



ECP
ROSATOM

ENVIRONMENTAL SAFETY REPORT

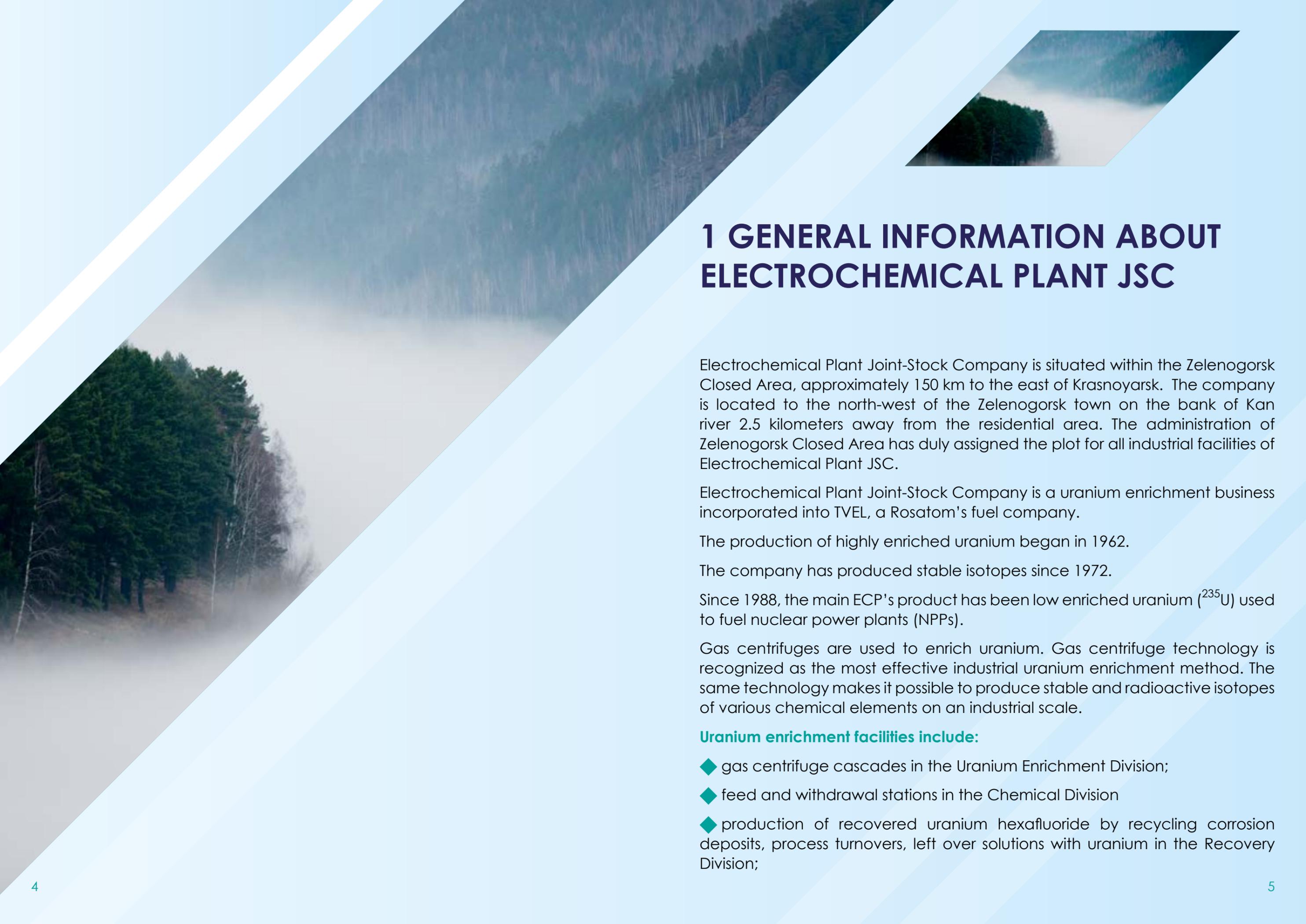
OF ELECTROCHEMICAL PLANT JSC FOR 2021

Department for Production and Environmental Control
2022



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1 GENERAL INFORMATION ABOUT ELECTROCHEMICAL PLANT JSC

Electrochemical Plant Joint-Stock Company is situated within the Zelenogorsk Closed Area, approximately 150 km to the east of Krasnoyarsk. The company is located to the north-west of the Zelenogorsk town on the bank of Kan river 2.5 kilometers away from the residential area. The administration of Zelenogorsk Closed Area has duly assigned the plot for all industrial facilities of Electrochemical Plant JSC.

Electrochemical Plant Joint-Stock Company is a uranium enrichment business incorporated into TVEL, a Rosatom's fuel company.

The production of highly enriched uranium began in 1962.

The company has produced stable isotopes since 1972.

Since 1988, the main ECP's product has been low enriched uranium (^{235}U) used to fuel nuclear power plants (NPPs).

Gas centrifuges are used to enrich uranium. Gas centrifuge technology is recognized as the most effective industrial uranium enrichment method. The same technology makes it possible to produce stable and radioactive isotopes of various chemical elements on an industrial scale.

Uranium enrichment facilities include:

- ◆ gas centrifuge cascades in the Uranium Enrichment Division;
- ◆ feed and withdrawal stations in the Chemical Division
- ◆ production of recovered uranium hexafluoride by recycling corrosion deposits, process turnovers, left over solutions with uranium in the Recovery Division;



- ◆ repairs of the primary process equipment with the site for incineration of spent gas centrifuges in the Recovery Division;
- ◆ inspection and repairs of separation-related devices and instruments in the Recovery Division;
- ◆ control of all uranium production and processing cycle in the Central Plant Laboratory;
- ◆ Energy Division with liquid nitrogen and cooling water preparation facility;
- ◆ Division for Grids and Substations;

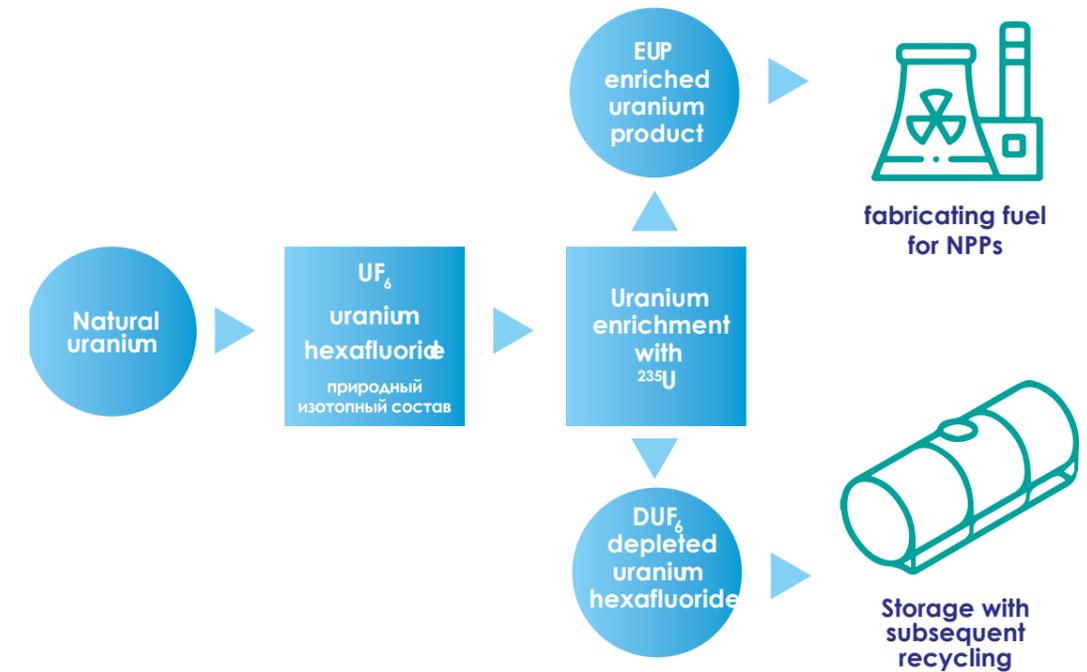
The plant has been present in the international uranium enrichment market since 1990, there have been no claims for the product.

The company constantly upgrades its equipment and introduces new generations of high-tech centrifuges. The main production layout is highly dynamic and flexible, easily reacts to the requirements of the enriched uranium market and may be rebuilt without loss of performance indicators. The high quality of products is ensured by the most advanced process control systems and the most advanced microprocessor-based systems monitoring the operation of the main and auxiliary equipment, as well as the high qualification and technological discipline of personnel. The products meet the requirements of Technical Specifications (TU), ASTM specifications and contracts with customers.

In 2009, Electrochemical Plant JSC was the first in Russia (and second in the world) to develop industrial reprocessing of depleted uranium hexafluoride (DUF₆).

Electrochemical Plant JSC is the only company in Russian nuclear sector that has a functioning defluorination line for depleted uranium hexafluoride (DUF₆), W-ECP plant with designed output of 10,000 tons of DUF₆ annually.

Production layout of Electrochemical Plant JSC



This W-ECP plant, which is unique for Russian nuclear sector, is designed to convert potentially hazardous uranium hexafluoride into a stable chemical form, uranium oxide (this substance is similar to natural state of uranium ores and suitable for safe long term storage), yielding commercial products: hydrofluoric acid and anhydrous hydrogen fluoride. The W-ECP plant makes it possible to reduce industrial areas occupied with containers holding an aggressive uranium compound.





W-ECP plant was built and commissioned as per the contract signed between FSUE «PA «ECP», TENEX, and French companies COGEMA and SGN in 2005. W-ECP started reprocessing of depleted uranium hexafluoride on December 18, 2009 as part of the Concept for Depleted Uranium Hexafluoride Management.

In December 2010, the first unit for rectification of 70 % hydrofluoric acid began producing commercial products, anhydrous hydrogen fluoride and 40 % hydrofluoric acid.

In 2011, the W-ECP plant reached design capacity and has since been operated at design capacity. The production has been effective and without failures from the start.

Produced hydrofluoric acid and anhydrous hydrogen fluoride may be applied in various industries including nuclear industry. The production shop has a railroad tank filling unit used to ship the products to customers.

According to specialists, uranium hexafluoride defluorination makes it possible to recycle a significant amount of fluorine and form a closed fluoride cycle within the nuclear industry. This also reduces dependency of Rosatom's companies on external supplies of hydrofluoric acid.

In 2021, the defluorination plant reprocessed a record amount of 11,522 tons of DUF_6 .

Beginning from 2011, hydrofluoric acid has been delivered to the companies of TVEL and to companies of chemical, metallurgic, mining, oil and gas industries, and used in production of fluoroplastics and refrigerants.

We deliver to Perm, Sterlitamak, Verkhnyaya Saldy, Pervouralsk, Chelyabinsk, Ufa, Volzhsky, Volgograd, Urengoy.

At the moment, Electrochemical Plant JSC is the largest manufacturer of stable isotopes by gas centrifuges and is in the top five of the world isotope manufacturers. The range of products encompasses 110 isotopes of 21 chemical elements. The annual output of isotopes reaches hundreds of kilograms.

Electrochemical Plant JSC now shares over 40 % of the worldwide stable isotope market.

Our specialists have earned extensive experience and taken part in developing unique methods for production of stable isotopes by gas centrifuges, which were initially used to enrich uranium.

The applied method of isotope separation allows obtaining maximally enriched products of high chemical purity, gives a competitive price advantage, while the available production capacity allows meeting the demand.

Centrifugal cascades are flexible production systems capable of changing the range of products with minimum intervals between production runs of limited batches that satisfy specific requirements of individual customers. A modern



reconfigurable cascade may take a few days to be switched to production of another isotope with its process gas having different physical and chemical properties. The concentration of the desired isotope may be increased both in the light and in the heavy fraction of the separated element's isotopic range.

The isotope products of Electrochemical Plant JSC are widely used in various fields, including nuclear power, medicine and electronics, general chemistry, physics, biotechnology, meteorology, agrochemistry and other fields of science.

The Siberian enterprise supplies its isotopes to a wide range of countries: Russia, USA, Canada, Brazil, Mexico, Germany, France, Spain, Netherlands, Belgium, Denmark, Italy, Norway, Sweden, Poland, Hungary, Finland, Korea, Taiwan, China, Japan, India, Jordan, Saudi Arabia, Australia, Uzbekistan and other countries.



The main types of environmental impact of the enterprise are emissions of radionuclides and harmful chemicals into the air, formation and storage of radioactive waste, generation of production and consumption waste, water intake from surface water bodies.



2 ENVIRONMENTAL POLICY OF ELECTROCHEMICAL PLANT JSC



The environmental policy of Electrochemical Plant JSC follows the basic principles of Rosatom's environmental policy.

The environmental policy of Electrochemical Plant JSC was last revised in 2018. The environmental policy of Electrochemical Plant JSC is harmonized with the environmental policy of JSC «ТВЭЛ».

The basic strategic goals of Electrochemical Plant JSC regarding environment are ensuring environmental safety needed for sustainable development of the enterprise and reducing the negative environmental impact of production process and products to the minimum acceptable level.

The environmental policy of Electrochemical Plant JSC serves as the basis to set goals and objectives in environmental safety and is implemented through the environmental management system.

Short-term environmental goals are set to realize the intentions and principles of the policy. The objectives take into account legal, regulatory and other requirements, significant environmental aspects, as well as financial, operational and stakeholder requirements.

The environmental policy is published on the official website of Electrochemical Plant JSC, is available to all stakeholders, and is communicated to all personnel of the enterprise, as well as contractors.



3 ENVIRONMENTAL, QUALITY AND OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEMS

Electrochemical Plant JSC has developed, documented, implemented, maintained and continuously improved an integrated management system (IMS), including quality management system (QMS), environmental management system (EMS), occupational health and safety management system (OHSMS) and energy management system (EMS).

In May 2021, Electrochemical Plant JSC successfully passed the recertification audit of corporate integrated management system of TVEL JSC for compliance with the standard ISO 14001:2015.

The experts of Intercertifica-TUV LLC, a Russian representative of TUV Thuringer e.V. (Germany), audited ECP's integrated management system.

The audit confirmed our compliance with the requirements of the international standard, Russian law, and the environmental safety requirements adopted by Electrochemical Plant JSC.

Internal and external audits, as well as top management review, are used to evaluate the performance of management systems.

During the reporting period, 23 internal audits of IMS were conducted. The audits confirmed that the company's operations comply with the requirements of international standards, Russian legislation and the requirements that Electrochemical Plant JSC has committed to the field of environmental safety.

Based on the annual top management report for 2021, the quality management system, the environmental management system, the

occupational health and safety management system and the energy management system of Electrochemical Plant JSC were found suitable, adequate and effective .

СЕРТИФИКАТ

соответствия системы менеджмента
требованиям стандартов ISO 9001:2015,
ISO 14001:2015, ISO 45001:2018
и ISO 50001:2018

В соответствии с правилами сертификации подтверждено
выполнение требований стандартов в организации

Акционерное общество
"Производственное
объединение

 "Электрохимический завод"
663690, Российская Федерация,
Красноярский край, город Зеленогорск,
ул. Первая Промышленная, дом 1

в области:

Производство, хранение и поставка урана с обогащением не более 65% для
энергетических и исследовательских реакторов. Производство и поставка
изотопной продукции, фтористоводородной кислоты и безводного фтористого
водорода.

Регистрационный номер сертификата:	TIC 15 100 52672/5 TIC 15 104 10699/5 TIC 15 118 20242/5 TIC 15 275 14075/5	Действителен до: 2024-08-27 Действителен с: 2021-08-28
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Отчет по аудиту №: 3330 2EPC M0

Сертификация проведена в соответствии с процедурами TIC по проведению аудита и
сертификации и предусматривает проведение регулярных наблюдательных аудитов.
Данный сертификат действителен только вместе с основным сертификатом.


Organ по сертификации
систем и персонала
TÜV Thüringen e.V.  Йена, 2021-08-12



На официальных сертификатах
голограммы.

Срок действия сертификата может быть проверен на Интернет-странице www.tuev-thueringen.de
Zertifizierungsstelle des TÜV Thüringen e.V. • Ernst-Ruska-Ring 6 • D-07745 Jena • ☎ +49 3641 399740 • zertifizierung@tuev-thueringen.de

CERTIFICATE

for the management system according
to ISO 9001:2015, ISO 14001:2015,
ISO 45001:2018 and ISO 50001:2018

The proof of the conforming application with the regulation was
furnished and in accordance with certification procedure it is certified for
the company

 **Electrochemical Plant,**
Joint Stock Company
663690, Russian Federation, Krasnoyarskiy krai,
Zelenogorsk, ul. Pervaya Promyshlennaya, 1

Scope:

Production, storage and delivery of uranium with enrichment less than 65% for
power and research reactors. Production and delivery of isotope products,
hydrofluoric acid and anhydrous hydrogen fluoride.

Certificate Registration No.:	TIC 15 100 52672/5 TIC 15 104 10699/5 TIC 15 118 20242/5 TIC 15 275 14075/5	Valid until: 2024-08-27 Valid from: 2021-08-28
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Audit Report No.: 3330 2EPC M0

This certification was conducted in accordance with the TIC auditing and certification procedures and
is subject to regular surveillance audits. The certificate is valid in conjunction with the main certificate.


TÜV Thüringen e.V.
Certification body for
systems and personnel  Jena, 2021-08-12



Original certificates
are branded with a hologram.

The current validity can be demanded at our homepage www.tuev-thueringen.de
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4 MAIN DOCUMENTS REGULATING ENVIRONMENTAL PROTECTION FOR ELECTROCHEMICAL PLANT JSC

Environmental protection activities of Electrochemical Plant JSC are carried out in accordance with the Codes of the Russian Federation, Federal laws in the field of environmental protection, decrees and orders of the President of the Russian Federation, Resolutions of the Government of the Russian Federation, regulatory acts of executive authorities, industry regulatory acts, as well as permits and regulatory documents of Electrochemical Plant JSC.

Table 1. List of documents regulating environmental protection for Electrochemical Plant JSC

No.	Name
1	Federal Law of 21.11.1995 No. 170-FZ «On the Use of Atomic Energy
2	Federal Law of 23.11.1995 № 174-FZ «On Environmental Expertise»
3	Federal Law No. 3-FZ of 09.01.1996 «On radiation safety of the population
4	Federal Law No. 89-FZ of 24.06.1998 «On Production and Consumption Wastes»
5	Federal Law No. 52-FZ of 30 March 1999 on Sanitary and Epidemiological Welfare of the Population
6	Federal Law of 04.05.1999 № 96-FZ «On Protection of Atmospheric Air»

No.	Name
7	Federal Law No. 7-FZ dated 10.01.2002 «On Environmental Protection»
8	Federal Law of 11.07.2011 No. 190-FZ «On radioactive waste management and on amendments to certain legislative acts of the Russian Federation
9	Law of the Russian Federation of 21.02.2002 № 2395-1 «On Subsoil»
10	«Urban Development Code of the Russian Federation» of 29.12.2004 № 190-FZ
11	«Land Code of the Russian Federation of 25.10.2001 № 136-FZ
12	«Water Code of the Russian Federation of 03.06.2006 № 74-FZ
13	Joint Venture 2.6.1.2216-07 «Sanitary protection zones and observation zones of radiation objects. Operating conditions and justification of borders».
14	JV 2.6.1.2523-09 «Radiation safety standards. (NRB-99/2009)
15	Joint Venture 2.6.1.2612-10 «Basic Sanitary Rules for Radiation Safety (OSPOORB-99/10)»
16	SanPiN 2.2.1/2.1.1200-03 «Sanitary Protection Zones and Sanitary Classification of Enterprises, Structures and Other Objects (new edition)
17	Certificate of state registration as an object having a negative impact on the environment dated 26.12.2016 No. JSC1ERA06
18	Draft Maximum Permissible Emissions (MPE) of Pollutants into the Air, approved by the order of the Krasnoyarsk Territory Administration of the Federal Service for Supervision of Natural Resources Management (Rosprirodnadzor) No. 1067 dated 12.10.2017. Validity period up to 12.10.2024
19	Permit for emission of harmful (polluting) substances into the air from 12.10.2017 № 05-1/32-151, issued by the Department of Rosprirodnadzor for Krasnoyarsk Territory. Validity period up to 12.10.2024
20	Norms of permissible discharge of pollutants into the Kan River, approved by the Yenisei River Basin Water Administration on 24.12.2018. Valid until 24.12.2023
21	Permit for discharge of substances and microorganisms into the environment No. 149 dated 30.01.2019 issued by the Krasnoyarsk Territory and Tyva Republic Department of Rosprirodnadzor. Valid until 24.12.2023
22	Draft waste generation and disposal limits (PNOOLR) approved by the order of the Krasnoyarsk Territory Federal Service for Supervision of Natural Resources Management dated 31.10.2018 No. 1317. Valid until 31.10.2023.
23	Document on approval of waste generation standards and waste disposal limits dated 31.10.2016 No. 05-1/26-101 issued by the Krasnoyarsk Territory Federal Service for Supervision of Natural Resources Management No. 1317 dated 31.10.2018. Valid until 31.10.2023

No.	Name
24	Permit for release of radioactive substances into the atmosphere No. GN-VR-0010 dd. 15.04.2021 issued by the Federal Service for Environmental, Technological and Nuclear Supervision. Valid until 01.05.2028
25	License GN-03-115-4165 of 23.12.2021 for the right to operate a nuclear facility issued by the Federal Service for Environmental, Technological and Nuclear Supervision. Valid until 23.12.2026.
26	License GN-05-401-3695 of 06.09.2019 for the right to handle nuclear materials during transportation, issued by the Federal Service for Environmental, Technological and Nuclear Supervision. Valid until 06.09.2024.
27	License GN-08-115-3370 of 23.06.2017 for the right to use nuclear materials in research and development, issued by the Federal Service for Environmental, Technological and Nuclear Supervision. Valid until 23.06.2027.
28	License GN-10-115-3357 of 15.05.2017 for the right to design and construct nuclear installations, radiation sources, nuclear materials and radioactive substances storage facilities, radioactive waste storage facilities, issued by the Federal Service for Environmental, Technological and Nuclear Supervision. Validity period up to 15.05.2027
29	License SO-11-115-1974 of 10.07.2013 for the right to carry out activities on the design of equipment for nuclear installations, radiation sources, nuclear materials and radioactive substances storage facilities, radioactive waste storage facilities, issued by the Federal Service for Environmental, Technological and Nuclear Supervision. Validity up to 10.07.2023
30	License SO-11-101-2051 of 24.01.2014 for the right to carry out design activities for nuclear installations, nuclear material and radioactive substance storage facilities issued by the Federal Service for Environmental, Technological and Nuclear Supervision. Validity period up to 24.01.2024
31	License GN-06-115-4176 of 31.12.2021 for the right to handle radioactive substances in the course of their processing and storage, issued by the Federal Service for Environmental, Technological and Nuclear Supervision. Validity up to 31.12.2026
32	Water use agreement No. 24-17.01.03.004-R-DZVO-S-2018-04219/00 of 06.09.2019, signed with the Ministry of Natural Resources and Environment of Krasnoyarsk Territory. Valid until 21.03.2024.
33	Decision on the provision of a water body for use dated 15.07.2014 No. 24-17.01.03.004-R-RSVH-S-2019-04482/00. Valid until 02.08.2029
34	License KRR 02958 VE dated 20.11.2017 for the usage of natural resources (exploration and extraction of potable ground water). Valid until 16.11.2042.



5 INDUSTRIAL, ENVIRONMENTAL, AND RADIATION MONITORING OF THE ENVIRONMENT

In terms of potential radiation hazard for the population, Electrochemical Plant JSC belongs to Category III object, the radiation impact of which in case of an accident is limited to the territory of the object, and the observation zone is not established for it. The category of the object is approved by Regional Office No. 42 of the Federal Medical and Biological Agency of Russia.

In accordance with the requirements of the Federal Law No. 7-FZ «On Environmental Protection», the company obtained the Certificate of State Registration as an object having a negative impact on the environment, No. AO1ERA06 of 26.12.2016. Electrochemical Plant JSC was assigned the second category by the degree of negative environmental impact.

The Sanitary Protection Zone (hereinafter referred to as SPZ) of Electrochemical Plant JSC was determined by during a corresponding project, which received



a positive sanitary and epidemiological conclusion and was approved by the Head of the Zelenogorsk CATO Administration in 2013. The SPZ coincides with the border of the main industrial site.

The area of the main industrial site land plot is 244.5 ha.

The industrial site of the enterprise has a fence around the perimeter, is guarded, has access railways and a network of paved roads, numerous communications of different purposes.

The territory of the enterprise is planned, landscaped and has green plants.

In accordance with Article 67 of the Federal Law dated 10.01.2002 No. 7-FZ «On Environmental Protection» the enterprise carries out industrial environmental control.

Industrial environmental control is carried out in accordance with the Industrial Environmental Control Programme.

The unit that provides this function in the enterprise is Department for Production and Environmental Control (DPEC). DPEC is accredited in the national



accreditation system as a testing laboratory, Accredited Entities List individual record No. RA.RU.512213.

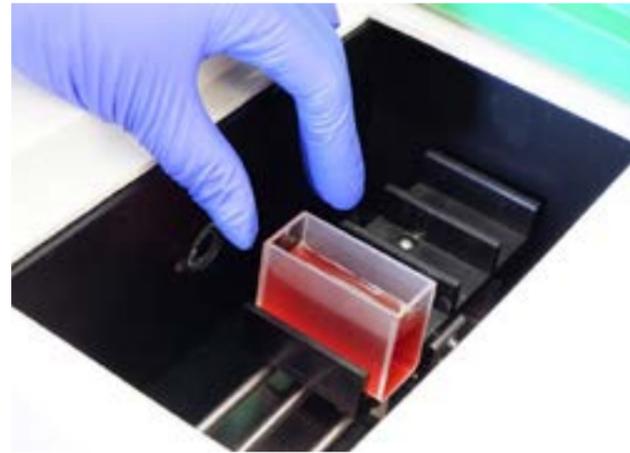
Radiation control is carried out by the radiation control laboratory in accordance with the «Regulation on radiation control of emissions, discharges, environmental objects and radioactive waste», approved by the Chief State Doctor of Office No. 42 of the Federal Medical and Biological Agency.



Types of industrial environmental and radiation control:

- ◆ Control of hazardous substances (hereinafter — HS) and radionuclides in atmospheric emissions;
- ◆ Control of HS content in atmospheric air at the border of the sanitary protection zone (SPZ);
- ◆ Monitoring of the volume activity of radionuclides in the ground layer of the atmosphere at the industrial site and in settlements;
- ◆ Control of contamination of snow, vegetation and soil with radionuclides within the industrial site and settlements;
- ◆ Control of HS and radionuclide content in the waste water of the plant, groundwater and surface water bodies;
- ◆ Control of radionuclide content in bottom sediments;
- ◆ Control of specific and volumetric activity, isotopic composition of radioactive waste.

The following methods for control of emissions and discharges of harmful chemicals are applied: potentiometric, photocolometric, atomic-absorption, X-ray fluorescent, capillary electrophoresis.



Department of industrial environmental control of the enterprise is equipped with modern measuring equipment: Kapel capillary electrophoresis system for quick and effective analysis of organic and inorganic ions in solutions, Spectroskan MAK-S-GV X-ray machine for spectral analysis, MGA-1000 atomic absorption spectrometer with autosampler for the determination of metals in air and water.

Radiation monitoring uses alpha-spectrometric method with radiochemical separation and radiometric method. SEA-13P semiconductor alpha energy spectrometers and RIA-02M and iSolo alpha radiometers are used as measuring instruments.

All instruments (spectrometers, radiometers, spectrophotometers, etc.) are included in the state register of instruments and undergo regular verification.

All radioactive waste generated at the enterprise is certified. Radiation control laboratory monitors the isotopic composition and specific activity of waste. The activity of radionuclides is determined by direct measurement with ISOCS gamma-spectrometric system.



In accordance with the order of the General Director of ROSATOM and the Regulation on the procedure for on-site monitoring of the state of subsurface resources at the enterprises and organizations of ROSATOM, Electrochemical Plant JSC has developed and is implementing the Program for on-site monitoring of the state of subsurface resources within the industrial site (sanitary protection zone) of Electrochemical Plant JSC. The purpose of the on-site monitoring of the state of subsurface resources (OMSR) is to obtain reliable information on the impact of nuclear and radiation hazardous facilities of the enterprise on the state of the subsoil, which is necessary to assess the environmental safety in the operation and decommissioning of these facilities, to inform the management on the implementation of environmental protection measures.



The main task of the OMSR is to obtain regular and reliable information on the state of the subsurface resources and to determine the spatial and temporal distribution of the various types of impacts on the subsurface resources in the area of monitoring objects.

OMSR is a part of environmental and radiation monitoring and includes control over the radiochemical, hydrochemical, hydrodynamic and temperature state of groundwater, monitoring of soils, snow cover, surface water and bottom sediments in the area of nuclear and radiation hazardous facilities of the enterprise.

The OMSR data are used to form annual forecasts and assessments of the safety at the nuclear and radiation hazardous facilities.

As part of the development of information-analytical systems for environmental monitoring at the Electrochemical Plant, an on-site automated measuring system for industrial environmental monitoring (AISPEM) was created. Its task is to provide continuous radiation and chemical monitoring of work areas and the entire area of the industrial site, as well as the closed area of Zelenogorsk. As of today, the system encompasses 61 control posts.

AISPEM controls all types of hazardous environmental impacts, which may be caused by the company's production, i.e. radiation (gamma radiation) and chemicals (hydrogen fluoride, ammonia, sulphur dioxide, nitrogen dioxide), as well as data on weather conditions (determines wind speed and direction, measures atmospheric pressure, temperature and relative humidity, and precipitation). Meteorological data allow forecasting the development of a possible emergency situation and making balanced decisions to protect the population and eliminate the negative consequences of possible emergencies.

AISPEM includes a mobile automated emergency response system with an environmental monitoring system (ASEMCAR). ASEMCAR is designed to quickly deploy a local mobile dispatch center (LMDC) or an emergency response headquarters (ERH) in the emergency response zone. It also can deploy a network of automatic and automated control stations for radiation, chemical and meteorological conditions that warns about exceeded permissible levels and transmits monitoring reports to the AISPEM database.

In 2015, AISPEM of Electrochemical Plant JSC passed the metrological certification and was entered into the Register of Measuring Instruments of the Russian Federation.



Radiation situation at the location of the plant has corresponded to the safe values of gamma background, typical for the East-Siberian part of Russia, ~ 0.15 $\mu\text{Sv/h}$, for the whole period of operation.

SCHEMATIC MAP

ECP monitors emission sources, environmental objects, discharge and ground water its area



SYMBOLS:

- sanitary protection zone
- monitoring of radioactive and chemically hazardous emissions
- sampling of soil, vegetation, snow and near-surface air
- sampling of ground water
- sampling of discharge water
- sampling of hazardous substances in air

AISPEM posts mapping within the industrial site

Radiation and chemical sensors ensure continuous monitoring of radiation background and hazardous chemicals in workplace air, within the industrial site, on the border of the sanitary protection zone and in the residential areas of Zelenogorsk.



- chemical monitoring
- weather monitoring
- radiation monitoring



6 Environmental impact

6.1 Water intake from water bodies

Water for cooling of main and auxiliary equipment is taken from Kan river via owned water intake facility. Water intake is located within the industrial site on the left bank of Kan river 97.4 km from its estuary. The water intake is protected to prevent young fish from entering.

The water is used as per the contract for water use between ECP and the Ministry of Natural Resources and Ecology of Krasnoyarsk Territory. The type of water use is water use with intake (extraction) of water resources from water bodies and return of water into water bodies.

Permissible water intake volume is 102,000,000 m³/ year.

Water taken from Kan river in 2021 was 73,421,670 m³.

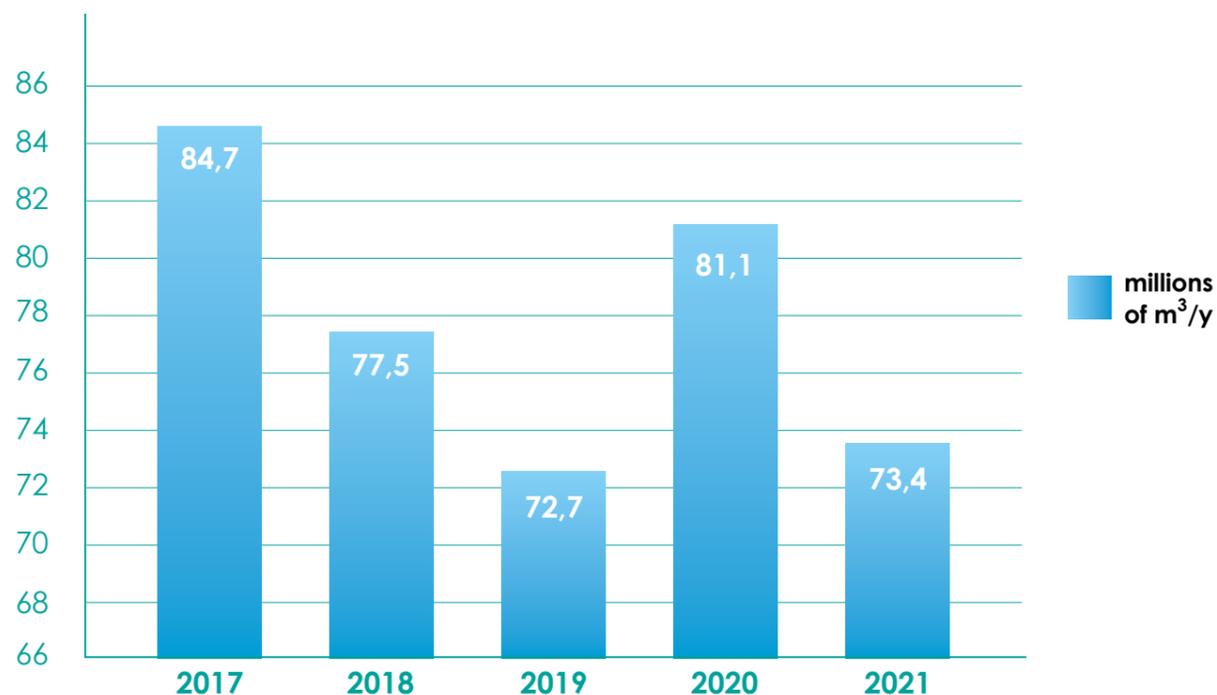
Table 2. Water intake volume according to the report of 2-tp (water department):

Source	Source type	Water intake volume, m ³ .
Industrial water, Kan river	Surface water body	73,421,670
Artesian wells	Underground	245,520
Municipal water lines	Communal water supply lines	911,060
Grids of TVK LLC, TEK-45 LLC		5,500
TOTAL		74,583,750

The water is taken from artificial wells as per the license granted by the Natural Resource Department for the Central-Siberian Region. The permissible water intake volume is 293,830 m³/year

In the reporting year, industrial water consumption increased by 8.3 % compared to 2020 due to the frequency control equipment that optimizes the operation of heat exchangers. This optimization of operational processes helps decrease water consumption from the Kan river.

Water consumption dynamics (millions of m³/y)



6.2 Discharges to the open water systems

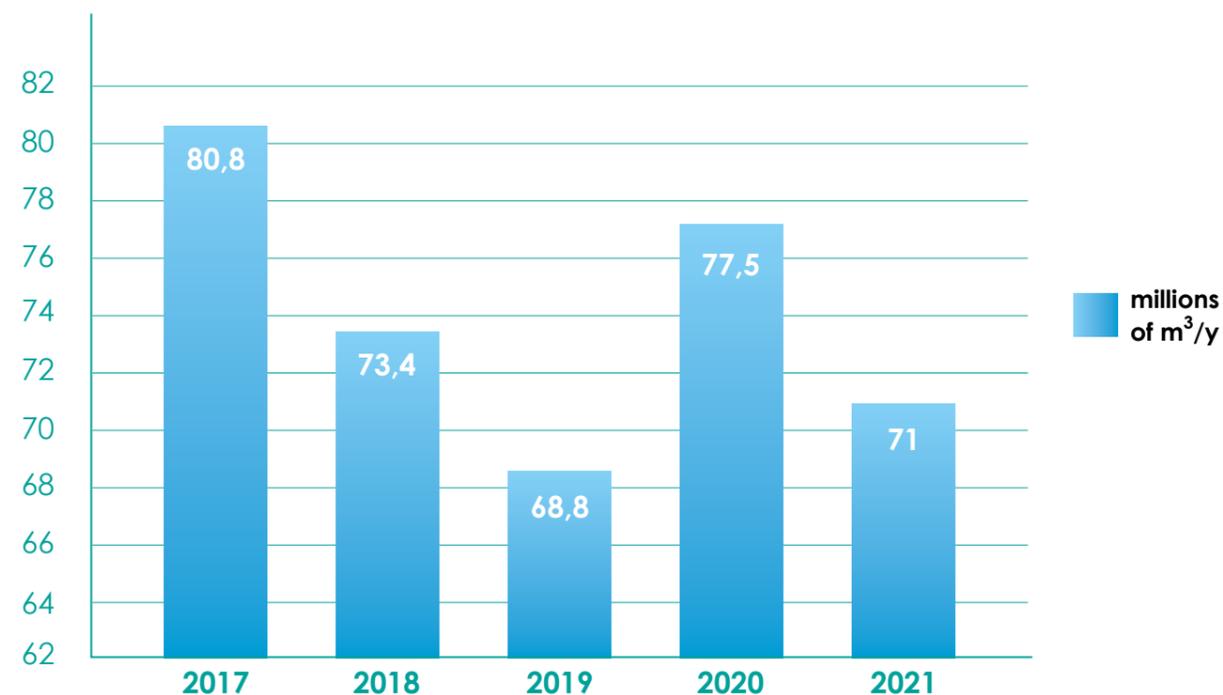
The water discharged after cooling of main and auxiliary equipment and rainwater drainage from the industrial site flow to the Kan river via a riverside outlet.

Water discharge is authorized under the Water Body Use Grant issued by the Ministry of Natural Resources and Ecology of Krasnoyarsk Territory and Pollutant Discharge Permit issued by the Regional Directorate for Natural Resource Supervision.

Permitted water discharge is 120,073,720 m³.

In 2021, 70,975,670 m³ were discharged, decreasing by 8.4 % as compared to 2020 due to the decreased intake from the Kan river for equipment cooling.

Water discharge dynamics (millions of m³/y)



6.2.1 Hazardous chemicals discharge

The quality of discharged water corresponds to the quality of the natural water withdrawn from the Kan River.

Table 3. Results of observations of the quality indicators of wastewater and surface water in 2021

Sampling point	Measured parameters	Measurements, mg/dm ³				
		1 quarter	2 quarter	3 quarter	4 quarter	
Kan river, 400 m above water discharge, at water intake point	BOD _p	1,6	2,9	1,5	2,5	
	BOD ₅	1,0	1,0	0,8	1,5	
	Weighted substances	3,2	21,3	8,5	3,5	
	Iron dissolved	0,12	0,31	0,216	0,079	
	Ammonium ion	0,18	0,36	0,27	0,19	
	Petroleum products	0,014	0,041	0,024	0,01	
	COD	9,9	22,5	15,6	10,6	
	Dry residue	187,3	129,7	155,0	178,3	
	pH	7,5	7,9	8,1	8,1	
	Dissolved oxygen	10,5	10,5	9,1	9,2	
	Toxicity	no acute toxicity				
	TCB, CFU/100 ml	144				
	TTCB, CFU /100 ml	below 9				
	Coliphage, PFU/100 ml	0				
	Intestinal infections agents	not detected				
	Cysts of pathogenic intestinal protozoa	not detected				
	Vital helminthe eggs	not detected				
	Water discharge	BOD _p	1,2	2,6	1,2	2,2
		BOD ₅	0,7	1,0	0,6	1,3
		Weighted substances	3,0	18,2	8,1	3,3
Iron dissolved		0,06	0,29	0,19	0,077	
Ammonium ion		0,09	0,29	0,21	0,16	
Petroleum products		0,011	0,03	0,02	0,009	
COD		9,2	21,5	14,8	8,9	
Dry residue		187,3	128,0	139,3	174,7	
pH		7,5	8,0	8,1	8,0	
Dissolved oxygen		9,6	9,6	8,6	8,7	

Sampling point	Measured parameters	Measurements, mg/dm ³			
		1 quarter	2 quarter	3 quarter	4 quarter
	Toxicity	no acute toxicity			
	TCB, CFU/100 ml	below 11			
	ТТКБ, КОЕ/100 мΛ	below 11			
	Coliphage, PFU/100 ml	0			
	Intestinal infections agents	not detected			
	Cysts of pathogenic intestinal protozoa	not detected			
	Vital helminthe eggs	not detected			
Kan river, 500 m below water discharge	BOD _p	No measurements were made due to the inability to take samples in winter	2,7	1,4	2,5
	BOD ₅		1,2	0,8	1,6
	Weighted substances		24,0	8,5	3,0
	Iron dissolved		0,19	0,19	0,05
	Ammonium ion		0,25	0,26	0,09
	Petroleum products		0,049	0,024	0,005
	COD		16,3	15,7	6,3
	Dry residue		99,5	130,3	166,0
	pH		8,0	8,1	8,2
	Dissolved oxygen		9,8	9,0	8,7
	Toxicity	no acute toxicity			
	TCB, CFU/100 ml	below 9			
	TTCB, CFU /100 ml	below 9			
	Coliphage, PFU/100 ml	0			
Intestinal infections agents	not detected				
Cysts of pathogenic intestinal protozoa	not detected				
Vital helminthe eggs	not detected				

6.2.2 Radionuclide discharge

The facility does not discharge radioactive substances into water bodies. Uranium-238, uranium-235 and uranium-234 in discharged water are on background level not exceeding the sanitary-hygienic limit of 0.2 Bq/kg.

6.3 Emissions to atmospheric air

6.3.1 Emissions of hazardous chemicals

Emitting process equipment is fitted with gas treatment devices:

- ◆ Chemical absorption units and ion ventilation filters for hydrogen fluoride capture;
- ◆ Water scrubbers for soot and radionuclide purification;
- ◆ Aerosol filters for suspended substances and radionuclides.

Gas treatment efficiency is 70–99.9 %.

In 2021, stationary contaminant sources emitted 27.513 tonnes of contaminants representing 68 % of the permitted amount.

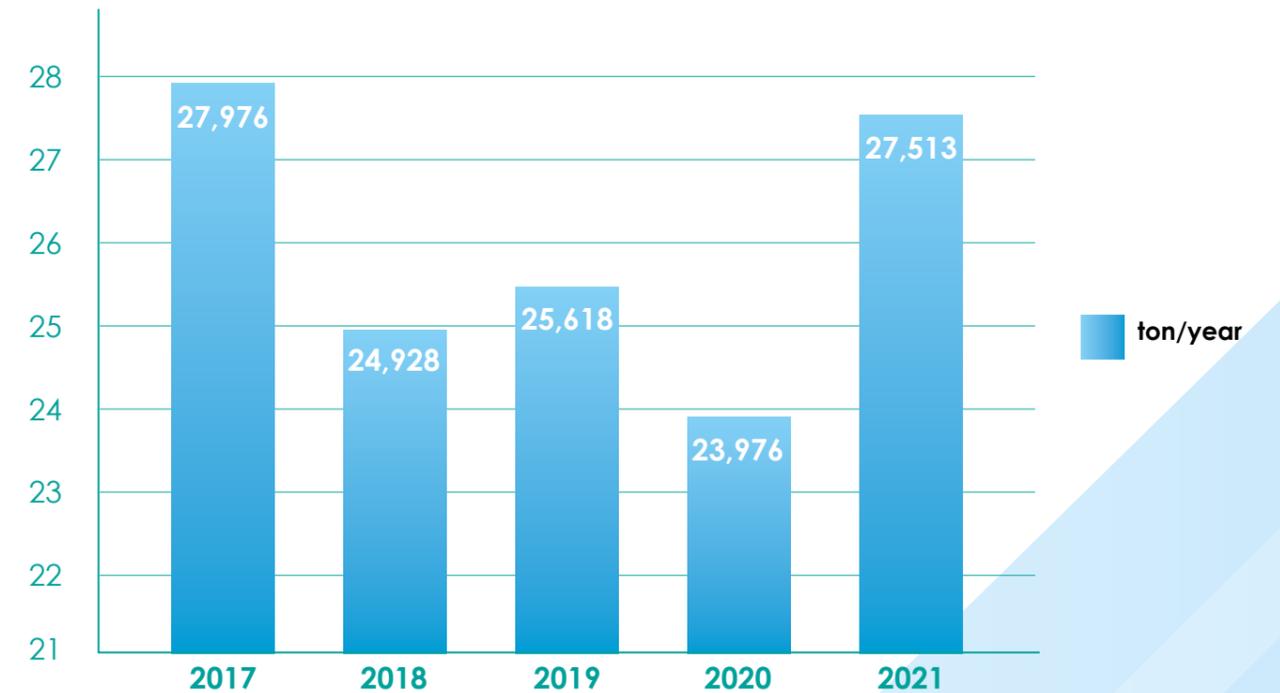
Table 4. Emission breakdown (basic substances)

No.	Contaminant	Hazard class	Purification rate, %	Actual emission in 2021, t	Maximum permitted limit, t	% of the limit
1	Ammonia	4	–	7,463	8,889	83,96
2	Carbon (soot)	3	70,0	0	7,776	0
3	Hydrogen fluoride	2	93,0	0,275	0,441	62,36
4	Kerosene	–	–	6,045	8,055	75,05
5	Hexan	4	–	1,353	1,804	75
6	Acetone	4	–	1,402	1,84	76,2
7	Gasoline	4	–	0,445	0,479	92,9
8	Iron oxide	3	99,0	0,28	0,28	100
9	Freon-22	4	–	3,3	3,3	100
10	Freon-134a	–	–	3,2	3,2	100
11	Freon-141b	–	–	3,216	3,4	94,59
12	Other			0,534	0,551	96,9
	Total:			27,513	40,015	68,76

In the reporting year, the mass of greenhouse gas emissions in terms of CO₂-equivalent when using Freon-134a and operating road transport amounted to 4.88 thousand tons of CO₂-eq.

The amount of ozone-depleting substances used in the reporting period amounted to 9.1 tons, the mass of ozone-depleting substances emitted amounted to 13.3 tons.

Contaminant gross emission dynamics (t/year)



The increase in pollutant emissions in the reporting year was due to the commissioning of additional process facilities.

6.3.2 Radionuclide emissions

In 2021, 99.06×10^6 Bq were released constituting 0.58 % of permissible limit determined by the Permit for Radionuclide Atmospheric Emission issued by the Federal Environmental, Industrial and Nuclear Supervision Service of Russia.

Below is the composition of the radionuclide emissions:

U^{238} — 36.58×10^6 Bq

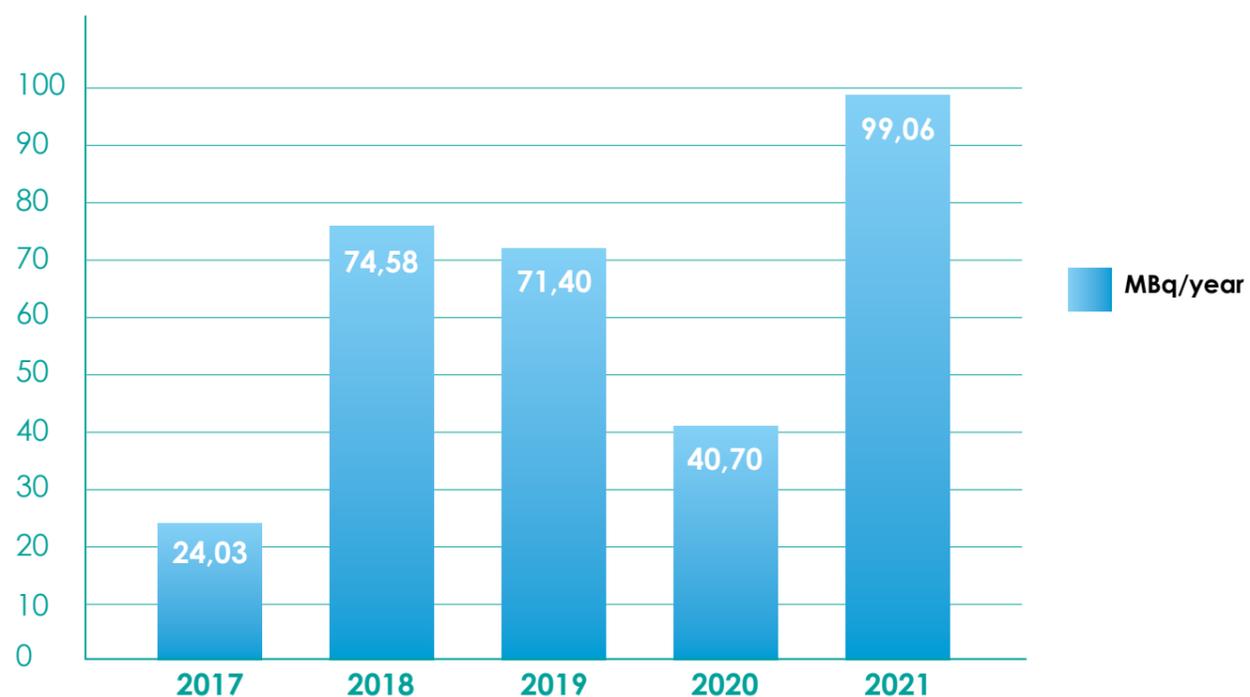
U^{234} — 56.04×10^6 Bq

U^{235} — 3.374×10^6 Bq

U^{236} — 3.036×10^6 Bq

U^{232} — 0.03×10^6 Bq

Radionuclide emission dynamics (MBq/year)



The increase in radioactive emissions in the reporting year was due to the commissioning of additional process facilities.

6.4 Waste

6.4.1 Handling of industrial waste and consumption waste

The facility has developed standard limits for waste generation and storage approved by the Federal Environmental, Industrial and Nuclear Supervision Service of Russia. All types of industrial waste and consumption waste are certified.

ECP does not have its own waste burial and decontamination facilities.

The Handling procedure for industrial and consumption waste is the internal document that regulates waste handling in the facility. The adverse environmental impact from waste is reduced by observing waste generation and storage limits, conditions of temporary waste accumulation on the production site, and decreasing the amount of generated waste.

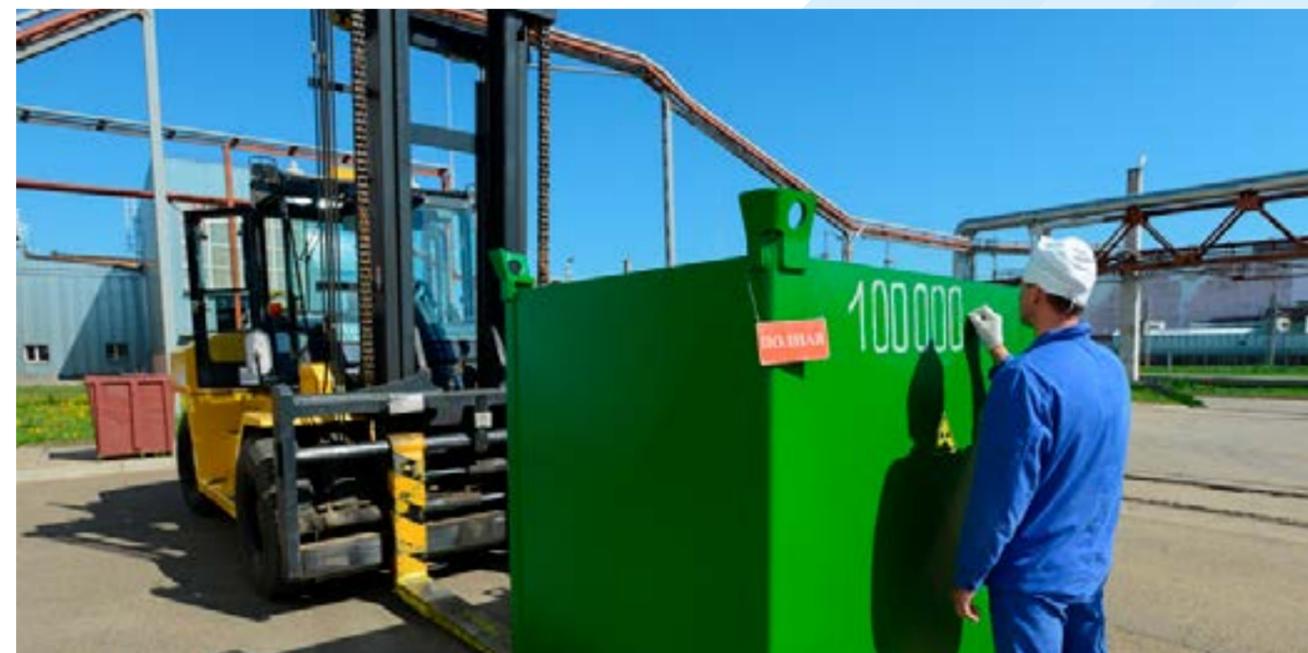
The facility has a procedure for accurate registration of generated, reused, decontaminated, and stored industrial and consumption waste. In 2021, ECP generated 11,715.378 tons (5,297.766 tons in 2020) of industrial and consumption waste:

0.02 % — hazard class I waste;

0.04 % — hazard class III waste;

94.14 % — hazard class IV waste;

5.8 % — hazard class V waste (almost non-hazardous).



In the reporting year, all generated waste was given to the external specialized organizations for recycling, decontamination, and disposal.

Hazard class I waste is represented only by spent mercury-containing lamps.

Table 5. Waste generation dynamics (t/year):

Hazard class	2017	2018	2019	2020	2021
I	2,659	3,731	3,242	4,676	2,916
II	0	0	0	0	0
III	73,885	0	537,028	205,435	4,99
IV	2 499,522	3 698,26	6 090,81	4 125,355	11 028,3
V	4 571,468	3 666,069	2 802,598	962,300	679,2

The amount of industrial and consumption waste generated in 2021 has increased by 121%, the number of allocated waste increased by 164 %, the amount of waste sent for disposal has decreased by 47 %.

The increase in the amount of generated and disposed of production and consumption waste in 2021 is associated with an increase in the amount of construction waste generated as a result of large-scale dismantlement activities carried out in preparation for the construction of the depleted UF6-defluorination unit, W2-ECP plant.

The reduction in the amount of waste transferred for disposal was caused by the scheduled shutdown of the incineration section for the main production equipment, which resulted in no additional volume of ferrous and nonferrous metal scrap to be disposed.

The industrial and consumption waste transferred for decontamination in 2021 increased by 1.76 tons due to large scale replacements of used mercury lamps in 2020.

No cases of exceeding the established limits for production and consumption waste disposal were registered in the reporting year.

The established limits for production and consumption waste disposal in the reporting year have not been exceeded.

Table 6. Information about generation, neutralization and allocation of industrial and consumption waste for the last 5 years

Year	Generated waste, tons	Annual limit for generated waste, tons	Given to external organizations for disposal, tons	Given to external organizations for neutralization, tons	Given to external organizations for burial, tons	Annual limit for waste allocation, tons
2017	7 147,534	8 577,633	4 497,300	2,659	2 647,575	4 147,833
2018	7 368,060	17 726,707	3 486,019	3,731	3 878,310	13 514,917
2019	9 433,678	17 726,707	3 202,275	3,242	6 228,161	13 514,917
2020	5 297,766	17 726,707	1 189,234	4,676	4 103,856	13 514,917
2021	11 715,378	17 726,707	860,222	2,916	10 852,24	13 514,917

6.4.2 Handling of radioactive waste

The source of radioactive waste at Electrochemical Plant JSC is the ongoing operation of the nuclear facility: recycling of process solutions, elimination or repair of equipment, replacement of outdated and worn equipment, incineration of spent gas centrifuges, appliances and materials used by personnel in their work, repair of industrial rooms.



The facility generates the following types of solid very low-activity radioactive waste:

- ◆ slag and ash from incineration of gas centrifuges;
- ◆ ceramics (fittings, insulators), fiberglass;
- ◆ plastic compounds, rubber, teflon;
- ◆ work clothes, personal protection equipment, cloth rags;
- ◆ construction and other waste;
- ◆ sediment after pulp separation plant.

All solid radioactive waste is given for storage to specialized near-surface storage facilities. In 2021, radioactive waste was handled in compliance with License No. GN-03-115-4165.

In 2021, the storages received 89.367 tons (62.14 m³) of radioactive waste.

Table 7. Radioactive waste dynamics

MU	2017	2018	2019	2020	2021
Mass, tons	691,806	608,489	117,72	105,967	89,376
Volume, m ³	684,552	609,524	80,434	66,571	62,14



6.5 Medical and biological characteristic of the location

Interregional Office No. 42 of the Federal Medical and Biological Agency of Russia, within its capacity to control and supervise sanitary and epidemiological wellbeing of people employed at the facility and living within the closed area of Zelenogorsk, regularly checks the compliance of Electrochemical Plant JSC with radiation safety requirements.

It has been confirmed that conditions and arrangement of actions for radiation safety in handling of ionizing radiation sources are assured.

Sanitary and hygienic situation at Electrochemical Plant JSC has been stable and virtually unchanging for several last years as confirmed by radiation control:

- ◆ average annual concentrations of radionuclides in the workspace air below are below permissible levels for personnel;
- ◆ radionuclide activity in workspace air has been at the level of averaged data for the last 5 years;
- ◆ work surface contamination is below permissible levels;
- ◆ radionuclides in the water discharged into Kan river are on the background level in the river and do not exceed the regulatory limit;
- ◆ radionuclide emissions into atmosphere are significantly lower than normative limits;
- ◆ radionuclide content in the environment is at the background level.

No incidents or radiation emergencies have been recorded. No cases of occupational diseases or suspected occupational diseases were detected.

Interregional Office No. 42 of the Federal Medical and Biological Agency annually analyzes and evaluates radiation in the environment in Zelenogorsk using the results of radiation control performed by the Center for Hygiene and Epidemiology No. 42 of the Federal Medical and Biological Agency.

Radiological conditions in Zelenogorsk (according to the results of multi-year studies) are characterized as favorable. Measured results of the gamma-radiation effective dose have remained stable for several years (~ 0.15 μSv/h) and conform to the natural values of the Eastern-Siberian Region confirming that Electrochemical Plant JSC does not industrially impact human environment.

The principal share into public radiation exposure in Zelenogorsk is brought by natural ionizing current sources.

The annual effective dose that the population in Zelenogorsk receives from natural sources of ionizing radiation is significantly lower than the accepted irradiation level.

Social and hygienic monitoring shows contamination-free environment in Zelenogorsk, that is: no industrial contamination of atmosphere, soil, and water bodies. Tap water is safe in sanitary and epidemiologic terms.

Socio-economic conditions are amongst the determining factors in public health of Zelenogorsk. The population of Zelenogorsk tends to decrease in all age groups except from people over 60 years. This is caused by natural and migrational population decline.

In 2021 natural population dynamics in Zelenogorsk did not change significantly: the population is declining with a coefficient of 8.61, which is higher than long-time average annual values in Krasnoyarsk Region and Russia.

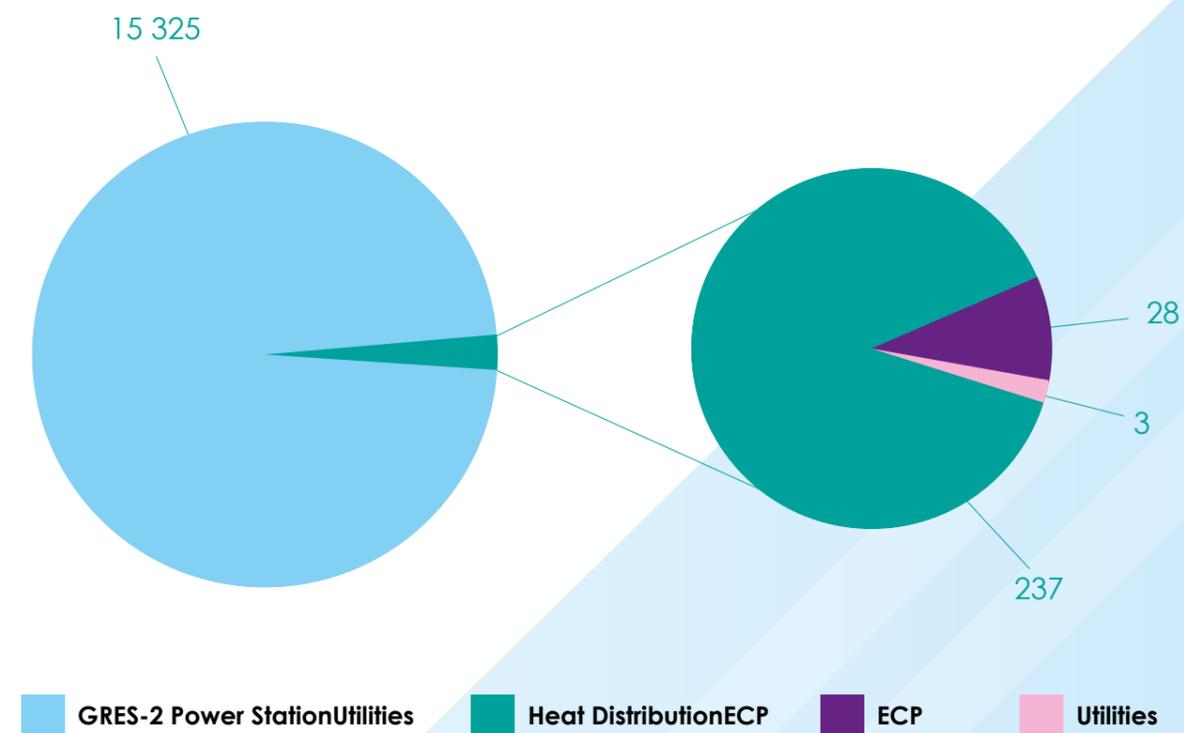
According to Interregional Office No. 42 of the Federal Medical and Biological Agency, general mortality rates in Krasnoyarsk Region and in Zelenogorsk have remained within the same range for 3 years. General mortality rate in Zelenogorsk is on the level of Krasnoyarsk Region: 12.2 for 1000.



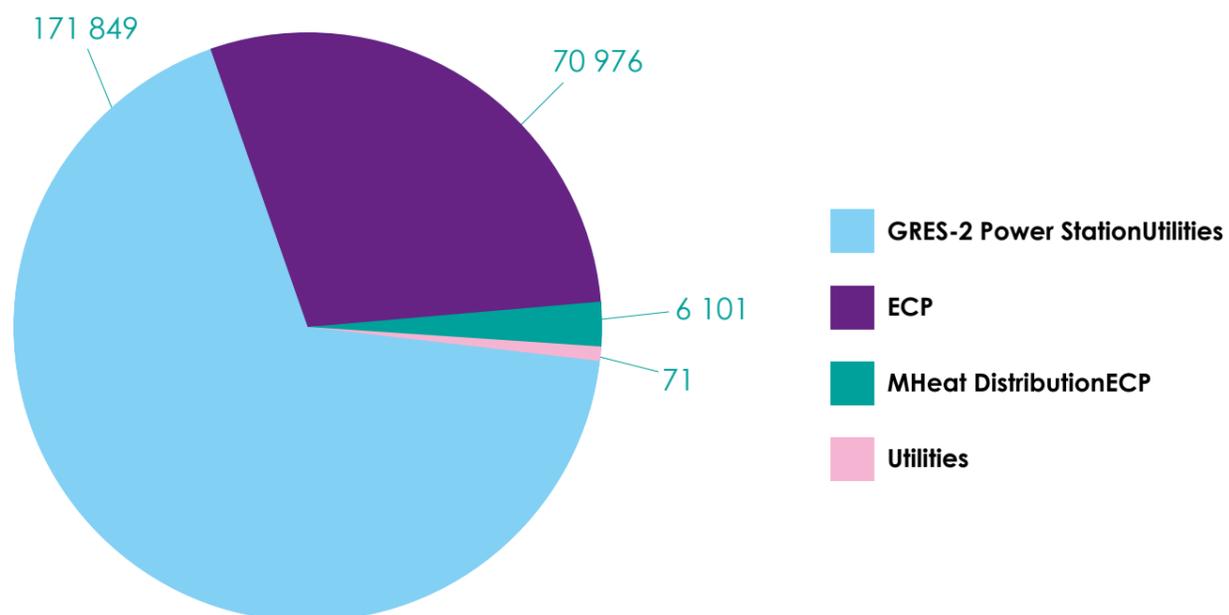
The principal mortality cause in Zelenogorsk as well as in Krasnoyarsk Region has been diseases of cardiovascular system, the second cause is tumors, the third is diseases of digestive system, the fourth is injuries and poisonings, the fifth is symptoms, signs and inaccurate description of the condition.

6.6 The share of Electrochemical Plant JSC in emissions, discharges and waste produced in the locality

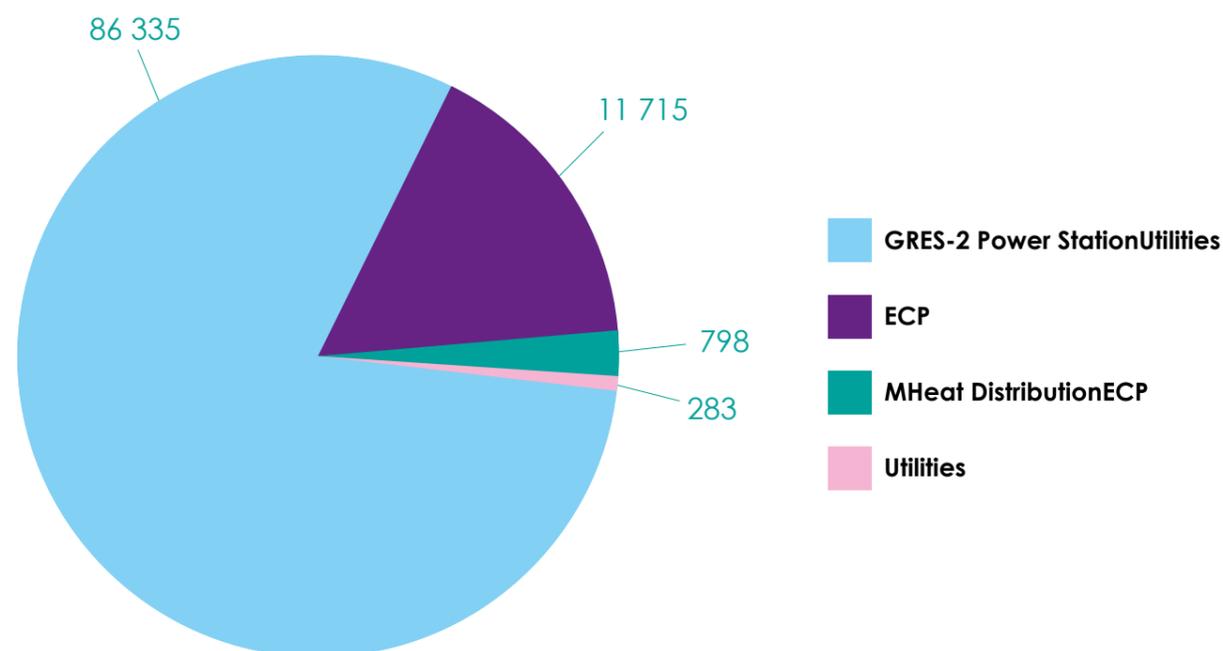
The share of air pollution among the industrial polluters (according to the data provided by businesses of Zelenogorsk closed area in 2021), tons/year



The share of water discharge among the principal industrial polluters (according to the data provided by businesses of Zelenogorsk closed area in 2021), thousands of m³



The share of waste generated by the principal industrial polluters (according to the data provided by businesses of Zelenogorsk closed area in 2021), tons



6.7 Condition of the location of Electrochemical Plant JSC

There are no areas contaminated with hazardous chemicals and radionuclides within the location of Electrochemical Plant JSC, the sanitary protection zone of the industrial site, and outside of it.

The impact of emissions, discharges, waste of the enterprise to the environment is limited within the area of the industrial site and complies with the requirements to emissions, discharges, waste.

Department for Production and Environmental Control measures radionuclides and hazardous chemicals in environment within and outside the sanitary protection zone (SPZ). Control points are placed according to the dominant wind pattern, background points are placed downwind.

Hydrogen fluoride (HF), being the most hazardous of the discharged substances, is controlled in five points within the sanitary protection zone and in one point near the town of Zelenogorsk. The concentrations of other contaminants discharged by the facility are less than 0.1 of the threshold on the SPZ line, therefore their concentrations are not controlled beyond SPZ.

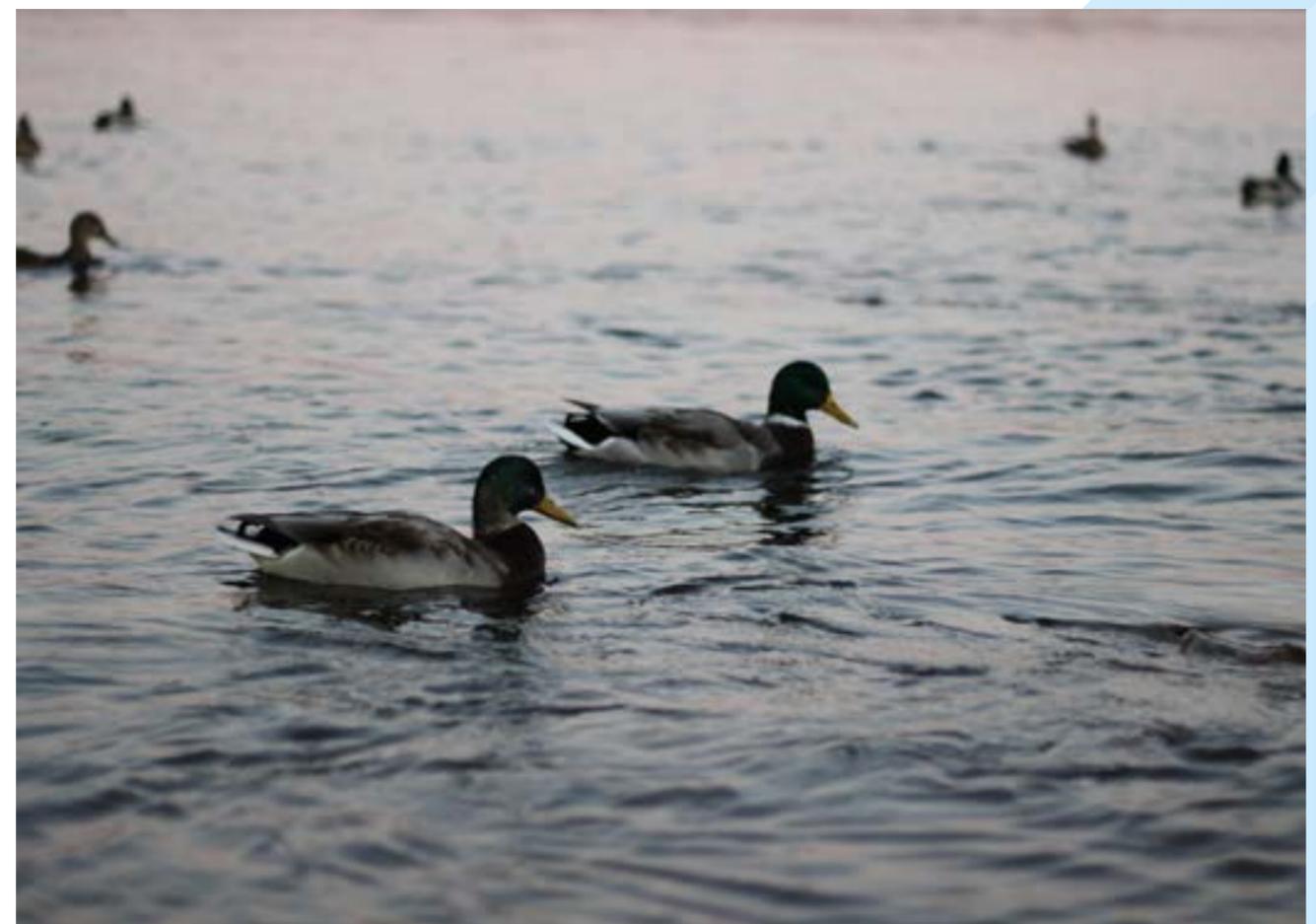
Table 8. Results of production and environmental control for 2017 – 2021

Year	Location	Specific activity of uranium isotopes (total of uranium-234, uranium-238, uranium-235), Bq/kg			Near-surface layer of air	
		Soil	Vegetation	Snow	Volumetric activity of alpha-emitting nuclides, Bq/m ³	HF concentrations, mg/m ³
2017	On border of SPZ	73,38	4,46	0,119	0,0007	< 0,001
	Town	45,2	0,97	0,03	0,0003	< 0,001
	Background	45,8	0,90	0,03	0,0001	< 0,001

Year	Location	Specific activity of uranium isotopes (total of uranium-234, uranium-238, uranium-235), Bq/kg			Near-surface layer of air	
		Soil	Vegetation	Snow	Volumetric activity of alpha-emitting nuclides, Bq/m ³	HF concentrations, mg/m ³
2018	On border of SPZ	76,05	4,18	0,151	0,000 7	< 0,001
	Town	39,9	0,90	0,03	0,000 3	< 0,001
	Background	35,8	0,90	0,03	0,000 1	< 0,001
2019	On border of SPZ	87,45	2,95	0,26	0,000 7	< 0,001
	Town	45,6	0,91	0,07	0,000 6	< 0,001
	Background	37,6	0,90	0,03	0,000 3	< 0,001
2020	On border of SPZ	90,2	3,89	0,061	0,000 8	< 0,001
	Town	45,0	1,18	0,037	0,000 6	< 0,001
	Background	35,0	1,05	0,03	0,000 4	< 0,001
2021	On border of SPZ	85,2	2,07	0,20	0,000 8	< 0,001
	Town	42,4	0,90	0,04	0,000 4	< 0,001
	Background	49,0	0,94	0,03	0,000 3	< 0,001

The values for uranium isotopes and hydrogen fluorides near the town are comparable with background values confirming that the facility does not negatively impact environment and public health.

Water discharged from the facility is classified as «clean to requirements», the content of hazardous chemicals and uranium isotopes in it is at the background level.





7 IMPLEMENTATION OF ENVIRONMENTAL POLICY

For implementation of its environmental policy, Electrochemical Plant JSC annually determines environmental goals and plans actions to achieve them.

HTM-2-1-4000 refrigerator was sent for modernization in order to reduce the inventory of refrigerators filled with Freon-12, hazardous for the ozone layer.

The enterprise has upgraded the general and gas purifying ventilation of the chemical division for energy saving purposes.

The instruments and equipment of the Department for Production and Environmental Control to promote the informational and analytical systems of environmental control and environmental safety management.

For stakeholder interaction, the external website of Electrochemical Plant JSC has published the Environmental Safety Report for 2020 in Russian and English languages.



The following principal technical actions are planned for 2022 in relation to the environmental policy:

- ◆ commissioning the HTM-2-1-4000 (XM-8) refrigerator;
- ◆ upgrades of exhaust ventilation in building 2D;
- ◆ upgrading the automated measurement system for the production and environmental monitoring of Electrochemical Plant JSC;
- ◆ upgrading the inventory of instruments of the Department for Production and Environmental Control;
- ◆ planned assessment of environmental aspects and related environmental impacts, risks, and opportunities

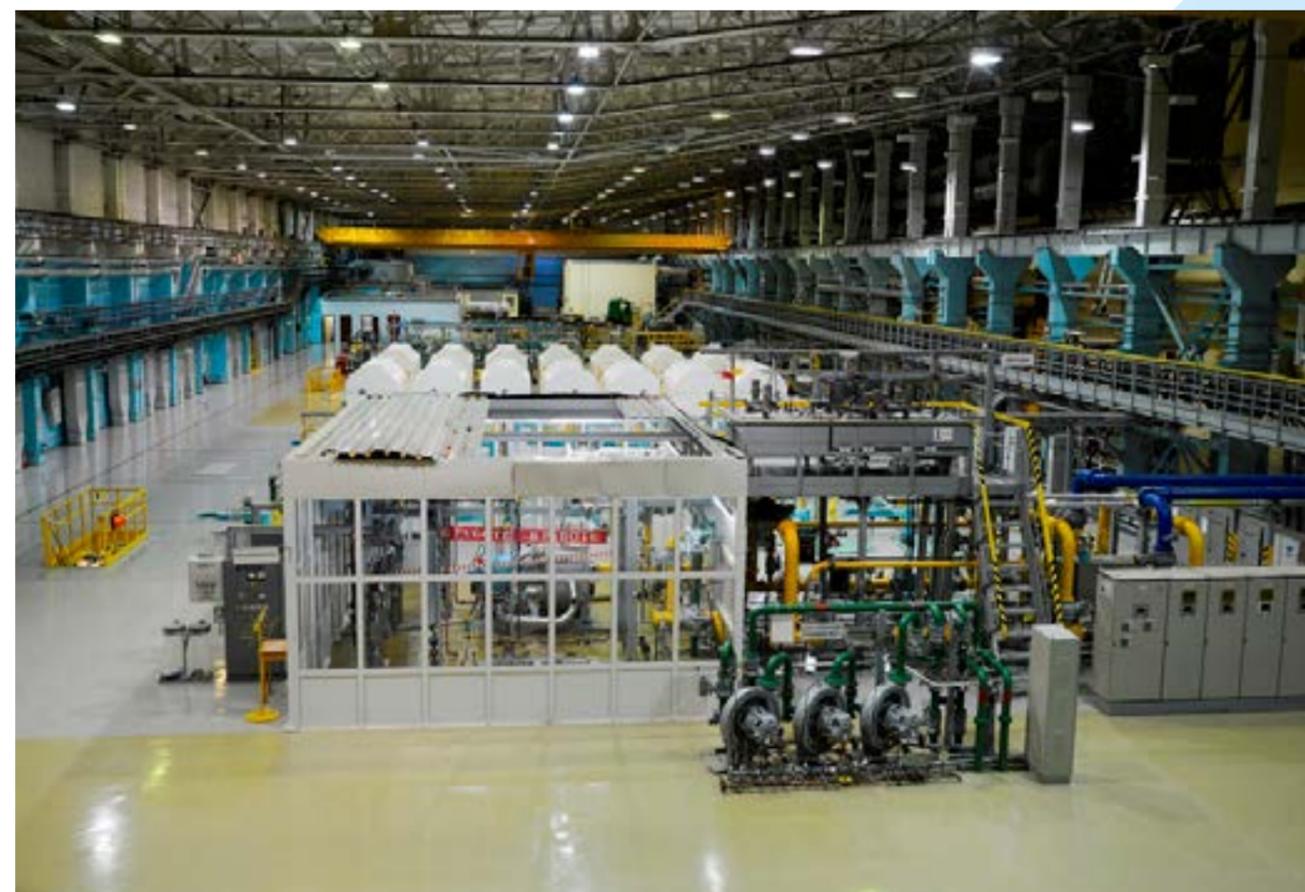
In 2021, ECP paid 7,694,924 rubles for the negative impact to the environment.

This includes:

- ◆ for emission of contaminants — 1,582 rubles;
- ◆ for waste allocation — 7,693,342 rubles.

Table 9. Total costs for environmental protection in 2021, thousands of rubles

No.	Description	Actual annual cost, thousands of rubles
1	Costs of protection and rational use of water resources	35 625,0
2	Air protection costs	20 813,0
3	Costs of protection from industrial and consumption waste	54 273,0
4	Costs of environmental radiological safety	28 035,0
5	Costs of protection and rehabilitation of surface water	5 962,0
6	Costs of public awareness activities in the field of environmental protection	539,0
7	Investments in fixed assets aimed at environmental protection and rational use of natural resources	–
8	Costs of environmental protection activities	13 485,75
Total environmental protection costs:		158 732,75





8 ENVIRONMENTAL ACTIVITY AND RAISING PUBLIC AWARENESS

8.1 Interaction with state and local authorities

ECP externally communicates with the state environmental and legal supervisory authorities by submitting timely, complete and true environmental information (statistical reports, environmental protection plans, financial documents, statements about environmental control of production, reports on the organization, and results of industrial environmental control, etc.).

There were no fines or injunctions from supervisory authorities for violation of environmental laws and regulations in the reporting period.

8.2 Interaction with environmental organizations, scientific and social institutes and public



Electrochemical Plant JSC always responds to statements and reports of organizations and the public concerning environmental protection issues.

During 2021, no complaints and claims related to the environmental impact of the company were registered from public organizations or residents of Zelenogorsk.

The Company builds and maintains stable, constructive and transparent relations with stakeholders, prepares and disseminates information on the environmental impact of its activities.



In 2021, the following environmental safety awareness events were held:

- ◆ Press conference of the General Director of Electrochemical Plant JSC for the leading regional and local media;
- ◆ Participation of the company's specialists in the reception of the Public Council of Rosatom State Corporation;
- ◆ Company tour for the authorities and municipal organizations of Rybinsk district, towns of Zaozerny and Borodino;
- ◆ presentation of the Environmental Safety Report of ECP for 2020;
- ◆ Professional orientation classes for the high-school of Zelenogorsk;
- ◆ Environmental actions under «Clean Lake» and «Garden of Memory» projects.



8.3 Public awareness

ECP informs the population and external parties about the implementation of the Environmental Policy and the enterprise's activities in the field of environmental protection through the mass media (Impulse-ECP corporate newspaper, Panorama town newspaper, TViN TV programs).

The Impulse-ECP newspaper, an informational outlet of ECP, published 26 articles on environmental issues in the period from January to December 2021.

The company's environmental protection activities are periodically covered by mass media, such as TViN TV studio, Enisey TV television channel, Zeleny Gorod radio, Rossiyskaya Gazeta, Strana Rosatom, Element Buduschego, and Panorama newspapers.

The Environmental Safety Report of Electrochemical Plant JSC is annually published on the company's website.





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