KEY RESULTS
KEY RESULTS 2018
BULGARIA
Contractual documents for nuclear fuel supply to Kozloduy NPP in Bulgaria in 2018–2020 come into force.

FINLAND
TVEL JSC and Fortum Power and Heat (Finland) sign an agreement on development of a new modification of VVER-440 nuclear fuel for Loviisa NPP.

RUSSIA
Operational launch of the special purpose subsidiary «Rusatom – Additive Technologies» (RusAT, JSC) acting as the nuclear industry integrator for additive manufacturing business development.

UZBEKISTAN
TVEL JSC supplies nuclear fuel for VVR-SM research reactor at the Institute of Nuclear Physics (a part of the National Academy of Sciences) in Uzbekistan, for the first time after the reactor renewed its operation.

CZECH REPUBLIC
The fourth generation VVER-1000 fuel TVSA-T.mod.2 was loaded at Temelin NPP in the Czech Republic.

RUSSIA
Chepetsky Mechanical Plant (ChMP) starts production of the new product – hafnia (oxide).
RUSSIA
The first batch of VVER-1000 TVS-2M fuel with the second-generation ADF-2 anti-debris filter (protects the fuel from damage in the reactor core) was loaded at the Rostov NPP.

NUCLEAR FUEL WAS LOADED INTO THE WORLD'S FIRST FLOATING NPP.

SWITZERLAND
TVEL JSC and the European Organization for Nuclear Research (CERN) sign an R&D Agreement on the Future Circular Collider (FCC) Study. ChMP starts manufacturing of superconductive wires for FCC.

RUSSIA
"The new gas centrifuges plant" investment project is completed at the site of Kovrov Mechanical Plant.

PRODUCTION OF NEW GENERATION GAS CENTRIFUGES FOR SEPARATION OF STABLE ISOTOPES IS LAUNCHED AT TVEL FUEL COMPANY.

RUSSIA
The world's first batch production of uranium-plutonium MOX fuel for fast neutron BN-800 reactor starts in Rosatom.

NOVEMBER
RUSSIA
Novosibirsk Chemical Concentrates Plant manufactures the initial loading fuel for Belarus NPP unit one, the batch successfully passes quality control.

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KEY RESULTS 2018

RUSSIA
The first experimental Russian-made accident-tolerant fuel assemblies for VVER and PWR reactors are manufactured at Novosibirsk Chemical Concentrates Plant to be further tested in MIR research reactor.

INDIA
TVEL JSC and the Department of Atomic Energy of the Government of India sign the contract for supplies of fuel pellets for Tarapur NPP.

CHINA
TVEL JSC and Chinese company CNLY (a part of CNNC corporation) sign the contract for supply of nuclear fuel for CFR-600 fast-neutron reactor.
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)

THE ENTERPRISES OF TVEL FUEL COMPANY ARE LOCATED IN 10 REGIONS OF THE RUSSIAN FEDERATION.
### KEY PRODUCTS AND SERVICES

TVEL Fuel Company of Rosatom is one of the major players in the global market in nuclear fuel production. The Company’s share in the world market of fuel fabrication is 17%.

TVEL completely provides with nuclear fuel Russian nuclear power industry, research reactors and the nuclear icebreaker fleet of Russia, as well as the world’s only floating NPP.

TVEL nuclear fuel supports the work of research reactors in nine countries.

TVEL Fuel Company is the world’s largest producer of enriched uranium covering more than a third of the global market needs. In addition, the company supplies various nuclear fuel components to the global market for foreign-designed power and research reactors.

TVEL Fuel Company includes enterprises that focus on in the production of gas centrifuges, uranium conversion and enrichment, fabrication of nuclear fuel, as well as research and development.

Enterprises of TVEL Fuel Company have a wide expertise in production of non-nuclear products in such industries as chemistry, metallurgy, mechanical engineering.

TVEL Fuel Company is the world leader in the production of stable isotopes with a global market share of more than 40%.

Customers in Russia and abroad are also supplied with products made of lithium, zirconium, titanium and calcium, as well as superconducting materials. In addition, TVEL is actively developing new high-tech businesses of the XXI century, such as additive technologies and power storage systems.

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**KEY RESULTS 2018**

- Every 6th commercial power reactor in the world is running on TVEL fuel.
- 76 nuclear power units in Russia and 14 countries in Europe and Asia.
- The reactors functioning with TVEL fuel and components annually produce more than 400 billion kWh of electricity.
Supplies of nuclear fuel for commercial power reactors of Russian design

Supplies of nuclear fuel and its components in cooperation with Framatome

37 Numbers of units

100% Share of national nuclear power capacity

**KEY RESULTS 2018**

POSITION IN THE GLOBAL MARKET

- Supplies of nuclear fuel for commercial power reactors of Russian design
- Supplies of nuclear fuel and its components in cooperation with Framatome
- 37 Numbers of units
- 100% Share of national nuclear power capacity

*Considering operation of Leningrad NPP unit 1 until 22.12.2018*
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 2018 reached 17%.

TVEL Fuel Company is the world’s largest supplier of uranium enrichment services, providing exports of separative work units and enriched uranium to the global market via TENEX JSC, thus satisfying an essential share of the relevant needs of foreign power plants and research reactors.

Nuclear fuel modernization is carried out in close cooperation with customers, as the major priority of TVEL Fuel Company is client satisfaction.

**Our advantages**

- Impeccable business reputation as a supplier of reliable and efficient nuclear fuel.
- Customer-confirmed product quality and reliability.
- Flexibility of the technological and commercial conditions of cooperation.
- The full technological chain for the initial stage of the nuclear fuel cycle.
- An efficient science and technology cluster providing continuous advancement of nuclear fuel performance.
- Quality control at all stages of production cycle.

**KEY RESULTS 2018**

- **Export revenue in 2018**: 961 USD mln
- **Export orders portfolio (nuclear products and services), 10 year prospect**: 13.3 USD bln

**Our advantages**

- Complete supplies of fuel assemblies (including uranium enrichment at the previous stage).
- Customer-focused approach – development and fabrication of nuclear fuel according with the client’s individual request.
- Reference experience of the new fuels due to the exploitation at the Russian NPPs.
- Constant upgrade of nuclear fuel, development and introduction of new models and modifications of fuel assemblies with advanced performance.
SECOND CORE

TVEL creates new businesses in high-tech industries, responding to the demands and needs of the market in innovative products and technologies.

TVEL Fuel Company provides the Russian and international market with the wide range of non-nuclear products in the following key areas: Power Storage, Machine Building, Metallurgy, Chemistry.

In 2018, revenues from the second core businesses increased by 22.8%, up to RUB 13.5 bln.

In 2018, TVEL Fuel Company introduced completely new management patterns for development of new businesses.

One of such patterns is the industry integrator format.

Such companies are established to combine the expertise and technological capabilities of industrial and scientific enterprises throughout Rosatom (with a possible participation of other partners) in new business areas for accelerated development and market launch of products and services.
In 2018, two new companies started functioning within the nuclear fuel division. These are the so-called industry integrators for the “Additive manufacturing” and “Power storage” new business directions.

RusAT LLC (RusAtom Additive Technologies) is the industry integrator for additive manufacturing. The company is engaged in design and 3D manufacturing printers, additive powders, components, software and providing 3D-printing services.

Cathode materials LLC is the industry integrator for the Power storage business, incorporated within TVEL Fuel Company.

In 2018, TVEL Fuel Company enterprises signed the first commercial contracts and launched the first pilot project for introduction of power storage systems based Li-ion batteries at Vyksa Metallurgical Plant in Nizhny Novgorod region. The new equipment, which was integrated into the plant’s power grid, will provide the company with a stable power supply, energy storage devices were also installed at the on-site electric transport.

RUSAT MAJOR ACHIEVEMENTS IN 2018:

- Production cooperation chains within Rosatom for development of AM equipment, software and AM materials.
- Complete design documentation for the line of RusMelt 3D printers.
- Start of the Additive manufacturing center project within TVEL Fuel Company.
- Start of several projects of development of key elements for AM equipment based on Selective Laser Melting and Direct Laser Cladding technologies.
- Approval of nine draft projects of national standards, follow-up of the national standardization programme for additive manufacturing.
In 2018, TVEL JSC adopted the strategies for Internal digitalization and IT business development. The key areas are digital production, engineering data management, operational management, maintenance and repair, back-office efficiency, industrial safety, cyber security and IT infrastructure development.

TVEL FUEL COMPANY PRODUCES THE FOLLOWING PRODUCTS:

- Active materials for Li-ion batteries.
- Stationary power storage (to provide energy to isolated areas, for energy infrastructure, emergency uninterruptible power supply sources).
- System of accumulation of electricity for in-plant logistics and electric transport.
- Electric power storage systems for passenger electric transport.

**KEY RESULTS 2018**

**Metallurgy**
- special metallurgy
- titanium metallurgy
- superconductive materials and superwire

**Chemistry**
- lithium products
- stable isotopes
- catalysts
- fluorine compounds

**Machine Building**
- instrument engineering
- equipment for NFC and Oil and Gas Industry

**Additive technologies**
- 3-D printers
- metal powders for 3D printing
- 3D printing services

**Energy Storage**
- energy storage devices based on chemical current sources
- electric power generators based on fuel elements
- materials for lithium-ion batteries
The new tool for non-nuclear businesses development introduced in 2018 was establishment of business partnerships in the Russian regions of TVEL operations with support of the local government authorities. Due to the integration of capabilities, TVEL and the regional enterprises set out a number of joint projects in order to draw-up a competitive market offer. In 2018, TVEL management held more than 30 meetings with the regional administrations, attended nine regional forums, organized eleven business missions and held seven strategic sessions with the potential partners. As a result, in 2018, five business development roadmaps were prepared and signed with the regional administrations (2 maps with the Irkutsk region, 1 map with the Novosibirsk, Vladimir regions and the Udmurt Republic).

TVEL Fuel Company established the corporate business accelerator which provides development of startups and new projects from ideas to industrial implementation. This lays the foundation for the dynamic growth of new businesses. In addition to funding, project teams are provided with qualified expertise and recommendations from market experts.

This format of search, selection and funding of innovative projects should ensure the advanced development of non-nuclear businesses: essentially reduce the time for products development, promote the attraction of the best ideas and specialists from the market, move-up to open innovation model. The business acceleration involves projects in the field of additive technologies, metallurgy, machine-building and power storage. After the first acceleration cycle, 16 projects were selected out of 42 applications, three of them finally passed to the investment phase.
THE STRATEGY OF TVEL FUEL COMPANY IS AIMED AT ACHIEVEMENT OF THE FOLLOWING INDICATORS BY 2030:

- Growing the footprint in the global market of uranium enrichment and nuclear fuel fabrication services, producing traditional goods with advanced consumer properties and entering the new nuclear markets.
- 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.

Mission of TVEL Fuel Company

Meeting the requirements of the customers in nuclear fuel cycle and in the related sectors, in strict compliance with requirements of safety, security, environmental and social awareness.

Strategic targets of TVEL Fuel Company

- Twofold growth of revenue in comparable terms of 2014.

KEY RESULTS 2018
In 2018, TVEL Fuel Company achieved all KPI and target indicators.

**FINANCIAL RESULTS**

- **89.8** RUB bin adjusted FCF
- **163,173** RUB mln revenue (net) from sales
- **65,259** RUB mln EBITDA
- **49,204** RUB mln net income
- **39.9%** EBITDA margin

**DIAGRAM 2**

**DISTRIBUTION OF REVENUE FROM NUCLEAR FUEL SALES BY CONSUMERS’ GEOGRAPHY, %**

- Asian consumers: 33%, 42%, 50%
- European consumers: 56%, 45%
- Russian consumers: 11%, 12%, 9%

**KEY RESULTS 2018**
TVEL Fuel Company produces nuclear fuel for all types of power reactors of Russian design — VVER-440, VVER-1000, VVER-1200 (III+ generation reactors), RBMK, BN-600 and BN-800 fast neutron reactors, completely ensuring functioning of the NPPs in Russia and a number of foreign countries.

R&D RESULTS

1,774 items of intellectual property TVEL Fuel Company holds as of 2018.

VVER-1200 FUEL
- Novosibirsk Chemical Concentrates Plant manufactured the initial loading fuel for the VVER-1200 powered unit 1 of Belarusian NPP, as well as the the initial loading for unit 2 of Novovoronezh NPP-2.

VVER-1000 FUEL
- The fourth generation VVER-1000 fuel TVSA-T.mod.2 was loaded at Temelin NPP in the Czech Republic;
- The first batch of VVER-1000 TVS-2M fuel with the second-generation ADF-2 anti-debris filter (protects the fuel from damage in the reactor core) was loaded at the Rostov NPP.

VVER-440 FUEL
- Rosatom engineers completed “longevity testing” of fuel assembly models with an optimized hydro-uranium ratio for VVER-440 reactors at the Paks and Loviisa nuclear power plants in Hungary and Finland, respectively.

PRODUCTION FACILITIES DEVELOPMENT
- Machine-building Plant (Electrostal, Moscow region) completes construction of the manufacturing area for production of uranium dioxide powder by pyrohydrolysis at VPGU-600 installation.

KEY RESULTS 2018

Constant improvement of nuclear fuel and adoption of new technological solutions make operation of nuclear power plants more efficient.
In 2018, Rosatom started batch production of MOX Fuel for the BN-800 fast neutron reactor at Beloyarsk NPP. Industrial production of MOX fuel at Mining and Chemical Combine (MCC, Zheleznogorsk, Krasnoyarsk region) was set-up with the coordination role of TVEL.

The fuel pellets are manufactured from a mixture of oxides of depleted uranium accumulated at facilities of TVEL Fuel Company of Rosatom, and oxides of plutonium extracted during reprocessing of spent nuclear fuel.

In 2018, Rosatom engineers checked the condition of the VVER-1000 fuel assemblies (TVS-2M), partially equipped with REMIX pellets, which had been irradiated at Balakovo NPP. The results confirmed operability of the experimental fuel rods with no obstacles for further test-mode operation.

In 2018, TVEL continued reactor irradiation of mixed nitride uranium-plutonium fuel (MNUP-fuel) and achieved the design burn-up results. The result of the post-reactor studies allowed to obtain permission to extend the resource of the experimental fuel assemblies in the BN-600 reactor at Beloyarsk NPP.

intellectual property items were registered in 2018
<table>
<thead>
<tr>
<th>PEOPLE</th>
<th>TVEL Fuel Company headcount at the year-end</th>
<th>labor efficiency</th>
<th>average age of employees</th>
<th>share of employees under 35 years old</th>
<th>Total amount spent by the Company on its social programs made</th>
</tr>
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<td>22,469 persons</td>
<td>7.43 RUB mln/pers.</td>
<td>45 years old</td>
<td>20.8%</td>
<td>RUB 1,237 mln, per worker – RUB 57 thous.</td>
</tr>
</tbody>
</table>

**SALARY**

- The average salary in TVEL Fuel Company (TVEL JSC included) — RUB 82,243, up 6% year-on-year.
- The salary increase and indexation amounted RUB 220 mln.

**EDUCATION**

- Number of TVEL Fuel Company employees trained in 2018 – 13,123.
- Amount of training investment — RUB 118.4 mln.
- In 2018, the TVEL enterprises provided practical training to 600 students of higher educational institutions and vocational secondary schools.
- Graduates of higher educational institutions and vocational secondary schools employed by the Company – 81, 12 of them took target preparation classes of TVEL Fuel Company.
Focus on HSE and improving working conditions of the staff is a constant priority of TVEL management.

The tasks of reducing, as well as the subsequent and complete exclusion of heavy physical labor on the grounds of complex mechanization and automation, are being comprehensively addressed. The priority is given to ensuring safe and healthy working conditions. Particular attention is paid to compliance with labor protection requirements while accomplishing investment projects aimed at modernization of industrial facilities.

The implementation of current measures for labor protection is reflected in labor protection agreements making an integral part of collective agreements, as well as in comprehensive labor protection plans.

TVEL spent grand total of

$$\text{2.08 RUB bln} \quad \text{77.4 RUB thous. per each employee on labor protection arrangements in 2018.}$$

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1 Lost Time Injury Frequency Rate calculated as the total number of accidents (including fatalities) per million man-hours worked.

This value is calculated taking into account the accident that occurred in December 2018 and the investigation of which was completed in 2019.

2 Including CFR 3 and CFR 4.
SUSTAINABILITY

Following the principles of sustainability, TVEL Fuel Company exercises business management with respect for the principles of transparency and close interaction stakeholders.

TVEL plans and manages production operations taking into account complex economic, social and environmental development prospects of its enterprises and regions of their location.

Being fully aware of the responsibility to the local communities, the Company pursues socially friendly policy meeting the needs of local population and not threatening the interests of the future generations.
TERRITORIES OF OPERATION

In 2018, TVEL Fuel Company’s funding of social and economic development of the cities of presence and charity projects amounted RUB 1,794 mln.

TVEL Fuel Company is a major taxpayer in the Russian regions of its operations. Gross tax liabilities (actually paid) reached RUB 15.1 billion in 2018.

TVEL Fuel Company supports social projects in culture, education and sports.

TOTAL AMOUNT OF GRANS IN 2018 AMOUNTED TO RUB 184.6 MLN, INCLUDING:

- Environment
- Culture
- Education
- Healthcare
- Patriotic, moral and cultural values
- Sports
- Veterans and socially disadvantaged groups
- Young generations
In 2018, the Government of the Russian Federation approved draft resolutions on creation of territories of the advanced social and economic development (TASED) in the so called Closed Administrative Territorial Units (CATU) Novouralsk, Seversk and Glazov. The application for creation of TASED in CATU Zelenogorsk was agreed by the Government and the governor of Krasnoyarsk Territory, ROSATOM State Corporation, and sent to the Russian Ministry of Economic Development.

In order to attract investors to TASED / industrial parks in TVEL’s regions of operations and also to identify and develop joint business projects of the “second core” business, TVEL Fuel Company established joint working groups with the regional authorities, business entities and scientific communities.

Establishment of TASED zones in “nuclear” CATU towns is aimed at creating jobs, raising regional investment attractiveness, as well as advancing their socio-economic development.
The network project “School Science and Technology Park” is the core project among other TVEL educational initiatives. It is an educational environment that enables integration of the resources of education, science and industry. It functions as a network of the laboratories with modern high-tech equipment. The educational programs include environmental monitoring, robotics and intellectual systems, 3D-modeling and prototyping, chemical and biological researches, lego-designing, programming materials processing, chemical analysis, etc.

“Lean Polyclinic” project is aimed at improving efficiency of medical institutions and access to healthcare service in the towns of Zelenogorsk, Novouralsk, Seversk, Glazov, Novosibirsk and Kovrov.

Under the project, the work of medical institutions is improved by introducing modern standards of communication, IT services and barrier-free environment for people with limited mobility. As the result the patient’s time of visiting a clinic is significantly reduced, comfort is provided and the quality of medical care increases.
ENVIRONMENT PROTECTION

Environment protection funding amounted to 2,203.8 RUB mln.

The total amount of industrial and consumer waste of the Company’s enterprises decreased by 23.6% in 2018 year-on-year and amounted about 31.8 thousand tons.

- Water consumption decreased by 62% to 120.9 mln m³ as compared year-on-year, mainly because of recycling water supply introduction.
- Total air pollutant emissions were reduced by 61.4% year-on-year, in particular, due to the changes in accounting caused by the transfer of the property rights of the SGChE’s power plant in Seversk from SGChE JSC to OTEK JSC, as well as the accomplishment of energy efficiency program.
- Execution of works under the FTP NRS-2 at the expenses of the federal budget amounted to RUB 429.6 mln.
- Execution of works under the Special Reserve Fund No. 3 “Decommissioning and R&D” of ROSATOM State Corporation amounted to RUB 607.88 mln.
In 2018, power consumption by TVEL’s enterprises was

2 858.9

Heat consumption

2 053.3

that corresponds to the level of the previous year.

In 2018, the enterprises of TVEL Fuel Company did not register any INES events as well as any unexpected occurrences or incidents, that could have a negative environmental impact.

Siberian Group of Chemical Enterprises, Angarsk Electrolysis Chemical Complex, Central Design and Technology Institute and Bochvar Institute of Inorganic Materials started the projects of expertise centers for decommissioning nuclear- and radiation-hazardous sites.
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