



**URALS
ELECTROCHEMICAL
PLANT**

ASC «ROSATOM» COMPANY

UECP JSC ENVIRONMENTAL SAFETY REPORT

2019

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Foreword

Public Environmental Safety Report 2019 is the twelfth annual environmental report prepared on a voluntary basis by Urals Electrochemical Plant Joint Stock Company and addressed to the wide range of the concerned parties. The report contains data on UECP JSC environmental activities, environmental safety and environmental impact.

One of the Company key tasks remaining constant for many years is to ensure the parity between the economic and environmental values. Practically it is ensured by the implementation of corporate programs focused on technical upgrade, modernization and energy saving. In particular, UECP JSC management understands the need for keeping a balance between strategic objectives of corporate business development and environmental protection being of critical importance for life and health of present and future generations.



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In 1945 the USSR Soviet of People's Commissars took the decision to start the construction of gas diffusion plant in Sverdlovsk-44 located in Sverdlovsk region. The Plant was designed for producing highly enriched uranium (HEU) under the Soviet nuclear weapons program. In 1949 Urals Electrochemical Plant was put in operation. It was the first in the USSR industrial company providing commercial uranium isotope separation using gas diffusion method. To meet the needs of nuclear power industry (reactors, offshore power plants, research reactors and nuclear power plant reactors) the production of low enriched uranium (LEU) started in 1954.

In 1962 the first in the world centrifuge uranium enrichment plant was commissioned, being an important step towards increasing efficiency of UECP enrichment production. UECP experts and qualified personnel contributed to development and provided the advanced level of enrichment production. In 1966 the plant reconstruction program started, and by 1988 the gas diffusion equipment was completely replaced by the centrifuges. It made possible to reduce the power consumption of separation production by a factor of 10 resulting in twofold or threefold increase of enrichment capacity.

In the early seventies UECP entered the international market and since then, it has exported low enriched uranium to the companies in France, Germany, Belgium, England, the USA, South Korea, Sweden, Spain, Finland, Switzerland, Italy, Argentina. In 1989 UECP ceased the generation of weapon-grade uranium. Pursuant to intergovernmental agreements on reduction of nuclear weapons UECP initiated HEU conversion into fuel for nuclear power plants in 1995. For this purpose UECP developed and introduced the special HEU-LEU technology.

On August 15, 2008 Federal State-owned Unitary Enterprise Ural Electrochemical Integrated Plant was reorganized into Joint-Stock Company Ural Electrochemical Integrated Plant.

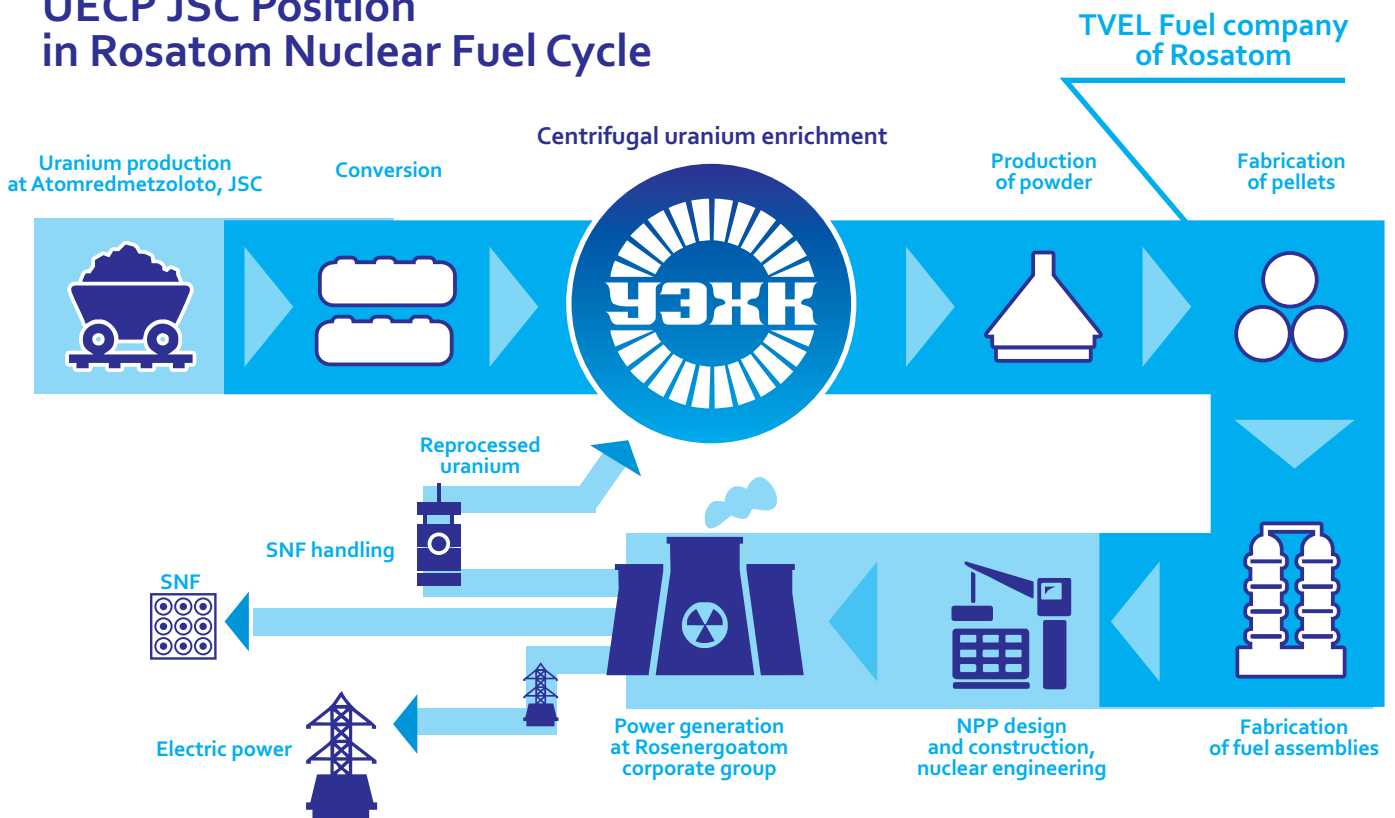
An important milestone became UECP incorporation into ROSATOM TVEL Fuel Company in 2010. TVEL Fuel Company comprises separation-sublimation combine, gas centrifuge production, fabrication of nuclear fuel and research & development cluster. It enabled further effective development of the Company, its production facilities, infrastructure and human resources.

As from 2015 in accordance with the Russian Federation law the full commercial name of the Company is Urals Electrochemical Plant Joint-Stock Company (UECP JSC).

UECP JSC is located in the industrial area of Novouralsk city in Sverdlovsk region, 80 km north-west of Yekaterinburg. Two settlements share borders with the Company: Novouralsk city (about 81 000 residents) and Verkh-Neivinsky settlement (about 5 000 residents).

UECP JSC is one of the key players in the Russian nuclear fuel cycle, holding intermediate position between uranium mining and fuel fabrication for nuclear reactors.

UECP JSC Position in Rosatom Nuclear Fuel Cycle



At present UECP JSC is the largest uranium enrichment company not only in Russia, but also in the world. The Company enrichment production applies highly effective and reliable gas centrifuge technology. The following companies represent enrichment production of Russia and apply the same technology:

- Electrochemical Plant, Joint-Stock Company, (ECP), Zelenogorsk, Krasnoyarsk region
- Siberian Chemical Plant, Joint-Stock Company, (SCP), Seversk, Tomsk region
- Joint-Stock Company Angarsk Electrolysis Chemical Plant (AECF) Angarsk, Irkutsk region.

Natural uranium consists of three radioactive isotopes:



The majority of nuclear power reactors run on uranium fuel enriched in U-235. The Russian enriched uranium export contributes to balancing global energy mix and is of the same importance as the Russian gas and oil export.

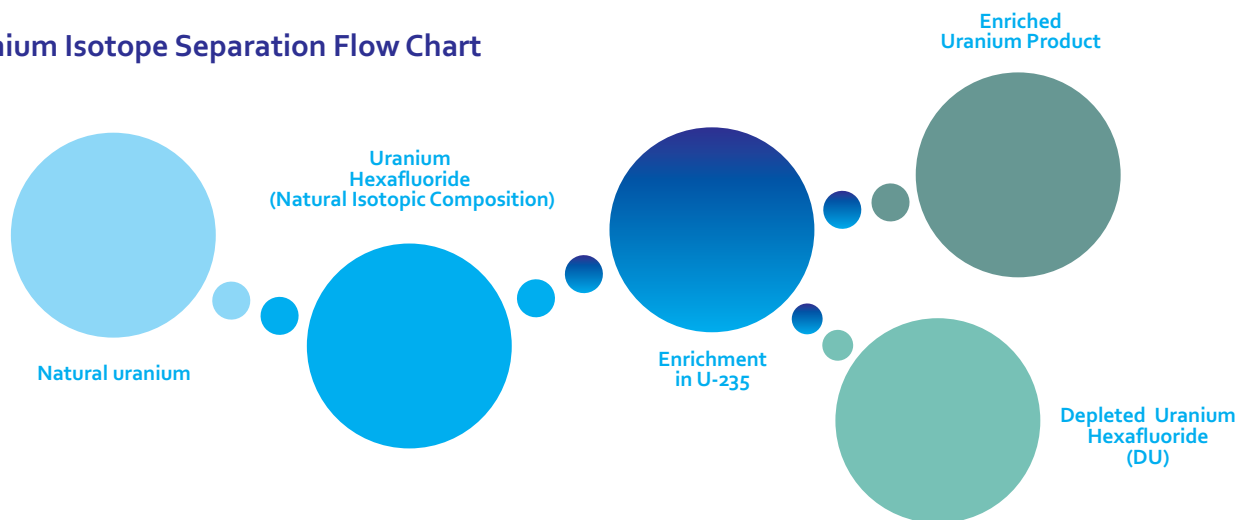
The key element of UECP JSC structure is the production cluster consisting of process shops 53, 54, 87, and directly associated subdivisions: analytical center (department 16), chemical metallurgical shop (shop 70), machinery revision shop (shop 19) and special product storage, transportation and control department (department 7). The gas centrifuge cascades are located in shops 53, 54, 87. "Chelnok" facility located in shop 54 is used for transfer of uranium hexafluoride of required U-235 assay into the cylinders of foreign customers.

Enrichment production waste processing (extraction, precipitation, vessel washing, U₃O₈ fluorination, solid radioactive waste conditioning, metal waste preparation), operation of process pulp filtration unit, preparation of solid radioactive waste delivery to State Unitary Enterprise "National operator for radioactive waste management" (SUE NO RWM) are performed in the chemical metallurgical shop. Equipment decontamination and process equipment repair are conducted in the machinery revision shop.

Analytical center performs analytical procedures and produces uranium isotopic and chemical composition certified reference materials.

Special product storage, transportation and control department ensures nuclear material storage and transportation and performs some operations related to nuclear material control and accounting.

Uranium Isotope Separation Flow Chart



The natural uranium is converted into uranium hexafluoride for the purpose of enrichment.

Enriched uranium product (EUP) and depleted uranium hexafluoride (DU) are resulted from the enrichment process.

EUP is delivered to the customer, and DU is transferred for storage and further processing.

Environmental management is a part of corporate governance system with well-defined organizational structure, and is aimed to achieve the environmental policy objectives by means of implementing environmental programs.

Environmental management concept is based on sustainable development. In 1992 in Rio de Janeiro the summit of state heads was held. It was devoted to sustainable development of human society and nature, and adopted Agenda 21 with general provisions of the new concept being suggested to all countries of the world. The summit concluded that environmental management shall be treated as the key dominant of sustainable development and the highest priority for industrial operations and business.

In 1993 in the course of the Uruguay Round negotiations devoted to establishment of the World Trade Organization, it was decided to introduce the new environmental international standards. International Standardization Organization (ISO) issued ISO 14000 standards specifying the concept of environmental management system.

One of the key parameters of the Company sustainable development is the effectiveness of Quality management system (QMS) that covers the whole life cycle of the products from development to implementation, and ensures faultless operation of all production process chains. UCEP JSC QMS is being constantly improved: from zero-defect production, complex quality control system to QMS implementation, certification and performance since 2004 according to ISO 9001.



STRATEGIC GOAL

Ensuring safe and sustainable development, minimization of environmental impact

UECP JSC management system is certified against the following standards

- ISO 9001:2015
- ISO 14001:2015
- ISO 50001:2011
- BS OHSAS 18001:2007

as part of Rosatom TVEL Fuel company integrated management system

The technology of enriched uranium transfer into the transport cylinders of international customers was finalized in 1973.

Over the whole period of export activities the Company received no claims related to the supplied products quality.

UECP JSC ensured introduction and successful operation of Environmental management system (EMS). Comprehensive certification audit for compliance with ISO 9001 and ISO 14001 was conducted at UECP JSC in 2010. The audit conducted in UECP JSC subdivisions resulted in issuing the Certificate of conformity which proved the compliance of UECP JSC production organization with QMS and EMS requirements. In 2011-2012 the Company was audited for conformity to ISO 9001 and ISO 14001 international standards. The audit results proved the conformity of UECP JSC QMS to the issued TUV CERT certificate. In July 2012 UECP JSC Environmental management system was successfully audited by “Vattenfall Nuclear Fuel AB”, Sweden..



Comprehensive certification audit was conducted at UECP JSC in July 2013. The audit confirmed the compliance of QMS performance with the issued Certificate of conformity. In October 2013 UECP JSC was audited in the framework of JSC TVEL Integrated management system under the requirements of three international standards: ISO 9001(Quality management system), ISO 14001 (Environmental management system) and OHSAS 18001 (Occupational health & Safety assessment system). In 2013 UECP JSC Environmental management system was also successfully audited by the Swedish company «Vattenfall Nuclear Fuel AB». The audit results convinced the Swedish customers of UECP JSC being a reliable and safe business partner.

In 2014 JSC TVEL Integrated management system was traditionally successfully audited. Besides, in 2014 UECP JSC was given Certificate of QMS conformity to ISO 50001 (Energy management system). In 2015-2017 the audits for compliance with four standards: ISO 9001, ISO 14001, OHSAS 18001, ISO 50001 were conducted. Furthermore, in 2015 UECP JSC Integrated Management System was successfully audited by the representatives of Emirates Nuclear Energy Corp. (ENEC) from United Arab Emirates.

In 2016 the witness audit was conducted for compliance with four standards: ISO 9001, ISO 14001, OHSAS 18001, ISO 50001.



In 2017 the witness audit was conducted for compliance with four standards: ISO 9001, ISO 14001, OHSAS 18001, ISO 50001.

In 2017 UECP JSC was included into TVEL JSC pilot project for transfer to new versions of ISO 14001:2015 standards. Within the framework of TVEL JSC pilot project for transfer to new versions of standards the following documents were developed:

- Register of risks and opportunities of UECP JSC Corporate Environmental Management System
- External and internal issues as related to UECP JSC QMS and EMS
- External and internal interested parties as related to UECP JSC EMS.
- Identification of environmental aspects and risks by new procedure was conducted.

In 2018 and 2019 Corporate Integrated Management System of UECP JSC as part of TVEL JSC was audited by TUV CERT. UECP JSC experts performed management system audits in Company subdivisions, subsidiaries and affiliates, companies–suppliers of services/products.

In 2019 UECP JSC Management System was successfully audited by the foreign customer (Vattenfall Nuclear Fuel AB, Sweden) in order to determine the degree of the Company compliance with requirements of ISO 9001:2015, ISO 14001:2015, OHSAS 18001/ISO 45001:2018, corporate social responsibility. In 2019 UECP JSC facility providing complex service and recertification of 30B/48Y cylinders (Cylinder Service Center) was also successfully audited by foreign customer (CONVERDYN, USA) in order to determine the degree of the its compliance with requirements of normative documents ASME NQA-1-2008, US NRC CFR as part of existing international contract between TENEX JSC and CONVERDYN.

Early in 2020 TKB Intercertifika LLC adviser conducted a diagnostic audit of UECP JSC Management System for conformity with requirements of GOST P 53663-2009 (ISO 28 000:2005) "Supply chain safety management System" to determine the scope of necessary revision of management system procedures and documents for subsequent certification in compliance with ISO 28 000:2005.

Management system audits in UECP JSC subdivisions, subsidiaries and affiliates, companies–suppliers of services/products were conducted as per schedule. 27 internal audits were held in 2017

Therefore, at present UECP JSC Integrated management system includes:

- Environmental management system aimed to improve procedures that ensure environmental safety
- Quality management system aimed to improve procedures that ensure high quality of released products
- Occupational health & safety management system established for the Company employees
- Energy management system aimed to improve procedures that ensure energy saving and conservation of natural resources.

Integrated management system was introduced and operates in all UECP JSC subdivisions providing quality and operational safety at all stages of production.

Constant mitigation of environmental and social impact is the key priority of UECP JSC environmental policy. When planning its activities, the Company takes into consideration the interconnection of environmental and production issues. UECP JSC employees are aware of their responsibility for ecological implications of production process and strive for decreasing the man-made impact on the environment.

In pursuance of ROSATOM State Corporation environmental policy UECP JSC management adheres to the following key principles:

- presumption of potential environmental hazard in planning and carrying out activities
- permanent readiness of UECP JSC management and personnel to prevent and mitigate emergency situations and other accidents
- coincidence of environmental, economic and social concerns of UECP JSC and population, non-governmental organizations, governmental authorities and local authorities for the purpose of sustainable development and promotion of favorable environment and ecological safety
- ensuring high environmental performance, mitigation of UECP JSC impact on the environment and natural resources at reasonable costs
- transparency and availability of the information related UECP JSC operations in the field of environmental protection and ecological safety.

UECP JSC main tasks in the field of environmental protection and ecological safety:

- meet the requirements of international, federal and regional legislation, rules and guidelines in the area of radiation and nuclear safety, environmental protection, sanitary-and-epidemiological well-being of population, protect population in natural and man-made emergency situations, and other commitments undertaken by UECP JSC
- develop the natural environment and radiation control and monitoring systems using advanced automatic equipment and software
- improve the resource and energy efficiency of production
- ensure decommissioning of UECP JSC nuclear facilities being out-of-service
- reduce the volume of radioactive and hazardous industrial waste
- regularly inform UECP JSC personnel, citizens and other concerned parties of environmental and radiation situation and UECP JSC environmental impact
- continuously improve the integrated management system as required by ISO 9001, ISO 14001, OHSAS 18001, ISO 50001, IAEA GSR Part 2, IAEA GS-G-3.1.

The first UECP JSC environmental policy was introduced on April 22, 2008 by UECP JSC General Director order. The Company environmental policy was annually revised and updated.

The current revision of UECP JSC environmental policy was introduced on January 10, 2019 by UECP JSC General Director order and was approved by ROSATOM State Corporation and TVEL JSC. The Company environmental policy is available in mass media and at UECP JSC web-site.



- Constitution of the Russian Federation
- Federal Law on Environmental Protection No 7-FZ of January 10, 2002
- Federal Law on Ecological Assessment No 174-FZ of November 23, 1995
- Federal Law on Ambient Air Protection No 96-FZ of May 4, 1999
- Water Code of the Russian Federation No 74-FZ of June 3, 2006
- Federal Law on Production and Consumption Waste No 89-FZ of June 24, 1998
- Federal Law on Sanitary and Epidemiological Well-being of Population No 52-FZ of March 30, 1999
- Federal Law on Radiation Safety of Population No 3-FZ of January 9, 1996
- Federal Law on Nuclear Energy Use No 170-FZ of November 21, 1995
- Federal Law on Radioactive Waste Management and Amendments to Certain Legislative Acts of the Russian Federation No 190-Z of July 11, 2011
- Federal Law on Underground Resources No 2395-1 of February 21, 1992
- Sanitary Rules SP 2.6.1.2523-09 of July 7, 2009 «NRB-99/2009 Radiation Safety Standards»
- Sanitary Rules SP 2.6.1.2612-10 of April 26, 2010 «Basic Sanitary Rules for Radiation Safety» (OSPORB-99/2010)

Furthermore, the Company activities in the field of radiation, nuclear and environmental safety are regulated by the Russian Federation governmental rules, statutory standards, sanitary rules, norms, guidelines and other regulatory documents, issued by the government of the Russian Federation, ministries, departments, state regulatory authorities within the scope of their competence.

The list of the Company main authorization documents in the field of environmental protection

UECP JSC obtained all necessary permits in accordance with the applicable environmental legislation of the Russian Federation, including:

- certificates of public registration of environmentally hazardous facilities
- permits for emissions of polluting chemical substances and radionuclides
- limit for production and consumption waste disposal
- certificates for hazardous production and consumption waste
- water use agreement
- decisions on the granting of water bodies for use
- licenses for use of nuclear energy
- other documents.

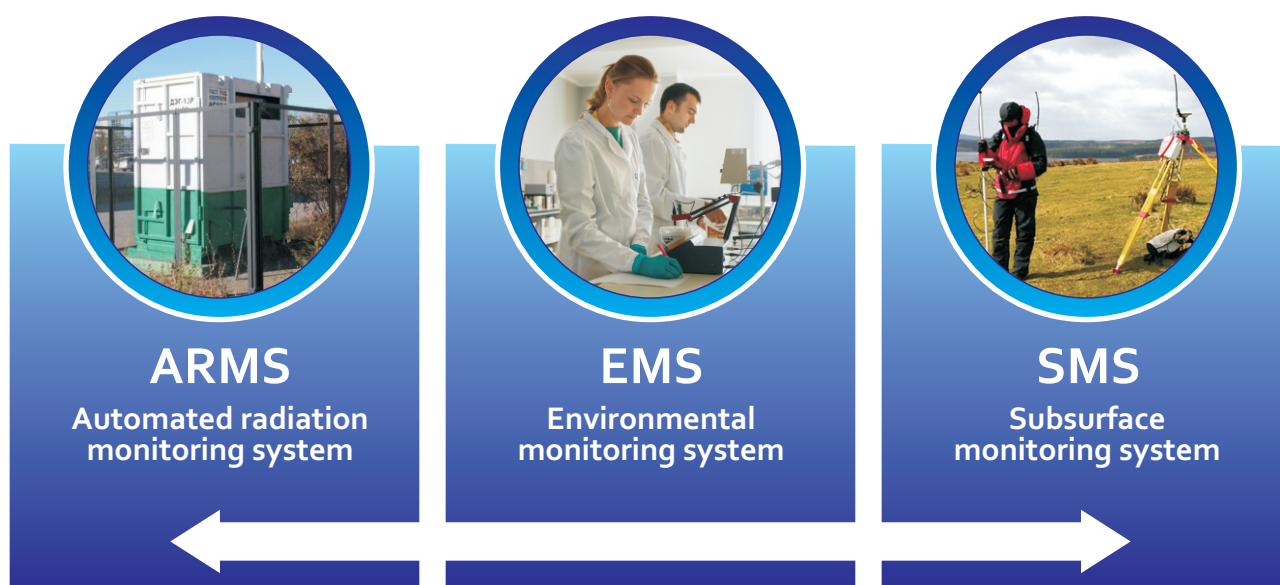
Contractors providing services and performing works at the Company site also have the complete set of necessary permits and licenses.

There are no areas polluted by radionuclides at UECP JSC industrial site and sanitary protection area. Gamma-radiation equivalent dose rate does not exceed the natural background. The average value makes 0.06 $\mu\text{Sv}/\text{hour}$. Over the whole period of UECP JSC operations there were no cases of environmental contamination caused by emergencies, spills, etc. Pursuant to the “Decision on establishing category of UECP JSC potential radiation hazard as per Principal Sanitary Radiation Safety Rules (OSPORB-99/2010)” approved by the RF FMBA territorial body, UECP JSC is referred to the III category of potential radiological hazard. Therefore, the observation area for UECP JSC is not specified. The sanitary protection area for UECP JSC, as the nuclear hazardous facility, is specified by “Project for UECP JSC sanitary protection area” and approved by the Head of Novouralsk urban district and UECP JSC General Director. The Company site total area makes 512.3 hectares. The Company land assets do not include the conservation areas and valuable biodiversity territories.

The following monitoring objects within UECP JSC impact area are:

- water bodies of the open hydrographic system
- atmospheric air
- vegetation
- atmospheric precipitation (snow)
- radiation environment
- meteorological parameters.

UECP JSC performs monitoring of radiation, ecological situation and natural environment using three systems:



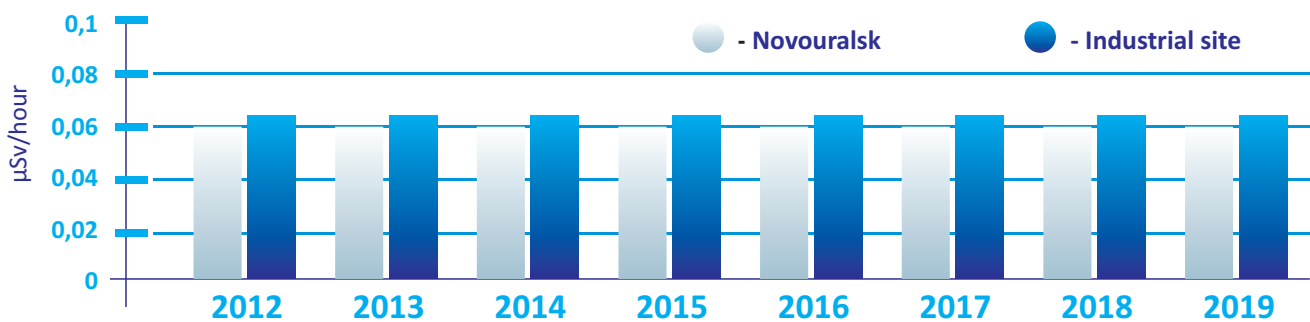
ARMS. Radiation monitoring and meteorological observations

Control of radiation situation is ensured by Environmental protection department (EPD) by means of automated radiation monitoring system (ARMS), being a part of ROSATOM unified state automated radiation monitoring system. The system is designed for ensuring continual automatic monitoring of radiation and meteorological conditions in monitoring stations connected with the control panel. At present UECP JSC automated radiation monitoring system is equipped with the most advanced equipment.

Nine monitoring stations cover all UECP JSC industrial sites. The measuring data of equivalent gamma-radiation dose rate received by UECP JSC automated radiation monitoring system are daily transferred to FSUE «ROSATOM Situation-crisis center". Thereafter these data shall be available at web-site www.russianatom.ru.

By results of regular laboratory measurements the content of radioactive substances in atmospheric air and in water objects is persistently low and does not trend upward. The exposure dose rate at the Company industrial sites and in Novouralsk does not exceed 0.15 $\mu\text{Sv}/\text{hour}$, which is well below the standard values and background exposure dose rates specified for Urals region.

Diagram 1. Average equivalent dose rate



Monitoring of the natural environment

Industrial environmental control and ambient monitoring is carried out by the Company Environmental protection department. Environment radiation monitoring is performed by UECP JSC Analytical center personnel, chemical content analysis is performed by a number of certified companies according to concluded contracts.

UECP JSC Analytical center is equipped with the most advanced instruments, equipment and measuring devices for sampling and analysis of environmental samples. For example, determination of uranium isotope content in the natural environment locations is performed by mass-spectrometric analysis using modern mass-spectrometers manufactured by the leading global producers of analytical equipment.

Results of long-term measurements confirm that:

- the content of radionuclides in ambient waters is ~ 150 times below the sanitary limits
- the content of radionuclides in Novouralsk atmospheric air and UECP JSC site does not exceed the background level and is ~ 270 times below acceptable limit
- the radionuclide content in soil does not exceed the background level.

Due to the necessity of determining the laws of dynamics, the structure and chemical composition of underground waters to control the quality of the Company's ambient waters and technical water supply to process facilities, the Company created the network of monitoring wells and stations keeping track of the hydrodynamic status and water quality of water-bearing layers. Testing of methods, techniques and equipment for wells installation and connection, sampling and water samples' analysis procedures, and other operations were performed.

At present the introduction of brand new subsurface monitoring system makes it possible to obtain correct and complete information on the state of underground hydrosphere. At the same time the system serves as a resource for establishing a basis of the future integral information-analytical system of radiation ecological monitoring (IAS REM) at ROSATOM State Corporation enterprises.

Organization of subsurface state monitoring system included geologic and geodesic researches of UECP JSC radioactive waste storage facilities' locations, cameral treatment of researches performed during the previous years. The research of change in geoecological indicators was conducted, the analysis of the site geological and hydro-geological structure was performed, geological and hydro-geological cross sections were prepared. This work resulted in creation of UECP JSC underground water observation well network which includes 38 wells. The geoinformation system was developed.

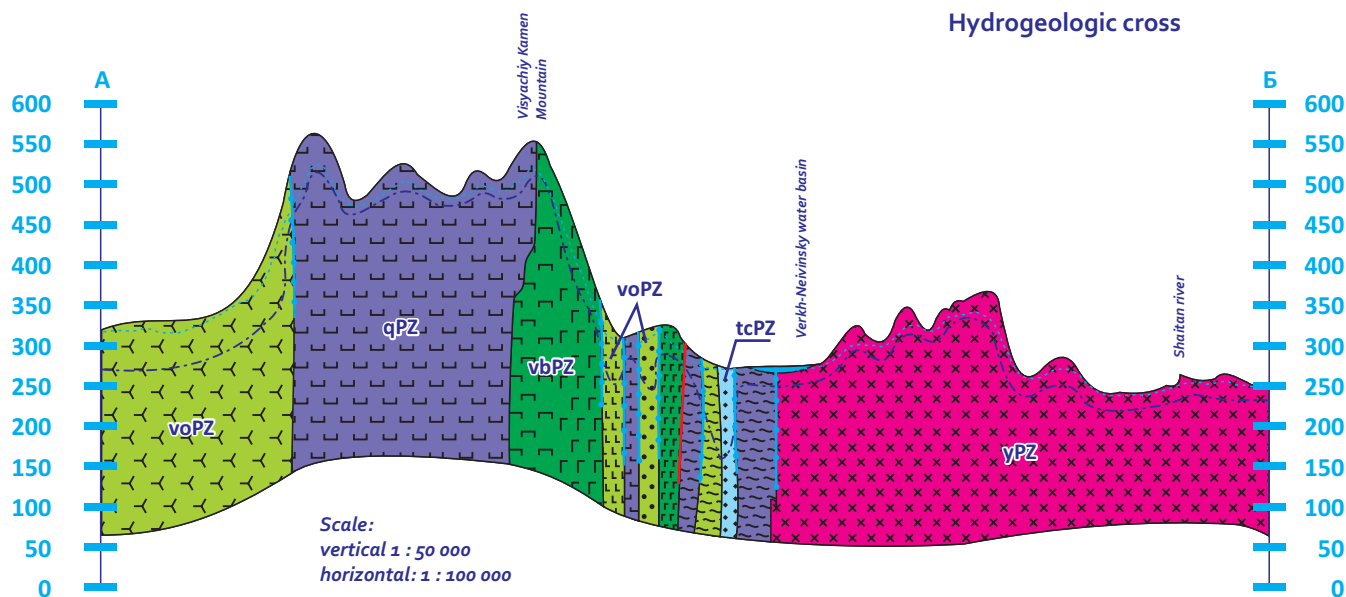


The goal of the research conducted and being conducted is to confirm that UECP JSC nuclear hazardous facilities do not impact the underground waters, and that the underground waters' impact will not cause the population and personnel radiation and toxic exposure, and natural environment radioactive and chemical contamination.

Results of monitoring the area outside UECP JSC site confirm the absence of exceeding intervention limits for uranium isotopes and therefore the absence of radioactive waste storage facilities' impact on the underground waters.

To improve performance of subsurface monitoring system in 2020 UECP JSC is planning to put in operation another five monitoring wells at UECP JSC industrial site.

Hydrogeologic cross section in the area of UECP JSC and Novouralsk urban district location



LEGEND

HYDROGEOLOGICAL AREAL CLASSIFICATION

- voPZ** Paleozoic water-bearing zone of igneous-sedimentary rock fracturing. Volcanomictous sandstone, bibbley-rock, puff-stone, basalt, tuff siltstone, tuff sandstone, carbon-bearing cherts.
- tcPZ** Paleozoic water-bearing zone of terrigenous-carbonate rock fracturing. marmorized limestone, crystalline limestone.
- ypZ** Paleozoic water-bearing zone of intrusive felsic rock fracturing. Granodiorite, tonalite, diorite.
- vbPZ** Paleozoic water-bearing zone of basic and medium intrusive rock fracturing. Gabbro-diorite, harzburgite.
- qpZ** Paleozoic water-bearing zone of ultrabasic intrusive rock fracturing. Dunite, serpentinite, pyroxenite.

LITHOLOGICAL COMPOSITION

- Dunite
- Serpentinite
- Chert
- Granodiorite
- Basalt
- Puff-stone of various composition
- Crystalline limestone
- Gabbro-diorite
- Harzburgite
- Bibbley-rock

The population is free from radiation exposure

In 2014 the Company experts developed the science-based reference levels. Meeting these levels absolutely confirms the absence of the Company environmental impact ('zero' environmental impact). These reference levels were exceeded in none of environmental components.

Table1. Main objects of ecological interest within UECP JSC zone of influence

Object of ecological interest	Effect indicator	Zero Level	Actual Content 2019
Ambient waters	Uranium content, kg/l	2.2	0.02 - 0.03
Ambient air	Total α -activity Bq/m ³	0.33	<0.13
Vegetables – potatoes	Uranium content, kg/l	2.4	0.79
Vegetables – except of potatoes	Uranium content, kg/l	1.7	0.38 - 0.47
Grassland	Uranium content, kg/l	135	32

Subject to environmental legislation alteration UECP JSC has made public registration of all operated facilities. By environmental impact UECP JSC facilities are regarded as 2nd and 3rd category facilities.

6.1

Withdrawal of water from water sources

UECP JSC takes water from Verkh-Neivinsky, Neivo-Rudyansky and Ayatsky water basins for process needs, and water supplied by MUP Vodokanal (Municipal unitary company). is used as drinking water. Recirculating water supply shall be performed as follows:

Upon equipment cooling the process water shall be discharged through the guide channels into the basins separated by dams from the main water bodies of Verkh-Neivinsky and Neivo-Rudyansky basins. Water in the basins shall be cooled and thereafter supplied again to the process facilities using pumping stations

Table 2. Water withdrawal from natural water sources, thousand m³/a

Water source	2014	2015	2016	2017	2018	2019
Verkh-Neivinsky water basin	3052	2798	2706	2415	2419	2586
Neivo-Rudyansky water basin	638	540	585	542	567	542
Ayatsky water basin	17	7	31	11	14	22
Total	3707	3345	3322	2968	3000	3150

Characteristics of water sources

- **Verkh-Neivinsky water basin**

is used for the supply of drinking water to Novouralsk urban district population and technical water to the companies of Novouralsk urban district and Verkh-Neivinsky settlement. Withdrawal of water greatly impacts the water basin (makes over 5 % of average annual volume). The total capacity of Verkh-Neivinsky water basin makes 64 million m³.

- **Neivo-Rudyansky water basin**

is used for the supply of technical water to the Company facilities. Generally it is used as waste water receiver for Novouralsk urban district industrial and public utilities.

- **Ayatsky water basin**

is used as a reserve water source for adding water to Verkh-Neivinsky water basin in the low water years. It also serves as water source for gardeners' partnerships.

Table 3. Fresh water saving due to recycling and reuse of water supply

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
187779	181942	182807	175298	160598	160723	155925	138609	155016	153726

Consumption in recirculating water supply systems, thousand m³/a

6.2

Discharges into open hydrographic system

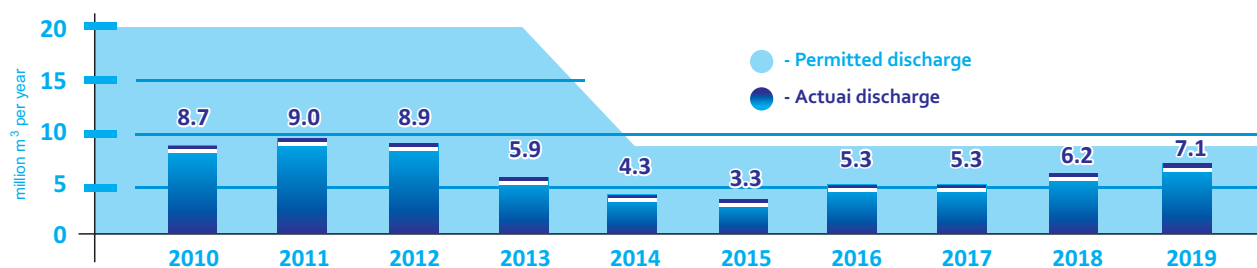
UECP JSC discharges waste waters through 3 discharge outlets. Permissible discharge limits (PDL) were specified for every discharge outlet. Permits for discharge of pollutants with waste waters were obtained. The Ministry of natural resources of Sverdlovsk region issued "Decisions on the granting of water bodies for waste water discharge". According to «Decisions ...» UECP JSC was permitted to discharge up to 8.3 million m³ of waste waters into the surface-water bodies. According to the in-process monitoring results the actual volume of discharge in 2019 made 7.1 million m³. The waste water is classified as partially clean water. Off-schedule discharge is not performed. Water receiver is Obvodnoy channel on Bunarka river. Pollutant content is independent of the year average dryness.

Table 4. Wastewater composition by main pollutants in 2019

Priority pollutants	Class of hazard	ADL, t/a	Actual discharge, t/year
Petroleum products	3	*	0.35
Suspended substances	4	*	36
Ammonia nitrogen	4	*	1.8
Nitrites	2	2	0.48
Phosphates	4	*	0.45
Total, only by basic substances			39.08

*- in compliance with Federal Law dated 21.07.2014 № 219-FZ (as amended on 26.07.2019) On revision of Federal Law On Environmental Protection and certain legislative acts of Russian Federation allowable discharge rates in regard to these pollutants for UECP JSC objects are not set.

Diagram 2. Waste water volume



In 2019 industrial water consumption has increased due to increase of water consumption by UECP JSC water consumers - the companies of Novouralsk industrial cluster, and precipitation enhancement.

6.3

Radionuclides discharge

UECP JSC implemented actions focused on terminating discharge of waste waters, containing radionuclides. This work resulted in termination of radionuclide discharge into surface-water bodies since 2006.

In 2019 the actual release made 26 tons, staying at the level of 2018. The maximum allowable emission for UECP JSC amounts to 26 tons. It should be noted that previously the most part of chemical release was made by UECP JSC thermal power plant (TPP).

The overall air emissions were reduced due to transfer of TPP assets to RIR JSC branch in 2017.

The Company chemical release monitoring is performed in accordance with annual “Chemical releases monitoring plan”, approved by UECP JSC Technical Director. Hydrogen fluoride release from all emission sources of enrichment production shall be controlled by means of instrumental methods. The volume of other emissions shall be determined using duly approved procedures based on emission calculations by specific indicators.

Diagram 3. Air Emissions

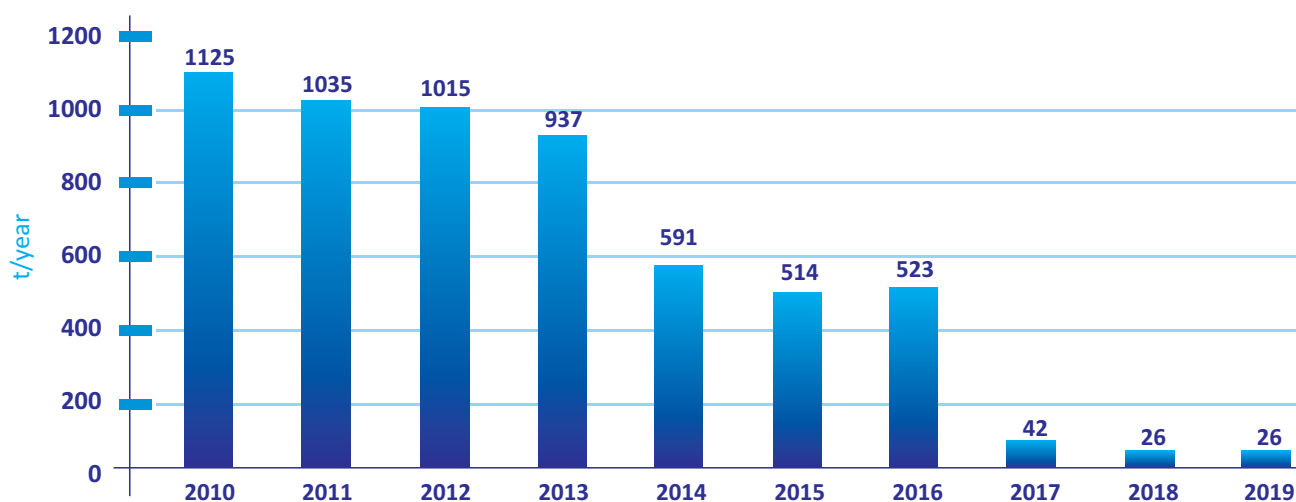


Table 5. UECP JSC chemical pollutant emissions

t/year

Pollutant	2014	2015	2016	2017	2018	2019
Total	591.035	513.624	523.008	41.757	26.070	26.070
Including controlled emission sources	525.671	478.820	491.091	21.215	26070	26070
Solid	1.074	0.857	0.898	0.714	0.678	0.678
Gas and liquid pollutants, among them	589.961	512.767	522.110	41.043	25.392	25.392
Sulfur dioxide	4.960	3.706	3.808	0.438	0.141	0.141
Carbonic oxide	61.142	29.189	37.078	16.453	0.157	0.157
Nitrogen oxides (in-equivalent NO ₂)	475.171	431.377	432.700	1.931	0.327	0.327
Hydrocarbons (without VOC)	0.420	0.420	0.420	0	0	0
Volatile organic compounds (VOC)	40.243	40.208	40.205	14.104	10.045	10.045
Other gas and liquid pollutants	8.025	7.867	7.899	0	14.722	14.722
Persistent organic pollutants	0	0	0	0	0	0

Initiatives on greenhouse gas reduction and progress made

The Company implements the “Program for energy saving and energy efficiency improvement in UECP JSC for 2011-2020”. The Program effectiveness is confirmed by the yearly decrease of direct greenhouse gas emissions resulting from organic fuel combustion and indirect emissions resulting from energy consumption. The overall direct greenhouse gas emissions were reduced due to transfer of TPP assets to RIR JSC branch in 2017.

Indirect greenhouse gas emissions were increased due to thermal power overconsumption.

The overconsumption causes are as follows:

- increase of steam rate and energy consumption resulting from changing the operating mode of UECP JSC boiler plant
- duplication of hot water production capacity (of RIR JSC steam) and decrease of thermal power consumption from MUP “Water boiler” (with the same capacity)
- increase of percentage losses attributable to heat transfer (previously attributable to heat production) resulted from changing the contract conditions and calculation methods after RIR JSC was granted the UTB (Unified Tariff Body) status.

Table 6. Direct & indirect greenhouse gas emissions

Material (substance)	2014	2015	2016	2017	2018	2019
Direct greenhouse gas emissions						
For all types of emissions in CO ₂ equivalent	385342	356986	379953	94	145	79
Indirect greenhouse gas emissions						
For all types of emissions in CO ₂ equivalent	792706	734215	723213	840648	876353	885221

Interesting fact:

According to IAEA publication «Nuclear Power Reactors in the World» (Reference data series No. 2, 2019 Edition) the global nuclear power generation made ~ 2562.8 TW-h in 2018. It is commonly known that we need 393 kg of fuel equivalent (0.393 t) to generate one thousand kW-h of electric power by traditional sources. It would cause the atmospheric emissions making 920 kg (0.92 t) of carbon dioxide. Therefore, nuclear industry prevented releases amounting to 2358 million tons of greenhouse gas under the sun!

Table 7. Greenhouse gas emission rate

Material (substance)	2014	2015	2016	2017	2018	2019
Total direct and indirect greenhouse gas emissions, ton	1178047	1091201	1080129	40657	876353	885300
Annual products and services revenue, mln rubles	20543	20523	22908	23881	22310	23560
Intensity of greenhouse gas emissions /annual revenues from product sales, tons/mln rubles	57	53	47	35	39	38

Evaluation of UECP JSC contribution to greenhouse gas emission reduction

In estimating greenhouse gas emissions by the nuclear industry companies it should be mentioned that atomic energy is classified as low carbon energy source. According to the forecast of International Energy Agency the share of low carbon sources in the global energy mix will make 40 % by 2040. Along with renewable generation resources, atomic energy will become the integral part of low carbon energy mix.

UECP JSC covers ~ 20% of the global demand for uranium enrichment. UECP JSC is involved in generation of every fifth nuclear power kilowatt under the sun, and thus the Company activity saves the earth atmosphere from releasing ~470 million tons of greenhouse gas!!!

The results of radionuclide emission monitoring are given in Table 8. According to the Table, UECP JSC radionuclides release meets the specified limits. Thus, the population dose rate from radionuclide inhalation does not exceed 0.005 mZv/year, which makes 0.5% of population dose limit.

Table 8. Results of radionuclides release monitoring

Nuclide	2014	2015	2016	2017	2018	2019
Total atmospheric release of long-lived alpha-active radionuclides, Gbq/year	0.103	0.098	0.093	0.087	0.079	0.073
Allowable release level, Gbq/year	0.92	0.55	0.3	0.3	0.3	0.3

6.7 Production and consumption waste management

The Company obtained all necessary permits for production and consumption waste management. There were no cases of exceeding the waste generation limits. Significant volume of waste is delivered for processing to the authorized companies. Every year UECP JSC performs organizational and technical activities focused on waste reduction.

Increase in figures results from increase of ferrous scrap yield (5th class of hazard) and change of regulations in the field of solid municipal waste management. Of 5173 tons of production and consumption waste, generated in 2019, 4260 (82%) tons made ferrous and non-ferrous scrap waste being delivered for processing and returned to production facilities in the form of finished products.

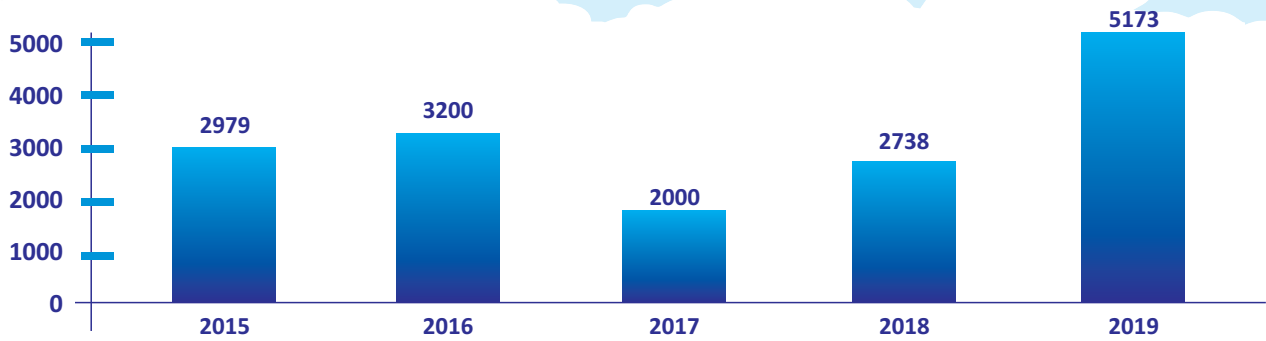
In 2018 the processed production and consumption waste volume made 95% of the total waste volume. In 2017-86%, in 2016-81%.

In 2019 according to changes in production and consumption waste management legislation UECP JSC made a contract with SMW regional operator for waste removal from UECP JSC site.

Table 9. Dynamics of production and consumption waste generation, t/year

Pollutant	2015	2016	2017	2018	2019
Total waste generation Including:	2979	3200	2000	2738	5173
1st class	8	30	3	2	4
2d class	0	0	0	0	0
3d class	19	73	<1	3	<1
4th class	578	453	223	129	817
5th class	2374	2644	1773	2604	4351
Processed waste	2400	2600	1720	2585	4260
Delivered for disposal	579	600	280	153	96
Solid municipal wastes transferred to regional operator	0	0	0	0	817

Diagram 5. Generation of production and consumption waste, tons per year



6.8

Radioactive waste management

Generation of solid radioactive waste (SRW) at different stages of production process is resulted from UECP JSC nuclear facility operation. UECP JSC generates SRW of two types:

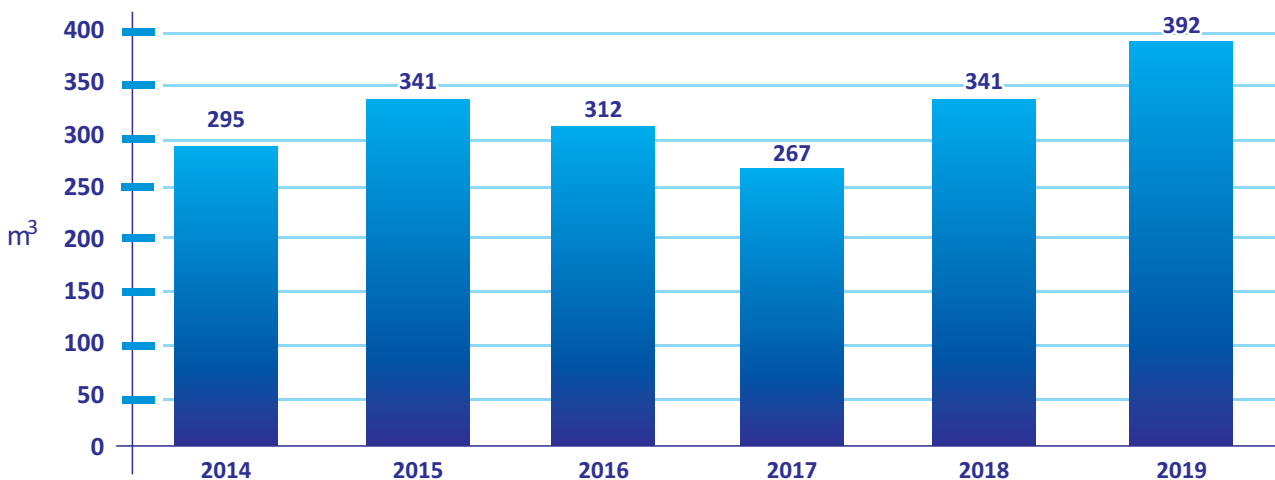
- low-level radioactive waste (amounts to <10% of SRW total volume),
- very low-level radioactive waste.

The most part of SRW volume collected at the Company facilities is subject to processing for further compacting. After processing SRW packages shall be delivered to FSUE "NO RAO" SRW storage facility, which is safe and isolated from the environment.

Decontaminating uranium-bearing solutions shall be processed by means of special technology. Upgrade of uranium-bearing solution processing technology in 2006 ensured reduction of the content and activity of radioactive substances in such solutions to the background levels. It makes possible to tell responsibly of zero radioactive substances' discharge with wastewater.

Radiation safety assurance of personnel, population and environment on the basis of radiation safety regulations and radiation protection requirements are UECP JSC core principles and criteria while handling SRW .

Diagram 6. SRW generation



SRW volume increase was due to expansion in the number of equipment decommissioned during production modernization.

UECP JSC is committed to introduction of energy-saving technologies and cost reduction. Based on the results of the research conducted in 2010 the Program for energy saving and energy efficiency improvement in 2011-2020 at UECP JSC was developed, approved and started in 2011. The Program is focused on the effective use of energy resources and reduction of energy losses resulted from changes in personnel behavior, and improvement of production process..



Effective use of energy resources & energy loss reduction

- UECP JSC introduced and ensured successful operation of energy management system as per ISO 50001. UECP JSC Energy policy was developed and introduced.
- In terms of enrichment production equipment technical upgrade gas centrifuges of the 5th generation were replaced by gas centrifuges of the 9th/9th+ generation with low energy consumption.
- In industrial water supply subdivision one compressor was replaced by two dual compressors with improved specific values of power consumption for compressed air cubic meter production.
- Automated control system of frequency-regulated drive for TOU-64 and TOU-65V main equipment cooling pumps was commissioned.
- New lithium-ion battery was commissioned instead of lead-acid batteries of 600 Ah capacity at the MSDS-4 substation in operating DC voltage system.
- An automated energy accounting system and data collection center including over 600 energy metering units (water, wastewaters and thermal energy) and 500 electricity metering units were commissioned.

Table 10. Energy consumption

	2014	2015	2016	2017	2018	2019
UECP JSC power consumption, thousand kW/ h	1068888	1006733	976161	979059	1012306	1023411
UECP JSC thermal energy consumption, Gcal	667107	591284	604521	587907	627539	631946
Total energy consumption, GJ	6643175	6101719	6045161	5985584	6279965	6330000

Share of UECP JSC emissions, discharge & waste in Sverdlovsk region

UECP JSC share in total volume of chemical pollutants (ChP), radionuclide emissions and discharge both in Sverdlovsk region and within the territory of Rosatom State Corporation enterprises makes less than 1 percent.

Table 11. Comparison of indicators with total volume within the territory

Indicator	Total volume within the territory	UECP JSC total volume	UECP JSC Share	
ChP emissions, thousand tons	857*	0.026	<0.01%	* Total volume in Sverdlovsk region in 2018.
Discharge (volume of discharged waters), million cubic meters	717*	7.1	<1%	
Production and consumption waste, million tons	155*	0.0052	<0.01%	** Total volume in JSC TVEL companies in 2018. The given values of radionuclide emissions and discharge do not exceed the RF permissible limits.
α- emitting nuclides atmospheric emissions, GBq	4,76**	0.073	<2%	
α- emitting nuclides discharge into open hydrographic network, Bq	4,31x10 ⁹ **	0	0	

Share of sold products and its packing materials returned to producer for processing

UECP JSC production process allows for 100% return of packaging materials (vessels) to product manufacturer. Safety of purchased products and services is ensured by:

- incoming inspection and acceptance control
- specifying requirements for the suppliers.

When evaluating and choosing suppliers the following factors are taken into consideration:

- technical requirements for the supplied products and availability of regulatory documents specifying these requirements
- availability of documents proving conformity of product to ecological and environmental safety requirements (certificates of goods conformity and origin, safety and health certificates)
- availability of documentation confirming the product quality.

Contractor obligations on operations (activities) management in delivering products and services are specified in the contracts.

To improve the integrated management system the Company implements "Environmental protection and ecological safety requirements during work performance, product and service delivery by the contractors".

Financial aspects and other risks and opportunities for the Company in the context of climate change

Meteorological observations performed since 1960 show that temperature and wind regimes, amount of precipitations are practically constant within UECP JSC activity area, and their annual average is practically constant. Climatic and weather conditions are rather stable.

To minimize the weather damage risks the Company annually develops plans of activities focused on emergency situations' prevention (flood protection, fire protection). Taking into account the Company geographic location, existing statistical observations and developed activities addressed to mitigating any possible climatic accidents, these risks are extremely low.

In view of the slow rate of climatic changes, the Company management has not performed special quantitative evaluation of financial consequences in the context of climate changes in medium and long-term perspective.

7

Implementation of environmental policy

Environmental safety is of high priority for nuclear industry and is mandatory condition for the development of nuclear technology and nuclear facility operations. Moreover, despite of nuclear industry sustainable development, improvement of technology and safety, stabilization of nuclear industry is closely related to its ecological and social acceptability. At present it greatly depends on conditions ensuring reduction of radioactive waste volume, safe waste disposal, development of decommissioning technologies and solution of nuclear legacy problems.

UECP JSC scope of activity is of great strategic importance for the development of Novouralsk urban district, since it greatly contributes to its steady innovation progress. In this connection UECP JSC management understands the need for ensuring balance between strategic objectives for corporate business development and environmental safety, being the basis for life and health of present and future generations. One of the Company key tasks remaining vital for many years is to ensure the parity between the economic and environmental values. Practically it is ensured by technical upgrade, modernization and energy saving corporate programs, as well as detailed assessment and minimization of potential environmental risks during implementation of new build projects. Improvement of environmental and energy performance is the mainstream of the Company strategy, a key element of environmental management system and environmental policy. UECP JSC advanced multilevel environmental management system is underpinned by qualified scientists and engineers and meets the modern criteria for management efficiency in this field. The complex approach to solution of problems addressed to conservancy and environmental protection enables UECP JSC to achieve all intended environmental purposes, minimize environmental risks and increase social responsibility of business.

Initiatives on mitigating products & services environmental impact and the scope of mitigation measures

Operational safety of UECP JSC nuclear facility (NF) and its systems and components is ensured by steady implementation of defense-in-depth principle. Safety is ensured by application of physical protection system acting as a barrier on the way of ionization radiation, nuclear material and radioactive substance into the environment, should it be the package (vessel, pipeline) or structure, frame or roof of any building. UECP JSC NF safety includes protection of physical barriers, ensuring their operation within specified lifetime, and personnel and environment protection. For this purpose UECP JSC performs a complex of special measures to prevent emergencies which may result in process equipment seal failure (abnormality of process conditions, violation of equipment normal operation conditions and limits, self-sustained chain reaction, fire, dropping of goods, mechanical or corrosion damage, etc.), and consequence limiting control measures.

Safety level achieved by UECP JSC in NF operation and other activities in nuclear field are ensured primarily by technical measures and decisions taken in designing equipment, systems, NF components, and also by development of technological processes relating to nuclear material, radioactive substance and radioactive waste management.



Table 12. Current environmental costs in 2019, thousand rubles

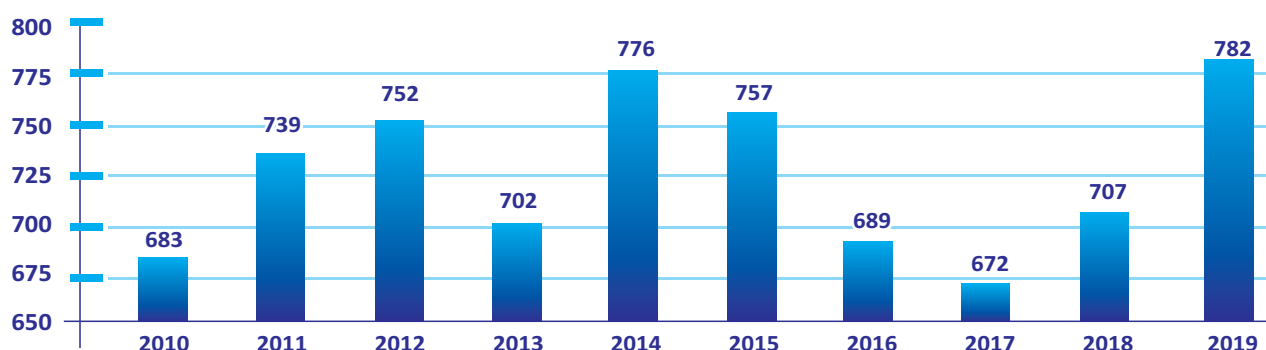
Type of environmental activity	Annual current (operating) costs	where from the Company's own funds
Total	729020	729020
including:		
air protection	113760	113760
collection and purification of waste water	287099	287099
waste management	3415	3415
environmental radiation safety	322786	322786
other environmental activities	1960	1960

Table 13. Cost of environmental services in 2019, thousand rubles

Type of environmental activity	Payment for environmental services	where from the Company's own funds
Total	52872	70323
including:		
air protection	455	-
collection and purification of waste water	45011	-
waste management	2545	33052
environmental radiation safety	4712	37271
other environmental activities	149	-

Implementation of measures on reducing environmental impact is one of the mainstreams of the Company environmental activity. UECP JSC environmental costs are basically related to processing and purification of discharge and emissions and addressed to supporting technical and organizational activities. Environmental protection investment is generally made in upgrading equipment and waste handling facilities.

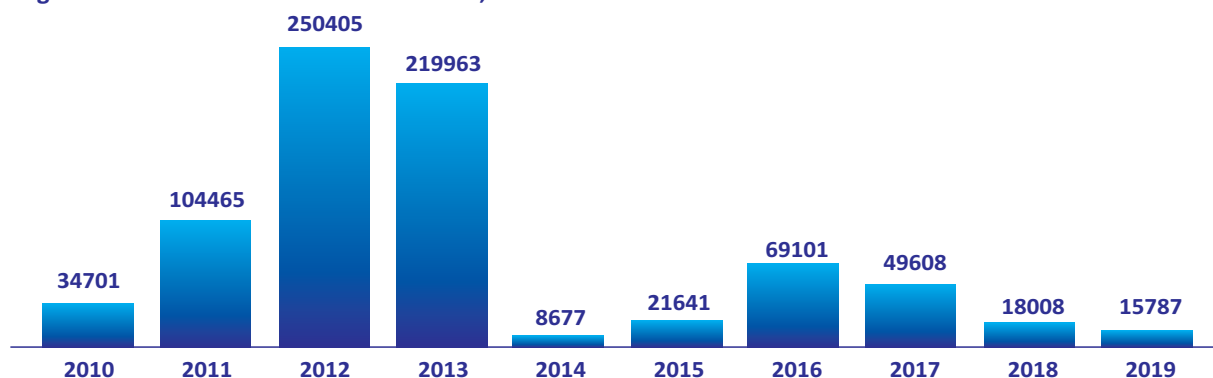
Diagram 7. Current (operating) environmental costs, mln rubles



In 2019 the cost increase occurred due to:

- SRW delivery to FSUE "NO RAO" SRW near-surface storage facility
- Increase in payment of services for industrial environmental monitoring of environmental medium (including radiation monitoring)
- execution of contract with regional operator on solid municipal waste management..

Diagram 8. Environmental investment data, thousand rubles



15.7
millions
rubles

In 2019 environmental costs by means of capital investment made 15 787 thousand rubles:

- Completion of equipping hydraulic engineering installations of Verkh-Neivinsk pond with local alarm systems
- Development of the ground water monitoring system at UECP JSC VI-VII industrial sites
- Activities on developing the facility for RAO conditioning and intermediate storage
- Development of radiation control systems of emissions and workplace air in enrichment production shops.

Table 14. Environmental pollution payments, thousand rubles

	2012	2013	2014	2015	2016	2017	2018	2019
Pollution charge	315	292	192	182	96	247	169	152
water bodies	105	84	64	60	43	95	100	101
open air	210	208	128	122	53	2	42	2
waste disposal	0	0	0	0	0	150*	27	49

* The calculation was made in accordance with new requirements of the Russian Federation legislation in the field of environmental protection and production and consumption waste management.



The proper level of nuclear, radiation, industrial, environmental and labor safety at UECP JSC was confirmed by many inspections conducted by the following executive authorities:

- Urals Directorate of the Rostekhnadzor– as related to compliance with industrial safety requirements at UECP JSC hazardous facilities
- Urals Interterritorial Directorate for supervision of nuclear and radiation safety - as related to nuclear facility operation compliance with standards and regulations
- RF FMBA Regional office No 31 – as related to UECP JSC compliance with health legislation requirements.

UECP JSC management cooperates closely with Novouralsk urban district administration. UECP JSC employees jointly with Novouralsk urban district public authorities constantly perform activities in the field of landscaping, garbage collection, and various charitable activities.



UECP JSC pays great attention to environmental education. One of the Company key principles stated in environmental policy is to ensure transparency and public availability of information related to UECP environmental protection and safety activities.

Dozens of information materials are published annually in corporative, local, regional and branch mass media. The published information highlights the Company environmental activities and environmental conditions in the territory of presence. In accordance with “transparency” policy pursued by UECP JSC, the Company annually organizes the ecological press-tours to the site for Novouralsk and Sverdlovsk region students, newsmen, bloggers and representatives of public organizations.



The tour participants receive unique opportunity to visit the Company process facilities, measure radiation background in any point of their route and make sure that the plant is environmentally friendly. Since 2008 the Company annually publishes Environmental safety report presenting full and objective information on UECP JSC current environment conditions and environmental impact. Since 2012 Environmental Safety Reports have been publically presented to concerned regional public communities and Novouralsk citizens. The Report is delivered to organizations cooperating with UECP JSC on environmental protection and industrial safety, mass media and public organizations located in Novouralsk urban district, and is available on UECP JSC web-site (www.ueip.ru). Furthermore, the news-bulletin on radiation situation in the territory of Novouralsk urban district is posted monthly on UECP JSC web-site.



UECP JSC management and specialists of environmental protection department are always ready to answer all questions related to the Company environmental activity and production ecological safety.

Cooperation with ecological public organizations, scientific and social institutions, population

In 2019 more than 60 informational materials that covered the Company environmental activity and state of environment at business site were published in corporative, city, regional and branch mass media. Five ecological press-tours to the site were conducted for Novouralsk and Sverdlovsk region students, newsmen, bloggers and representatives of public organizations.

In 2019 the following events were held:

- UECP JSC, Centrotech SPA LLC employees and Novouralsk citizens participated in traditional spring volunteer cleanup events.
- Within the framework of "Dedicated people" project a meeting with Senior Inspector on UECP JSC nuclear and radiation hazardous sites' safety monitoring A.P. Konstantinov was held, that was devoted to "Myths of nuclear town: what we are afraid of and what should we actually avoid".
- Public presentation of UECP JSC Environmental Safety Report 2018 was conducted. Teachers of natural sciences, students and educators of Novouralsk Technological Institute and medical college, non-governmental organization representatives and active young people participated in the presentation.
- Report on Novouralsk Urban District green issues was presented at the extended meeting of "Our Novouralsk movement" board.
- Series of ecological press-tours to UECP JSC site were conducted for Ural Region media personnel and Novouralsk Urban District students.
- Special section "Environmental situation" was created at UECP social network pages.



- Round table "Cooperation of UECP JSC and citizens in the field of environmental safety" was held in Novouralsk Museum&Exhibition Center.
- Public hearings concerning validation of UECP JSC license to perform activity in nuclear field "Nuclear facility operation" were held in Novouralsk Museum&Exhibition Center.
- The conclusion by the state ecological expertise related to supporting materials for licensing UECP JSC activity in nuclear field was approved. As a result UECP JSC obtained a new license for core activity.



Company awards

UECP JSC was awarded the diploma of the winner of Municipal Environmental Contest "Green owl – 2019" in the nomination of Environmental Activity Leader among Novouralsk Urban District companies.

Employees awards

As a result of national Championship of cross-industry nonprofessional occupations of high-technology industries WorldSkills Hi-Tech 2019 engineer of department 23 N.V. Morozov was awarded a gold medal in the Environmental Protection competence.

At the IV Rostom State Corporation Professional Skill Championship AtomSkills-2019 the Head of department 23 A.V. Nalivayko and engineer of department 23 N.V. Morozov were awarded a silver medal in the Ecologist competence.

Team of the following contributors:

- Environmental Protection Department engineer N.V. Morozov
- Environmental Protection Department engineer M.V. Noskov
- Environmental Protection Department engineer D.N. Shibalenkov
- Environmental Protection Department engineer V.V. Sennikov
- Environmental Protection Department engineer E.E. Yelina

took the 2d place for the project "Getting the conclusion by the state ecological expertise related to supporting materials for licensing UECP JSC activity in nuclear field" in the Safety Culture Development nomination in the Contest of scientific and technological works of UECP JSC and Novouralsk scientific and production site companies in 2019.

Team of the following contributors:

- Head of department 23 A.V. Nalivayko
- Acting head of public relations department O.V.Khmelyova
- Engineer of department 23 M.V. Noskov
- Chief specialist on cooperation with press relations services and mass media O.S. Taran

took the 3d place for the project "Communication with the population on UECP JSC activity in the field of environmental safety and production safety" in the Safety Culture Development nomination in the Contest of scientific and technological works of UECP JSC and Novouralsk scientific and production site companies in 2019.

According to new version of Environmental policy the main future tasks in the field of environmental protection and ecological safety are:

- further meeting the requirements of international, federal and regional legislation, rules and guidelines in the area of radiation and nuclear safety, environmental protection, sanitary-and-epidemiological well-being of population, protecting population in natural and man-made emergency situations, and other commitments undertaken by UECP JSC
- developing the natural environment and radiation control and monitoring systems using advanced automatic equipment and software
- improving the resource and energy efficiency of production
- ensuring decommissioning of UECP JSC nuclear facilities being out-of-service
- reducing the volume of radioactive and hazardous industrial waste
- regularly informing UECP JSC personnel, citizens and other concerned parties of environmental and radiation situation and UECP JSC environmental impact
- constant improving the integrated management system as required by ISO 9001, ISO 14001, OHSAS 18001, ISO 50001, IAEA GSR Part 2, IAEA GS-G-3.1.



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