



FUEL COMPANY OF ROSATOM

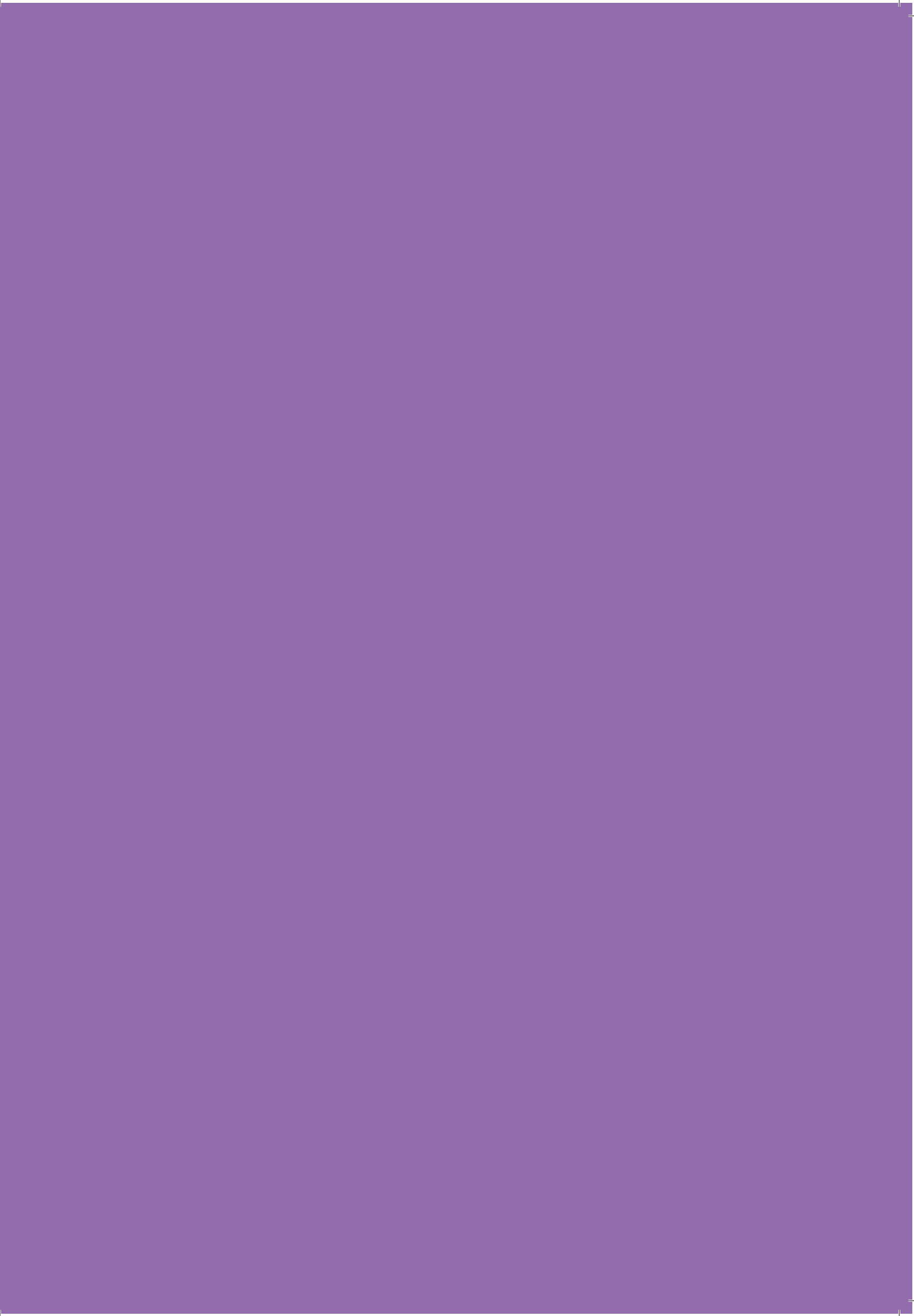
TVEL



2015
KEY
FACTS



ROSATOM

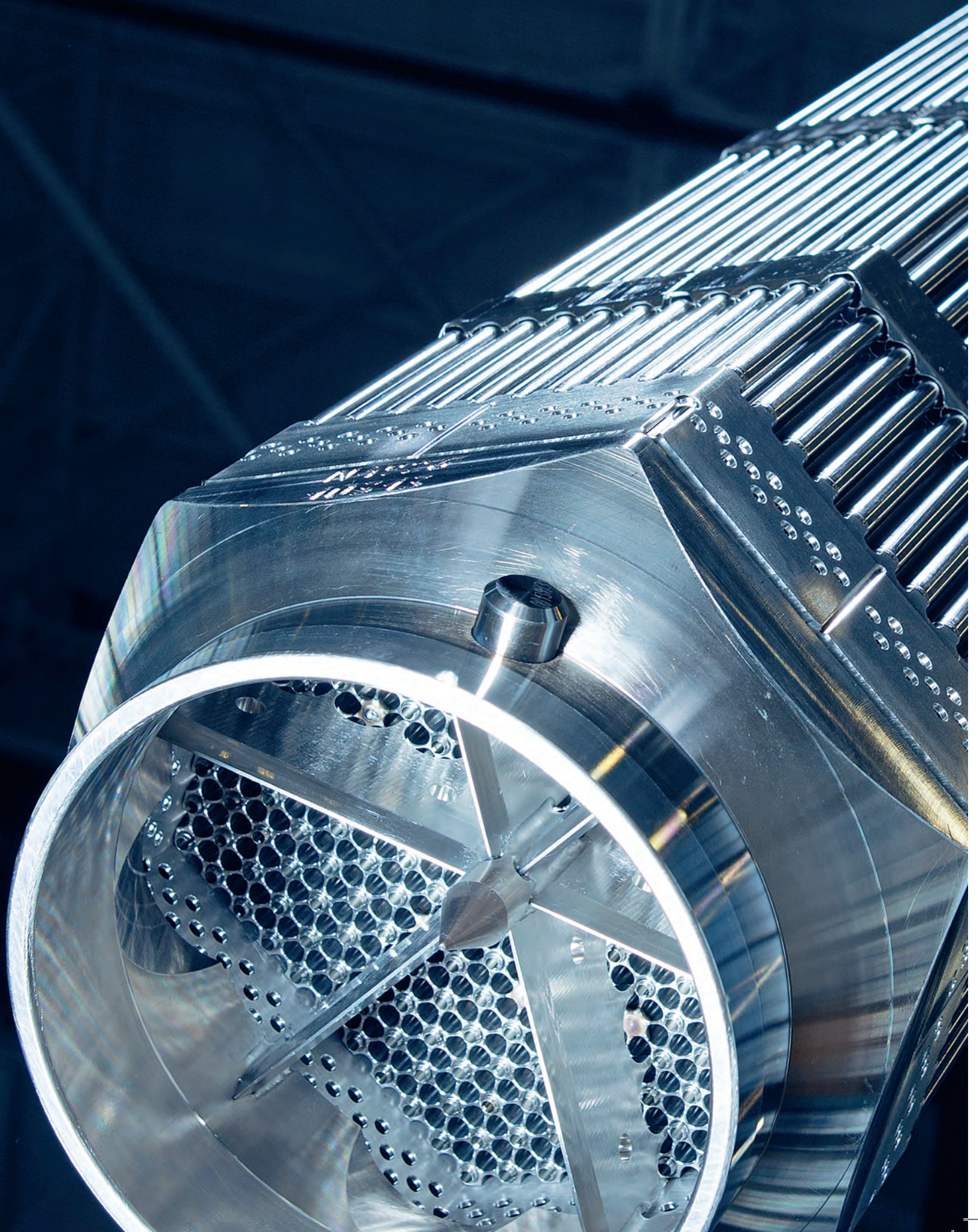


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For more details
please visit the company
website.

www.tvel.ru



FUEL ASSEMBLY
FOR POWER REACTORS

**CORE
PRODUCTS
AND SERVICES**

CORE PRODUCTS AND SERVICES

NUCLEAR FUEL

TVEL Fuel Company is a developer and manufacturer of nuclear fuel and associated nuclear and non-nuclear products for power generation and scientific research. TVEL fuel is used both in Russian and Western built reactors.

TVEL gives top priority to nuclear, radiation, environmental and industrial safety.

Comprehensive offering, high quality and reasonable pricing supported by large-scale production and know-how create competitive advantages of the products manufactured by TVEL.



TVEL Fuel Company manufactures nuclear fuel and its components for:

Water-water reactors

VVER-440, VVER-1000, PWR, BWR and PHWR

Fast breeder reactors

N-600 and BN-800

Uranium graphite reactors

RBMK-1000 and EGP-6

Research and marine reactors

TVEL PRODUCTS
SATISFY THE MOST
DEMANDING
RELIABILITY
REQUIREMENTS

The core component of nuclear fuel is a fuel rod or element in the form of a solid metal tube containing cylindrically-shaped pellets of fissionable material (usually sintered uranium dioxide).

Fuel rods are grouped into fuel assemblies. The design and size of fuel rods depend on the reactor type. For example, fuel rods for VVER-1000, the most widely used Russian power reactor, are over 3.5m long and 9.1mm in diameter, with their cladding made of zirconium-niobium alloy.



TVS KVADRAT

Established expertise in nuclear fuel development and manufacturing quality enabled TVEL Fuel Company to produce 17x17 fuel for Western built pressurized water reactors.

TVS KVADRAT fuel assemblies designed for the PWR core satisfy all the latest technical, economic and performance requirements for PWR fuel.



CORE PRODUCTS AND SERVICES

URANIUM CONVERSION AND ENRICHMENT

Separation and sublimation facilities provide uranium conversion and enrichment services for the nuclear fuel production

TVEL companies offer end-to-end uranium conversion and enrichment services. Natural or reprocessed uranium is first converted into uranium hexafluoride (UF₆), a compound easily turning into a gaseous state, which is then separated into uranium isotopes in the gas centrifuge process.

TVEL Group companies (Urals Electrochemical Plant, Siberian Chemical Plant, Angarsk Chemical Electrolysis Plant and Electrochemical Plant) manufacture uranium hexafluoride with a pre-defined U-235 content.



CORE PRODUCTS AND SERVICES

GAS CENTRIFUGES AND URANIUM ISOTOPE SEPARATORS

A gas centrifuge is a sophisticated device designed to obtain enriched uranium for nuclear reactors of power plants.



30 YEARS
CENTRIFUGE SERVICE LIFE



1,500 RPS
ROTATIONAL SPEED



0.1% PER YEAR
FAILURE RATE

COMPANY HISTORY

TVEL BIRTHDAY

12 September 1996

TVEL Open Joint Stock Company, a wholly state-owned company, was established by Presidential Decree No. 166 dated 8 February 1996 'On Improvement of Nuclear Fuel Cycle Management' to become a holding company of nuclear fuel cycle assets.

V.F. Konovalov
TVEL Founder and the first President



TVEL
WAS THE RIGHT
DECISION

2003

TVEL proved its extensive expertise and engineering qualification by repairing fuel cleaning equipment at Paks NPP (Hungary).

2006

Nuclear watershed
In his state-of-the-nation speech delivered on 10 May 2006, Russian President Vladimir Putin spoke on the need to reform the nuclear industry. "The Russian power industry needs a step forward to the next generation of safer nuclear reactors. We should strengthen Russia's position on the global nuclear engineering market by leveraging our expertise, cutting edge technologies and international cooperation." (Vladimir Putin)

2010

TVEL incorporated as Rosatom's Fuel Company. TVEL adopted Development Strategy 2020. R&D center established. TVS-2M fuel supply contract signed with Tianwan NPP. International bid succeeded to build a plant in Ukraine.

2011

TVEL's 15th anniversary. TVS Kvadrat fuel. Joint ALVEL R&D Center established in the Czech Republic. Successful test of fuel assemblies for floating nuclear plants. Joint Kazakh-Russian Uranium Enrichment Center established.

2007

Federal Law on Rosatom State Atomic Energy Corporation.

2007

Yuri Olenin appointed TVEL President. New Look program adopted. Fuel supply contract signed with Sizewell NPP. Fuel first shipped to Bushehr NPP.

2008

Introduction of Rosatom Production System (RPS) at TVEL companies. Strategic partnership with Slovenské elektrárne, a.s.

2009

Superconductors first produced in Russia. Fuel supply contract signed with India. Generation II fuel shipped to Paks NPP. Bid succeeded to supply fuel to Temelin NPP.



"OUR GOAL IS GLOBAL MARKET LEADERSHIP IN NUCLEAR TECHNOLOGIES."
Yuri A. Olenin, TVEL President

2012

Generation IX centrifuges put into operation. Breakthrough Project launched. The first contract concluded with ALVEL.

2013

Fuel supply contract signed with China. Completion of the Megatons to Megawatts Program. Zero Failure Memorandum. TVEL awarded for its ITER contribution.

2014

Expansion into Western markets with TVS Kvadrat project.

ROSATOM VALUES

AS A ROSATOM GROUP COMPANY, TVEL IS GUIDED BY CONSISTENT CORPORATE VALUES THAT HAVE BEEN EVOLVING THROUGHOUT THE RUSSIAN NUCLEAR HISTORY. IN LINE WITH THE GLOBAL BEST PRACTICES, ROSATOM VALUES LAY A FOUNDATION FOR THE NUCLEAR INDUSTRY ETHICS. WORK HAS BEEN ONGOING SINCE 2014 TO EMBED THE VALUES INTO TVEL'S CORPORATE CULTURE.

In 2014, Rosatom defined a uniform set of corporate values approved on 3 July 2014 by its Strategic Council.



ONE STEP AHEAD

We strive for global leadership. We are always one step ahead in technology, expertise and professional skills. We foresee tomorrow and ready for it today. We never stop developing and learning. Each day we work better than yesterday.



ACCOUNTABILITY

Each of us is accountable for personal performance to the nation, industry, colleagues and customers. We set stringent requirements on ourselves. It is the achievement that is valued, not effort spent. Success is a springboard for new achievements.



EFFECTIVENESS

We always find the best solutions for emerging challenges. We are effective in everything we do – we keep on improving processes and optimize resources to achieve our goals. There is no barrier to prevent us from offering the most effective solutions.



ROSATOM



ONE TEAM

We are all Rosatom. We have common goals. Teamwork yields unparalleled results. We are stronger together and can achieve the most ambitious goals. Personal success is success of the company.



RESPECT

We respect our customers, partners and suppliers. We are always attentive to each other regardless of our positions and working areas. We respect nuclear industry traditions and history. Historical achievements inspire us to excel in what we do.



SAFETY

Safety is our top priority. Our primary task is to protect human health and environment. Since safety is a serious matter, we know and obey safety rules and stop unsafe behavior.

TVEL FACTS AND STATISTICS

FUEL RODS FOR VVER-1000 REACTORS

A single fuel rod contains:



FUEL PELLETS

Total length of fuel pellets produced by Elemash and NCCP last year:



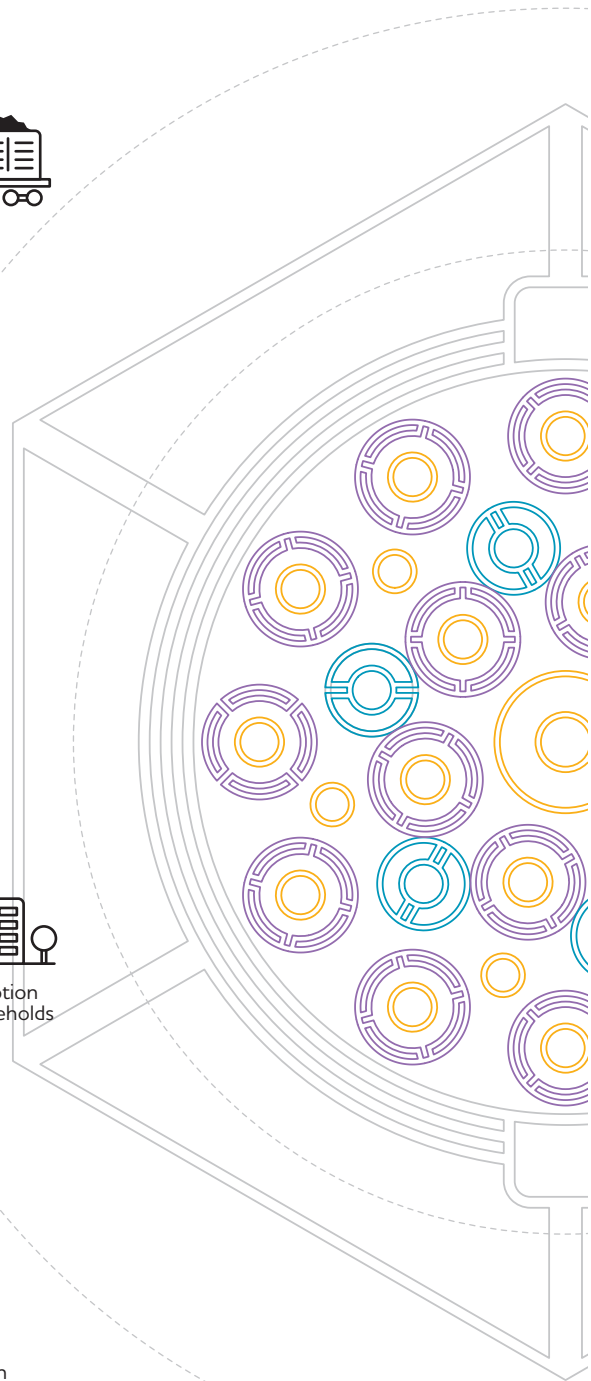
FUEL ASSEMBLIES FOR VVER-1000 REACTORS

A single fuel assembly generates:

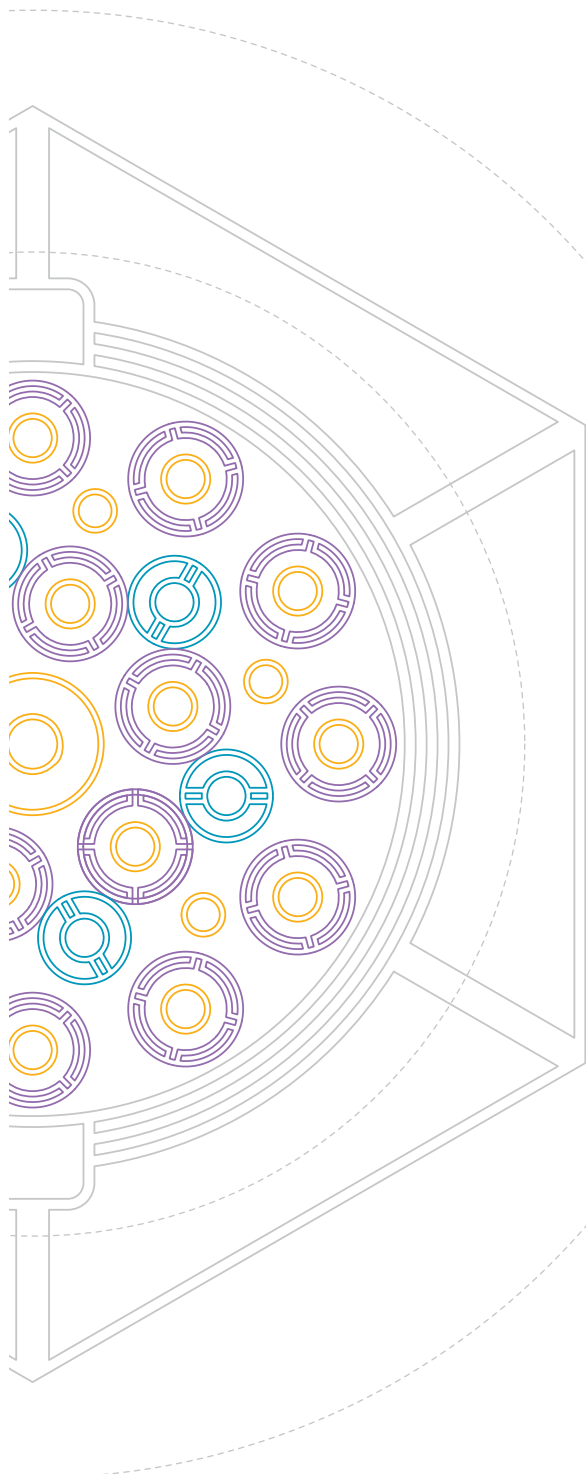


FUEL ASSEMBLIES FOR VVER-1000 REACTORS

Total height of fuel rod claddings in a single fuel assembly:

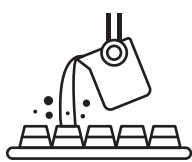


STICS



FUEL ASSEMBLIES FOR VVER-1000 REACTORS

Working temperature in the pellet core:



melting point of steel
and cast iron

~

1,300 °C
1,500 °C



TEMPERATURE

FUEL ASSEMBLIES FOR VVER-1000 REACTORS

Weight of a single fuel assembly:



Volkswagen Beetle
car with two passengers

~

760

kg



WEIGHT

SUPERCONDUCTING STRAND FOR ITER

Total length of superconducting strands
produced by Chepetsk Mechanical Plant for ITER:



enough to encircle
the Earth almost
1.5 times

~

56,000

km



LENGTH

NB₃SN STRAND

A superconducting strand with a 0.82 mm
diameter and a 0.53 sq mm cross-section
has 10,000 fibers:



a human head has
270 hairs per sq cm

~

1,9 MILLION
fibers/cub cm



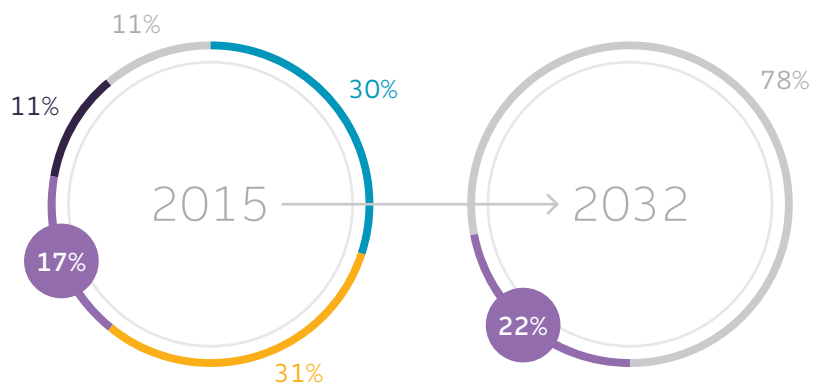
DENSITY

TVEL STRATEGIC GOALS

Nuclear fuel fabrication

Major producers:

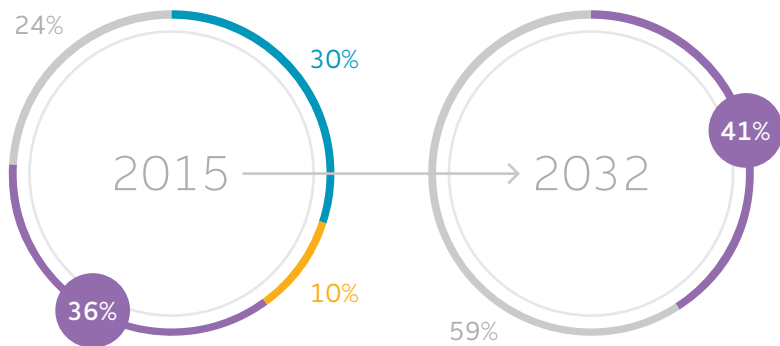
- Areva
- Westinghouse
- TVEL
- GNF
- Others



Uranium enrichment

Major producers:

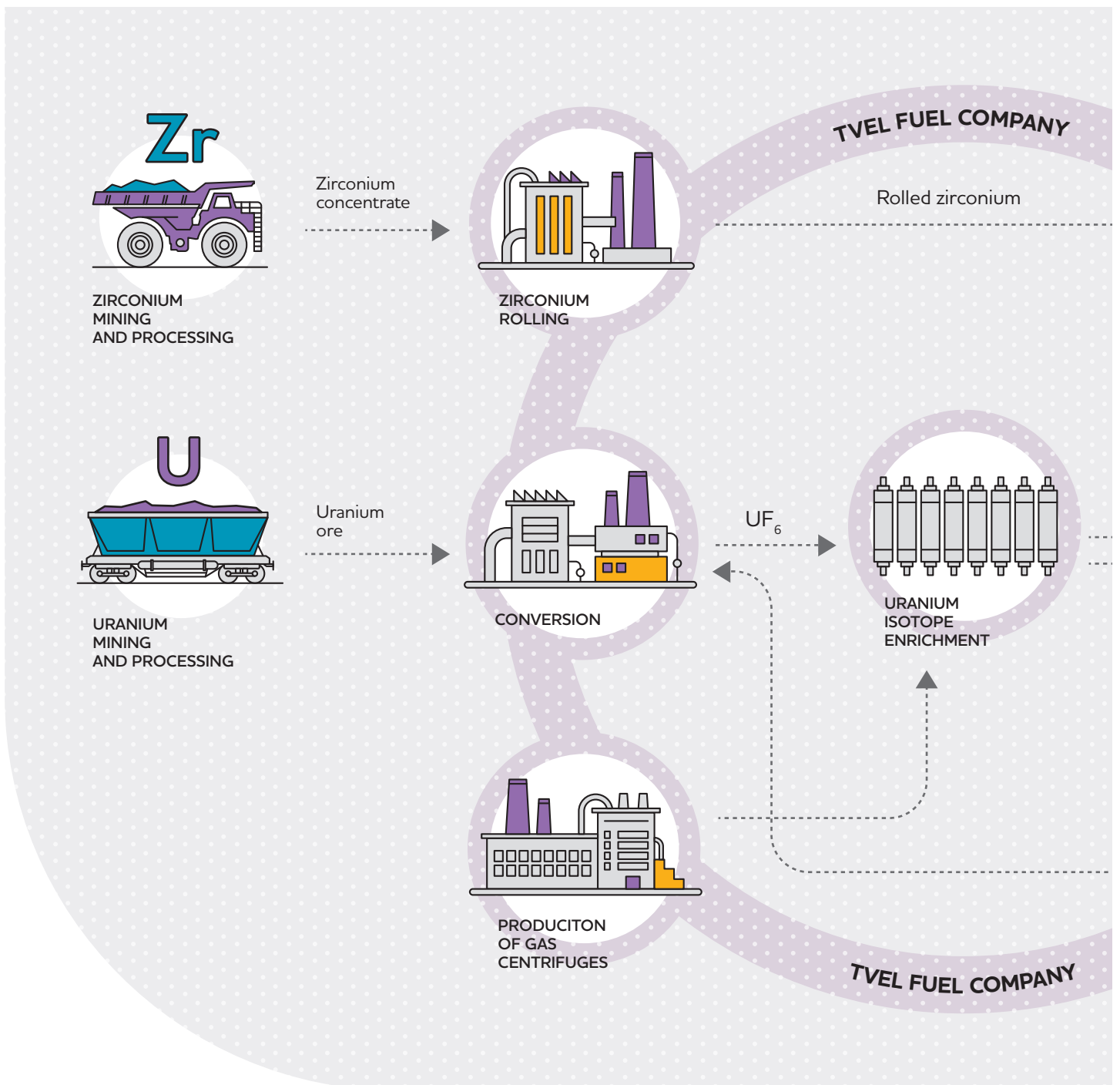
- Urenco
- Areva
- TVEL
- Others



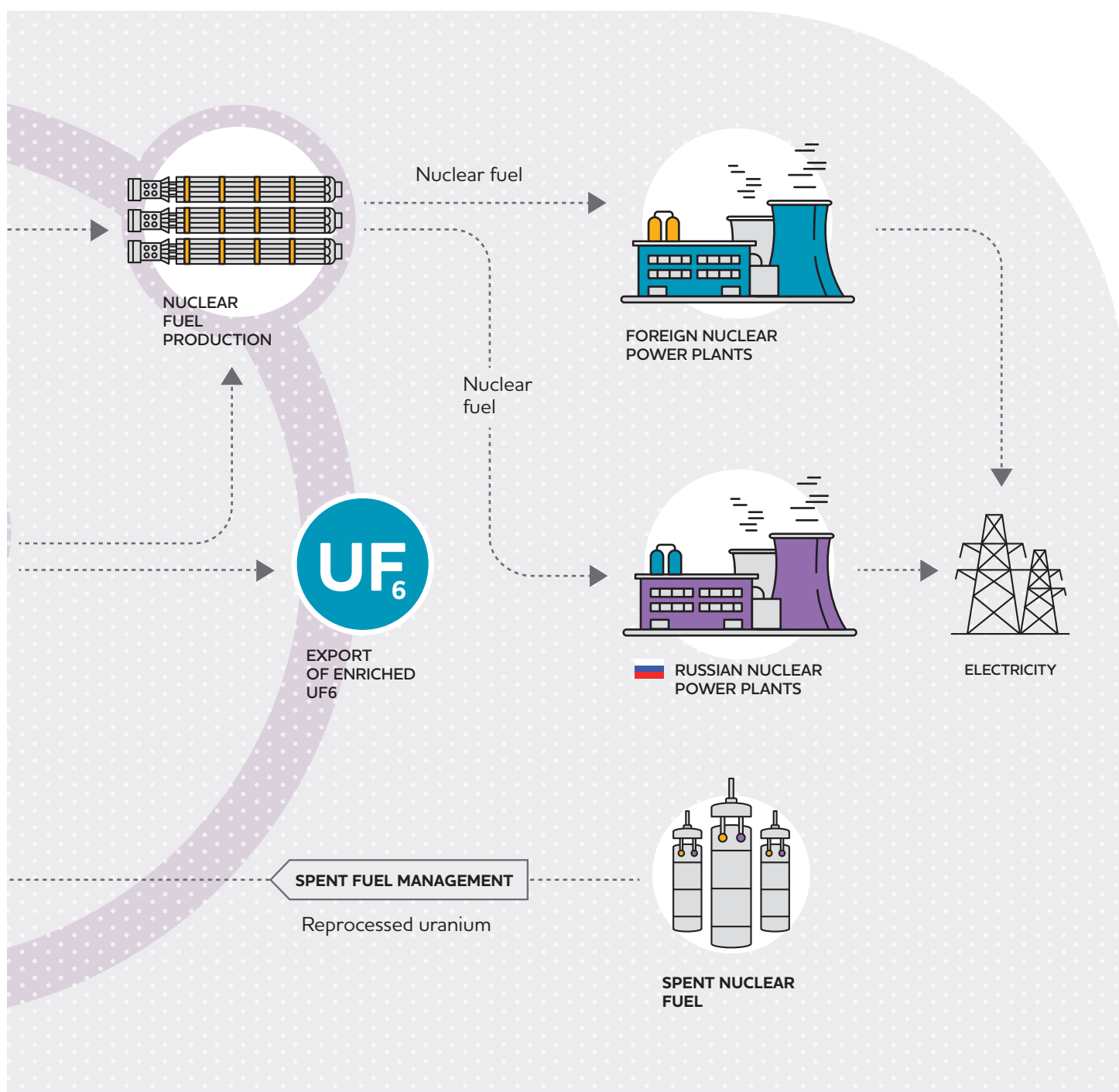
KEY PERFORMANCE INDICATORS

| Indicator | 2012 | 2013 | 2014 |
|--|---------|---------|---------|
| Net revenue from sales (less VAT, excise taxes and similar charges), RUB m | 121,958 | 131,436 | 137,962 |
| Gross profit, RUB m | 39,289 | 39,628 | 44,663 |
| Net profit, RUB m | 19,642 | 23,866 | 20,870 |
| Net assets, RUB m | 566,907 | 579,708 | 590,006 |
| EBITDA (earnings before interest, tax, depreciation and amortization), RUB m | 42,668 | 51,163 | 48,959 |
| Total gross taxes, RUB m | 23,419 | 27,695 | 25,774 |
| Operating environmental expenses, RUB m | 2,224 | 2,213 | 2,371 |

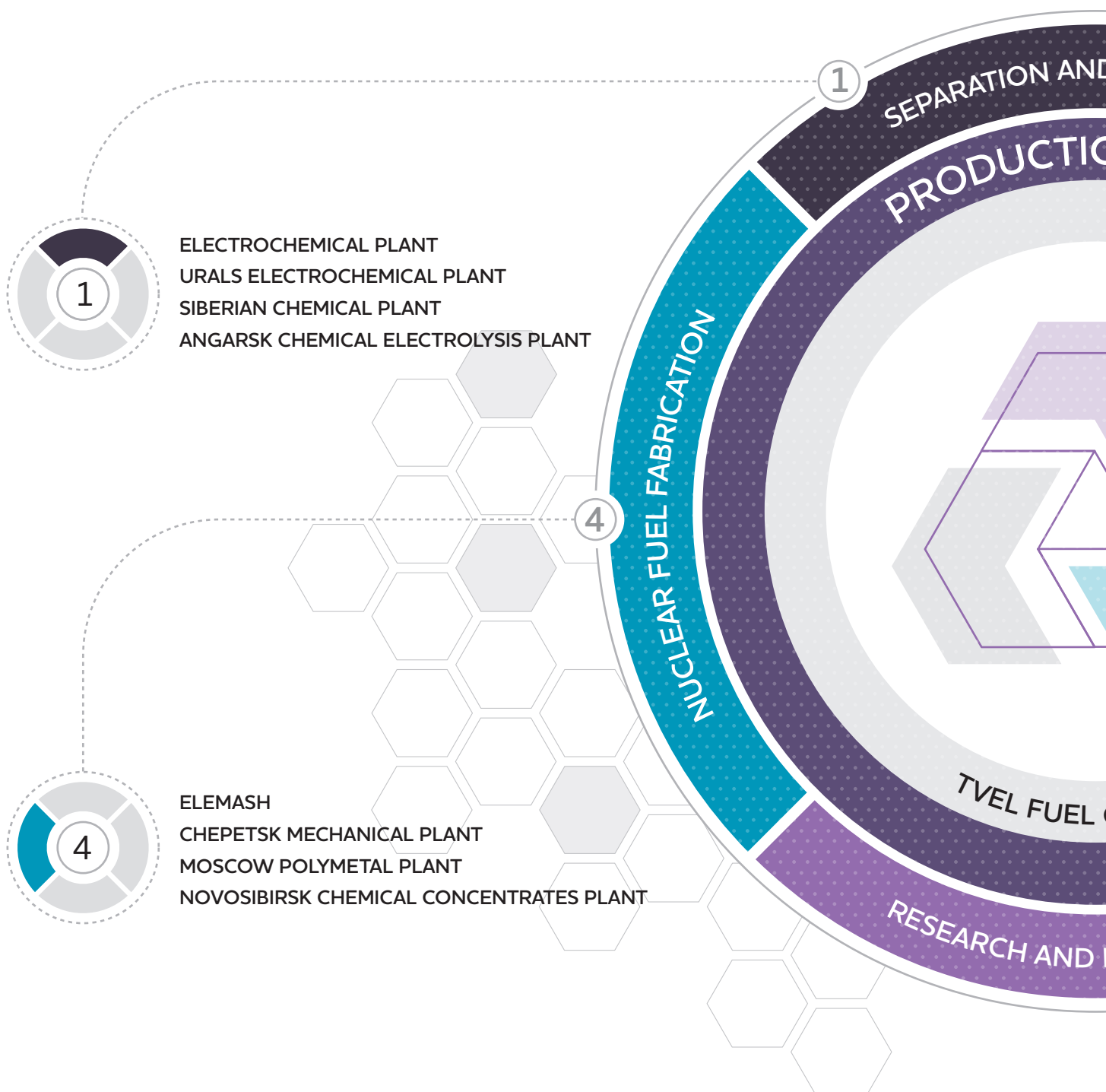
TVEL AS PART OF THE NUCLEAR FUEL

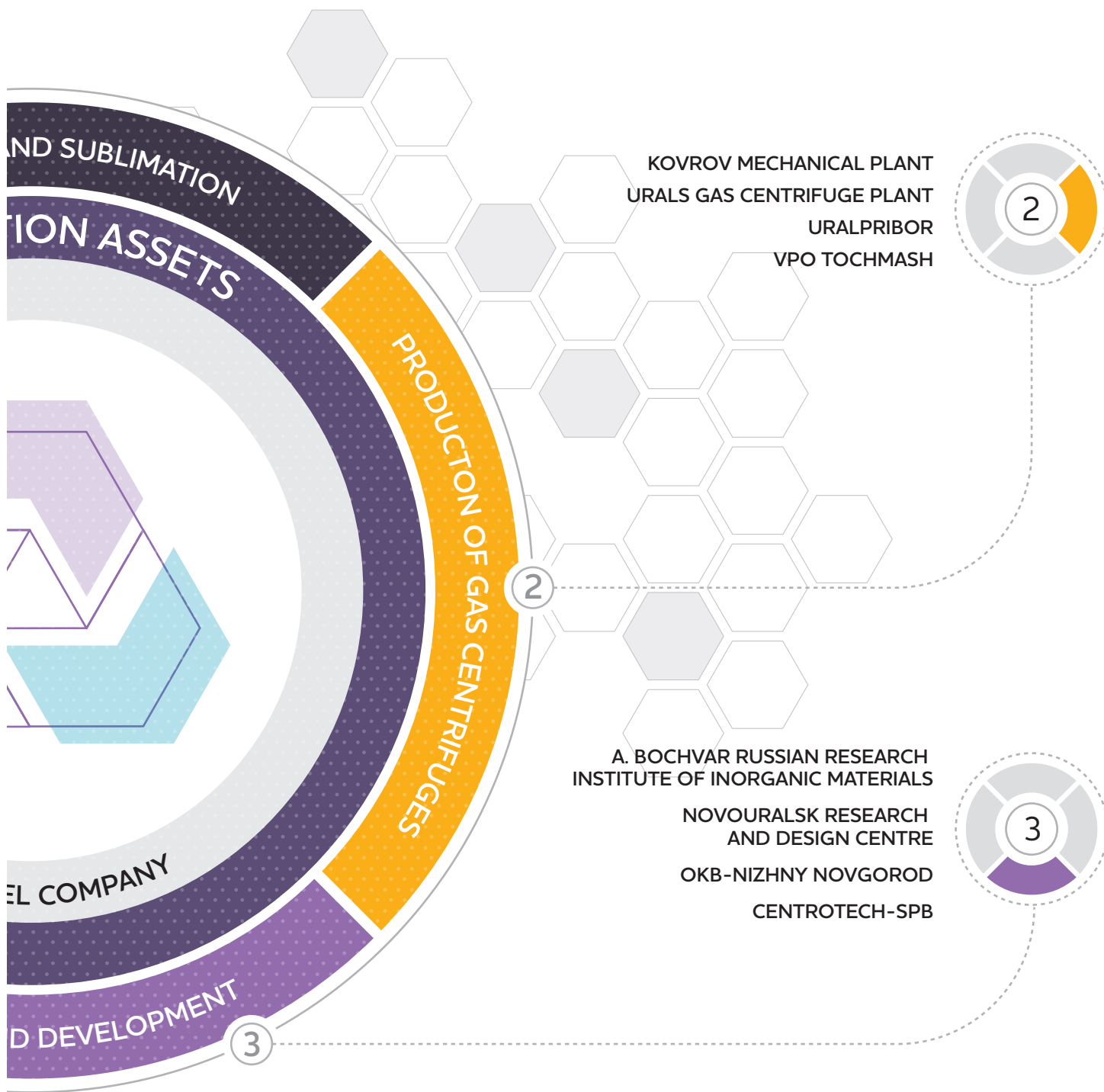


. CYCLE



TVEL STRUCTURE





SUPERCONDUCTORS: A STEP TOWARDS POWER OF THE FUTURE

As part of Russia's involvement in the ITER project, TVEL developed a superconductor manufacturing technology. Since 2009, superconductors have been produced at the Chepetsk Mechanical Plant.



Researchers at the Russian Research Institute of Inorganic Materials have developed a unique technology that solves a number of technical challenges. Protected by 18 patents, the technology offers practical solutions for the manufacturing process.

The entire production cycle is organized at the Chepetsk Mechanical Plant. The end-to-end process starts with the manufacturing of basic materials (niobium, niobium-titanium alloy and high-tin bronze) to finally produce superconducting strands, each less than 1 mm in diameter and having over 18,000 fibers (for Nb₃Sn strands).

ITER IS AN INTERNATIONAL RESEARCH PROJECT INTENDED TO PROVE THE VIABILITY OF CONTROLLED THERMONUCLEAR FUSION AS AN ENERGY SOURCE. THE FUSION REACTOR IS BASED ON THE RUSSIAN TOKAMAK CONCEPT. ITER PROJECT INVOLVES EU, USA, CHINA, JAPAN, INDIA, RUSSIA AND SOUTH KOREA

To expand applications of its superconductor technology, the Chepetsk Mechanical Plant continues the development of improved solutions to produce superconducting strands for computed tomography and magnetic particle accelerators, including for the Russian NICA project.

SUPERCONDUCTOR APPLICATIONS



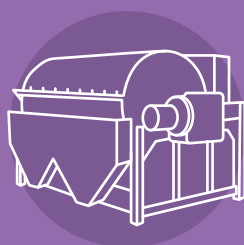
MEDICINE
NMR imagers



TRANSPORT
Vessels, air carriers
and trains (maglevs)



ENERGY
Superconducting
magnetic energy
storage (SMES)



INDUSTRY
Magnetic
separators



**CHEMISTRY
AND BIOLOGY**
NMR scanners



**EXPLORATION,
MINING AND
PROCESSING**



RESEARCH LABS
High field pulsed
magnets



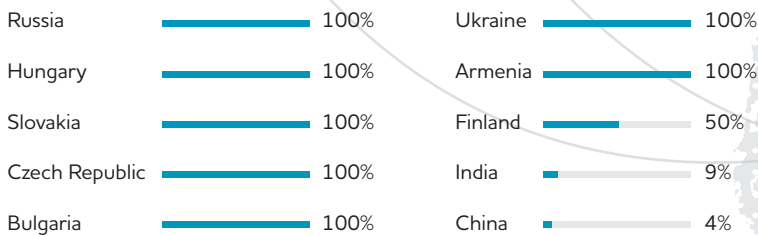
**TELECOMMUNICATION
SYSTEMS**

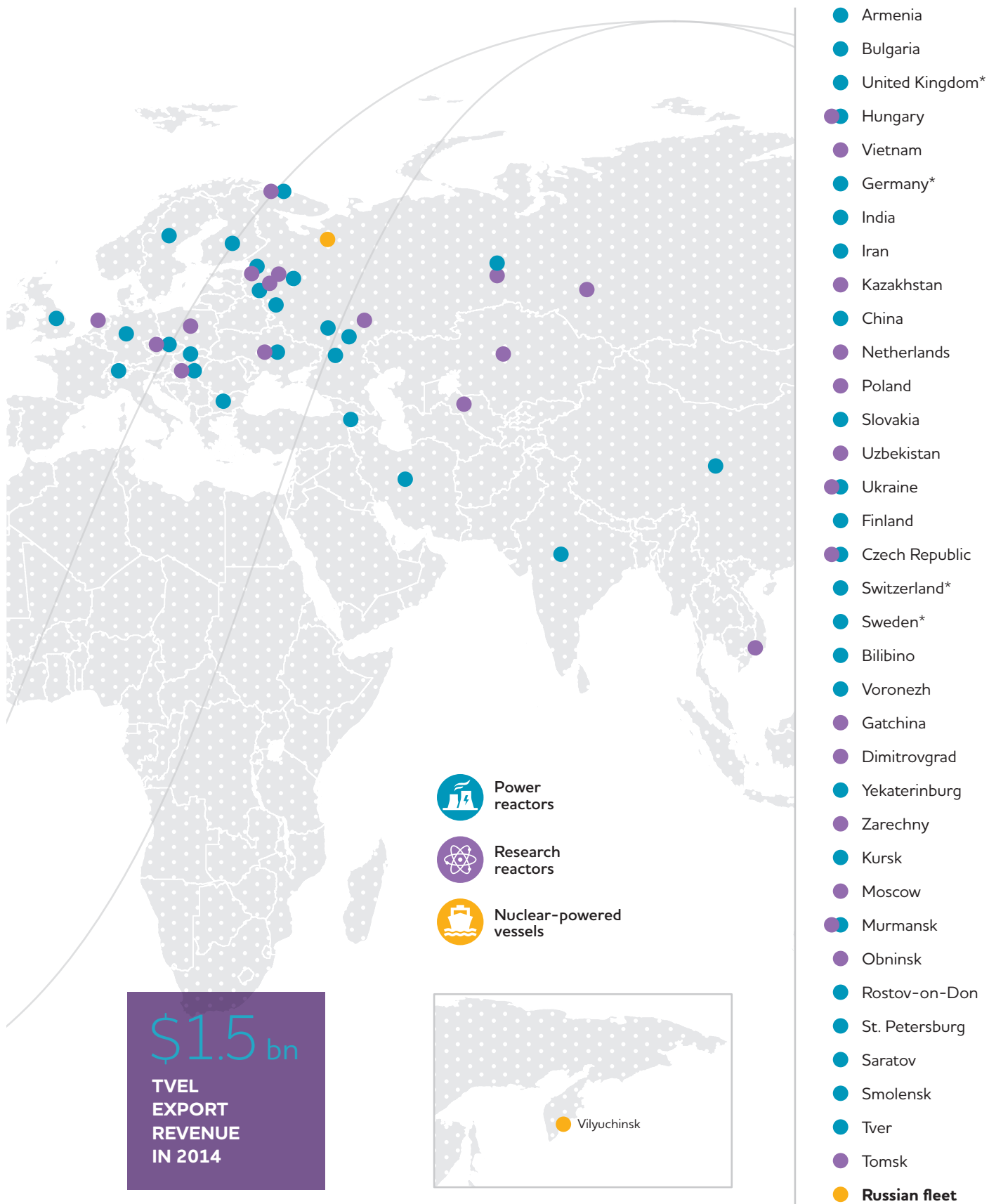
TVEL ON THE GLOBAL MARKET

YEAR 2014



NUCLEAR POWER PLANTS RUNNING ON RUSSIAN FUEL, %





INTERNATIONAL QUALITY, ENVIRONMENT, SAFETY AND ENERGY MANAGEMENT STANDARDS

Quality management in TVEL is based on the principles embedded in ISO 9000 family of standards. The company has adopted an integrated quality management system certified to ISO 9001:2008, ISO 14001:2004 and BS OHSAS 18001:2007 by TÜV International Certification.

Our quality management system covers design, development, production, storage, delivery and maintenance of fuel assemblies, reactor core components and materials.



**TVEL STRATEGIC PRIORITY IN
QUALITY MANAGEMENT IS
ONGOING IMPROVEMENT OF
PRODUCT QUALITY AND
CUSTOMER SATISFACTION
AS A WAY TO EXPAND MARKETS,
ENSURE SUSTAINABLE
DEVELOPMENT AND ACHIEVE
GLOBAL LEADERSHIP**

TVEL believes product quality is a foundation of safe and efficient performance.



ZERO FAILURE PROJECT

In 2012–2013, Rosenergoatom and TVEL's partners from the Czech Republic, Ukraine and Bulgaria signed memorandums of participation in the Zero Failure project.

The project aims at achieving the zero failure of nuclear fuel and improving safety of Russian nuclear products.

**EACH YEAR TVEL
CARRIES OUT
A CUSTOMER
SATISFACTION
SURVEY BASED
ON ISO 9001:2008
PROCEDURES AND
REQUIREMENTS**



ENVIRONMENTAL POLICY

Nuclear and radiation safety is our top priority in the field of environmental protection.

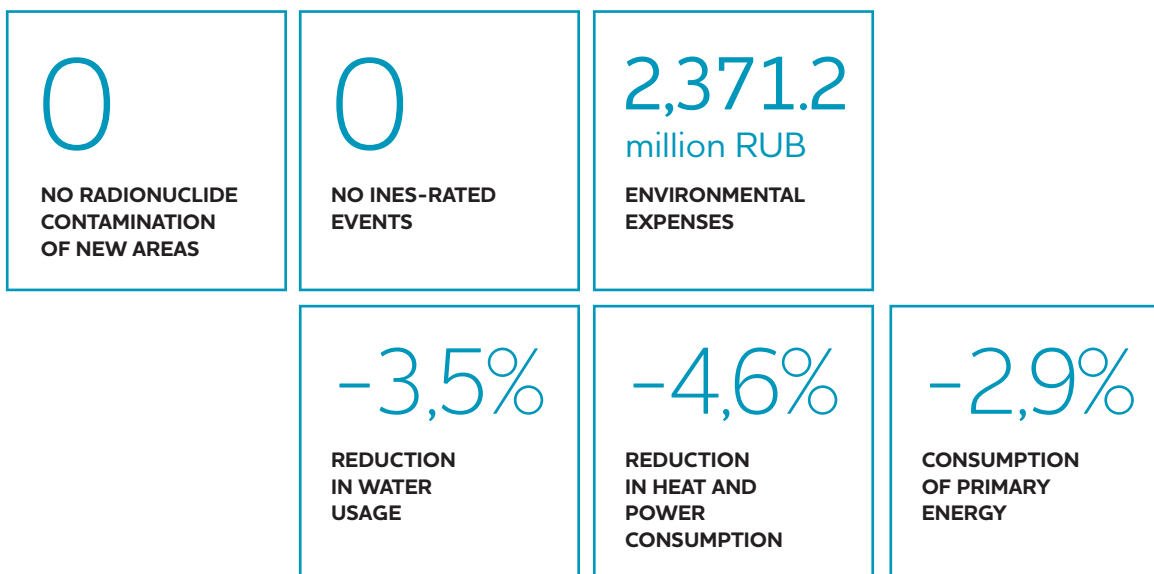
"We acknowledge that a set of production processes involving nuclear, radioactive and other hazardous materials should not affect the environment and human health.

Our strategic goals are environmental safety, sustainable development and mitigation of negative effects caused by production processes and nuclear products on the environment."

From TVEL Environmental Policy



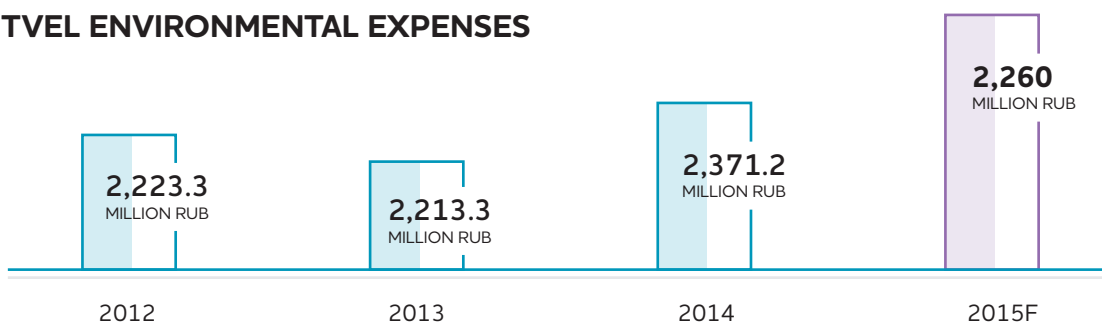
ENVIRONMENTAL PERFORMANCE 2014



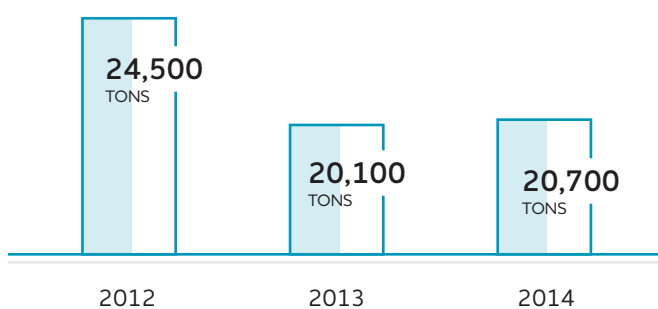
AREAS OF FOCUS

- Nuclear legacy management
- Nuclear decommissioning and return to greenfield status
- Mitigation of negative environmental effects
- Development of environmental management systems
- Adoption of sustainable technologies
- Environmental monitoring
- Nature conservation

TVEL ENVIRONMENTAL EXPENSES



TOTAL POLLUTANT EMISSIONS BY TVEL COMPANIES



** Companies with large co-generation plants account for most emissions.



TVEL'S NEW BUSINESSES

METALLURGY



- Special metallurgy (hafnium and calcium)
- Special rolled pipes (titanium and stainless steel)
- Nanometallurgy (high-temperature superconductors)
- Hydrometallurgy (nickel products and rare earth metals)

ENGINEERING



- Special products
- Instrumentation (smart meters)
- Nuclear fuel cycle equipment (NPP, ISFSI)
- Precision mechanics, etc.

POWER TECHNOLOGIES



- Lithium-ion batteries, materials and components, LI energy storage systems
- Hydrogen economy

CHEMICAL TECHNOLOGIES



- Fluorine compounds
- Isotopes
- Zeolite catalysts
- Automotive and industrial catalysts



RESEARCH AND DEVELOPMENT

REVENUE FROM SALES
OF NON-NUCLEAR INNOVATIVE PRODUCTS4,054
million RUB

2012

4,819
million RUB

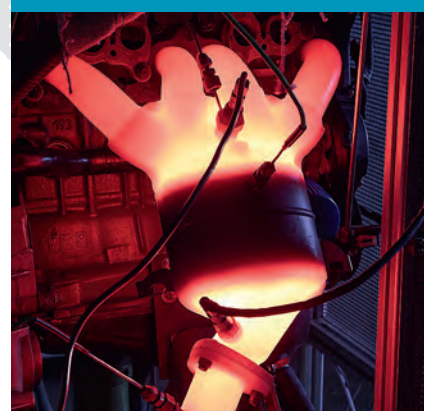
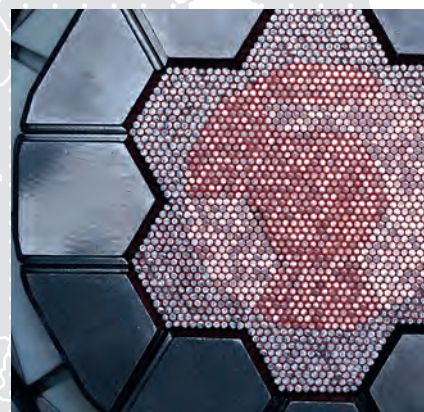
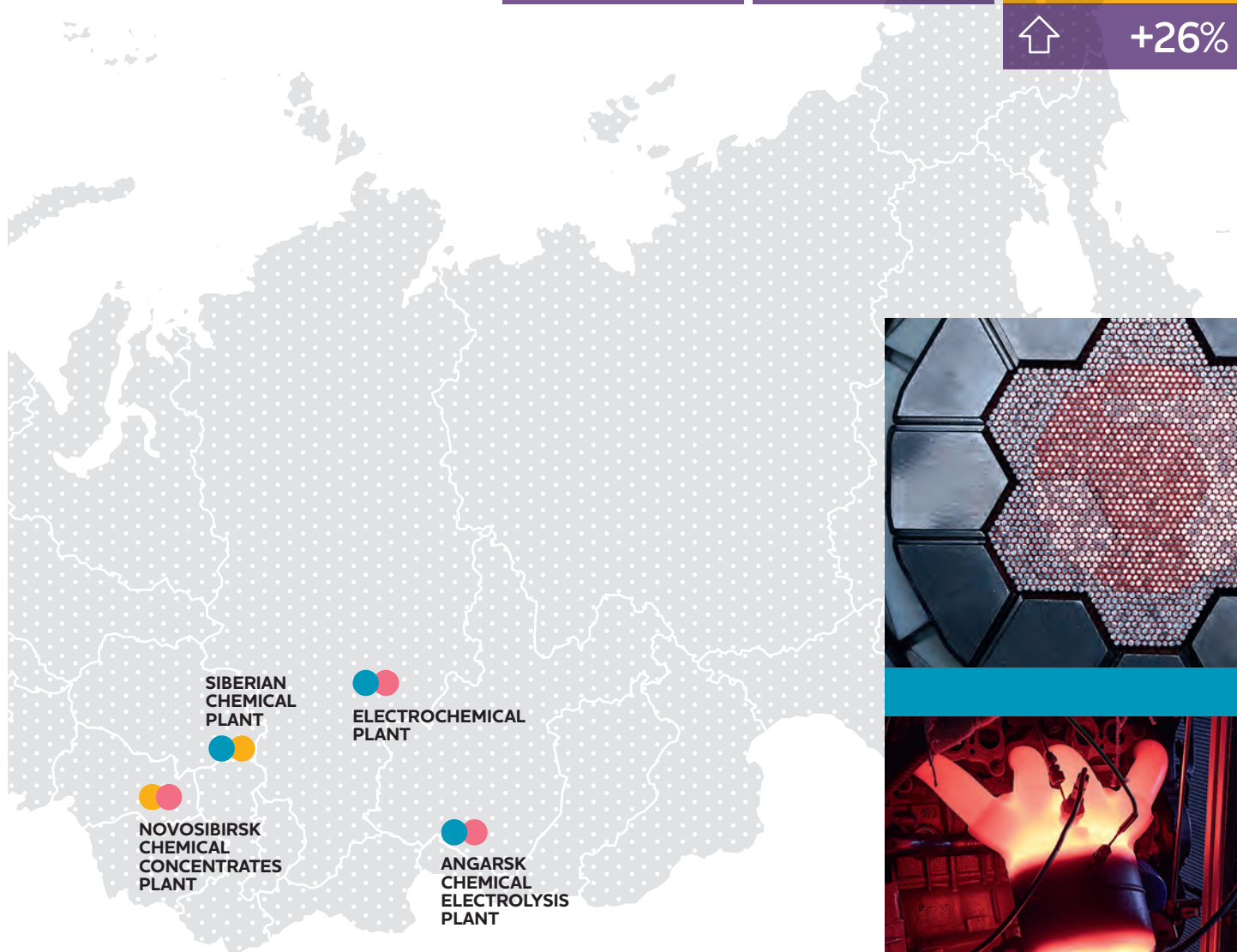
2013

6,059
million RUB

2014



+26%



HUMAN CAPITAL MANAGEMENT



HR POLICY

Cooperation with educational institutions is a part of a broader program covering employer brand promotion and talent acquisition. The program is updated on an annual basis and provides for career guidance events, workplace visits for students, meetings with employees, and other student activities (the First Step into Nuclear Project game and the Mental Energy science festival).

Areas of cooperation with vocational and higher educational institutions:

1. Long-term talent planning for 2014–2021.
2. Raising student awareness around professional development opportunities at TVEL Fuel Company and promotion of TVEL and Rosatom as reliable employers.
3. Workplace training programs and internships at TVEL.
4. Joint training programs between:
 - National Nuclear Research University (MEPhI), D. Mendeleev University of Chemical Technology, Moscow State University of Fine Chemical Technologies and A. Bochvar Russian Research Institute of Inorganic Materials;
 - Stoletovs Vladimir State University (Engineering Department) and VPO Tochmash (since 2014);
 - Seversk Technology Institute (Radiochemical Department) of the National Nuclear Research University and the Siberian Chemical Plant (since 2014).
5. Talent competitions (TeMP Contest of Young Professionals and Career Days).

23%

EMPLOYEES
BELOW 35 YEARS
OF AGE

RECRUITMENT
OF YOUNG TALENTS
IS A TOP PRIORITY OF
OUR HR POLICY

In 2014, **746 students** did an internship at TVEL Group companies, with further **687 interns** expected in 2015.

MILESTONES AND HIGHLIGHTS 2014

Hungarian MVM Paks II and TVEL signed an offtake contract to supply fuel for two Paks NPP units now under construction.

Four TVS-Kvadrat assemblies were loaded into a European pressurized water reactor as part of the pilot operation stage.

TVEL and Kozloduy NPP signed a contract to develop an improved nuclear fuel cycle with 3,120 MW Generation II fuel for Units 5 and 6 and carry out a safety assessment.

TVEL and Dukovany NPP signed a contract to supply RS-E grade fuel starting from 2015.

TVEL and Slovakia signed a nuclear fuel supply contract for 2016–2021.

Following the arrangements between TVEL and JNPC to supply TVS-2M Generation II fuel, Tianwan NPP Unit One has been operating in the extended 18-month fuel cycle since February 2014.

The joint Kazakh-Russian Uranium Enrichment Centre reached its rated annual capacity of 5 million SWU.

Breakthrough Project: TVEL received regulatory approval of its project to construct a MNUP fabrication facility. Rosatom signed off construction documents.

As part of the Breakthrough Project, the Siberian Chemical Plant produced a pilot batch of MNUP fuel assemblies to be tested in BN-600 reactor and justify the feasibility of fuel for BREST-OD-300 and BN-1200 reactors.

Uranium conversion processes consolidated at the Siberian Chemical Plant.

TVEL completed deliveries of NbTi and Nb₃Sn superconducting strands for the ITER magnet system.

Chepetsk Mechanical Plant adopted a sophisticated titanium processing technology, and launched production of calcium cored wire.

FOR NOTES

Lined area for taking notes, consisting of multiple horizontal lines.



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Angarsk Electrolysis Chemical Plant

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Siberian Chemical Plant

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VPO Tochmash

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Centrotech-SPb

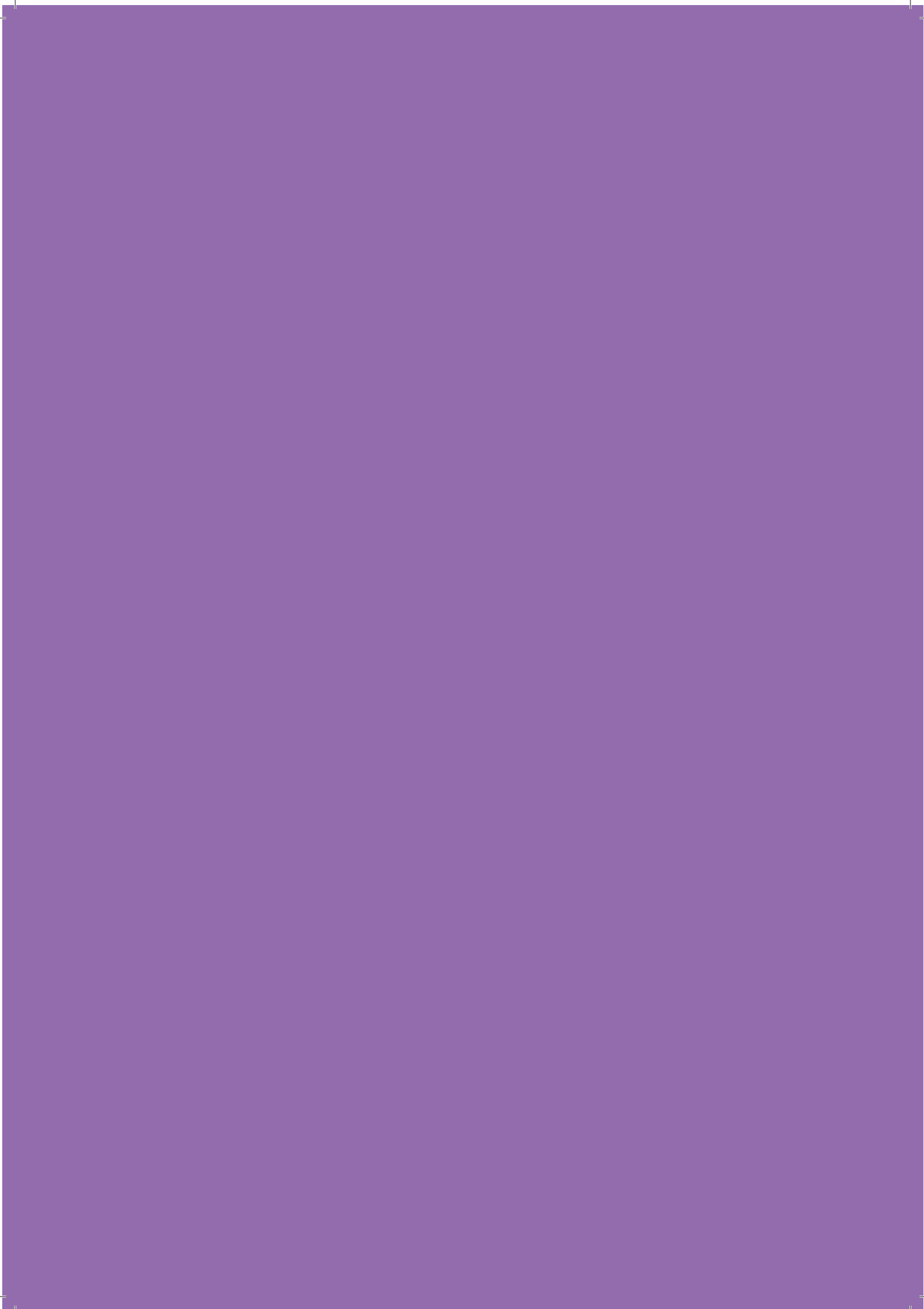
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