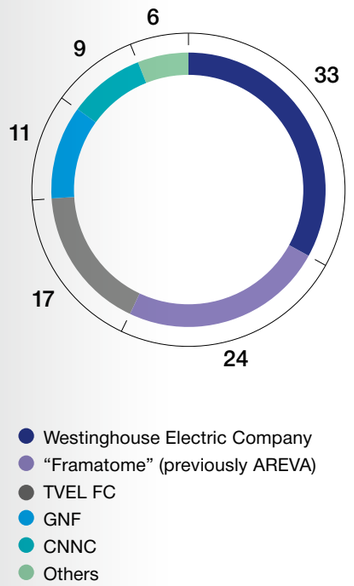
The Asian region remains the most promising market where the main construction of new units is in progress and there are serious plans to build up the nuclear capacity. The reduced demand is expected in FE NFC markets of Europe and North America due to ageing of the reactor fleet, decommissioning of the existing capacity and small quantity of new projects aimed at replacement of the retired capacity.

Furthermore, in 2017 the country markets of nuclear power changed their long-term prospects. South Korea, which was seen as one of the growth drivers of the world's nuclear power, set a course toward abandoning the construction of new nuclear power plants and extending the operating time of the existing reactors after reaching their design deadlines. At the same time at the end of 2017 France decided to postpone its plans to reduce the share of nuclear power in the national energy balance to 50% starting from 2025 to a more distant future.

Taking into account the above, it is expected that by 2025 the nominal capacity of the global nuclear reactor fleet will grow insignificantly: from the current 390 GW up to ~400 GW. By t 2030 we can expect the capacity to grow up to ~450 GW.

Diagram 2

**Key Competitors of the Nuclear Fuel Fabrication Market in 2017, %**




## POSITION OF TVEL FUEL COMPANY IN THE WORLD MARKET OF THE FRONT END OF NUCLEAR FUEL CYCLE

TVEL Fuel Company is one of the global leaders in nuclear fuel production. The Company's share in the global market of fuel fabrication in 2017 reached ~17%[1]. TVEL Fuel Company jointly with TENEX JSC provides a significant part of the needs of foreign design reactors in uranium enrichment services.

TVEL Fuel Company is sufficiently competent to produce and supply fuel and its components for all types of the existing Russian reactors (VVER, RBMK, EGP, BN), light-water western-design reactors (PWR and BWR), as well as fuel components for western-design pressurized heavy water reactors (PHWR). The Company successfully manufactures nuclear fuel from reprocessed uranium (in cooperation with Framatome (previously AREVA NP)) in compliance with the European regulations for manufacturing technology and the products manufactured. TVEL Fuel Company elaborated the in-house design of FA for PWR reactors — TVS-K fuel.

In recent years alongside with the increasing pressure on European NPPs operators, it is widely spoken out on the issue of the necessity to reduce the energy dependence on Russia, to diversify supply sources; which can be used as a means of competition restraint.

Due to increased competition in the fuel fabrication market, the initiatives of TVEL Fuel Company on improvement of technical and economic features of fuel, making TVEL FC products more attractive for its customers both on traditional fuel market for Russian-design reactors, and on the fuel market of Western-design PWR reactors, are extremely important.

[1] Taking into account the loading of nuclear fuel into reactors and physical start-up of Rostov NPP power unit No.4 and Leningrad NPP-2 power unit No.1 in December 2017.

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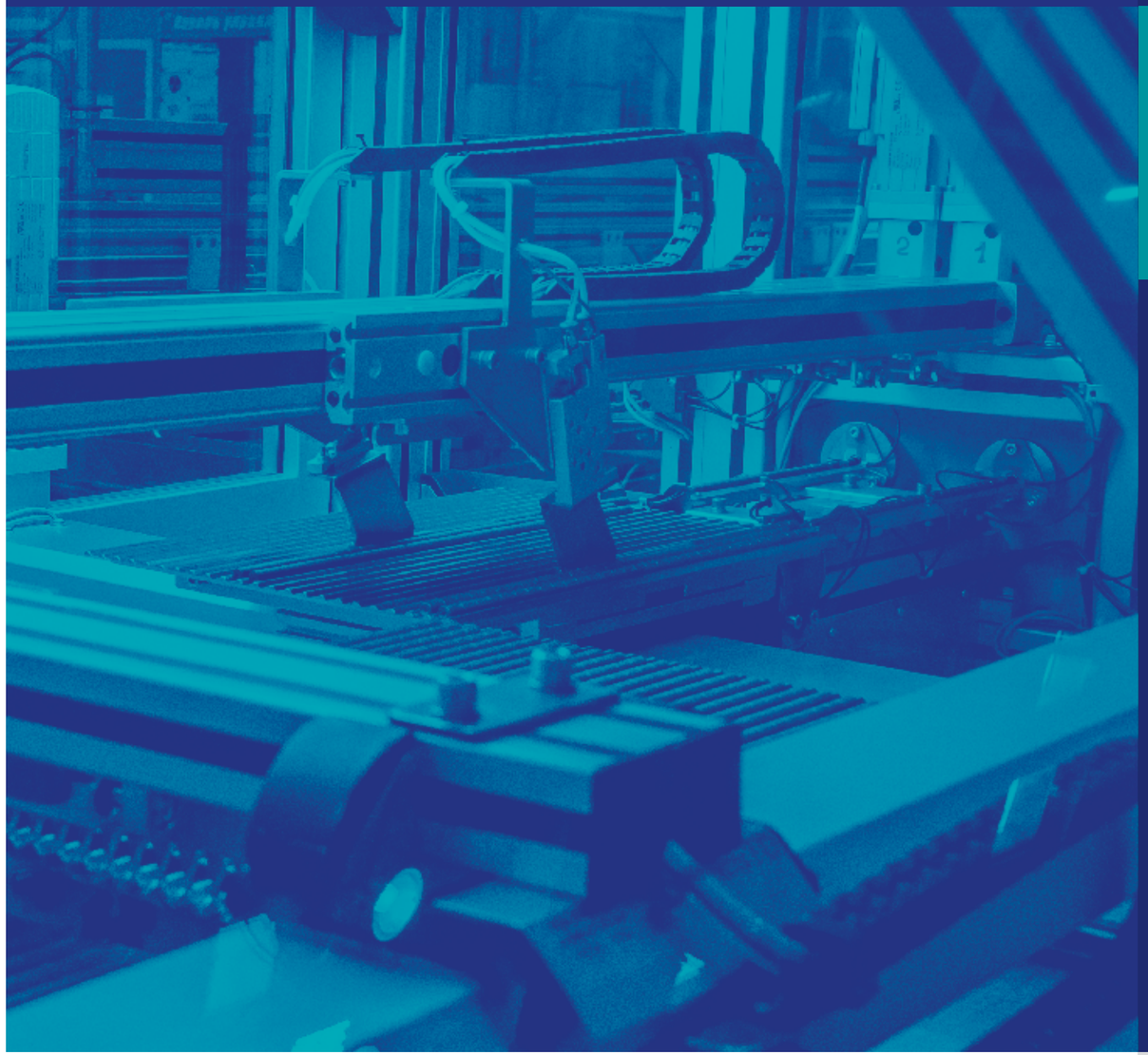

# TVEL Fuel Company in the Global Market of Nuclear Fuel for Power Reactors

Current supplies of nuclear fuel for power reactors designed in Russia

Current supplies of nuclear fuel and components in cooperation with AREVA

1 Number of units

Share of national nuclear power capacity


7 AFFORDABLE AND CLEAN ENERGY

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# Operating Results of TVEL Fuel Company in the NFC Front End Market

**Within the scope of contractual obligations, TVEL Fuel Company carries out a full range of works on the fulfilment of the legislative requirements established by supervisory authorities of the Customer's country and which are necessary for licensing of nuclear fuel and components for reactor core**

TVEL JSC uses an integrated approach to work in the world market of FE NFC. The assets of TVEL Fuel Company include all process cycles of nuclear fuel fabrication which makes it possible to offer products and services related to FE NFC in the form of package supplies, and also to take into account the current and perspective market trends and challenges in own production activity. The result of this is the flexibility of contract pricing and optimal transport logistics, while the reliability of supply is ensured by the presence of several enterprises specializing in various areas of FE NFC.

## KEY RESULTS 2017

**Nuclear fuel and components for Russian and western design NPPs**

- Contract documents signed:
  - for supply of fuel, components and engineering services for first and second turn units in Tianwan NPP (China);
  - supply of nuclear fuel to Haykakan Atomayin Electrakayan CJSC (Armenia), under which contract the FA reserve will be created;
  - addition to fuel supply to Ukrainian NPPs in 2018 with Energoatom State Enterprise National Nuclear Energy Generating Company (Ukraine);
  - fuel supply for Akkuyu NPP (Turkey);
  - fuel supply for Ostrovets NPP (Belarus);
  - engineering services related to introduction of the new generation fuel assemblies with optimized water-uranium ratio on the operating Paks NPP (Hungary) power units;
  - additional supply of TVS-K fuel for pilot operation at NPP Ringhals (Sweden) starting from 2019.
- Start up of nuclear fuel supply contract with El Dabaa NPP (Egypt).
- Creation of nuclear fuel reserves by customers to ensure diversification of supply source and energy supply security (Armenia, Czech Republic, Iran, Hungary).
- Continuation of licensing TVSA-T mod.2 in the Czech Republic and preparation for delivery and loading in Temelin NPP (Czech Republic).
- The license obtained for TVSA-12 fuel operation in Kozloduy NPP (Bulgaria) unit No.5;
- Continuation of cooperation with Framatome (previously AREVA NP) in terms of producing with Machine-Building Plant (MSZ PJSC) facilities nuclear fuel and components from reprocessed uranium according to Framatome technology for European NPPs with PWR.

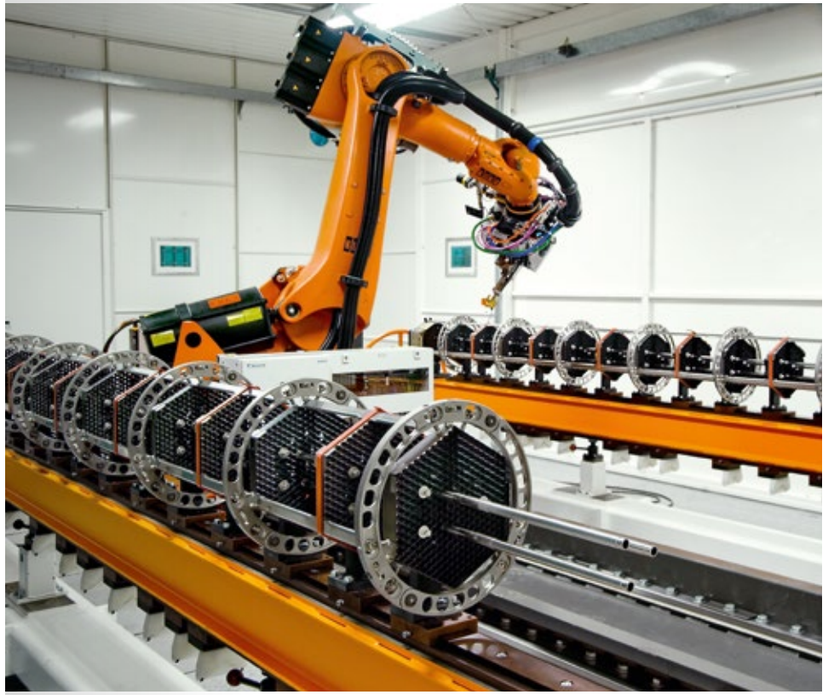
Table 3

**Key indicators of TVEL FC in the world market of the front end nuclear fuel cycle**

| Key indicators | Value |
|---|---|
| Export proceeds, USD bln | 1.2 |
| Export orders portfolio for products and services of FE NFC for a 10 year period, USD bln | 10.8 |



**Within the framework of international obligations for 2017, the Company obtained 70 one-time licenses (52 export and 18 import), the period of validity of three licenses from previously issued licenses was extended, and received two identification approvals of the Federal Service for Export Control of Russia (FSTEC), one of which — under the art. 20 FSTEC, as well as six authorizations from FGUP Gostekhstroi**



**Nuclear fuel and components for research reactors designed abroad**

- The contract was signed regarding fuel supply for reopened in Uzbekistan research reactor VVR-SM of the Institute of Nuclear Physics of the Academy of Sciences of the Republic of Uzbekistan, with an option of further regular supplies and introduction of improved uranium-molybdenum fuel.
- A number of contracts were signed with the foreign partners for qualification of zirconium fuel components, as well as supply of fuel components for research reactors of foreign design.
- Deliveries of uranium and zirconium components of nuclear fuel were carried out within the contracts concluded in 2015–2017.
- Start-up of the contract for nuclear fuel supply for experimental fast neutron reactor CEFR.

## GOALS AND PLANS IN THE MIDTERM

- Protection and strengthening of the position in the traditional nuclear fuel markets, implementation of the annual supply program.
- Implementation of the existing contracts, development of cooperation with foreign energy companies and industrial partners with the view of promoting TVS-K fuel at target markets.
- Promoting the development of nuclear power generation as one of the key components of green energy.
- Tenfold growth of revenue by the year 2030 in non-nuclear operations (including established businesses) in comparable terms of 2014.

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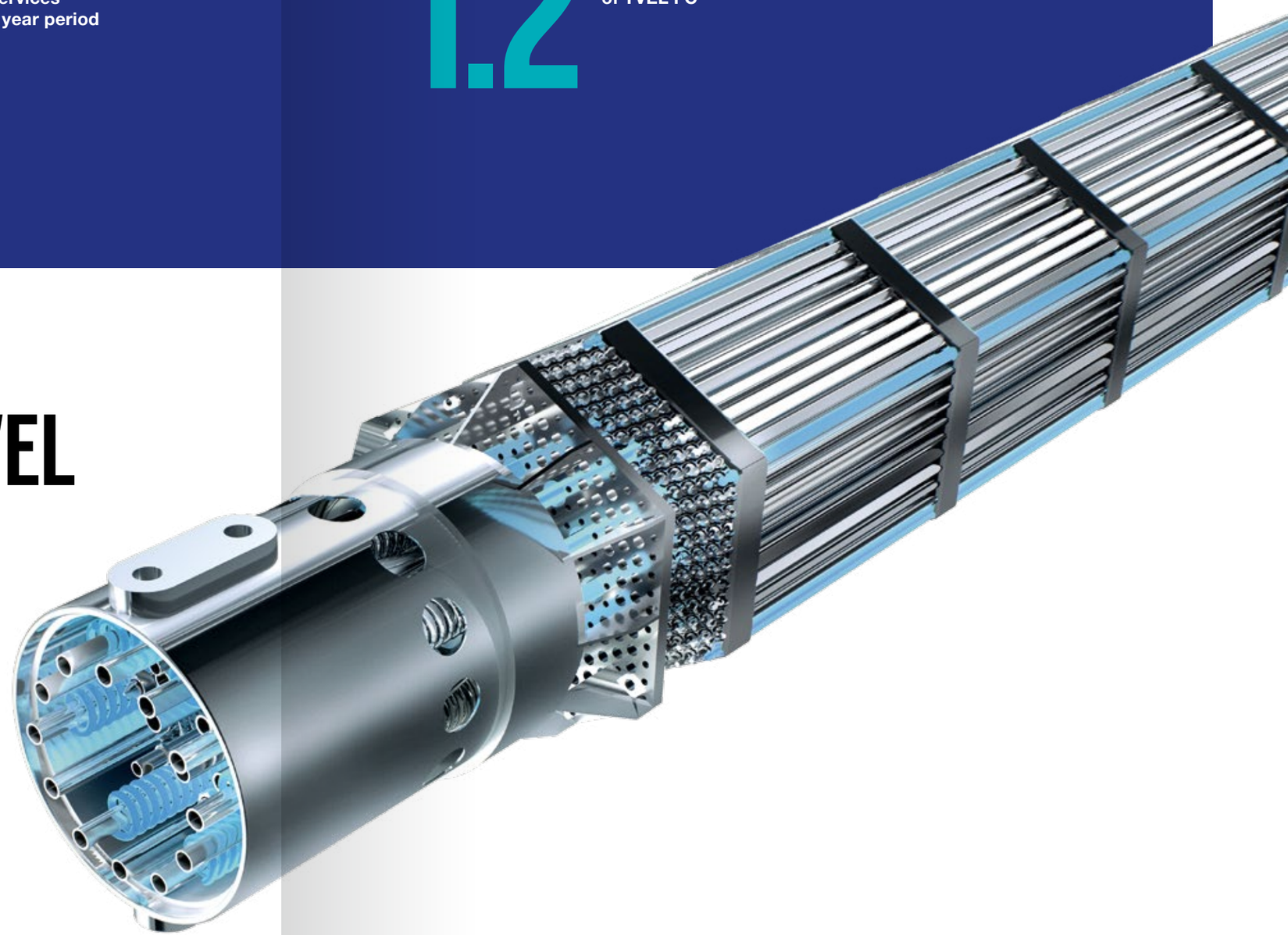
**10.8** USD bln
export orders portfolio
for products and services
of FE NFC for a 10 year period

**1.2** USD bln
export proceeds
of TVEL FC



# 2 Strategy of TVEL Fuel Company

# Mission and Values

**Meeting the requirements of the customers of TVEL Fuel Company both in the field of nuclear fuel cycle and in the related sectors, in strict compliance with requirements of safety, security, environmental and social awareness**

**Mission of TVEL Fuel Company**
Meeting the requirements of the customers of TVEL Fuel Company both in the field of nuclear fuel cycle and in the related sectors, in strict compliance with requirements of safety, security, environmental and social awareness[1].

**Strategic Vision of TVEL Fuel Company**
*Fuel Division* is the global leader in front end of NFC and the related fields.

Workers of TVEL Fuel Company are governed by *the Values* shared by all organizations and enterprises of ROSATOM State Corporation. These core values were formed throughout the history of development of the nuclear industry in Russia and they conform with the global approach to determination of the fundamental principles of the industry.

[1] Mission as a part of the development strategy of TVEL Fuel Company was approved by the Strategic Board of ROSATOM State Corporation.

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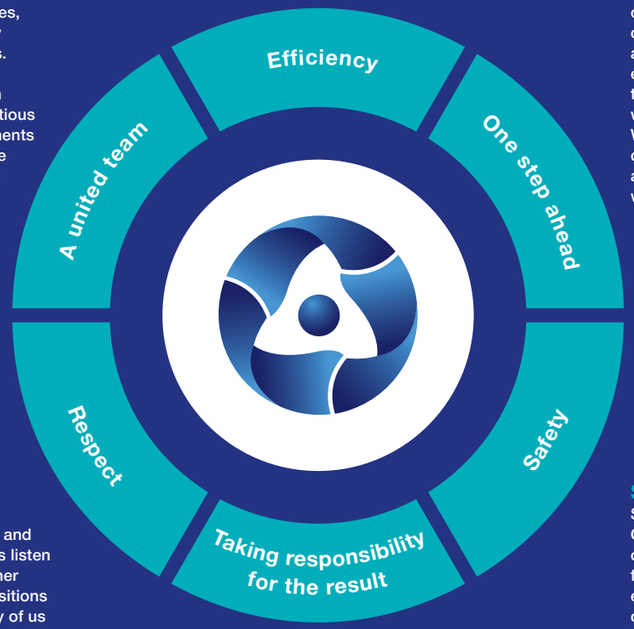
# Values of TVEL Fuel Company

### EFFICIENCY
We always look for the best solution. We are efficient in everything we do. When faced with a task, we use the company's resources as rationally as possible and always seek to improve the work processes. No obstacle can prevent us from finding the most efficient solution.

### A UNITED TEAM
We all are ROSATOM. We have common goals. Working as a team of likeminded colleagues, we can achieve truly extraordinary results. Together we stand stronger and we can meet our most ambitious goals. The achievements of our employees are the achievements of the Company.

### ONE STEP AHEAD
Our ambition is to be a leader in the global markets. We are always one step ahead in terms of technology, knowledge and qualifications of our employees. We can tell what tomorrow will bring and we stand prepared today. We are always learning and developing. Every day we attempt to do better than we did yesterday.




### RESPECT
We respect our customers, partners and suppliers. We always listen to and hear each other regardless of the positions and jobs that we any of us may have. We respect the history and traditions of the industry. The achievements of the past inspire us to new levels of success.

### SAFETY
Safety comes first. Our top priority in our operations is to ensure full safety of people and environment. When it comes to safety, every little thing matters — we know our safety rules, strictly follow them and never hesitate to crack down on safety violations.

### TAKING RESPONSIBILITY FOR THE RESULT
Each of us bears personal responsibility to the state, the industry, the colleagues and the customers for the result and quality of our work. We require excellence in everything we do. We praise the result, not the effort. A good result is the basis of our further progress.



# TVEL Fuel Company supports UN Sustainable Development Goals


**Konstantin Sokolov**
Vice-President
for Communication,
Administration
and Energy Efficiency,
Chairman of the Committee
on Public Annual Reporting
of TVEL JSC

In September 2015, the UN adopted the Sustainable Development Goals (17 global goals and 169 corresponding objectives), officially known as "Transforming Our World: the 2030 Agenda for Sustainable Development". These goals are aimed to contribute to prosperity while protecting the planet's environment. To achieve these Goals the joint efforts of the governments, private sector, civil society and the world citizens are required.

TVEL Fuel Company and its employees support the UN sustainable development goals. Being a socially responsible company, TVEL JSC aims to make a positive contribution to achievement of the goals that are closest to its activity: "Affordable and Clean Energy" and "Climate Action". Nuclear fuel produced by TVEL Fuel Company is operated by NPPs that command a large part in total power balance. Prime cost of electric power generated by NPP may compete with other types of power plants.

The most considerable advantage of NPP is the absence of emissions of aerosols and greenhouse gases in the atmosphere, which is primarily due to the high quality, environmental friendliness and reliability of our products.

The relevant information about the Company's contribution in UN goals achievement is marked with the pictograms in the Report.

Public Integrated Report of TVEL JSC was prepared in accordance with the International Integrated Reporting Framework and GRI Standards.

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# Strategy

**Development strategy and business plan of TVEL Fuel Company for the years 2015–2019 were adopted by the Strategic Board of ROSATOM in December, 2014. The strategy of TVEL Fuel Company sets core performance indicators for mid-term and long-term outlook till 2030**

**Priority Operation Areas**

TVEL Fuel Company faces the challenge to strength its presence in the world market of NFC fabrication and enrichment by 2030. Leadership of TVEL Fuel Company in the front end NFC market will be ensured by a series of projects being accomplished. First of all, such projects include promotion of the Russian design TVS-K fuel on the foreign market (for reactors designed abroad).

One of the innovative areas for NFC market is the Proryv project ("Breakthrough") at the facilities of SGChE JSC (Seversk, Tomsk region), with the construction of the Experimental Demonstration Energy Complex (EDEC), the main goal of which is to demonstrate stable operation of the full range of facilities ensuring the closure of the fuel cycle using fast natural-safety reactors.

Furthermore, TVEL Fuel Company carries out the following tasks with the view of FE NFC growth:

- accomplishment of the Nuclear Fuel Zero Failure project, within the framework of which the Company together with its partners conduct regular audits of nuclear fuel producers and NPPs, offering a reference fuel qualified at Russian NPPs;
- accomplishment of a series of projects on improvement of nuclear fuel consumer properties for operating NPPs;
- development of cooperation with European partners, China and India.

The key conditions for the development of the second core business is the presence in TVEL Fuel Company of the necessary infrastructure and production capacity, as well as the required equipment, licenses and qualified staff. Financial stability of TVEL Fuel Company is achieved through the development of non-nuclear business in conditions of challenges and changing market environment in FE NFC markets, additional workplaces are created. The growth in revenue from the "second core" must be facilitated by consolidation of scientific and design organizations of TVEL Fuel Company in a scientific-production association SPA Centrotech, as well as by entrance to adjacent markets.



Scheme 1

**Strategic targets of TVEL Fuel Company**

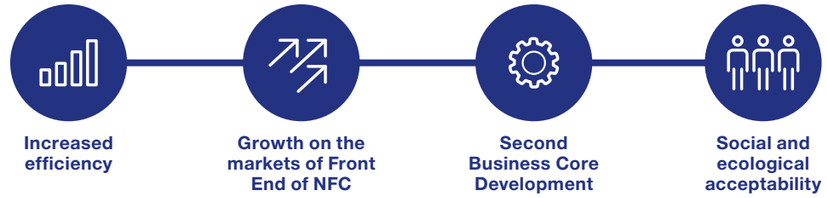


Table 4

**Goals correlation of ROSATOM and TVEL Fuel Company**

| Strategic goals of TVEL Fuel Company | Strategic goals of ROSATOM State Corporation: 1. Increase of the international market share | 2. Reduction of the cost of products and the lead time | 3. New products for Russian and international markets | Operational environment: Prevention of adverse environment impact |
|---|---|---|---|---|
| Growth on NFC Markets | ● | | ● | |
| Second Business Core Development | | | ● | |
| Effciency Improvement | | ● | | |
| Social and Ecological Acceptability | | | | ● |

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Following the achievement the strategic goal “Efficiency Improvement”, the priority is given to solving the tasks of compacting the production areas and managing the performance.

One of the striking examples of the concentration of production areas is the concentration of conversion cycle in Siberian Group of Chemical Enterprises (at the sublimate and radiochemical plants), which started in 2016. Under unfavourable global economic conditions with the price for natural uranium conversion service dropped and continuing to decrease, TVEL Fuel Company decided to withdraw the uranium conversion from Angarsk Electrolysis Chemical Complexand Chepetsky Mechanical Plantand concentrate this production at Siberian Group of Chemical Enterprises. A series of investment projects was accomplished in order to secure a stable operation of the branch conversion center. In particular, the modernization of fluorine production was carried out. As a result of this the conversion capacity was increased by 1.5 times.

One of the key projects is the transition of mechanical production from the facilities of Tochmash VPA JSC (Vladimir) to the site of KMZ PJSC (Kovrov, Vladimir region). At the end of January 2017, the Strategic Board of ROSATOM approved the concept of concentrating the production of Tochmash VPA JSC and KMZ PJSC. This solution will increase the production efficiency of these enterprises.

Performance management objectives include increasing productivity, reducing costs and optimizing resources.

The main priorities are still careful attitude to the environment, transfer of “clean” areas after nuclear production to future generations, introduction of non-waste technologies and reduction of the “nuclear legacy”.

In terms of ensuring social acceptability, TVEL Fuel Company’s activity is one of the successful examples of the implementation of the concept of creating territories of the advanced social and economic development (TASED), social and charitable programs (support and development of small and medium-sized business in cities, creation of new jobs, improvement of cities, etc.) in the territories of ROSATOM presence.

**Following the achievement the strategic goal “Efficiency Improvement”, the priority is given to solving the tasks of compacting the production areas and managing the performance**

The strategy of TVEL Fuel Company is oriented at achievement of the following indicators by the year 2030:

- Strengthening the presence in the global market of uranium enrichment and nuclear fuel fabrication services owing to manufacture of traditional products having good consumer properties and entry to new nuclear markets.
- Twofold growth of the revenue in comparable terms of 2014.
- Tenfold growth of revenue in non-nuclear businesses (including established businesses) in comparable terms of 2014.
- Threefold growth of labor efficiency in comparable terms of 2014.

**Drivers of growth and achievement of objectives in NFC markets:**

- supplies of nuclear fuel for new VVER units in the Russian Federation and abroad;
- global commercialization of TVS-K fuel;
- use of feed material RRM and RF;
- supplies of nuclear fuel and components for research reactors of western and Russian design;
- expansion of supplies of zirconium components.



Table 5
**SWOT analysis**

| Strengths | Weaknesses |
|---|---|
| ▸ High quality and reliability of products verified by its consumers | ▸ Need to address the problem of “nuclear legacy” and provision of nuclear and radiation safety |
| ▸ Reference of the products due to cooperation with Russian NPPs within the operation of new types of fuel, possibility to pass fuel qualification in RF | ▸ Social and environmental commitments in the regions of presence, rehabilitation of sites |
| ▸ Product management on all FE NFC cycles, control over production at all stages | ▸ Insufficient business diversification |
| ▸ Strong technical and scientific cluster that allows continuous improvement of nuclear fuel characteristics | |
| ▸ Financial stability due to efficient resource management on all FE NFC cycles | |
| ▸ Load following and increased fuel cycles due to fuel characteristics | |
| ▸ Flexible technological and commercial conditions of cooperation | |
| ▸ Price competitiveness of the products due to cost optimization | |
| ▸ Support on the part of ROSATOM and the state | |
| ▸ Recognizable brand | |

| Opportunities | Threats |
|---|---|
| ▸ Supply of nuclear fuel for new VVER units in the Russian Federation and abroad | ▸ Reduction of prices for the products and services of FE NFC |
| ▸ Expansion of PWR markets presence | ▸ Low rate of NPP capacities commissioning on the traditional markets |
| ▸ Expansion of cooperation with the South-East Asian countries | ▸ Competition with conventional and alternative power sources |
| ▸ Supply of nuclear fuel and components for research reactors | ▸ Growing tension on external markets, including VVER segment |
| ▸ Development of new modifications of nuclear fuel, improvement of fuel cycles and campaigns | ▸ Quantitative restrictions on Russian products on separate markets |
| ▸ Development of scientific and technological cooperation with foreign partners | ▸ Efforts made by the market players to improve the efficiency |
| ▸ Application of different types of raw material | ▸ Need for additional efforts to preserve prime cost benefits in conditions of inflation and volatility in currency exchange rates |
| ▸ Expansion of zirconium components supplies | |
| ▸ Scientific and technological support of the customer at the fuel operation | |
| ▸ Development on the markets of general industrial activities and future-oriented products | |

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Table 6
**Contribution of the results 2017 in achievement of the strategic goals of TVEL Fuel Company**

| Target | Project | Results | Effect |
|---|---|---|---|
| **Growth on NFC markets** | Fuel supply to NPPs of Russian design | ▸ Conclusion of contractual documents for supply of fuel, components and engineering services for NPPs abroad | ▸ Market development |
| | Fuel supply for fast neutron reactors, creation of the facilities ONFC and RU BREST *(the Proryv project)* | ▸ Successful completion of preliminary tests of a complex of carbothermic synthesis of nitrides that has no analogues in the world, made at the request of SGChE JSC for *the Proryv project*<br>▸ SGChE JSC completed successfully acceptance testing of 3 experimental fuel assemblies with mixed uranium-plutonium nitride fuel, the products were delivered to Beloyarsk NPP and loaded into BN-600 nuclear reactor core | ▸ Development prospects |
| | Promotion of fuel components produced using Russian and foreign technologies to world markets | ▸ A number of contracts were signed with the foreign partners for qualification of zirconium fuel components, as well as supply of fuel components for research reactors of foreign design | ▸ Market development |
| | Promotion of TVS-K to foreign markets | ▸ Continuation of works on promotion of TVS-K fuel for power reactors PWR 17x17 of foreign design | ▸ Market development |
| | Design and improvement of nuclear fuel and reactor cores for nuclear power units | ▸ Successful completion of licensing the modified fuel type TVSA-12 for unit No. 5 Kozloduy NPP (Bulgaria) | ▸ Market retention |
| **Second business core development** | Creation and development of new businesses | ▸ Integrator companies on new areas such as Additive Technology and Energy Storage Devices were created within TVEL Fuel Company's framework<br>▸ ChMP JSC and Severstal JSC signed the contract for calcium wire supplies<br>▸ The Company signed a 5-year contract with Hermit GmbH (Germany) for supply of a large batch of titanium mill products of ChMP JSC<br>▸ Creation in cooperation with QSIL GmbH (Germany) of a joint venture for the production of highly pure quartz concentrate<br>▸ Completion of works on the pilot model of second generation metal powder 3D printer<br>▸ Significant increase of the revenue from sales of automotive catalysts and neutralizers produced by Ecoalliance LLC | ▸ Entering new markets |
| | Concentration of production facilities of VPA Tochmash JSC and KMZ PJSC | ▸ Start-up of the investment project "Concentration of Production Facilities of VPA Tochmash JSC and KMZ PJSC" (Vladimir region) | |



Table 6 *(continued)*
**Contribution of the results 2017 in achievement of the strategic goals of TVEL Fuel Company**

| Target | Project | Results | Effect |
|---|---|---|---|
| **Efficiency improvement** | Increasing the efficiency of industrial sites areas use | ▸ In 2017, within the framework of the industry project "Branch Topology Concept" and with the aim of solving problems on the concentration of industries, TVEL Fuel Company initiated a separate program "Increasing the efficiency of areas use in TVEL Fuel Company".<br>▸ The Company established the list of objects unclaimed for the implementation of the Company's strategy with their subsequent inventory made and the costs for their maintenance determined.<br>▸ The concept of production concentration and further use of unclaimed objects is prepared. | ▸ Efficiency improvement |
| | Development of new Gas Centrifuges | ▸ KMZ PJSC and SPA Centrotech LLC started serial production of the modernized gas centrifuge GC-9+. In terms of productivity, modernized GC significantly outperforms the previous GCs, while production cost is lower. | |
| | Infrastructure cost management | ▸ The Company started the project on transformation of corporate functions. | |
| | Rehabilitation of contaminated areas | ▸ VNIINM JSC developed new technologies and mobile facilities for the decontamination of radiation hazardous objects that are being decommissioned.<br>▸ Successful progress of the works on liquidation of the nuclear "heritage" facilities within he Federal target program "Nuclear Radiation Safety 2" ( FTP NRS-2): preservation of B-1 and B-25 basins, ground storage areas of solid radioactive waste at the facility 16 KhMZ JSC, SGChE JSC, decommissioning of the unit Y-5, facility 53 at VNIINM JSC (completed in 2017), decommissioning of the facility 804 at Angarsk Electrolysis Chemical Complex (AECC JSC), decommission of FA production for IUGR at NCCP JSC. | ▸ Maintenance of environmental security and social awareness in the cities of TVEL Fuel Company presence |
| **Social and environmental acceptability** | Program for regional work and social projects | ▸ Organizationals works on TASED creation in Novouralsk and Seversk before signing the RF Government Regulation about their establishment.<br>▸ Opening of School Technoparks in the cities of TVEL Fuel Company operations — Zelenogorsk, Novouralsk, Seversk and Glazov. | ▸ Maintenance of environmental security and social awareness in the cities of TVEL Fuel Company operations |

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Table 7

**Factors of long-term business sustainability and cooperation with the customers**

| Factors | Description |
|---|---|
| **Safety and reliability of fuel** | ‣ Fuel safety is the strategic priority of TVEL Fuel Company.<br>‣ The Company makes considerable investments in safety of fuel.<br>‣ Implementation of the zero failure program. |
| **Creation of zero-waste technologies, and rehabilitation of sites** | ‣ SGChE JSC completed the five-year work on improving the technology of preparation of liquid radioactive wastes for deep burial.<br>‣ Bochvar Institute (VNIINM JSC) developed new technologies and mobile facilities for the decontamination of radiation hazardous objects that are being decommissioned.<br>‣ Works on liquidation of the nuclear “legacy” facilities within FTP NRS-2: preservation of B-1 and B-25 basins at SGChE, decommissioning of the facility 53 at VNIINM JSC, decommissioning of the facility 804 at AECC. |
| **High quality** | ‣ Production automation, minimization of the human errors.<br>‣ Technological improvement of instrumentation operations.<br>‣ Compliance with the requirements of international quality management. |
| **Development of the second business core** | ‣ Increase of the Company’s stability in conditions of the nuclear business cyclicality.<br>‣ Expansion of the Company’s financial stability base. |



# Business model

**The value generated by TVEL Fuel Company involves not only marketable products and increase of profitability of the Company, but also a great variety of economic, social and environmental effects of activities. TVEL Fuel Company activity depends on a great number of external and internal factors, it provides for close cooperation with stakeholders**

The value generated by TVEL Fuel Company involves not only marketable products and increase of profitability of the Company, but also a great variety of economic, social and environmental effects of activities. TVEL Fuel Company activity depends on a great number of external and internal factors, it provides for close cooperation with stakeholders.

This cooperation is characterized by the fact that tangible and intangible resources used by the Company (financial, natural, manufactured, human, social and intellectual capitals[1]), are controlled both by TVEL Fuel Company and its stakeholders. Conversion of capitals in the course of activities is of great importance to the Company and its stakeholders.

Business model describes the activity of TVEL Fuel Company for integrated value creating as a system to the capital employed, production process, products and results obtained. The business model is aimed at achieving the strategic goals through implementation of competitive advantages. The business model takes into account the risks typical for the activities of TVEL Fuel Company, possibilities and risk management capabilities of the Company.

Business model includes: capitals (resources and relations) used by TVEL Fuel Company, manufactured products and services, as well as results of TVEL Fuel Company operations, providing for capitals changes, including increment of resources being used and consolidation of relations with stakeholders.

[1] According to the International Integrated Reporting Framework “capital” means resources and relations being the sources and the results of value creation processes.

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# Business model of TVEL Fuel Company

## Resources

**FINANCIAL CAPITAL**
- Undistributed profits and monetary assets
- Accumulated reserves of TVEL FC
- Consolidated investment resources
- Industry reserves
- Means of the Federal target programs
- Loans, credits, subsidies

**MANUFACTURED CAPITAL**
- High technology production basis, materials (including regenerated and waste uranium)
- Public infrastructure (roads, communication facilities, etc.)

**INTELLECTUAL CAPITAL**
- Intellectual property assets of TVEL FC
- Global achievements of science and engineering
- Domestic projects
- National intellectual resources

**HUMAN CAPITAL**
- Staff
- Joint ventures personnel
- Potential workers
- Youth
- Experts, consultants
- Long-service employees, retirees

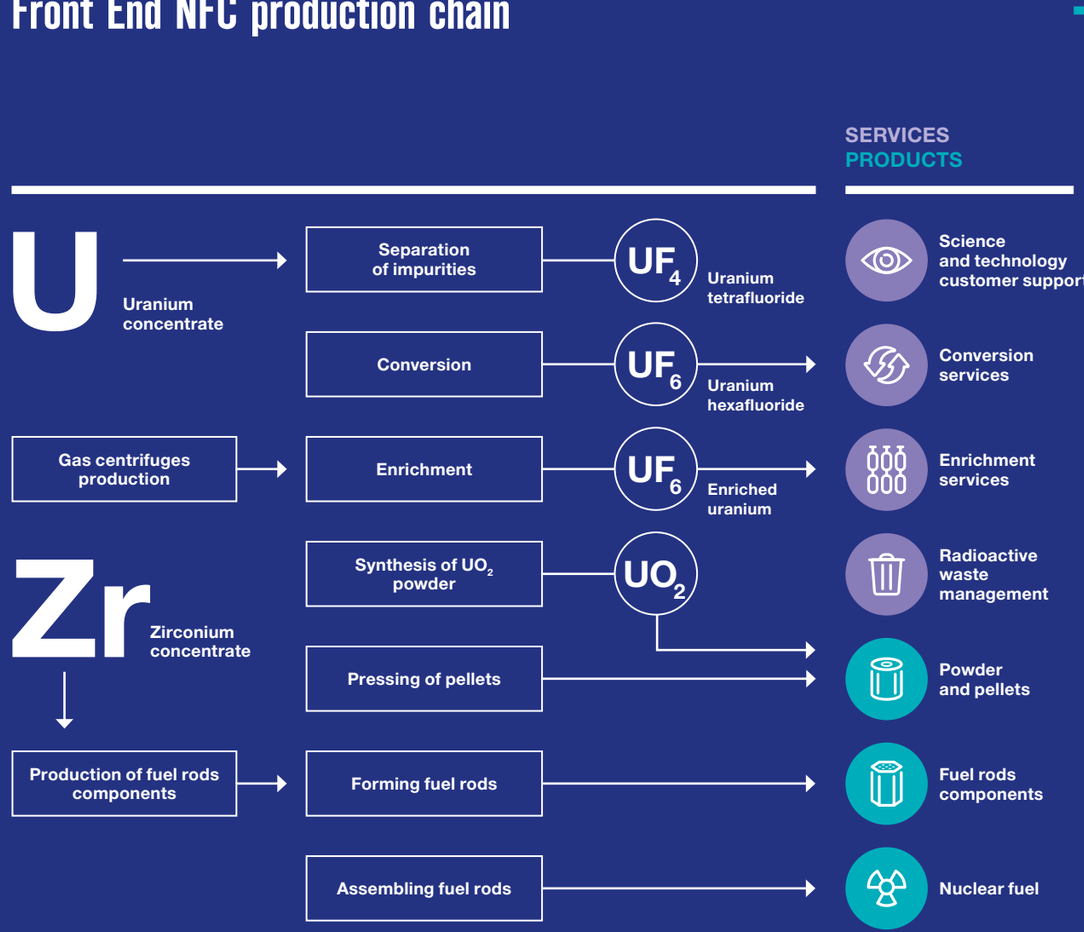
**SOCIAL AND RELATIONSHIP CAPITAL**
- Reputation of TVEL FC and its enterprises
- Position in the Global Market of FE NFC
- Strong relations with Russian and foreign customers and suppliers
- Competitive and high quality outputs
- Recognisable and reputable brand name
- Internal relations of TVEL FC
- Public image of the country and nuclear industry
- Interrelations in supply chain
- Initiatives of the state, ROSATOM

**NATURAL CAPITAL**
- Proprietary and leasable land resources
- Environment
- Natural raw materials

- Internal resources
- External resources



# Front End NFC production chain




## Second Core

- Metallurgy
- Chemical industry
- Mechanical engineering
- Power industry

## Main Products

- Calcium injection wire
- Titanium
- Lithium products
- Autocatalysts
- Isotope products

# Results 2017

- Internal resources
- External resources

### FINANCIAL CAPITAL

**55.0** RUB bln Net income

**20.5** RUB bln Paid dividends

### MANUFACTURED CAPITAL

**684.7** RUB bln Net assets

### INTELLECTUAL CAPITAL

**108** Number of new registered intellectual property objects

### HUMAN CAPITAL

**61** RUB thous. Social programs expenditures per 1 employee

**0.06** LTIFR

**4%** Average salary growth

### SOCIAL AND RELATIONSHIP CAPITAL

**14.9** RUB bln Gross tax liabilities

**286.9** RUB mln Charitable contributions

### NATURAL CAPITAL

**2.2** RUB bln Environmental expenses

**0** New areas contaminated with radionuclides

**0** INES rated events

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# Risk Management

**Risk Management of TVEL Fuel Company is based on continuous monitoring of its external and internal environment, complex analysis of threats and opportunities affecting achievement of both economic and social goals of the Company**

Risk Management of TVEL Fuel Company is based on continuous monitoring of its external and internal environment, complex analysis of threats and opportunities affecting achievement of both economic and social goals of the Company.

Main goal of the Risk Management System (RMS) is identification, assessment and minimization of threats that may affect the results of activities of the Company.

Main RMS objectives are the following:

- timely identification of risks that may affect the achievement of the goals of TVEL Fuel Company;
- support of stable financial environment of the companies of TVEL Fuel Company with due consideration of the risks;
- continuous monitoring of risks and control over implementation of the plans of arrangements aimed at reduction of likelihood of risks occurrence and minimization of the consequences of such occurrences.

The Risk Management System of TVEL Fuel Company is built and optimized in accordance with the most modern world practices, principles and approaches reflected in the international standard ISO 31000:2018 (over the past few years has been developed by the International Organization for Standardization), as well as in the concept of COSO Enterprise Risk Management (issued in 2017, it has applied significance in building the relationship between risk management and the value of the business).

Current trends in risk management assume a transition from formal description of risks to the integration of risk management mechanisms into business processes, mainly related to the adoption of strategic management decisions.



Analysis of the risks affecting the achievement of target values of financial and economic activities of TVEL JSC and the companies forming TVEL Fuel Company management system shall be carried out at the stage of development of the budget and medium-term plans, and at the stage of their control and performance forecast, as well as at the stage of making strategic management decisions, selecting the best ways to implement the key projects.

In 2017, TVEL JSC carried out organizational work on its risk management adaptation to the best world practices and harmonization of the local regulatory acts in the enterprises of TVEL Fuel Company.

In the reporting year, TVEL JSC issued the order on updating the key risks for the period 2017–2019. The Company identified the factors of key risks, risk management methods, assigned responsible persons for risk management. This order was extended to all enterprises included in the management contour of TVEL Fuel Company.

In 2017, within the context of risk management on certain areas of activity, TVEL JSC developed and approved the following regulatory acts:

- Strategy of currency risk management in TVEL JSC;
- Standard of TVEL Fuel Company represents the Quality Manual (now a product quality document includes a separate detailed section on risks);
- Order No. 4/49-п dated 08.02.2017 “On the implementation of the Guidelines for conducting an analysis of the impact of organizational changes on safety of the nuclear facilities of TVEL JSC and the companies forming TVEL Fuel Company management system”.

In 2017, TVEL Fuel Company also introduced an automatic system for risk assessment regarding the investment projects.

Plans on further development of the RMS for 2018 include introduction of a project risk management system, as well as development and application of an early response and risk monitoring system.

Table 8

**Participants of TVEL FC risk management processes and their roles**

| CRMS Participants | Functions of RMS members in risk management |
|---|---|
| **President of TVEL JSC** | ‣ Approval of the risk management policy of the Company;<br>‣ Approval of the list of key risks;<br>‣ Appointment of key risks holders and distribution of responsibility for risks management;<br>‣ Approval of the limits of particular risks, strategies, programs of particular risks management;<br>‣ Consideration of the issues related to distribution of authorities and responsibilities for particular risks management. |
| **Risk holders (Responsible for risks management)** | ‣ Identification and assessment of risks;<br>‣ Development of key risk indicators;<br>‣ Development and implementation of programs for particular risks management. |
| **Risk Officer of TVEL JSC** | ‣ Organisation and methodological support of risks identification;<br>‣ Organization and methodological support of the process of development of risk management activity. |

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Table 9
**Management of TVEL Fuel Company Key Risks**

| | Risk | Risk factors | Risk management mechanisms | Trends in likelihood of risk occurrence in the reporting year | Trends in risk significance in the reporting year |
|---|---|---|---|---|---|
| 1 | **Risk of NFC product/ service sale volumes reduction** | ▸ Delays in commissioning of power units.<br>▸ Transition to NF fabrication with increased long-term performance. | ▸ Improvement of fuel technical characteristics and introduction of new types of fuel, improvement of fuel economic characteristics.<br>▸ Promotion of products in new market segments. | ○ | ○ |
| 2 | **Price and currency risks** | ▸ Reduction of prices for the products and services of TVEL Fuel Company due to changes of market prices for natural uranium and its conversion and enrichment services.<br>▸ Reduction of prices for the products and services of TVEL Fuel Company due to changes of prices deflator indices.<br>▸ Mismatch in assets and liabilities denominated in the same currency.<br>▸ Growth of volatility courses of the main world currencies (Euro, dollar). | ▸ Development and introduction of the strategy of natural hedging of currency risks | ○ | ↑ |
| 3 | **Risk of failure on the part of counterparties (suppliers, customers) to fulfil obligations in full and on time** | ▸ Decreased financial and economic stability of customers/ suppliers. | ▸ Provision by the contracts of payment methods and/ or methods to secure obligations to reduce the credit risk level, including but not limited to a letter of credit, advance payment (100% if possible, but no less than 10%), funds reservation, provision by the counterparty of bank guarantee or guarantee of payment equal to the amount of the granted trade credit under the contracts providing for deferred payment for the delivered products/services.<br>▸ Monitoring of financial standing of the counterparties with the purpose to detect any signs of changes in financial standing, leading to changes in the level of the credit risk and/or the measures of the credit risk management.<br>▸ Qualification of counterparts using non-financial indicators. | ○ | ○ |



Table 9 *(continued)*
**Management of TVEL Fuel Company Key Risks**

| | Risk | Risk factors | Risk management mechanisms | Trends in likelihood of risk occurrence in the reporting year | Trends in risk significance in the reporting year |
|---|---|---|---|---|---|
| 4 | **Risk of increase of costs of fabrication, enrichment and conversion services** | ▸ Changes in service tariffs of natural monopolies, sole suppliers.<br>▸ Reduced equipment loading level.<br>▸ Appearance of unforeseen weak points in production chain.<br>▸ Incorrect information on resource state. | ▸ Application of the principles of the Uniform Industrial Procurement Standard of ROSATOM while working with suppliers.<br>▸ Implementation of ROSATOM Production System.<br>▸ Implementation of the long-term programs and investment projects aimed at optimization of engineering and production processes.<br>▸ Development and introduction of the programs of efficiency increase at all enterprises of the Company.<br>▸ Adoption of production cost management concept in order to personalize the costs.<br>▸ Long-term forecasts of the demands and production capacity balance (together with ROSATOM and relative divisions of ROSATOM State Corporation).<br>▸ Stock optimization and turnover increase. | ○ | ↓ |
| 5 | **Risk of nuclear, radiation safety** | ▸ Violation of requirements in environment protection and nuclear radiation safety.<br>▸ Insufficient level of emergency preparedness.<br>▸ Lack of resources for decommissioning of nuclear and radiation hazardous facilities, securing nuclear and radiation security, etc. | ▸ Modernization and automation of facilities, safe operation management.<br>▸ Decommissioning of nuclear and radiation hazardous facilities of TVEL Fuel Company, as well as the “nuclear heritage” objects using the funds of FTP NRS-2 and the sectoral reserves.<br>▸ Professional development of personnel.<br>▸ Continuous monitoring of nuclear and radiation safety state.<br>▸ Setting and implementation of tasks and objectives, and elaboration of measures aimed at reduction of risks in the field of NRS.<br>▸ Complex and technical inspections. | ○ | ○ |
| 6 | **Risk of environmental safety** | ▸ Inability to comply with the requirements to environment protection. | ▸ Setting of tasks and objectives, and elaboration of measures aimed at reduction of risks in the field of environment protection, operational health and labor safety.<br>▸ Review of draft regulations containing requirements to environment protection. Interpretations of the practical application of the requirements. | ○ | ○ |

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Table 9 *(continued)*

**Management of TVEL Fuel Company Key Risks**

| Risk | Risk factors | Risk management mechanisms | Trends in likelihood of risk occurrence in the reporting year | Trends in risk significance in the reporting year |
|---|---|---|---|---|
| | ▸ Insufficient level of emergency preparedness.<br>▸ Lack of resources for implementation of environmental safety actions. | ▸ Implementation of actions aimed at safety improvement using special reserve funds of ROSATOM State Corporation.<br>▸ Emergency response drills and personnel training, provision of information with the purpose of unscheduled inspections.<br>▸ Comprehensive and technical inspections, audits, ecological monitoring.<br>▸ Improvement of the integrated system of environmental safety management (ISO 14001:2004), and occupational health and industrial safety management (OHSAS 18001:2007). | | |
| ❼ **Risk of personnel health and safety** | ▸ Violations of safety requirements.<br>▸ Hazardous and harmful production factors.<br>▸ Violation of the corporate code of conduct. Failure to comply with work and rest schedule.<br>▸ Lack of resources for safety actions implementation. | ▸ Improvement of safety culture.<br>▸ Implementation of actions to prevent injuries.<br>▸ Promotion of safe labor.<br>▸ Provision of the Company's staff with personal protective equipment.<br>▸ Complex and technical inspections, audits.<br>▸ Setting of tasks and objectives, and elaboration of measures aimed at reduction of risks in the field of industrial safety.<br>▸ Planning of costs for labor protection in accordance with the Industrial Agreement.<br>▸ Improvement of the integrated professional (labor safety), industrial and environmental safety management system (ISO 14001: 2004; OHSAS 18001:2007). | ○ | ○ |
| ❽ **Risk of industrial safety violation** | ▸ Insufficient level of emergency preparedness.<br>▸ Lack of resources for safety actions implementation. | ▸ Emergency response drills.<br>▸ Complex and technical inspections.<br>▸ Performance review of outside emergency response teams.<br>▸ Setting of tasks and objectives, and elaboration of measures aimed at reduction of risks in the field of industrial safety.<br>▸ Reservation of funds and resources, public liability insurance.<br>▸ Improvement of the integrated professional (labor safety), industrial and environmental safety management system (ISO 14001: 2004; OHSAS 18001:2007). | ○ | ○ |



Table 9 *(continued)*

**Management of TVEL Fuel Company Key Risks**

| Risk | Risk factors | Risk management mechanisms | Trends in likelihood of risk occurrence in the reporting year | Trends in risk significance in the reporting year |
|---|---|---|---|---|
| ❾ **Social and political risks** | ▸ Events (political conflicts and/or mass social protests) resulting in substantial change in the parameters of actions of TVEL Fuel Company and its enterprises, for instance, missed deadlines of commissioning or cancellation of construction, unscheduled termination of operating activity, damage to goodwill of TVEL Fuel Company and its governance. | ▸ Implementation of actions aimed to mitigate the risks of social and political tension in the regions of presence.<br>▸ Cooperation with regional and municipal public authorities on issues relating to the territories' development, regional taxes gain and maintenance of social and economic stability.<br>▸ Implementation of charitable social efforts in the cities of TVEL Fuel Company's presence.<br>▸ Formation of the system of multi-level internal (including on a cascade basis) and external communications.<br>▸ Holding of social forum-dialogues in the regions of presence of the enterprises of TVEL Fuel Company. | ○ | ↓ |
| ❿ **Reputation risk** | ▸ Large-scale accidents in nuclear sector.<br>▸ Distribution of negative information about ROSATOM State Corporation, its enterprises.<br>▸ Mass protests against nuclear power engineering.<br>▸ Election campaigns in regions and cities of presence.<br>▸ Construction of burial sites for radioactive wastes in the regions of presence of TVEL JSC subsidiaries. | ▸ Observance of the industrial regulation concerning organization of delivery of information to the public in case of emergencies constituting a threat to business and social reputation of ROSATOM State Corporation.<br>▸ Implementation of the Uniform information policy of TVEL Fuel Company of ROSATOM.<br>▸ Integrated communications.<br>▸ Implementation of target communication programs to promote products and services of TVEL JSC and its subsidiary companies.<br>▸ Formation of corporate culture values and implementation of the project "Public response to ROSATOM values".<br>▸ Enhanced activity of the information conciliatory committees in municipal districts of the regions of presence of TVEL Fuel Company. | ○ | ↓ |

↑ Growth ↓ Decrease ○ Without change

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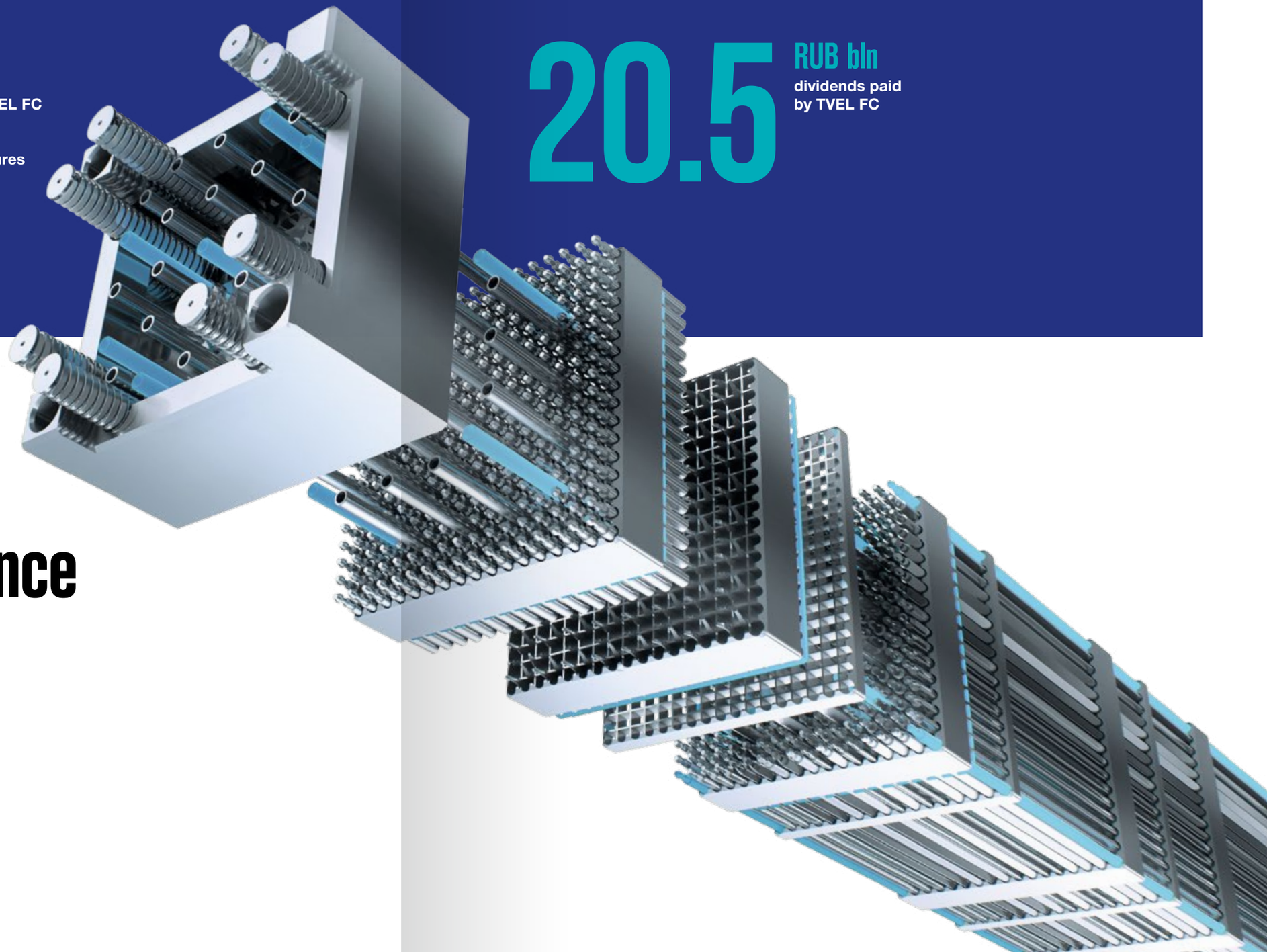
**2.7** **RUB bln**
total amount saved by enterprises of TVEL FC from procurement through public competitive procedures

**20.5** **RUB bln**
dividends paid by TVEL FC



# 3 Governance

# Corporate Governance

**Principal direction for corporate governance improvement is to ensure rapid decision-making by governing bodies along with detailed consideration of the matters which enables efficient activities of TVEL JSC and its subsidiaries**

In corporate governance TVEL JSC (further the Company) adheres to the policy of compliance with Russian and international standards, as well as with ROSATOM corporate governance practice which ensures the unity of nuclear industry enterprises management.

Principal direction for corporate governance improvement is to ensure rapid decision-making by governing bodies along with detailed consideration of the matters which enables efficient activities of TVEL JSC and its subsidiaries.

Measures taken by TVEL JSC to improve the corporate governance:

- Exclusion to the extent possible of the circulation of paper media applied for convening meetings and for submission to the Board of Directors of materials on the agenda. The decision-making process by the management bodies is implemented through the Uniform industry-specific electronic document management system.
- Local regulatory acts are being amended with the purpose to reduce the time and improve the quality of corporate paperwork.

In the reporting year the system of corporate governance in TVEL Fuel Company was focused on improvement of interaction between the governing bodies, and increase of their efficiency. Similar plans remain for the next year.

In the course of corporate policy implementation the Company coordinates and controls subsidiary companies activity in production, scientific and research, investment, financial, price, selling, social and personnel fields. Legal relations between TVEL JSC and subsidiary companies in decision making procedures in the process of production economic activity are based on the approved regulations on interaction of ROSATOM with TVEL JSC, as well as interaction of TVEL JSC with its subsidiaries.

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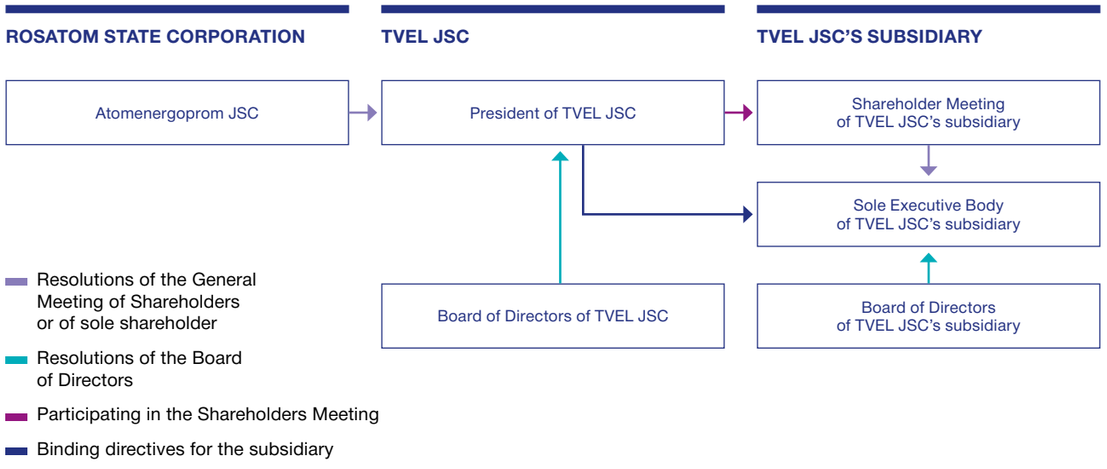
Scheme 2

**Structure of TVEL JSC corporate governance bodies**






TVEL JSC is not a public joint-stock company, and the Company discloses all the required information on the website: *www.e-disclosure.ru/portal/company.aspx?id=400* (in conformity with the Regulation on Disclosure of Information by the Issuers of Equity Securities) on a voluntary basis, assuming no obligations on regular and required disclosure, namely:

- the articles of association, amendments and supplements thereto, annual reports, annual financial statements (including audit reports);
- decisions on issuance (additional issuance) of securities;
- information about approval of annual financial statements;
- explanatory notes to annual financial statements;
- audit reports;
- lists of affiliates;
- notices of disclosure of the list of affiliates and acquisition of more than 20% of voting shares in other joint-stock company.

The basic documents regulating the activity of the corporate governance system are the Articles of Association of TVEL JSC and the Regulations on the Board of Directors of TVEL JSC.

TVEL JSC puts into practice some provisions of the Corporate Governance Code recommended by the letter dated April 10, 2014 No 06-52/2463 of the Central Bank of Russia, with due regard to specific character of the legal status of ROSATOM set by legal regulatory acts of the Russian Federation, providing for unity of nuclear industry enterprises management.

## SCHEME OF TVEL JSC CORPORATE GOVERNANCE BODIES

TVEL JSC governance bodies are formed in accordance with the Articles of Association of the Company.

Decisions on the issues referred to the competence of the General Meeting of shareholders are taken by the sole shareholder of TVEL JSC — Atomenergoprom JSC.

The supreme executive bodies of the subsidiaries of TVEL Fuel Company are general meetings of shareholders (members). The procedure of decision-making at general meetings of shareholders (members) of the companies included in TVEL Fuel Company is determined by internal regulations on these bodies.

The governance bodies of TVEL JSC and the companies governed by TVEL Fuel Company include the boards of directors and the sole executive bodies acting on the ground of relevant regulations approved by the general meetings of shareholders.

**In the reporting year the system of corporate governance in TVEL Fuel Company was focused on improvement of interaction between the governing bodies, and increase of their efficiency. Similar plans remain for the next year**

The governance bodies in the companies of TVEL Fuel company include audit committees[1], operating on the ground of relevant regulations approved by the general meetings of shareholders (members).

No committees and commissions operated within the Board of Directors of the Company during the reporting period.

[1] Audit Committees are active in MSZ PJSC, NCCP PJSC, KMZ PJSC, RusAt LLC.

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**The supreme executive bodies of the subsidiaries of TVEL Fuel Company are general meetings of shareholders (members). The procedure of decision-making at general meetings of shareholders (members) of the companies included in TVEL Fuel Company is determined by internal regulations on these bodies**

## BOARD OF DIRECTORS

The Board of Directors plays a key role in strategic management of TVEL JSC and TVEL Fuel Company in general. The Board of Directors is formed by the Sole Shareholder of TVEL JSC — Atomenergoprom JSC with due regard to qualification and expert knowledge that are required to solve the specified problems.

The Board of Directors consists mainly of outside directors (not the employees of the Company), professionals who have wide experience in the industry and understanding of the specifics of the nuclear industry and the Company activities.

From January 1, 2017 till September 25, 2017 the members of the Board of Directors were the following persons:

- Barabanov Oleg Stanislavovich;
- Zalimskaya Lyudmila Mikhaylovna;
- Korogodin Vladislav Igorevich;
- Lokshin Aleksandr Markovich;
- Solomon Nikolai Iosifovich;
- Olenin Yuri Alexandrovich.

By the decision of the Sole Shareholder of TVEL JSC No. 40 dated September 25, 2017 the following seven members were elected to the Board of Directors:

- Barabanov Oleg Stanislavovich;
- Zalimskaya Lyudmila Mikhaylovna;
- Korogodin Vladislav Igorevich;
- Lokshin Aleksandr Markovich;
- Olenin Yuri Alexandrovich;
- Solomon Nikolai Iosifovich;
- Nikipelova Natalia Vladimirovna.

By the decision of the Sole Shareholder of TVEL JSC No. 41 dated November 1, 2017, Lokshin Aleksandr Markovich was excluded from the Board of Directors.

Members of the Board of Directors are not shareholders of TVEL JSC. In 2017, members of the Board of Directors committed no transactions on acquisition or alienation of the Company's shares. Information on TVEL JSC shareholding must be disclosed by the candidates to the position of the member of the Board of Directors at the time of filling the consent form for election. Biography of the members of the Board of Directors is available in the interactive version of the Report.

There are no independent members in the Board of Directors within the meaning of the Corporate Governance Code of TVEL JSC.

In accordance with the Articles of Association of TVEL JSC the decision on payment of remuneration to the members of the Board of Directors of the Company falls within the competence of the General Meeting of Shareholders (decision of the Sole Shareholder of TVEL JSC — Atomenergoprom JSC).

No remuneration and compensation of the expenses related to performance of obligations were provided for the members of the Board of Directors of TVEL JSC in 2017. All members of the Board of Directors of the Company get salary according to the place of their primary business.

## REPORT OF THE BOARD OF DIRECTORS OF TVEL JSC ON THE RESULTS OF THE COMPANY DEVELOPMENT IN THE PRIORITY FIELDS

In 2017, the Board of Directors held 20 absentee meetings and made decisions[1], on the most important issues of TVEL JSC activity, including:

- approval of the budget and scheduled financial-economical indicators of activity of TVEL JSC;
- approval of recommendations to the Sole Shareholder concerning net income distribution following the results of 2016;
- approval of organizational structure of TVEL JSC;
- approval of recommendations to the Sole Shareholder concerning dividend payment following the results of nine months of the reporting year;
- termination of membership in ALVEL a.s. (ALVEL JSC);
- approval of recommendations to the Sole Shareholder concerning alterations made to the Articles of Association of TVEL JSC and approval of the revised Articles of Association of TVEL JSC;
- the decision was taken to participate in limited liability company "Rusatom — Additive Technologies";
- pre-agreed appointments to the posts directly subject to TVEL JSC President.

[1] The Board of Directors did not held any attendee meetings.

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**SOLE EXECUTIVE BODY**

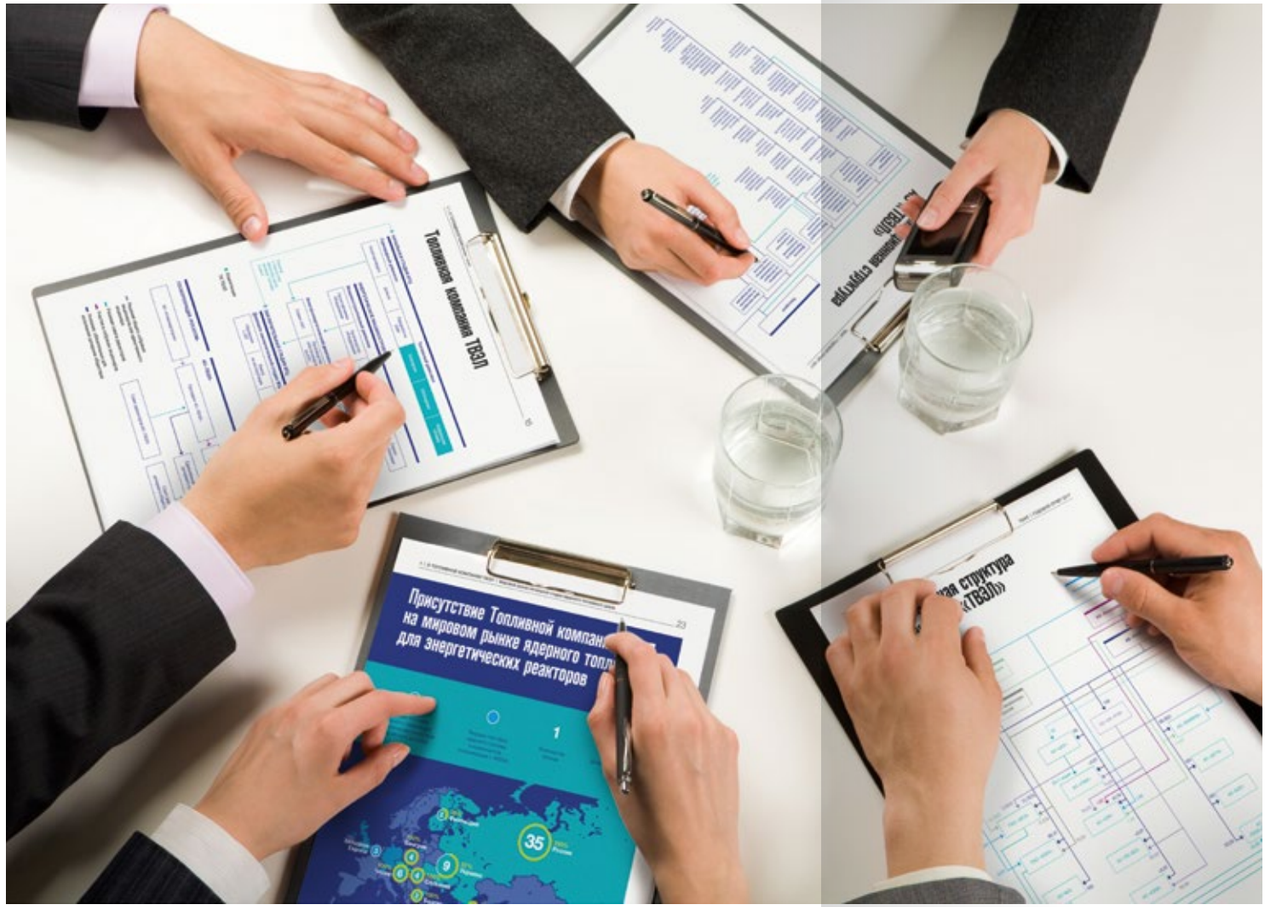
During the period from 01.01.2017 till 25.09.2017, in accordance with the decision of the Sole Shareholder the functions of the Sole Executive Body were imposed on the President of TVEL JSC — Olenin Yuri Alexandrovich.

Yuri Alexandrovich Olenin does not hold any shares of TVEL JSC. In 2017, he committed no transactions on acquisition or alienation of the Company's shares.

Starting from 26.09.2017, in accordance with the Articles of Association of TVEL JSC by the Resolution of the Sole Shareholder of the Company and on the ground of the Contract executed with the Company the functions of the Sole Executive Body are performed by the President of TVEL JSC — Natalya Vladmirovna Nikipelova[1].

Natalya Vladmirovna Nikipelova holds no shares of TVEL JSC. In 2017, she committed no transactions on acquisition or alienation of the Company's shares.

In accordance with the contract concluded between TVEL JSC and the President of TVEL JSC, the amount of remuneration following the year results shall be determined by the resolution of the Board of Directors according to the financial-economic performance of the Company and the key performance indicators (KPI) percentage of the President of TVEL JSC. Key Performance Indicator Card includes 11 indicators. For the information concerning achievement of indicators please refer to the Section "Financial Performance".




**Target indicators of strategic growth and complex programs of efficiency increase approved by the governance bodies of TVEL Fuel Company's subsidiaries are based on optimization of production functional structure and costs reduction due to introduction of new and modernization of current production units, technological process improvement, implementation of efficient system of labor motivation, restructuring of non-profile assets and production units**

**SHARE CAPITAL STRUCTURE**

"Atomic Energy Power Corporation" Joint Stock Company (Atomenergoprom JSC) is the owner of 100% of voting shares of TVEL Joint-Stock Company.

The authorized capital of TVEL JSC is formed from nominal value of the Company's shares held by the Sole Shareholder — Atomenergoprom JSC.

The Company's authorized capital amounts to Twenty-two million nine hundred sixty-one thousand six hundred seventy (22,961,670.00) rubles.

The Company placed registered common shares with nominal value of one (1) ruble per each in the amount of Twenty-two million nine hundred sixty-one thousand six hundred seventy (22,961,670) pieces.

All shares of TVEL JSC are issued in non-documentary form.

No changes were made in the share capital structure in the reporting year.

**RELATED-PARTY TRANSACTIONS AND MAJOR TRANSACTIONS**

During the period 01.01.2017 till 18.01.2017, TVEL JSC made no transactions classified as related-party transactions.

On January 18, 2017 the new edition of the Company's Articles was registered which contains the provision on non-application to the Company of Chapter XI of the Federal Law of 19.12.1995 No. 208-FZ "On Joint Stock Companies".

In 2017, the Company concluded a major transaction (Minutes of the meeting of the Board of Directors of TVEL JSC dated 29.06.2017), the subject of which is the property which value is 25 to 50 percent of the book value of the Company's assets — Additional Agreement to Loan Contract between Atomenergoprom JSC (Borrower) and TVEL JSC (Lender). The subject of the transaction is the provision of monetary funds on loan terms in full or in parts, the amount of debt on which (excluding the accrued interest for using the loan, forfeits) at each time of the contract can not exceed 140,000,000,000.00 (one hundred and forty billion) rubles. The interest rate under the contract is 3 to 10.65 percent per annum of the amount of money provided. The contract is valid until May 11, 2019.

[1] Biographical data are contained in the online version of the Report in the section "Board of Directors".

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# Management Efficiency Improvement

**In 2017, TVEL Fuel Company focused on the implementation of the strategic goal for development of the second core of business — formation of a mechanism for managing the creation of new non-nuclear products and their promotion to the market**

### ORGANIZATIONAL STRUCTURE OF TVEL JSC

Changes in organizational structures made by TVEL Fuel Company are stipulated by structures formation based on target programs, objectives and strategy of TVEL Fuel Company. This approach is in line with the industry-wide standards, and was adopted within implementation of the project of ROSATOM for harmonization of the organizational structure of the companies comprising the industry. The ultimate goal of these transformations is to establish functional chains of ROSATOM — TVEL JSC — subsidiary company, to enhance the efficient interaction between the management levels within TVEL Fuel Company and to cut the red tape.

In 2017, TVEL Fuel Company focused on the implementation of the strategic goal for development of the second core of business — formation of a mechanism for managing the creation of new non-nuclear products and their promotion to the market. Within the framework of this direction, there have been changes in the organizational structure of TVEL Fuel Company with the aim of creating a more effective system for managing the development, production and sale of products of general industrial activity.

Thus, the positions of Vice-President for New Business Development and Vice-President for Technological Development were introduced into the organizational structure of TVEL JSC.

### EFFICIENCY IMPROVEMENT OF PRODUCTION SUPPORT OFFICE FUNCTIONS

In 2017, the Company continued to improve the efficiency of production support office functions. Change teams and expert boards were created. The Company organized training of heads of change teams in the area of process management on the functions improvement — a total of 82 people, trainings on the program “Analysis and Improvement of Business Process Efficiency” for 230 participants of the project.

The maps of all key processes were prepared, the main problems



were identified. The results included opening and implementation of 309 projects and 487 activities to improve the efficiency of functions, which allowed to reduce the cost of functions by RUB 449.3 million.

In 2018, it is planned to continue works on improving the efficiency of functions through the formation of an optimal order from production flows (supply chains), building a feedback system with production flows both with customers, increasing the speed of response by support services to production problems.

### CONCENTRATION OF PRODUCTION

In 2017, within the framework of the industry project “Branch Topology Concept” and with the aim of solving problems on the concentration of industries, TVEL Fuel Company initiated a separate program “Increasing the efficiency of areas use in TVEL Fuel Company”, which contour included all companies of TVEL Fuel Company. During the implementation of the program in 2017, the Company conducted an inventory of all objects, determined the costs for their maintenance, and formulated a register of objects unclaimed for implementing the company strategies.

The concept of sites development of TVEL Fuel Company enterprises and further use of unclaimed objects was formulated, with the following results by the year 2030: decrease

**The main condition for work on compacting areas is the preservation of jobs in the cities where Fuel Company TVEL is present**

in areas of land plots of production enterprises in TVEL Fuel Company by 65%, reduction of the areas of buildings by 48%, reducing the cost of maintaining the sites by 29%.

When forming the concept, the following factors were primarily taken into account:

- New business development that is a portfolio of products, timing of the projects implementation, possibility of reserving current sites or building new ones;
- Site development model which is development of the Company’s business or creation of a new business, attraction of residents.

### INFORMATION TECHNOLOGIES

With the view to increase the efficiency and optimize business processes, TVEL Fuel Company uses up-to-date information technologies (IT) and solutions.

Department of Information Technologies develops and introduces new information systems in accordance with Information Technologies Transformation Program of ROSATOM State Corporation, and with due regard to the needs and development plans of TVEL Fuel Company.

**IT Strategy of TVEL Fuel Company**

TVEL Fuel Company developed the strategy of information technologies development till 2013 aimed at introducing information technologies to improve the efficiency of management and production activities.

The main directions of development (strategic guidelines) were revised:

- the vector of IT development was shifted from automation of the financial and economic block (supporting and auxiliary processes) to digitalization of production activities of the enterprises of TVEL Fuel Company. Improvement of the system of products engineering data management (2018–2022) allows switching to work with a “digital double” of the product throughout the life cycle of the Company’s products. Digitalization of processes of operational management of discrete manufacturing (2017–2023) and continuous production (2019–2023), as well as automation of maintenance and repair management processes (2018–2022) allow for a systematic increase in labor productivity and a reduction in the cost per unit of output;

Table 10
**Targets on Increasing the Areas Use Efficiency**

| | Current status | 2022 | 2025 | 2030 |
|---|---|---|---|---|
| Land area, thous. | 19.2 | 8.1 | 7.0 | 6.6 |
| Area of buildings, mln $m^2$ | 6.6 | 4.6 | 4.3 | 3.4 |
| Costs of maintenance and operation of premises, infrastructure costs, bln rubles | 12.4 | 10.7 | 10.3 | 8.8 |

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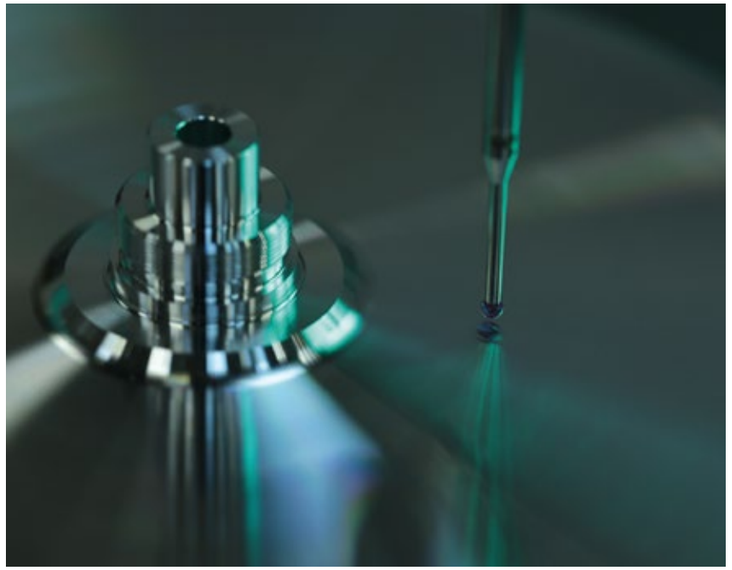
- moving towards centralization of IT solutions at the divisional level, which will reduce the cost of ownership of IT solutions, the costs of their integration, provide the necessary base for unifying business processes in enterprises and, as a result, their transparency, speed and control, improve efficiency of the IT service response to the needs of TVEL Fuel Company business in terms of changing rate in IT solutions.

In IT strategy, a new direction was identified — “Increasing the operational efficiency of the IT function”, which integrates all activities (events, projects, organizational changes) aimed at developing and improving the internal processes of IT functions, maximizing their centralization at the divisional level, transition to a customer-oriented service model, commercialization of promising areas of IT development in TVEL Fuel Company.



**The Company works out the systematic application of the technology of production systems simulation and reengineering in TVEL Fuel Company and in the industry as a whole**



# Anti-Corruption

**The management and the workers of TVEL Fuel Company fully share the anti-corruption policy implemented by the Government and ROSATOM State Corporation**

Concentration in TVEL Fuel Company of significant material, financial and intellectual resources determines the critical importance of ensuring their security (including counteracting the misuse of assets, their theft, corruption and other economic abuses).

In order to create conditions for reduction of corruption and embezzlement, the enterprises of the Company adopted a local regulatory document “Concerning implementation of the Complex program for anti-corruption and anti-embezzlement in TVEL JSC and companies of the management system of the Fuel Company”. The document is based on the approved by ROSATOM “Anti-Corruption Plan 2016-2017 of the State Atomic Energy Corporation “Rosatom”.

In 2017, TVEL JSC enacted the following anti-corruption orders:

- “On application of the Unified Sectoral Guidelines for the Assessment of Corruption Risks in TVEL JSC”;
- “On approval of the Procedure for the employees of JSC TVEL to take measures to prevent any possibility of conflict of interest”.

The Unified Sectoral Guidelines for the Assessment of Corruption Risks in the companies of ROSATOM are aimed at:

- establishment in the companies of ROSATOM of general approaches to identify processes and business operations in the activities of an organization, the implementation of which is associated with likelihood of corrupt practices committed by employees of such organization, both for personal gain and for the benefit of the organization;
- ensuring compliance of anti-corruption measures implemented with the specifics of the organization’s activities and the tasks of rational use of resources focusing at carrying out work to prevent corruption; formation of the list of posts associated with high corruption risk; development of a set of measures to eliminate or minimize corruption risks;
- ensuring minimization of possible corruption manifestations and risks in the implementation of large-scale projects with the government participation, including infrastructure projects financed within the framework of federal target programs and at the expense of the National Welfare Fund.

Normative legal acts and local documents of TVEL JSC in the field of anti-corruption are posted on the Company’s official website: *www.tvel.ru/about/theft/.*

**Contacts of the corporate hot line of ROSATOM for anti-corruption and anti-embezzlement in nuclear sector:**
**phone: 8 (800) 100-07-07**
**e-mail: 0707@rosatom.ru**

**For details visit ROSATOM website:**
**www.rosatom.ru/about/protivodeystvie-korruptsii**

**And TVEL Fuel Company website:**
**www.tvel.ru/about/theft/**

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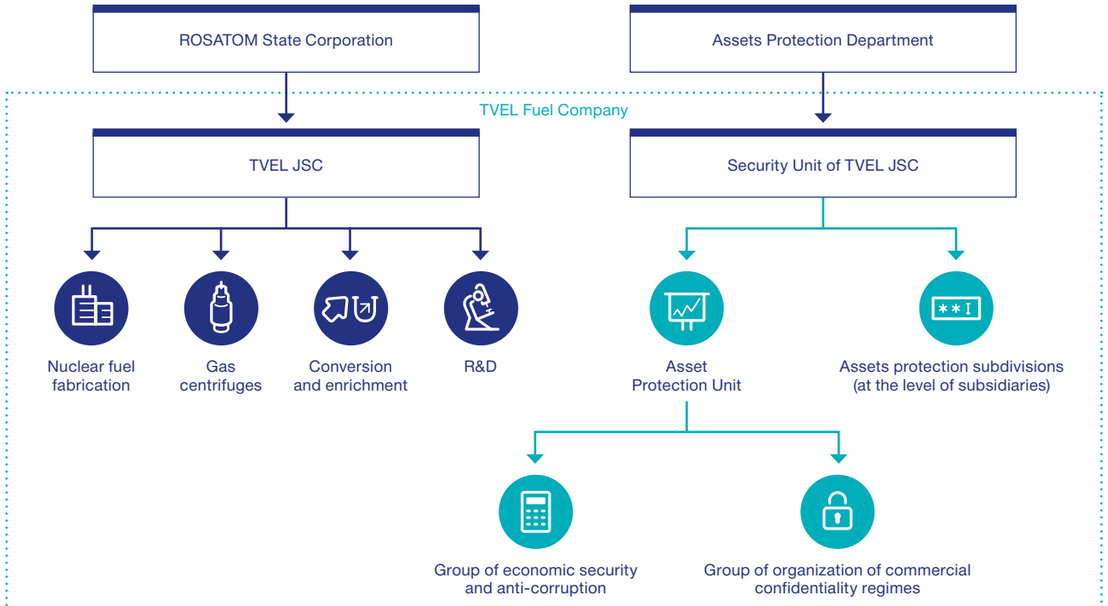
Scheme 3
**System for combating unlawful behavior in TVEL FC**




To arrange a system for prevention of illegal behavior the following was established in TVEL Fuel Company:
- the security unit (at the level of TVEL JSC), including Asset Protection Unit comprising the group of economic security and anti-corruption and the group of organization of commercial confidentiality regimes;
- assets protection subdivisions at the level of subsidiaries.

The main objectives of the security unit of TVEL JSC are to create conditions for the effective development of the Company by successfully countering the negative influences of external and internal factors that threaten the implementation of its strategic initiatives and the fulfilment of the production plans of the nuclear industry.

As of December 31, 2017, in the asset protection subdivisions, there were 64 qualified specialists with the necessary knowledge and experience.

Main fields of structural subdivisions' work:
- ensuring economic security and protection of assets of TVEL JSC and its subsidiaries in the course of production and financial economic activity;
- revealing, prevention and localization of threats (risks) to economic interests and business reputation of TVEL JSC and its subsidiaries;
- information and analytical support of the President of the Company and structural subdivisions of the Company regarding the economic security;
- arrangement in the Company and its subsidiaries of the regime of commercial and business secrecy;
- development and implementation of measures aimed at prevention of corrupt behavior.

Main results of asset protection subdivisions in 2017:
- the economic effect associated with the performance of the asset protection subdivisions of TVEL Fuel Company was RUB 1,588 million;
- 219 checks were carried out for safety of carriers containing the information representing a commercial or official secret;
- 33 business processes were evaluated in the framework of execution of the order on corruption risks;
- inspections were carried out on 102 appeals received through the specialized communication channels "Hot Line";
- 174 employees were brought to disciplinary responsibility.



# Internal Control System

**Internal Control System (ICS) of TVEL Fuel Company is an interconnected integral complex of organizational structures, processes, their rules, and characteristics of management system that is continuously or from time to time performing internal control function and ensuring internal control goal achievement**

Internal Control System (ICS) of TVEL Fuel Company is an interconnected integral complex of organizational structures, processes, their rules, and characteristics of management system that is continuously or from time to time performing internal control function and ensuring internal control goal achievement.

Special Department of Internal Control (SDIC) is a subdivision of TVEL Fuel Company's organization engaged in internal control activities with respect to various spheres of business.

SDIC of TVEL JSC (the unit of the Director for Internal Control and Audit) operates in accordance with regulatory legal acts of the Russian Federation, local regulations of TVEL JSC and ROSATOM State Corporation, and the provisions on these structural subdivisions.

SDICs were created in 9 companies of TVEL Fuel Company: AECC JSC, VNIINM JSC, KMZ PJSC, MSZ PJSC, NCCP PJSC, SGChE JSC, UEIP JSC, ChMP JSC.

Table 11
**Number of control activities conducted by the specialists of SDIC and the companies forming TVEL Fuel Company , ea.**

| Indicator | 2015 | 2016 | 2017 | 2017/2016, % |
|---|---|---|---|---|
| Number of control activities in accordance with the plan, including: | **120** | **125** | **118** | **94** |
| with Audit Committees | 15 | 2 | 1 | 50 |
| audit of financial and business activities including procurement and personnel record management | 84 | 75 | 71 | 95 |
| internal audit | 12 | 8 | 16 | 200 |

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In accordance with ROSATOM Internal Control Development Concept the main purpose of ICS is to promote the achievement of TVEL Fuel Company's strategic goals, to contribute to corporate governance improvement in TVEL JSC and companies forming the management system of TVEL Fuel Company, in compliance with the requirements of the Russian Federation law, regulatory state authorities and international standards.

The purpose of ICS development is to maintain corporate governance mechanisms, primarily the regulatory ones, consistent with changing external and internal conditions.

Apart from the scheduled inspections, the workers of SDIC in TVEL Fuel Company conduct unscheduled inspections by the order of the governance. They also participate in the working groups in the audits of their organizations and in inspections conducted by ROSATOM State Corporation.

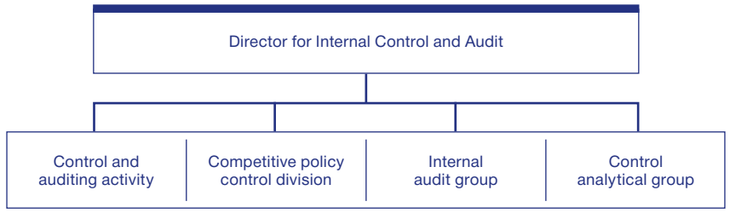
The key directions for the internal control system development in TVEL Fuel Company are as follows:

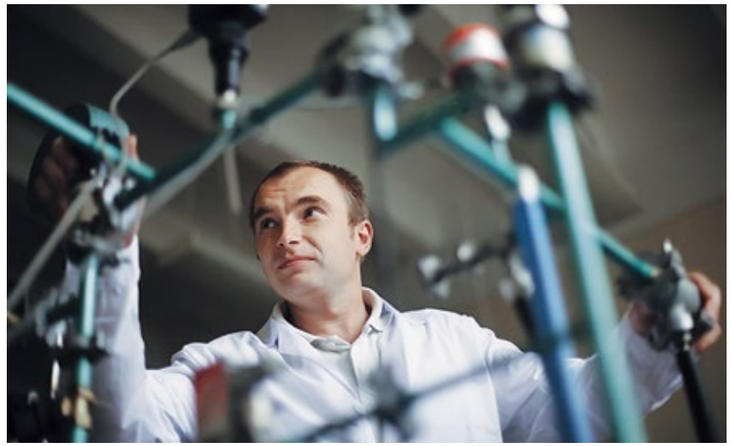
- further integration of adequate control procedures in the processes, and allocation of duties and responsibilities to the participants of the processes for the efficiency of internal control;
- development of mechanisms for involving critical stakeholders in internal control activities;
- ICS reliability and efficiency monitoring development by introduction of various methods to promote continuous and regular assessment of the internal control system state;
- SDIC competence and potential development.

**Main results 2017**

In accordance with the approved plans for 2017, the workers of SDIC conducted 118 control activities. Reduction of the number of scheduled inspections, as compared to the previous period, is connected with the change in the approach to control activities, and introduction of the methods and practice of appraisal and assessment activities

Scheme 4
**SDIC of TVEL JSC**



The inspections conducted at the enterprises of TVEL Fuel Company revealed violations and deviations in implementation of financial and economic operations, including procurement activities. Based on the revealed facts, corrective measures were developed, and disciplinary measures were applied to employees who committed violations.

In 2017, SDIC of TVEL JSC organized an audit of the internal control system at all stages of the life cycle of the investment project. Auditing of eight investment projects of TVEL Fuel Company being in various stages of accomplishment was carried out. The audit identified the main problem areas, developed and approved measures to improve the level of reliability of the internal control system at certain stages of the life cycle of investment projects.

**Plans 2018:**

- increasing the competence in the field of internal audit;
- timely and full identification of material violations in the activity of the companies of TVEL Fuel Company, identification of "weak" places at control facilities and development of recommendations for the integration of preventive control procedures;
- contribution to the achievement of strategic goals of the Fuel Division with regard to increase of the share in the international market, reduction of prime cost, increase of revenue from new products.



# Procurement Management

**More than 95% of competitive procurement procedures are carried out through on-line sales platforms. This promotes openness and transparency of the Company, and saves labor and financial resources.**
**Procurement procedures are implemented using the following electronic platforms: United Electronic Market Place JSC, Fabrikant LLC and Economics Development Center JSC**

TVEL Fuel Company supports, respects and protects basic human rights and builds its external business relationship on the principles of honesty, integrity and openness.

More than 95% of competitive procurement procedures are carried out through on-line sales platforms. This promotes openness and transparency of the Company, and saves labor and financial resources.

Procurement procedures are implemented using the following electronic platforms: United Electronic Market Place JSC, Fabrikant LLC and Economics Development Center JSC.

Total amount saved by the subsidiaries of the Company in 2017 through the procurement procedures on an open competitive basis made RUB 2.7 billion.

Table 12
**Key indicators of procurement activities of TVEL Fuel Company**

| Indicator | 2015 | 2016 | 2017 (plan) | 2017 (actual) | 2018 (plan) |
|---|---|---|---|---|---|
| Share of procurement through public competitive procedures under the UIPS, % | 97 | 97 | 95 | 97 | 95 |
| Total amount of procurement of TVEL FC, RUB mln | 130,632 | 100,988 | 60,370 | 95,261 | 103,206 |
| Total amount saved by subsidiaries of TVEL FC from procurement through public competitive procedures on an open competitive basis, RUB mln | 2,852 | 2,850 | minimum 2,000 | 2,719 | minimum 2,000 |

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All planned indicators for 2017 were achieved. Dynamics in the above figures indicates the enhanced efficiency of procurement management and transparency of procedures.

The largest procurement groups are the products and services purchased from the companies of nuclear industry, power supply. These are the largest categories in procurement from sole supplier.

Key documents that regulate procurement and set TVEL Fuel Company supplier and contractors selection criteria:

Federal Law No. 223-FZ "On Procurement of Goods and Services by Particular Types of Legal Entities";

ROSATOM Uniform Industrial Procurement Standard;

TVEL JSC Corporate Standard "Procurement Process"

Some of the key suppliers and contractors of the Company enjoy monopolist position on the market. Under the provisions of UIPS (Uniform Industrial Procurement Standard of ROSATOM State Corporation) no tender is provided for such contractors (natural monopoly entities), only according to the "Procurement from Sole Supplier" procedure.

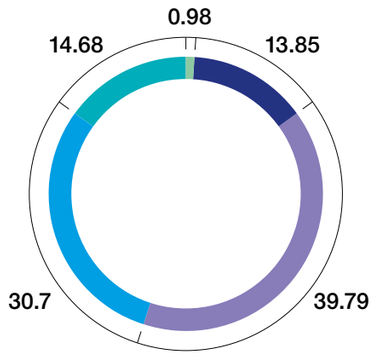
Basic groups of competitive procedures:

- materials and equipment,
- construction and installation works;
- manufacture of components;
- repair and maintenance of equipment.

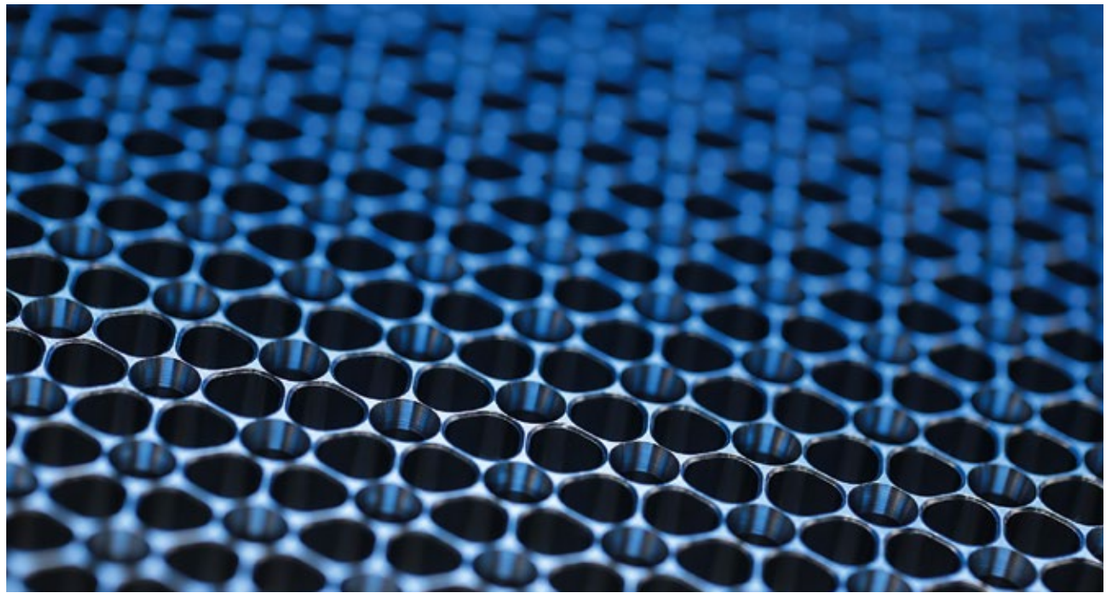
Pursuant to provisions of the Uniform Industrial Procurement Standard of ROSATOM the Company may not provide any preferences to the suppliers on a territorial basis. The exception is only envisaged for outsourcing companies founded during the restructuring of TVEL Fuel Company. UIPS guarantees to such companies certain volumes of orders over a period of five years from the date of incorporation in the following way: for the first year — 90%, second year — 75%, third year — 60%, fourth year — 40%, fifth year — 25% of total annual demand of the customer.

Diagram 3

**Procurement structure according to cost criterion, %**




- Up to RUB 500 thous.
- RUB 500 thous. — RUB 10 mln
- RUB 10 mln — RUB 100 mln
- RUB 100 mln — RUB 1 bln
- Above RUB 1 bln





## Since September 2012 the Arbitration Committee operates in TVEL JSC; the Arbitration Committee is vested with authority to consider complaints against actions (or omission thereof) of any customer, competent authority, procurement manager and/or procurement commission during the implementation of procurement procedures on behalf of organizations of TVEL FC management system

Local suppliers participate in competitive procedures on a common basis, and no specific approaches to local suppliers are applied. The Company maintains no special records for such suppliers.

In planning and implementation of procurement activity the enterprises of TVEL Fuel Company afforded priority rights to small and midsized businesses in accordance with the Federal Law No. 223-FZ "On Procurement of Goods and Services by Particular Types of Legal Entities", and in accordance with the Resolution of the Government of the Russian Federation d/d December 11, 2014 No.1352 "Concerning special aspects of participation of small and midsized business in procurement of products, works, services by particular legal entities". The share of procurement from small and midsized business related to certain enterprises of TVEL Fuel Company makes from 19.34% to 78.44%, when the regulatory level is 18%.

In the reporting year, the Company initiated works within the three-year program "Transformation of the MTO process in the Fuel Company", which made it possible to achieve the following indicators in 2017:

- reduced warehouse stocks by 26% relative to the fact of 2016;
- conducted 86 audits of manufacturers of critical products;
- 90% of goods and 60% of works and services are procured under the category management;
- the economic effect of procurement under the category management in 2017 amounted to RUB 1.5 billion.

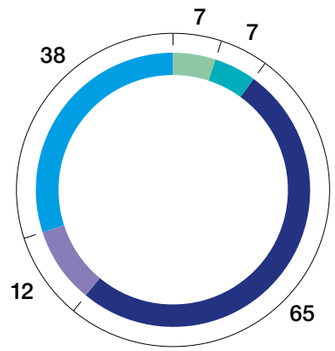
In 2017, the Arbitration Committee of TVEL JSC received 129 complaints related to procurement activities of the Fuel Division. 14 complaints were admitted as reasonable (partially reasonable).

In 2017, the total volume of warehouse material assets at the enterprises of TVEL Fuel Company was reduced by 26% relative to the fact of 2016.

Suppliers and contractors are evaluated using the criteria of labor practices, impact on society and environment subject to availability of all permits and licenses set by the law. Such criteria also include availability of management system certificates as evaluative ones i.e. forming the final evaluation for a member of procurement procedure. The Company does not perform any evaluation study of actual and potential impacts in the supply chain; all concluded contracts are checked for compliance with the Russian legislation.

Diagram 4

**Complaints received by the Arbitration Committee of TVEL JSC in 2017, ea**




- Recognized as reasonable
- Recognized as partially reasonable
- Recognized as unreasonable
- Withdrawn
- Left unconsidered

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**1,195** RUB mln
investments into R&D

**10,988** RUB mln
volume of sales from general industrial activities

# 4 Performance Results

# Financial Capital

**Financial Capital is the most vital in the Company's activities. Capital gains ensure current operations and promote investments thereby generating growth of other capitals used by TVEL Fuel Company**

## INVESTMENT MANAGEMENT

TVEL Fuel Company carries out its investment activities in line with the Uniform Industry-Specific Policy of ROSATOM and its organizations.

The Investment Committee of TVEL JSC (further "the Committee") is a permanent collegiate advisory board that acts under the guidance of the Chairman of the Committee and follows the principles of the investment policy of ROSATOM and its organizations.

**RESULTS 2017**

In 2017, the Committee held 32 meetings. Amount of financing of the Portfolio components of TVEL Fuel Company made RUB 26,514 mln, which is in line with the level of the previous year. Amount of financing of the Portfolio of TVEL Fuel Company tends to yearly fluctuations, it depends on combination of different stages of life cycle of the Portfolio components marketable at the same time (more than 200).

Funding of industrial and technological base of primary production accounts for the biggest share in overall investment outlay.

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Table 13
**Structure of the investment committee of TVEL JSC in 2017**

| | Name, title |
|---|---|
| **Chairman** | N.V. Nikipelova — President of TVEL JSC |
| **Deputy Chairman** | M.A. Timoshenko — Vice-President for Economy and Finance of TVEL JSC |
| **Secretary** | P.A. Pozdniakov — Director of Investment Department of TVEL JSC |
| **Members** | M.G. Zarubin — Senior Vice-President for Production of TVEL JSC |
| | P.I. Lavrenyuk — Senior Vice-President for Science, Engineering, Technology and Quality of TVEL JSC |
| | Yu.A. Kudryavtsev — Senior Vice-President for New Business Development of TVEL JSC |
| | K.K. Sokolov — Vice-President — Business and Fuel Power Resources Manager of TVEL JSC |
| | K.Iu. Bergazov — Vice-President for Technological Development of TVEL JSC |
| | S.I. Boridko — Vice-President for Safety of TVEL JSC |
| | E.V. Lyakhova — Director for Economy and Investments of ROSATOM |
| | V.I. Korogodin — Director for Lifecycle Management of Nuclear Fuel Cycle and NPP of ROSATOM State Corporation |
| | O.S. Barabanov — Director for Development and Restructuring of ROSATOM State Corporation |
| | S.V. Komova — Deputy Director of Department of Economic Analysis — Head of Internal Pricing Division of ROSATOM State Corporation |
| | A.S. Voronin — the expert of the Division of investment project portfolio management of the Department of Investment Management of ROSATOM State Corporation |

Table 14
**Amount of financing for TVEL FC investment projects by directions, RUB mln**

| Direction | 2015 | 2016 | 2017 (plan) | 2017 (actual) | 2018 (plan) |
|---|---|---|---|---|---|
| Nuclear industry | 18,553 | 16,347 | 17,321 | 14,073 | 16,496 |
| In-house regulations development | 1,070 | 529 | 813 | 1,045 | 579 |
| Development of infrastructure | 1,212 | 1,987 | 3,925 | 3,451 | 2,617 |
| Safety and encumbrances | 7,982 | 6,520 | 3,718 | 5,890 | 7,762 |
| Other | 309 | 1,131 | 698 | 2,055 | 108 |
| **Total for TVEL FC** | **29,125** | **26,514** | **26,475** | **26,514** | **27,562** |



Table 15
**Achievement of major KPI and production indicators of TVEL FC in 2017[1]**

| KPI, unit of KPI measurement | KPI level | | | KPI weight, % | KPI type (continuous, discrete, cutoff) | KPI performance |
|---|---|---|---|---|---|---|
| | Lower level | Target | Upper level | | | |
| AFCF of State Corporation (taking into consideration Fuel Division AFCF), RUB bln | 257<br>60.4 | 285<br>67.1 | 342<br>80.5 | 20 | Continuous | 308.7<br>77.4 |
| Investment activity integrated efficiency indicator, % | 80 | 100 | 108 | 10 | Continuous | 81.3 |
| Semi-fixed costs, RUB bln | 40.4 | 38.5 | 29.0 | 10 | Continuous | 36.4 |
| Labor efficiency, RUB mln/person | 8.3 | 8.5 | 9.8 | 10 | Continuous | 8.46 |
| Proceeds from sales of new products beyond the profile, RUB bln | 7.8 | 8.7 | 13.0 | 20 | Continuous | 6.12 |
| Foreign orders portfolio for traditional products for 10 years, USD mln | 9,113 | 10,126 | 12,659 | 10 | Continuous | 10,836 |
| Foreign proceeds for traditional products, USD mln | 926 | 1,029 | 1,287 | 10 | Continuous | 1,199.8 |
| Reduction of stock, RUB bln | –24 | –30 | –45 | 10 | Continuous | –45.7 |
| LTIFR and reduction of injuries at industrial sites of the enterprises, including the contractors (of basic level 2016), % | | 0,3/ preservation of basic level | | –20 | Downgrading | 0.06/–33 |
| State orders, including State Defense Orders from other governmental customers and organizations, % | | 100 | | –100 | Cutoff | 100 |
| No INES events level 2 and above | | No events | | –100 | Downgrading/ Cutoff | 0 |

[1] Financial and economic indicators are given in accordance with the consolidated management statements of TVEL Fuel Company.

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Diagram 5

**Revenue (net) from sales, RUB mln**

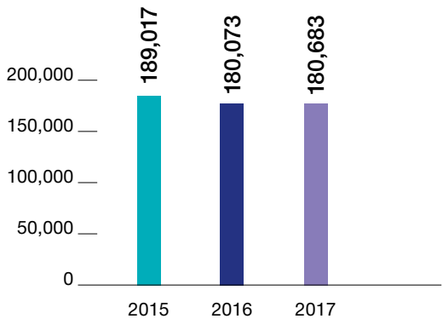



Diagram 6

**Gross profit, RUB mln**

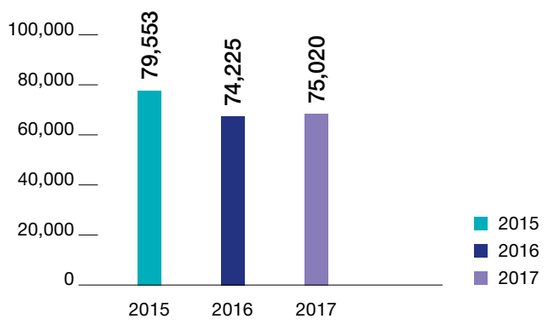



Diagram 7

**Net income, RUB mln**

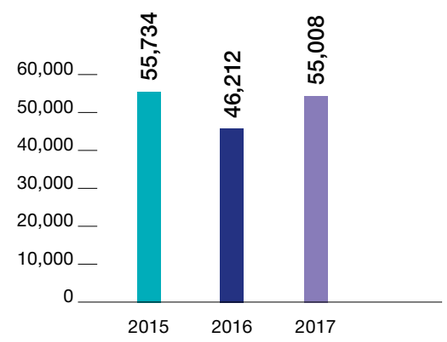
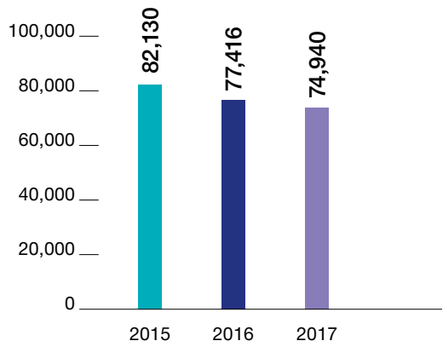



Diagram 8

**EBITDA, RUB mln**




**FINANCIAL RESULTS**

In 2017 TVEL Fuel Company achieved all KPI and target production indicators applied to evaluate the performance.

In the reporting year there were no changes in total revenue as compared to the previous year (+0.3%). The main part of revenue of TVEL Fuel Company comes from sales of nuclear fuel and its components (63.8%), and rendering of conversions and enrichment services (21.15%), and sales of other products (13.40%). Significant increase in revenue is provided by the activities on reduction of cost, other expenses, and by the effect of other uncontrolled factors, in particular changes in exchange rate.



Diagram 9

**Distribution of consolidated revenue by types of products, RUB mln**

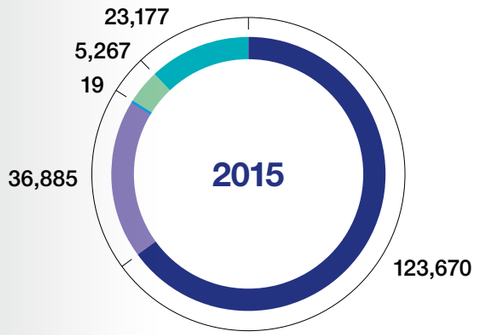
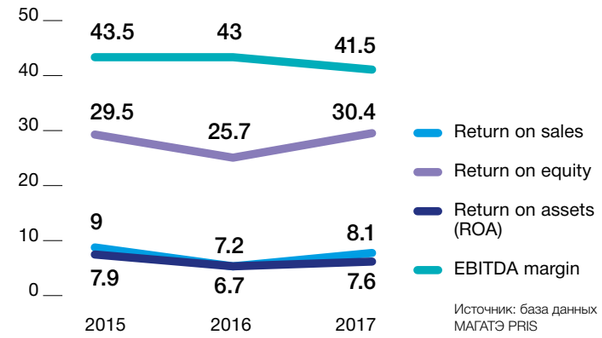



Diagram 10

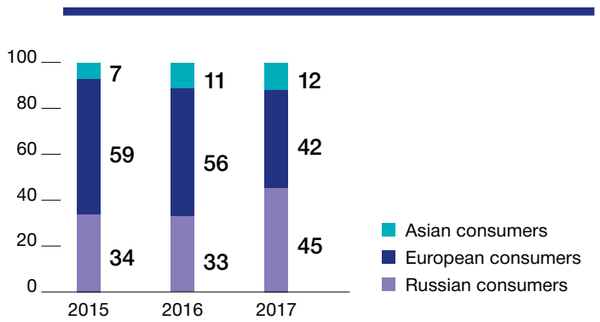
**Key profitability indices, %**




Источник: база данных МАГАТЭ PRIS

Diagram 11

**Distribution of revenue from nuclear fuel sales by consumers' geography, %**




Profitability indices of sales, equity and assets have been increased noticeably in the reporting year due to increase of gross and net profit.

In 2017 the export products were sold to the total amount USD 1,163 mln. Sales of nuclear fuel and its components amount to 94.5% — the largest share in the export revenue.

In 2017 share of revenue received from FA sales made RUB 106,806 mln — 59% in total consolidated revenue. Main consumers are Russian and European NPPs. Number of consumers from Asian countries has also increased.

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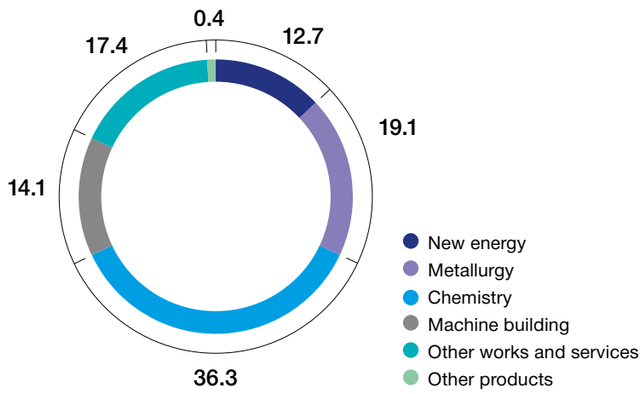
Diagram 12

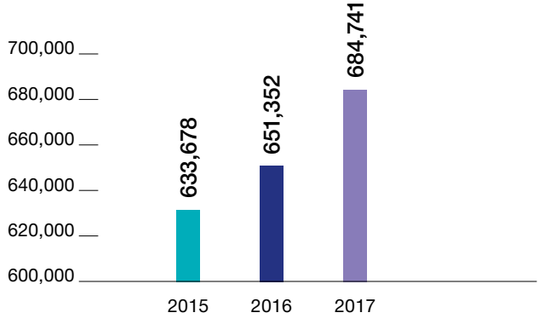
**Structure of revenue from general industrial activities in 2017, %**




Following the results 2017 volume of sales from general industrial activities increased by 7.8%, to RUB 10,988 mln.

Diagram 13

**Net assets of TVEL Fuel Company, RUB mln**




Financial soundness and liquidity indicators of the Company are at high level. In 2017 the current liquidity ratio improved considerably, receivables turnover ratio showed positive trend.

Table 16

**Financial soundness and liquidity indicators of TVEL Fuel Company**

| Indicator | 2015 | 2016 | 2017 | Δ 2017/2016, % |
|---|---|---|---|---|
| Ratio of borrowed and own funds | 0.14 | 0.10 | 0.07 | –30 |
| Current liquidity ratio | 3.15 | 4.02 | 6.02 | 50 |
| Return on basic production capacity | 1.31 | 1.15 | 1.13 | –1.7 |
| Receivables turnover period. days | 80 | 79 | 96 | 21 |
| Stock turnover period. days | 188 | 168 | 140 | –16 |



Table 17

**Basic financial indicators of TVEL Fuel Company in 2017, RUB mln**

| Indicator | | Revenue (net) from sales | Net profit |
|---|---|---|---|
| Separation-sublimation complex (SSC) | AECC JSC | 5,958 | 2,035 |
| | PA ECP JSC | 14,237 | 4,706 |
| | SGChE JSC | 14,956 | 494 |
| | UEIP JSC | 23,881 | 5,861 |
| **Total for SSC** | | **59,032** | **13,096** |
| Nuclear Fuel Fabrication Complex (NFFC) | MSZ PJSC | 21,623 | 3,490 |
| | NCCP PJSC | 8,105 | 1,670 |
| | ChMP JSC | 13,516 | 2,014 |
| | MZP JSC | 826 | –316 |
| **Total for NFFC** | | **44,070** | **6,858** |
| Gas Centrifuge Complex (GCC) | KMZ PJSC | 2,708 | –240 |
| | Centrotech SPA | 2,027 | –654 |
| **Total for GCC** | | **4,735** | **–894** |
| Research Complex | VNIINM JSC | 2,689 | 61 |
| | Tochmash VPA JSC | 1,892 | –250 |
| **TOTAL for Research Complex** | | **4,581** | **–189** |
| Ecoalliance LLC | | 2,677 | 105 |

Table 18

**Dividend payout, RUB mln**

| Indicator | 2015 | 2016 | 2017 | Δ 2017/2016, % |
|---|---|---|---|---|
| Dividends paid to Atomenergoprom JSC, RUB mln | 15,296 | 28,233 | 20,468 | –28 |
| Dividends paid to TVEL JSC from subsidiaries | 1,930 | 2,820 | 2,298 | –19 |

Dividend policy of TVEL JSC with regard to subsidiary companies is set with account of need for investment in production, its reconstruction and improvement of technical facilities.

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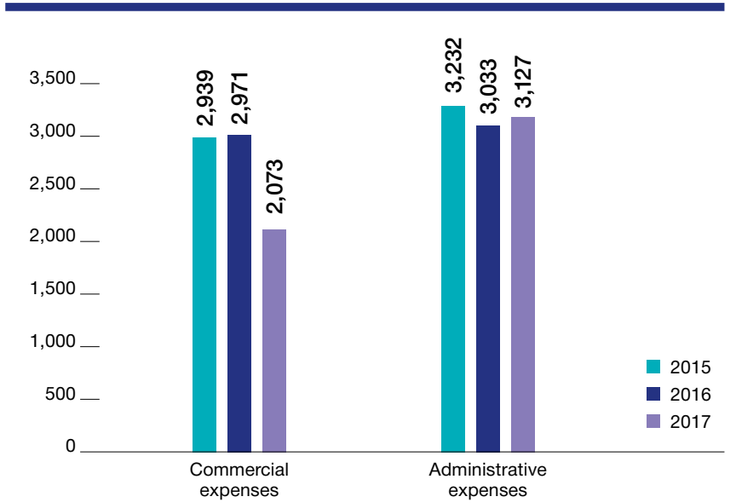
Diagram 14
**Commercial and administrative expenses of TVEL Fuel Company, RUB mln**




**COST REDUCTION**

Work on costs optimization and improvement of efficiency of TVEL Fuel Company is going on. In 2017 prime-cost reduction made RUB 2,736 mln due to the activities on expenses reduction.

The most progress was made in the following activities of TVEL JSC management system:

- optimization of personnel related costs;
- reduction of purchase price of materials and equipment;
- elaboration of target regulations on Inventory storage and consumption rates;
- reduction of materials costs due to revision of specific requirements;
- optimization of costs of non-nuclear materials;
- improvement of efficiency in power facilities and power consumption;
- optimization of services on heavy, routine-preventive, current repair and maintenance.

Share of administrative expense in revenue 2017 made 1.73%, in line with the level of the previous year *(Diagram 14)*.



# Manufactured Capital

**TVEL Fuel Company comprises three complexes for type-specific production of the front end nuclear fuel cycle, and scientific and design-engineering assets.**
**The plans on production and sales of products and services in the reporting year were fulfilled to the full extent, which ensured compliance with all contractual commitments of the Company to Russian and foreign customers**

**BUSINESS ASSETS AND OPERATIONAL RESULTS**

*Separation-Sublimation Complex (SSC)* comprises a group of integrated plants engaged in enrichment and conversion of uranium.

In 2017 the plan of SSC enterprises for production of enriched uranium products and achievement of the set capacity utilization factor was accomplished to the full extent *(Table 20)*.

For detailed structure of TVEL Fuel Company please refer to:
***www.tvel.ru/about/structure/***

Table 20
**Labor efficiency dynamics of the separation and sublimation complex, RUB mln/person**

| Subsidiary companies | 2015 | 2016 | 2017 | Δ 2017/2016, % |
|---|---|---|---|---|
| SGChE JSC | 3.88 | 4.73 | 5.17 | 9 |
| AECC JSC | 4.54 | 5.90 | 7.04 | 19 |
| PA ECP JSC | 5.77 | 6.78 | 7.41 | 9 |
| UEIP JSC | 9.40 | 10.49 | 11.18 | 7 |

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# Competencies of enterprises of TVEL Fuel Company

Nuclear Fuel Fabrication Complex

Gas Centrifuge Complex

Separation-Sublimation Complex

Machine Building

Metallurgy

New Energy

R&D

Chemistry

Additive Technologies

**8.46**
**RUB mln/person**
**Labor efficiency**


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**Milestones 2017:**

- In 2017 ChMP JSC using the facilities for uranium tetrafluoride production[1] continued recycling of off-grade warehouse uranium to uranium oxide with further shipping for sublimation production at SGChE JSC to get uranium hexafluoride and its involvement in nuclear fuel cycle.
- 5 sections of gas centrifuges of the 9th generation were commissioned at UEIP JSC.
- SGChE JSC put into operation the fourth series of electrolyzers for fluorine production to increase conversion production capacity.

Main objectives 2018 and in the midterm of the separation-sublimation complex of TVEL FC:

- Completion of off-grade warehouse uranium recycling.

*Nuclear Fuel Fabrication Complex (NFFC)* is a group of subsidiary industrial enterprises that manufacture nuclear fuel for various reactors.

The main activity of TVEL Fuel Company is production and sales of fuel assemblies for power and research reactors. The planned volume of the manufactured fuel products is determined in accordance with preliminary orders made by consumers based on the plans of primary charging and recharging. In 2017 the plan of TVEL Fuel Company for production of nuclear fuel was implemented in full.

**Milestones 2017:**

- Launch and timely production of FA simulators for Unit No.1 of Belorusian NPP.
- Production and shipment of initial loading fuel set for Unit No.4 of Rostov NPP.
- Production and shipment to the customer of initial loading fuel set for Unit No. 4 of Tianwan NPP (China).
- Production and shipment of FA and targets for research reactor “Maria” (Poland).
- Commencement of operation of new acid storage facility at MSZ JSC.

**Launch of fluorine production unit has marked the final stage of the major project for reconstruction of the sublimate plant capacities that will enable essential increase in uranium hexafluoride production volume.**

**Thus, the program for concentration at SGChE JSC of all conversion cycle of TVEL Fuel Company of Rosatom is completed.**

**There was no need in construction of separate building to launch the fourth series of electrolyzers: the available building at the industrial site of the sublimate plant was used for this purpose. There was also need in production of electrolyzers: ready for service units were purchased from AECC JSC.**

[1] In 2016 production of uranium tetrafluoride by ChMZ JSC was terminated; conversion program was transferred to SGChE JSC.



Main objectives 2018 of the nuclear fuel fabrication complex of TVEL FC:

- production and delivery to the customer of the initial loading fuel for Unit No.1 of Belorusian NPP;
- Supply of MOX fuel for BN-800 reactor;
- development and launch of new facility for uranium dioxide power production;
- launch of upgraded production of fuel for research reactors at NCCP PJSC.

*Gas Centrifuge Complex (GCC)* is a group of subsidiary industrial enterprises producing gas centrifuges (GC) and accessories for enterprises of the separation-sublimation complex.

Plans for batch production of GC-9, GC-9+ and pilot batches of new advanced GC were implemented to the full extent.

Launch of batch production of GC-9+ and qualification tests of batch production became major milestones 2017. Performance efficiency of the upgraded gas centrifuge is considerably superior to its previous version, and its production cost is lower.

Main objectives 2018 of the GC complex of TVEL Fuel Company:

- completion of works on concentration of gas centrifuge production at KMZ PJSC in one process building in the framework of the investment program “New facility for gas centrifuges production”;
- production of pilot batches of long-range GC;
- follow-on works on cost improvement of GC production.

Medium-term objectives — batch production of new generation GC.

*Scientific and Production Association*

With the purpose to improve research and design activity and to provide full life cycle of the products (from marketing to disposal), in 2015 TVEL Fuel Company implemented the first stage of establishment of the scientific and production association (SPA). The scientific-design and technological competencies of three design bureaus (NRDC LLC, OKB-Nizhny Novgorod JSC, Centrotech-SPb JSC) were united.

In 2016 consolidation of main activity of the above-mentioned companies with the production enterprises Uralpribor LLC and ZEP LLC was completed. The companie’s organizational structure was established at the basis of UGCMP LLC (Novouralsk) with responsibility subdivision into the section of new businesses development, the section of gas centrifuges development, and the section of operational activity. In January 2017 the company was officially renamed as SPA Centrotech LLC[2].

[2] Centrotech-SPb JSC (Saint Petersburg) is the leading design bureau established in 1945, with huge experience and rich history. Taking into account that Centrotech-SPb JSC joined the developing SPA, the continuity in history and the best traditions of the consolidated enterprises became an important argument to choose the name and logo “Centrotech”.

Table 20
**Labor efficiency dynamics of the fabrication complex, RUB mln/person**

| Subsidiary companies | 2015 | 2016 | 2017 | Δ 2017/2016, % |
|---|---|---|---|---|
| Machine-Building Plant (MSZ PJSC) | 5.20 | 5.46 | 5.33 | –2 |
| Novosibirsk Chemical Concentrates Plant (NCCP PJSC) | 4.83 | 4.92 | 6.04 | 23 |
| Chepetsky Mechanical Plant (ChMP JSC) | 4.02 | 4.58 | 4.38 | –4 |
| Moscow Polymetal Plant (MZP JSC) | 1.56 | 0.97 | 4.48 | 362 |

Table 21
**Labor efficiency dynamics of the gas centrifuge complex, RUB mln/person**

| Subsidiary companies | 2015 | 2016 | 2017 | Δ 2017/2016, % |
|---|---|---|---|---|
| KMZ PJSC | 2.33 | 2.58 | 2.79 | 8 |

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**In 2018 an industrial cluster may appear in Novouralsk**

In 2017 the enterprises of TVEL Fuel Company in Sverdlovsk region — UEIP JSC and Centrotech SPA LLC started establishment of Novouralsk Industrial Cluster (NIC) with a focus on machine-building.

At the fist stage NIC will include ten industrial enterprises of Novouralsk, including the city-forming UEIP JSC and Centrotech SPA LLC, as well as ANK-Service LLC and UEIP Atommashkompleks LLC.

It is planned that at NIC the pool of the key competences will be set, including those required for development of the machine-building complex in Sverdlovsk region, and industrial cooperation of enterprises in the most promising lines of production, including the import substitution.

The status of industrial cluster gives the right to apply for state subsidies out of the federal budget to recover 50% of incurred costs. At the moment, the maximal recoverable amount within one project makes about RUB 200 million per year. The recoverable costs include the costs of training, working out of the design documentation, licensing and certification, production and testing of prototypes and pilot batches, and other events.

Under the road map, in 2018 Novouralsk Industrial Cluster will be included in the register of industrial clusters of the Ministry of Industry and Trade of the Russian Federation.

The industrial cluster format is the tool of state support of industry and import substitution intended to promote industrial cooperation by establishment of new production chains and integration into the existing ones. Under the regulator's requirements the industrial cluster must comprise at least ten enterprises. At least 20% of products manufactured by each participant (except for manufacturer of the finished product), must be used at other enterprises of the same cluster. State support of industrial clusters includes budgetary recovery of costs on a number of organizational and technological activities.

Thus, the unified production and design complex for development and manufacturing of gas centrifuges for Russian uranium enrichment and for production of non-nuclear products was established in Novouralsk.

In accordance with the corporate strategy 2017–2022 the revenue of SPA Centrotech LLC from sales of non-nuclear products should increase from RUB 284 mln to RUB 3.8 bln.

Launch of batch production of GC-9+ jointly with KMZ PJSC is the major milestone 2017 for SPA Centrotech LLC.

*General Industrial Activities*

Development of non-nuclear business — is one of priority tasks set by ROSATOM to the enterprises of nuclear industry. The basis used for determination of new businesses development is as follows: competences accumulated for the years of nuclear production development, and availability of highly skilled personnel.

It is also important that new products manufactured at the newly established productions must be in demand on out-of-the-industry markets, new for TVEL Fuel Company, outside the limits of nuclear fuel cycle. This is ensured due to application of modern and efficient technologies, obtained owing to successful work in the traditional nuclear field.

Table 22

**Labor efficiency dynamics of the scientific-production complex, RUB mln/person***

| 2015 | 2016 | 2017 | Δ 2017/2016, % |
|---|---|---|---|
| 2.99 | 1.91 | 2.06 | 8 |

* Data 2015-2016 include UGCMP LLC indicators.



TVEL Fuel Company addresses the range of inter-related issues through establishment of new high-technology businesses. New technologies in nuclear production provide advantages in technological process, contributing to increase of equipment capacity, rise of degree of automation. This results in reduction of workforce requirements at nuclear production.

Development of new non-nuclear businesses is a real opportunity to employ personnel dismissed due to optimization of main nuclear production and to ensure social stability in the regions of presence.

Moreover, new businesses mean additional revenue, and consequently additional budget revenue that may be allocated to address different issues in the regions of presence of TVEL Fuel Company.

Objectives aimed at strengthening of the Company positions on new markets require rapid development of scientific and technical potential, which in turn implies need for improvement of R&D, projects, production, economy, promotions and sales management systems. In 2017, the Company started the works on establishment of management system for second business core development.

At present time TVEL Fuel Company implements 61 non-nuclear business projects. The projects are at different stages, total funding in 2017 amounted to RUB 900 mln. Revenue from general industrial activities made RUB 11 billion.

Main projects:

- "Development of metal multipowder 3D Printer production";
- "Establishment of pilot metal powder production" (including for additive technologies);
- "Arrangement and mastering of titanium production";
- "Increase of calcium wire production";
- "Establishment at NCCP PJSC of the Centre of Competences for Development and Production of Lithium Chemical Cells";
- "Arrangement of energy storage systems production";
- "Development of isotope production at PA ECP JSC";
- "Development of pigment titanium dioxide production";
- "Development of high-purity quartz concentrate production";
- "Improvement of existing industrial complex for automotive catalysts production".


**Development of general industrial activities of the Company resulted in 2017 in preservation of 90 jobs. As of the end of 2017 there were created 2,500 jobs with general industrial activities**

Second business core development supposes increase of interests to 18% revenue from non-nuclear products in total revenue of TVEL Fuel Company by 2030. These are challenging plans that require concentration of resources. Total revenue from non-nuclear products sales must be at least RUB 143 billion by 2030.

Main efforts in the second business core development are connected with expansion of market presence of non-nuclear products, implementation of investment projects, transactions on acquisition of equity in companies with the required competences and potential for development. The works are on-going to create the management systems for non-nuclear businesses development.

The following directions of non-nuclear activity are being developed: New Energy, Machine Building, Metallurgy, Chemistry.

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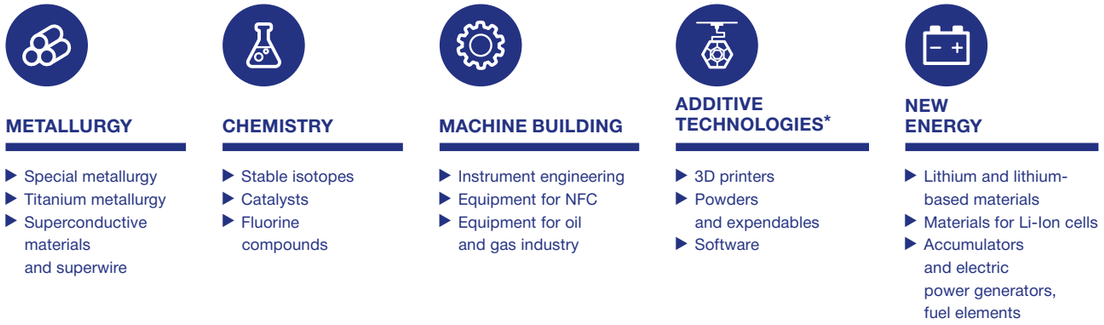
Scheme 5
**Key directions of new businesses development in TVEL FC**




* Read more about this direction on page 103, section “Intellectual capital”.

Table 23
**Integrator**

| Integrator | Purpose of establishment |
|---|---|
| **Additive technologies (approved)** | Business development in the sphere of full range additive technologies (production of granulated metal powder, 3D printers and services rendering) |
| **Energy storage devices (approved)** | Establishment of vertically-integrated company with own import-substituting production of smart materials and storage cells |
| **Oil service** | Establishment of system integrator for integrate approach to oil services rendering, with own import-substituting production of equipment |
| **Metallurgy** | Establishment of system integrator of metallurgical products to deal with import-substitution of key metallurgical products |

In 2017 the works started to bring out the most challenging and large-scale activity to integrators — independent legal entities. The purpose of the integrators — is concentration of resources on development of marketable and efficient key-activity specific businesses.

**Metallurgy**
In this field TVEL Fuel Company made considerable progress: in 2017 sales growth of titanium products was 49%, calcium wire for liquid steel processing — more than 40%, products of hafnium and niobium — 18 and 45% respectively. Demand for metals and alloys with the enhanced characteristics (strength, weight, workability), as well as increase of steel and alloys smelting efficiency will contribute to development of this direction within the industry integrator. On the core Russian market estimated at RUB 180 billion the share of TVEL Fuel Company by 2025 may reach 7%.

***Titanium production***
Over the last five years ChMP JSC has carried out organizational, scientific-research and design-experimental activities: regulatory framework has been prepared and ingot production process has been elaborated.

The plant has launched batch production of more than 250 products out of 19 alloys, including intermetallic titanium-based alloys. Main types of products — are ingots, rods, seamless tubes and welding wire. Production of unique capillary tubes and tubes with spiral fining has been mastered.

The products of the plant have number of serious competitive strengths, in particular: full-range production (from ingot melting to the end product) of seamless tubes within one production site — the only one in Russia.

Under the contract the specialists of ChMP JSC have elaborated the manufacturing process for the products most demanded on the European market, in compliance with requirements of foreign standards.



Table 24
**Metallurgy**

| New businesses | Products | Basic enterprises | Scope | Supplies geography |
|---|---|---|---|---|
| **Special metallurgy** | ▸ Zirconium alloys | ChMP JSC | ▸ Electric Power<br>▸ Machine Building<br>▸ Medicine<br>▸ Metallurgy | Russian Federation |
| | ▸ Hafnium | | | Russian Federation/ Great Britain |
| | ▸ Calcium metal<br>▸ Calcium injection wire | | | Russian Federation/ Estonia, Kazakhstan, Norway, France, Latvia, Belgium, Sweden |
| | ▸ Nickel filtering elements, powders | Centrotech SPA LLC | | Russian Federation |
| **Titanium metallurgy (full range titanium production)** | ▸ Seamless titanium tubes, ingots, forgings, rods, wire | ChMP JSC | ▸ Different engineering industries: aircraft engineering, ship-building, engine-building, etc., medicine | Russian Federation/ Germany |
| **Superconductive materials and superwire** | ▸ Superconductive wires | ChMP JSC | ▸ Electric power<br>▸ Medicine<br>▸ Transportation<br>▸ Telecommunications systems | Russian Federation |
| | ▸ High-strength nanocomposite superwire | Research and Production Enterprise “Nanoelectro” LLC | | Russian Federation |

**Through adoption of technological conversions of new alloys, ChMZ JSC will increase the level of competences development, expand the product range and strengthen the positions of TVEL Fuel Company on the world market.**

**Under conditions of strict requirements set by the designers to improvement of physic-chemical properties and specification of materials and alloys for the updated and new articles and components for aircraft, ship- and machine-building industries, titanium production at ChMZ JSC will be focused on development of the range of products out of new alloys.**

In 2017 production of spring wire for automotive industry was launched.

*Contract with Hermith GmbH*
In late 2016 ChMP JSC signed a five-year contract with Hermith GmbH — European distributor of titanium products. In 2017 the contract was ratified.

Under the contract the specialists of ChMP JSC elaborated the range of products, most demanded on the European market, in compliance with technical requirements of foreign standards. In February 2017 the first batch, comprising mostly the pilot samples, was shipped to the customer for control tests. Qualification stage provided by the contract will make it possible to set the rate of increase in scope of future supplies. The contract provides for annual manifold increase in scope of supply, and the peak will fall on 2021.

**5**
**–year contract with Hermith GmbH. Delivery to the European market more than 1 thous. tons of different titanium products made by ChMZ JSC**

**>2**
**RUB billion total amount of the contract with Hermith GmbH**

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In the first quarter there were shipped 12 tons of titanium products for aircraft industry, more than 4.5 tons for medical industry that sets special requirements to the product quality. In 2017, ChMP JSC launched production of titanium spring wire. In autumn the first qualification batch was shipped to the Italian company Ferrari. New lines of cooperation with Hermith GmbH include also titanium wire for additive technologies and titanium spring wire.

*Titanium for the world shipbuilding industry*

ChMP JSC produces more than 50% of titanium welding wire for the Russian shipbuilding market. The enterprise also produces more than 15 items of titanium welding wire applied in welding of elements of hull structures of vessels.

Titanium wire produced by ChMP JSC has additional advantages due to the low hydrogen content and the quality of outer surface. The innovative product showed good results with the leading enterprises of the United Shipbuilding Corporation and enterprises of the Russian power engineering industry.

In summer 2017, at the International Maritime Defence Show in Saint-Petersburg ChMP JSC presented innovative technological solutions for the world shipbuilding industry.

During the International Maritime Defence Show specialists of ChMP JSC reached an agreement on cooperation with titanium roll stock consumers. More than 50 negotiation with major shipbuilding enterprises were held.


**The application of titanium tubes in the “heart” of nuclear-power icebreaker proves quality and reliability of titanium products by ChMZ JSC. This unique article represents the main structural element of the reactor of nuclear-powered vessels**

*Production of high-duty titanium alloys*

ChMP JSC successfully mastered the unique manufacturing process of commercial-grade large ingots of high-duty alloys based on titanium intermetallides VIT-1 and VTI-4.

The technology adopted at TVEL JSC enterprises contributed to successful execution of the order for ingot production (weighing 450 kg each one) for the purposes of the Russian aircraft industry by smelting the large ingots with diameter 450 mm, with estimated weight up to 1,480 kg with subsequent cutting into the parts with the required weight. This process scheme resulted in substantial improvement of key indicators of metallurgical process, and enabled metal loss reduction at interstage operations and labor costs, as compared to smelting of small ingots. Scope of smelting and orders schedules decreased, and volume of products increased.

Due to the big diameter of ingots and their weight, there were chosen the optimal modes of electrodes preheating prior to smelting and cooling-down of ingots. Special attention was given to the ingots with high level of uniformity (distribution efficiency) of alloying elements. All these actions made it possible to avoid defects of the ingots and to get the required quality of the products.

**By 2022 ChMZ JSC can hold more than**

**30%**

**of the Russian titanium market**

**Revenue of ChMZ from sales of non-nuclear products must increase**

**4.6**

**times from RUB 2.7 bln in 2017 to RUB 12.6 bln by the end of 2022**

In August 2017 TVEL Fuel Company shipped the batch of FA jackets manufactured by Chepetsky Mechanical Plant for the multi-purpose nuclear-powered icebreaker Arctic.

These seamless thin-walled hexagonal tubes made of zirconium alloy with the walls 1.6 mm thick are manufactured in Russia at ChMZ according to the unique and exclusive technology, developed by the specialists of the plant in cooperation with the scientists of VNIINM JSC.

Hexagonal tubes for reactor plant are the super-duty articles with strict requirement to quality.

High purity of surface, improved accuracy of lines and faces — these are the key factors of the essential production steps. Finishing process steps require delicate workmanship, because a hexagonal tube is a deformable thin-walled difficult-to-make profile.

The production scheme developed by the specialists of ChMZ metallurgy centre, the unique process, facilities and instrumentation make it possible to produce hexagonal tubes in compliance with customer requirements.

***Superconductive materials and superwire***

*Production of the components for electrical wire*

In 2017, ChMP JSC shipped to Research and Production Enterprise “Nanoelectro” LLC the pilot batch of conductive cores made of copper, chrome and niobium, for the winding heat-resistant wire ПОЖ-700. This type of wire is applied in the reactors’ (VVER) control and safety system, and improves their reliability.

A new product represents the rectangular-sectioned wire made of copper alloy. Production process was developed by Research and Production Enterprise “Nanoelectro” LLC, and was introduced by the plant specialists using the facilities and unique up-to-date equipment of the shop for production of superconducting materials, that was established at ChMP JSC during execution of works under ITER International Project. In future the enterprise is ready to master the production of conductive cores with different cross-sections and of various alloys, in compliance with the requirements of the customers.

***Special metallurgy***

*Calcium injection wire*

In 2017 ChMP JSC concluded contracts for delivery of Calcium injection wire to the major Russian steel companies: Severstal PJSC, Magnitogorsk Iron & Steel Works PJSC, NLMK PJSC.

In 2017 the calcium wire was qualified for liquid steel processing by foreign customer at ArcelorMittal plants.

*Production of equipment for zirconium manufacturing*

Improvement of zirconium manufacturing is the strategical objective of TVEL Fuel Company, that will strengthen position of ROSATOM on the world nuclear fuel market.

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In 2017 the machine-building complex of ChMP JSC was the first in Russia to produce the unique processing equipment out of HASTELLOY (rare alloy resistant to highly aggressive media) — the absorption column for zirconium chlorides and hafnium separation unit.

This new equipment of ChMP JSC made it possible to reach new quality of zirconium, and the team of the subsidiary company has got new competences. ChMP JSC became the first enterprise in Russia to work with HASTELLOY alloy on an industrial scale.

The absorption column has successfully passed the acceptance tests and complies with all quality requirements.

The machine-building complex of ChMP JSC has also set the rectifying and splitter columns. They will comprise the plant that will make it possible to produce nuclear purity zirconium (free of any impurities), to reduce power consumption and to speed up manufacturing and technical processes.

*Hafnium*

TVEL Fuel Company develops the first Russian high-tech production of hafnium out of hydrometallurgical wastes of ChMP JSC for the needs of metallurgy, nuclear power engineering, defence industry and electronics.

The elaboration by the plant specialist is considered to be unique, since for the first time in Russia within one enterprise there was established the full-range process cycle for hafnium oxide production: from zircon and impurity elements to the finished products with at least 99% content of the base material.

Hafnium oxide is applied to obtain anoxic compounds (carbides, borides, nitrides) that are used for production of hard, wear-resistant coatings for heated assemblies and parts of air-space equipment, the tools for high-speed processing and high-temperature materials. It is also applied in production of special grades of glass for fibre-optic articles, as film-forming materials in optical fabrication.

Revenue of ChMP JSC from delivery of products made of hafnium to foreign customers increased eight times in the reporting year as compared to 2016, and amounted to more than RUB 100 mln. In 2017 the enterprise completed the process of iodide hafnium development.

**In May 2017 the representative of the US company QSA Global Inc. visited PA ECP JSC to audit the Quality Management System for compliance with CFR and ISO requirements. Following the audit results it was acknowledged that PA ECP JSC maintains proper quality management system for supply of the enriched stable isotope products under QSA Global Inc. order**

**Chemistry**

Growth in demand of isotope products is the crucial factor for development of isotope products manufacturing.

***Production of stable isotopes***

ECP remains the world leader in stable isotopes production: its products cover more than 40% of requirements of the world market. In 2017 the Company developed and delivered stable isotopes for international and home scientific projects:production and delivery of 40 kg batch of Germanium-76 isotope; production of 6 kg of polycrystalline silicon-28. PA Electrochemical Plant JSC after long-term pause has delivered the batch of Germanium-76 isotope to continue the tests in search of neutrinoless double beta decay that are carried out by international scientific collaboration GERDA. The delivery has been performed under the contract concluded between M. Planck Institute for Nuclear Physics and JSC Isotope — the official supplier of isotopic complex of ROSATOM State Corporation.

The first Germanium-76 for GERDA project was developed at PA ECP JSC in 2004-2005. At that time the company obtained the competences under the special requirements set to production, storage and transportation of this product.

Due to the proper logistic scheme developed by the specialists of PA ECP JSC together with JSC Isotope, new batch of Germanium-76 was delivered in due time to the purchaser who carried out the isotope quality tests and proved its compliance with the contract terms. In addition to provision of high chemical purity and content of target isotope, PA ECP JSC has completed non-routine tasks to comply with requirements to storage and transportation of the products. Interim storage of Germanium isotopes has been organized in underground storehouse in special-purpose enclosure to protect the products from cosmic radiation. The specialists of the enterprise have also manufactured special transport and storage container with functionality similar to underground enclosure.

Silicon enriched in silicon-28 has been manufactured and delivered under International project (contract with Federal Physical Technical Agency of Germany) for creation of mass standard “Kilogram-3”.

In 2017 during implementation of the programme “Development of isotope production at Electrochemical Plant JSC PA”, there was put into operation a new unit for production of iridium enriched in stable isotope iridium-191, this will enable increase in production of this isotope.

Disks made of iridium-191 serve as a base for creation of gamma ray radiation source based on iridium-192 radionuclide in non-destructive control systems for evaluation of commercial products’ quality using radiography technique.

Finished products in commodity forms made of iridium $^{191}$Ir and $^{192}$Ir are delivered to USA under the contract concluded between JSC Isotope (the authorized supplier of isotope complex products of ROSATOM to the international market) and the company QSA Global Inc (USA).

SGChE JSC manufactures the products under 11 items of stable isotopes, including stannum, sulphur, chrome, lead, wolfram, xenon and others. Stable isotopes are generally applied as starting material for production of radioisotopes that are widely applied in industry, science, and medicine.

Starting from January 1, 2017 the isotope separation plant started commercial operation of high-tech gas centrifuge unit that made it possible to widen the range of production capacity of SGChE JSC, and to ensure utilization of gas centrifuge production capacities.

In 2017 SGChE JSC concluded long-term contract on delivery of isotope products with Russian manufacturer of medical supplies. Under the five-year contract SGChE JSC undertakes to manufacture and to deliver to the customer the stable isotopes to the amount more than RUB 70 mln for application in diagnostic medical equipment.

Table 25

**Chemistry**

| New businesses | Products | Basic enterprises | Scope | Supplies |
|---|---|---|---|---|
| **Production of stable isotopes** | ▸ Production of 95 isotopes of 19 chemical elements: Ar, W, Ge, Fe, Ir, Cd, Si, Kr, Xe, Mo, Ni, Sn, Os, Pb, Se, S, Te,C, Zn | PA ECP JSC, SGChE JSC, NCCP PJSC | ▸ Industries<br>▸ Medicine<br>▸ Research of new generation elementary particles properties<br>▸ Agriculture<br>▸ Metrology<br>▸ Researches in the sphere of geology, biology, oceanology, etc. | Russian Federation, USA, Germany, Canada, Republic of Korea, Great Britain, Uzbekistan, China, Japan, France |
| **Catalysts** | ▸ Autocatalysts | Ecoalliance LLC (UEIP JSC subsidiary) | ▸ Industries<br>▸ Transportation | Russian Federation |
| | ▸ Zeolite catalysts for petroleum chemistry | NCCP PJSC | ▸ Industry | Russian Federation |
| **Fluorine compounds** | ▸ Extra pure anhydrous fluorine hydrogen | ECP JSC SGChE JSC | ▸ Nuclear, oil-producing and chemical industry<br>▸ Transport | Russian Federation |
| | ▸ Trifluoromethanesulfonic Anhydride (Triflic Anhydride) | AECC JSC | ▸ Pharmaceutical, chemical industry<br>▸ Agricultural chemistry | Russian Federation, foreign trade supplies |

If GERDA tests reveal neutrinoless double beta decay, this rare reaction means that neutrino and antineutrino represent the same subnuclear particle, as it was suggested by Ettore Majorana in 1930s.

This will involve adjustment of the Standard model of particle physics, which is considered to be the theoretic foundation of the modern concepts of structure and development of matter.

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***Катализаторы***

Ecoalliance LLC (Novouralsk, Sverdlovsk region) — the subsidiary of UEIP JSC — is the only Russian manufacturer of catalysts systems for neutralization of exhaust gases. The enterprise covers full technological cycle: from catalyst development to batch production of exhaust gases neutralizers. Ecoalliance LLC holds 31% of the Russian market of automotive catalysts for gasoline and diesel engines.

Key competences of Ecoalliance LLC:

- design development and modelling of neutralizers, catalytic collectors of the cars with gasoline and diesel engines complying with the international standards Euro 3, Euro 4, Euro 5, Euro 5+, Euro 6;
- prototype production;
- development of catalysts for purification of industrial emissions;
- production of precious metals salt solutions;
- services on comprehensive testing to confirm compliance with environmental requirements of automotive transport.

In 2017 Ecoalliance LLC launched commercial operation of dynamometer test stands for light vehicles VULCAN II EMS-CD48L 2WD by HORIBA (Japan). The parties signed the certificate of commencement of commercial operation of the test stand, and acknowledged thereby successful completion of improvement of gas analysis equipment complex of Ecoalliance LLC. This modern test stand enables participation of the subsidiary of the Urals Integrated Electrochemical Plant in supplies of products complying with EURO-5 and EURO-6 standards.

Notwithstanding the difficulties on the Russian automotive market — sales of light vehicles decreased in 2015 by 33% in monetary terms, the market decline continued in 2016, growth began only in 2017 — revenue of Ecoalliance LLC increased. From 2014 to 2017 the revenue increased more than three times (from RUB 0.76 bln to RUB 2.6 bln). In 2017 sales grew from RUB 1.9 bln to RUB 2.6 bln. Development strategy provides for revenue increase up to RUB 4 bln following the results 2022.

In 2018 the plant plans to launch new production — Chrome-50 isotope for scientific research in the field of neutrino physics. Chrome-50 will become the 107th isotope (21st chemical element) in the range of production competences of the plant.

**1.5**

**RUB billion**

**Revenue from sales of products, works and services of general industrial activities in 2017 at PA ECP JSC made RUB 1.5 billion, and exceeds 10% of the annual total revenue of the enterprise**

**>300**

**RUB million**

**Annual revenue from sales of fluohydric products for the first time ever exceeded RUB 300 million**

**>14**

**USD million**

**Revenue from sales of isotope products on the international market exceeded USD 14 million**

**Machine Building**

In 2017 the design of equipment set (five items) for drilling mud cleaning was developed. Batch production of three items of the equipment for drilling mud cleaning started in 2017, the products were shipped to the consumers. Shipment of the full sets of drilling equipment is scheduled starting from 2018.

**New energy**

***Energy storage devices***

The unified branch integrator for new business line “Energy Storage” was established within the group of TVEL JSC. The estimated total revenue of the integrator will amount to RUB 11 billion by 2030.

The long-term benefits of this direction are provided by market demand for energy storage systems, including for transport, and the initiative of major cities to use green e-transport.

In 2017 Centrotech SPA LLC concluded the contract for elaboration of manufacture and delivery of the products with the leading Russian manufacturer of passenger transport with grid-isolated run. Scopes of delivery are scheduled for 2018–2023. Total amount of deliveries under the contract for the mentioned period will make RUB 8.6 bln.



Table 26

**Machine Building**

| New businesses | Products | Basic enterprises | Scope | Supplies |
|---|---|---|---|---|
| **Instrument engineering** | ▸ Car electrical equipmen | Tochmash VPA JSC | ▸ Electric Power<br>▸ Industries<br>▸ Transportation | Russian Federation |
| | ▸ Static frequency converters<br>▸ Dosimeters<br>▸ Radiation meters<br>▸ Controllers<br>▸ Printed circuit boards<br>▸ Connector boxes | Centrotech SPA LLC | ▸ Electric Power,<br>▸ Industries | Russian Federation |
| **Nuclear fuel cycle equipment** | ▸ Core components | Tochmash VPA JSC | ▸ Electric Power<br>▸ Industries | Russian Federation |
| **Equipment for impurities filtering** | ▸ Filters | Centrotech SPA LLC | ▸ Electric Power<br>▸ Industries | Russian Federation |
| **Mining industry equipment** | ▸ Oil-fields equipment | Centrotech SPA LLC | ▸ Mining and processing of mineral resources | Russian Federation |

***Lithium and lithium-based materials***

In 2017 new projects were initiated for diversification of the lithium products range.

High quality of lithium products was qualified and proved by new clients.

Test sample of current source on solid oxide fuel cells (250 W) has been produced, design of the pilot unit is being updated to comply with changes of the customer requirements.

In-site e-transport of UEIP JSC and PA ECP JSC was re-equipped from conventional storage batteries to lithium-ion batteries.

Energy JSC carried out researches of active material for lithium-ion batteries, and obtained positive results proving applicability of the material in batch production of batteries by Energy JSC.

***Electrochemical power sources***

In 2017 Centrotech SPA fulfilled a commitment under the contracts with Energy JSC for delivery of electrodes for supercondensers and nickel-cadmium cells. From August 2017 to May 2017 the partners received 325 thousand electrodes.

Production technique of positive electrodes was developed in 1997 by the specialists of electrochemical fabrication of the Plant of electrochemical transducers (at the present time — the subdivisions of Centrotech SPA LLC). Today Centrotech SPA is the only world manufacturer of this product. Its unique character is explained by great electrical capacity of super-thin electrodes.

Electrodes produced by TVEL Fuel Company are intended for production of supercondensers and alkaline cells applied in the power supply systems of civil e-transport, for instance: underground railway, electric vehicles, hybrid cars, electric buses, trolley buses.

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Table 27
**New energy**

| New businesses | Products | Basic enterprises | Scope | Supplies |
|---|---|---|---|---|
| **Lithium and lithium-based materials** | ▸ Lithium hydroxide-7<br>▸ Lithium metal<br>▸ Lithium chloride | NCCP PJSC | ▸ Transportation<br>▸ Electric Power<br>▸ Metallurgy<br>▸ Aircraft<br>▸ Industries<br>▸ Telecommunications Systems | Russian Federation, Germany, USA, Great Britain, China |
| **Materials for Li-Ion cells** | ▸ Lithium Ferrophosphate | NCCP JSC, Katodnye Materialy (Cathode Materials) LLC (NCCP JSC subsidiary) | | Russian Federation |
| | ▸ Lithium cobaltate | | | |
| | ▸ Lithium tetrafluoroborate | SGChE JSC | | |
| | ▸ Electrolyte fluid for lithium batteries | | | |
| **Accumulators and electric power generators, fuel elements** | ▸ Special purpose (military and space machinery) electrochemical power sources (alkaline fuel cells)<br>▸ Electrochemical power sources on solid oxide fuel cells | Centrotech SPA LLC | ▸ Electric Power<br>▸ Telecommunications Systems | Russian Federation |

In the nearest 5 years NCCP JSC plans to increase revenue from non-nuclear products by 82% to RUB 3.9 billion by 2022.

The enterprise holds strong position on the market of commercial and isotope lithium products.

The way forward is connected with both export development and production of high-technology products — energy storage systems based on chemical cells (Li-ion cells).

The concept of NCCP site development involves continuation of work to upgrade production capacities, and to attract investors for establishment of new productions using the available plant territories.

**PRODUCTION MANAGEMENT**

TVEL Fuel Company has always been concerned with special approaches to production and management processes in order to implement the strategic goals of ROSATOM with regard to the orders portfolio expansion, to maintain efficient production under conditions of severe and ever-growing competition on the global markets.

**ROSATOM Production System**

ROSATOM Production System (RPS) is the culture of lean manufacturing and continuous improvement of processes aimed to reveal and reduce all losses in production and business processes, and to ensure competitive advantage on a global scale.

RPS is based on five principles which encourage the employees:

- to be attentive to customer's requirements;
- to respond the issues as they emerge;
- to incorporate quality into the process and produce no defective products;
- to identify and eliminate any losses (excess inventory, decoupling stocks, downtime, unnecessary movements, etc.);
- to set an example to colleagues.

For details please refer to: *www.rosatom.ru/about/system*.

RPS implementation is aimed to integrate the idea of diligence and optimality into administrative decisions-making logic at production site, and through production — into other processes and structural subdivisions of the company. Implementation of RPS projects is focused on performance gain, costs reductions and improvement in the products quality. Knowledge of RPS tools and competence in applying these tools are a guarantee of professional growth of employees engaged in the nuclear industry.

Starting from 2015, ROSATOM applies the system-based approach to deploy RPS at the pilot enterprises of the industry.

The Company included into ROSATOM management system can receive the status of RPS enterprise only subject to system-based application of RPS. According to the concept of RPS development, all RPS nterprises implement the integrated package of RPS arrangements, and are subdivided as follows:

- RPS Leader,
- RPS Candidate,
- RPS Reserve.

The integrated package of RPS arrangements provides for:

- setting clear objectives to the employees to the level of small group leaders based on scope definition of the enterprise, division, sector;
- RPS methodology training of the managers of the enterprises, participants of the projects;
- development of the product flows of the enterprise;
- implementation of RPS projects in office and at production site under a single methodology;
- incentive and development programs for different level employees.

**Enterprises — RPS Leaders receive the package of privileges including the following: business-trainings at the enterprise, possibility to share experience with the advanced Russian and foreign enterprises, family tickets, certificates for training in ROSATOM Corporate Academy, participation in Workspace Design project, etc.**

**Launch of the project "Production planning with the supply chain"; introduction of "easy" decisions at the first stage of the project allowed to reduce PT of supply chain planning by 30.5% (from 82 days to 57 days).**

**By 2018 the project provides for mapping of the planning processes, analysis of the current planning problems, determination and implementation of arrangements for planning organization in SAP, achievement of goals of planning PT reduction and "just-in-time" production.**

In 2017 seven enterprises of TVEL Fuel Company — MSZ PJSC, UEIP JSC, KMZ PJSC, SGChE JSC, PA ECP JSC, ChMP PJSC, NCCP PJSC confirmed their RPS Leader status, maintained the achieved level and continued application of RPS tools and principles.

Following the results 2017 AECC JSC was granted the status "RPS Candidate" with inclusion into the RPS application contour in 2018.

The work within the framework of the branch program "Complex manufacturing optimization of nuclear industry enterprises" and divisional program "Transfer to operating models based on control over the whole supply chain" is aimed to improve performance of TVEL JSC and the companies included into TVEL Fuel Company management system.

In the reporting period TVEL Fuel Company opened and implemented more than 1027 RPS projects intended to address the issues in the product flows and to improve efficiency of all business processes. More than 80% managers of TVEL FC enterprises were involved in the project activity.



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Table 28
**Major RPS Projects implemented in 2017**

| Enterprises | Project | Results |
|---|---|---|
| TVEL JSC<br>MSZ PJSC<br>NCCP PJSC<br>ChMP JSC<br>PA ECP JSC<br>UEIP JSC<br>SGChE JSC<br>AECC JSC | Project group for optimization of through product flows | ‣ PT reduction for the key flows by 31%<br>‣ Stock reduction in key flows by RUB 9.6 billion |
| TVEL JSC<br>MSZ PJSC<br>NCCP PJSC<br>ChMP JSC<br>KMZ PJSC | Industrial stability improvement (Fabrication + KMZ) | ‣ Industrial stability improvement by 29 points (from 60 to 89%)<br>‣ “Just-in-time” production improvement by 20 points (from 50 to 70%)<br>‣ RIP reduction at enterprises MSZ PJSC, NCCP PJSC, ChMP JSC, KMZ PJSC by RUB 772.1 mln<br>‣ Economic benefit under the project in 2017: RUB 39.6 mln |
| TVEL JSC<br>PA ECP JSC<br>UEIP JSC<br>SGChE JSC<br>AECC JSC | Perfect turn (SSC enterprises) | ‣ Reduction by 118 thousand man-hours (from 2,986 thousand man-hours to 2,868 thousand man-hours)<br>‣ Interoperability increase by 29.5% (from 6.9 to 9.05 skills and competences per 1 worker)<br>‣ Reduction of time of response to deviation offset by 38.7% (from 21.6 min. to 13.2 min. per process deviation)<br>‣ The project benefit — reduction in production costs by 66 million rubles/year |
| TVEL JSC<br>ChMP JSC<br>NCCP PJSC<br>MSZ PJSC | Adjustment of zirconium products delivery for the client’s requirements | ‣ PT Reduction by 30% (from 133 days to 83 days)<br>‣ RIP reduction by 29% (from 193 tZr to 140 tZr)<br>‣ Warehouse reduction by 1742 $m^2$<br>‣ Economic benefit under the project: 525.8 RUB mln |
| TVEL JSC<br>ChMP JSC<br>NCCP PJSC<br>MSZ PJSC<br>KMZ PJSC | Increase of the value of work of production personnel | ‣ Labor intensity reduction by 167.4 thousand hours<br>‣ Increase in labor efficiency by 4.35%<br>‣ Economic benefit under the project: 87.3 RUB mln |
| MSZ PJSC | “Increase of RBMK flow efficiency” | ‣ PT Reduction by 20% (from 101.7 days to 81.4 days)<br>‣ RIP reduction by 25.4% (from 131 tZr to 97.6 tZr)<br>‣ Increase in labor efficiency by 7.2% (from 2.34 tU/person to 2.51 tU/person) |
| NCCP PJSC | “Optimization of lithium stock supplies planning process” | ‣ PT reduction by 7.4% (from 95 days to 88 days)<br>‣ Reduction in labor intensity of the process by 25% (from 600 days to 450 days)<br>‣ Increase in “meeting deadline” discipline from 25% to 75%<br>‣ Economic benefit under the project: 29.776 RUB mln |
| KMZ PJSC | “Improvement of the process of instrumental support of the GC production” | ‣ Decrease in tool circulation at production site by 25%<br>‣ Tools and equipment costs saving in the cost structure by 0.2%<br>‣ Economic benefit under the project: 68.7 RUB mln |



In 2018 TVEL Fuel Company intends to focus on the following areas of efficiency improvement: product quality improvement, logistics improvement, production flow efficiency improvement, forming of branch RPS samples. It is also planned to develop the client-to-supplier principle within the supply chain and the functions in relation to the material flow.

**Suggestions for Improvement**

The Company maintains regulated payments for suggestions for improvement (SFI):

- payments equal to 300 / 700 / 1,000 rubles for submitting SFIs of various categories and economic value;
- after SFI introduction — payment of interest from economic benefit received from SFI introduction;
- for assistance in implementation of SFIs with technical solutions (rationalization proposals): up to 30% of the amount paid to the authors.

Personal and team RPS contests are also held at the level of enterprise or structural subdivisions and the whole TVEL Fuel Company. The contest winners are awarded with diplomas, valuable gifts and participation in corporate divisional and branch events.

The best SFIs take part in annual Industrial contest of suggestions for improvement and projects on implementation of ROSATOM Production system, held among the workers of the companies of ROSATOM State Corporation. Following the result 2017 Trofimov S.V. — the maintenance technician of UEIP JSC, became the leader in the number of implemented 174 SFIs.

To increase involvement of the workers in continuous improvement in 2017 KMZ PJSC organized the pilot Kaizen team with the purpose to reduce the time of SFI introduction. In 2018-2019 it is planned to organize similar Kaizen teams at other companies of TVEL Fuel Company.

In 2017 there were filed more than 114 thousand SFIs. Efficiency indicator of the SFIs process is the quality indicator; it is calculated as the ratio of the adopted SFIs to the submitted ones. Thus, in 2017 93.8% SFIs were accepted for realization (in 2016 — 93.1%), 95.4% of accepted SFIs were implemented (in 2016 — 91,6%), which is illustrative of SFI quality growth.

536 SFIs were found to be efficiency suggestions. 86.8% were accepted for realization, 89.7% — implemented.

In average, in TVEL Fuel Company one worker submits 5.6 SFIs. 80% of personnel of the Company participate in the improvement process through SFI submission.

Economic benefit from SFI implementation following the results of the year made RUB 289.3 mln.

Amount of the paid personal bonuses for the benefit from efficiency suggestions and SFI made RUB 40.8 mln, amount of the operating bonuses paid to minor groups for contribution to efficiency improvement made RUB 96.0 mln.

In 2017 enterprises of TVEL Fuel Company for the purposes of the labor efficiency improvement carried out the work to reduce the time spent to solve the production problems, this allowed to manage the time of the personnel. The organizational arrangements were carried out to eliminate the works that bring no value, the measures were implemented aimed at improvement of labor efficiency.

Diagram 15
**Work with suggestions for improvement in TVEL Fuel Company**

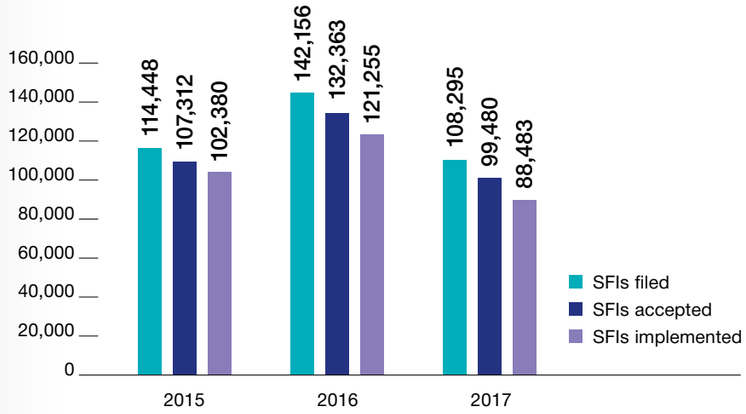


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Table 30

| | |
|---|---|
| SFI per 1 worker | **5.6** |
| Operating bonuses paid to minor groups for contribution made to efficiency improvement | **96.0 RUB mln** |
| Personal bonuses paid for the benefits from efficiency suggestions and SFI | **40.8 RUB mln** |
| Workers who submit SFIs | **80%** |
| Economic benefit from efficiency suggestions and SFIs | **289.3 RUB mln** |

**Among TVEL FC enterprises the most SFIs per one employee were registered at AECC JSC — more than 12 suggestions, and at SGChE JSC — more than 10 suggestions**

All measures were evaluated in terms of safety, compensatory measure were implemented.

This resulted in increase of labor efficiency in TVEL Fuel Company by 4.35%, and increase in interoperability by 29.5%. Increase in labor efficiency of production functions personnel made 4.4%.

## QUALITY MANAGEMENT

For continuous improvement of quality, industrial safety and reduction of impacts of the industry and the products on the environment, TVEL JSC has introduced and operates the integrated quality, ecology, health and labor safety and energy management system (IMS) that was certified in accordance with the requirements of international standards ISO 9001:2008, ISO 14001:2004, ISO 50001:2011 and BS OHSAS 18001:2007 at TUV International Certification.

The main strategic goal of TVEL JSC in terms of quality is permanent improvement of the product quality and operational safety, aimed at maximum compliance with the customers' requirements, and allowing to expand the markets, ensure sustainable development of subsidiary companies. The set of measures and procedures


focused on effective operation of the quality management system has been elaborated and introduced to achieve this goal; customer feedback is maintained to develop and improve the activity of TVEL JSC; customers' satisfaction assessment is carried out on an annual basis.



The System covers the full range of design, development, production, storage, delivery and scientific-technical support of FA and the components of nuclear reactor cores, including the materials and accessories.

To improve IMS TVEL Fuel Company has introduced and updates the culture of safe production — the priority objective identifying occupational activity of the workers and the business processes of the organization. The required documents have been worked out to comply with the requirements of IAEA and the customers' preferences.

The works have been scheduled to transfer TVEL JSC and its subsidiaries to new versions of ISO 9001 and ISO 14001 for subsequent certification in 2018. The works have been provided to develop and improve IMS, to introduce risk-oriented management model for sustainable success of TVEL Fuel Company.

**Results 2017**

The foreign companies-customers have performed the audit of the quality management systems within the framework of nuclear fuel deliver for VVER and PWR reactors. Following the results of inspection, the Customers have noted positive tendencies in development of the integrated management system.

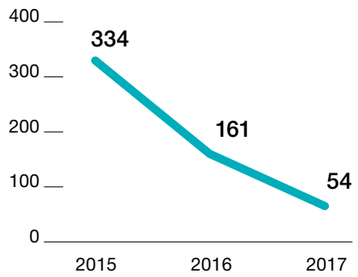
TVEL JSC and its subsidiary companies (MSZ PJSC, NCCP PJSC, ChMP JSC, VNIINM JSC, SGChE JSC, PA ECP JSC, UEIP JSC, AECC JSC, KMZ PJSC, Tochmash VPA JSC, Centrotech SPA LLC, "Industrial Innovations" JSC) successfully passed the witness audit in 2017 with international certification authority TÜV Thüringen e.V. (representatives of Intercertifica TÜV LLC together with TÜV Thüringen). The active Integrated Management System certificate was confirmed.

In the reporting year no penalties were charged for non-compliance with laws and regulations concerning the provision and use of products and services.

The number of nonconformities of nuclear fuel and gas centrifuges revealed by the Quality Control Department and representative of the customer at the manufacturing plants in 2017 was reduced three times as compared to the previous year.

Diagram 16

**Number of revealed nonconformities, ea.**




**TVEL Fuel Company continuously improves the product quality through technical upgrade of production, improvement of the processes automation, and implementation of the number of investment and RPS projects aimed at efficiency improvement**

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Diagram 17
**Customers' satisfaction assessment, points (five-point scale)**


**There were no claims or complaints filed by the customers in 2017.**

**No events of non-compliance with regulations and voluntary certification concerning impact of the products and services on health and safety were revealed**

In 2017 the customers' satisfaction was assessed. Main customers of TVEL Fuel Company involved in the customers' satisfaction assessment:

- Rosenergoatom Concern JSC (Russia);
- Techsnabexport JSC (TENEX JSC) (Russia);
- Slovenske elektrarne (Slovakia);
- Kozloduy NPP (Bulgaria);
- Paks NPP (Hungary);
- Energy Study Centre (Hungary);
- CEZ (Czech Republic);
- Fortum (Finland);
- Research Center (Poland);
- Vattenfall (Sweden);
- JNPS (China);
- State Enterprise National Nuclear Energy Generating Company "Energoatom" (Ukraine);
- Research Institute (Korea);
- Research Institute DNRI (Vietnam).

The average index of the customers' satisfaction level in 2017 was 4.49 points of 5 available.



# Intellectual Capital

**The main objective of scientific and technical activities of TVEL Fuel Company is to ensure competitiveness of the products and safety of production and operation**

The main areas of scientific and technical activities of TVEL Fuel Company are as follows:

- improvement of existing structures, creation of new types and technologies of nuclear fuel production;
- design and technological development of the separation-sublimation complex;
- innovative activities in the non-nuclear industry.

The scope of research and development (R&D) is defined by the decisions of the management of ROSATOM State Corporation, contractual obligations, and is subject to revision on an annual basis at the meetings of the Scientific and Technical Council No. 2 of ROSATOM — "Nuclear Materials and Technologies of Nuclear Fuel", the STC of TVEL JSC and its sections.

## INNOVATIVE ACTIVITIES IN THE NUCLEAR INDUSTRY

The innovative activity in the nuclear industry is of fundamental importance for long-term competitiveness and sustainability of TVEL Fuel Company, since FE NFC services and products form the base of the Company enterprises' activity (85% based on results 2017).

**Main R&D issues:**

- increased burnup fraction of unloaded nuclear fuel;
- improved operating life of FA;
- improved operating reliability of nuclear fuel, justification for FA operating efficiency under the conditions of the increased capacity of power units (for VVER-1000 to 107% from Nnom) subject to safety assurance;
- creation of new types of gas centrifuges;
- optimization of TVS-K design (for PWR), new types of fuel for research reactors, floating power units, new cores for nuclear-powered icebreakers.

**Major R&D directions for nuclear fuel:**

- design and improvement of nuclear fuel and reactor cores of Russian design (primarily VVER-1000/1200/1300);
- design of nuclear fuel for Western reactors (PWR);
- design of nuclear fuel for low-capacity nuclear power stations, research reactors and nuclear-powered icebreakers.

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**Results of implementation of the project "Moving towards Zero Failure" in 2017:**

- In accordance with the plan of ROSATOM State Corporation, NPPs and manufacturing plants have introduced or implemented the measures aimed to preclude the events of FA failure at NPP.
- To preclude the FA failure caused by debris-defects the specialists have elaborated and proved by experiments the structure of the 2nd generation anti-debris filter (ADF) with the improved characteristics. Introduction of new batch of FA with ADF-2 is planned in 2018 at Rostov NPP.
- Low level of failure is registered at Rostov NPP, Zaporozhye NPP, Rivne NPP, some units of Balakovo NPP. Kozloduy NPP is the leader in the lowest number of failed FA over a long period of time. From 2012 to 2017 only one failed FA was detected at Kozloduy NPP, this fact proves high quality of nuclear fuel production and excellent operation of these units.

**Operating results 2017 from improvement of nuclear fuel properties and production technologies**

***Design and introduction of nuclear fuel and cores of Russian power reactors:***

- Development and approval of technical projects of fuel elements, fuel elements with Gd and fuel assemblies TVSA-T.mod.2 for Temelin NPP. Acceptance testing of fuel pellets (uranium and urania-gadolinia), fuel-elements claddings, bottom nozzles. The above listed articles have been put into production.
- Execution of documents for industrial operation of TVSA-PLUS.
- Preparation and signing of supplement to the contract for delivery of TVS-2M to Tianwan NPP (Units 3-4) and engineering services.
- Feasibility studies of RK-3+ application at Dukovany NPP.

**7**

**bln RUB**
**up to 7 billion rubles is planned to increase the revenue from the sale of innovative products by 2020 from the current 600 million rubles**

**500**

**mln RUB**
**total amount of innovative non-nuclear projects financing in 2017**

- Development of technical projects of NPP-2006 core with conventional and regenerated fuel.
- Conclusion of the contract with Engineering Company ASE JSC under the project Paks-2 NPP (Units 5 and 6) for elaboration of the document on nuclear fuel.
- Preparation and signing of the contract for delivery of new nuclear fuel and rendering of services involving licensing of fuel for Akkuyu NPP.

***Design of nuclear fuel for low-capacity nuclear power stations, research reactors and nuclear-powered icebreakers:***

- Acceptance testing of experimental double FA MR 0039.04.00.000 with LEU-fuel for MARIA research reactor in Poland.
- Optimization of design and production process of experimental fuel elements of MIR type with high-density uranium-molybdenum fuel.
- Post-irradiation examination of two experimental FA IRT-3M with uranium-molybdenum fuel after irradiation in MIR research reactor with average burnup 60%.

**Plans 2018 for nuclear fuel design and improvement**

***Introduction of the improved and new nuclear fuel and cores of NPP with VVER-1000/1200/1300 and VVER-440 reactors:***

- Development of justification (critical power ration, reflood at loss-of-coolant accident) for operation of the cores VVER-1000 with TVS-2M with mixing grid at the capacity level 107%.
- Implementation of R&D program on computational-experimental justification of the cores VVER-1200 and VVER-TOI (safety limits, radioactive GFP, controllability, etc.).
- Development of TVS-2006 design with the improved thermomechanical behavior (including without fuel assembly fixation in support grid).
- Preparation of materials for justification of operation pre-test assembly program of TVS-4 on the Unit No. 3 Rostov NPP.
- Implementation of the "Program of experimental and theoretical computation studies for justification of extended dry storage of new type FA".
- Introduction of TVSA-T.mod.2 design for Temelin NPP (Czech Republic).
- Development of documentation to justify the expansion of pre-test assembly program of the third generation cartridges and implementation of local parameters control on the Unit No.4 Kolsk NPP.
- Expansion of pilot operation of the third generation cartridges on the power unit 4 of Kolsk NPP in order to confirm representativeness of the reactor core control using In-Core Monitoring System.
- Design engineering of cartridge with fuel elements with outer diameter 8.9 mm. Elaboration of the supporting materials will be completed in 2019.
- Design engineering of jacketless assemblies RK-3+ for Dukovany NPP.



***Design of nuclear fuel for Western reactors (PWR):***

- Study of TVS-K within pre-test assembly program at Ringhals NPP.
- Postirradiation examination of fuel elements at Studsvik Nuclear AB.
- Development in cooperation with the American companies of the supporting materials to ensure pre-test assembly program of fuel assemblies TVS-K in USA.

## SECOND BUSINESS CORE DEVELOPMENT

TVEL Fuel Company is engaged in development of innovative areas of activities (additive technologies, new materials and alloys, implementation of new types of isotope products, energy generators and storage units, small-size gas turbine plants). There are plans to increase revenue from sales of innovative products from current RUB 600 mln to RUB 7 bln by 2020, subject to successful implementation of investment projects and implementation of M&A plans.

It is impossible to establish new non-nuclear production without R&D. Scope of non-nuclear businesses R&D financing is being steadily increased. In 2017 scope of works doubled as compared to 2016, and made RUB 270 mln. R&D projects are being implemented with co-financing on the part of the Ministry of Education, in 2017 the amount of co-financing made RUB 131 mln. In 2017 total amount of non-nuclear innovative projects financing reached RUB 500 mln.

Main R&D areas for non-nuclear businesses development in 2017:

- development and creation of 3D printer;
- establishment of lithium hydroxide production;
- development of equipment and centrifuge technology for REE isotopes separation;
- development of new titanium alloys and articles made therefrom;
- development of design and manufacturing technique of the long-range superconducting wires;
- establishment of energy storage production.

**Additive Technologies**

In 2015 Ural Electrochemical Integrated Plant (UEIP JSC) became the winner of the contest organized by the Ministry of Education and Science of the Russian Federation, and secured the status of the industrial partner for creation of the first Russian plant of layer-by-layer powder synthesis (metal 3D printer) together with RPA CNIITMASH JSC. The projected cost of the home-produced printer will be by 20–30% lower than that of foreign printers.

The Ministry of Education and Science of the Russian Federation is the co-funder of the project aimed at establishment of production of automated complexes of layer-by-layer synthesis of geometrically-complex metal parts (3D printer); the project is being implemented with involvement of the top higher educational institutions of Russia, enterprises of ROSATOM State Corporation.

In 2017 the unified branch integrator — RusAT LLC — was established within the group of TVEL JSC in a new business area of ROSATOM State Corporation. The integrator will ensure production and rendering of complex services in the field of additive technologies: production and delivery of materials (metal powders, rods made of different materials), 3D printers, production and delivery of articles. Growth of the global market and development of the Russian

Diagram 18

**Investments into R&D by TVEL JSC, RUB mln**

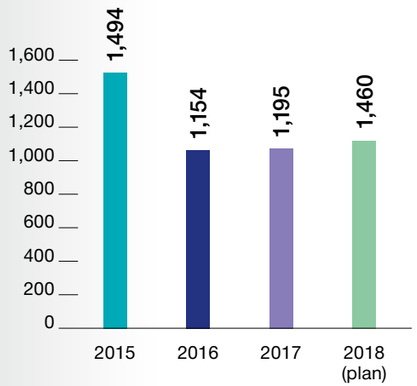
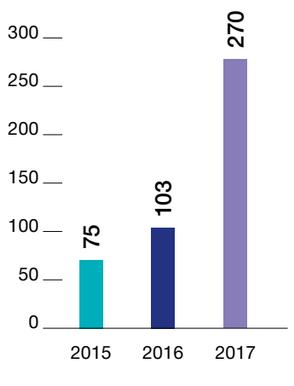



Diagram 19

**Scope of non-nuclear businesses R&D financing, RUB mln**

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Scheme 6
**Potential consumers of 3D printers**

**MILITARY-INDUSTRIAL COMPLEX**
- Production of geometrically-complex elements of special-purpose devices

**AIRCRAFT INDUSTRY**
- Production of elements for aircraft engines

**ENERGY INDUSTRY**
- Production of turbine blades

**MACHINE BUILDING**
- Production of geometrically-complex elements of different structures

additive technologies market are the important determinants of this area. By 2025 the global market is valued at RUB 980 bln, and Russian — at RUB 61 bln. The estimated share of the integrator will be 5% and 45%, respectively.

Possibilities created by the integrator with 3D technologies:
- manufacturing of products of any configuration and form, with complex inner structure (inside passages, etc.);
- considerable weight-saving (by 50% and more, due to removal of passive sections);
- materials saving (application of more than 95% material; during conventional machine processing — less than 30% material is used);
- savings in production mastering (twofold reduced lead time);
- savings in labor costs (labor intensity is reduced 3–8 times);
- creation of the articles with unique and improved technical parameters;
- unique combination of materials (creation of composites using materials that cannot be interfused by any other way, for instance, ceramics-metal, etc.).

## ADDITIVE TECHNOLOGIES FOR GAS TURBINE ENGINES

In July 2017 TVEL JSC presented at the International Aviation and Space Show MAKS-2017 the unique development by Grigory Shanin, the student of the Bauman Moscow State Technical University.

The prototype of gas turbine low-thrust engine developed by Grigory Shanin during his studies, with support of TVEL Fuel Company of ROSATOM, was selected for competition of innovative youth ideas, and in 2017 was admitted the winner at the final stage of Young Professionals Tournament "TeMP" of ROSATOM State Corporation.

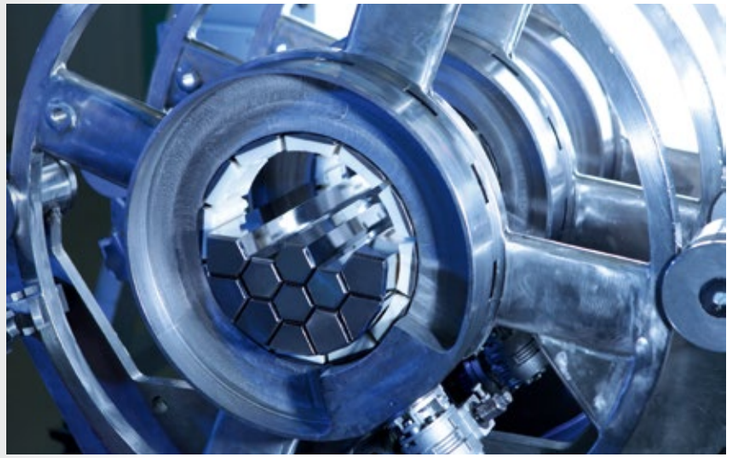
The design of gas turbine low-thrust engine for unmanned aerial vehicles was improved with additive technologies: 70% of elements are produced using layer-by-layer technique. Gas turbine plant can be in demand on the world and the Russian UAV market. As compared to the competitors, the prototype has fuel efficiency improved by 40% and tenfold increased operation life.

The technological groundwork, laid at development of the prototype of gas turbine low-thrust engine, became the foundation of new investment project opened by TVEL JSC. The Company intends to start pre-test assembly program of engines at one of its sites.

## ADDITIVE TECHNOLOGIES FOR FA

In August 2017 VNIINM JSC formed the work team for development of the pilot technology of 3D printing of FA end pieces. The capabilities of additive technologies will be used in nuclear industry for production of elements for all types of FA. First of all, these are the end pieces: heads, bottom nozzles, support grid, anti-debris filters. These articles are difficult-to-make using the existing methods, application of 3D-printing will make it possible to produce articles with unique design.





**Results 2017:**
Production of metal powder samples for 3D printer with the quality exceeding the foreign analogues. Decision-making concerning improvement (together with Centrotech SPA LLC) of powder production plant with a view to apply additive technologies internationally on an industrial scale.

The pilot model of metal poly-powder 3D printer of the second generation of 3D printers, developed by ROSATOM State Corporation, was assembled in November. Print modes of the assembled 3D printer are being adjusted.

It is planned that in 2019 a high-tech production for 3D printers assembly will be established at Novouralsk site of TVEL JSC; this will additionally create nearly 30 jobs.

**Plans 2018:**
- Development and presentation of the integrator development plan, provision of the integrator activity funding.
- Development of the product line.
- Preparation of the intra-branch list of articles that can be produced with application of additive technologies.

**Superconductors**
In furtherance of the competences in the area of low-temperature superconductors, TVEL Fuel Company continues the development of design and manufacturing technique of wires for the project of the European Centre for Nuclear Research (ECNR, Switzerland) on creation of FCC (Future Circular Collider), and for magnetic systems of high-energy physics facilities, and for other applications.

In 2017 the design and experimental technology for production of $Nb_3Sn$-based superconducting wire were developed at the request of ECNR for the project on improvement of the existing LHC collider. The wire was designed based on "internal tin source" method. Pilot lot of wire has been sent to ECNR for tests and experimental cable manufacturing.

It is planned that in 2018 the required wire characteristics for FCC will be achieved with the experimental samples. Conclusion of the contract with ECNR for production of qualification batch of superconducting wire is planned for the first half of the year. VNIINM JSC is the developer of design and technology, and ChMP JSC is involved in production of the pilot batches and technology elaboration. The world leading companies from the USA, EU, Korea, Japan and China are also engaged in development of wire for FCC project.

At the moment neither company has reached all combined characteristics of superconducting wire set by the requirements of ECNR for FCC project. It is planned that the required characteristics will be attained by 2020.

Other types of low-temperature superconductors — NbTi-based wires — are required for creation of modern medical equipment, primarily MRI-scanners.

In June 2017 VNIINM JSC received the utility model patent "Superconducting composite magnesium diboride based (MgB2) wire". Magnesium diboride based wires can be applied to create magnetic systems of medical tomographs, where traditionally there are applied superconductors based on NbTi alloy, and also for wind machines and complex power lines with simultaneous transmission of electricity and refrigerating agent (liquid hydrogen) in one pipe.

Possibility of operation under conditions of refrigeration with liquid hydrogen, neon, helium vapors and cryocoolers, and relative low price of base materials are the advantages of magnesium diboride based superconductors over conventional low-temperature superconductors (Nb3Sn and NbTi).

To use the specified advantages, the characteristics of wire, attained by now in the world production, must be essentially improved. That is why MgB2 based superconductors are not used widely in electrical equipment, and their application is limited to pilot and demo units with low magnetic field (<5 T) and temperatures up to 15–20 K.

At present high-temperature superconductors are considered as base materials for application in the wide range of electrotechnical devices. Current limiters, power transmission cables, transformers, electric propulsion systems, energy storage units — this is the incomplete list of devices where application of high-temperature superconducting materials may lead to significant improvement of performance

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# “Proryv” (Breakthrough) Project

**“Proryv” is the major modern nuclear power project. It provides for creation of the closed nuclear fuel cycle that will make it possible to preclude severe accidents at NPP, to generate power without irradiated fuel production, and to recycle the spent nuclear fuel. This will resolve the problem of the limited availability of resources in nuclear power industry, and will contribute to non-proliferation of nuclear weapons.**

Within the project the Siberian Group of Chemical Enterprises (SGChE JSC) creates a pilot-demonstration energy complex (PDEC). The main task of PDEC is to prove stable operation of the full complex of objects that ensure closure of fuel cycle with application of fast inherent safety reactors. The Proryv Project is the top-priority project of ROSATOM in the planning horizon 2035–2040.

Closed nuclear fuel cycle — is a new integrated product in the sphere of nuclear power technology offering the following unique properties:

- elimination of severe accidents;
- consistent reduction of accumulated SNF and transition to generation of RW which is radiation- and toxic-equivalent to the relevant properties of uranium raw materials (radiation-equivalent RW burial);
- absence of practical restrictions of fuel base;
- engineering support of non-proliferation regime;
- ability to compete with other large-scale nuclear-power technologies, including non-nuclear.

PDEC involves the fabrication/re-fabrication module (FRM), power unit with BREST-OD-300 reactor facility, and SNF BREST-OD-300 reprocessing module, including the facilities to handle high-activity wastes from reprocessing module, fabrication/re-fabrication modules and reactor facility BREST-OD-300.

FRM is intended for production of mixed nitride uranium plutonium fuel for start load and reload of the BREST-OD-300 reactor. Spent mixed nitride uranium plutonium fuel is transferred to the SNF processing module for extraction (SNF PM) of 99.9% nuclear materials, which will be used for MNUP fuel production. Construction of three facilities — FRM, BREST-OD-300 and SNF RM — will provide the opportunity to master the technology and prove the closure of the nuclear fuel cycle; no other country has ever managed to do this.

Its is planned that nearly 1000 jobs will be created with PDEC. To launch FRM by 2020 more than 250 workers must be employed and trained.

SGChE was chosen as the site for PDEC because this industrial complex has all specialists required for nuclear fuel cycle closure: for work on reactor, for fuel production and for irradiated nuclear fuel recycling. Besides, Tomsk has the unique scientific potential, which has been in demand during the whole period of research activities at PDEC.

By the end of 2017, 50% of construction of main FRM process buildings are completed, unique process equipment is manufactured and delivered at the construction site, namely:

- unit for carbothermic synthesis;
- units for pellets pressing;
- high-temperature continuous furnace for production of uranium plutonium fuel pellets.

In 2017 the project documentation on power unit with BREST-OD-300 reactor facility was improved. Launch of PDEC FRM under the Federal Target Program is planned for 2020.

**Main results 2017:**

- Construction of walls and floors of the main process buildings, start of special steel lining of the inside premises.
- Heating pipe main was laid to the PDEC site, now the buildings are connected to the heating line.
- SGChE received non-standard equipment for 15 FRM process plants.

- Improvement of design solution to reduce prime costs of the reactor construction.
- Development, production and installation of three experimental FAs with MNUP fuel in the reactor facility BN-600 (Beloyarsk NPP) for justification of operation capacity of RU BREST-OD-300 fuel.
- Starting from August the applications are being accepted from SGChE employees who want to undergo training and to work at PDEC facilities. Development in cooperation with the specialists of Seversky Institute of Technology (SIT) of MEPhI NRNU of training programs for the required job clusters. 36 persons were accepted for re-training in first two groups.

In 2017 SGChE JSC performed R&D using experimental benches for elaboration of technology for fast reactors SNF recycling, that made it possible:

- to justify selection of the combined technology for spent nuclear fuel reprocessing for SNF PM;
- for the first time in Russia to produce powders of mixed uranium and plutonium oxides using SHF denitration;
- to set requirements to the analytical equipment of the future SNF PM.

Total amount of investments in construction of PDEC objects in 2017 made nearly RUB 2.6 bln.

**Plans 2018:**

- erection of process equipment for MNUP fuel production;
- production and delivery to BN-600 of three EFAs with MNUP fuel to justify the working efficiency of RU BN-1200 fuel;
- R&D for elaboration of SNF reprocessing technology;
- state expertise of the project documentation for BREST-OD-300 construction;
- preparation of documentation for construction of BREST-OD-300 reactor;
- training of the workers for FRM operation, with the involvement of the resources of the National Research Tomsk Polytechnic University and Seversk Institute of Technology of MEPhI NRNU.

### Mox-Fuel Project

Industrial production of MOX-fuel was established for fuel supply of Unit No.4 Beloyarsk NPP with BN-800 reactor facility.
In 2017 TVEL JSC together with FSUE MCP worked on elaboration of MOX-fuel production technology and attainment of the design capacity, launch into manufacture and production of fuel under the current contracts with Rosenergoatom Concern JSC.

### Nuclear Fuel for Fast Rectors

In 2017 production of FA BN-600 with EK164 steel jacket FAs for reduction of BN-600 reactor core was continued. Application of the advanced austenite steel EK-164 will make it possible to increase reactor life and to improve efficiency of fuel utilization of power unit No. 3 of Beloyarsk NPP with BN-600 reactor.

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characteristics as compared to conventional devices (decrease of weight and size, improvement of network reliability, etc.).

"Applied superconductivity" has been determined as branch-wise strategic technological direction that includes development of high-temperature superconducting (HTS) materials and HTS-based devices, including with involvement of the enterprises of TVEL Fuel Company.

**High-Tech Steel**

In summer 2017 the scientists of VNIINM JSC represented the development result of high-tech steel EK-181 (RUSFER-EK181) for the cores of nuclear and fusion reactors with liquid metal coolant with operation temperature up to 700 degrees.

Its advantages include high-temperature strength, heat and radiation resistance, rapid activity decay. Application of steel will make it possible to improve neutronics of reactor cores due to decrease of parasitic neutron loss, and will ensure reduction in expenses for RW disposal and burial.

In the course of elaboration and commercial development of steel EK-181, VNIINM JSC created materials knowledge bases for stress-strain, thermal and nuclear-physical properties of low-activated structural materials. The research results are protected by two patents and nine "know-hows", more than 40 articles have been published in refereed journals.

**Quartz Concentrate**

In July 2017 AECC JSC and German company QSIL GmbH signed the legal binding documents on establishment of joint venture Quartz LLC for production of high-purity quartz concentrate. Share of QSIL GmbH in the project will make 60%, share of AECC JSC — 40%. Production facilities will be created at AECC JSC industrial site. Total amount of investments in the project is estimated at RUB 600 mln, including initial contributions of shareholders to the authorized capital of the enterprise, scheduled recapitalization and funds raising.

The project implementation will allow creation of international industrial cooperation in vertically integrated production chain. New enterprise will use hydrothermal synthesis to grow synthesized high-purity quartz crystals out of the gangue quartz mined in deposits of the Polar Urals and Irkutsk region; then the crystals will be reprocessed into high-purity quartz concentrate. The whole output will be delivered to Europe on QSIL enterprise, the world leading manufacturer of articles out of quartz. In particular, high-purity quartz sand, produced in Irkutsk region, will be used to manufacture quartz glass, which is widely used in semiconductor industry for production of processors, computer memory devices, etc.

The project complies with the principles of the Uniform Industry-Specific Policy for development of new businesses of ROSATOM State Corporation, and is intended to address the strategic objective for development of the second industrial core due to the market launch of new export-oriented products. New enterprise can hold 2,5% of the world market of high-purity quartz concentrate, and in future can increase this share to 10%.

The start of pilot batch production is scheduled for 2018. Launch of production line is scheduled for 2021, initial production output will be 250 tons/year. The enterprise will create 50 new jobs.

**Titanium Dioxide**

In 2017 the project company "Sibirsky Titan" LLC was established for the purposes of joint implementation of the project on production at the industrial site of SGChE JSC of the import-substituting titanium dioxide, which is widely applied in paint-and-varnish industry. The investors are SGChE JSC and Davinchi Holding Company. Completion of equipment installation and start of pre-test assembly program are scheduled for 2018.



Table 30

**Number of registered inventions, utility models, industrial designs and production secrets (know-how), ea.**

| Items of intellectual property | 2015 | 2016 | 2017 |
|---|---|---|---|
| Russian Inventions | 53 | 40 | 40 |
| Foreign Inventions | 3 | 2 | 1 |
| Russian Utility Models | 6 | 1 | 5 |
| Foreign Utility Models | 1 | 0 | 0 |
| Russian Industrial Designs | 0 | 0 | 0 |
| Foreign Industrial Designs | 0 | 0 | 0 |
| Production Secrets (Know-How) | 96 | 61 | 62 |

**INTELLECTUAL PROPERTY**

As of the end of 2017 TVEL Fuel Company holds 1,881 items of intellectual property. The objects protected by the law include inventions, utility models, production secrets (know-how), software for electronic computing machines, databases, trademarks and industrial designs.

Assessment of the intellectual property items, the system of identification and legal protection of intellectual property items, created by the enterprises of TVEL Fuel Company, are performed in compliance with the requirements of Russian Federation legislation, Standard Industry Methodological Recommendations and local regulations together with "Nauka and Innovatsii" (Science and Innovations) JSC, the Division for Innovations Managements of ROSATOM State Corporation.

Functions of identification and legal protection of the items of intellectual property are assigned to the Patent and Licensing Department of TVEL JSC, as well as to technical departments, development design offices, intellectual property protection teams and patent-information departments of the Company's enterprises.

In 2017 there were registered 108 intellectual property items.

As of December 31, 2017 TVEL Fuel Company holds 45 national and regional patents of foreign countries (countries of the European Union, USA, Japan, etc.) for items of intellectual activity.

**Involvement of universities in projects implementation**

VNIINM JSC carries out R&D in cooperation with the leading educational institutions: D.I. Mendeleev University of Chemical Technology of Russia, I. Kant Baltic Federal University, National Research Nuclear University MEPhI, National Research Tomsk Polytechnic University, etc.

Non-nuclear businesses are being developed in innovative areas of activities. Participation of the core universities of ROSATOM makes it possible to engage the most ambitious teams and scientific research results.

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In the area of Additive Technologies the Company cooperates with National University of Science and Technology MISiS and St. Petersburg Polytechnic University as regards R&D for creation of multipowder 3D printer. Currently the project is being implemented on production of automated complexes of layer-by-layer synthesis of geometrically-complex metal parts (3D printer); the project is co-funded by the Ministry of Education.

In 2017 Centrotech SPA LLC together with the team of the Ural Federal University and the Institute of High Temperature Electrochemistry of the Ural Branch of the Russian Academy of Sciences elaborated the working design documentation for power plants on solid oxide fuel cells 250W and 500 W. The technology of production of unit fuel element, stack, solid oxide fuel cell, held by Centrotech SPA LLC (ZEP LLC) and developed in 2016 together with the Ural Federal University and the Institute of High Temperature Electrochemistry of the Ural Branch of the Russian Academy of Sciences served the base technology for this development result. This development is unique due to refusal of precious metals, which will make it possible to reduce the price of the article at batch production, and to make use of the articles on the objects where no security is required (unlike the articles with high content of precious metals). Production of demonstration model of power plant 250W and demonstration model of power plant 500W is planned for 2018, as a continuation of the joint activity.

### COMPUTER MODELLING CENTRE

The Computer modelling centre was established at VNIINM JSC in order to consolidate knowledge and to preserve essential competences.

The Computer modelling centres will make it possible to develop new engineering materials and types of fuel both for nuclear and thermo-nuclear power engineering, to enhance capabilities of VNIINM JSC and to consolidate its competitive performance on the Russian and foreign markets with breakthrough researches in the sphere of modern material engineering.

The Computer modelling centre of VNIINM JSC will become the integrator for computer modelling in the interest of the enterprises of ROSATOM State Corporation. The unified quality standard will be introduced to carry out research for models development and verification; activity of specialists on modelling and production and representatives of the regulating authorities will also be coordinated.

Establishment of the Computer modelling centre will improve the existing computing tasks of VNIINM JSC, lead to reduction in expenses for this type of services through outsourcing, result in improvement of performance and quality of works performed by the institute.



The products under development will be applied primarily at the objects of Gazprom PJSC (to power the cathodic protection station, and the infrastructure facilities of the pipeline system of Gazprom PJSC). The future would-be customers are mobile network operators, major electric distribution companies, housing and utility sector objects, settlements that are distant from electric power transmission lines, etc.

The issue is being negotiated concerning engagement of D.I. Mendeleev University of Chemical Technology of Russia to production of isotopes of light elements.

The work with the Moscow Aviation Institute is also in progress in the sphere of development of new titanium alloys and establishment of industrial production of articles made of such alloys for the purposes of the aircraft industry.

Amount of investment for R&D in higher educational establishments was RUB 215 mln in 2017.

**40**

**Russian inventions registered in 2017**

**62**

**Production Secrets (Know-How) registered in 2017**

**215**

**RUB mln**

**Amount of investment for R&D in higher educational establishments was in 2017**

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# Human CapitaL

**HR Policy of the Company is intended to ensure steady growth of labor efficiency, the balance between the interests of its employees and the employer, rational use of professional and management capabilities in accordance with the long-term development strategy of the Company**

**Principles of HR management ensuring the achievement of strategic goals**


## HR POLICY

All HR management activities, which are undertaken to achieve the goals set, are focused on the long-term personnel stability of TVEL Fuel Company.

Midterm HR Policy Development Plans:

- development and further improvement of safety culture;
- provision of incentive tools efficiency;
- development of professional qualifications system;
- development of the corporate culture;
- promotion of the employer brand.

## STAFF COMPOSITION

The process of production concentration led to headcount optimization. Thus, the share of newly created jobs reduced by 53.9%, and the total average headcount for the year 2017 decreased by 2.1%. Steady decrease in headcount in 2015–2017 was caused by restructuring processes, centralization of management functions and personnel outsourcing.



**91%**
**Staff density**

**1,4%**
**Unwelcome turnover**

**43 years**
**Average age**

**>350**
**RUB mln**
**Allocated for pay rise and indexation**

**21.9%**
**Young specialists under 35 years old**

**11**
**Workers per 1 manager**

**4-5**
**Levels of management in production**

**3**
**Levels of management in office**

**2.2 times**
**Average pay in the Company is higher than average pay in Russia**

Table 31
**Key indicators**

| Indicator | 2015 | 2016 | 2017 | Δ 2017/ 2016, % | 2018 (plan) |
|---|---|---|---|---|---|
| TVEL Fuel Company headcount at the year-end, persons | 22,724 | 21,843 | 21,391 | –2.1 | – |
| Average Headcount of TVEL Fuel Company, persons | 22,527 | 22,127 | 21,793 | –1.5 | 22,645 |
| Candidates and Doctors of Science, persons | 235 | 260 | 284 | 9.2 | 280 |
| Holders of MBA degree, persons | 15 | 17 | 18 | 5.9 | 2 |
| Employees employed in the industry for more than 5 years, % | 82 | 84 | 82 | –2.4 | 82 |

The ultimate goal of these processes with regard to HR management is to enhance labor efficiency in TVEL FC subsidiaries to match major foreign competitors.

At the same time, the target staff figures are growing, which is due to the rapid development of general industrial activities. The production and provision of non-nuclear services entail not only the development of new markets outside NFC, but also the need to create substitute high-tech industries for the released qualified staff.

Major part of the employees are men (65.4%)[1]. Average age of employees of the Company is 42.6. The employees under 35 years old comprise 21.9% of total staff.

[1] 82% of top managers in TVEL Fuel Company are men.

In March 2017, within the framework of the corporate HR policy and with the purpose of preserving labor resources, a part of staff was transferred with observance of current labor legislation of the Russian Federation from SibRegionPromservis LLC (subsidiary of SGChe JSC) to Research and Production Company VAB-70 LLC.

In the difficult economic situation prevailing at SibRegionPromservis, when production efficiency enhancement and process optimization program aimed at its financial recovery was launched by TVEL JSC, an acceptable solution was found allowing to employ laid-off specialists. 75 former employees of the subsidiary company of subsidiary of SGChe JSC were hired by agreement of the parties by VAB-70 LLC, with retention of their competencies and wages. In addition to guaranteed transfer to a new employer, employees also received additional remuneration for their work with SibRegionPromservis.

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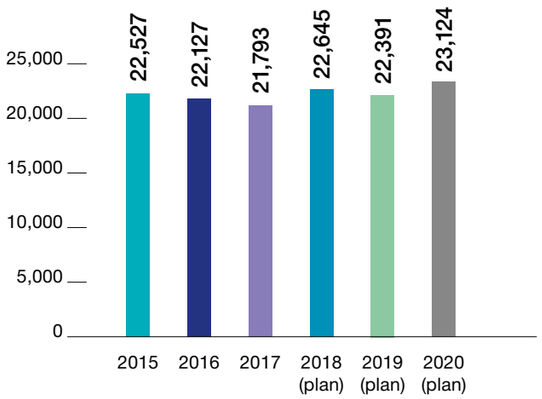
Diagram 20

**Average Headcount of TVEL Fuel Company, persons**




TVEL Fuel Company hires mainly the local residents in the territories of presence, and involves specialists from other regions only if and when no properly qualified candidates are available at the local labor market. So, due to implementation of a new project on production sites concentration at Tochmash VPA JSC and KMZ PJSC, the share of top management rotated from other regions has increased in Vladimir region.

Table 32

**Average headcount in key production enterprises of TVEL FC in 2017, persons**

| Enterprise | Headcount |
|---|---|
| Angarsk Electrolysis Chemical Complex (AECC JSC) | 907 |
| Electrochemical Plant (PA ECP JSC) | 1,938 |
| Siberian Group of Chemical Enterprises (SGChE JSC) | 3,400 |
| Ural Electrochemical Integrated Plant (UEIP JSC) | 2,137 |
| **Total per SSC** | **8,382** |
| Machine-Building Plant (MSZ PJSC) | 4,059 |
| Novosibirsk Chemical Concentrates Plant (NCCP PJSC) | 1,345 |
| Chepetsky Mechanical Plant (ChMP JSC) | 3,094 |
| **Total per NFFC** | **8,498** |
| Kovrov Mechanical Plant (KMZ PJSC) | 972 |
| **Total per GCC** | **972** |
| **Centrotech SPA LLC** | **986** |
| Bochvar Institute (VNIINM JSC) | 918 |
| Tochmash VPA JSC | 1,215 |
| **Total for Research Complex** | **3,119** |



Diagram 21

**Composition of top management in TVEL FC subsidiaries by residence in the reporting year, %**

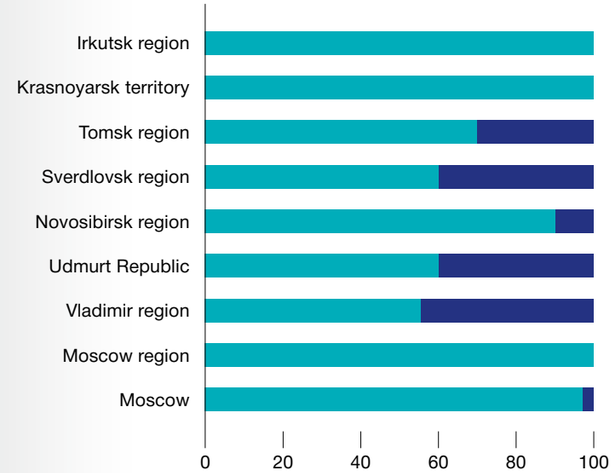
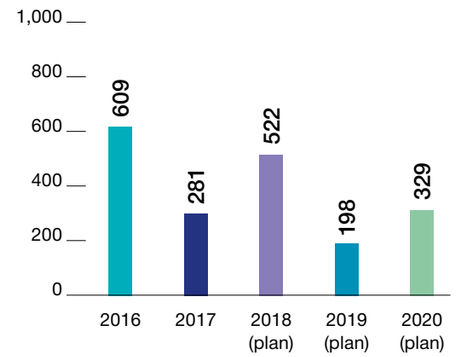



Diagram 22

**Jobs creation in TVEL Fuel Company***




* Creation of new positions at enterprises of TVEL Fuel Company for current and new projects.

Diagram 23

**TVEL FC total headcount by age in 2017, persons**

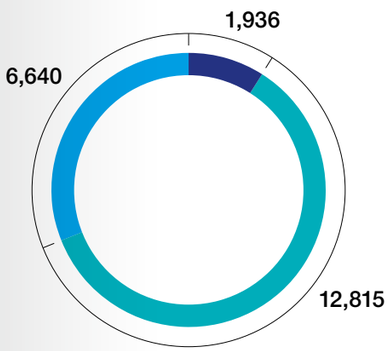
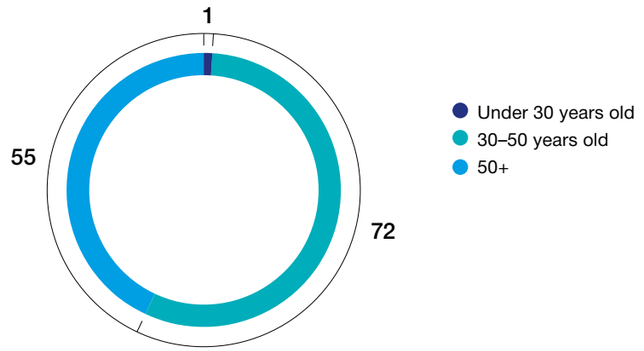



Diagram 24

**TVEL FC total top managers headcount by age in 2017, persons**

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SGChE JSC employs the Provision on Housing Conditions Improvement for Employees of SGChE JSC aimed at social support of its employees. In the reporting year 18 employees improved their housing conditions with help from the enterprise, and 22 employees — in 2017.

UEIP JSC won the regional stage of the Federal Contest "Russian Organization of High Social Performance" in nominations "For jobs creation and development in organizations of the production sector" and "For the reduction of occupational injuries and occupational diseases in organizations of the production sector".

Chemical Club "Element of the Future" was formed by TVEL Fuel Company in February 2017. The project is aimed at increase of personnel engagement in the Company's production and technological operation processes based on chemical knowledge. In addition, the club is created as a communication tool to promote the formation of professional communities of chemical engineers and laboratory chemists, as well as other specialists of TVEL JSC enterprises — carriers of chemical competencies. It is important to note the importance of the Chemical Club "Element of the Future" spreading chemical knowledge in Russia and in international communities, including among students and school youth.

SGChE JSC has organised the 4th Science Festival "Energy of Intelligence" with more than 1,000 guests, 70 participants, 20 master classes, 2 quests, 3 film shows and countless positive emotions. Employees of the enterprise and their families, schoolchildren of Seversk who plan to make their career in nuclear industry were invited to the festival. The program of the festival was rich in scientific master classes in three areas: "The Universe", "Earth", "Human". Here one could take part in a family competition to create Shurush-battele aircraft.

MSZ PJSC took the 4th place in Trade Jobs Best Employers rating of the Moscow Region, according to the Regional Problems Study Centre.

**Staff number at SGChE JSC will be preserved**

The total headcount number at SGChE JSC, as well as those employed by TASED residents will be 5,600 by 2021.

As of January 1, 2017, the company had 3,515 employees. According to the forecasts of TVEL JSC Managing Company, by 2021 the total headcount at EDEC facilities of SGChE, the established industrial enterprises and enterprises of TASED Seversk will be 5,600 persons. According to the target figures, 1093 employees will be engaged at Proryv Project. Nearly 2.5 thousand employees will work at the enterprises formed by general industrial activities of SGChE and in the structures of TASED residents. At the same time, SGChE JSC preserves a unique technological conversion — the Conversion Center, which is designed to perform the entire industrial program in the Russian nuclear fuel production chain. In addition, extensive long-term works on decommissioning and maintenance in safe condition of former facilities of the radiochemical and chemical-metallurgical plants are to be performed by qualified personnel of SGChE JSC. It will take several decades to bring this part of the site into a safe state, and this, in its turn, will provide jobs for more than 700 people for the entire long-term rehabilitation period.



Table 33

**Personnel Engagement, %**

| Enterprise | 2015 | 2016 | 2017 |
|---|---|---|---|
| TVEL JSC | 87 | 85 | 83 |
| Angarsk Electrolysis Chemical Complex (AECC JSC) | 93 | 96 | 97 |
| Bochvar Institute (VNIINM JSC) | 83 | 84 | 85 |
| Kovrov Mechanical Plant (KMZ PJSC) | 91 | 89 | 90 |
| Tochmash VPA JSC | 85 | – | – |
| Centrotech SPA LLC | 66 | 64 | 80 |
| Electrochemical Plant (PA ECP JSC) | 92 | 91 | 93 |
| Ural Electrochemical Integrated Plant (UEIP JSC) | 78 | 92 | 98 |
| Siberian Group of Chemical Enterprises (SGChE JSC) | 78 | 66 | 82 |
| Machine-Building Plant (MSZ PJSC) | 80 | 80 | 83 |
| Novosibirsk Chemical Concentrates Plant (NCCP PJSC) | 75 | 85 | 85 |
| Chepetsky Mechanical Plant (ChMP JSC) | 83 | 67 | 63 |
| **Average on TVEL FC** | **83** | **82** | **83** |

**PERSONNEL ENGAGEMENT**

Much attention is given to personnel engagement in the industry. Personnel engagement, employees involvement in business and success of the Company have direct effect on business performance and efficiency. Engagement study is conducted annually at enterprises of the division and the industry under the unified industrial slogan: "ROSATOM Cares About Your Opinion". In general, annual surveys allow to estimate staff sentiments at the enterprise, to assess satisfaction with work conditions by 19 factors, and to determine the share of involved employees who:

- recommend their company as a good employer to their relatives and friends;
- strive to do the best job they can, improve production processes and come up with improving proposals;
- intend to keep being employed by the Company in future.

Based on the survey results, the management of each enterprise develops action plans aimed at increasing and maintaining the level of personnel engagement. Thanks to the work done, TVEL Fuel Company takes top positions in personnel engagement among the industry divisions year on year, being among the "Best Employers of Russia".

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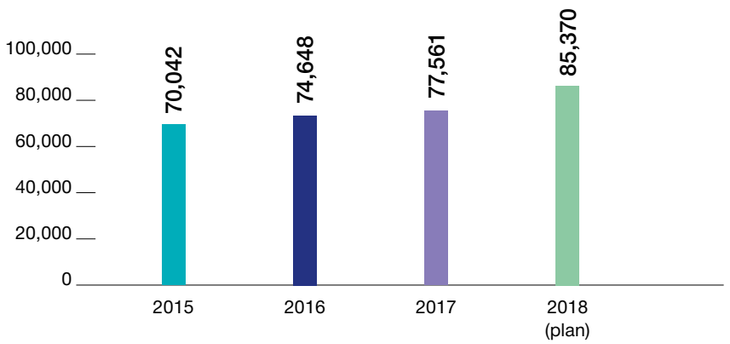
Diagram 25

**Average salary in TVEL FC (TVEL JSC not included), RUB**

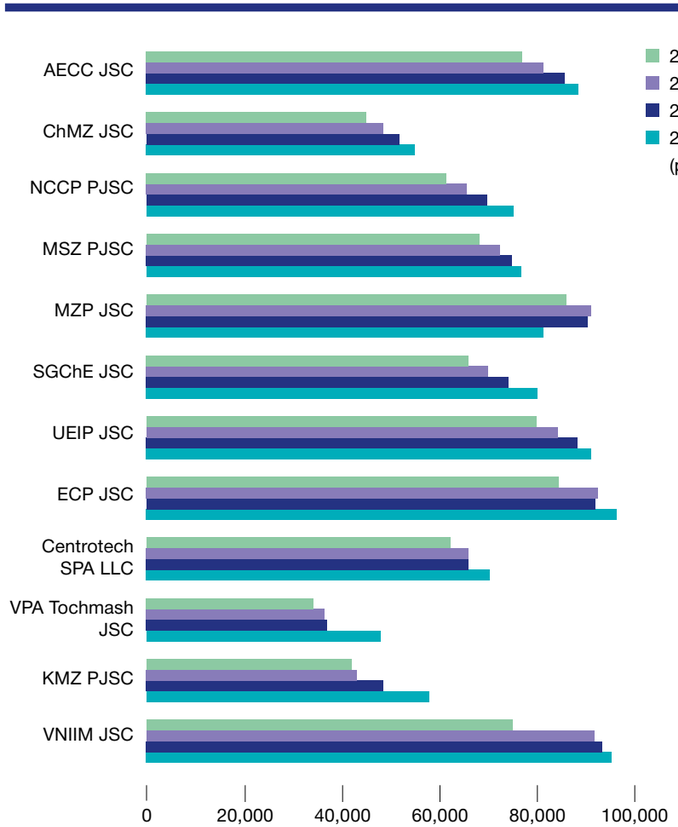



**77,561 RUB**

**Average salary in TVEL FC (TVEL JSC not included), which is 4% higher than in the previous year**

Diagram 26

**Average pay at TVEL FC subsidiaries, RUB**




## MOTIVATION AND REWARD SYSTEM

Incentive and reward policy in TVEL Fuel Company is aimed at maintenance of salary competitiveness. The salary increase and indexation amounted RUB 350 mln in the reporting period.

The average salary level in TVEL Fuel Company (TVEL JSC not included) made RUB 77,561 which is 4% higher than in the previous year.

Ratio of standard entry level wage of the Company to minimum wage in some regions varies from 1 to 1.3 times (maximum — 1.3 times in Novosibirsk region, minimum 1.0 in Moscow and Sverdlovsk region).

**Arrangements 2017:**

- salary indexation at all enterprises of TVEL Fuel Company, except for TVEL JSC;
- increase of annual premium rate in certain enterprises (increase by per cent corresponding to salary indexation per cent);
- selective reconsideration of the employees' personal additional incentive following the results of the annual assessment;
- review of remuneration system and benefits efficiency in the Company's enterprises; collection, of the employees' proposals for alteration of salary disclosure documents.



Table 34

**Ratio of average pay in the subsidiaries of TVEL Fuel Company to average pay in regions of operations, times***

| Region | 2015 | 2016 | 2017 | Average pay in the region in the reporting year, RUB |
|---|---|---|---|---|
| Moscow | 2.56 | 2.30 | 2.83 | 59,823 |
| Moscow region | 1.70 | 1.71 | 1.94 | 38,830 |
| Vladimir region | 1.59 | 1.57 | 1.87 | 22,807 |
| Udmurt Republic | 1.80 | 1.86 | 2.16 | 24,078 |
| Novosibirsk region | 2.16 | 2.26 | 2.61 | 26,796 |
| Sverdlovsk region | 2.33 | 2.51 | 2.77 | 28,959 |
| Tomsk region | 1.98 | 2.02 | 2.36 | 31,604 |
| Krasnoyarsk territory | 2.38 | 2.49 | 2.68 | 34,468 |
| Irkutsk region | 2.38 | 2.38 | 2.74 | 31,110 |

* Including TVEL JSC.

**Arrangements 2018:**

- payment of up to 50% of annual premium in advance (in order to increase the employees' social security level due to volatile economic environment and rise in inflation);
- salary indexation in all subsidiaries of TVEL Fuel Company, except for TVEL JSC (scheduled indexation % — not less than consumer price index);
- there might be increase of annual premium rate in certain enterprises (increase by per cent corresponding to salary indexation per cent);
- selective reconsideration of the employees' personal additional incentive following the results of the annual assessment;
- updating of local salary and benefits disclosure documents in order to improve their efficiency (reconsideration of annual premium calculation, approaches to PAI identification following the results of the assessment, etc.);
- elaboration and implementation of measures aimed at increase of variable part of total remuneration depending on personal and collective labor efficiency.

**KPI system for top executive management and inferior management**

Business performance management system applied by TVEL Fuel Company is based on generating of KPI list ensuring comprehensive development of division for the Company's top management. Maximum preference is given to such spheres as nuclear, radiation, industrial safety and ecology; operational efficiency; increase of nuclear products and industrial operation markets share, where the Company improves its performance by introduction of new products.

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Table 35
**Examples of KPI for TVEL FC Management**

| Basic KPI for TVEL JSC Top Management | Basic KPI for Vice-Presidents | Basic KPI for Directors of Subsidiaries |
|---|---|---|
| ▸ Lost time injury frequency rate (LTIFR) | ▸ Cost of products manufacture | ▸ Investment activity integrating efficiency indicator |
| ▸ No INES events level 2 and above | ▸ Operating efficiency | ▸ Lost time injury frequency rate (LTIFR) |
| ▸ Labor efficiency | ▸ Labor efficiency | ▸ Fulfilment of government contracts, investment projects |
| ▸ Proceeds on new products | ▸ Proceeds from sales and foreign orders portfolio, as well as on new products of the Company | ▸ Full cost of the production unit sold |
| ▸ Reduction of semi-fixed costs | | |

## NON-MATERIAL BENEFITS FOR EMPLOYEES

System of non-material benefits for the employees of TVEL Fuel Company is aimed to encourage professional growth, increase in efficiency and performance, attainment of the goals and the best final results of activities, enhancement of the work quality and arrangement of conditions for creative activity.

Achievements of the employees of the Company are marked with state awards, awards of ROSATOM and TVEL JSC in accordance with the Uniform Industry-Specific Award Policy.

During the year 2017 in celebration of commemorative days and anniversaries, including the 100th anniversary of MSZ PJSC, about 3 thous. workers and veterans received rewards and bonuses for best performance, contribution to development of enterprises, TVEL Fuel Company and nuclear industry, in particular:

- national awards — 46 employees;
- awards of ROSATOM — nearly 900 persons, including merit badges — 125 workers and veterans, labor merit badges “Veteran of Nuclear Power and Industry” — 115 workers, and Anniversary Medal “100 Years of Machine Building Plant” of ROSATOM — more than 1000 workers and veterans of MSZ;
- awards of TVEL JSC — more than 1 thous. persons.

## DEVELOPMENT OF STAFF CAPACITIES

People are an important asset of TVEL Fuel Company, which provides internal stability and business modernization. Traditionally, HR development and training is one of the top priorities of HR policy of TVEL Fuel Company.

The development and training mission is focused on creation of an environment for employees to achieve the business goals while increasing the level of their professionalism, corporate culture and personnel management technologies.

The purpose of HR development program is to support business priorities of ROSATOM State Corporation.

Priority development programs at the Company’s enterprises:

- Program of Succession Pool Formation and Development: “ROSATOM Assets”, “ROSATOM Assets. Basic Level”, “ROSATOM Capital” and “ROSATOM Talents”. The program is aimed at increasing management competencies in accordance with a single value model, as well as involving staff in key sectoral strategic projects and industry tasks.
- The globalization participants development program Global Professionals aimed at client-oriented approach development, readiness for change, innovation and knowledge acquisition according to international standards.
- Training program in the field of safety culture aimed at building workers’ understanding of general principles of safety culture, developing a leadership position in terms of safety, creating an atmosphere of openness and trust in the team.



**178**
**Internal coaches on improvements**

**89**
**Improvement tools trainings**

**11,430**
**Number of employees trained**

**3**
**Leader Forums held**

**106**
**Engineers who mastered TRIZ tools**

**28**
**Process factories**

## Personnel Training

Within HR Development and Training Provisions, the Company’s enterprises regularly provide training to enhance competencies of their workers. Amount of investment training in 2017 made RUB 111.4 mln. (which is 10.3 million more than in 2016). Average training hours per each employee of the Company in 2017 made 66 hours. In the reporting year 11,430 employees of TVEL Fuel Company passed training. Average training hours per each employee of the Company in 2017 made 66 hours.

Educational events contributing to development of skills are implemented using the resources of corporate coaches, as well as the external providers of training services.

TVEL Fuel Company enterprises regularly implement sectoral and divisional training programs to enhance competencies of managers and employees of enterprises.

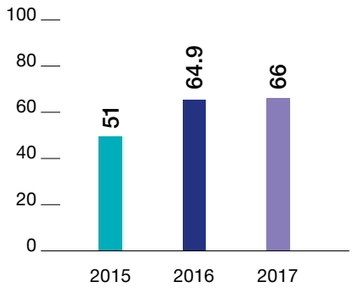
## Personnel Efficiency Assessment

In 2017 the Company continued to successfully apply the annual personnel efficiency assessment system[1]. The assessment is based on the employee’s compliance with corporate values and the required level of professional and technical knowledge and skills.

The key principles of assessment are objectivity and relevance. Objectivity is achieved by evaluations calibration (alignment of evaluation criteria for employees of different divisions subordinate to one superior manager) by heads of departments and the superior leader at round table. Assessment of corporate values is performed only in relation to the behavioral indicators of the employee associated with his/her professional activities and influencing his/her performance.

[1] Managers, specialists, employees and workers are subject to assessment.

Diagram 27
**Average training hours per employee**




In September 2017, the organizational and communication block was added to the Leader Forum at SGChE JSC which was dedicated to safety culture enhancement in TVEL Fuel Company. Its participants, specialists in communications, HR, representatives of labor protection and nuclear safety services, as well as members of succession pool program proposed a number of projects aimed at safety culture development, “unsafe behavior” causes analysis and formation of correct value and psychological patterns focused on prioritization of safety issues for each employee.

The forum was attended by 106 people, 16 production tasks were considered. The participants worked out 5 directions for improving the safety culture: motivation, communication and leadership in the field of safety culture, increasing efficiency in ensuring electrical safety and interaction with contractors.

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Following the results of assessment the recommendations were made concerning alteration of personal additional incentives, choice of training program and recruitment of employees to succession pool and career planning.

In 2017, part of the staff of category “Managers, specialists, employees” were evaluated on the basis of the single information system “RECORD”. In 2018-2019, it is planned to apply the automated assessment system to all the companies included into TVEL Fuel Company management system.

**PROFESSIONAL STANDARDS**

TVEL JSC is the member of the Council for professional qualifications in the sphere of nuclear power, which shall be responsible for reviewing the professional standards elaborated for the industry.

An industry-specific working group on professional qualifications in nuclear energy complex of ROSATOM was created in 2017, which included employees of TVEL FC. Over the past year, 20 professional standards were coordinated in the industry in key engineering and trade jobs.

Critical Knowledge (CK) is the knowledge accumulated by organization in specific subject areas, as well as personal knowledge and experience of employees, obtaining priority depending on the specifics of the organization’s activities in a resource-constrained environment.

The Fuel Division has implemented a systematic approach to preservation of critical knowledge based on existing IAEA knowledge management concepts. Within the said approach, knowledge mapping has been carried out with the subsequent formation of a knowledge map. Mapping the knowledge of workers and organizations in general allows to combine individual fragments of knowledge kept in different places and get a general idea of knowledge pattern of the organization and employees possessing certain knowledge. The final product of CK is the detailed program for the conservation of CK developed for organization, including both methods for preserving critical knowledge and skills, as well as measures required to reduce the negative impact from their loss.

A divisional professional efficiency contest among inspectors of TVEL Fuel Company of ROSATOM was held at Chepetsky Mechanical Plant (ChMZ) at the end of November 2017. General tasks were prepared for its participants: 50 theoretical questions, interpretation of drawing, and in the practical part — detail measurement and drawing a report on usability and compliance with the drawing. The experts of the contest summed up the results — representatives of MSZ PJSC and ChMZ JSC became the best inspectors of the Fuel Division.



In addition, a mentorship program has been implemented in the industry aimed at the transfer of key knowledge and skills, having following objectives:

- ensuring continuity of generations in key technical positions;
- preservation and transfer of key knowledge and skills;
- raising the professional level of employees;
- increasing the level of motivation for young workers’ professional development.

TVEL Fuel Company’s corporate award for Best Solution / Development was established in 2008 and became the most important and prestigious award in the Company for talented engineers, technologists, designers, managers who won corporate competition.

The awards are given to corporate authors of enterprises of TVEL Fuel Company, who have introduced new technologies and design developments, organized new production and made achievements in financial and economic activities, enhancing corporate governance etc.

The following awards were presented in 2017:

- author team of NCCP PJSC was awarded 1st place Diploma “Best Engineering and Process Solution” for development of a technology for processing carbonate precipitates of lithium-7 to produce a solution of lithium-7 hydroxide;
- author team of SGChE JSC was awarded 1st place Diploma “Best Development of New Production / Best Solution for Reconstruction and Building” for reconstruction of electrolysis production of fluorine of a sublimate plant;
- author team of ChMZ JSC and VNIINM JSC was awarded 1st place Diploma for organizing the processing of substandard uranium-containing materials.

**Partnership with Educational Institutions**

Recruitment of promising young people is one of the top priorities in HR policy of TVEL Fuel Company. By hiring young specialists, the Company intends to preserve and strengthen its position in the sphere of science and advanced technologies in the years ahead.

Cooperation with educational institutions is carried out on the basis of the communication plan on work with universities and graduates; the plan that is being continuously updated on an annual basis.

With a view of occupational guidance for schoolchildren the Company’s enterprises organize excursions, meetings with young specialists, information and educational activities.

In September 2017, the delegation of TVEL Fuel Company visited Armenia, and jointly with Armenian partners organized a number of events aimed at developing cooperation in scientific and educational spheres. During the meeting, an agreement was reached on organization of Smart Nuclear international youth network community on the basis of Miru-MIR open communication platform sponsored by TVEL JSC to popularize nuclear science and to overcome radio and technophobia.

In October TVEL JSC and the Russian-Armenian (Slavic) University (RAU, Yerevan) signed the cooperation protocol aimed at implementing a number of humanitarian projects. In particular, the parties agreed on implementation of a historical and memorial program related to the joint contribution of the peoples of two countries to the implementation of the Soviet nuclear project, the participation of young specialists from the Fuel Division of ROSATOM in RAU research conferences and invitation of Armenian students to seminars held by TVEL JSC.

TVEL Fuel Company of ROSATOM took part in a large-scale event for schoolchildren, students and graduates — ROSATOM Career Day — held at MEPhI National Research Nuclear University.

The central event of the Career Day which brought together about three thousand young people was a vacancy fair. People from the Fuel Division of ROSATOM presented the information on the prospects for employment at enterprises entering the management contour of TVEL JSC and answered questions about traineeship. Senior students could apply for internship, while graduates filed their CVs. Young people were invited to participate in an experiment and apply their knowledge in building an atomic reactor, answer quiz questions and cross-word puzzles.

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In 2017 the enterprises of the Company offered practical training to 554 students of higher educational institutions and vocational secondary schools, 32 of them were employed by TVEL Fuel Company. In 2018 the Company expects 477 students to take their practical training.

During the reporting period the Company employed 83 graduates of higher educational institutions and vocational secondary schools, 17 of whom took target preparation classes for employment by TVEL Fuel Company. Diploma grade point average of employed graduates was over 4.2. Per cent of graduates from core universities of ROSATOM is over 40%.

## UNIFIED YOUTH POLICY

The youth as the most active part of the staff has always been the indicator of changes and driver of the Company's development.

In December 2016 TVEL Fuel Company approved the Concept of the Unified Youth Policy and determined its priorities:

- promotion of the ROSATOM strategy and Values, strategic objectives of TVEL Fuel Company;
- strengthening of business reputation of TVEL JSC;
- implementation of social ideology.

The Unified Youth Policy supposes participation of young specialists in historical work, development of corporate science, establishment of new production units in order to provide the flow of workforce into the cities of presence, increase of personnel engagement, in implementation of the strategic initiatives of TVEL JSC "Social Responsibility", "Environmental Responsibility", etc.

In March 2017, the First Strategic Session of the Joint Youth Council was held with participation of active members of youth associations of the Management Company and all its subsidiaries. The young leaders forum organized by the initiative of the Management Company allowed to form a strategic vision of the Company's image at the turn of 2030–2050 in line with the world trends in development of nuclear industry and high-tech sphere.

Junior Factory Quest Training developed at UEIP JSC entered the TOP-3 of best HR practices of ROSATOM State Corporation. Quest Training contains elements of vocational guidance of schoolchildren, increases students' interest in ROSATOM enterprises, introduces the values of ROSATOM State Corporation, the principles of Lean Production and RPS tools.

## SOCIAL PROGRAMS

Corporate social programs of voluntary medical insurance, insurance against accidents and diseases operate at the enterprises of TVEL JSC to provide additional extended coverage to employees. The said programs have been approved by industry trade unions and implemented in line with the Uniform Industry-Specific Policy of ROSATOM and its organizations. All operating collective agreements of TVEL Fuel Company contain the provisions dealing with occupational safety and health issues.

TVEL Fuel Company has developed corporate social programs in the following areas:

- non-state pension benefits;
- voluntary health and industrial injuries insurance;
- assistance in housing programs;
- sanitary and resort treatment and recreation of employees and their children;
- catering;
- assistance to non-working pensioners;
- organization of sports and cultural events;
- benefits to employees in difficult situations.

TVEL FC social programs represent a strong motivating factor. Total amount spent by the Company on its social programs in 2017 made RUB 1,320.7 mln, or RUB 60.6 thous. per worker.

Diagram 28

**Expenses of FC TVEL on social programs, RUB mln**

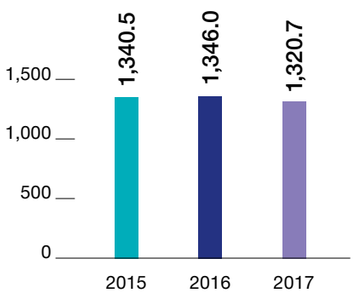


Diagram 29

**Expenses of FC TVEL for social programs per employee, RUB thous.**

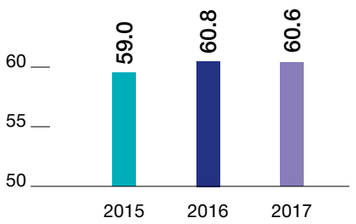




Table 36

**Outcomes of implementation of major corporate social programs in 2017**

| Corporate social program | Funds allocated under the program in the reporting year, RUB mln | Highlights by the end 2017 |
|---|---|---|
| Voluntary health insurance (VHI) | **180.4** | 99% of TVEL FC employees are insured under VHI policy* |
| Accident and health insurance | **10.2** | 89% of TVEL FC employees are covered by accident and health insurance. |
| Sanitary and resort treatment, recreation of children | **158.2** | 3,378 employees got vouchers to sanitary and rehabilitation resorts in 2017, where 2,130 persons work in harmful conditions, and 1,743 children. Maximum amount of each voucher in 2017 was RUB 56.7 thous. for a 21-days treatment course |
| Assistance in improvement of housing conditions | **92.3** | 1,011 employees improved their housing conditions under the program in 2017 and 568 out of them were young specialists up to 35 years old |
| Benefits to employees in difficult situations | **61.2** | The amount of benefit does not depend on the position, the types and criteria of benefits provision are unified |
| Sports and cultural events | **141.2**** | The enterprises of TVEL FC held more than 850 corporate, sports and children's events in 2017. Total number of participants — over 55 thous. of workers and members of their families |
| Assistance to non-working pensioners | **507.9** | There are over 39 thous. non-working pensioners registered in the organizations (personnel service, veterans' council, trade unions) of TVEL Fuel Company. 1,106 pensioners got vouchers to sanitary resorts |
| Non-state pension provision | **131.2** | By the end of the reporting year 18,6% of TVEL FC workers were involved in the non-state pension provision program; pension accruals were accumulated at Atomgarant Non-State Pension Fund |
| **Total** | **1,282.6** | – |

* New employees are included in the VHI program after successful completion of probationary period, thus at the moment less than 100% of the employees can be covered by the VHI policy.

** Taking into account the funds allocated to primary trade union organizations.

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## INTERACTION WITH TRADE UNIONS

Every employee has the right to join a trade union organization. Primary trade unions function in all enterprises of TVEL Fuel Company. The management of the Company and ROSATOM support their employees' membership in trade union organization. Share of employees being the members of trade unions reaches 98% in some subsidiaries.

Within the framework of social partnership development program, the management of TVEL JSC regularly holds quarterly joint meetings with the Russian Trade Union of Nuclear Energy and Industry Workers (RUNPIW) and the chairmen of primary trade union organizations of TVEL Fuel Company. Participants of those meetings discuss the issues related to the activities of TVEL Fuel Company and development prospects. Besides, 4 meetings of working groups were held jointly with RUNPIW in 2017.

## OCCUPATIONAL HEALTH AND SAFETY

### Occupational Health and Safety Management System

The main directions, directives and commitments in the sphere of health and safety of TVEL Fuel Company's workers are recorded in TVEL JSC Health and Labor Protection Policy.

System-based application of the guiding principles of the Policy, the uniform methodology for the identification and assessment of occupational risks allows the Company to reduce the impact of harmful and hazardous production factors in the workplace, to allocate targeted funds to solve the most important labor protection problems.

Priority goals and objectives aimed at reducing occupational risks make an integral part of the planning process; they are included in Occupational Health and Safety Objective Achievement Program. Goals are updated annually and assume the special assessment and the improvement of working conditions, reducing injuries, increasing awareness and competence to perform job tasks in a safe manner. In 2017 these positions were also a priority.

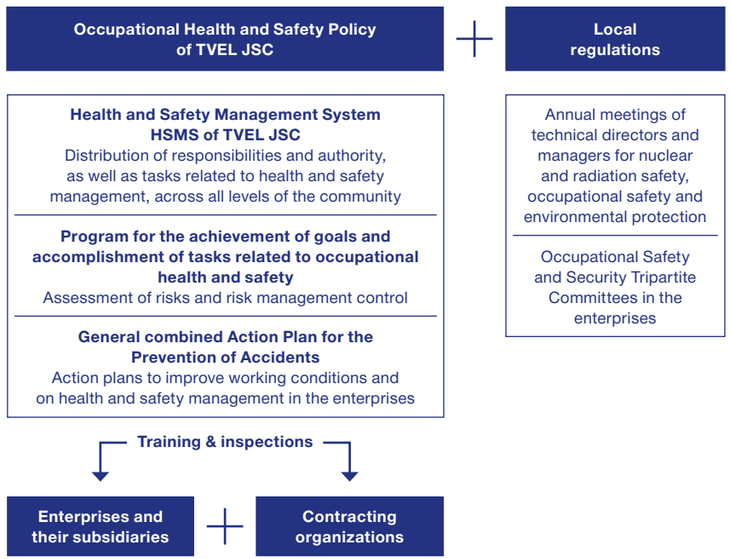
About 76.8 thousand SFIs submitted in 2017 were focused on improving the safety culture.

The Company spent grand total[1] of RUB 1.9 bln or RUB 64.9 thous. per each employee on labor protection arrangements in 2017.

Accident frequency rate (determines the number of casualties per 1,000 of workers) FR in 2017 was 0.1, injuries were recorded only at three enterprises. LTIFR (Lost Time Injury Frequency Rate, 1 mln. man/hour decreased and was 0.06 (0.09 in 2016). However, the severity of injuries has increased. In 2017, there were two death cases — at SGChE JSC and KMZ PJSC, and one severe injury at ChMP JSC. The cause of injuries at SChC JSC and ChMP JSC was poor organization of work, at KMZ PJSC the reason was violation of labor discipline by the injured person.

[1] Including CFR 3 and CFR 4.

Scheme 7
**Occupational Health and Safety Management in TVEL Fuel Company**






**LTIFR ratio of TVEL Fuel Company in 2017 was 0.06 against ROSATOM State Corporation's planned ratio no more than 0.3**

There were also accidents in contract organizations that occurred on the site of UEIP JSC: one severe injury (Corvette LLC) and one fatal casualty (Stimul-SN DPC LLC)[2]. The first occurred due to violation of safety requirements during vehicle operation, the second one — due to the non-use of personal protection equipment by the injured person.

Following the results of the strategic session 2017 with participation of technical directors of the companies, an analysis was made of fatal and severe accidents occurred at TVEL Fuel Company enterprises over the past 10 years, and also typical causes were identified that result in violation of labor protection requirements and accidents, hazardous areas and production conversions were specified, lists of possible emergency situations were prepared, and solutions for localizing possible incidents were defined.

The Comprehensive Action Plan was implemented in 2017 to prevent accidents, including severe and fatal ones at TVEL Fuel Company enterprises, including subsidiaries and contractors operating on the territories of enterprises. Video systems to monitor technological processes and prevent injuries were installed at hazardous industrial sectors of enterprises.

[2] All injured workers were men. Average Industrial Injuries Frequency Rate by contractors is not calculated due to the absence of recording system.

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Table 37

**Dynamics of the Indicators on Occupational Health and Industrial Safety in TVEL FC***

| Показатель | 2015 | 2016 | 2017 |
|---|---|---|---|
| Average Industrial Injuries Frequency Rate (IIFR) | **0.23** | **0.16** | **0.1** |
| Injury Rate (IR) | **0.03** | **0.02** | **0.01** |
| Occupational Disease Rate (ODR) | **0.00** | **0.00** | **0.02** |
| Absentee Rate (AR) | **1.88** | **2.65** | **2.55** |
| Lost Day Rate (LDR) | **1.90** | **0.40** | **0.58** |

* Data on CFR-4 contour. Deviation ratio (DR) for 2015 and 2016 was revised due to calculations of planned worked hours, and not actually worked hours. Injury Rate, Occupational Diseases Rate and Lost Days Rate were calculated using a 200,000 ratio. Lost Days Rate was calculated excluding fatal accidents.

No emergencies at hazardous facilities or mass accidents occurred during the reporting period.

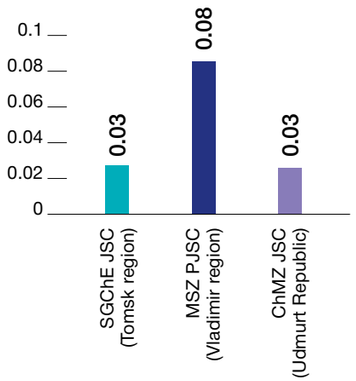
Each organization of TVEL Fuel Company having hazardous production facilities, implemented measures to ensure industrial safety, which allowed to reduce hazardous chemicals and to lower the hazard class of production facilities.

No violations of safety parameters or limits of the effective and equivalent doses set by the nuclear and radiation safety regulations were registered at the subsidiaries of the Company in 2017.

All production enterprises of the Company operate within the approved effective dose limits applicable to the personnel, no Group A personnel is available (individuals exposed to the effective dose of 100+ mSv and more over a period of 5 successive years, or individuals exposed to annual effective dose of 50+mSv and more).

Diagram 30

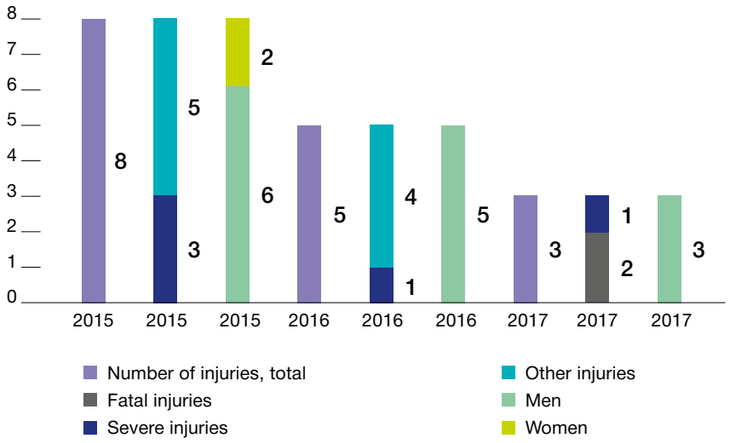
**Average Industrial Injuries Frequency Rate in TVEL FC subsidiaries***




* At remaining enterprises of TVEL FC, the rate is equal to 0.

Diagram 31

**Industrial injuries at TVEL FC enterprises, persons****




** Data for 2015-2016 are given on CFR-4 contour.



In 2017, the Department for Nuclear, Radiation, Industrial and Environmental Safety of TVEL JSC together with the Inspectorate for Control over Safety of Nuclear and Radiation Hazard Facilities of TVEL JSC carried out 15 inspections, including 5 unscheduled inspections by the orders of the TVEL JSC management. The inspections revealed 878 violations (676 violations were revealed in 2016).

**In 2017 the enterprises of TVEL Fuel Company:**

- **did not register any INES events at level 2 and above;**
- **did not exceed limits of annual effective radiation doses of the personnel;**
- **had no Group A personnel exposed to effective radiation dose 100 mSv and above over any successive 5 years.**

Diagram 32

**Average Annual and Maximum Effective Dose in 2015-2016, mSv**

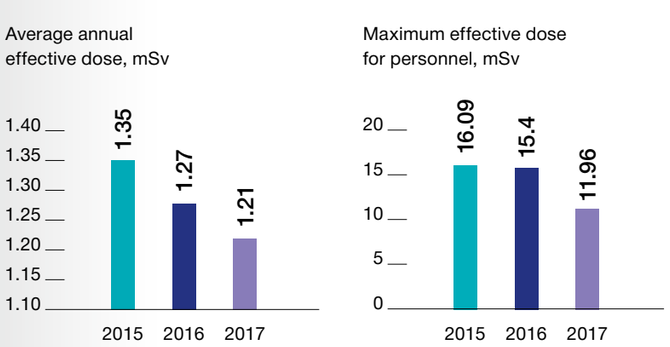



Diagram 33

**Group A personnel distribution by individual irradiation dose in 2017, persons**

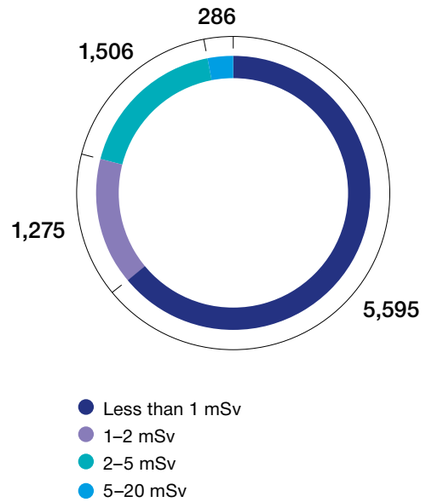



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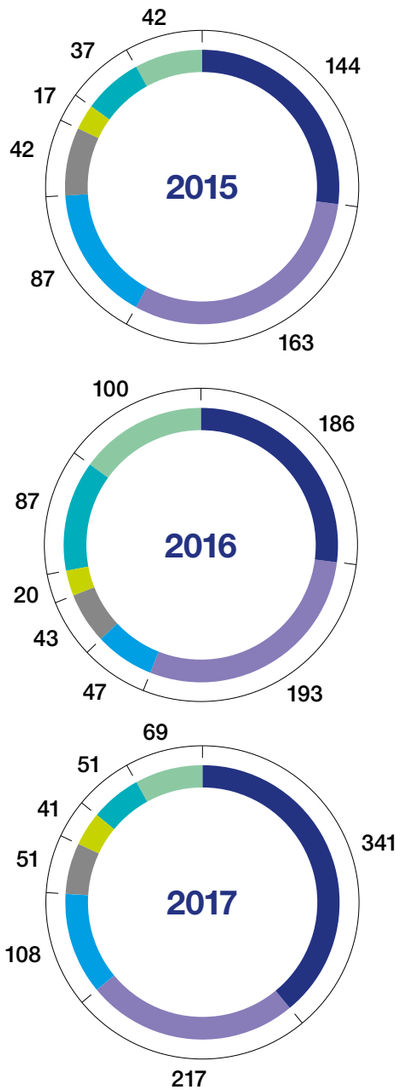
Diagram 34

**Structure of Revealed Violations, ea**




## TVEL JSC won the All-Russian Contest "Russian Business Leaders": Dynamics and Responsibility–2017" in nomination "For achievements in the field of occupational safety and health of workers"

For the purposes of prevention and mitigation of the impact of hazardous and harmful production factors the workers in harmful and hazardous working environments are provided with special and properly certified free clothing, footwear and individual protection means. Average cost of individual protection equipment per each worker exposed to hazardous or harmful working environments in 2017 amounted to RUB 14.2 thous.



# Social Capital

**The Company developed strategic initiatives and target projects on social and economic development of the regions/territories of presence and ensuring their social stability.**
**The "TVEL JSC Program for Regional Work and Social Projects" is being implemented, systematizing the experience in this area**

### SOCIAL PARTNERSHIP IN THE TERRITORIES OF PRESENCE

Achievement of strategic objectives by TVEL Fuel Company is impossible without social accord in the territories of presence or compliance with social and environmental acceptability requirements. Social strain in regions and in territories of presence may cause reputation damage to TVEL JSC which has the image of a reliable supplier of nuclear fuel and uranium enrichment services, and therefore may cause re-orientation by foreign partners towards the Company's competitors (see also Risk Management Section).

The Company developed strategic initiatives and target projects on social and economic development of the regions/territories of presence and ensuring their social stability. The "TVEL JSC Program for Regional Work and Social Projects" is being implemented, systematizing the experience in this area and including three groups of projects:

- formation and preservation of social accord environment in the territories of presence of TVEL Fuel Company;
- cooperation with local and regional public authorities with respect to the concept of the territories' development, the growth of regional taxes and maintenance of social and economic stability;
- enhancement of social programs efficiency and social partnership development.

### Complaints and Appeals Handling

Complaints and appeals handling is performed in conformity with the Federal Law "On the procedure of handling appeals filed by citizens of the Russian Federation" No. 59-FZ d/d May 2, 2006. Feedback is mandatory, all appeals and responses are recorded.

Appeals are lodged directly to TVEL JSC, and received from the ROSATOM hotline and from the state authorities.

To establish direct communication "Employee-President of TVEL JSC", the so called "post boxes" were installed in all subsidiaries of the Company, thus any employee may address the top management of TVEL Fuel Company confidentially. Besides, one can address directly the President of TVEL JSC on Company's official website or intercorporate intranet portal.

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**TVEL JSC is a member of All-Russian Industrial Association of Employers "Association of the Employers of the Nuclear Industry, Energy and Science of Russia" (President of the Company is a member of the Board), and National Association of Procurement Institutes (NAPI)**

Table 38

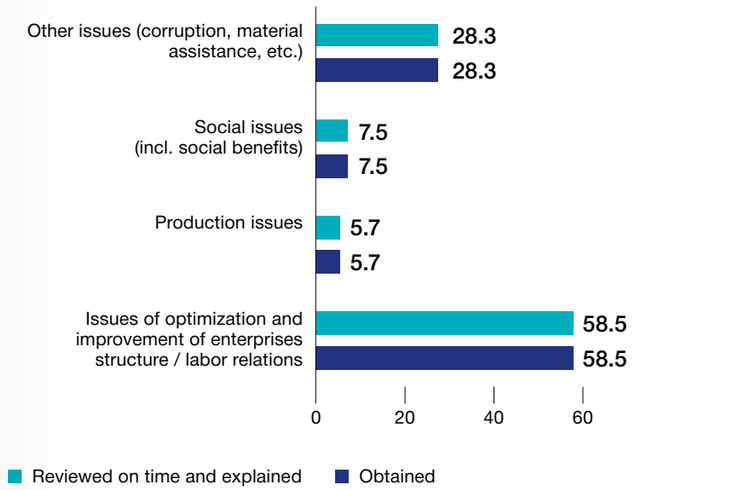
**Financing of the Program for Social and Economic Development of the cities of TVEL Fuel Company's presence, 2017**

| City | Scope of funding, RUB mln | Events |
|---|---|---|
| **CATU Novouralsk** | **300** | ‣ Construction of a dwelling house for young specialists, a school, an exhibition and marketing center of the NCED<br>‣ Reconstruction of a skating pavilion<br>‣ Modernization and repair of social facilities<br>‣ Major repair of "Samotsvety" Children's Resting Camp buildings<br>‣ Acquisition of road machinery<br>‣ Courtyard areas improvement, including sports and children's playgrounds etc. |
| **CATU Seversk** | **30** | ‣ Activities aimed at business support and promotion (the funds have been outlined and will be allocated to Managing company after TASED creation) |
| **Glazov** | **234.7** | ‣ Construction of an ice hall<br>‣ Construction of a gym hall and workshops for Physics and Mathematics Lyceum<br>‣ City's sports clubs supporting etc. |
| **Angarsk** | **53** | ‣ Continuation of construction works of a kindergarten for 220 children<br>‣ Improvement of municipal and courtyard areas,<br>‣ Major repair of "Lesnik" People's Hall |
| **TOTAL** | **617.7** | |



Diagram 35

**Results of appeals handling in 2017, %**




17 PARTNERSHIPS FOR THE GOALS

**Agreements on cooperation with the regions**

In 2012 TVEL JSC initiated the drawing up and signing of Agreements on Cooperation between ROSATOM and public authorities of the territorial entities of the Russian Federation.

Presently there are agreements between ROSATOM and Sverdlovsk region, Irkutsk region, Tomsk region, Krasnoyarsk territory and the Udmurt Republic.

Annually under the concluded agreements, local government bodies, regional government agencies and TVEL Fuel Company develop and implement joint program of social and economic development of cities of presence of the Company's enterprises.

These agreements determine the following key aspects:

- co-financing of programs for social and economic development of nuclear cities;
- the terms of co-funding of Entrepreneurial Development and Supporting Fund;
- the terms of joint participation in establishment of Physical and Mathematical Lyceums.

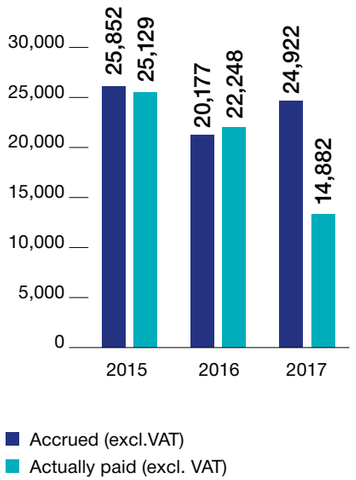
Funds are allocated under the initiative budgeting principle: residents hold meetings, take decisions on further improvements, and inform public authorities of their initiatives.

TVEL Fuel Company is a major taxpayer in the budgets of various regions of the Russian Federation. Gross tax liabilities (actually paid) made RUB 14.9 billion in 2017[1].

[1] Besides, VAT paid by TVEL Fuel Company made RUB 9.3 billion. Thus, the total actually paid tax deductions (including profits tax for consolidated taxpayers group) amounted to RUB 24.1 billion.

Diagram 36

**Gross tax liabilities of TVEL Fuel Company, RUB mln**

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**Public dialogue forums**

In recent years public organizations play an increasingly important role in country's and urban community's social life. Social partnership policy makes it possible to address the most complicated issues by negotiations, dialogue, search of a balance of interests of different population groups. The idea of social partnership is to reach the compromise. That's why in 2017 TVEL Fuel Company carried on the tradition of public municipal dialogue forums.

The purpose of those events was to reduce social strain, to create the platform for consolidation of sound social force, to strengthen relations between different participants of social processes, and to reach a new level in the work of non-commercial organizations.

A III Civil dialogue forum "The way to a successful future through civil agreement" was held in CATU Novouralsk organised by TVEL JSC and UEIP JSC. The Duma deputies and members of the Public Chamber of Novouralsk urban district, honorary citizens of the city, representatives of the Public Council of Rosatom SC, the Veterans Council of Novouralsk, trade-union and public organizations of the NUD, TVEL JSC and UEIP JSC, the expert and journalistic communities took an active part in the dialogue forum.

The dialogue forum had five thematic discussion centers:

- Implementation of ROSATOM and the Fuel Division projects;
- Lean City — Lean Polyclinic;
- Business platform;
- Grant making;
- Clean City — Safe World.




In the course of the dialogue, a package of socially significant civil initiatives aimed at further development of Novouralsk industrial site and CATU Novouralsk has been developed. Participants discussed consolidation of relations between government, business and the general public, formation of an adequate understanding of the most important and significant for population issues of the city's social and economic life.

In particular, it was proposed to organize a project office for municipal investment projects registration and support on the basis of Entrepreneurial Supporting Fund in CATU Novouralsk, and to delegate to the Fund the powers to promote within the framework of intermunicipal cooperation Novouralsk businesses as well as the whole territory with its competitive advantages and favorable business conditions, in the region and beyond.

There was another proposal to develop with a financial backing a municipal environmental program in 2018, to create a Novouralsk municipal center for environmental information — an interface for environmental education of the population.

The dialogue forum formalized all ideas in a memorandum, it became the next stage in urban environment consolidation in solving problems of social and economic development of Novouralsk. The delegates if the Third Civil dialogue forum decided to create a dialogue forum community on social media as an official communication platform of municipal community.

The dialogue forum in Glazov discussed the municipal infrastructure and urban improvement, as well as social assistance, including the implementation of joint social initiatives of TVEL JSC and local self-government bodies. The agenda of the forum in Zelenogorsk was business-oriented, business-climate issues were discussed, including the establishment of TASED and social assistance. The main topic of dialogue forums in Seversk and Novouralsk was environmental safety.

Table 39

**Working-age population employed by subsidiaries of TVEL FC**

| City (enterprise) | Region | share of working-age population employed by subsidiaries of TVEL FC |
|---|---|---|
| Angarsk (AECC JSC) | Irkutsk region | 0.73% |
| Vladimir (Tochmash VPA JSC) | Vladimir region | 0.63% |
| Kovrov (KMZ PJSC) | | 1.3% |
| Glazov (ChMP JSC) | Udmurt Republic | 6.1% |
| Zelenogorsk (PA ECP JSC) | Krasnoyarsk territory | 6.0% |
| Novouralsk (UEIP JSC) | Sverdlovsk region | 4.8% |
| Seversk (SGChE JSC) | Tomsk region | 5.2% |
| Elektrostal (MSZ PJSC) | Moscow region | 4.6% |

Table 40

**Highlights of Dialogue Forums Holding**

| City | Number of participants | Date | Number of city public organizations — participants of the Dialogues Forum |
|---|---|---|---|
| **Glazov** | 80 | 27.04.2017 | 10 |
| **Zelenogorsk** | 700 | 13.05.2017 | 30 |
| **Novouralsk** | 170 | 30.08.2017 | 9 |
| **Seversk** | 350 | 24.06.2016 | 7 |

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**TASED creation**
Establishment of TASED in CATU is aimed at creation of new jobs, increase of investment attractiveness of CATU and level of development as compared to the average level of social and economic development of the entities of the Russian Federation.

The declared projects assume creation of more than 5.5 thousand jobs, the investments will amount to more than RUB 40 billion. The third part of the declared projects are the projects of ROSATOM and TVEL Fuel Company.

## TASED (territory of the advanced social and economic development) is the part of a territorial entity of the Russian Federation with the special legal regime for entrepreneurial and other activities

### TO CARRY OUT THE SAID COMMISSIONS, ROSATOM AND TVEL JSC:

**2014**

Established work teams in subsidiaries of TVEL FC and TVEL JSC

Drew up CATU passports for CATU Integrated Development Programs.

CATU Integrated Development Programs (IDP) were developed and approved by local and regional authorities, and submitted for inspection and approval to the Government of RF.

**2015**

Basing on EDP working teams with the involvement of developers formed the concept of the territory of advanced social and economic development in nuclear industry CATU.

**2016**

The concepts of TASED creation were considered at at the level of territorial entity of the Russian Federation.

Concepts were sent to the Ministry of Economic Development of the Russian Federation and to the Ministry of Finance of the Russian Federation.

ROSATOM working team on issues of TASED property in CATU was formed.

Proposals (applications) for TASED creation were sent to authorized federal executive bodies / the Ministry of Economic Development of the Russian Federation:

- CATU Seversk (July 2016),
- CATU Zelenogorsk (August 2016),
- CATU Novouralsk (August 2016)

The concept of TASED in Glazov was approved at the level of territorial entity of the Russian Federation.

**2017**

CATU-based TASED Managing Company ATOM-TOR was established in territories of ROSATOM facilities.

Plans for preventive measures for establishment of TASED in CATU of TVEL Fuel company had been prepared and implemented before the release of RF Government Regulations.

**2018 (planned)**

Formation of TASED Managing Company:

- formation of property complex,
- formation of subsidiary managing companies.

Creation of TASED in nuclear industry CATU:

- issue of the RF Government Regulations,
- conclusion of agreements between the Ministry of Economic Development, the government of a constituent entity of the Russian Federation, municipal authority).

Registration of first residents:

- formation of marketing strategy.

Table 41
**The projected effect of TASED creation**

| City | Zelenogorsk | Seversk | Novouralsk | Glazov |
|---|---|---|---|---|
| **Number of new jobs, including** | **466** | **1,490** | **2,715** | **913** |
| ‣ Under the project of ROSATOM and TVEL Fuel Company | 242 | 651 | 973 | 0 |
| ‣ Under CATU projects | 224 | 839 | 1,742 | 913 |
| **Amount of investment, RUB mln, including** | **2,458** | **11,811** | **19,427** | **6,981** |
| ‣ Under the project of ROSATOM and TVEL Fuel Company | 1,340 | 4,795 | 3,598 | 6,981 |
| ‣ Under CATU projects | 1,118 | 7,016 | 15,829 | 0 |

### PREFERENCES TO TASED RESIDENTS

**1. Value-added tax**
- Declarative order of tax refund.
- Credit (refund) of tax declared as recoverable in tax return, until the completion of in-house tax audit.

**2. Corporate income tax**
- Tax rate for federal budget tax: 0% during 5 tax periods, starting from the tax period in which the first profit was received.

**3. Corporate property tax**
- Exemption during 5 years
- Organizations having the TASED resident status.

**4. Rates of insurance for tased residents**
- Pension Fund of the Russian Federation: 6.0%
- Social Insurance Fund of the Russian Federation: 1.5%
- Federal Statutory Health Insurance Fund: 0.1%
- TOTAL: 7.6%

**5. Land tax**
- Exemption during 3 years.
- Organizations-residents of TASED regarding land plots located in TASED territories.
- Tax rate for the tax to the budgets of Russian constituent entities: up to 5% during 5 tax periods starting from the tax period when first profit was received from activities carried out in the implementation of agreements for TASED and cannot be less than 10% during the following 5 tax periods.

**6. Mineral Extraction Tax**
- Within 120 tax periods (from the beginning of corporate income tax rate period in accordance with Article 284.4 of the Tax Code of the Russian Federation). Coefficient characterizing the territory of mining (CTM 1) is assumed to be equal to:
- 0 — first 24 tax periods
- 0.2 — from 25 till 48 tax periods
- 0.4 — from 49 till 72 tax periods
- 0.6 — from 73 till 96 tax periods
- 0.8 — from 97 till 120 tax periods
- 1 — from 121 tax period and further

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# 286.9

**RUB million**

**TVEL Fuel Company spent RUB 286.9 million in 2017 on social and charitable projects to develop the territories of presence of its enterprises, out of this amount RUB 119.4 million were funded by TVEL JSC, and RUB 167.5 million — by TVEL JSC subsidiaries**

## SOCIAL AND CHARITABLE ACTIVITY

TVEL Fuel Company's contribution to social and economic development of territories of presence implies both participation in the regional and local budgets income base, and realization of comprehensive social and charity programs.

Since 2012 the Charity Council has been working within TVEL JSC; its functions include the determining of purposes and priority areas of charitable activity, approval of the budget and charity events, efficiency assessment of the charitable activity of TVEL FC, etc.

In 2017, the Council held 13 meetings.

The principles of charitable activity:

- support of charitable programs and projects in the cities of the Company's enterprises presence (social projects contests);
- backing-up common values (promotion of business environment, "Entrepreneur of the Year" contests, creation of new jobs, development of educational, health, culture and sports infrastructure);
- co-funding of charitable programs jointly with the local authorities and central government bodies of the Russian Federation constituent entities.

TVEL Fuel Company spent RUB 286.9 million in 2017 on social and charitable projects to develop the territories of presence of its enterprises, Out of this amount RUB 119.4 million were funded by TVEL JSC, and RUB 167.5 million — by TVEL JSC subsidiaries.

### Small and Medium Enterprises Support and Development

Creation of new jobs and promotion of business environment in the cities of presence are priority directions of charitable activities for TVEL Fuel Company for the last five years.

For example, "Businessman of the Year" contests are held annually sponsored by TVEL Fuel Company to encourage the most effectively developing small and midsized business entities.

In 2013, the Entrepreneurial Development and Supporting Funds were organized in the territories of the Company's presence in terms of co-funding with local authorities and government bodies of the RF constituent entities. The Funds issue loans, grants and subsidies to small and medium-sized business entities (SMBs) for the creation of new jobs, the development of new industries, participation in exhibitions and fairs and business missions.

Due to the funds more than 1.8 thous. jobs were created in 2013–2017 in Glazov, CATU Zelenogorsk, Novouralsk, Seversk.

Scheme 8

**Operating pattern of Entrepreneurship Support and Development Funds**

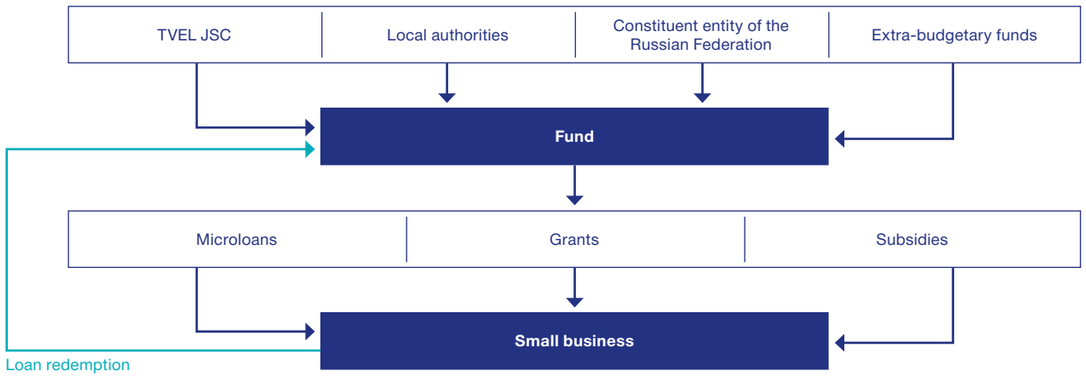




Table 42

**Funds allocated for charity and social projects in 2017**

| № | Major areas | amount, RUB mln |
|---|---|---|
| 1 | Installation of outdoor fitness and Work Out complexes | 20.0 |
| 2 | "Lean Polyclinic" project promotion | 47.3 |
| 3 | Measures taken to improve living conditions of medical community (CATU Novouralsk) | 20.0 |
| 4 | Support to the information centers of nuclear industry | 29.0 |
| 5 | Creation of school technoparks | 4.0 |
| 6 | Provision of gratuitous assistance in organizing and holding sports events for nuclear industry workers | 7.5 |
| 7 | AtomClasses opening and support | 6.0 |
| 8 | Participation and holding of the contest "Businessman of the Year" | 1.5 |
| 9 | Organization and holding of social projects contest | 8.6 |
| 10 | Activities on organization and establishment of TASED in cities of CATU and Glazov, as well as activities aimed to damp social risks in the cities of the Company's enterprises presence | 63.1 |
| 11 | Gratuitous aid to veteran organizations, orphanages, disabled persons, retirees, persons in hardship | 10.3 |
| 12 | Organization and holding of municipal and regional social and cultural events, gratuitous aid to cultural institutions, patriotic education projects support (including support of Suvorov Military Schools) | 19.3 |
| 13 | Support of projects on the erection of a monument to centrifuge creators in CATU Novouralsk and pioneer constructors of Angarsk | 11.0 |
| 14 | Gratuitous aid to amateur, children's and mass sports | 6.8 |
| 15 | Activities aimed at urban improvement in the cities of the Company's enterprises presence | 1.6 |
| 16 | Supporting educational projects, including activities aimed at development of children's research and technical creativity (robotechnics) | 10.4 |
| 17 | Other activities aimed at developing the cities of the enterprises' presence, raising the living standards of the population, creating an attractive social environment (environmental measures, support of the parishes of the ROC etc.) | 20.5 |
| | **Total** | **286.9** |

Table 43

**Performance of Entrepreneurship Development Funds in 2013–2017**

| City | Number of SMBs projects that received financial support | Number of created jobs |
|---|---|---|
| Glazov | 332 | 620 |
| Zelenogorsk | 22 | 145 |
| Novouralsk | 252 | 815 (including self-employed) |
| Seversk | 92 | 269 |
| **Total** | **698** | **1,849** |

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**The Coordination Board approved the extended education standard for "School Technopark" project, a showcase of children's and youth design and engineering developments was held during the "ATOMEXPO'2017" International Forum in Moscow, a contest "School Technopark Brand" was organized and held in 2017**

## Support of Schoolchildren

### *AtomClasses*

TVEL Fuel Company sponsors so called "AtomClasses", operating in the cities of the Company's presence (Angarsk, Glazov, Zelenogorsk, Kovrov, Novouralsk, Seversk, Elektrostal). The AtomClasses are specialized classes in best schools of the cities with advanced teaching of physics and mathematics. The specific feature of such classes is the profound study of nuclear physics and nuclear technologies.

The important part of the project is procurement of the advanced laboratory equipment for teachers to demonstrate innovative physical presentations, and for students of AtomClasses to have their training laboratory courses and to carry out research works. Such advanced training will help the students to succeed at academic competitions, contests, school children's academic achievements festivals. Further on, the AtomClasses graduates will be able to continue their education in relevant technical universities.

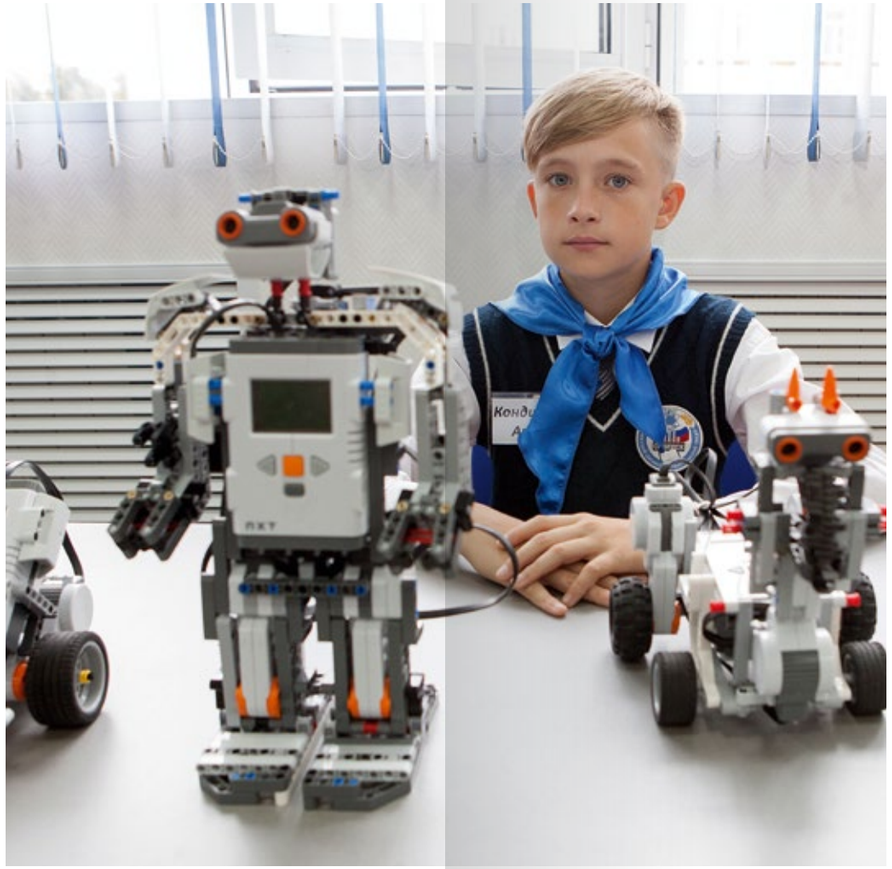
To implement the project RUB 6 million were allocated in 2017. In 2018 it is planned to continue the project financing at the same 2017 level.

### *Physics and Mathematics Lyceums*

One of the primary areas of TVEL Fuel Company's charitable activity is support of Physics and Mathematics Lyceums for training of future skilled specialists for the nuclear industry.

This project is designed to create conditions for children's self-expression, to reveal and support talented schoolchildren, bring up the prospective scientists. Besides, the project provides for upgrading of teachers' qualifications

The project is being implemented in four cities: CATU in Seversk, Zelenogorsk, Novouralsk and Glazov in terms of co-funding with local authorities and government bodies of the Russian Federation constituent entities.



**SGChE JSC was the partner of the school contest in Chemical Analysis**

SGChE JSC became the partner of an open municipal contest held on the base of the General Education School No. 197 in CATU Seversk with the international Junior Skills elements.

The partnership project of SGChE JSC in Seversk became a tangible embodiment of the recommendations developed by the Chemical Club of ROSATOM TVEL Fuel Company at its first meeting "Element of the Future" that is to become a carrier of knowledge in various fields of chemistry and chemical technologies.

Schoolchildren had a unique chance to show their skills and abilities in three main areas of competence: "Laboratory of Chemical Analysis", "Engineering Design" and "Turning work on CNC machines".

SGChE JSC supervised the "Chemical Analysis" competence area, and helped to build up chemical bases required for proper and fascinating lab sessions and experiments.



Table 44

**Performance of AtomClasses in 2016–2017 academic year**

| City | Participation of schoolchildren in contests and academic competitions, number of events | Participation of schoolchildren in project and educational events, occupational guidance, number of events | Number of top places in contests and academic competitions |
|---|---|---|---|
| Seversk | 11 | – | 21 |
| Zelenogorsk | 16 | – | 40 |
| Novouralsk | 7 | 2 | 36 |
| Glazov | 16 | – | 51 |
| Kovrov | 13 | 16 | 26 |
| Angarsk | 21 | 6 | 71 |
| Elektrostal | 14 | 10 | 9 |

The Coordination Board for Physics and Mathematics Lyceums development coordinates their work and serves as a discussion platform for teaching staff and managers of TVEL Fuel Company. Meeting of an on-site and off-site national training conference for Physics and Mathematics Lyceums is held on a quarterly basis, where teachers discuss essential problems of education in the sphere of physics and mathematics and possible ways to solve them in an actual teaching practice.

RUB 2 million were provided for charity budgeting of this project for 2018 by TVEL JSC.

### *School Technoparks*

In continuation and development of the existing project aimed at support of Physics and Mathematics Lyceums, TVEL Fuel Company in 2016 launched the project on creation of polyvariant education environment, "School Technopark" in CATU Zelenogorsk, Novouralsk, Seversk and Glazov. Establishment of the centres for innovative technical creative work will contribute to retention in Russia of motivated staff with a taste for design, inventive activity, and to involvement of talented school age youth in solution of design and engineering problems in favour of the nuclear industry.

24 multi-discipline laboratories were created under the project, mainly in robotics and computer modelling. The project was implemented as an open space project, students of all and any educational institutions of the city can work in the laboratories. The network structure of the project allows the specialists from different laboratories and different cities to exchange information, there's an Internet portal. The projects development in the Technopark is supervised by tutors from enterprises of TVEL Fuel Company and universities (MEPhI, Tomsk State University, etc.).

In summer 2017, the Coordination Board of Physics and Mathematics lyceums of the cities of the Company presence approved the industry specific standard of extended education for "School Technopark" students based on a module-competence approach. It is a set of requirements that are mandatory for implementing a networked educational program which were established:

- to the results of mastering the educational program;
- to educational program structure;
- to terms of educational program implementation.

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The standard has been developed with due regard to the requirements of ROSATOM and TVEL JSC, the specific nature of general education institutions involved in the implementation of extended education on the basis of School Technoparks.

The project won widespread support of regional authorities.

In August 2017, the Governor of Tomsk region, S. Zhvachkin, attended the opening of the School Technopark in CATU Seversk.

In 2018, the Company plans to continue funding the project, organizing and holding design and development contests, purchasing additional equipment, and implementing other actions.

**TVEL JSC and Rossotrudnichestvo launched a partnership project between the schools of Russia and Portugal**

The project involves schools with in-depth study of physics, mathematics and technical disciplines. Russia is represented in the project by Gymnasium No. 21 of Elektrostal, Moscow region (participant in the ROSATOM School project with an AtomClass established), Portugal — by the school Sebastião e Silva — Liceu de Oeiras, the district of Lisbon, known in Europe due to the victories of its students in international competitions and contests of R&D projects.

The two schools signed a protocol on cooperation for a period of eight years with an option to extend it. The parties agreed on mutual visits, exchanging academic knowledge and best educational practices, on holding online scientific conferences and joint research.

The project of cooperation between Russian and Portuguese schools is implemented on the basis of "Miru-MIR" (Smart Nuclear) open communication platform, sponsored by TVEL JSC to popularize nuclear science, energy and industry, establish links and develop cooperation between scientific, public and educational organizations in partnership with the leading Russian and foreign enterprises.

**The School Technopark of CATU Seversk was named as one of the best educational practices in Russia at the meeting held in November 2017 on the basis of the Education Department of Moscow under the Ministry of Education of the Russian Federation for heads of educational authorities of 64 cities of the Russian Federation.**

Table 45
**Key indicators of School Technopark project**

| City | Number of schoolchildren involved in educational programs of technoparks | Number of R&D works of schoolchildren implemented under the project | Number of technical educational programs under the project | Number of participants in research and technology contests/ share of winners and awardees (citywide) |
|---|---|---|---|---|
| Seversk | 3,048 | 130 | 4 | 734/123 |
| Zelenogorsk | 1,453 | 42 | 27 | 470/77 |
| Novouralsk | 400 | 83 | 21 | 180/120 |
| Glazov | 458 | 190 | 5 | 151/34 |



**Healthy Lifestyle**

***Social project "My Yard. My House. My Family"***

In 2011 the project "My Yard. My House. My Family" was initiated. This project is the part of strategic social initiative of TVEL JSC for development of the cities of presence and creation of comfortable living conditions.

The main directions of the project in 2017:

- installation of Work Out facilities;
- arrangement of courtyard trainers (instructors) institute who would train children and youth during the season free of charge;
- organization and holding of district and municipal Work Out festivals;
- involvement of official organizations (Work Out Federation) and major and popular local communities in holding Work Out festivals.

Places for sport areas were chosen by local authorities with due consideration to the public opinion, within participatory budgeting and subject to location of previously installed playgrounds. The so-called "Yard Days" were held after installation and opening of playgrounds. TVEL Fuel Company spent RUB 20 mln in 2017 on this project.

Table 46
**Work Out facilities set in 2017**

| City | Number of work out facilities in 2017 | Number of working trainers (instructors) | Number of work out facilities with trainings conducted by trainers/ instructors | Number of trainings conducted by trainers | The number of cultural events held ("Work Out Festivals", "Yard Days") |
|---|---|---|---|---|---|
| Seversk | 10 | 15 | 50 | 250 | 40 |
| Zelenogorsk | 1 | 8 | 24 | 48 | 25 |
| Novouralsk | 2 | 12 | 16 | 956 | 31 |
| Glazov | 3 | – | – | – | 24 |
| Kovrov | 8 | 10 | 8 | 349 | 2 |
| Angarsk | 4 | 26 | 26 | 3,796 | 5 |
| Elektrostal | 2 | – | – | – | – |
| Vladimir | 7 | – | – | – | – |
| **Total** | **37** | **71** | **124** | **5,399** | **127** |

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*Plans 2018:*

- to proceed with installation of work out and street fitness facilities;
- to organize and hold district, municipal and interregional work out festivals;
- to involve official organizations (Work Out Federation) and major popular communities in holding work out festivals in the territories of presence of TVEL Fuel Company;
- to form local youth communities on the basis of out-of-door sports grounds in the cities of presence.

**The main tasks of the project are to reformat the logistics of medical facilities' processes, both for adults and children, to optimize the work at front desks and to shorten the patient's polyclinic time**

"***Lean Polyclinic*" *project***

In the sphere of health, TVEL JSC assists in improving the efficiency of medical institutions, improving living conditions of medical workers, acquisition of modern equipment and support of health facilities in the cities of presence.

Since 2017 TVEL JSC together with ROSATOM and the Ministry of Health of the Russian Federation has been participating in implementation of a large-scale project "Lean Polyclinic". The project is aimed at enhancement of operating efficiency of medical and preventive institutions and the level of access to health care for the population of Glazov, Zelenogorsk, Novouralsk, Seversk.Under the project, the work of front desks in medical institutions is being improved introducing modern standards of communication, informational support and build-up of an accessible environment for people with limited mobility:

- introduction of an E-queue;
- improvement of occupational ergonomics of medical staff;
- doctors are exempted from work unnatural for them, including paper work;
- patients' flows are split up into healthy visitors who need just certificates and periodic screening, and sufferers, including patients with a viral infection;
- logistics changes in terms of vaccination, periodic screening, health survey, pharmaceutical benefits.

Another direction of the project is provision of housing for medical workers.

The volume of project funding from all sources in 2017 was about RUB 60 million.

Training of medical staff included familiarization with ROSATOM production system, including an insight into the basic principles of lean production, the history of the development of the production system in the nuclear industry and prerequisites for RPS introduction in budget-funded organizations and institutions. Gained knowledge and skills were reinforced by medical staff at "Process Factory" of TVEL Fuel Company organizations. The fulfilment of the training course tasks is intended to familiarize health workers with basic concepts, tools of lean production and to form, regardless of age and status, a new look at the effectiveness of processes, especially in conditions of increasing consumers' requirements for medical services quality.

RPS specialists of TVEL Fuel Company defined for each medical institution the range of tasks and a set of targets forming the project design passport. During the project implementation, the Company purchases the equipment, changed internal organizational processes, optimized the logistics, which resulted in gradual changing of the image of a medical institution as a more client-oriented one.

In 2018, it is planned to continue the project realization in children's polyclinics and take measures to provide housing for medical workers.

In Zelenogorsk, PA ECP JSC allocated more than RUB 4.9 million for improvement of the polyclinic building "Clinical Hospital No. 42" and acquisition of new equipment, and involved its specialists to teach medical staff the principles of ROSATOM production system.

In Novouralsk, UEIP JSC specialists shared their experience in implementing the RPS, helped to organize properly the work of municipal polyclinics. Optimization of the processes allowed to reduce the waiting time in front-desk queue, call center provided the opportunity for patients to get prompt answers to questions of interest.

Besides, medical institutions in Novouralsk were also reorganized. The municipal polyclinic No. 3 now has a renovated entrance, porch, parking was arranged, workplaces of all therapists and district nurses were equipped with PCs, patient sessions increased. Due to the measures taken, health survey time cut to a third. In polyclinic No. 1, the front desk is being renovated, all registrars were trained in the prevention of conflict situations. Due to that the number of patient complaints decreased.

Besides, in 2017 TVEL Fuel Company allocated RUB 20 million for purchase of apartments for medical specialists of the Central Medical Sanitary Department No. 31 in Novouralsk.

According to an independent study, the patient satisfaction in the city's polyclinics of Novouralsk grew from 39 to 73%, waiting in queue decreased from 20 minutes to 5 minutes.



Table 47

**Financing of the Lean Polyclinic project in the territory of TVEL Fuel Company enterprises presence in 2017**

| Territory | CATU Novouralsk | CATU Seversk | CATU Zelenogorsk | Glazov |
|---|---|---|---|---|
| Amount of project financing from the budget of TVEL FC, RUB mln. | 5 | 5 | 5 | 7.3 |
| Amount of project financing from the budget of TVEL FC subsidiaries, RUB mln. | 8.9 | 2.5 | 4.9 | 9 |
| Amount of project co-financing from the budgets of medical institutions, RUB mln. | 10 | 1 | 0.16 | 1 |

17 PARTNERSHIPS FOR THE GOALS

## STAKEHOLDER ENGAGEMENT

TVEL FC always applies the principles of transparency,[1] and constantly interacts with stakeholders, systematizes, analyses and takes into consideration their requests. This approach allows to respond quickly to potential risks related with stakeholders relations, in particular with those of social and reputation nature.

System of relationships with each group of stakeholders influences and will influence the operations of TVEL Fuel Company, that's why due consideration of their interests in planning and in the course of daily operations is the most important condition of sustainable development. Analysis of the key events, major financial and production outcomes and the Company's performance in the sphere of sustainable development demonstrates that social capital is among the major sources of business stability.

Company's view on sustainable development is shown in Annual Report of TVEL JSC for 2014: *www.tvel2014.ru/ru/section_3/#section_3_2.*

[1] Taking into account the objective industry-specific limitations.

**Stakeholders engagement events during the preparation of the Report 2017**

While preparing the Report the principles of Standard AA1000APS were adhered to, in particular, the compliance of the information published with the requests of stakeholders involved was ensured. Two dialogues with stakeholders (live and off-site dialogues) were conducted to implement this principle, as well as public consultations on draft Report.

Participants of these dialogues were the representatives of ROSATOM State Corporation, industry partner organizations, subsidiaries, environmental, public, trade union organizations, higher educational institutions, local governmental authorities, mass media, consultants and auditors.

**4.9**

**RUB million allocated PA ECP JSC in Zelenogorsk for improvement of the polyclinic building "Clinical Hospital No. 42"**

Magic Christmas Tree charitable action was held at the end of December 2017.

Employees of TVEL JSC made donations for more than RUB 50 thousand to continue therapy of a four-year-old daughter of one of AECC JSC employees.

The Christmas tree was decorated with toys made by the children of JSC TVEL employees. Every employee who made a donation could take home any decoration from the magic Christmas tree.

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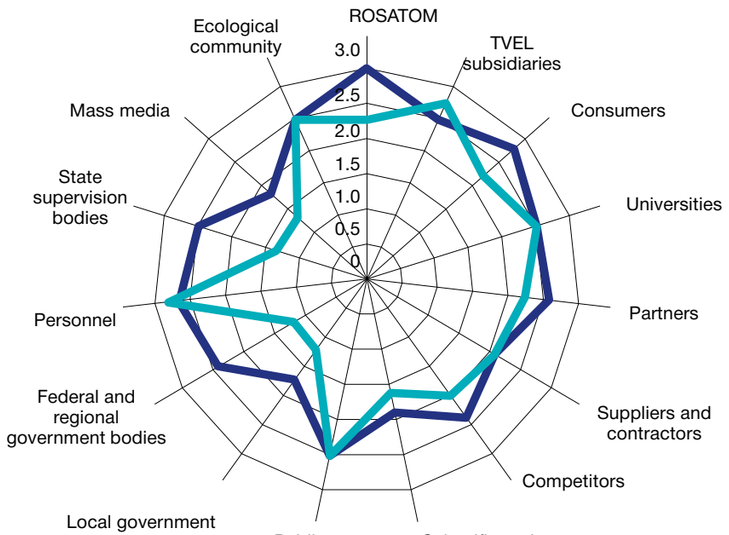
Diagram 37

**TVEL Fuel Company's Stakeholders Rank Chart**




Index of impact of stakeholders on TVEL FC
Index of impact of stakeholders on TVEL FC on stakeholders

In November 2017 TVEL JSC organized an off-site dialogue on the concept of Annual Report 2017. The Report concept developed by the Company with account of the proposals from the Stakeholders Commission was presented; the participants gave recommendations which allowed to finalize and refine the concept of the Report.

In the course of the dialogue held on February 16, 2018, participants discussed the issues of preparation of TVEL JSC Public Annual Report 2017, summarized some outcomes 2017, presented the priority issues to be disclosed in the Report:

"Improvement of Efficiency and Sustainable Development of ROSATOM TVEL Fuel Company".

The draft annual report of TVEL JSC 2017, which was prepared in accordance with recommendations of the stakeholders given in the course of the dialogues, was presented during the public consultations on April 25, 2018. Following the event the proposals were made by the stakeholders on the information to be disclosed in the Report.

The table specifying the stakeholders' comments is given in an interactive version of the Report. The minutes of the dialogues are available at:

*tvel.ru/wps/wcm/connect/tvel/tvelsite/finance/annual_report/dialog/*


## TVEL JSC ANNUAL REPORT 2016 AWARDS

- Prizewinner in the nomination "The Best Report on Corporate Social Responsibility and Sustainable Development" of the XX annual contest of annual public reporting of the Moscow stock exchange.
- Top position and the title "Leader of Corporate Transparency among State-Owned Companies" in the rating "Corporate Transparency of the Largest Russian Companies — 2017" of the Russian Regional Network on Integrated Reporting.
- 2nd place in general rating of industry-specific contest of annual public reporting of ROSATOM.
- Platinum winner in the International Competition MarCom Awards 2017 (USA) in category Annual Report (Print Media | Print Creativity)
- Silver title in international award "LACP 2017 Spotlight Awards Global Communications Competition" in category "Print: Annual Report. Companies with a Turnover USD 1–10 bln", and is in TOP-100 world's best annual reports.



# Natural Capital

**TVEL Fuel Company regularly takes part in national and regional environmental events, proving high social responsibility in environment protection and preservation of the country's natural wealth. The Company works consistently on reduction of adverse environmental effects of its operation**

PA ECP JSC territory of presence, Krasnoyarsk territory

## ECOLOGICAL POLICY

2017 was declared the Year of Ecology in Russia. The key thematic goal of the Year of Ecology is to draw attention to issues of concern in the environmental sphere and improve the country's ecological security.

In 2017, environmentally significant enterprises of TVEL Fuel Company implemented the Action Plan in the Year of Ecology, including organizational, R&D, educational and industrial-specific events aimed at improvement of environmental protection at TVEL JSC and environmentally significant organizations of TVEL Fuel Company.

During the Year of Ecology the enterprises of TVEL Fuel Company also focused on implementation of a large number of technological efforts to improve production, introduce innovative technologies for atmospheric and water discharge treatment, waste management.

The main environmental goal of TVEL Fuel Company is promotion of ecological, nuclear and radiation safety, implementation of the Company's strategic objective

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to provide social and ecological suitability.

TVEL Fuel Company maintains the Integrated Management System, where a Corporate Environmental Management System is a constituent.

System-based application of the guiding principles of Ecological Policy, the unified methodology of environmental aspect identification and environmental risks and opportunities evaluation allows to allocate funds to solve the most important problems, thus improving performance in the field of ecology. Priority goals and objectives aimed at reducing environmental risks are an integral part of the planning process; they are included in TVEL Fuel Company's Environmental Objective Achievement Program and Ecological Policy Implementation Plan.

TVEL Fuel Company activity aimed at reduction of adverse environmental impact of the enterprises is characterized by branch specificity and carried out in two directions:

- Removal of the environmental "heritage" of the first nuclear project, created as a result of execution of the military state programs on enterprises included into the management system of the Company, which implies execution of large scale works connected with decommissioning of the nuclear industry facilities and rehabilitation of the contaminated territories.
- Reduction of the impact by the enterprises on the environment connected with current production operations. Ecological management system in being developed in this direction with implementation of modern resource saving production technologies, routine environmental protection actions and continuous environmental quality monitoring.

In accordance with the above directions, enterprises of TVEL Fuel Company formulate annual plans of environment protection measures.

- NCCP PJSC became the winner of All-Russian Contest "Russian Business Leaders: Dynamics and Responsibility — 2017" in nomination "For Ecological Responsibility".
- NCCP PJSC was acknowledged the winner of Novosibirsk EcoProm-2017 contest in nomination "Production Ecology".
- Following the results 2016 PA ECP JSC became the winner in special nomination "Environmentally Exemplary Enterprise of the Fuel Company" of ROSATOM's contest "Environmentally Exemplary Enterprise of the Nuclear Industry" (The results of the contest were announced in the late 2017).
- UEIP JSC won municipal ecological contest Green Owl-2017 in nomination "The Leader in Environmental Compliance in Novouralsk Municipal District".
- ChMZ JSC became the winner of the Ecological Responsibility-2017 contest in nomination "Sponsor and Charity Support", and won the prize of the Republican contest under the annual national campaign "Environmental Hazards Protection Days".
- The project "Ecological Safety in Handling Solid Radioactive Waste", presented by UEIP JSC, became the finalist of the National Crystal Compass Award in the nomination "Best Environmental Project of Industrial Enterprises and Business".
- For the initiative and significant contribution to the environmental protection and participation in National Environmental Volunteer Clean-Up Day "Green Spring 2017" TVEL Fuel Company was awarded the diploma of V.I. Vernadsky Non-Governmental Environmental Fund.

- The project "Clean City — Safe World" is implemented to strengthen the image of TVEL Fuel Company of ROSATOM as a socially and environmentally responsible company. The project promotes environmental responsibility of personnel and is aimed at environmental education and development of social activity of the residents in the regions of presence of the Fuel Division of ROSATOM State Corporation, as far as environmental protection is concerned.
- Under the project, on the basis of School Technoparks the students of Physics and Mathematics Lyceums in the territories of presence of PA ECP JSC, SGChE JSC, UEIP JSC, ChMZ JSC and supervised by TVEL Fuel Company, designed the robots for environmental quality monitoring.
- In 2017, TVEL Fuel Company won V.I. Vernadsky National Environmental Award for the project "Clean City — Safe World".

The enterprises of TVEL Fuel Company make regular efforts to improve the existing and introduce the advanced environmental technologies and technologies for monitoring adverse impact on the environment, staff and population of the regions of the enterprises' presence. Special attention is paid to environmental safety during improvement of the existing nuclear fuel production technologies.

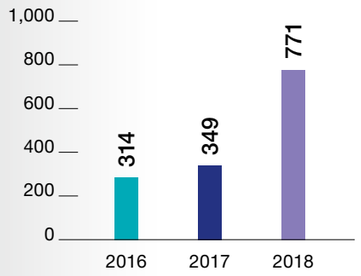
Employees of TVEL JSC and its subsidiaries take an active part in the development of scientific and technical reference books on the best available technologies; these reference book are used at the enterprises included into the management system of TVEL Fuel Company.

Environmentally important subsidiaries of TVEL Fuel Company (AECC JSC, PA ECP JSC, SGChE JSC, NCCP PJSC, UEIP JSC, ChMP JSC, MSZ PJSC) issue and publish on websites the annual public reports on environmental safety to inform the stakeholders, partners, local government bodies, and the public.



Diagram 38

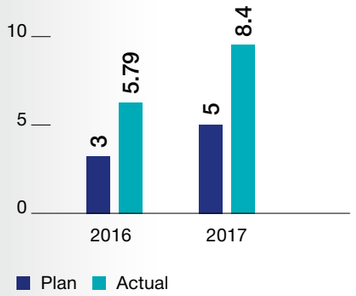
**Amount of financing for energy saving and efficiency improvement program, RUB mln***




* The targeted growth of financing is explained by participation of each and every enterprise of TVEL Fuel Company in the Program events since 2017.

Diagram 39

**Reduction of energy consumption at TVEL FC enterprises in 2017 (as compared to 2015) in monetary terms, %**




**ENVIRONMENTAL IMPACT**[1]

The facilities of enterprises of TVEL Fuel Company are generally classified as the II category objects causing moderate adverse environmental impact[2]. However, there are four objects of the I category (metallurgical production) at ChMP JSC where continuous monitoring of their environmental impact is maintained. No excess of the specified standards was registered in 2017.

**Energy Saving and Efficiency Improvement Program**

The project on energy consumption reduction and energy efficiency improvement of industrial companies of ROSATOM is of great importance for the nuclear industry competitiveness recovery.

TVEL Fuel Company is one of the leaders in introduction of automated systems for accounting of energy resources and methods to improve energy efficiency in the nuclear industry, including processes of energy inspections, formation of long-term investment, organizational and technical programs and specific activities for energy efficiency. The Company's enterprises are involved in Energy Saving and Efficiency Improvement Program (further "the Program") since 2011. The Program was approved subject to the results of energy and thermovisional inspections held at the Company's organizations.

The representatives of TUV International Certification LLCA carried out regular witness audit of Energy Management Corporate System (EMCS) at TVEL JSC and its subsidiaries. No deviations and discrepancies were revealed. In 2017, the Company's enterprises were also audited by the auditors of TVEL JSC.

The Program has established target values for reduction of energy consumption (as compared to the reference year 2015) in monetary terms. In 2017 the target indicator of energy resources consumption was 5%. As a result of the implemented activities this value was achieved and even surpassed.

In 2017, the energy consumption by the Company's enterprises was

[1] The Report contains consolidated data on TVEL Fuel Company, and in certain cases, where necessary, discloses the data on each separate company.

[2] According to the Clause 1 of the Article 4.2 of the Federal Law No. 7-FZ "On Environmental Protection" d/d January 10, 2002.

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Table 48

**Dynamics of energy saving by the enterprises of TVEL FC under comparable conditions as compared to 2015, on an accrual basis as a result of efforts to reduce energy consumption and energy efficiency increase**

| Indicator | 2016 | 2017 | 2018 (plan) |
|---|---|---|---|
| Total amount of saved electric power, mln kWh | 118.4 | 171.53 | 181.493 |
| Total amount of heat energy, thous. Gcal | 206.9 | 268.8 | 280.97 |
| Total amount of electric power and heat energy, thous. GJ | 1,291.7 | 1,742.9 | 1,829.7 |

Diagram 40

**Total amount of energy saved by efforts to reduce energy consumption and improve energy efficiency, in money terms under comparable conditions, RUB mln**

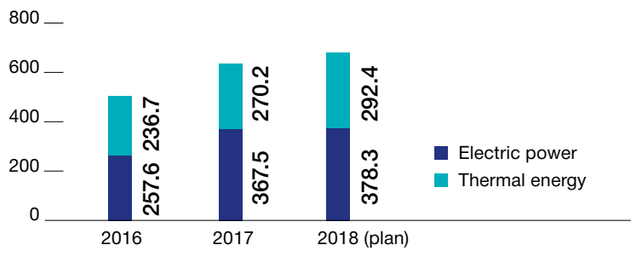
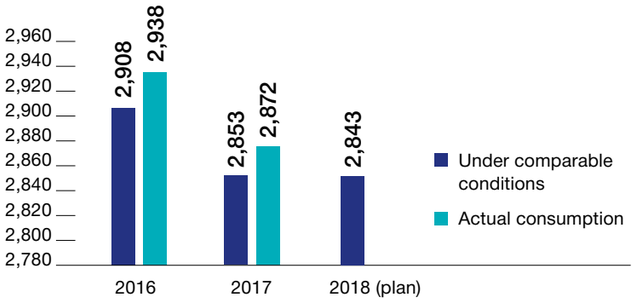



Diagram 41

**Electric energy consumption, mln kW*h**




reduced by 5.67%, heat energy — by 11.5% as compared to the reference values of 2015 under comparable conditions[1]. The reduction in energy resources consumption (as compared to 2015) in monetary terms was 8.4% (RUB 834 mln).

Change in the structure of fuel consumption in 2017 was caused by the use of gas instead of goal by HPP at SGChE JSC. Estimated consumption in 2018 is stipulated by the fact that starting from January 1, 2018 all HPPs of TVEL Fuel Company were excluded from the perimeter of the Company.

[1] Calculation of saving is carried out in accordance with the approved by the order of ROSATOM methods for calculation of cost saving gained from reduced energy consumption, and own methods for the enterprises of TVEL Fuel Company, approved by TVEL JSC and coordinated with ROSATOM State Corporation.



Diagram 42

**Heat energy consumption, thous. Gcal**

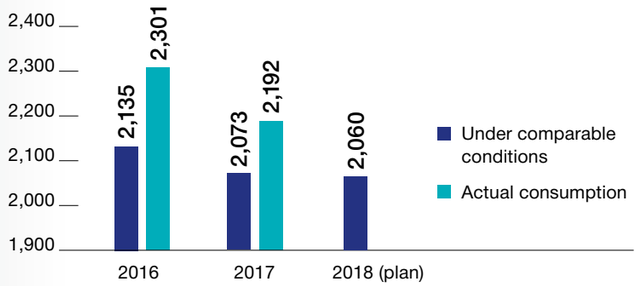



Diagram 43

**Electric power and heat energy consumption by TVEL FC enterprises in money terms under comparable conditions, RUB mln**

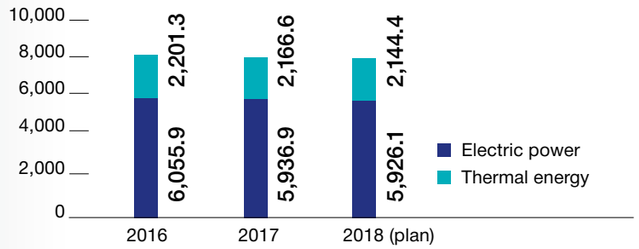
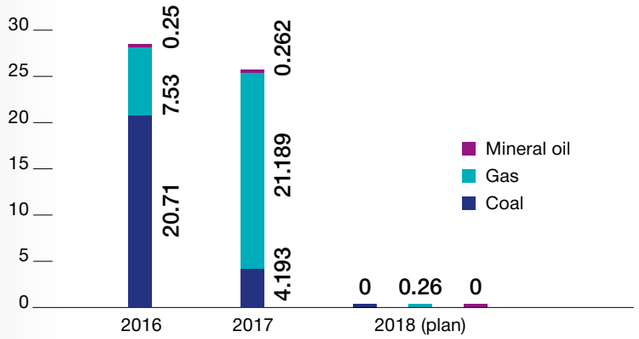



Diagram 44

**Primary energy sources consumption*, mln GJ**




* Including generation of electricity and thermal energy by HPPs at TVEL Fuel Company's subsidiaries. In 2017, HPPs at ChMZ JSC and UEIP JSC were taken over by OTEK JSC; in 2018, HPPs at SGChE JSC will also be taken over. In 2017, OTEK JSC was procuring coal for HPP at SGChE JSC.

***Results 2017:***

- Creation of the circulating water supply system on the base of existing hydrotechnical structures of AECC JSC:
  - replacement of energy-intensive pump 12 NDS TOU-4 of building 803 with less powerful pump D500 made it possible to save annually 489.9 thous. kWh;
  - pre-test assembly of NK-2 (fixed cascade) without OK-2 (refining cascade) made it possible to save annually 576 thous. kWh;
- Optimization of industrial water and air supply system of PA ECP JSC;
- Modernization of refrigeration supply and conditioning system of PA ECP JSC: refrigeration supply scheme of building 901 was upgraded with two new refrigerating machines that are more energy-efficient by 20% than the machines in operation; 10 of 16 refrigerating machines were updated; energy consumption of refrigerating machines was reduced by 31%. Besides, enhanced management and automation system was introduced; it enables management of equipment refrigeration process almost without human involvement. Total economic benefit of these activities will amount to at least RUB 3 mln per annum;
- Modernization of general and gas-cleaning ventilation systems of PA ECP JSC;
- Reconstruction of sanitary sewer system of NCCP PJSC ensured meeting the target values of water consumption and runoff from — 29.6% in 2016 to 5.5% in 2017 as compared to 2015. Following the results 2017, as compared to 2016, the funds in the amount of RUB 23.84 million were saved by preventing penetration of ground water, defrost water and rain water to bitumen compound storage facility, as well as by reduction of charges for excess of threshold limit value;
- Decentralization of air supply system of SGChE JSC;

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- Decommissioning of Technological Control Objects No. 7 and 8, which made it possible to save electric power and deaerated water at SGChE JSC;
- Extension of temperature range for operational parameters of gas centrifuges in summer time, and, consequently, change in operating mode of refrigeration equipment of building 34 of SGChE JSC;
- Change in heating scheme of reactor plant and radiochemical plant (relocation of pump station of Fire Pumphouse of building 475 beyond the area of reactor plant of site 11 of SGChE JSC);
- Reduction of costs for dilution of condensed water with domestic and drinking water at SGChE JSC;
- The system of frequency-controlled drives of equipment cooling pumps of Technological Control Objects No. 64 and 65 of UEIP JSC was made automatic. The application of this system results in electrical energy saving for at least 3 mln kWh per annum.
- Structure 715 at ChMP JSC became weather-resistant. Due to stained-glass glazing of the building in 2017, nearly RUB 4 million were saved, or RUB 8 million on an annual basis.
- The power transformers at MSZ PJSC were replaced.

In December 2017, the author team consisting of employees of UEIP JSC — Klyushin A.A., Lobov A.G., Fukalov A.I., Khramov V.V. — was given the Corporate Award in nomination "Best Engineering and Process Solution" for the project "Technical Upgrading of Supervisory Control System of Building 3001, Shop 53". The project authors were awarded the 3rd class diplomas.

Due to their great expertise the team members managed to minimize costs and to reduce capital expenses by RUB 166.9 million (survey and design — RUB 13 mln, construction and installation — RUB 55.5 mln, equipment — RUB 80.2 mln, pre-commissioning — RUB 18.2 mln) and operational expenses by RUB 108.2 thous. per annum.

***Plans 2018:***

- Modernization of heating system at AECC JSC;
- Optimization of industrial pump station (installation of low-pressure impeller) at PA ECP JSC;
- Replacement of refrigerating machines at UEIP JSC;
- Completion of decentralization of the compressed air supply system at MSZ PJSC;
- Modernization of general lighting network (including replacement of lamps with LEDs) at ChMP JSC;
- Installation of circulating pumps in heating systems of buildings at Centrotech SPA LLC.

**Use and Processing of Materials**

The quantity of materials necessary for the manufacture of products at enterprises of the Company is determined by the production program.

Enterprises of separation-sublimation complex use uranium and synthetic materials for products manufacturing. Enterprises of fabrication block use raw materials represented by enriched uranium product. Synthetic materials, ferrous and non-ferrous metals are basically used in the manufacture of gas centrifuges.

All raw materials used by TVEL Fuel Company enterprises are purchased. No renewable materials are used in production. Examples of the used materials are shown in Table below.

Table 49

**Use of materials for main production by TVEL FC Enterprises*, tons**

| Material | 2015 | 2016 | 2017 |
|---|---|---|---|
| Sulfuric acid | 1,171 | 713 | 735 |
| Technical sulfuric acid (oleum) | 12,005.2 | 12,247.2 | 12,664.87 |
| Nitric acid | 11,859.6 | 18,584.7 | 22,494.6 |
| Hydrochloric acid | 7,260.6 | 5,649.0 | 7,093.1 |
| Ferrous metals | 2,385.0 | 2,112.0 | 2,358.5 |
| Non-ferrous metals | 786.2 | 834.9 | 846.1 |

* Data was retrospectively adjusted due to the changed approach to data collection of the companies included in management system of TVEL Fuel Company.



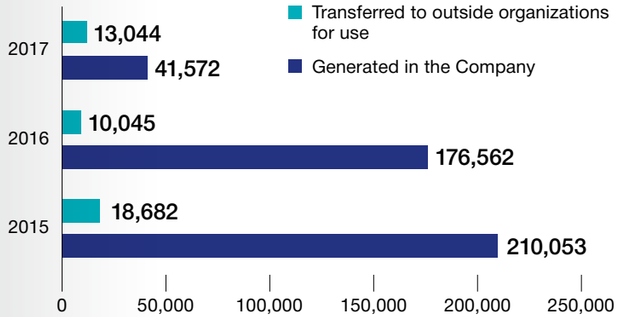
Table 50

**Share of used waste produced over a year, %**

| Enterprise | 2015 | 2016 | 2017 |
|---|---|---|---|
| ChMP JSC | 32% | 135% | 11% |
| NCCP PJSC | 1% | 0% | 0% |
| MSZ PJSC | 66% | 56% | 55% |
| AECC JSC | 1% | 1% | 2% |
| Tochmash VPA JSC | 1% | 1% | 1% |
| **Total for TVEL FC** | **2.57%** | **5.80%** | **7.17%** |

Diagram 45

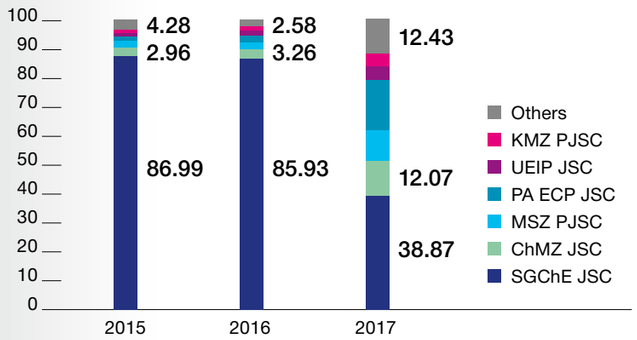
**Waste Generation and Recycling, tons***




* Information is provided according to the new form No. 2-TP (waste) approved by the ROSSTAT Order No. 529 "On Approval of Statistical Tools for Organization of Federal Statistical Monitoring of Industrial and Consumer Waste by the Federal Service for Environmental Control" d/d August 10, 2017.

Diagram 46

**Structure of waste generation at TVEL FC enterprises, %**




**Industrial and Consumer Waste Disposal**

In 2017, the total amount of industrial and consumer waste of the Company was decreased by 76.5% as compared to the level of 2016 and made around 41.6 thous. tons.

Main reasons of waste formation decrease in 2017:

- Reduction of hazard class 5 (slightly hazardous) waste (ashes and slag) generation due to reduction of coal burning by HPP (Seversk Branch of OTEK JSC) and reorganization of waste calculation[1].
- Reduction of generated at UEIP JSC waste and scrap containing uncontaminated ferrous metals due to the fact that there was no need for replacement of the existing process equipment.

In technological processes of the enterprises of TVEL Fuel Company the produced waste could not be reused during manufacture of the key products. Non-production waste of hazard class 5 (slightly hazardous) was used in 2017 by MSZ PJSC and ChMP JSC (55% and 11% respectively).

[1] In 1st–3rd quarters of 2017 SGChE JSC accounted for all wastes generated in the process of production economic activity of HPP at OTEK JSC; since the fourth quarter of 2017 HPP at OTEK JSC began to account for the generated waste independently.

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Table 51

**Waste generated at TVEL FC enterprises by hazard classes, thous. tons**

| Indicator | 2015 | 2016 | 2017 | Δ 2017/2016, % |
|---|---|---|---|---|
| **Total waste, including:** | **210.1** | **176.6** | **41.6** | **–76.5%** |
| Hazard Class I | 0.21 | 0.09 | 0.04 | –56% |
| Hazard Class II | 4.08 | 0.05 | 0.02 | –59% |
| Hazard Class III | 0.49 | 0.43 | 0.49 | 14% |
| Hazard Class IV | 10.80 | 8.92 | 9.36 | 5% |
| Hazard Class V | 194.47 | 167.1 | 31.7 | –81% |

The bulk of waste (76%) was represented by Hazard Class V (slightly hazardous) waste, such as ash slag resulting from solid fuel burning at the HPPs (Seversk branch of OTEK JSC[1]). Ash and slag were dumped at HPP. The bulk of other wastes was delivered to specialized organizations.

### Water Consumption and Water Disposal

In 2017 withdrawal of water by the enterprises of the Company decreased by 4% to 402 mln m³ as compared to the previous year, water consumption for own needs decreased by 15% to 319 mln m³. Thus, 319 mln m³ of water were disposed by the Company's enterprises (55.2% of the standard). All water was disposed into natural water bodies.

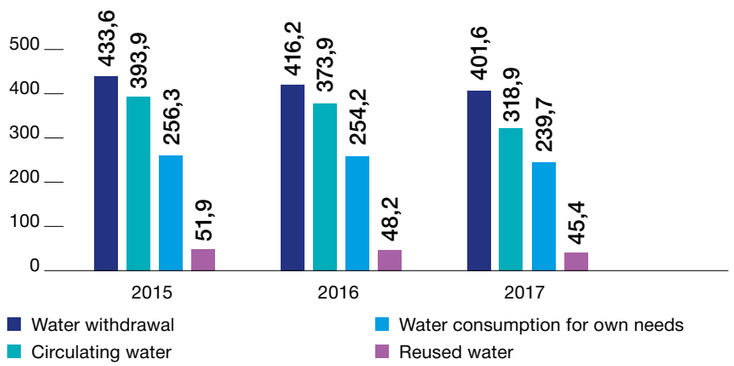
Reasons for decrease in volumes of water withdrawal and consumption:

- transfer of industrial water intake of ChMP JSC to the HPP at Glazov Branch of OTEK JSC;
- measures aimed at water consumption reduction by AECC JSC;
- transfer of property complexes of HPPs at SGChE JSC, UEIP JSC and ChMP JSC to the branches of OTEK JSC.

[1] From the first to the third quarter of 2017 SGChE JSC accounted for the waste.

Diagram 47

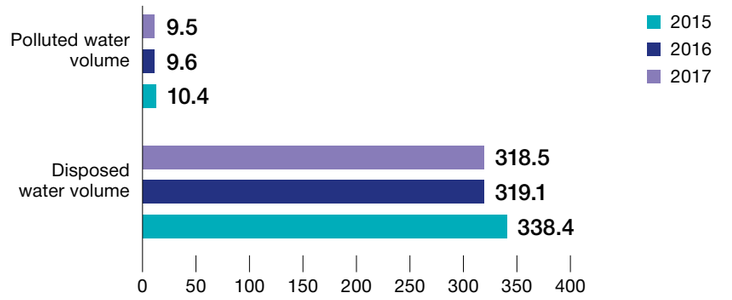
**Water consumption in 2015–2017*, mln m³**




* Actual consumption method is mainly used in calculation of water consumption indicators at the Company's enterprises.

Diagram 48

**Water disposal by enterprises of TVEL FC in 2015–2017, mln m³**






AECC JSC territory of presence, Irkutsk region, lake Baikal

The main source of water withdrawal is represented by natural sources 94% (379 mln m³). Water is being withdrawn by the enterprises of TVEL Fuel Company from natural sources in accordance with the set standards. Water withdrawal from public and other water supply systems was 23 mln m³ in 2017.

In 2017, the standard of water withdrawal was set at 709 mln m³, the actual volume of withdrawal was 57% of the set standard.

In 2017, the storm water treatment plant system VEKSA-80M was put into operation at NCCP JSC. This complex makes it possible to enhance efficiency of waste water cleaning from suspended particles and petroleum products.

**Withdrawal of water by the Company's enterprises decreased by**

**4%**

**Water consumption for own needs decreased by**

**15%**

In 2017, the volume of return water was 240 mln m³. The share of return water of the total amount of withdrawn water was 60%, the share of reused water of the total volume of withdrawn water was 11%. Water consumption in the systems of return water decreased by 6%.

In 2017, the volume of disposal of polluted waste water by the Company's enterprises decreased by 1%, which is directly connected to decrease in water withdrawal.

Difference in percent decrease as compared to 2016 of water withdrawal volume and polluted waste water volume is conditioned by the fact that some TVEL Fuel Company enterprises accept waste water from outside organizations.

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Diagram 49

**Emissions of ozone-depleting substances, tons**

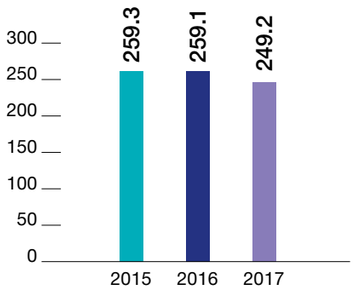
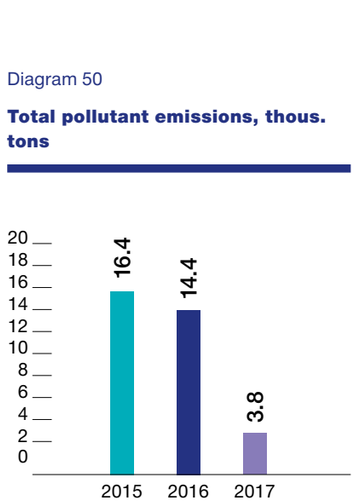



Diagram 50

**Total pollutant emissions, thous. tons**




13 CLIMATE ACTION

**Pollutant Emissions**

In 2017, total pollutant emissions into the atmosphere by the Company's enterprises amounted to 3.8 thousand tons (7% of the set standard).

Reduction of emissions by 74% as compared to 2016 is explained by:

- reduction of burned coal fuel at HPP (Seversk Branch of OTEK JSC)[1];
- transfer of property complexes of HPPs at UEIP JSC and ChMP JSC to OTEK JSC;
- production area optimization and dismantling of equipment at Tochmash VPA JSC.

Among the enterprises of TVEL Fuel Company the largest volumes of emissions were reported at SGChE JSC and ChMP JSC. At SGChE JSC the large portion of waste is caused by the HPP at Seversk Branch of OTEK JSC (during the first three quarters of 2017 it enjoyed the Authorization for Pollutants Emissions of SGChE JSC).

[1] During the first three quarters 2017, HPP at Seversk Branch of OTEK JSC enjoyed the authorization for pollutants emissions of SGChE JSC.

It should be noted that this HPP supply heat and electricity to the settlements within the range of the enterprise location. At ChMP JSC the emissions are caused by technological processes of chemical metallurgical production.

Reduction of emissions of ozone-depleting substances by 4% is stipulated by:

- replacement by AECC JSC of refrigerating machines using ozone-depleting substances as refrigerants;
- transfer of refrigeration supply equipment of industrial water supply shop to Novouralsk Branch of OTEK JSC.

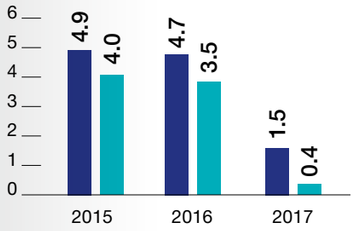
Decrease in nitrogen and sulphur oxide emissions by 68% and 89%, correspondingly is stipulated by overall emissions decrease in TVEL Fuel Company. In 2017, emissions of solid substances amounted to 0.738 thous. tons, and volatile organic compounds — 0.502 thous. tons.

In 2017, greenhouse gas emission intensity amounted to 5.11 tons/RUB mln of revenue (in 2016 — 5.12 tons/RUB mln). The emissions from technological processes form the bulk of greenhouse gas emissions at TVEL Fuel Company.



Diagram 51

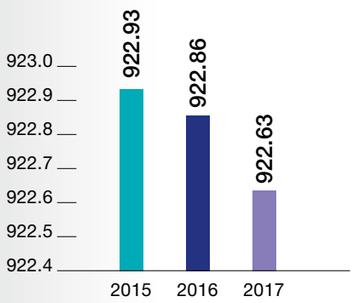
**Emission of specific pollutants, thous. tons***




* Determined by computational method along with instrumental verification.

Diagram 52

**Carbon dioxide equivalent greenhouse gas emissions, thous. tons***




* The carbon dioxide emissions were taken into consideration to determine greenhouse gases emissions, because carbon oxide emitted into the atmosphere from anthropogenic sources is oxidized to carbon dioxide. The indicators were determined by computational method and recalculated in accordance with the Methodological Guidelines used to Quantify the Greenhouse Gas Emissions by Organizations that Carry out Economic and Other Activities in the Russian Federation, approved by the Order No. 300 of the Ministry of Natural Resources d/d June 30, 2015, namely:

- Formula No. 2 of the Methodological guidelines was used in computation.
- The amount of $CO_2$ emissions was calculated by conversion from CO (multiplied by factor1.57).
- Emissions of CH4 (methane) of UEIP JSC and emissions of perfluoromethane (freon 14) of ChMZ JSC, subject to GWP specified in the Appendix No. 3 of the Methodological Guidelines, were also taken into account in calculating the total amount of greenhouse gas emissions at TVEL FC.

15 LIFE ON LAND

**Relative Impact of TVEL Fuel Company Enterprises on the Environment in the Regions of Presence**

The enterprises included in the management system of TVEL Fuel Company are located on lands that are owned by the enterprises, as well as on lands that are used on a leasehold basis and are owned by the Russian Federation. Industrial sites of the enterprises and adjacent territories are not referred to the territories with high valued biodiversity, they are not inhabited by animals and plants included in the IUCN (International Union for Conservation of Nature and Natural Resources) Red List and the national list of protected species.

The Russian environmental legislation sets the standards of admissible impact on the environment to provide compliance with the environmental quality standards. The enterprises, in their turn, follow the standards of admissible impact of the environment, and, thus, they do not create threats to animals and plants inhabiting the areas adjacent to the enterprises of TVEL Fuel Company.

Taking into account the fact that industrial sites of the enterprises do not affect the territories with high valued biodiversity, there is no impact of activity, products and services on endangered and valuable species.

In accordance with the Russian Federation nature protection laws TVEL Fuel Company enterprises set the standards of admissible impact on the environment that ensure the environmental quality preservation. Strict compliance with the standards of admissible impact on the environment by the enterprises ensures the absence of threats to animals and plants inhabiting the areas adjacent to the Company's enterprises.

The impact of the major part of the Company's enterprises on the environment of the regions of presence is in general less than 5% of the total impact of industrial facilities on the environment of the corresponding regions. This level of exposure corresponds to the following indicators:

- AECC JSC (3.3% of waste water discharge in Irkutsk region);
- PA ECP JSC (4.9% of waste water discharge in Krasnoyarsk territory);
- SGChE JSC (0.5% of total discharge in Tomsk region).

The 5% level was exceeded by SGChE JSC (56.4% of withdrawn water, 73.7% of the total discharge of waste water in Tomsk region). The share of impact of the rest of TVEL FC enterprises in the total impact of economic activities on the environment in the regions of presence is insignificant.

**No emergencies and incidents resulting in negative environmental impact occurred in 2017 at the enterprises of TVEL Fuel Company**

**EXPENSES RELATED TO ENVIRONMENT PROTECTION**

In 2017, operating expenses of the Company enterprises for environment protection amounted to RUB 2,207 million. Target funds, that were allocated in the framework of the investment and project activities of TVEL Fuel Company and ROSATOM State Corporation, were used to finance both technical and organizational arrangements.

The share of expenses is related to the activities for environment radiation safety assurance (RUB 848 mln). Considerable expenses are related to collection and treatment of waste water (RUB 480 mln).

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Table 52

**Expenses of TVEL FC related to environment protection, RUB mln**

| Expenditure items | 2015 | 2016 | 2017 |
|---|---|---|---|
| Radiation safety assurance | 817 | 726 | 848 |
| Waste water collection and treatment | 512 | 473 | 480 |
| Atmosphere air protection and prevention of climate change | 283 | 219 | 209 |
| Waste disposal | 172 | 135 | 121 |
| Protection and rehabilitation of lands, surface and ground water | 61 | 51 | 56 |
| Other activities in the sphere of environment protection | 474 | 502 | 492 |
| **Total** | **2,318** | **2,106** | **2,207** |

The share of environment protection expenses of TVEL Fuel Company falls on SGChE JSC, UEIP JSC and ChMP JSC.

In 2017, total amount of payments for negative impact on the environment increased by 69.6% as compared to the previous year and amounted to RUB 11.2 mln.

In the reporting year, there were no non-financial fines and penalties for negative environmental impact of enterprises included in the management system of TVEL FC, no damage was caused to the environment.

In 2017, the amounts of fines increased due to revealed violations in document management in the sphere of environment protection (generally, failure to meet the deadlines for document handling). The specified violations were revealed during the inspections of the State Supervisory Authorities; in 2017, the number of inspections increased as compared to 2016. According to the issued instructions the remedial measures are taken within the specified terms, and the reports are submitted in accordance with the established procedure.

Diagram 53

**Environment protection costs outlay of TVEL FC in 2017, %**

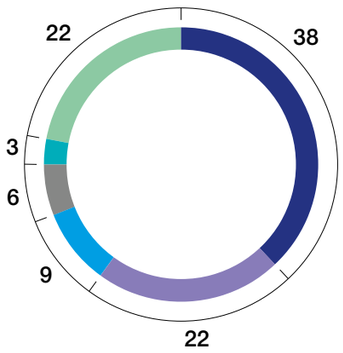



Diagram 54

**Structure of payments for negative environmental impact, RUB mln**

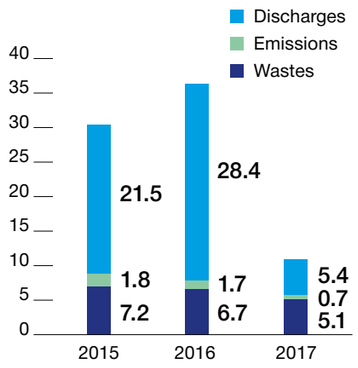
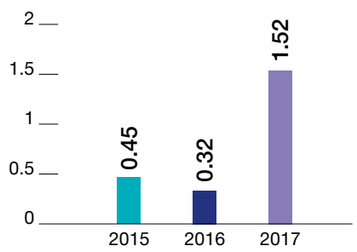



Diagram 55

**Fines and penalties collected for the impact caused to the environment, RUB mln**






## NUCLEAR AND RADIATION SAFETY

Activities of TVEL Fuel Company are carried out in accordance with the laws of the Russian Federation pertaining to the use of nuclear power with due account to IAEA requirements.

Assurance of nuclear and radiation safety (NRS) of facilities of the Company enterprises, prevention and exclusion of any possibility of inadmissible exposure of the personnel, population and environment to radiation are the key priorities of environmental policy of TVEL Fuel Company.

Lists of nuclear hazardous sections are elaborated for all nuclear-hazardous facilities of the Company, there are conclusions on the nuclear safety issued by the Department of Nuclear Safety of IPPE RF SSC FSUE. All nuclear hazardous sections are equipped with emergency alarm systems in the case of self-sustaining fission chain reaction.

Units of the enterprises for processing, storage, manufacturing with application of nuclear materials and radioactive substances, radioactive wastes treatment have sanitary-epidemiological conclusions on compliance of conditions of work with radiation sources with sanitary rules.

According to the conclusions made by the territorial departments of the State Sanitary and Epidemiological Service of the Russian Federation, the radiation situation at the Company's enterprises, within their sanitary protection areas and control areas (areas of professional responsibility) is estimated as satisfactory.

In 2017, within the framework of supervising the activity of TVEL Fuel Company's enterprises, the state supervisory authorities (Rostekhnadzor (Federal Service for Ecological, Technological and Atomic Supervision), FMBA, EMERCOM, RPN (Federal Service for Environmental Control) carried out 184 inspections and

**Federal Target Program "Nuclear and Radiation Safety Assurance for 2016–2020 and up to 2030"**

Within the strategic initiative "Environmental Responsibility" of TVEL Fuel Company, the works are ongoing for liquidation of "nuclear heritage", including rehabilitation of contaminated areas.

Since 2016 there is a new Federal Target Program "Nuclear and Radiation Safety Assurance for 2016–2020 and up to 2030" (FTP NRS-2, website: *фцп-ярб2030.рф).*

FTP NRS-2 includes 17 events of TVEL Fuel Company to the total amount RUB 38.9 billion, including RUB 35.3 billion out of the federal budget. The said arrangements will be performed at facilities of SGChE JSC, AECC JSC, UEIP JSC, NCCP PJSC, MSZ PJSC, VNIINM JSC and EDB-Nizhny Novgorod JSC. Six of them are short-term arrangements that have already been implemented within FTP NRS in 2008–2015; and the rest 11 are new decommissioning projects.

Apart from decommissioning of NRHF and rehabilitation of the contaminated territories of FTP NRS-2, the decision was taken on decommissioning of the sublimation production at AECC JSC, production of uranium tetrafluoride at ChMP JSC and chemical metallurgical plant of SGChE JSC. The above measures shall be implemented partially at the expense of the special reserve fund No. 3 (Decommissioning and R&D) of ROSATOM State Corporation.

One of the key objectives set to the industry is reduction in expenses and production costs to ensure competitiveness on the world market. In this regard, it is planned that by 2030 NRHF will be decommissioned, 470 thousand square meters of territories contaminated with radionuclides territories will be rehabilitated. This will significantly reduce the cost of products manufactured by enterprises of TVEL Fuel Company due to reduction of contaminated areas and subsequent production compaction. Significant means spent annually for safe maintenance of NRHF of TVEL Fuel Company will also be preserved.

The main program documents providing for realization of activities in the area of NRS are as follows:

- "Fundamentals of State Policy in the Sphere of Nuclear and Radiation Safety of the Russian Federation up to 2025"
- Federal Target Program "Nuclear and Radiation Safety Assurance for 2016–2020 and up to 2030"

**17**

**events of TVEL Fuel Company are included in FTP NRS-2 totaling amount RUB 38.9 billion, including RUB 35.3 billion out of the federal budget**

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Table 53

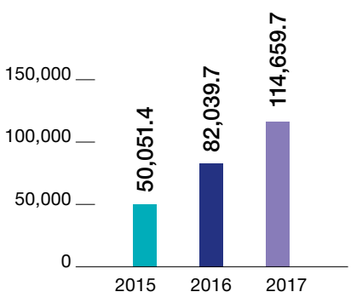
**Execution of works under the FTP "Nuclear and Radiation Safety Assurance for 2016–2020 and up to 2030" at the sites of the Company's subsidiaries at the expense of the federal budget***

| Subsidiary | Name of enterprise | Scope of finance, RUB mln | | |
|---|---|---|---|---|
| | | 2017 (plan) | 2017 (actual) | 2018 (plan) |
| SGChE JSC | Reconstruction of facility 13 at Radiochemical Plant | 100.0 | 100.0 | 60.0 |
| | Conservation of B-1 storage bay | 100.0 | 100.0 | 96.0 |
| | Conservation of B-25 pond | 157.7 | 157.7 | 97.3 |
| AECC JSC | Decommissioning of structure No. 2 (Building 802) and structure No. 4 (Building No. 804) | 752.5 | 360.3 | 769.4 |
| VNIINM JSC | Decommissioning of facility U-5, preparation for decommissioning of areas of radioactive contamination No. 2 and No. 9 and research buildings | 0.0 | 99.3 | 0.0 |
| NCCP JSC | Decommissioning of fuel rods for industrial uranium-graphite reactors | 446.1 | 105.6 | 0.0 |
| | **TOTAL at the Company's sites** | **1,556.3** | **922.9*** | **1,022.7** |

* Taking into account the savings following the results of tendering procedures.

Diagram 56

**Investments into the development of radioactive waste and spent nuclear fuel treatment technologies, RUB thous.**




**Results 2017:**

VNIINM JSC completed decommissioning of building 53 with construction area 360 m² and variable number of storeys (2/3).

In the territory of industrial site of NCCP PJSC decommissioning to "green lawn" of building 73 with construction area of 12,144 m² was completed. The works were performed using own funds in the amount of RUB 416.8 mln.

SGChE JSC continues the conservation of B-1 and B-25 ponds. In 2016–2017, nearly RUB 481.9 mln out of the federal budget was spent to carry out these arrangements.

The works on development of infrastructure for radioactive waste treatment were completed on the industrial site at AECC JSC; the works on dismantling and radioactive waste treatment are in progress. In 2016–2017, RUB 1.1 billion out of the federal budget was spent to carry out this work.



Table 54

**Sources of financing for liquidation of the nuclear "heritage" in 2017**

| Sources | Number of activities | Scope of financing, RUB mln | List of major activities |
|---|---|---|---|
| The Federal Budget within the Federal Target Program "Nuclear and Radiation Safety Assurance for 2016–2020 and up to 2030" (FTP) | **5** | **922.9** | ‣ Decommissioning of structure No.2 (building 802) and structure No.4 (building No. 804) of AECC JSC<br>‣ Conservation of B-1 and B-25 ponds at SGChE JSC<br>‣ Reconstruction of the site No.13 at SGChE JSC<br>‣ Decommissioning of uranium-graphite production reactor of NCCP PJSC<br>‣ Decommissioning of facility U-5 of VNIINM JSC |
| The Special Reserve Fund No. 3 "Decommissioning and R&D" of ROSATOM State Corporation | **24** | **461.15** | ‣ Complex engineering and radiation inspection of the 3rd and the 4th turn at Joint Venture AECC JSC<br>‣ Preservation of terrestrial solid radioactive waste storage of site 16 of Chemical-Metallurgical Plant at SGChE JSC<br>‣ Preparation for decommissioning of "Makety" Warehouse Complex at NCCP PJSC<br>‣ Preparation for decommissioning of structures G, A at VNIINM JSC<br>‣ Preparation for decommissioning of facility M2079 at SGChE JSC |
| Reserve No. 3 "Decommissioning of R&D" remaining at the disposal of the organization | **9** | **33.62** | **VNIINM JSC**<br>‣ Working out and introduction of database for deactivation technologies during decommissioning of nuclear and radiation hazardous facilities<br>‣ Development of microplasma ablation decontamination method<br>‣ Development and approval of procedure for dismantling of large tanks contaminated by radionuclides and containing radioactive deposits of complex composition<br>‣ Creation of contamination confinement method using high-temperature application of powder fixing coatings<br>**SGChE JSC**<br>‣ Review works in the area of B-1 pond |

Table 55

**Federal Target Program "Nuclear and Radiation Safety Assurance for 2016–2020 and up to 2030"**

| Indicator | Unit | Planned | Actual |
|---|---|---|---|
| Number of INES violations of level 2 and higher | units | 0 | 0 |
| Commissioning of spent nuclear fuel repositories | thous. tons | – | – |
| Commissioning of spent radioactive waste repositories | thous. m³ | 880 | 3,000 |
| Preparation for decommissioning of nuclear and radiation-hazard facilities | units | 11 | 11 |
| Number of decommissioned nuclear and radiation-hazard facilities | units | 3 | 3 |

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**Rehabilitation of the Areas Contaminated by Radionuclides**

Lands contaminated with radionuclides are within the area of professional responsibility of MSZ PJSC, NCCP PJSC, ChMP JSC and SGChE JSC.

In 2017, within the scope of remedial actions aimed at improvement of radiation situation in the territory of MSZ PJSC industrial site, the impact of radioactive contaminated areas on groundwater and the environment in the northern part of industrial site was studied, and the territory of building 73 at NCCP PJSC industrial site was rehabilitated (FA production for uranium-graphite production reactor).

In the reporting year, the emissions of radionuclides into the atmosphere were within the permissible limits.

In the late 2017, the total area of territories contaminated with radionuclides subject to rehabilitation amounted to 15,226.9 thous. $m^2$.

Following the conclusions of regulatory authorities the radiation and nuclear safety in the Company, in general, conforms with the regulations and rules in the field of nuclear power use. TVEL Fuel Company registered no cases of cancellation of any license related to nuclear power application.

The Company implements the concept of defence-in-depth, based on physical barriers to ionizing radiation proliferation at all stages of nuclear facilities life cycle.

During product transportation TVEL JSC ensures compliance with the Regulations for the Safe Transport of Radioactive Materials NP-053-16 and IAEA SSR-6 Regulations for the Safe Transport of Radioactive Materials, as well as other international documents on transport.

In 2017, the first batch of RW of UEIP JSC was placed for final isolation at class 3 and 4 subsurface RW repository (CATU Novouralsk, Sverdlovsk region). RW repository, designed and financed by UEIP JSC is currently the only Russian facility able to assure safety and reliable final isolation of low and extremely low-level radioactive waste.

Most of radioactive wastes located at the sites of TVEL JSC subsidiaries are placed in temporary RW disposal sites (48.6% of the total volume in $m^3$) and long-term RW storage facilities (39.6%). In the reporting year, 47,877.1 $m^3$ of ILW, 369,351.9 $m^3$ of LLW, and 255.0 $m^3$ of VLLW were delivered to specialized organizations.

**No contamination of new areas occurred resulting from activities of TVEL FC subsidiaries in the reporting year.**

- The scientists of VNIINM JSC presented technologies and facilities for decontamination of radiation hazardous sites:
  - method and facility for air-free application of localizing and decontaminating polymer compounds which allows treating large areas and preventing cross contamination;
  - foam decontamination of above-ground equipment using special decontaminating agents and foaming systems.
- Specialists of VNIINM JSC developed cold crucible induction melting technology for solidification of radioactive waste generating at radiochemical enterprises and NPPs. Its main advantages are low intensity of materials use, simplicity and low price of cold crucible structure. The crucible is an easily replaceable wear and tear part of the facility. Small size of melter allows remote replacement of life-expired equipment.
- The project of ChMZ JSC "Reprocessing of Substandard Uranium-Containing Materials of Previous Years with Production of Depleted Uranium Oxide Suitable for Enrichment" won the National Award of the Udmurt Republic.
- SGChE JSC completed the preparation of B-25 pond conservation stage (nuclear heritage facility remained after national defence programs completion). The activities being in progress during 2016-2017 were completed 91 days ahead of schedule provided by the contract.
- The employees of SGChE JSC were the first to apply this unique unrivalled technology for conservation of open-type radioactive waste storage facilities of B-1 pond. The application of engineering solution made it possible to complete in time the covering of water area of open-type radioactive waste storage facility. The economic effect of the engineering solution amounted to RUB 15 mln. The radioactive waste stored in B-1 pond was successfully isolated to protect the environment in 2017.



Table 56

**Pollution of the environment with radionuclides (RN)**

| Indicator | 2015 | 2016 | 2017 |
|---|---|---|---|
| Emission of alpha-active RN into the atmosphere, Bq | $9.49 \cdot 10^9$ | $8.72 \cdot 10^9$ | $7.36 \cdot 10^9$ |
| Presence of areas contaminated with RN, thous. $m^2$ | 16,081.4 | 16,081.4 | 15,226.82 |
| Discharge of waste water containing RN, Bq | $2.09 \cdot 10^9$ | $3.22 \cdot 10^9$ | $3.41 \cdot 10^9$ |

Table 57

**Pollution of the environment with radionuclides as of the end of 2017**

| Subsidiary Company | Areas contaminated with radionuclides, thous. $m^2$ | | | |
|---|---|---|---|---|
| | Total | Including: | | |
| | | Sanitary protection zone | Area of professional responsibility | Industrial site |
| MSZ PJSC | 48.1 | 0 | 0 | 48.1 |
| NCCP PJSC | 372.3 | 0 | 210 | 162.3 |
| ChMP JSC | 202.5 | 0 | 0 | 202.5 |
| SGChE JSC | 14,604.0 | 333 | 0 | 14,271.0 |
| **Total** | **15,226.9** | **333** | **210** | **14,683.9** |

Table 58

**Presence of RW on the sites of TVEL FUel Company subsidiary sites by the level of radioactivity as of 31.12.2017**

| Indicator | Unit | Level of radioactivity | | | |
|---|---|---|---|---|---|
| | | High | Medium | Low | Very low |
| **Presence of RW on the sites of TVEL Fuel Company subsidiaries as of the end 2017, total** | **$m^3$** | **13,056** | **291,383** | **4,256,145** | **5,876,176** |
| | **Bq** | **$8.50 \cdot 10^{16}$** | **$2.00 \cdot 10^{18}$** | **$7.22 \cdot 10^{14}$** | **$2.13 \cdot 10^{14}$** |
| Accumulated before July 15, 2011 ("heritage")* | $m^3$ | 13,000 | 291,261 | 3,865,385 | 5,816,078 |
| | Bq | $8.50 \cdot 10^{16}$ | $2.00 \cdot 10^{18}$ | $7.02 \cdot 10^{14}$ | $2.08 \cdot 10^{14}$ |
| Produced after July 15, 2011, total | $m^3$ | 246 | 48,969 | 780,099 | 33,970 |
| | Bq | $1.37 \cdot 10^{14}$ | $8.74 \cdot 10^{15}$ | $2.24 \cdot 10^{13}$ | $4.69 \cdot 10^{12}$ |
| Produced in the reporting year | $m^3$ | 56 | 47,993 | 369,809 | 6,721 |
| | Bq | $2.71 \cdot 10^{13}$ | $6.44 \cdot 10^{14}$ | $2.25 \cdot 10^{12}$ | $3.57 \cdot 10^{11}$ |

* Date of entry into force of the Russian Federation Federal Law No. 190-FZ d/d July 11, 2011 "On Radioactive Waste Treatment and Amendments to a Number of Legislative Acts of the Russian Federation" that delimits the ownership between the Russian Federation and the companies that produce new radioactive waste.

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## FIRE AND DISASTER PREVENTION

In 2017, TVEL Fuel Company continued to improve facility-specific system of emergency prevention and response, and fire safety system.

To ensure the readiness for emergency and fire management, TVEL Fuel Company enterprises held the drills involving deployment of material and human resources of both the enterprises and the interacting forces of territorial and functional subsystems of the Single State Emergency Management System. In 2017, there were held 434 drills and trainings, including 10 snap drills.

To control the readiness of TVEL Fuel Company for freshet and fire season, on April 19, 2017 there was held a divisional drill with deployment of material and human resources of the enterprises and the interacting forces of EMERCOM of Russia, branches of the Emergency Center SPb FSUE, FMBA of Russia, Atom-Okhrana FSUE, etc. The drill proved readiness of participants to seasonal natural hazards.

In October 2017, TVEL Fuel Company took part in the nationwide civil defence drill involving interaction with territorial bodies of EMERCOM of Russia and local government bodies in dealing with major emergency recovery. The actions of the teams that represented the Company enterprises were favourably judged during inspections and execution of practical tasks of the drills.

The officials of TVEL Fuel Company's EMS improved their skills in organization of communication, transmission of control and reporting signals, data exchange in dealing with prevention of natural and man-made emergencies.

Considerable efforts were made to improve fire safety by carrying out organizational and technical measures, which made it possible:

- to reduce the number of violations found by the state fire supervisory authorities of the EMERCOM of Russia by 32% in comparison with 2016;
- to improve the timeliness of compliance with the received instructions up to 99%;
- to complete the implementation of investment projects aimed at re-equipment of facilities with automatic fire fighting systems to 100% in 2017;
- to ensure continuous monitoring of fire situation in forests on industrial sites and surrounding areas and the complex of preventive measures that would prevent wildfires;
- to improve the quality of training of managers and specialists responsible for fire safety in specialized training centres, and to upgrade the system of fire safety briefing of employees;
- to ensure further development of the volunteer fire-fighter movement, holding of review-contests and competitions.

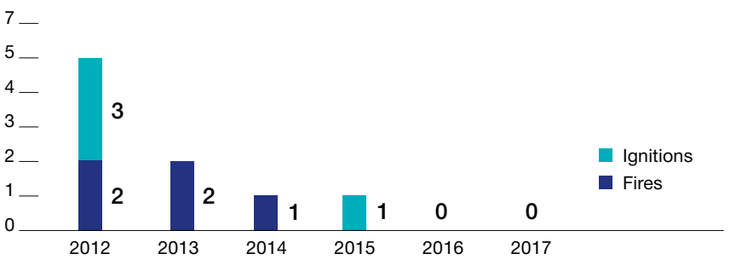
**Thanks to the purposeful work carried out in TVEL Fuel Company emergencies of natural and man-made, including fire, at Company's enterprises for the reporting period not allowed.**

**434**

**drills and trainings, including 10 snap drills, to eliminate emergency situations and fires were held in 2017**

Diagram 57

**Number of fires and ignitions in TVEL FC**






Organizational and technical fire protection activities allowed to prevent fire at industrial sites of the enterprises and continue the positive tendency of their number reduction beginning from 2012.

### Emergency Preparedness and Response

Activity intended to ensure emergency preparedness and response of TVEL Fuel Company subsidiaries is carried out in eight key areas.

Non-staff emergency response teams were formed at the Company's enterprises. These teams were certified by the industry certification commission of TVEL JSC, they have the necessary material and human resources to response emergency and are maintained in continuous readiness.

### The Unified State Automated Radiation Monitoring System of the Russian Federation

The enterprises of TVEL Fuel Company (MSZ PJSC, ChMP JSC, VNIINM JSC, SGChE JSC, UEIP JSC, AECC JSC, PA ECP JSC) operate and constantly improve the Automated Radiation Monitoring Systems (ARMS).

The ARMS of TVEL Fuel Company enterprises are included into the Sector ARMS of ROSATOM State Corporation, which in its turn is interconnected with the Unified State Automated Radiation Monitoring System (ARMS).

Scheme 9

**Key areas of activity to ensure emergency preparedness and response by TVEL JSC subsidiaries**

**1.** Development of radiation, chemical and environmental situation monitoring systems and local warning systems

**2.** Continuous readiness of emergency rescue teams

**3.** Updating of emergency response plans at major industrial facilities

**4.** Emergency response drills under accident and emergency plans

**5.** Setting up and maintaining the emergency preparedness and response packages at hazardous industrial facilities

**6.** Introduction of corrective and compensatory measures to prevent industrial accidents

**7.** Interaction with Emergency Centre SPb and its affiliates to ensure emergency preparedness in transportation of dangerous goods and industrial safety

**8.** Maintenance of on-duty dispatching service system in readiness

ARMS is untended for continuous radiation and meteorological control at production facilities of enterprises and in residential areas of the territories of presence. The outcomes are transmitted to the Situation and Crisis Management Center of ROSATOM State Corporation, after that they are available at *www.russianatom.ru*. Modernization will allow to monitor automatically all fixed monitoring stations and to transmit the obtained information to the Situation and Crisis Management Center on an hourly basis.

**UEIP JSC completed the automation of control over solid radioactive waste processing, as well as performance of equipment and safety systems. The rate of data receipt and processing by the monitoring system increased several times; now, there is no need in continuous on-site presence of the employees. New automated workstations contributed to increase in quality of technological process and its safety, including environmental aspect.**

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**Physical Protection of Nuclear Facilities**

The systems of physical protection (PP) at the enterprises of TVEL Fuel Company are created and operated according to the requirements of current statutory documents.

In accordance with the Uniform Policy of ROSATOM and TVEL JSC the system of physical protection, safety and counter-terrorism security of all enterprises of TVEL Fuel Company is being continuously improved.

In the furtherance of the counter-terrorism security goals all facilities (territories) of the companies included into the management system of TVEL Fuel Company were classified, safety data sheets and amendments thereto were drawn up, the updated summary list of classified facilities (territories) of the company was drafted.

The performance of the systems of physical protection is regularly evaluated in the course of complex and special-purpose inspections.

In 2017 the security department of TVEL Fuel Company conducted five inspections of physical protection and security at nuclear- and radiation-hazardous and high-security facilities of VNIINM JSC, SGChE JSC, MSZ PJSC, ECP JSC, MZP JSC. In the course of inspections of the systems of physical protection special attention was paid to verifying the compliance with the requirements of legal regulatory acts, conditions stipulated by the Rostekhnadzor licenses, as well as to corrective actions. Analysis of the inspection findings shows that the enterprises of TVEL Fuel Company take measures aimed at enhancement of the systems of physical protection, safety and counter-terrorism security.



# About the Report

**The Public Annual Report (hereinafter referred to as “the Report”) is the ninth integrated report which covers performance of TVEL JSC and its subsidiary companies (together referred to as Rosatom TVEL Fuel Company, TVEL Fuel Company, TVEL FC, the Company) in 2017**

The subsidiary companies of TVEL JSC (AECC JSC, SGChE JSC, UEIP JSC, PA ECP JSC, KMZ PJSC) also publish their integrated reports, which can be found on their official websites.

**THE PURPOSE OF THE REPORT:**

- Informing the target audiences, stakeholders and the general public on the results of TVEL JSC in 2017, development strategies and plans for the short and medium term;
- Providing expertise of public acceptability of TVEL JSC performance through the involvement of stakeholders in the dialogue and detailed acquaintance with the reporting materials.

**OBJECTIVES OF THE REPORT:**

- Providing complete, reliable and balanced information about the Company’s activities in accordance with the GRI Standards requirements;
- Ensuring compliance of the process of preparation of the Report and information in it with the current industry and international standards and recommendations;
- Organization of constructive interaction with stakeholders;
- Development of the institution for interaction with subsidiaries;
- Development and improvement of the system of public annual reporting.

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**This Report is prepared in compliance with the following regulatory documents:**

- Federal Law No. 208-FZ d/d December 26, 1995 "On Joint Stock Companies".
- Federal Law No. 402-FZ d/d December 6, 2012 "On Accounting".
- RF Government Regulation No. 1214 d/d December 31, 2010 (as revised on July 19, 2017) "On improving management procedure of open joint stock companies, the shares of which are under federal ownership and owned by federal state unitary enterprises".
- Provision of the Bank of Russia No. 454-P d/d December 30, 2014 "On Disclosure of Information by the Issuers of Equity Securities".
- Corporate Governance Code (recommended by letter of the Central Bank of the Russian Federation d/d April 10, 2014).
- Uniform Industry Specific Guidelines on Execution of Public Reports in ROSATOM and its organizations.
- Sustainability Reporting Guidelines of the Global Reporting Initiative.
- Standard AA1000 APS 2015 of Accountability.
- International Integrated Reporting Framework, version 1.0.

*The integrated format* of the Report provides detailed description of the Company's performance in the context of the environment and shows its impact on the stakeholders.

The Report discloses the *essential information* information which is important to those who use this Report to assess the performance of the Company. In the course of execution of the Report, a questionnaire was conducted for internal and external stakeholders, and a matrix of material aspects was drawn up.

*Aspect boundaries* and content of the Report were determined by the Committee on Public Annual Reporting involving the Committee of Stakeholders, and agreed on by TVEL JSC subdivisions. Disclosed issues are material for all subsidiaries from the Report profile, unless otherwise is specified herein. Occupational Health and Safety aspect is important not only for the Company, but also for contractor organizations rendering capital construction services at the Company's facilities. The data on "Occupational Health and Safety" were disclosed on all organizations of TVEL Fuel Company. Data on government subsidies and training in anti-corruption practices are shown only for TVEL JSC.

*Coverage of the aspects* had no changes as compared to the previous reporting period. No significant reformulations of the indicators given in previous reports were done.

**Materiality Determination Process**

Under conceptual development of the Report 2016, the materiality analysis was carried out in November 2016 in accordance with new GRI Standards, including GRI principles. Representatives of the Company and its key stakeholders were invited to evaluate both the GRI and TVEL Fuel Company-specific themes, which complies with GRI Standards recommendations. Materiality matrix was prepared based on the survey result. When developing the concept of the Report for 2017, in December 2017 the stakeholders were asked to confirm the relevance of the material aspects selected in 2016, or propose changes. As a result of this questionnaire, the matrix of significant aspects did not change.

The matrix has been prepared in axes of "The significance of the Company's impact on economics, environment and society" (average assessment made by managers of TVEL Fuel Company, who took part in survey) and "Influence on stakeholder assessments and decisions" (external stakeholders' assessments). The most essential issues were highlighted in dark blue.

The GRI content index is placed in the interactive version of the Report: *tvel.ru/wps/wcm/connect/tvel/tvelsite/finance/annual_report/.*

**Rationale for choosing priority atopics of the Report**

Based on the analysis of the Company's performance during the reporting period, the basic results and the key events the priority aspects of the Report has been formulated to be disclosed in the integrated Report 2017: TVEL strategic initiatives — efficiency improvement and sustainable development.

**Stakeholder Engagement**

Stakeholders engagement is an integral element of public reports preparation and day-to-day activity of TVEL Fuel Company.

The Stakeholders Commission was established by the Company in 2013 to promote regular feedback on the matters pertaining to the activity of the Company and its public position on specific matters.

Stakeholders' suggestions were taken into account while preparing the Report, as well as the analysis of the best Russian and international practices of disclosure in annual reports. Details see in Section "Stakeholder Engagement".

Following the 2017 reporting campaign 18 suggestions of stakeholders were received: 8 of them have been taken into account while preparing the Report, 1 — partially considered, 3 — will be taken into account while preparing the next reports. The minutes of the respective dialogues are available on the website: *tvel.ru/wps/wcm/connect/tvel/tvelsite/finance/annual_report/dialog/.*

Table 59
**Information about Report**

| | |
|---|---|
| **Reporting cycle** | Annual |
| **Format** | Integrated |
| **Comparative indicators** | For 3 years |
| **Target indicators** | Shown for 2018 and the reporting year, where the approved plans are available |
| **Report Profile** | TVEL JSC, AECC JSC, SGChE JSC, UEIP JSC, PA ECP JSC, KMZ PJSC, Tochmash VPA JSC, MSZ PJSC, ChMP JSC, MZP JSC, NCCP PJSC, VNIINM JSC, Ecoalliance LLC, Centrotech SPA LLC, Centrotech SPb JSC, OKB-Nizhny Novgorod JSC (OKB-NN JSC), NRDC LLC, Incorporated Company RSK JSC, EC RGC, Industrial Innovation JSC, RusAR LLC, CFR-4 (subsidiary companies of TVEL Fuel Company)* |
| **Priority theme of the Report** | TVEL strategic initiatives — efficiency improvement and sustainable development |
| **GRI disclosure level** | GRI G4 Comprehensive Version** |
| **Date of the previous Report publication** | June 2017 |

* Aspect boundaries are presented in the interactive version of the Report.
** Performance indicators and standard elements are generated and presented in the Report in accordance with the Russian Accounting Standards. Financial report data pursuant to the International Financial Reporting Standards (IFRS) are not presented due to later generation thereof.



Scheme 10
**Material aspects matrix**
(GRI Standards themes are italicized)

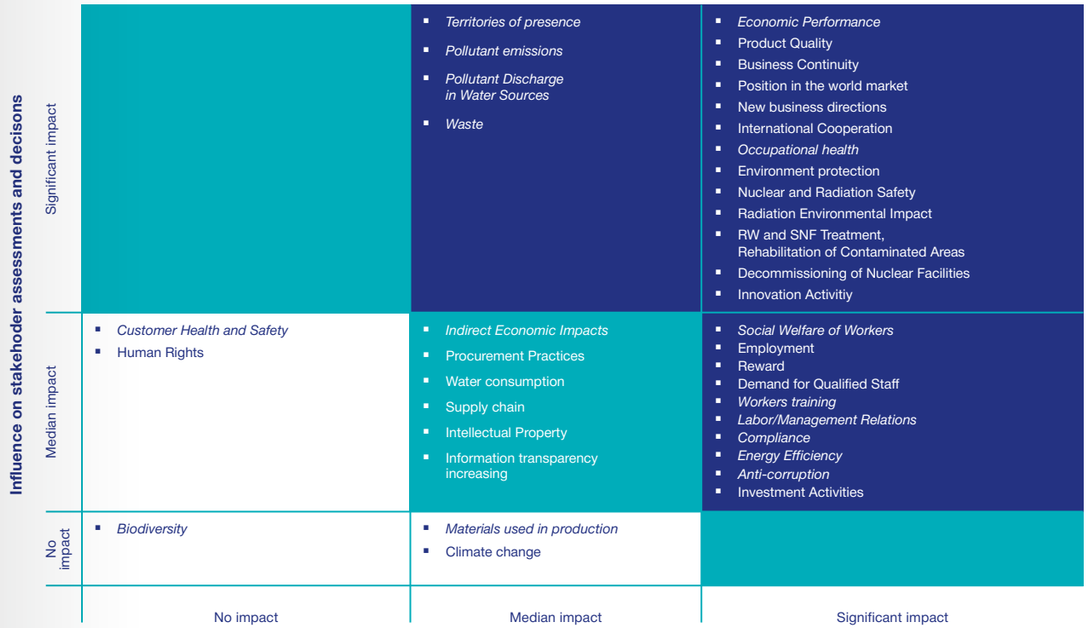


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Table 60
**Compliance of the material aspects of TVEL Fuel Company to GRI aspects**

| Competitive advantages of TVEL Fuel Company | Compliance with GRI Material Aspects |
|---|---|
| Economic Performance | ▸ Economic Performance |
| Occupational Health and Safety | ▸ Occupational Health and Safety |
| Social Welfare of Workers | ▸ Employment |
| Employment | |
| Workers Training | ▸ Training and Education |
| Labor/Management Relations | ▸ Labor/Management Relations |
| Compliance | ▸ Ecological Compliance<br>▸ Social-Economic Compliance |
| Energy Efficiency | ▸ Energy |
| Anti-Corruption | ▸ Anti-Corruption |
| Territories of Presence | ▸ Local Communities |
| Pollutant Emissions | ▸ Emissions |
| Pollutant Discharge in Water Sources | ▸ Effluents and Waste |
| Waste | |
| Product Quality | – |
| Business Sustainability | – |
| Position in the World Market | – |
| New Business Directions | – |
| International Cooperation | – |
| Environment Protection | – |
| Nuclear and Radiation Safety | – |
| Radiation Impact on Environment | – |
| RW and SNF Treatment, Rehabilitation of Contaminated Areas | – |
| Decommissioning of Nuclear Facilities | – |
| Innovative Activities | – |
| Reward | – |
| Demand for Qualified Staff | – |
| Investment Activities | – |



**Reliability of the information contained in the Report has been confirmed by:**

- The Statement of the Director for Internal Control and Audit of TVEL JSC (with respect to efficiency of the internal control system applicable to generation of the Report and compliance of generation procedures with requirements of law, internal regulations of ROSATOM and TVEL JSC in the sphere of public reporting);
- The Statement of the audit organization Nexia Pacioli LLC, confirming the reliability of 2017 Financial Statement of TVEL JSC;
- The Statement of the audit organization confirming the reliability of non-financial data published in the Report.

The Organization that renders services of independent assurance of non-financial data of the Report was selected through competitive procurement practices.

The Report was approved by TVEL JSC Board of Directors.

This Report covers the year 2017. All prior and future periods are mentioned herein in description of corporate strategy, collation of performance indicators and results, forecasts and risk assessments. In addition to factual information, this Report describes and assesses potential and probable events. Any statements herein other than statement of facts shall be construed as forecasts. Forecasts of this kind are relevant only at the time of publishing. TVEL JSC (unless otherwise specifically provided for by applicable legislation) is not obliged to review or update the said forecasts or factors in any new pieces of information. Actual performance results may differ from the forecasted ones.

The Company appreciates the employees who took part in preparation of this Report, and all participants of public consultations and dialogues. We hope you will find this Report interesting and informative in terms of the new information about TVEL Fuel Company. Our working team is open to your feedback and suggestions on the matters and the issues that you would like to see in the next annual report. Feedback form is available in the interactive version of the Report on the site: *tvel.ru/wps/wcm/connect/tvel/ tvelsite/finance/annual_report/.*

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# Terms and Definitions

## A

**Ash and Slag**
Waste generated from solid fuel burning.

## B

**Background Radiation**
Background Radiation Ionizing radiation composed of space radiation and ionizing radiation of naturally distributed natural radionuclides (on Earth surface, in the air, foodstuffs, water, human organism, etc.).

**Becquerel (bq)**
A unit of radionuclide activity in the radiation source, equal to nuclide activity where one nucleus decays per second.

**Burnup Fraction**
Fraction of an initial quantity of a given nuclide that has undergone burnup in reactor under the neutrons influence.

**Business Model**
According to the International Integrated Reporting Framework, business model is a system of transforming the capitals through business activity aiming to fulfil strategic purposes and create value over the short-, medium- and long term.

## C

**Capital**
According to the International Integrated Reporting Framework, resources and relations being the source and the results of value (integrated value) creation processes.

**Circulating water**
Water that has been used in the processing cycle, and after cooling or purification it is used for the same purposes.

**Closed Nuclear Fuel Cycle**
Nuclear fuel cycle where spent nuclear fuel is processed for uranium and plutonium extraction for nuclear fuel remanufacturing.

## D

**Dashboard**
Interactive information panel for presentation of information needed for executibe decision-making, enhancement of operating efficiency, process handling, KPI assessment, etc. in user-friendly interface.

**Decommissioning**
Decommissioning of a reactor facility and follow-up activity to ensure its safe dismantling, equipment disposal and further use of the site.

**Depleted Uranium**
Uranium that contains less isotopes U-235 than natural uranium.

**Depleted Uranium**
Uranium depleted through extraction of U-235, which is economically unfeasible to use; stored at a disposal site (dump).

**Dump of Radioactive Material**
Controlled entry of radionuclides into water bodies with liquid waste of a nuclear facility.

## E

Nuclear fuel where the content of fissionable nuclides is higher than in natural raw material.

**Enriched Uranium**
Uranium which contains more U-235 isotope than natural uranium
Reactor quality uranium is usually enriched approximately to 3.5% U-235, and the content of U-235 in weapon-grade uranium is over 90%.

**Enrichment (isotopic)**
- **a)** the content of atoms of a certain isotope in the isotopic mixture of the same element, if this exceeds the share of the given isotope in a naturally occurring mixture (expressed as a percentage);
- **b)** process resulting in an increased content of a certain isotope in the isotopic mixture.



## F

**Fast Neutrons**
Neutrons with kinetic energy higher than certain definite value. In Nuclear Reactor Physics fast neutrons are those with energies above 0.1 MeV.

**Financial Capital**
According to the International Integrated Reporting Framework, the pool of funds that is:
- available to an organization for use in the production of goods or the provision of services;
- obtained through borrowings, equity or grants, or generated through operations or investments.

**Fuel Assembly**
A package of fuel elements (rods, bars, plates and others) held together with the aid of spacer grids and other structural elements, which are integral during transportation and in-pile irradiation. Assemblies are loaded into the nuclear reactor core.

**Fuel Pellet**
A pellet of compacted uranium dioxide is the basis of nuclear fuel and is contained inside fuel elements.

**Fuel Production**
Nuclear fuel production, generally in the form of ceramic pellets enclosed in metal tubes (fuel elements), which are subsequently assembled in fuel assemblies (FA).

**Fuel Recharging**
Operations by material-handling machines to replace the spent fuel; the fuel exposure degree required for recharging depends on the fuel composition after exposure, allowable work duration and on the reactivity change.

**Fuel-Element Cladding**
Metal tubes in the active zone of the reactor containing oxide fuel pellets.

## G

**Gas Centrifuge**
Equipment intended to obtaining enriched uranium required for operation of nuclear reactors of nuclear power plants.

**Gas Diffusion Technology**
Gas-diffusion method method for separating uranium isotopes, based on phenomenon of molecular diffusion through the micropores in a membrane (barrier).

**Global Reporting Initiative, GRI**
An international reporting system concerning economic, environmental and social performance, based on the Sustainability Reporting Standards.

## H

**Heat Carrier**
Liquid or gas used for heat transfer from the active zone of the reactor to steam generators or directly to the turbines.

**Highly Enriched Uranium**
Uranium with uranium-235 isotope equal or higher than 20%.

**Human Capital**
According to the International Integrated Reporting Framework, people's competencies, capabilities and experience, and their motivations, including:
- alignment with and support for an organization's governance framework, risk management approach, and ethical values;
- ability to understand, develop and implement an organization's strategy;
- loyalties and motivations for improving processes, including their ability to lead, manage and collaborate.

## I

**Indirect Energy Use (Consumption)**
Indirect energy use (consumption) indicates the amount of energy required for production by the reporting company of the consumed or purchased externally (i.e. produced outside the company) electric energy, steam, heat energy and other types of intermediate energy.

**Integrated Report**
Integrated report represents brief overview that reveals how strategy, corporate management, activities and prospects in the context of the environment lead to value creation over the short, medium and long-term periods.

**Intellectual Capital**
According to the International Integrated Reporting Framework, organizational knowledge-based intangibles.

**ISAE 3000 International Standard on Assurance Engagements**
The Standard of the International Federation of Accountants "The performance of assurance engagements other than audits and reviews of historical financial information".

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# L

**Low-enriched uranium**
Uranium that contains the isotope U-235 in a concentration of less than 20%.

# M

**Manufactured Capital**
According to the International Integrated Reporting Framework, manufactured physical objects (as distinct from natural physical objects) that are available to an organization for use in the production of goods or the provision of services, including:

- buildings and structures;
- equipment;
- infrastructure.

**Maximum Permissible Dose**
The maximum value of the individual equivalent radiation dose per year, which does not cause unfavorable changes in health after 50 years of uniform exposure.

# N

**Natural Capital**
According to the International Integrated Reporting Framework, these are:

- renewable and non-renewable environmental resources and processes, including — air, water, land, minerals and forests;
- biodiversity and eco-system health.

**Net working time**
Working time minus time of scheduled breaks.

**Neutron**
An elementary particle with no net electric charge; can be found in each atomic nucleus except for hydrogen. Single neutrons moving with different speeds are released during the fission reaction. Slow (thermal) neutrons, in their turn, can easily cause fission of nuclei of “fissionable” isotopes, e.g., U-235, Pu-239, U-233; fast neutrons can cause fission of “fertile” isotope nuclei, e.g. U-238. Sometimes atomic nuclei can capture neutrons.

**Nuclear Energy**
Internal energy of atomic nuclei released by nuclear fission or nuclear reactions.

**Nuclear Facility**
Any facility that generates, processes or handles radioactive or fissionable materials.

**Nuclear Fuel**
A material containing fissionable nuclides which, being placed in the nuclear reactor, makes it possible to sustain a nuclear chain reaction.

**Nuclear Fuel Cycle**
The sequence of manufacturing processes for ensuring the operation of nuclear reactors from uranium production to the disposal of radioactive waste.

**Nuclear Fuel Depletion**
Reduction of any nuclide concentration in nuclear fuel due to nuclear transformations of this nuclide during the reactor operation.

**Nuclear Power**
Branch of power engineering that uses nuclear energy for electricity and heat supply purposes.

**Nuclear Reactor**
A unit wherein a controlled chain nuclear reaction with energy release takes place. Reactors are classified according to their purpose, carrier type, design and other characteristics.

**Nuclear Waste**
Radioactive materials generated on various stages of the nuclear fuel cycle, including development of uranium deposits, enrichment, fuel production, reactor operation, fuel processing, etc.

**Nuclide**
Type of atom with a definite number of protons and neutrons in the nucleus characterized by an atomic mass and atomic (order) number.

# O

**Ozone-Depleting Substances**
Any substance with an ozone-depleting potential higher than 0, that can deplete the stratospheric ozone layer. Most of ozone-depleting substances, including chlorofluorohydrocarbons, halons and methylbromide, fall under the Montreal protocol as amended.

# P

**Phase Gate Approach to Investment**
A principle of planning and carrying out investment activities applied to divide investment processes into phases, where each phase is preceded by Gate Review of the results achieved and the further project implementation plans and risk, and a decision is made on the further project implementation phase to be proceeded to.

**Power Unit**
One of the NPP reactors with necessary additional equipment.

**Pre-test assembly program**
A stage in the nuclear plant commissioning from the power start-up to the plant’s acceptance for commercial operation.



**Primary Energy Sources**
Initial form of energy used to satisfy energy requirements of the reporting organization. Examples of primary sources include non-renewable energy sources, e.g. coal, natural gas, oil and nuclear energy. They also include such renewable sources as biomass, sun and wind energy, geothermal and hydraulic energy.

# R

**Radiation Exposure**
The total of individual exposure doses received or planned in the operations on decommissioning, maintenance, repair, replacement or dismantling of nuclear facility components.

**Radiation Monitoring**
Acquisition of information on the radiological conditions in the organisation and in the environment and on human exposure levels (includes dose control and radiometric monitoring).

**Radiation Safety**
A set of arrangements seeking to limit the exposure of personnel and the public to the lowest possible radiation dose values in a socially acceptable way, as well as to avoid the early effects of exposure and keep the delayed radiation effects within tolerable limits.

**Radioactive Discharge**
Radionuclide emission into the atmosphere resulting from operation of a nuclear facility.

**Radioactive Isotopes**
Isotopes with unstable nuclei undergoing radioactive decay.

**Radioactive Waste**
Nuclear materials and radioactive substances that no longer can be used.

**Radioactive Waste Processing**
Technological operations aimed at altering the aggregative state and/or physic-chemical properties of radioactive waste and their transformation into forms suitable for transportation, storage and/or disposal.

**Radioactive Waste Treatment**
General term that covers all activities related to the processing, conditioning, transportation, storage and burial of radioactive waste.

**Radionuclide**
General name for radioactive atoms. They pose a great danger to environment.

**Regenerated Uranium**
Uranium separated from spent nuclear fuel in the process of radio-chemical reprocessing for repeated use in nuclear fuel (regenerated fuel).

**Rehabilitation of Contaminated Areas**
Reduction of the extent of radioactive contamination to the level ensuring the maximum protection of population and recovery of all elements of the ecosystem (water, soil, air) to the applicable normative level.

**Research Reactor**
A nuclear reactor designed to be used as research object with a view to obtain data on reactor physics and technology required for design and development of a reactor of the same type or of components thereof.

# S

**Social and Relationship Capital**
According to the International Integrated Reporting Framework, — the institutions and the relationships within the Company and between the Company and different groups of stakeholders and other communities aimed to enhance collective well-being.

**Social Partnership**
A system of institutes and mechanisms of coordination of the interests of the production process participants (workers, employers, state authorities, local self-government) based on equal cooperation.

**Spent Nuclear Fuel Reprocessing**
A complex of chemical processes intended to remove fission products from spent nuclear fuel and fissile material recovery for reuse.

**Sublimation Production**
Uranium hexafluoride production.

# T

**Tailing Dump**
Complex of special structures and equipment intended for storage or burial of radioactive, toxic and other tailing materials called tails.

**Terminal farm**
Group of servers that are meant to provide remote workspace (desktop, applocations) for users that connect to them through client programs for remote access.

**Top Management**
Directors General, Deputies Director-General.

# U

**Uranium Conversion**
Chemical engineering process of uranium-containing materials transformation into uranium hexafluoride.

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**Uranium Hexafluoride**
a chemical compound of uranium and fluorine (UF6). This is the only highly volatile uranium-fluorine compound (when heated to 53oC, uranium hexafluoride passes from solid into gas); it is used as raw material for separation of uranium-238 and uranium-235 isotopes using a gas-diffusion technology or a gas-centrifuge technology, and for production of enriched uranium.

**Uranium Ore Enrichment**
Combination of processes for the primary treatment of uranium-bearing mineral raw material to separate uranium from other minerals contained in the ore. This does not involve any changes in the content of minerals, but only mechanical separation thereof with the resultant production of an ore concentrate.

## V

**VVER**
Water-water energetic reactor with water used as heat carrier and decelerator. The most common type of Russian NPP reactors has two modifications: VVER-440 and VVER-1000.

## W

**Worker capacity**
Share of net working time that the worker is doing operations according to technological process and current workplace management.



# Abbreviations

**ACS DEP**
Automated Control System for Design Engineering Pre-production

**AFCF**
Adjusted free cash flow

**AFST**
Automated gas filling station

**AMSIEM**
Automated measuring system of industrial and ecological monitoring

**ARMS**
Automated radiation monitoring system

**BN**
Fast neutron reactor where the heat carrier within the first and second loop consists of sodium, while the third loop carries water and steam. In Russia is applied at Beloyarsk NPP

**BWR**
Boiling water reactor — a reactor that uses boiling water as heat carrier

**CATU**
Closed administrative and territorial unit

**CD and ES**
Civil defence and emergency situations

**CEFA**
Combined experimental fuel assembly

**CERI**
Complex Engineering and Radiation Inspection

**CFHC**
Chlorofluorohydrocarbons

**CFR**
Center of Functional Responsibility

**CRMS**
Corporate risk management system

**CU**
Conversion unit

**DB**
Database

**DIC&A**
Director for Internal Control and Audit

**EBITDA**
Earnings before interest, taxes, depreciation and amortization — an analytical indicator, used to define a company's profit, before interest expenses, taxes, depreciation and amortization are subtracted

**EChG-AFC**
Electrochemical generators on alkaline fuel cells

**EChG-SOFC**
Electrochemical generators on solid oxide fuel cells

**ECM**
Electronic Computing Machines

**EDEC**
Experimental demonstration energy complex

**EGP**
Energy channel-type graphite reactor with steam overheat, used on Bilibino NPP

**EMERCOM**
The Ministry of the Russian Federation for Affairs of Civil Defence, Emergencies and Elimination of Consequences of Natural Disasters

**Emergency Center SPb FSUE**
Federal State Unitary Enterprise "Emergency Centre of the Ministry of Nuclear Energy of Russia" (Saint Petersburg)

**EMS**
Emergency Management System (Facility Level)

**EUP**
Enriched uranium product

**FA**
Fuel Assembly

**FE NFC**
Front end of nuclear fuel cycle

**FE, FEG**
Fuel element

**FMBA**
Federal Medical and Biological Agency

**FRM**
Fabrication/refabrication module

**FSUE**
Federal State Unitary Enterprise

**FTP**
Federal Target Program

**GC**
Gas Centrifuge

**GCC**
Gas Centrifuge Complex

**GOST**
State Standard

**HEU**
Highly Enriched Uranium

**HHCS**
Hyper heat-conductive sections

**HM**
Heavy metals

**HPP**
Heat and power plant

**IA**
Investment Activities

**IAEA**
International Atomic Energy Agency — international regulatory body that monitors nuclear safety performance and non-proliferation of nuclear weapons in the world

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**IC**
Information Center

**ICS**
Internal Control System

**IDP**
Integrated Development Planning

**IFI**
Information favoured index

**IFRS**
International Financial Reporting Standards

**IMS**
Integrated Management System for Quality, Environment and Safety

**IMSd**
Integrated Management System for Design

**INES**
International Nuclear Event Scale

**IT**
Information Technologies

**ITER**
International Thermonuclear Experimental Reactor built on basis of tokamak by international group of scientists under the aegis of IAEA. It is supposed to be a pilot version of the world's first DEMO thermonuclear power plant

**IUGR**
Industrial uranium-graphite reactor

**JCPOA**
Joint Comprehensive Plan of Action

**JSC**
Joint Stock Company

**KPI**
Key performance indicators

**LEU**
Low-enriched uranium

**LHM**
High purity lithium-7 hydroxide monohydrate

**LIC**
Lithium-ion cells

**LLC**
Limited liability company

**LRW**
Liquid radioactive waste

**LTIFR**
Lost time injury frequency rate — number of lost time incidents divided by total hours worked for the reporting year and rated as 1 mln man hours

**LWS**
Local warning systems

**MM**
Mass media

**MNUP**
Mixed nitride uranium-plutonium

**MOX-fuel**
Mixed Oxide Nuclear Fuel (generally on basis of uranium and plutonium)

**MPS**
Managerial personnel reserve

**MSE**
Managers, specialists, employees

**MW**
Megawatt — unit of power equal to 106 watts. MW(e) — electric power of a generator; MW(t) — thermal power of a reactor or heat source (e.g., full thermal power of the reactor itself is generally three times higher than the electric power)

**NF**
Nuclear fuel

**NFC**
Nuclear fuel cycle, set of arrangements aimed at operation of nuclear power industry, including production and processing of uranium ore, fuel production, its transportation to NPP, storage and treatment of SNF. In case of SNF burial NFC is called opened, and if fuel reprocessing and repeated use are provided — it is called closed

**NPF**
Non-state pension fund

**NPP**
Nuclear power plant, industrial facility for electric power production

**NRHF**
Nuclear and radiation hazardous facilities

**NRS**
Nuclear radiation safety

**OR**
Oil Refinery

**PHWR**
Pressurised heavy water reactor — foreign reactors with heavy water ($D_2O$) as reactor coolant

**PJSC**
Public Joint Stock Company

**PWR**
Pressurized water reactor — type of foreign reactors with pressurized water, analogue of VVER reactor

**R&D**
Research and development

**RBMK**
High-power channel-type reactor — type of single-cycle energetic reactor with water as hear carrier, and graphite as decelerator

**RN**
Radionuclide

**RPS**
ROSATOM Production System

**RR**
Research Reactor

**RRM/RF**
RRM (regenerated raw material) — uranium hexafluoride obtained from regenerated fuel of industrial reactors
RF — uranium hexafluoride obtained from irradiated fuel of NPP reactors

**RU**
Reactor unit

**RUEI**
Russian Union of Entrepreneurs and Industrialists

**RUNPIW**
Russian Union of Nuclear Power and Industry Workers

**Russian-Kazakhstan Project ERC**
Russian-Kazakhstan Project "Uranium Enrichment Center"

**RW**
Radioactive waste

**SC**
Subsidiary companies

**SDIC**
Special Department for Internal Control



**SFI**
Suggestions for improvement

**SH**
Stakeholders, parties concerned

**SNF**
Spent nuclear fuel

**SPA**
Scientific-production association

**SRWS**
Solid Radioactive Waste Storage

**SSC**
State Scientific Center

**SSC**
Separation and sublimation complex

**STC**
Scientific and Technical Council

**SWU**
Separative work unit

**TASED**
Territory of advancing social and economic development

**TIPS**
Theory of Inventive Problem Solving

**TVEL FC — TVEL Fuel Company**
TVEL JSC and subsidiary companies included into the management system of the Company and consolidation framework used for the reporting

**TVSA (FAAD)**
Fuel assembly of alternative design

**TVS-K**
Name of fuel assembly for PWR reactors developed in Russia

**UIPS**
Uniform Industrial Procurement Standard of ROSATOM State Corporation

**VAT**
Value added tax

**VHI**
Voluntary health insurance

**VVER**
Water-to-water energetic reactor

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# 5 Appendices

# APPENDIX 1.
# Auditor's Report on Financial Statements for the Year 2017

**THE AUDITED ENTITY**

**Name:**
Joint Stock Company "TVEL"
(hereinafter referred to as JSC "TVEL")

**Location:**
bld. 24, Bolshaya Ordynka st., Moscow, 119017

**THE AUDITOR**

**Name:**
Limited Liability Company **"Nexia Pacioli"**
(**"Nexia Pacioli"** LLC)

**Location:**
bld. 2, Malaya Polyanka st., Moscow, 119180

**INDEPENDENT AUDITOR'S REPORT TO THE SHAREHOLDERS AND BOARD OF DIRECTORS OF JSC "TVEL"**

**Opinion**

We have audited the accompanying financial statements of JSC "TVEL" (the Company), which comprise:

- Balance Sheet at December 31, 2017;
- Statement of profit or loss for the year ended December 31, 2017;
- Statement of changes in equity for the year ended December 31, 2017;
- Statement of cash flow for the year ended December 31, 2017;
- Notes to the financial statements for the year ended December 31, 2017.

In our opinion, the financial statements present fairly in all material respects, the financial position of JSC "TVEL" as at December 31, 2017, and its financial performance and its cash flows for the year then ended in accordance with Russian accounting standards.

**Basis for Opinion**

We conducted our audit in accordance with International Standards on Auditing (ISAs). Our responsibilities under those standards are further described in the Auditor's Responsibilities section of our report. We are independent of the Company in accordance with the ethical requirements that are relevant to our audit of the financial statements in the Russian Federation, and we have fulfilled our other responsibilities in accordance with these requirements and the IESBA Code. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

**Other Matter**

The financial statements of the Company for the year ended December 31, 2016, were audited by another auditor LLC "FBK" who expressed an unmodified opinion on those statements on March 01, 2017.

**Responsibilities of Management and Those Charged with Governance for the Financial Statements**

Management is responsible for the preparation of the financial statements in accordance with Russian accounting standards and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error. In preparing the financial statements, management is responsible for assessing the Company's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Company or to cease operations, or has no realistic alternative but to do so. Those charged with governance are responsible for overseeing the Company's financial reporting process.

**Auditor's Responsibilities for the Audit of the Financial Statements**

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with ISAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with ISAs, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Company's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Company to cease to continue as a going concern.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

The certified auditor responsible for the audit resulting in this independent auditor's report is
**T.S. Kaurova,**
licence number 02-000088,
main registration number 21606080624

**Deputy of General director by audit**
**"Nexia Pacioli" LLC** _____ **O.V. Danilova**
(signature) (name)

State Registration Number 1027739428716
Bld. 2, Malaya Polyanka street, Moscow, 119180, Russia
A member of Self-regulated organization of auditors Association "Sodruzhestvo"
Main registration number 11606052374

**March 05, 2018**



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# APPENDIX 2. Financial Statements for the year 2017

## Balance sheet as at December 31, 2017

**Organization:** Joint Stock Company "TVEL"
**Type of business:** Production of nuclear fuel
**Form of incorporation/form of ownership:** Joint Stock Company
**Measurement unit:** in thous. RUB
**Location (address):** bld. 24, Bolshaya Ordynka st., Moscow, 119017

| Codes: | |
|---|---|
| Form under OKUD | 0710001 |
| Date (day, month, year) | 31.12.2017 |
| under OKPO | 45046040 |
| TIN | 7706123550 |
| under OKVED | 24.26 |
| under OKOPF/OKFS | 1 22 67/16 |
| under OKEI | 384 |

| Comments | Index description | Code | As on December 31, 2017 | As on December 31, 2016 | As on December 31, 2015 |
|---|---|---|---|---|---|
| | **ASSETS** | | | | |
| | **I. NON-CURRENT ASSETS** | | | | |
| 5.1 | Intangible assets | 1110 | 1,099,385 | 1,055,754 | 1,329,604 |
| 5.2 | Results of research and development | 1120 | 1,115,609 | 470,339 | 511,917 |
| | Intangible development assets | 1130 | – | – | – |
| | Tangible development assets | 1140 | – | – | – |
| 5.3 | Fixed assets | 1150 | 170,416 | 154,397 | 245,073 |
| | Buildings, vehicles, equipment etc. | 1151 | 170,416 | 114,382 | 200,808 |
| | Capital investments in progress | 1152 | – | 40,015 | 40,015 |
| | Advances to suppliers | 1153 | – | – | 4,250 |
| | Income-bearing investments in tangibles | 1160 | 414,716 | 416,554 | 427,667 |
| 5.5 | Financial investments | 1170 | 203,386,909 | 209,655,354 | 223,589,430 |
| | Deferred tax assets | 1180 | 5,207,194 | 4,042,626 | 1,480,598 |
| | Other non-current assets | 1190 | 3,080,489 | 3,310,529 | 2,867,665 |
| | **Total I** | **1100** | **214,474,718** | **219,105,553** | **230,451,954** |
| | **II. CURRENT ASSETS** | | | | |
| 5.4 | Stock | 1210 | 59,866,941 | 68,750,309 | 84,916,423 |
| | ‣ Raw, materials and other similar assets | 1211 | 7,774,339 | 8,578,293 | 8,581,245 |
| | ‣ Work in progress expenditures | 1212 | 45,483,552 | 48,957,800 | 61,716,761 |
| | ‣ Finished products and goods for resale | 1213 | 6,592,606 | 11,214,216 | 14,618,417 |
| | ‣ Shipped goods | 1214 | 16,444 | – | – |
| | ‣ Other stock and expenses | 1219 | – | – | – |
| | Value added tax on purchased assets | 1220 | 3,492,685 | 8,575,202 | 13,017,390 |
| 5.7 | Accounts receivable | 1230 | 32,912,114 | 30,104,703 | 20,641,223 |
| | ‣ Settlements with buyers and customers | 1231 | 24,291,307 | 18,387 786 | 14,927,726 |
| | ‣ Advances made | 1232 | 2,129,997 | 611,518 | 2,151,253 |
| | ‣ Other debtors | 1233 | 6,490,810 | 11,105,399 | 3,562,244 |
| | ‣ VAT reclaimed | 1235 | 4,176,139 | 6,576,297 | 497,216 |
| | ‣ Payments on agent act | 1236 | 1,394,746 | 2,337,662 | 2,337,662 |
| | ‣ Unpresented for payment accrued revenue | 1234 | – | – | – |



| Comments | Index description | Code | As on December 31, 2017 | As on December 31, 2016 | As on December 31, 2015 |
|---|---|---|---|---|---|
| 5.5 | Financial investments (excluding cash) | 1240 | 71,473,277 | 27,797,237 | 1,640,000 |
| 5.6 | Cash | 1250 | 3,934,336 | 9,435,365 | 42,826,542 |
| | Other current assets | 1260 | 361,464 | 454,658 | 863,924 |
| | **Total II** | **1200** | **172,040,817** | **145,117,474** | **163,905,502** |
| | **BALANCE** | **1600** | **386,515,535** | **364,223,027** | **394,357,456** |
| | **LIABILITIES** | | | | |
| | **III. CAPITAL AND RESERVES** | | | | |
| | Equity capital (pooled capital, collective capital, contribution of partners) | 1310 | 22,962 | 22,962 | 22,962 |
| | Own shares redeemed from shareholders | 1320 | – | – | – |
| | Received contributions from stockholders to share capital before registration of changes in constituent documents | 1330 | – | – | – |
| | Revaluation of non-current assets | 1340 | – | – | – |
| | Additional capital (without revaluation) | 1350 | 181,731,790 | 181,731,834 | 181,732,335 |
| | Reserve capital | 1360 | 522,402 | 258,255 | 125,886 |
| 5.14 | ‣ Reserves formed in accordance with legislation | 1361 | 521,254 | 257,107 | 124,738 |
| | ‣ Reserves formed in accordance with founding documents | 1362 | 1,148 | 1,148 | 1,148 |
| | Undistributed profit (uncovered loss) | 1370 | 110,095,198 | 97,246,595 | 105,197,731 |
| | **Total III** | **1400** | **292,372,352** | **279,259,646** | **287,078,914** |
| | **IV. LONG-TERM LIABILITIES** | | | | |
| | Borrowed funds | 1410 | – | – | – |
| | Deferred tax liabilities | 1420 | – | – | – |
| | Estimated liabilities | 1430 | – | – | – |
| | Other liabilities | 1450 | 2,450,963 | 1,429,164 | 925,753 |
| | **Total IV** | **1400** | **2,450,963** | **1,429,164** | **925,753** |
| | **V. SHORT-TERM LIABILITIES** | | | | |
| 5.13 | Borrowed funds | 1510 | 50,140,638 | 40,181,112 | 63,008,851 |
| 5.10 | Accounts payable | 1520 | 40,584,170 | 42,507,215 | 42,253,983 |
| | ‣ Suppliers and contractors | 1521 | 26,847,061 | 25,586,785 | 20,874,830 |
| | ‣ Advances received | 1522 | 12,158,164 | 12,434,174 | 18,249,393 |
| | ‣ Accounts payable to employees | 1523 | 1,163 | 1,496 | 1,356 |
| | ‣ Accounts payable to state non-budget bodies | 1524 | – | – | 70 |
| | ‣ Accounts payable in respect of taxes and levies | 1525 | 3,315 | 3,318 | 17,472 |
| | ‣ Other creditors | 1526 | 1,574,467 | 4,481,442 | 3,110,862 |
| | Deferred income | 1530 | 1,417 | 2,309 | 912 |

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| Comments | Index description | Code | As on December 31, 2017 | As on December 31, 2016 | As on December 31, 2015 |
|---|---|---|---|---|---|
| 5.15 | Estimated liabilities | 1540 | 965,995 | 843,581 | 1,089,043 |
| | Provisions | 1546 | – | – | – |
| | Accounts payable to customers | 1547 | – | – | – |
| | Other liabilities | 1550 | – | – | – |
| | **Total V** | **1500** | **91,692,220** | **83,534,217** | **106,352,789** |
| | **BALANCE** | **1700** | **386,515,535** | **364,223,027** | **394,357,456** |

**Director** (signature) **N.V. Nikipelova** (name)

**March 05, 2018**

**Acting Chief accountant** (signature) **V.P. Slobodyan** (name)

(power of attorney № 4/183/2017-Дов from 18.10.2017)



# Profit and Loss Statement for the year 2017

**Codes**

| | |
|---|---|
| Form under OKUD | 0710002 |
| Date (day, month, year) | 31.12.2017 |
| under OKPO | 45046040 |
| TIN | 7706123550 |
| under OKVED | 24.46 |
| under OKOPF/OKFS | 1 22 67/16 |
| under OKEI | 384 |

**Organization** Joint Stock Company **"**TVEL**"**
**Type of business** Production of nuclear fuel
**Form of incorporation / form of ownership** Joint Stock Company
**Measurement unit:** in thous. RUB
**Location (address)** Bld.24, Bolshaya Ordynka st., Moscow, 119017

| Comments | Index description | Code | Over 12 months of 2017 | Over 12 months of 2016 |
|---|---|---|---|---|
| 5.17 | Proceeds, including | 2110 | 145,024,699 | 147,245,526 |
| | Proceeds from sale of own products | | 125,159,028 | 129,289,163 |
| | Proceeds from carrying out work, rendering services | | 15,906,972 | 14,426,701 |
| 5.17 | Prime cost of sales, including | 2120 | (92,972,461) | (94,636,751) |
| | Prime cost of sales of own products | | (79,127,989) | (83,008,951) |
| | Prime cost of carrying out work, rendering services | | (12,169,594) | (10,236,737) |
| | Gross profit (loss) | 2100 | 52,052,238 | 52,608,775 |
| 5.17 | Commercial expenses | 2210 | (1,112,599) | (2,142,985) |
| 5.14, 5.17 | Management expenses | 2220 | (9,189,894) | (8,167,555) |
| | Sales profit (loss) | 2200 | 41,749,745 | 42,298,234 |
| | Income from participation in other entities | 2310 | 2,298,168 | 2,816,603 |
| | Interest receivable | 2320 | 5,431,588 | 1,589,293 |
| | Interest payable | 2330 | (3,802,997) | (4,181,471) |
| 5.18 | Other income, including | 2340 | 1,505,471 | 2,661,314 |
| | Income from raw material, supplies and unmarketable goods (net) | | – | 350,381 |
| | Income from foreign currency sales or purchases | | 364,195 | 744,039 |
| | Income from granting rights of using the results of intellectual activity | | 204,441 | 205,221 |
| | Income from bad debt reserves | | 675,872 | – |
| | Income of prior years defined in the reporting period (net) | | 86,145 | – |
| | Income from inventory surplus and other property as a result of inventory check | | 115,880 | – |
| 5.18 | Other expenses, including | 2350 | (8,587,531) | (21,352,489) |
| | Expenses from currency differences on liabilities and assets in foreign currency | | (480,930) | (6,171,144) |
| | Other expenses from uncompensated disposal of assets | | (542,124) | – |
| | Amortization of intangible assets | | (228,060) | – |
| | Expense for reserve of investment depreciation/contribution to legal capital of other companies purchased for other purposes | | (6,302,919) | (12,709,792) |
| | Expenses for R&D with positive results, not recognized as assets | | (468,716) | – |
| | Income (loss) before tax | 2300 | 38,594,444 | 23,831,484 |
| | Current profit tax | 2410 | (8,424,376) | (6,978,752) |
| 4.17 | Including permanent tax liabilities (assets) | 2421 | (150,500) | (218,385) |
| 4.17 | Variation of deferred tax liabilities | 2430 | (129,509) | 8,959 |
| 4.17 | Variation of deferred tax assets | 2450 | 1,144,129 | 2,548,432 |
| | Other | 2460 | 145,804 | (65,867) |
| | Redistribution of profit tax within consolidated group of taxpayers | 2465 | 646,868 | 2,237,544 |
| | Net profit (loss) | 2400 | 31,977,360 | 21,581,800 |

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| Comments | Index description | Code | | Over 12 months of 2015 |
|---|---|---|---|---|
| | **FOR REFERENCE ONLY**<br>Result of revaluation of non-current assets not to be included in net profit (loss) of the period | 2510 | – | – |
| | Result of other operations not to be included in net profit (loss) of the period | 2520 | (44) | (501) |
| | Cumulative financial result for the period | 2500 | 31,977,316 | 21,581,299 |
| | **For reference**<br>Basic earnings (loss) per share | 2900 | 1,39 | 0,94 |
| | Diluted earnings (loss) per share | 2910 | – | – |

**Director** (signature) **N.V. Nikipelova** (name)

**March 05, 2018**

**Acting Chief accountant** (signature) **V.P. Slobodyan** (name)

(power of attorney № 4/183/2017-Дов from 18.10.2017)



# Capital Statement for the year 2017

**Codes:**

| | |
|---|---|
| Form under OKUD | 0710003 |
| Date (day, month, year) | 31.12.2017 |
| under OKPO | 45046040 |
| TIN | 7706123550 |
| under OKVED | 24.46 |
| under OKOPF/OKFS | 1 22 67/16 |
| under OKEI | 384 |

**Organization:** Joint Stock Company **"**TVEL**"**
**Type of business:** Production of nuclear fuel
**Form of incorporation/form of ownership:** Joint Stock Company
**Measurement unit:** in thous. RUB
**Location (address):** bld. 24, Bolshaya Ordynka st., Moscow, 119017

## 1. FLOW OF CAPITAL

| Index description | Code | Equity capital | Own shares redeemed from shareholders | Received contributions from stockholders to share capital before registration of changes in constituent documents | Additional capital | Reserve capital | Undistributed profit (uncovered loss) | Total |
|---|---|---|---|---|---|---|---|---|
| **Value of the capital as of December 31, 2015** | **3100** | **22,962** | **–** | **–** | **181,732,335** | **125,886** | **105,197,731** | **287,078,914** |
| **For the year 2016**<br>Increase of capital — total: | 3210 | – | – | – | 278 | 4,699,894 | 21,581,800 | 26,281,972 |
| Including<br>Net profit | 3211 | X | X | X | X | X | 21,581,800 | 21,581,800 |
| Revaluation of property | 3212 | X | X | X | – | X | – | – |
| Income charged directly to increase of capital | 3213 | X | X | X | 278 | 4,699,894 | – | 4,700,172 |
| Additional emission of shares | 3214 | – | – | – | – | X | – | – |
| Increase in the par value of shares | 3215 | – | – | – | – | X | – | – |
| Reorganization of the legal entity | 3216 | – | – | – | – | – | – | – |
| Use of industry-based reserves for investment purposes | 3217 | X | X | X | X | X | – | – |
| Share capital payment before registration of amendments in founding documents | 3218 | X | X | – | X | X | X | – |
| Reduction of the capital — total: | 3220 | – | – | – | (779) | (4,567,525) | (29,532,936) | (34,101,240) |
| Including<br>Loss | 3221 | X | X | – | X | X | – | – |
| Revaluation of property | 3222 | X | X | – | – | X | – | – |
| Expenses charged directly to reduction of the capital | 3223 | X | X | – | (779) | (4,567,525) | – | (4,568,304) |
| Decrease in the par value of shares | 3224 | – | – | – | – | X | – | – |
| Decrease in the number of shares | 3225 | – | – | – | – | X | – | – |
| Reorganization of the legal entity | 3226 | – | – | – | – | – | – | – |
| Dividends | 3227 | X | X | – | X | X | (29,532,936) | (29,532,936) |
| Share capital payment before registration of amendments in founding documents | 3228 | X | X | – | X | X | X | – |
| Change in the additional capital | 3230 | X | X | X | – | – | – | X |
| Change in the reserve capital | 3240 | X | X | X | X | – | – | X |

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| Index description | Code | Equity capital | Own shares redeemed from shareholders | Received contributions from stockholders to share capital before registration of changes in constituent documents | Additional capital | Reserve capital | Undistributed profit (uncovered loss) | Total |
|---|---|---|---|---|---|---|---|---|
| **Value of the capital as on December 31, 2016** | **3200** | **22,962** | **–** | **–** | **181,731,834** | **258,255** | **97,246,595** | **279,259,646** |
| **For the year 2017** Increase of the capital — total: | 3310 | – | – | – | 376 | 5,989,145 | 31,977,360 | 37,966,881 |
| including Net profit | 3311 | X | X | X | X | X | 31,977,360 | 31,977,360 |
| Revaluation of property | 3312 | X | X | X | – | X | – | – |
| Income charged directly to increase of capital | 3313 | X | X | X | 376 | 5,989,145 | – | 5,989,521 |
| Additional emission of shares | 3314 | – | – | – | – | X | – | – |
| Increase in the par value of shares | 3315 | – | – | – | – | X | – | – |
| Reorganization of the legal entity | 3316 | – | – | – | – | – | – | – |
| Use of industry-based reserves for investment purposes | 3317 | X | X | X | X | X | – | – |
| Share capital payment before registration of amendments in founding documents | 3318 | X | X | – | X | X | X | – |
| Reduction of the capital — total: | 3320 | – | – | – | (420) | (5,724,998) | (19,128,757) | (24,854,175) |
| including Loss | 3321 | X | X | – | X | X | – | – |
| Revaluation of property | 3322 | X | X | – | – | X | – | – |
| Expenses charged directly to reduction of the capital | 3323 | X | X | – | (420) | (5,724,998) | – | (5,725,418) |
| Decrease in the par value of shares | 3324 | – | – | – | – | X | – | – |
| Decrease in the number of shares | 3325 | – | – | – | – | X | – | – |
| Reorganization of the legal entity | 3326 | – | – | – | – | – | – | – |
| Dividends | 3327 | X | X | – | X | X | (19,128,757) | (19,128,757) |
| Share capital payment before registration of amendments in founding documents | 3328 | X | X | – | X | X | X | – |
| Change in the additional capital | 3330 | X | X | X | – | – | – | X |
| Change in the reserve capital | 3340 | X | X | X | X | – | – | X |
| **Liability on December 31, 2017** | **3300** | **22,962** | **–** | **–** | **181,731,790** | **522,402** | **110,095,198** | **292,372,352** |



# Capital Statement for the year 2017 (continued)

## 2. CORRECTIONS DUE TO CHANGE IN THE ACCOUNTING POLICY AND ELIMINATION OF ERRORS

| Index description | Code | As of December 31, 2015 | Changes in the capital for 2016 | | As of December 31, 2016 |
|---|---|---|---|---|---|
| | | | On account of the net profit (loss) | Based on other factors | |
| **Capital — total** | | | | | |
| Before corrections | 3400 | – | – | – | – |
| Correction due to: | | | | | |
| ▸ change in the accounting policy | 3410 | – | – | – | – |
| ▸ elimination of errors | 3420 | – | – | – | – |
| After corrections | 3500 | – | – | – | – |
| including **Undistributed profit (uncovered loss)** | | | | | |
| Before corrections | 3401 | – | – | – | – |
| Correction due to: | | | | | |
| ▸ change in the accounting policy | 3411 | – | – | – | – |
| ▸ elimination of errors | 3421 | – | – | – | – |
| After corrections | 3501 | – | – | – | – |
| **Other capital items, where corrections were made** | | | | | |
| Before corrections | 3402 | – | – | – | – |
| Correction due to: | | | | | |
| ▸ change in the accounting policy | 3412 | – | – | – | – |
| ▸ elimination of errors | 3422 | – | – | – | – |
| After corrections | 3502 | – | – | – | – |

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### 3. NET ASSETS

| Index description | Code | As of December 31, 2017 | As of December 31, 2016 | As of December 31, 2015 |
|---|---|---|---|---|
| Net assets | 3600 | 292,373,769 | 279,261,955 | 287,079,734 |

**Director** _____ **N. V. Nikipelova**
(signature) (name)

**March 05, 2018**

**Acting Chief accountant** _____ **V. P. Slobodyan**
(power of attorney (signature) (name)
№ 4/183/2017-Дов
from 18.10.2017)



# Cash Flow Statement for the year 2017

**Organization:** Joint Stock Company **"**TVEL**"**
**Type of business:** Production of nuclear fuel
**Form of incorporation/form of ownership:** Joint Stock Company
**Measurement unit:** in thous. RUB
**Location (address):** bld. 24, Bolshaya Ordynka st., Moscow, 119017

**Codes:**

| | |
|---|---|
| Form under OKUD | 0710004 |
| Date (day, month, year) | 31.12.2017 |
| under OKPO | 45046040 |
| TIN | 7706123550 |
| under OKVED | 24.46 |
| under OKOPF/OKFS | 1 22 67/16 |
| under OKEI | 384 |

| Index description | Code | Over 12 months of 2017 | Over 12 months of 2016 |
|---|---|---|---|
| **Cash flow associated with day-to-day operations** | | | |
| **Receipts — total** Including: | **4110** | **147,868,698** | **139,075,345** |
| From sale of products, goods, works and services | 4111 | 138,058,600 | 137,008,106 |
| From lease payments, license payments, royalty and other similar payments | 4112 | 418,716 | 446,160 |
| From re-sale of financial investments | 4113 | – | – |
| Other receipts | 4119 | 9,391,382 | 1,621,079 |
| **Payments — total** Including: | **4120** | **(104,520,065)** | **(94,644,551)** |
| To suppliers (contractors) for raw materials, materials, works, services | 4121 | (85,203,532) | (77,250,914) |
| Associated with remuneration of employees labour | 4122 | (2,361,344) | (2,130,913) |
| Interest on debt obligations | 4123 | (3,744,963) | (3,984,701) |
| Corporate profit tax | 4124 | (6,752,835) | (6,406,575) |
| Other payments | 4129 | (6,457,391) | (4,871,448) |
| **Balance of cash flow associated with day-to-day operations** | **4100** | **43,348,633** | **44,430,794** |
| **Cash flow associated with investment activities** | | | |
| **Receipts — total** Including: | **4210** | **101,394,000** | **121,234,156** |
| Cash flow associated with investment activities | 4211 | 166,486 | 115,855 |
| From sale of shares (participation shares) in other organizations | 4212 | 71,118 | 916,442 |
| From return of loans granted, from sale of debt securities (rights of funds claim from third parties) | 4213 | 93,812,858 | 114,942,600 |
| Dividends, interest from long-term financial investments and similar revenues from share interests in other companies | 4214 | 7,343,539 | 4,230,926 |
| Other receipts | 4219 | – | 1,028,333 |
| **Payments — total** Including: | **4220** | **(139,383,978)** | **(142,314,916)** |
| Associated with acquisition, creation, modernization, reconstruction and preparation for current assets operation | 4221 | (1,773,012) | 1,100,888 |
| Associated with acquisition of shares (participation shares) in other organizations | 4222 | – | – |
| Associated with acquisition of debt securities (rights of funds claim from third parties), loans provision to third parties | 4223 | (137,452,565) | (141,214,028) |
| Interest on debt obligations included in the value of investment asset | 4224 | – | – |
| Other payments | 4229 | (158,400) | – |
| **Balance of cash flow associated with investment activities** | **4200** | **(37,989,978)** | **(21,080,760)** |

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| Index description | Code | Over 12 months of 2017 | Over 12 months of 2016 |
|---|---|---|---|
| **Cash flow associated with financial activities** | | | |
| **Receipts — total** Including: | **4310** | **61,117,400** | **58,507,400** |
| Getting credits and loans | 4311 | 61,117,400 | 58,507,400 |
| Owners' (participants') money deposits | 4312 | – | – |
| From issue of shares, increase in participation shares | 4313 | – | – |
| From issue of bonds, promissory notes and other debt securities and etc. | 4314 | – | – |
| Budgetary provisions and other target financing | 4315 | – | – |
| Other receipts | 4319 | – | – |
| **Payments — total** Including: | **4320** | **(71,644,157)** | **(107,197,008)** |
| To owners (participants) due to repurchase their shares or their resignation | 4321 | – | – |
| For payment of dividends and other payments under distribution of profit in favour of owners (participats) | 4322 | (20,428,757) | (28,232,936) |
| Associated with payment (repurchase) of promissory notes and other debt securities, repayment of credits and loans | 4323 | (51,215,400) | (78,964,072) |
| Other payments | 4329 | – | – |
| **Balance of cash flow associated with financial operations** | **4300** | **(10,526,757)** | **(48,689,608)** |
| **Balance of cash flow for the reporting period** | **4400** | **(5,168,103)** | **(25,339,574)** |
| **Balance of cash and cash equivalents as of reporting period beginning** | **4450** | **9,435,365** | **42,826,542** |
| **Balance of cash and cash equivalents as of reporting period end** | **4500** | **3,934,336** | **9,435,365** |
| Effect of exchange rate changes to ruble | 4490 | (332,925) | (8,051,603) |

**Director** _____ **N.V. Nikipelova**
(signature) (name)

**March 05, 2018**

**Acting Chief accountant** _____ **V.P. Slobodyan**
(power of attorney № 4/183/2017-Дов from 18.10.2017) (signature) (name)



# APPENDIX 3.
# Internal Audit Conclusion on "Public Annual Reporting Preparation"

## Report of the Internal Control and Audit Department of TVEL JSC following the Results of "Public Annual Reporting Preparation" Audit Process 2017

The internal audit of the process of preparing the public annual report of TVEL JSC (further — the Report) was executed in compliance with "The Procedure for Planning and Conducting Internal Audits of Business Processes Carried out by TVEL JSC and the Companies Included in the Management System of the Fuel Company", approved by the Order No.271 of the President TVEL JSC dated December 14, 2011.

In conformity with the Regulation of Public Annual Reports (Order of the President d/d February 10, 2016 No. 4/32-П), TVEL JSC approved the order d/d October 26, 2016 No. 4/408-П "Concerning preparation of Annual Report of TVEL JSC for 2017", which defines the basic stages and dates of the Report generation, including preparation of the Concept of the Report, information accumulation, preparation of the draft Report, expertise of the draft Report by the ROSATOM public reporting working group, conducting public events (dialogues, public consultations) with stakeholders, conducting pubic assurance of the Report, ensuring approval of the Report by the Board of Directors of TVEL JSC and publication of the Report on the website *www.e-disclosure.ru* and on the official TVEL JSC website *www.tvel.ru*.

The auditing covered the following:

- Assessment of efficiency of the internal control system for the process of preparing the public annual reporting (including the analysis of regulations and formalization of the key processes related to generation of the public annual reporting; analysis of effective implementation of key control procedures ensuring the reliability of the public annual reporting).
- Assessment of compliance of the public annual reporting generation procedure with the requirements of applicable laws and internal statutory requirements regulating the business process of public annual reporting preparation.
- The recommendations of improving the quality of preparing public annual reporting were given.

The audit results proved the satisfactory status of the internal control system for the process of making the public annual reporting and the compliance of the annual public reporting generation procedure of TVEL JSC with the applicable laws, Policy of ROSATOM in the sphere of public reporting and the requirements of internal statutory documents of TVEL JSC regulating the process of public annual reporting preparation.

**Director for Internal Control and Audit** _____ **N.V. Belykh**
(signature) (name)

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# APPENDIX 4.
# Independent Assurance Report on Joint-Stock Company TVEL Annual Report 2017

## INTRODUCTION

The Independent Assurance Report is addressed to the Management of Joint-Stock Company TVEL (hereinafter referred to as JSC TVEL).

The subject of assurance is sustainability activities of JSC TVEL as well as the Annual Report 2017 of JSC TVEL including information on key organisations of TVEL Fuel Company of Rosatom within the declared consolidation perimeter (hereinafter referred to as the Report).

## RESPONSIBILITIES

The management of JSC TVEL bears full responsibility for the preparation and accuracy of the Report.

We are responsible for the results of independent assurance of the Report only to JSC TVEL within the engagement and do not assume any responsibility to any third party.

## SCOPE, CRITERIA AND LEVEL OF ASSURANCE

Sustainability activities of JSC TVEL was evaluated considering the following criterion:

- Nature and level of JSC TVEL compliance with the principles of the AA1000 Accountability Principle Standard 2008 — inclusivity, materiality, responsiveness.

The Report was evaluated considering the following criteria:

- Compliance with the requirements of GRI Sustainability Reporting Standards (Comprehensive option).
- Compliance with the requirements of the International Integrated Reporting Framework.
- Compliance of the Report preparation process with the requirements of State Corporation **"Rosatom"** in the sphere of public reporting.

The engagement was planned and performed in accordance with AA1000 Assurance Standard 2008 (moderate level of assurance) and International Standard on Assurance Engagement 3000 (revised) **"**Assurance engagements other than audits or reviews of historical financial information**"** (limited level of assurance). The statement corresponds to type 2, as defined by AA1000AS 2008, in accordance with the limitations specified in section **"**Limitations of the engagement**"** of the present statement.

The selective verification of information in the Report performed under aforementioned levels of assurance does not claim to provide a high level of assurance. The work was based on the supporting materials provided by the management of the entity and its employees, publicly available information and analytical methods of confirmation. In relation to the quantitative information contained in the Report the work performed cannot be considered sufficient for identification of all possible deficiencies and misstatements. However, the collected evidence is sufficient for expressing our conclusion in accordance with the above levels of assurance.

## METHODOLOGY OF ASSURANCE

In our engagement, we have performed the following procedures:

- Study and selective testing of systems and processes implemented by JSC TVEL to ensure and analyze the compliance of the activities with AA1000APS 2008 principles, collection of evidence confirming practical implementation of these principles.
- Participation in the dialogues and public presentation of the Report, study of minutes of public dialogues.
- Interviewing the management and employees of JSC TVEL and obtaining documentary evidence.
- Study of information available on the web-sites of JSC TVEL and its subsidiary companies related to their activities in the context of sustainable development.
- Study of public statements of third parties concerning economic, environmental and social aspects of activities of JSC TVEL and its subsidiary companies in order to check validity of the declarations made in the Report.
- Analysis of non-financial reports of foreign companies working in the similar market segment for benchmarking purposes.
- Analysis of the current system of internal audit of non-financial reporting in JSC TVEL.
- Selective review of documents and data on the efficiency of the management systems of economic, environmental and social aspects of sustainable development in JSC TVEL.
- Study of the existing processes of collection, processing, documenting, verification, analysis and selection of data to be included into the Report.
- Analysis of information in the Report for compliance with the aforementioned criteria.



## LIMITATIONS OF THE ENGAGEMENT

The engagement was performed only in relation to data for the year ended 31 December 2017.

The evaluation of reliability of the information on performance in the Report was conducted in relation to compliance with the criteria to be applied to prepare sustainability report 'in accordance' with the GRI Standards and information referred to in the GRI Content Index, as well as in relation to compliance with requirements of the International Integrated Reporting Framework. In respect to the quantitative performance indicators the conformity assessment to external and internal reporting documents provided to us is performed.

Assurance does not apply to forward-looking statements, as well as statements expressing the opinions, beliefs and intentions of JSC TVEL to take any action relating to the future. The assurance on the statements which are based on expert opinion is not performed.

Assurance is performed only in relation to the Russian version of the Report in the MS Word format which includes information to be published in a hard-copy form as well as in digital form on the JSC TVEL website.

This assurance report is the translation of the Russian original. The Russian version prevails.

## CONCLUSIONS

The following conclusions are based on the assurance work performed within the limitations of the engagement specified above.

### Nature and extent of compliance of JSC TVEL with AA1000 APS 2008 principles

As a result and within the scope of our work, we did not identify material non-compliance with criteria of AA1000APS 2008 in respect to adherence of JSC TVEL to the principles (Inclusivity, Materiality, and Responsiveness).

### Compliance of the Report with the GRI Sustainability Reporting Standards (Comprehensive option) Analysis of compliance to the GRI Standards requirements

In order to form a position on this issue, we have performed analysis of compliance to the GRI Standards requirements concerning principles and disclosures for the chosen 'in accordance' option.

- General disclosures are reported in compliance with the requirements of the standard GRI 102 (2016) for the chosen 'in accordance' option.
- Management approach disclosures are reported mainly in compliance with the requirements of the standard GRI 103 (2016): explanations of why the topic is material and of how the organization manages the topics are reported for material topics as well as explanations of how the organization evaluates the management approach for some material topics.

Topic-specific disclosures required for the Comprehensive option are reported in compliance with requirements of GRI Standards. If it is not possible to disclose required information, the Report identifies the information that has been omitted and explains reason for omissions.

### Overall assessment of the Report

As a result and within the scope of our work, we did not identify material non-compliance to the requirements to the report prepared 'in accordance' with the Comprehensive option of the GRI Standards. The conclusion is stated taken into account abovementioned analysis of compliance to the GRI Standards requirements.

### Compliance of the Report with the requirements of the International Integrated Reporting Framework

Based on the procedures performed and evidence obtained, we did not identify material non-compliance with the guiding principles of the International Integrated Reporting Framework and with requirements to the structure of content elements of integrated reports.

### Compliance of the Report preparation process with the requirements of State Corporation Rosatom in the sphere of public reporting

Based on the procedures performed and evidence obtained, we did not identify material non-compliance of the Report preparation process with the Unified Sectoral Guidance of the State Corporation Rosatom in the sphere of public reporting.

### Recommendations

**1.** It is reasonable to disclose GRI indicators in relation to target values.

**2.** Increase completeness of reporting on material topics by reducing the number of disclosures with omissions.

**3.** In case of disclosure with omissions due to absence of a recording system, provide more specific information about

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plans to obtain data in future.

4. Take into account remarks in the foregoing sections of the statement.

**STATEMENT OF COMPETENCE AND INDEPENDENCE**

**“**NP Consult**”** LLC, an independent audit firm, professionally rendering assurance services, is a licensed provider of assurance services in accord-ance with AA1000 Assurance Standard. **“**NP Consult**”** LLC is a member of Self-regulatory organization of auditors Association “Sodruzhestvo”. **“**NP Consult**”** LLC complies with the independence and other ethical requirements of the Code of Ethics for Professional Accountants issued by the International Standard Board for Accountants, which is founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behavior.

**“**NP Consult**”** LLC applies International Standard on Quality Control 1 and, accordingly, maintains a comprehensive system of quality control including documented policies and procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements. **“**NP Consult**”** LLC employs a system of quality control of audit services, including control of compliance to ethical norms.

**“**NP Consult**”** LLC states that the present assurance report is an independent auditor’s position on the Report. **“**NP Consult**”** LLC and its staff have no relations with JSC TVEL and its subsidiary companies that could result in the conflict of interest related to the independent assurance of the Selected Indicators.

**General Director**
**LLC “NP Consult”** _____ **N. Y. Khrenov**
(signature) (name)

**Moscow, July 2, 2018**

AA1000
Licensed Assurance Provider
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# APPENDIX 5.
# Statement on Public Assurance

## Statement on Public Assurance of the TVEL JSC Report for 2017

**INTRODUCTION**

TVEL Fuel Company (hereinafter “the Company”) management contacted us with an offer to assure the 2017 Annual Report of the Company (hereinafter **“**the Report**”**) in terms of completeness and materiality of information disclosed therein, and to assess the performance of Company’s management in response to recommendations and remarks of stakeholders. We were provided with the possibility to take part in off-site dialogue concerning the Report’s concept (December 2017), dialogue on the priority topic (February 2018) and public consultations on the draft of the Report (May 2018). We also took part in the process of actualization of priority topics to be disclosed in the Report.

**DRAFT REPORT EVALUATION PROCEDURE**

We hereby confirm that we are acting independently and undertake to be objective in our evaluation, thereby expressing our personal expert opinion rather than the opinion of organizations we represent.

Our conclusion is based on the study of the final version of the Report and the analysis of information obtained in the course of dialogues and public consultations, in which we and our representatives participated and were allowed to freely express our opinion on the matters under discussion.

We are not aware of any facts that compromise reliability of data set forth in this Report. However, checking of the data collection system and verification of reliability and completeness of information is not the subject matter of public assurance.

No remuneration has been received from TVEL FC for our efforts and time invested in this project.

The results of our work are formalized in this Statement on Public Assurance wherein the opinions we all agreed upon are presented.

**COMPLETENESS AND MATERIALITY OF INFORMATION**

The Report contains relevant information that is sufficiently complete for proper understanding of the current state and prospects of the Company.

The Report covers topics that are material for stakeholders. Materiality assessment procedure used by the Company, based on GRI Standards requirements, made it possible to take into account opinions of all stakeholder groups.

According to our reckoning there are no reasons for doubt concerning the reliability and relevance of topics prioritization results.

**COMPANY’S RESPONSE TO COMMENTS AND RECOMMENDATIONS OF STAKEHOLDERS**

The Company consistently proceeds with serious work on providing wide audience for the dialogues and in the course of preparation of this Report traditionally demonstrated its willingness to conduct open communication with stakeholders on various aspects of its activities

The Company has duly noted recommendations of the stakeholders received during dialogues and public consultations, conducted their analysis and used most of them in the final version of the Report. Moreover, the Company carried out several obligation that were taken in the previous reporting campaigns, thus the Reports transparency and information value were increased.

**ASSESSMENT, COMMENTS AND RECOMMENDATIONS**

We all share positive opinion about the Report — its form and the information disclosed. The Company has prepared an informative and well-structured document that meets our expectations.

We note that the Company is focused on following advanced Russian and international standards on corporate reporting.

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In the first place these are GRI Standards on sustainability reporting (an outstanding feature of the Company is the application of the comprehensive option).

In our opinion, the Company has pursued a successive approach to increasing transparency and accountability of its activities. By defining the priority topic of the Report as “TVEL strategic initiatives — efficiency improvement and sustainable development” the Company demonstrated high level of aspiration to maintenance of social and ecological acceptability on the territories of presence of its enterprises, as well as actual results achieved on the way to compacting production areas and cost optimization aimed at efficiency improvement.

We believe that the Report discloses information on all key aspects of Company’s activities, including new businesses. Strategy is described in detail, as well as reporting year’s input in its achievement, SWOT-analysis, factors of Company’s long-term sustainability.

We are confident that the Company will consistently pursue commitments and plans, disclosed in this Report, and will preserve the high quality of stakeholder engagement.

| | (signature) | (name) |
|---|---|---|
| Councillor of the Head of The Federal Service for the Supervision of Environment, Technology and Nuclear Management | | **A. I. Kislov** |
| Executive Director of the Association of Closed Administrative Territorial Unit for Nuclear Industry | | **A. I. Makarenko** |
| Secretary of the Central Committee of RUNPIW | | **A. G. Vanichkin** |
| Deputy Chairman of RUNPIW | | **Y. V. Borisov** |
| Head of Project Department of the Nuclear Fuel Life Cycle ROSATOM State Corporation | | **O. I. Linyaev** |
| Member of Public Council of ROSATOM State Corporation, Member of the Board of the Centre for Russian Ecological policy | | **V. F. Menshchikov** |
| Candidate of technical sciences, Honored Worker of the Russian Water Industry, Director of “Consulting Institute of ecological projects”, Member of Public Council of ROSATOM State Corporation | | **N. G. Davydova** |
| Executive Director of Interregional Public Ecological Organization “GREENLIGHT” | | **O. V. Plyamina** |
| Director General of the Institute of Natural Monopolies Issues | | **Yu. Z. Saakyan** |



# APPENDIX 6.
# RUIE Public Endorsement of the Report

**TVEL JSC Annual report 2017 has passed a public endorsement in the Council of RUIE on non-financial reporting**

Российский союз промышленников и предпринимателей

СВИДЕТЕЛЬСТВО

об общественном заверении
корпоративного нефинансового отчета

Годовой отчет АО «ТВЭЛ»
за 2017 год

прошел общественное заверение в Совете РСПП
по нефинансовой отчетности

Развернутое заключение Совета РСПП по нефинансовой отчетности об общественном заверении годового отчета АО «ТВЭЛ» за 2017 год направлено в Компанию, которая может публиковать его без каких-либо изменений и использовать как для внутрикорпоративных целей, так и в целях коммуникаций с заинтересованными сторонами.

Регистрационный номер 127.04.102.02.17

Президент РСПП А.Шохин

Москва, 2018

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# APPENDIX 7.
# Table of Considerations of Suggestions by the Stakeholders

| No. | Suggestions by Stakeholders to the information to be disclosed in the Report | Response by TVEL Fuel Company |
|---|---|---|
| 1 | Detailed coverage of the results and plans of the project to improve the efficiency of areas use both in terms of improving the production process, and in terms of the positive social impact of the enterprises of TVEL JSC on the regions of presence | Taken into account |
| 2 | Add the information on the costs of all activities related to the implementation of the project to improve the efficiency of areas use | Not taken into account |
| 3 | Show the relationship of the UN Sustainable Development Goals with the strategic objectives of TVEL Fuel Company | The possibility of disclosure in future reports will be considered |
| 4 | Take into account the changes in environmental legislation in the formation of the Report section **"**Natural Capital**"** | Taken into account |
| 5 | Focus on the works of TVEL Fuel Company in respect of young experts: school graduates, university students | Taken into account |
| 6 | Reduce the use of unnecessarily borrowed words in the Annual Report, such as **"**Workout**"**, **"**Case**"**, etc. | Partially taken into account |
| 7 | Describe the program **"**Lean Polyclinic**"**: goals, results, plans. Include the data on evaluation of patient satisfaction | Taken into account |
| 8 | Show the dependence of wage increase on labor productivity for each enterprise | The Report provides the information on labor productivity in the section **"**Manufactured Capital**"**, the dynamics of wages — in the section **"**Human Capital**"**. The information on each enterprise is useful to reflect in the annual reports of the companies themselves, which are part of the Fuel Division |
| 9 | Provide the information on the specific deadlines for the completion of activities under the nuclear and radiation safety program | In **"**Natural Capital**"** section of the Report there is a reference to the FTP NRS-2, which presents the specific terms of the implemented activities |
| 10 | Reflect the information that all the enterprises of the Fuel Company were registered by the state and each of them was assigned a certain category of environmental impact | Considered in **"**Social Capital**"** |
| 11 | Show the planned environmental effect from the production and technical measures implemented by the Fuel Company | To be modified in future reports |
| 12 | Shift the focus to the result in the table which gives the information on organizational events for improving the environmental management system | Not taken into account |
| 13 | Add the reference year 2015 to the diagram **"**Amount of Financing for Energy Saving and Efficiency Improvement Program**"** | Not taken into account, since financing is not linked to the reference year and in 2015 it was implemented in accordance with the previous program |
| 14 | Not to record in the tables those companies of the Fuel Company that do not affect the total emissions of pollutants | Taken into account |
| 15 | Visualize fines and penalties as compensation for damage to the environment | Not taken into account |
| 16 | To bring the Report in line with the current regulatory framework regarding the Uniform Industry Specific Guidelines on Execution of Public Reports in ROSATOM and its organizations | Taken into account |
| 17 | Add the case about the annual Best Solution / Development contest within the Fuel Company | Considered in **"**Human Capital**"** section |
| 18 | Disclose in the Report concrete results of the activities of the Scientific and Technical Council (NTS) as one of the main elements in the creation and implementation of innovative developments | To be modified in the future reports |



# CONTACT DETAILS


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