FSUE "National operator for radioactive waste management"

REPORT

on environmental safety for 2019





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White bear and brown bear

(Nenets fairy tale)

GENERAL CHARACTERISTICS AND MAIN ACTIVITY OF FSUE «NORW»

1.1. General information

In the international practice the most secure way to isolate radioactive waste (hereinafter - RW) is recognized as their final disposal at special facilities. The final disposal of RW is the final, very important and environmentally responsible stage of RW management, aimed at RW isolation from human habitation environment ensuring reliable long-term safety for the entire period of RW activity.

The Federal State Unitary Enterprise «National Operator for Radioactive Waste management» (FSUE «NORW») was created in accordance with the Federal Law #190-FZ of July 11, 2011 "On management of radioactive waste and on amendments to some acts of law of the Russian Federation" on the basis of the state enterprise «Central Research Laboratory of Industrial Innovation Technologies», established by the order of the Ministry of Atomic Energy and Industry of the USSR of April 9, 1990 #269.

According to the order of the Government of the Russian Federation dated March 20, 2012 #384-p, FSUE "NORW" got the status of the national operator for radioactive waste management and is the only organization, authorized to dispose radioactive waste and perform other activities related to that.

Figure 1. General scheme of RW management



Providing a solution to the problems of the accumulated nuclear legacy and newlyproduced radioactive waste, the enterprise is, in fact, a state production and environmental enterprise, the key goal of which is the final disposal of radioactive waste, considering any potential risks to the environment and human health.

The mission of FSUE «NORW» is to ensure the environmental safety of the Russian Federation in the field of final disposal of radioactive waste. FSUE «NORW» was recognized as an organization suitable to operate nuclear facilities and carry out activities in the field of atomic energy use (Certificate of March 07, 2012 #GK-S008, effective amended as of November 13, 2017) by the governing body in the person of State Corporation Rosatom.

The main activities of FSUE «NORW» in accordance with the Charter, are as follows:

- radioactive waste disposal
- ensuring the safe handling of radioactive waste accepted for final disposal
- ensuring the operation and closure of the final disposal facilities
- ensuring nuclear, radiation, technical, fire safety, environmental protection
- ensuring radiation control on the territory of RW final disposal facilities including routine radiation surveillance after closing down such facilities

- performing customer functions for the design and construction of final disposal facilities for radioactive waste including design and survey
- forecasting the volumes of final disposal of radioactive waste, infrastructure development for radioactive waste management and placing relevant information on the website of FSUE «NORW» and the website of State Corporation «Rosatom» on the Internet
- providing technical and information support for the Control and Accountability System of Nuclear Material and Radioactive Waste
- informing the public, government authorities, other state bodies, local governments on safety issues when handling radioactive waste, and on the radiation situation in the territories where radioactive waste disposal facilities are located
- carrying out inventory of final disposal facilities for radioactive waste
- performing preparatory and pre-project work related to the construction of final disposal facilities
- purchasing land sites, incomplete construction facilities and equipment for the purposes of radioactive waste disposal
- designing, manufacturing and assemblying equipment for the purposes of radioactive waste disposal
- conducting research and development to justify and increase the operational and closure safety of disposal facilities
- storaging radioactive waste before transferring it to disposal facilities
- developing and implementing the community-focused activities considering the programs of socio-economic development and environmental safety arrangement for the RF constituents on the territory of which the radioactive waste disposal facilities are located; such programs shall be aimed at ensuring citizens' social protection including

measures for health protection of the citizens living on territories adjacent to radioactive waste disposal facilities

- developing and implementing measures to ensure the physical protection of final disposal facilities, including the creation of a system and elements of a physical protection system
- implementing measures on revealing locations for potential radioactive waste disposal facilities placement, involving social and marketing research, legal aspects analysis associated with potential radioactive waste disposal facilities placement, implementation of research efforts, R&D and other studies necessary for decision making on disposal facilities placement
- ensuring protection of state secret information as well as other restricted access information in accordance with Russian Federation legal and regulatory documents and Rosatom State Corporation local documentation
- organizing and conducting public hearings.

Nuclear materials, radioactive substances, radioactive waste are subject to state accounting and control in the state accounting and control system for nuclear materials and in the state accounting and control system for radioactive substances and radioactive waste according to Article 22 of the Federal Law «On the Use of Atomic Energy». One of the activities of FSUE «NORW» is the technical and informational support for the state accounting and control of radioactive substances and radioactive waste. In 2016, the Russian Government issued Resolution No. 542 of June 15, 2016 «On the Management of the State System for Accounting and Control of Radioactive Material and Radioactive Waste», which establishes, inter alia, the procedure for carrying out state accounting and control of RW, i.e. collecting, recording information on the amount, the gualitative composition and transporting of radioactive waste; registration of radioactive waste; registration of RW storage facilities; maintaining the register of radioactive waste; maintaining cadastre register of radioactive waste storage facilities; registration of the passport of radioactive waste.

Currently, «NORW» is mainly active in two major areas:

1. operational activities

2. creating final disposal facilities for radioactive waste. (pre-project activities, design and construction).

1.2. Operational activities of FSUE "NORW"

The enterprise consists of the central office and the following branches and offices in the regions where existing and future final disposal facilities for radioactive waste are located:

- 1. branch «DIMITROVGRADSKIY» (Dimitrovgrad, Ulyanovsk region)
- 2. branch «ZHELEZNOGORSKIY» (Zheleznogorsk, Krasnoyarsk Krai)
- 3. branch «SEVERSKIY» (Seversk, Tomsk region)
- 4. department «NOVOURALSK» of branch «SEVERSKIY» (Novouralsk, Sverdlovsk region)
- 5. branch «OZERSKY» (Ozersk, Chelyabinsk region).

Dimitrovgradskiy, Severskiy and Zheleznogorskiy branches are engaged in the deep disposal of liquid radioactive waste (LRW). Department «Novouralsk» of Branch «Severskiy» operates the near surface disposal facility for the 3rd and 4th classes of radioactive waste. Branch «Ozersky» was established at the end of 2017 for the construction and subsequent operation of a near surface disposal facility for class 3 and 4 radioactive waste.





Liquid radioactive waste disposal

The deep disposal facility for liquid radioactive waste (DDF LRW) stands for a complex of underground and above-ground facilities intended for liquid low and intermediate level radioactive waste disposal into deep geological formations, isolated from the above and below lying aguifers.

Table 1. Operation activities of FSUE "NORW" branches on class 5 RAW disposal

Branch	nch Dimitrovgradky Zheleznogorskiy branch branch		Severskiy branch			
Name	«Experimental industrial landfill» (DDF EIL)	Landfill «Severniy» (DDF landfill «Severniy»)	«Disposal sites 18 and 18a». (DDF Landfills 18 and 18a)			
Location	Ulyanovsk region, 6 km to south-west of Dimitrovgrad, at the territory of JSC «SSC RIAR» industrial site	Krasnoyarsk Territory, 60 km from Krasnoyarsk, 18 km from Zheleznogorsk. Within limits of FSUE MCC sanitary protection area	Tomsk region, 10 km from Tomsk city, 2,5 km from Seversk city living area at the territory of SCC JSC industrial site			
Year of constitution	1966	1967	1963			
Type of disposed waste	LRW, classified as Class 5 in accordance with disposed RW classification pursuant to the RF Government Regulation dated 19.10.2012 N 1069 (low- and intermediate level RW)					
Waste allocation (depth horizons)	Deep-seated collector formations, isolated from below and above aquifers. For waste allocation the following horizons are used:					
	Horizon III – at depth of 1419–1514 m, Horizon IV – at depth of 1114–1342 m.	Horizon I - at depth of 355 – 500 m, Horizon II - at depth of 180 - 280 m.	Site 18: Horizon II - at depth of 375-430 m. Horizon III - at depth of 260-303 m. Site 18a: Horizon II - at depth of 315-345 m.			

Branch	Dimitrovgradky branch	Zheleznogorskiy branch	Severskiy branch
Number of wells	28 observation; 4 injection	82 observation; 13 injection	212 observation; 15 injection
The area of subsurface mining allotment	15 455 ha	4 490 ha	10 970 ha
Potential radioactive hazard category (in accordance with Principal Sanitary Radiation Safety Rules OSPORB-99/2009 requirements)	Category III (impact in case of emergency shall be limited to site territory; the border of sanitary- protection area conforms with that of industrial site).	Category II (impact in case of emergency is possible at the territory of sanitary-protection area and measures might be required for impact mitigation).	Category I (impact in case of emergency shall be limited to site territory; the border of sanitary-protection area conforms with that of industrial site).
Scheduled volumes of RW disposal	Until 2025 it is planned to dispose no more than 7% of already injected LRW	Until 2025 it is planned to dispose no more than 3,5% of already injected LRW	Until 2025 it is planned to dispose no more than 5,5% of already injected LRW

The technological process of injection eliminates the possibility of negative impact on the components of the environment and the population. There were no emergencies leading to readiation impact on the environment and local population for all the operation time.

LRW disposal is accompanied by systematic observations over the distribution of waste using a network of observation and test wells only at predetermined boundaries of the geological environment and conducting special studies.

Scheduled repairs, technical control and maintenance, and quality control are constantly carried out. Disposal sites are serviced 365 days a year, 24 hours a day.

Solid radioactive waste disposal

Department «NOVOURALSK» of branch «SEVERSKIY» operates a near surface disposal facility for radioactive waste in Novouralsk (hereinafter – NSDFRW). Establishing the facility in Novouralsk, Sverdlovsk Region, was provided for by the federal target program «Nuclear and Radiation Safety in 2008 and for the period up to 2015».

The construction of NSDFRW was carried out in accordance with the project developed by the Ural Design and Research Institute VNIPIET. The operation of NSDFRW began in November 2016, when the first batch of solid 3rd-class radioactive waste from the Ural Electrochemical Combine was accepted.

NSDFRW is located in the industrial zone of the city of Novouralsk, at the industrial-purpose area, to the north of the residential areas. The nearest settlements: Novouralsk is located 4 km to the south; the village of Belorechka is 4.5 km to the north, the village of Verkh-Neyvinsky is 4.8 km to the south-east, the village of Neivo-Rudyanka – 5 km to the northeast.

NSDFRW is intended for disposal of 3rd and 4th classes of radioactive waste according to the classification of the radioactive waste, approved by the Decree of the Government of the Russian Federation of October 19, 2012, #1069.

NSDFRW includes RW storage (map #10), building #1, integrated transformer substation and other facilities.

NSDFRW safety is provided by successive implementation of in-depth multi-barrier protection principles, based on deployment of physical barriers systems on the way of ionizing radiation and radioactive substances transmission into the environment, on the use of technical procedures system for physical barriers protection and capacity retention as well as employees (personnel), population and environment protection measures.

1.3. Activities to create the final disposal facilities for radioactive waste

Clause 4 of the Decree of the Government of the Russian Federation, dated November 19, 2012, #1185 «On establishing a process and timeframe for creation of a unified state system for management of radioactive waste» provides for the creation of a system of final disposal facilities for radioactive waste.

One of the most important aspects of minimizing the negative impact on the environment and preventing environmental and radiation risks, as well as a crucial step in the process of creating final disposal facilities, is the pre-design stage, where prospective sites are determined and selected. The basic principles of the siting for the placement of such facilities are shown in Figure 3.



Only a combination of these conditions makes it possible to consider the sites as suitable for the placement of disposal facilities.

At the pre-project and project stages, the major part of work is to conduct an environmental impact assessment (EIA), which the safety of not only the facility itself, but also the region of its location will depend on in the future. Impact assessment is carried out in several stages (shown in figure 4) in accordance with the Regulation on environmental impact assessment of the planned economic and other activities in the Russian Federation, enacted by Order #372 of the State Environmental Committee of the Russian Federation dated May 16, 2000.

Figure 4. EIA procedure



*OBIN - investment case studies

FSUE "NORW" facilities at the design stage and at the stage of construction

1. Construction of underground research laboratory in the Krasnoyarsk Krai Underground research laboratory (URL) is being created in the Krasnovarsk Krai (Nizhne-Kansky massif) for final isolation of the 1st and 2nd class radioactive waste.

In the frameworks of the URL construction project the 220 kV high-voltage power line construction and assembly works were performed under the State Contract in 2018 – 2019. The main works were finished on November 15th, 2019. The further planning includes equipment setup and testing as well as seasonal works. Under the State Contract, the works are to be completed on June 30th, 2020.

In 2019 works under the State Contract, concluded for Energocomplex facilities construction stage in 2018, were continued to be performed. Construction and assembly work completion is planned on October 30th, 2020.

Works completion under the above-stated contracts will ensure closed curcuit power supply for the URL with required reliability, necessary for mining works commencement in 2021.

In 2019 the State Contract for URL ground facilities construction was concluded, forming the infrastructure, and ensuring the URL laboratory performance. In 2019 works were performed in accordance with schedule. Construction and assembly work completion is planned on October 30th, 2021.

In November 2019, another State Contract was concluded for construction and assembly works performance on internal and external railways to connect Zheleznogorsk and Krasnoyarsk road junctions with the facility. Railroads are intended for delivery of various cargo required for construction and operation of the URL. Construction and assembly work completion is planned on August 31st, 2024.



The decision on the RW disposal site creation shall be taken only after full-scale confirmation of long-term safety in accordance with the results of studies in the URL, as well as public hearings and obtaining license for facility operation.



2. NSDFRW reconstruction in Novouralsk, Sverdlovsk region

At present, in accordance with the design project the works are performed on NSDFRW reconstruction in FSUE «NORW» Novouralsk department of Severskiy branch. The reconstruction includes construction of second stage of NSDFRW. In accordance with the project, construction and assembly works were performed in 2019. Works were performed in accordance with the schedule.

In 2018-2019, in accordance with the contract, design corrections were performed.

Contract works were performed at full scope. On May 29th, 2019, the corrected design documentation and engineering survey data obtained approval of FAI Glavgosexpertiza (State Expertise Institution).

In 2019 the category lifting equipment for the project was manufactured, this are cranes and lifting beams. The equipment was delivered to the site and accepted by the Client. Equipment assembly is planned for 2020.

In 2019 the contracts for manufacturing and delivery of process equipment (decontamination unit, spectrometer facility) were concluded. Equipment manufacturing and delivery is performed in accordance with schedules and contracts.

3. Near surface disposal facility for **3** and **4** class radioactive waste (Chelyabinsk region, Ozerskiy urban district)

In accordance with the Contract for design and survey works the project and engineering documentation was developed in 2019.

On September 6th, 2019, the positive resolution for project documentation and engineering survey data was obtained from FAI Glavgosexpertiza.

In 2019 the approval was obtained from State Environmental Expertise Committee within the licensing process for NSDF location and construction, and documents confirming the facilities location and construction safety was submitted to Rostekhnadzor.

Planning for 2020 includes obtaining license for NSDF location and construction as well as construction and assembly works commencement.

4. Near surface disposal facility for 3 and 4 class radioactive waste (Tomsk region, urban district – CATU Seversk)

In accordance with the Contract for design and survey works in 2019 the project and engineering documentation was developed.

On August 1st, 2019, the positive resolution for project documentation and engineering survey data was obtained from FAI Glavgosexpertiza.

In 2019 the approval was obtained from State Environmental Expertise Committee within the licensing process for NSDF location and construction, and documents confirming the facilities location and construction safety was submitted to Rostekhnadzor.

Planning for 2020 includes obtaining license for NSDF location and construction as well as construction and assembly works commencement.



Barley corn (Excerpt from Pavel Bazhov's fairy tale)

ENVIRONMENTAL POLICY OF FSUE "NORW"

FSUE "NORW" is an environmentally significant organization of the nuclear industry in accordance with the List of environmentally significant organizations of State Corporation Rosatom, approved on December 14, 2018.

In 2018, in accordance with the Unified Industry Environmental Policy of Rosatom and its organizations, approved by order of Rosatom #1/1232-P dated December 12, 2017, the FSUE "NORW" Environmental Policy was revised, and new wording was enacted by the FSUE «NORW» order #319-01/22-P dated January 17, 2019.

When planning and implementing the main activity, FSUE "NORW" is guided by the following principles:

principle of compliance – ensuring compliance of activities of NORW and branches of NORW with legislative and other regulatory requirements and standards, including international, in the field of ensuring environmental safety and protection.

the principle of presumption of potential environmental hazard – the awareness that any activity may have a negative impact on the environment, and the priority of mandatory consideration of environmental factors and assessing the possible negative impact on the environment when planning and implementing activities of NORW and branches of NORW.

the principle of scientific soundness of decisions – a scientifically based approach to making environmentally significant decisions by the management and officials of NORW and branches of NORW involving the expert community, as well as the obligation to use modern and promising scientific achievements.

the principle of consistency – a combination of environmental, economic and social interests of NORW and the community, public organizations, state authorities and local governments in the regions where NORW branches are located in the interests of sustainable development and ensuring favorable environment and environmental safety.

the principle of environmental efficiency – ensuring high performance of environmental activities, reducing the negative impact on the environment from the activities of the branches of NORW and the use of natural resources at a reasonable level of costs.

the principle of informational openness – compliance with the public right to receive reliable information on the state of the environment in the regions where NORW branches are located in accordance with the established procedure, transparency and availability of environmental information.

the principle of readiness – the constant readiness of the management and employees of NORW and branches of NORW to prevent, localize and eliminate the consequences of possible technological accidents and other emergency situations.

the principle of acceptable risk – the use of a risk-based approach for making environmentally effective management decisions.

the principle of continuous improvement – the continuous improvement of the system of environmental management and environmental safety through the use of targets and indicators of environmental performance.

the principle of best practices – the use of advanced domestic and foreign experience to improve the quality of the environment and ensure environmental safety.

To implement the basic principles of environmental activities, FSUE "NORW" undertakes the following obligations:

1.1. Conduct predictive assessment of the environmental impact of the disposal of radioactive waste on the environment to reduce environmental risks and prevent accidents.

1.2. Ensure the reduction of specific indicators of emissions and discharges of pollutants into the environment, the volume of waste generation, including radioactive waste, as well as the reduction of environmental impact.

1.3. Implement and maintain the best methods of environmental management and environmental safety in accordance with national and international standards in the field of environmental management.

1.4. Provide the necessary resources, including personnel, financial, technological, to environmental protection and environmental safety activity.

1.5. Improve the system of industrial environmental control and monitoring, apply modern methods and measurement tools to develop automated systems of environmental control and monitoring.

1.6. Involve, in the established manner, interested citizens, public and other non-profit organizations to participate in the discussion of the planned activities in the field of disposal of radioactive waste on environmental protection and environmental safety.

1.7. Ensure the interaction and coordination of activities in the field of environmental protection and environmental safety with the state authorities of the Russian Federation, state authorities of the constituent entities of the Russian Federation and local authorities.

1.8. Ensure reliability, openness, accessibility and objectivity of information on the environmental impact of NORW branches on the environment in their location areas as well as measures taken to protect the environment and ensure environmental safety.

1.9. Promote the establishment of environmental culture, the development of environmental education for all employees of NORW and environmental education of the population in the regions where branches of NORW are located.

Figure 5. Environmental policy of NORW





How the constellation Kan-Ergek appeared (Tales of the indigenous peoples of Siberia)

SYSTEMS OF ENVIRONMENTAL MANAGEMENT, **QUALITY MANAGEMENT AND HEALTH AND** SAFETY MANAGEMENT

3.1. Quality management system

In 2014, the FSUE "NORW" introduced a quality management system (hereinafter - QMS) and introduced the quality policy.

The quality management system of FSUE "NORW" is certified and complies with the requirements of GOST R ISO 9001-2015 (Certificate #ROSS RU.S.04HZH.SK.0615).

In 2019 the FSUE "NORW" has been brought up to date. In order to ensure QMS correct performance, the documented procedures were developed and approved (order dated November 20th, 2018, #319-11P/668-P).

The main results of QMS performance are:

- general Quality assurance program of FSUE «NORW», approved by the order of FSUE «NORW» dated June 04th, 2019, #319-01/434-P
- quality objectives of FSUE «NORW» for 2019
- guality management system for observation wells abandonment A-57 and P-2 for deep disposal facility of liquid radioactive waste «Severniy field of FSUE «NORW» Zheleznogorsky branch (order of FSUE «NORW» dated April 3rd, 2019 #319-1/234-P)
- Uniformed industry-specific methodology guidelines implemented for audit of data validity (order of FSUE «NORW» dated September 13th, 2019 #319-01/696-P)

• company standard developed and implemented «Readiness inspection of companymanufacturer equipment and processes before commencing production for FSUE «NORW» objects (STO 319-06.04-01-19)».

- company standard developed and implemented «Production compliance assessment for nuclear facilities of FSUE «NORW» in the form of inspection performed at the companymanufacturer's facilities» (STO 319-06.04-02-19)».
- QMS successfully passed the 2nd inspection audit for compliance with GOST P ISO 9001-2015 requirements.
- permanent quality control committee organized for FSUE «NORW», and the quality control working groups were determined and set to function for geographically isolated departments.
- key action plan was developed and approved for stepped commissioning of Uniformed informational industry-specific quality management system.
- FSUE «NORW» internal policies and procedures for QMS improvement were developed and implemented (22 documents total).
- five performance audit and five field sessions were conducted for external suppliers' and contracted construction-and-assembly companies' equipment (services) compliance assessment. The results allowed for timely obtaining the information on the quality of manufactured equipment and works/services performance/provision, introduce amendments into the risks probabilities and affect the industrial performance of contractors.
- ten internal audits conducted for OMS compliance in accordance with OMS Internal Audits Program of FSUE «NORW» for 2019, approved and implemented by the order of FSUE «NORW» dated December 29th, 2018, #319-11R/801-P. Revealed incompliances were eliminated.

3.2. Environmental management system (EMS)

The environmental policy of FSUE "NORW", introduced in 2014, was developed in accordance with the basic principles and provisions of the environmental management standards of the GOST R ISO 14000.

The environmental management system of FSUE "NORW" was implemented in 2019. The following necessary activities were conducted for implementation:

- action plan developed for EMS implementation (order of FSUE "NORW" dated August 30th, 2019 #319-01/659-P)
- EMS scope of application was identified
- EMS management approved (order of FSUE "NORW" dated November 29th, 2019, #319-01/917-P)
- environmental issues, objectives and risks were identified for the company, its departments and branches for the year 2020

In 2019, in order to identify the degree of FSUE "NORW" environmental management system availability for certification in compliance with international ISO 14001:2015 and internal national GOST P ISO 14001:2016, "NORW" introduced the practice of conducting an internal environmental audit, implemented the documented procedure for "Internal audit of FSUE "NORW" environmental management system" (order of "NORW" dated October 10th, 2019 #319-01/762-P).

In 2019 six company specialists have conducted special training on environmental management systems and obtained the internal auditors' certificates. The audit group was developed involving the specialists from environmental impact assessment department as well as specialists from different branches and involved external expertise.

The internal audit was performed in accordance with the program in December 2019. The main objective of internal audit was checking the status of environmental management system implementation and operability within departments and branches. The objectives also included the check of readiness for upcoming external audit. The auditors were operating mostly by reviewing documentation for compliance with the Standard as well as using methods of interviewing and observation.

On the results of environmental management system (EMS) internal audit FSUE "NORW" obtained the positive conclusion and confirmed the Company readiness for EMS inspection audit in 2020.

In 2020 FSUE "NORW" is scheduled for inspection audit for confirmation of implemented system of compliance with international ISO 14001:2015 and GOST P ISO 14001-2016 requirements.



How lions disappeared from Siberia (Tales of the indigenous peoples of Siberia)

MAIN DOCUMENTS REGULATING ENVIRONMENTAL PROTECTION ACTIVITIES **OF FSUE «NORW"**

The company's activities are based on strict compliance with legal and other regulatory requirements, as well as environmental standards and radiation safety, including the following documents:

4.1. Federal Laws

- Federal Law dated November 21st, 1995, #170-FZ "On the Use of Atomic Energy"
- Federal Law dated January 10th, 2002, #7-FZ "On Environmental Protection"
- The Law of the Russian Federation dated February 21st ,1992, #2395-1 "On Subsoil"
- Land Code of the Russian Federation dated October 25th, 2001, #136-FZ
- Water Code of the Russian Federation dated June 03rd, 2006, #74-FZ
- Forest Code of the Russian Federation dated December 04th, 2006, #200-FZ
- Federal Law dated November 23rd, 1995, #174-FZ "On environmental expertise"
- Federal Law dated January 09th, 1996, #3-FZ "On the radiation safety of the population"
- Federal Law dated June 24th, 1998, #89-FZ "On Production and Consumption Waste"
- Federal Law dated July 11th, 2011, #190-FZ "On management of radioactive waste and amendments to some acts of Law of the Russian Federation"
- Federal Law dated December 7th, 2011, #416-FZ "On water supply and wastewater disposal"
- Federal Law dated May 4th, 1999, #96-FZ "On the protection of atmospheric air" and others

4.2. Russian Federation Government Resolutions

- Order of the Government of the Russian Federation dated October 19th, 2012, #1069 «About criteria of classifying solid, liquid and gaseous waste as radioactive waste, criteria of classifying radioactive waste as special radioactive waste and as removable radioactive waste and criteria of the removable radioactive waste classification»
- Resolution of the Government of the Russian Federation dated September 28th, 2015, #1029 "On approval of criteria for classification of objects negatively affecting the environment into I, II, III and IV categories"
- Resolution of the Government of the Russian Federation dated January 28th, 1997, #93 "On the procedure of development of radiation-hygiene certificates for companies and territories"
- Order of the Government of the Russian Federation dated October 3rd, 2015, #1062 «About licensing the activities for collection, transportation, processing, utilization, neutralization, disposition of waste of the I-IV classes of danger» (with Regulations on licensing of activities for collection, transportation, processing, utilization, neutralization, disposition of waste of the I-IV classes of danger)
- Order of the Government of the Russian Federation dated August 16th, 2013, #712 "On procedure of certification of wastes of I-IV class of hazard"
- Order of the Government of the Russian Federation dated March 29th, 2013, #280 "On licensing of activities in the sphere of atomic energy utilization" and others.

4.3. Other documents

 Order of the State Committee of Environmental Protection of the Russian Federation dated May 16th, 2000 #372 «On approval of Procedure for planned activity environmental impact assessment in the Russian Federation»

• Order of RF ministry of natural resources and ecology dated February 28th, 2018, #74 «On approval of requirements to the contents of industrial environmental control program, procedure and terms of reporting on the results of implementation of industrial environmental control»

• The Resolution of the Chief State Sanitary Doctor of the Russian Federation of July 07th, 2009, N 47 "On approval of SanPiN 2.6.1.2523-09" (together with "NRB-99/2009 SanPiN 2.6.1.2523-09. Norms of Radiation Safety. Sanitary rules and norms")

• Resolution of the Chief State Sanitary Doctor of the Russian Federation № 40 of April 26th, 2010 "SP 2.61.2612-10 "Basic Sanitary Rules for Ensuring Radiation Safety" (OSPORB-99/2010)" (together with "SP 2.6.1.2612-10 OSPORB-99/2010 Sanitary rules and standards...")

• Certificates of state registration of objects of FSUE «NORW», which have a negative impact on the environment: the branch «Dimitrovgradskiy» - certificate #AO3FQHL3 dated December 30th, 2016, the branch «Severskiy» - certificate #BB1GYRAA dated February 9th, 2017

• Federal norms and rules in the field of atomic energy use "Disposal of Radioactive Waste. Principles, Criteria and General Safety Requirements" (NP-055-14)

• Federal norms and rules in the field of atomic energy use "Near Surface Disposal of Radioactive Waste. Safety Requirements» (NP-069-14)

• Federal norms and rules in the field of atomic energy use "Radioactive Waste Acceptance requirements for Disposal» (NP-093-14) and others.

4.4. Permits

Types of activities stipulated by the company's charter that are directly related to the management of radioactive waste during their final disposal, as well as to ensuring the radiation safety of personnel, the public and the environment, are performed by FSUE "NORW" under

• license dated July 16th, 2018 #GN-03-304-3539, issued by the Federal Service for Environmental, Technological and Atomic Supervision on the operation of a stationary facility and facilities intended for the disposal of radioactive waste by branch «Dimitrovgradskiy» of FSUE "NORW"

• license dated July 16th, 2018 #GN-03-304-3538, issued by the Federal Service for Environmental, Technological and Atomic Supervision on the operation of a stationary facility and facilities intended for the disposal of radioactive waste by branch «Zheleznogorskiy» of FSUE "NORW"

• license dated July 16th, 2018 #GN-03-304-3540, issued by the Federal Service for Environmental, Technological and Atomic Supervision on the operation of a stationary facility and facilities intended for the disposal of radioactive waste by branch «Severskiy» of FSUE "NORW"

• license dated August 05th, 2015 #GN-02-304-3058, issued by the Federal Service for Environmental, Technological and Atomic Supervision on the permit for construction of radioactive waste storage facility "Novouralskoye" of the branch "Severskiy" of FSUE "NORW"

• license dated November 10th, 2015 #GN-03-304-3092 with Amendment #1, issued by the Federal Service for Environmental, Technological and Atomic Supervision for the right to operate the first stage of a stationary facility intended for the disposal of radioactive waste (RW), which is operated by Department "Novouralsk" of Branch «Severskiy» of FSUE «NORW»

• license #ULN 15637 ZE, issued by the Federal Subsoil Use Agency (Rosnedra) for the right to use subsoil for the purpose of disposal of liquid low-and intermediate level radioactive waste at the landfill of the State Scientific Center – Research Institute of Atomic Reactors (Dimitrovgrad) valid until December 31st, 2020

• license #KRR 15638 ZG issued by Rosnedra for the right to use subsoil for the purpose of disposal of liquid radioactive waste in DDF landfill «Severniy» (Zheleznogorsk) valid until December 31st. 2020

• license #TOM 15636 ZG issued by Rosnedra for the right to use subsoil for the purpose of disposing of liquid radioactive waste in underground horizons by branch «Severskiy» of FSUE «NORW» valid until December 1st, 2026.

Branches have developed feasibility documents and received following approvals in sphere of environmental impact

• Permit #17/2015 dated March 30, 2015 issued by the Federal Service for Environmental, Technological and Atomic Supervision to branch «Zheleznogorskiy» on emissions of radioactive materials into atmosphere (valid until March 26, 2020)

• Permit #15/2014 dated December 25, 2014 issued by the Federal Service for Environmental, Technological and Atomic Supervision to branch «Severskiy» on emissions of radioactive materials into atmosphere (valid until December 29, 2019); permit extended in accordance with Letter dated January 24th, 2020 #06-02-05/113 until individual decision by Rostekhnadzor on refusal/issuing the permit for emissions

• Waste generation standards and waste disposal limits #265 dated March 23rd, 2016 established by the Federal Service for Supervision of Natural Resources in Krasnoyarsk Krai for branch «Zheleznogorskiy» (valid up to March 23, 2021)

• Waste generation standards and waste disposal limits #214 dated March 31, 2015 approved by the Federal Service for Supervision of Natural Resources in Tomsk region for branch «Severskiy» (valid up to March 31, 2020).

Contracting organizations providing services and performing work on the territory of radioactive waste disposal facilities are also provided with a full set of necessary permits and licenses.

Figure 6. Copies of Subsoil Use Licenses



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Truthful word (Excerpt from Pavel Bazhov's fairy tale)

INDUSTRIAL ENVIRONMENTAL MONITORING AND MONITORING OF THE ENVIRONMENT

The main task of industrial environmental and radiation monitoring, carried out in the regions of presence of FSUE "NORW", is to ensure activities within the established standards and in accordance with the requirements of current legislation and regulatory documents.

Industrial, environmental and radiation monitoring at branches and departments of FSUE "NORW" is mainly active in two major areas:

1. control of compliance with environmental legislation requirements. 2. control of compliance with radiation protection requirements.

Industrial environmental and radiation monitoring include the following:

- control of emissions of radioactive substances into the air
- control of production and consumption waste generation volumes
- control of the volume of secondary radioactive waste generation, the procedure for handling this waste
- control of the content of radioactive substances in the surface layer of atmospheric air and precipitation
- control of the content of harmful chemical and radioactive substances in surface and groundwater
- radiation monitoring of soil and vegetation

- control of individual doses of personnel
- control of the dose rate of gamma radiation, the flux density of alpha and beta particles at workplaces, in industrial premises and in the territory of disposal facilities
- control of the content of radioactive aerosols in the air of working and other premises
- control of levels of contamination of working surfaces and equipment, skin and working clothes by radioactive substances
- control of the level of pollution by radioactive substances of vehicles
- radiation monitoring during work on the decontamination of equipment, premises, and territory of the final disposal facilities.

Obtained, as a result of production control, data in 2019 show the following:

controlled radiation factors, including the content of radionuclides in environmental samples, do not exceed the permissible values established by the legislation and permit

RW management system complies with modern criteria, standards and safety requirements; safety principles are observed when radioactive waste is disposed of;

RW disposal facilities meet safety requirements.

The production environmental and radiation monitoring at the facilities of FSUE "NORW" is carried out in accordance with the programs developed by the branches and approved by the RF FMBA.

For some laboratory researches and tests under the program of industrial, environmental and radiation control, the third accredited parties are involved on the grounds of executed contracts for the specified types of services.

Subsoil monitoring

The system of observations of the state of the subsoil and the environment for "Dimitrovgradskiy", "Zheleznogorskiy" and "Severskiy" includes geophysical, hydrochemical and hydrodynamic studies in the process of filling the underground repository with radioactive waste. The main methods of controlling the spread of waste in the subsoil are geophysical studies in wells.

Geophysical surveys include the following types of work:

• gamma logging: to determine the natural gamma background created by the rocks forming the section and gamma anomalies caused by the appearance of waste in any interval of the section

• thermometry: to determine the rise in temperature of the layers and detect interfacial flows, as well as monitore the tightness of the production columns of observation wells

• resistivity measuring: to determine the electrical resistance of water filling the wellbore; serves as an indirect method to determe casing integrity

• magnetic-pulse flaw detection: to monitor the integrity of casing strings, as well as to determine areas of increased corrosion.

Hydrochemical studies include water sampling from observation wells, followed by chemical and radiometric analysis.

Hydrodynamic studies are to determine the position of the piezometric surface of the groundwater reservoir and overlying horizons (measuring levels or pressures at the top of wells). The study of changes in the depth of the groundwater level is carried out to determine the hydrodynamic parameters of reservoirs and to study the disturbed pressure regime of reservoirs and overlying aguifers, as well as to monitor the tightness of reservoirs.

Dimitrovgradskiy branch

Industrial environmental control in the «Dimitrovgradskiy» branch of FSUE «NORW» is carried out in accordance with:

- The program of industrial environmental control,
- The program of radiation monitoring for "Experimental and industrial landfill" LRW DDF,
- The program of subsoil monitoring for "Experimental and industrial landfill" of FSUE «NORW», and includes the following:
- ▶ sampling from observation wells of LRW deep disposal site;

▶ carrying out physicochemical and radiometric analyzes of formation water from observation wells.

- ▶ radiation parameters control:
 - emissions of radionuclides into the atmosphere
 - the content of radionuclides in water sources
 - ambient dose equivalent rate of gamma radiation at the territory of deep disposal site
 - surface radioactive contamination at the territory of deep disposal site.

In the reporting year, measurements of the monitored radiation parameters were made in full. Physical-chemical and radiometric studies of formation water from observation wells, the determination of radionuclide content in water supply sources were performed in the laboratory of radiation control of JSC "SSC RIAR".

The scheme of the observational network of "Experimental and industrial and fill" LRW deep disposal site is represented on Figure 7.

Figure 7 The observation network, the boundaries of the mining withdrawal of the subsoil and sanitary-protective zone of "Experimental industrial landfill" LRW deep disposal site (Dimitrovgrad, Ulyanovsk region)





According to hydrodynamic, hydrochemical, and geophysical monitoring data, the current state of the subsoil in the deep disposal site area is acceptable and predictable. The impact on the subsoil by the disposal of waste is expected and acceptable. The buried waste is distributed within the licensed subsoil block in the operating complexes. Signs of human-induced changes in the natural geological conditions in the buffer and overlying aquifers, including in fresh groundwater, were not observed.

Table 2. The scope of works performed on subsoil monitoring in 2019

Types of works





Scope of works

	84
lls	62
	84





Table 3. The main results of industrial environmental monitoring for 2019

Subject of monitoring	Defined parameters	Units	Average value	Maximum value	Hygiene norm
	Specific total alpha activity	Bq/kg	0,05	0,09	0,2
Water from water supply sources	Specific total beta activity	Bq/kg	0,09	0,11	1,0
	Specific activity Cs-137 Bq/kg		0,02	0,05	_
	Specific activity Rn-222	Bq/kg	3,89	3,97	60
Territory of LRW DDF	Ambient dose equivalent rate of gamma radiation (at the boundary)	µSv/h	0,08	0,14	2,5
	Surface radioactive contamination	particles / cm2min	not found	not found	_

Zheleznogorskiy branch

The production environmental and radiation monitoring of the facilities of the branch «Zheleznogorskiy» in 2019 was carried out on the grounds of.

Radiation monitoring programs at DDF landfill «Severniy» IN F01-04.111-2014.

Contract dated January 14th, 2019, #057310002709000023_301743 for the provision of a range of services for laboratory analysis of water and gas samples for radionuclides and hazardous chemicals in the area of liquid radioactive waste deep disposal facility landfill "Severniy" of Zheleznogorskiy branch of FSUE «NORW».

Contract dated December 13th, 2018, #0573100027017000147_301743 301743 for the provision of services for continuous radio-environmental monitoring in the area of liquid radioactive waste deep disposal facility landfill "Severniy" of Zheleznogorskiy branch of FSUE «NORW».

The scope of works performed on subsoil monitoring in 2019 is represented in Table 4.

Table 4. The scope of works performed on subsoil monitoring in 2019

Types of works

Hydrodynamic studies in observation wells

Hydrochemical analysis of samples from observation well

Geophysical studies in observation wells

Scope of works

	1498
lls	344
	343

According to hydrodynamic, hydrochemical, and geophysical monitoring data, the current state of the subsoil in the deep disposal site area is acceptable and predictable. The impact on the subsoil by the disposal of waste is expected and acceptable. The buried waste is distributed within the licensed subsoil block in the operating complexes. Signs of humaninduced changes in the natural geological conditions in the buffer and overlying aguifers, including in fresh groundwater, were not observed.

The map-scheme of the radio-ecological (radiometric) studies within DDF "Severniy landfill" is represented on Figure 8.

Figure 8. The map-scheme of the radio-ecological (radiometric) studies within DDF "Severniy landfill"



The average annual ambient dose rate of external radiation at the boundary of the sanitary protection zone.

On the boundary of the fencing of DDF landfill «Severniy»: $0,10\pm0,06 \,\mu$ Sv/h – average value $0,11\pm0,07 \ \mu Sv/h - average value$ <0,10 µSv/h – average value.

The main results of monitoring the average annual volume (specific) activity of radionuclides in the water of open water bodies and in the air in the sanitary protection zone (in units of water intake, admissible specific activity) for 2019 are presented in Table 5.

Table 5. Average annual volume (specific) activity of radionuclides in the water of open water bodies and in the air in the sanitary protection zone (in units of water intake, admissible specific activity)

#	Control point	De dia ana di da	Volume activity				
		Radionuciide	Bq/kg	in units of water intake			
	·	Water	,	•			
1	Inflow location of nameless	General alpha activity	<0,2	—			
I	creek into B.Tel river	General beta activity	<0,2	—			
Воздух							
#	# Control point	De dia mandiale	Volume activity				
		Radionuciide	Bq/m³	admissible specific activity			
2		Strontium-90	<20E-6	<7,4E-6			
	1 km to the north of DDF Severniy landfill fence	Caesium -137	<1,6E-6	<7,8E-8			
	,	General alpha activity	(120 ± 30)E-6	—			
		General beta activity	(690 ± 190)E-6	-			

Severskiy branch

• The industrial environmental and radiation control of the branch is carried out in accordance with the following documents:

- Production control programs for ensuring radiation safety in branch "Severskiy" of FSUE "NORW", RB P-319-f20-100-2014
- Radiation monitoring programs for DDF LRW of branch "Severskiy" of FSUE "NORW" RB P -319-2/212-2017
- Industrial environmental monitoring program of branch "Severskiy" of FSUE «NORW» PR-319-2/253-2018
- The scope of works on subsoil monitoring performed in 2019 are represented in Table 6.

Table 6. The scope of works on subsoil monitoring performed in 2019

Facility	site 18	site 18a	Radiation control service	Total
Hydrodynamic studies in wells	924	580	164	1668
Samples hydrochemical analysis	53	42	4	99
Geophysical studies in wells (logging complex 1)	31	49	0	80
Geophysical studies in wells (logging complex 2)	22	11	7	40

*I Logging complex is used for revealing the rate and type of filling the operating levels at DDF LRW Severskiy branch for evaluation of LRW filtrate spread. **II Logging complex is used for evaluation of wells underground condition. *** Besides the standard hydrochemical studies in accordance with monitoring program, 175680 readings were taken for underground water levels using the formation water level meters with the interval of once an hour (in 20 wells).

According to hydrodynamic, hydrochemical, and geophysical monitoring data, the current state of the subsoil in the DDF area is acceptable and predictable. The impact on the subsoil by the disposal of waste is expected and acceptable. The buried waste is distributed within the licensed subsoil block in the operating complexes. Signs of technogenic changes in the natural geological conditions in the buffer and overlying aquifers, including in fresh groundwater, were not observed

Locations layout for radiation control of atmospheric air, precipitation, dose rate of gammaradiation, snow cover, soil, vegetation (grass) is represented on Figure 9; groundwater control locations are shown on Figure 10.

Figure 9. Locations layout for radiation control of atmospheric air, precipitation, dose rate of gamma-radiation, snow cover, soil, vegetation (grass)





the point of control for atmospheric air, precipitation and g emission dose

the point of control for snow coat, soil and vegetatic

Figure 10. Groundwater control observation wells layout of Severskiy LRW DDF of FSUE «NORW»



Environmental monitoring in the area of the location of DDF "Site 18 and 18a" was conducted by the accredited Environmental Protection Laboratory of the Radiation Industrial and Sanitary Laboratory (RPSL) of JSC "SCC" under the contract with JSC "SCC" on the provision of a set of services dated January 10th, 2019, #0573100027018000176 301743.

The following indicators were subject to monitoring:

- emissions of radionuclides into the atmosphere
- content of radionuclides in the atmospheric surface layer
- content of radionuclides in atmospheric precipitation
- content of radionuclides in snow cover
- content of radionuclides in soil
- content of radionuclides in vegetation
- values of equivalent dose rate of gamma radiation during sampling and locally.

Content of radionuclides in the atmospheric surface layer

The average annual activity of radionuclides in the atmospheric surface layer at sites 18 and 18a were at levels close to background and in 2019 amounted to:

- strontium-90 3,10E-07 Bq/m3, which is 7 orders of magnitude lower than admissible specific activity, specified by «Radiation Safety Norms (NRB 99/2009)» for strontium-90.
- caesium-137 <4.10E-6 Bg/m3, which is 7 orders of magnitude lower than admissible specific activity, specified by «Radiation Safety Norms (NRB 99/2009)» for caesium-137.
- sum of alpha-active nuclides 1,10E-5 Bg/m3, which is 227 times lower than admissible specific activity for plutonium-239, -240.
- sum of beta-active nuclides 1,90E-4 Bg/m3, which is 142 times lower than admissible specific activity for plutonium strontium-90.

Content of radionuclides in atmospheric precipitation

The values of alpha-, beta-active nuclides, strontium-90 and cesium-137 in atmospheric precipitation do not exceed the average values typical for the territory of the sanitary protection zone of JSC "SCC", where the DDF is located, and in 2019 were as follows:

- sum of alpha-active nuclides 20 Bg/m2;
- sum of beta-active nuclides 83 Bg/m2;
- strontium-90 2,4 Bq/m2;
 cesium-137 <11 Bq/m2.

Content of radionuclides in snow cover, soil and vegetation (grass)

The content of alpha-active nuclides in the snow cover was at the level from 3,8 to 9,4 Bq/m2 (background point – 9,4 Bq/m2), strontium-90 – at the level from 1,5 to 4,6 Bq/m2 (background point – < 2,4 Bq/m2), cesium-137 – at the level of the lower limit of determination < 42 Bg/m2 (background point - < 42 Bg/m2).

The strontium-90 radionuclide content in the soil ranged from 1,34 to 3,12 kBq/m2 (background point – 0,16 kBq/m2), cesium-137 from < 4,6 to 7,7 kBq/m2 (background point – 1,67 kBq/m2), plutonium-239, -240 from 0,5 to 6,08 kBq/m2 (background point – 0.07 kBg/m2).

The specific content of strontium-90 radionuclide in the grass was from 2,5 to 10,0 Bg/kg (background point – 3,1 Bg/kg), cesium-137 - at the level of the lower limit of determination < 30 Bg/kg (background point - < 30 Bg/kg), plutonium - 239, -240 from 0,361 to 0,878 Bg/</p> kg (background point – 0.07 Bg/kg).

The specified values of the radionuclide content correspond to the levels of long-term observations for the specified area.

Novouralsk department of Severskiy branch

The industrial radiation (industrial environmental) control within near-surface disposal facility for radioactive waste (NSDFRW) sanitary-protection area of the branch is carried out in accordance with the following documents:

Company instruction I-319-4-2-2017 «Industrial radiation control procedure at nearsurface radiation materials disposal site of FSUE «NORW» Novouralsk department of Severskiy branch.

«Radiation control programs for Novouralsk near-surface radiation materials disposal site (dated March 5th, 2019 #319-4/964-BK). The program is approved by Interregional administration #31 of RF FMBA.

The main monitored parameters of environmental objects at the NSDFRW (atmospheric air, groundwater from observation wells, snow cover, vegetation, soil, surface water) are:

a) specific/volume activity by the sum of alpha-emitting radionuclides **6)** specific/volume activity by the sum of beta-emitting radionuclides**B)** specific/volume activity of radionuclides Am-241, Co-60, Cs-137, Sr-90, Pu-239

Figure 11. NSDFRW layout. 1 – map #10, 2- building #1, 3- complete transformer substation, 4 – fire tanks. Well 21, Well 23 – observation wells.



r) mass fraction of natural uranium isotopes, mass fraction of uranium-235
 g) concentration of Cu, Ni, Cd, Pb, Cr, Zn, Fe, F (for groundwater, surface water).

The results of the production and environmental control of environmental facilities at the NSDFRW for 2019 are represented in Table 7.

Table 7. Results of the production and environmental control of samples of the environmentat NSDFRW for 2019

Control object and parameter to be defined	Average	Среднее	Maximum
1. Atmospheric air at NSDFRW			
volume activity by the sum of alpha-emitting radionuclides	Bq/m³	5,45E-05	9,50E-04
volume activity by the sum of beta-emitting radionuclides	Bq/m³	1,16E-03	1,80E-03
2. Groundwater			
specific activity by the sum of alpha-emitting radionuclides	Bq/m³	1,37E-01	1,90E-01
specific activity by the sum of beta-emitting radionuclides	Bq/dm³	4,00-E-02	1,00E-01
3. Snow cover at NSDFRW			
specific activity by the sum of alpha-emitting radionuclides	Bq/dm³	<0,05	<0,05
specific activity by the sum of beta-emitting radionuclides	Bq/dm³	<0,01	<0,01
4. Soil at NSDFRW			
specific activity by the sum of alpha-emitting radionuclides	Bq/kg	7,68E+02	1,00E+03
specific activity by the sum of beta-emitting radionuclides	Bq/kg	4,68E+02	6,00E+02
5. Vegetation at NSDFRW			
specific activity by the sum of alpha-emitting radionuclides	Bq/kg	<3,5E+00	<4,0E+00
specific activity by the sum of beta-emitting radionuclides	Bq/kg	3,7E+02	4,17E+02
6. NSDFRW boundary			
gamma dose rate	µSv/h	0,10	0,18

Content of volume alpha, beta activity, volume activity of radionuclides (Am-241, Co-60, Cs-137, Sr-90, Pu-239) in samples of atmospheric air does not exceed the allowable volumetric activity in the inhaled air of individual radionuclides for critical groups population (NRB-99/2009).

The results of measurements of specific alpha, beta activity in underground water of controlled wells, snow cover do not exceed the permissible levels for drinking water supply (SanPiN 2.1.4.1074-01 "Drinking water. Hygienic requirements for water quality of centralized drinking water supply systems. Quality control. Hygienic requirements to ensure the safety of hot water systems»). The results of measurements of the specific activity of radionuclides (Am241, Co-60, Cs-137, Sr-90, Pu-239) in the groundwater of controlled wells, snow cover do not exceed the level of intervention for the content of individual radionuclides in drinking water (NRB-99/2009).

Analysis of the result of the content of specific alpha, beta activity, specific activity of radionuclides (Am-241, Co-60, Cs-137, Sr-90, Pu-239) in soil and vegetation samples for 2019 in comparison with the result obtained for 2018, did not reveal significant changes.

The results of measurements of the mass concentration of pollutants (Cu, Pb, Cr, Cd, Zn, F) in groundwater from controlled wells do not exceed the permissible levels for drinking water supply (SanPiN 2.1.4.1074-01 «Drinking water. Hygienic requirements for water quality of centralized drinking water supply systems. Quality control. Hygienic requirements to ensure the safety of hot water systems»).

The average annual gamma radiation DER at the boundary of the sanitary protection zone of NSDFRW is 0.10 μ Sv/h. (Background gamma radiation DER value for the Ural region is 0.3 μ Sv/h).

Conclusion:

The results of the production and environmental control of environmental facilities at the NSDFRW for 2019 show that the content of radioactive substances in the controlled objects is significantly below permissible levels (NRB99/2009, SanPiN 2.1.4.1074-01).



Fiery dancer (Excerpt from Pavel Bazhov's fairy tale)

ENVIRONMENTAL IMPACT

In accordance with the criteria approved by the Government of the Russian Federation dated September 28th, 2015, #1029, branches of FSUE «NORW» (Severskiv, Dimitrovgradskiv) are assigned to category II objects that have a negative impact on the environment, that is, those having a moderate environmental impact. Branches of FSUE "NORW" obtained certificates on the state registration of objects of FSUE "NORW" that have a negative impact on the environment.

The facilities of the branch «Zheleznogorskiy» of FSUE «NORW» in 2018 were removed from the state register of objects that have a negative impact on the environment (Certificates of removing #CFVIU53R dated May 29th, 2018; #CFVIU53N dated May 29th, 2018; #CFVIU53T dated May 29th, 2018).

6.1. Water intake from water sources

Dimitrovgradskiy, Severskiy branches, Novouralsk department of Severskiy branch.

Water intake from natural sources is not done separately, receiving water under contracts for the provision of water supply services.

Zheleznogorskiy branch

At the end of the year, 4.32 thousand m3 of water was pumped out of the production horizon (4.2 ths.m3 – for industrial purposes, 0.12 ths.m3 – for general purposes). Allowable water intake from relief well is 65 ths.m3.

The provision of drinking water to the staff of the branch «Zheleznogorskiy» in 2019 was carried out by the supply of bottled water under the contract dated December 09, 2018, #319/1571-D for the provision of services.

6.2. Discharges into the open hydrographic network

Dimitrovgradskiy, Severskiy branches, Novouralsk department of Severskiy branch. No discharges of harmful chemical and radioactive substances were done into the open hydrographic network. Water is disposed in sewer networks under contracts for the provision of complex services.

Zheleznogorskiy branch

Generated domestic water in the volume of 0.12 ths.m3 were pumped out by designated company under the contract.

6.3. Emissions to the atmospheric air

6.3.1. Emissions of harmful chemical substances (HCS)

Dimitrovgradskiy, Zheleznogorskiy, Severskiy branches, Novouralsk department of Severskiy branch

Due to the fact that there are no own stationary sources of emissions of HCS to the atmospheric air, HCS emissions into the atmospheric air are excluded.

6.3.2. Radionuclide emissions

Dimitrovgradskiy branch

The branch has no sources of radioactive substances released into the air that are subject to regulatory control.

Zheleznogorskiy branch

Emissions of radioactive substances into the air are carried out in accordance with the obtained permit dated March 30th, 2015, #17/2015. The actual radionuclide emissions from the emission sources of branch «Zheleznogorskiy» are given in Table 8.

Table 8. Emission of radionuclides into the atmospheric air by facilities of branch "Zheleznogorskiy" of the FSUE "NORW" in 2019

Emission source	Radionuclide	Release form	Maximum permissible emission, Bq/year	Actual emission, Bq/year	% of normal
Object 353a	Cesium-137	aerosol	8,99E+07	9,04E+04	0,10
00ject 5558	Strontium-90	aerosol	8,01E+07	3,25E+05	0,40
Object 353r	Cesium-137	aerosol	1,25E+07	5,83E+04	0,47
Object 5551	Strontium-90	aerosol	1,10E+07	2,10E+05	1,91
Object 353e	Cesium-137	aerosol	7,06E+06	5,89E+03	0,08
	Strontium-90	aerosol	6,31E+06	3,78E+04	0,60
Object 760	Cesium-137	aerosol	3,82E+07	3,99E+04	0,10
Object 760	Strontium-90	aerosol	3,44E+07	2,56E+05	0,75
Object 760a	Cesium-137	aerosol	7,66E+06	1,03E+04	0,13
	Strontium-90	aerosol	6,87E+06	7,36E+04	1,07

The total emission of beta-emitting nuclides into the air was 5.5406×105 Bg/year, which is 265 times less than the specified MPE standards.

Severskiy branch

The total emission into the air was:

alpha-emitting nuclides - 3,46×105 Bg/year, which counts to 0,4% of specified MPE norms.

beta-emitting nuclides - 5,51×106 Bg/year, which counts to 0,7% of specified MPE norms.

Novouralsk department of Severskiy branch

Novouralsk department do not have stationary radioactive substances emission sources subject to regulatory control.

6.4. Wastes

6.4.1. Production and consumption waste management

The production and consumption wastes generated at RW sites are handled at the branches in accordance with the requirements of the Federal Law #89-FZ dated June 24th, 1998, "On Production and Consumption Wastes" and the Instructions on the Management of Production and Consumption Wastes in the Branches of FSUE "NORW". In the branches, responsible persons are appointed for the collection and accounting of production and consumption wastes.

Dimitrovgradskiy branch

The branch, performing its activities, uses rented office and production premises. In accordance with lease agreements, lessors provide for the collection of production and consumption waste generated in the rented premises during the work activities of the employees of branch "Dimitrovgradskiy" and further perform transportation, storage, neutralization, recycling and other actions until complete disposal of waste and decontamination products in accordance with the requirements of the current legislation of the Russian Federation.

Zheleznogorskiy branch

During 2019, 5.82 tons of municipal solid waste were generated. Solid municipal waste was transferred to RostTekh LLC under the contract #319/2003-D dated February 9th, 2019. In 2019, 5.82 tons of municipal solid waste were transferred.

In 2015, according to the contract dated August 13th, 2015, #319/714-D, the Draft Standards for the Generation of Waste and the Limits on their Disposition were developed. In 2016, the Order of the Office of Rosprirodnadzor for the Krasnovarsk Krai of March 23rd, 2016, #265 waste generation standards and limits on their disposition were approved for branch "Zheleznogorskiy" of FSUE "NORW" for a period of 5 years.

Table 10. Dynamics of production and consumption waste generation at Zheleznogorskiy branch DDF

Waste type	Hazard class	Generation standard, ton	2015, ton	2016, ton	2017, ton	2018, ton	2019, ton
Unsorted waste from office and household premises of organizations (excluding large-sized) (Federal Classification Catalog of Wastes Code 73310001724)	IV	5,40	12	4,054	5,40	5,40	5,40
Wastepaper and paperboard from clerical and office work (Federal Classification Catalog of Wastes Code 40512202605)	V	0,42	12	0,316	0,42	0,42	0,42
Total:		5,82	12	4,37	5,82	5,82	5,82

Severskiy branch

Collection of production and consumption waste is performed in specially equipped places. Waste removal from the territory of DDF is performed by the specialized company "ABF System" LLC in accordance with the contract dated April 17th, 2019, #319/2113-D. Wastes generated in the rented office premises are disposed of in accordance with the rent contract dated September 19th, 2019, #319/2295-D by the lessor "House-8" LLC.

The amount of waste generated in 2019 on the territory of DDF is presented in Table 11.

Table 9. The amount of production and consumption wastesgenerated at Zheleznogorskiy branch DDF in 2019

Waste type	Hazard class	Amount of generated waste, tons	Transferred for disposal, tons	Availability at the site at the end of the reporting year	Name of organization to which the wastes were transferred
Unsorted waste from office and household premises of organizations (excluding large-sized) (Federal Classification Catalog of Wastes Code 73310001724)	IV	5,40	5,40	0,000	RostTekh LLC (license dated
Wastepaper and paperboard from clerical and office work (Federal Classification Catalog of Wastes Code 40512202605)	V	0,42	0,42	0,000	2018 #(24)- 5420-CTOP)

Table 11. The amount of production and consumption wastesgenerated at Severskiy branch DDF in 2019

Waste type	Waste type Hazard class		Amount Transferred of generated for disposal, waste, tons tons		Name of organization to which the wastes were transferred	
Mercury, mercury-quartz, fluorescent lamps, which have lost consumer properties (Federal Classification Catalog of Wastes Code 47110101521)	I	0,033	0,0	0,038	_	
Unsorted waste from office and household premises of organizations (excluding large-sized) (Federal Classification Catalog of Wastes Code 73310001724)	IV	1,5	1,5	0,000	ABF System LLC (license dated September 25th, 2017 #(70)-1844- CT/Π)	

Table 12. Dynamics of production and consumption waste generation at Severskiy branch LRW DDF

Waste type	Hazard class	Generation standard, ton	Waste generation by years, ton				
			2015	2016	2017	2018	2019
Mercury, mercury-quartz, fluorescent lamps, which have lost consumer properties (Federal Classification Catalog of Wastes Code 47110101521)	I	0,342	0,033	0,085	0,028	0,045	0,033
Unsorted waste from office and household premises of organizations (excluding large-sized) (Federal Classification Catalog of Wastes Code 73310001724)	IV	2,000	0,500	0,600	0,900	1,3	1,5
Garbage from twigs, branches from logging (Federal Classification Catalog of Wastes Code 15211001215)	V	2,376	_	0,200	_	_	-
Wastepaper and paperboard from clerical and office work (Federal Classification Catalog of Wastes Code 40512202605)	V	0,1053	_	_	0,100	_	_

In 2019 the branch has decreased the generation of used mercury fluorescent lamps (generation in 2018 – 0.045 ton, in 2019 – 0.033 ton). The reasons for generation decrease is that high-endurance lamps were used for replacement in 2018.

Unsorted waste generation from office and household premises of organizations (excluding large-sized) has increased: 2018 – 1.3 ton, 2019– 1.5 ton, due to increase of personnel number and new working places organization.

Novouralsk department of Severskiy branch

In the process of production activities of NSDFRW, production and consumption waste (non-radioactive) is generated. In accordance with the contract for the maintenance of buildings, structures and the territory of NSDFRW for 2019, ownership of production and consumption waste is transferred to the contractor at the time of loading the waste onto the transport of the company providing the services to FSUE "NORW" under this contract.

Construction waste management

The management of construction waste generated in the process of construction-assembly works at construction sites fall into jurisdiction of Contractor Company performing construction woks. General environmental requirements as well as responsibility for violating the environmental legislation requirements (including the waste management) are reflected in contracts. In accordance with stated contracts, the contractors at their own expense perform collection, loading-unloading, transportation and transfer of waste generated within the work performance process, to the locations of its disposal or to specialized organizations for recycling, treatment, decontamination, disposal. FSUE «NORW» performs constant control of contractors for compliance with environmental legislation requirements.

6.4.2. Radioactive waste management

Dimitrovgradskiy branch

During normal operation of DDF, solid radioactive waste (SRW) is not generated in Dimitrovgradskiy branch. The formation of solid radioactive waste occurs during repairs and decontamination of surfaces. These works are carried out by JSC SSC RIAR and ARS-Cleaning under separate contracts, specifying that the contractor company shall independently perform collection, transportation, and storage with further transmittal for disposal of SRW generated as the result of its operation.

Zheleznogorskiy branch

During normal operation of DDF landfill Severniy facilities the solid radioactive waste is not generated. SRW generated during repair works belong to and are transferred by the company performing the repair works.

Severskiy branch

During normal operation of DDFS everskiy facilities the solid radioactive waste is not generated. The formation of solid radioactive waste occurs during repairs and decontamination of surfaces; the generated wastes are transferred to specialized company for further burial.

Novouralsk department of Severskiy branch

As a result of industrial activities of DFRW, solid and liquid radioactive waste may be generated. In 2019, solid and liquid radioactive wastes in Novouralsk department ware not generated.

There are necessary primary collectors and other equipment for collection and temporary storage of radioactive waste in all the branches.

6.5. The percentage of production and consumption waste of FSUE "NORW" branches in the total volume on the territory of the branches

The impact of the activities of the branches of FSUE "NORW" on public health and various environmental components is minimal, which is confirmed by the data on the share of production and consumption wastes of the branches of FSUE "NORW" in the total volume of their location - Tomsk Region and Krasnoyarsk Krai given below. The data on regional indicators are reflected in the State Report on the State and Environmental Protection in the Krasnoyarsk Krai for 2019, available at http://mpr.krskstate.ru/dat/File/3/Doklad-2019. pdf, and the State Report on environmental status and protection in the Tomsk region for 2019, published at http://www.sibfo.ru/economics/ecology.php.



6.6. State of the FSUE "NORW" locations territory

During 2019, no cases of radioactive contamination of the territories of industrial sites of branches and department of FSUE "NORW" were registered.

No areas are polluted with harmful chemicals and radionuclides.

As follows from the long-term observations of the environment in the vicinity of branches Dimitrovgradskiy, Zheleznogorskiy and Severskiy liquid radioactive waste is securely localized within geological formations and does not have any direct impact on surface and groundwater and other environmental objects. According to the results of measurements of environmental samples at NSDFRW in Novouralsk including in the area of its location for 2015-2019 (atmospheric air, snow cover, soil, vegetation, ground and surface waters, etc.), this facility does not have any negative impact on the environment.

6.7. Biomedical characteristics of FSUE «NORW» branches regional locations

Dimitrovgrad, Ulyanovsk region

According to Ulyanstat data, Dimitrovgrad stable population as of January 1st, 2019 is 114.3 thousand people.

Within the period of January-October 2019, according to Ulyanstat data, 930 children were born in Dimitrovgrad, the number of born is 62 children less (93,8%) than in the previous year (992 children). 1439 people died, the number of died increased by 1,7% (1415 people). The natural increase indicator for Dimitrovgrad is showing a negative trend. The main medicaldemographic indicators for Dimitrovgrad are practically the same for Ulyanovsk region and Russian Federation: birthrate for the city is higher than that for the region; death rate and infant mortality is lower.

Both Dimitrovgrad and Ulyanovsk region in general have a satisfactory environmental status in Russian Federation, although there are issues, associated with industrial and transport emissions.

The city does not maintain environmentally dirty (chemical, petrochemical, metallurgy) industries. The main industrial facilities of the city are mechanical engineering plants causing no substantial emissions to the atmosphere and not consuming big amounts of water for industrial purposes. City heat and power station and boiler houses use only natural gas for fuel.

Morbidity¹

There are rather high numbers for heart diseases and endocrine system morbidity. Endocrine system morbidity is caused by iodine deficiency at the territory of Ulyanovsk region and in Dimitrovgrad.

Other morbidity indicators for city population are either similar to other Russia cities or

lower than that.

Oncological disease rate in the city (which is usually related to radiation impact) for the last period was lower than average RF numbers and only recently approximated them.

¹ Official site of Dimitrovgrad administration http://www.dimitrovgrad.ru/

Closed Administrative Territorial Unit (CATU) Zheleznogorsk, Krasnoyarsk Territory

The population of the closest to DDF LRW site Severniy CATU Zheleznogorsk town including the suburbs Tartat, Dodonovo, Noviy Put and Shivera is 93.79 thousand people. The distribution of population is highly irregular: west and south-west sectors have no steady population; the territories belong to State Forest Resourse.

Demographic situation in CATU Zheleznogorsk in 2019 was showing the decrese of stable population. The share of urban sector in stable population of CATU Zheleznogorsk (Zheleznogorsk town, Podgorniy village) is 97,4%, rural sector (Dodonovo, Noviy Put, Tartat and Shivera) is 2,6%.

Rate of overall incidence for population of 20-km observation area from DDF LRW according to long-term observation data is lower than comparable data for population living in reference Mansk area. Malignant growth occurence in population living 20-km observation area does not differ from corresponding indicators for reference area while the death rate from malignant growth in observation area is 20,4% lower than in reference area.

The following clinical entities are mostly recorded in primary incidence structure:

- respiratory diseases 45,9% in primary incidence structure
- diseases of the genitourinary system 11,2% in primary incidence structure
- traumas and poisoning 5,6% in primary incidence structure
- blood circulatory system diseases 5,1% in primary incidence structure
- musculoskeletal system diseases 4,3% in primary incidence structure
- ear diseases 4,1% in primary incidence structure
- contagious diseases in primary incidence structure 3,9%
- eye diseases 3,5% in primary incidence structure.

CATU Seversk, Tomsk region

The population of the closed administrative territorial unit is 114557 people, where 5,6% live out of town. By population CATU Seversk is the second in Tomsk region after Tomsk city. Following the previous years, in 2019 there is a tendency for decreasing the population number in CATU Seversk.

One of the characteristics for CATU Seversk demographic situation is the age pattern where people older than 60 make up the 22,3% of the populance.

For the last 10 years the birth rate in CATU Seversk has increased 1.4 times, which led to increase of the number of children in population structure.

The first rank in mortality cause structure for many years is taken by mortality due to blood circulatory system diseases followed by malignant growth.

The third ranked in mortality cause is mortality from external causes: trauma, poisoning, suicides and homicides.

The total mortality index among men is 1.3 times higher than that for women.

The negative demographic trends in recent years (birth rate decrease, negative decline in population, negative migration) have an effect not only on stable population number, but also on its structure. Decrease of active working age population is an evidence of this.

Novouralsk, Sverdlovsk region

The population of Novouralsk urban district is approximately 84.3 thousand people. The further decrease urban district population is expected at an average rate of 500 persons annually. Compared to average regional indicators, the total mortality indicators as well as mortality indicators for active working age population at the territory of Novouralsk urban district lower, but at the same time the birth rate is lower too.

Total mortality structure is not changed for a long period: the first rank is deaths of cardiovascular diseases (up to 55%), the second rank – oncological diseases (up to 19,3%) and the third rank - traumas and poisoning (up to 8,1%).



Blue snake (Excerpt from Pavel Bazhov's fairy tale)

IMPLEMENTATION OF FSUE "NORW" **ENVIRONMENTAL POLICY**

FSUE "NORW" and its branches implement the Environmental Policy considering the requirements of the Environmental Policy of Rosatom and its organizations.

Final disposal of radioactive waste is an effective environmental protection measure that prevents the effects of waste on the population and the environment. Performing this activity, in accordance with the existing legal documentation, additional measures are taken to meet the requirements of sanitary, radiation and environmental safety in order to ensure the localization of waste - a sanitary protection zone is organized and a mining allotment is obtained. Verification of compliance with the requirements for ensuring sanitary and radiation safety of final disposal of radioactive waste is done in accordance with observations, measurements and analysis of their results, calculations, and modeling.

In 2019 a large number of environmental events were held. The costs of environmental protection were aimed at ensuring the radiation safety of the environment and amounted to:

Dimitrovgradskiy branch

55 150,0 thousand rubles (including current (operational) costs for environmental protection of 44 700.0 thousand rubles and expenses for payment of environmental protection services of 10450,0 thousand rubles).

Zheleznogorskiy branch

264 717 thousand rubles (including current (operational) costs for environmental protection of 253 786,0 thousand rubles and expenses for payment of environmental protection services of 10 931,0 thousand rubles).

Severskiy branch

176 854,0 thousand rubles (including current (operational) costs for environmental protection of 90 275.0 thousand rubles and expenses for payment of environmental protection services of 86579,0 thousand rubles).

Novouralsk department

11301,58 thousand rubles (including current (operational) costs for environmental protection of 8079.5 thousand rubles).



Silver hoof (Excerpt from Pavel Bazhov's fairy tale)

ENVIRONMENTAL AND EDUCATIONAL ACTIVITY. PUBLIC ACCEPTANCE

The process of creation of the system for RAW final isolation involves supervision authorities as well as representatives of the public, mass media, environmental organizations. One of the main activities of FSUE «NORW» in the operation regions and while planning the company operations is providing information to the public on environmental and technological aspects of final isolation process. One of the key directions is education and enhancing the environmental knowledge in the field of radioactive wastes safe processing and final isolation.

Key environmental objectives of FSUE «NORW» communications:

1. Development of interaction with mass media, publishing the environmental-related materials;

2. Involving environmental entities and organizations into mutual work for the purposes of enlarging the expert community;

3. Ensuring effective communication between experts and the public on the issues of final isolation of radioactive wastes

4. Development of interaction with state authorities and local government at the Company geographical regions;

5. Development of international cooperation in engineering and scientific-and-educational sphere as well as in environmental safety.

The environmental safety issues and public acceptance are the main priority in taking the decisions on locations for radioactive waste final isolation.

8.1. Interaction with state authorities and local government. Key events of 2019.

The main form of FSUE «NORW» interaction with state authorities and local government is the approval of construction and operation plans for radioactive wastes final isolation facilities, as well as communication with state legal and licensing authorities.

In doing this, in 2019 within the licensing process of location and construction of 3 and 4 class radioactive wastes final isolation facilities at FSUE PO Mayak and SCC JSC (Chelyabinsk and Tomsk regions), FSUE «NORW» obtained state environmental expertise positive conclusions for license justification for location and construction of specified disposal sites (in January and May 2019).

On a monthly basis the authorized personnel of the RF state supervision authorities (Rostekhnadzor, FMBA of Russia, MES of Russia) performed the inspections of FSUE «NORW» branches in order to evaluate the state of nuclear and radiation safety of construction-assembly works, sanitary-hygiene, industrial and fire safety.

In total for the period, 59 scheduled and unscheduled field inspections were performed for FSUE «NORW» facilities.

8.2. Interaction with public environmental organizations, scientific and social institutes. Public awareness. Key results of 2019.

Within the scope of public awareness on radioactive wastes processing environmental safety of FSUE «NORW» (the norm of federal Law #190-FZ «On radioactive waste treatment, art.20) the environmental safety report was issued for 2018. The report includes company activities information aimed at preserving and improving the environmental state of the regions of operation. Report presentation was held in Sverdlovsk and Tomsk regions as well as in Kranoyarsk krai.

For population environmental awareness enhancement, the National operator for radioactive waste processing in the regions started implementing the "Environmental week" project, where the representatives of several regions where the final isolation facilities are located, are discussing the urgent issues connected with FSUE «NORW» activities and creation of uniform state structure for RAW treatment.

In 2019 the implementation of "Shelter for the atom" communication project continued, involving the creation, demonstration and discussion of educational movies revealing the essence of the process and environmental safety of RAW final isolation. The 3rd part of movie was shot; it is all about the underground research laboratories. The movie has been presented on local TV channels.

The movie provides information on Russian and foreign experience of searching for sites of deep formation isolation of highly active radioactive waste as well as detailed information on tasks for creation of underground research laboratories and the principles of their research. The movie was first demonstrated during Yekaterinburg "KSTATI" science festival. Movie presentations and discussions were also held in Krasnoyarsk krai, Chelyabinsk, Tomsk, and Ulyanovsk regions.

For informing the media representatives and the public about FSUE «NORW» activities on environmental protection the series of seminars were held as well as tours to the facilities for processing and isolation of RAW in Russia and abroad. In 2019 journalists and public representatives of Tomsk, Ulyanovsk, Chelyabinsk regions and Krasnoyarsk krai were informed about the experience of French and Korean operators. Also, visits were organized to the first in Russia final isolation facility near Novouralsk (Sverdlovsk region), as well as to the construction site for underground research laboratory near Zheleznogorsk (Krasnoyarsk krai).

Annually the National operator for radioactive waste management holds activities for school children and students. In 2019 this practice was continued in Krasnoyarsk krai, Sverdlovsk,





Tomsk, and Chelyabinsk regions.

The FSUE «NORW» personnel took part in all-Russia environmental subbotnik «Green Spring» in Sokolniki Park, Moscow. Similar events were held in company branches. Personnel of FSUE «NORW» Zheleznogorsk branch took part in Rosatom sports event «Atomic cities race» running the distance of 2019 meters. The sports event included also the first bicycle race.

OTHER EVENTS:

Sverdlovsk region

• A traditional environmental lecture was held for intellectual coterie of Sverdlovsk region Novouralsk School #54. In 2019 the young ecologists were given a lecture by the head of Novouralsk technological Institute NRNU MEPhI Grigoriy Zinovyev.

• The meeting was held between the heads of French municipal governments of RAW isolation sites with Novouralsk public representatives.

• Jointly with Yekaterinburg Atomic energy Information Center in Yekaterinburg, the school lessons were conducted on the issues of radioactive wastes safe processing.

• The tour was organized for Yekaterinburg Education department and educational institutions representatives to the Novouralsk RAW final isolation facility.

• The visit was organized for representatives of mass media, environmental and scientific organizations as well as public organizations of Novouralsk and Yekaterinburg to the underground research lab construction site in Zheleznogorsk, Krasnoyarsk krai.

- FSUE «NORW» environmental report was presented to Novouralsk public.
- The discussion of the book "81/2 myths about radioactive wastes".
- "Ecology week" performance involved the visit of Novouralsk final isolation facility visit by public representatives and mass media of Chelyabinsk, Tomsk, and Ulyanovsk regions.







During the visit they were informed about the facility operation and reconstruction process as well as facility environmental safety ensurance.

• The "round table" was conducted within "Ecology week" on the issues of radioactive wastes safe treatment for public, science and mass media representatives of Chelyabinsk, Tomsk, and Sverdlovsk regions.

• The visit was organized to near-surface RAW final isolation facility for veterans of UEC JSC.

• The possibility of incoming control of RW packaging was provided to the representatives of Novouralsk city public chamber.

Chelyabinsk region

• The scientific movie "Shelter for the atom. World underground research laboratories" was presented under "Step to the future" scientific-technical project in Chelyabinsk high school #11, Ozersk branch of NRNU MEPhI and Chelyabinsk atomic energy information center.

• The public and mass media representatives were introduced to the experience of France National Agency for radioactive waste treatment ANDRA

• A lecture and free discussion on RW final isolation was organized for students and mass media representatives.

Tomsk region

• The lecture was conducted within XVI International symposium on integration of water and rock formations during which the Russian and foreign scientists discussed the geological, hydrogeological, and geochemical aspects of liquid radioactive wastes final isolation in deep isolated formations.

• The representatives of the public, mass media and regional administration were presented the "Environmental safety report for 2018" in RIA Tomsk press center.

• The presentation was conducted for the part of the movie "Shelter for the atom" in Tomsk Atomic energy information center.

• A round table was organized for the results of FSUE «NORW» operation in 2019 for public representatives, scientific community, and mass media of Tomsk region. **Ulyanovsk region**

• Representatives of Ulyanovsk region public and mass media were informed about the history of operation and current state of La Manche RW final isolation facility of France National Agency for radioactive waste treatment ANDRA.







• The round table was conducted on National operator for RW management in Ulyanovsk information center for atomic energy for representatives of Ulyanovsk government, RIAR, research and environmental organizations, public and mass media.

• The presentation and discussion was conducted for the first part of "Shelter for the atom" movies series together with Ulyanovsk information center for atomic energy. **Krasnoyarsk region**



The discussion was conducted on the issues of long-term safety of deep disposal facility in Nizhne-Kansk rock monolith between National operator for radioactive waste management specialists and representatives of Federal company for RW treatment (BGE), Federal Institute of sciences of Earth and natural resources (BGR), the German Society of nuclear reactors and facilities safety (GRS), and Karlsruhe technological Institute (PTKA-KIT).
The visit to the construction site of underground research lab in Nizhne-Kansk rock massif was organized for representatives of administration, delegates and members of public



chamber of Zheleznogorsk CATU.

• Subbotnik was held by Zheleznogorsk branch personnel together with public representatives aiming at cleaning the territory adjacent to Mayakovskogo 11a building where the information center is planned to be located for discussions of RAW isolation environmental safety.

• The visit was organized for representatives of mass media, environmental and scientific



organizations as well as public organizations of Novouralsk and Yekaterinburg to the underground research lab construction site in Zheleznogorsk, Krasnoyarsk krai. After the visit, the round table was held on the issues of RW safe isolation.

• Nuclear Energy Agency "Crystalline club" was conducted in Krasnoyarsk involving specialists of FSUE «NORW». Scientists, experts and scientific researchers from Germany, Czech Republic, Switzerland, Romania, Japan, South Korea, China, and Russia discussed the research process in underground labs on opportunities of final isolation of highly active RAW in rock formations.

• The visit was organized for Nuclear Energy Agency "Crystalline club" Organisation for economic cooperation and development (NEA/OECD) experts to the construction site of underground research lab in Nizhne-Kansk rock massif.

• The agreement signed between FSUE «NORW» and Siberian Federal University on cooperation development in the sphere of education, information, scientific and innovation activities.

• The meeting organized for the members of the Federal Assembly of the Russian Federation to familiarize them with works status on construction of underground research lab in Nizhne-Kansk rock massif.

• The "Shelter for the atom. World underground research laboratories" movie premier show and discussion organized in Krasnoyarsk Kvantorium.

• The "Shelter for the atom. World underground research laboratories" movie premier show and discussion organized in Zheleznogorsk at the facilities of SFS RF MES fire and rescue academy.

• The tour was organized for representatives of administration, scientists and environmental protection agencies as well as heads of public organizations and mass media of public and mass media of Krasnoyarsk and Zheleznogorsk to the underground final isolation facility of France National Agency for radioactive waste treatment ANDRA.

8.3. The development of international cooperation in the sphere of technology and environmental safety assurance. Key events of **2019**.

The international cooperation of National operator for radioactive waste management is aimed at provision of information on company operation conformance with approved international standards and exchange of scientific-technical experience in the field of radioactive wastes treatment, as well as demonstration of real examples of final disposal sites safe operation in Russia and abroad.

South Korea:

On November 23-28, 2019, the representatives of FSUE «NORW» took part in international symposium on the issues of enhancing the safety increasing the trust level of stakeholders (SaRaM 2019).

Germany:

On March 18th, 2019, the "Russia-Germany cooperation in the field of atomic energy" seminar took part in Berlin where more than 40 specialists from different atomic fields of both countries took part. The representatives of the professional society discussed the issues of mutual scientific researches and technologies development in the field of RW safe management and final isolation in deep geological formations.

On September 5th, 2019 in Dresden the five-sided international agreement was signed on scientific cooperation between FSUE «NORW», Federal Institute for nuclear safety of Russian Academy of Sciences, Federal Institute of geoscience and natural resources (BGR, Germany), BGE TECNOLOGY GmbH (BGE TEC, Germany) and the Society for Reactors and Installations Safety (GRS), for the purposes of research and mutual development of approaches and methods for RW management and final isolation in deep geological formations.

France:

On April 08-12, 2019, the representatives of FSUE «NORW» took part in the international conference for geological isolation of RW (Modern 2020).

Within the Modern 2020 project the conference "Monitoring of radioactive waste geological disposal: strategies, technologies, decision making, public involvement";

In March and June 2019, the employees of FSUE «NORW» took training in France for ANDRA experience study on creation of finance system for RAW final isolation and creation of information centers for public information about the activities of FSUE «NORW»;

On June 17, 2019, the delegation of FSUE «NORW» headed by General Directorvisited the headquarters of France National Agency for radioactive wastes treatment ANDRA. During the visit, the report was signed on implementation of the Cooperation Agreement between Rosatom State Corporation (the executor from Russian side – FSUE «NORW») and France National Agency ANDRA dated November 22nd, 2017. The report was submitted to Committee for Atomic Energy and Alternative Sources of energy of France François Jackues and General Director of Rosatom State Corporation Alexey Likhachev;

During the work trip on June 17-21, 2019 the mayors of Russian «atomic» cities took part in the open session of Local Information Committee CSA;

On November 6th, 2019 in Paris the FSUE «NORW» took part in 10th meeting of Work group for cooperation in the field of peaceful use of atomic energy within Russian-French Counsel on economic, finance, industrial and trading issues (CEFIC). The working group was created in accordance with agreements achieved during 15th meeting of CEFIC. The working group meetings are held on an annual basis alternatively in France and Russia;

On November 27th FSUE «NORW» and ANDRA signed the roadmap for 2020 on implementation of Agreement dated November 22nd, 2017.

Crystalline club:

On June 25 – 27th the third field meeting of Crystalline Club took place in Krasnoyarsk. 35 participants took part in the meeting including 13 foreign delegates from 9 countries. The meeting included the technical tour to the site of underground research lab construction in Nizhne-Kansk rock massif.

The main objective of two days of the meeting was the consolidated development of fullscale Crystalline Club report chapters on the international experience of radioactive wastes (RAW) final isolation inside the rock formations. The participants of the Crystal Club were also familiarized with Russian program of RW DGR development. **Atomexpo:**

Within the XI international ATOMEXPO-2019 forum held in Sochi, FSUE «NORW» has organized the exposition and the distribution of materials. The Agreement on informational cooperation was signed between the heads of Russian and French cities adjacent to correspondent RAW final isolation sites, and the meetings with international companies were held:

- The municipal heads of Russian CATU and French cities
- ANDRA (France)
- BGE TECH and BGR (Germany)
- KORAD (Korean Republic)
- Representatives of IAEA and OECD/NEA

AtomEco (Hungary):

The delegation of FSUE «NORW» took part in XIII International public forum-dialogue and exposition «Atomeco 2019» taking place in Pecz, Hungary.

Specialists of FSUE «NORW» took part in discussions on safety assurance in the back-end sphere, issues of communication with public and parties involved during decisions taking on the construction of atomic energy facilities.











Stone flower (Excerpt from Pavel Bazhov's fairy tale)

ADDRESSES AND CONTACTS

General Director FSUE «NORW» IGIN Igor Mikhailovich

Contact: Bld 2, 49a Pyatnitskaya str, Moscow 119017 e-mail: info@norao.ru, www.norao.ru

Deputy General Director for Permits and Licensing MININ Andrey Vasilyevich

Contact: Bld 2, 49a Pyatnitskaya str, Moscow 119017 e-mail: AVMinin@norao.ru

Deputy General Director for Development – Head of Research KRASILNIKOV Victor Yakovlevich

Contact: Bld 2, 49a Pyatnitskaya str, Moscow 119017 e-mail: VYKrasilnikov@norao.ru Environmental expert SHILOVA Ekaterina Grigorievna

Contact: phone: 8 (916) 066-61-94 e-mail: EGShilova@norao.ru

Branch Dimitrovgradskiy

Branch Dimitrovgradskiy Director KARASEV Alexey Yurievich

Contact: office 1, 1a Osipenko str, Dimitrovgrad, Ulyanovsk region 433502 phone: +7 (84235) 45977 e-mail: AYKarasev@norao.ru

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Branch Zheleznogorskiy

Deputy General Director - Branch Zheleznogorskiy Director TROKHOV Nikolay Nikolaevich

Contact: 13, Oktyabrskaya str. Zheleznogorsk, Krasnoyarsk Krai, 662971 phone: +7 (3919)74-67-67, fax: +7(3919)74-64-44 e-mail: NNTrokhov@norao.ru

Branch Severskiy

Branch Severskiy Director SEDELNIKOV Vladimir Pavlovich

Contact: 8, Kommunistichesky avenue Seversk, Tomsk region, 636035 phone: +7(3823) 78-78-09, 78-78-23 e-mail: VPSedelnikov@norao.ru

Novouralsk Department of Branch Severskiy

Deputy General Director – Novouralsk Department Head ALEKSANDROV Vyatcheslav Vladimirovich

Contact: 7, Dzerzhinskogo str Novouralsk, Sverdlovsk region, 624130 phone: +7 (34370) 7-86-93 e-mail: VVAleksandrov@norao.ru

Branch Ozersky

Branch Ozersky Director TRUKHAN Igor Mikhailovich

Contact: 71, Kyshtymskaya str. Ozersk, Chelyabinsk region, 456780 phone: +7 (985) 809-16-15 e-mail: IMTrukhan@norao.ru



Aru-Mendure

(Excerpt from Pavel Bazhov's fairy tale)

I**re** fairy tale)

ANNEX

Annex 1

Radioactive waste – materials and substances not subject to further use, as well as equipment, products (including spent sources of ionizing radiation), the content of radionuclides in which exceeds the levels established in accordance with the criteria established by the Government of the Russian Federation. Radioactive waste can be recognized as materials with a high content of natural radionuclides, produced during non-atomic energy-related activities for the extraction and processing of mineral and organic raw materials with a high content of natural radionuclides, if these materials are not to be further used.

RW is classified as follows:



Attachment 2

Safety measures during radioactive waste disposal. Protective barriers system

RW disposal method, containment structure, type and properties of safety barriers are defined depending on RW characteristics and volume, considering the natural conditions of disposal site location and the results of safety assessment in accordance with NP-055-14 requirements.

3 and 4 class RW are to be disposed in near-surface disposal facilities – the facilities constructed above, level or lower the ground surface at depths down to one hundred meters.

DFRW safety is provided by successive implementation of in-depth multi-barrier protection principles, based on deployment of physical barriers systems on the way of ionizing radiation and radioactive substances transmission into the environment.

Safety assurance during RW disposal is implemented mostly by using the multi-barrier protection principle, when the breach of one safety barrier (natural or engineered) as well as probable external natural or man-caused event shall not cause the decrease of facility long-term safety level.

The engineered barriers for DFRW include the RW packaging, its separate elements (form, container), DFRW engineering structures and their separate parts and elements including the construction facilities, buffer materials, underlying and covering screens.

The natural barriers for DFRW refer to natural geological formations including carrying and (or) surrounding formations.

At present, the following types of design options are available for 3 and 4 class RAW final isolation:

ANNEX

1. Silo type



2. Shaft or tunnel type



1- grass reinforcement; 2 - natural layer 0,1 m; 3 - natural soil 0,9 m; 4 - quarry stone protection layer 0,5 m; 5 - crushed stone 0,3 m; 6- 20-feet containers with 4 class waste (OHRAW); 7 - contaminated soil; 8 - 4 class waste (OHRAW) in 2001 steel barrels; 9 - bentonite mat 2 layers; 10 - levelling layer of sand 0,7 m; 11 - geogrid; 12 - drain trench; 13 - Big Bags with contaminated soil; 14 - reinforced concrete foundation; 15 - crushed stone 0,3 m; 16 - bentonite mat 2 layers.

4. Trench-type



6. Modular structure with covering screen (above-ground facility)



5. Combined type



7. Modular structure (underground facility).



LRW DDF engineering barriers system includes the following:

• LRW DDF wells casing, water-proof along the full depth, restricting the low-laying aquifers breach into upper-laying ones, with engineering barrier service life of not less than 100 years.

• wells annulus and inter-tube space materials shall have the permeability factor not exceeding that of confining formations drilled through by the well, with service life of not less than 100 years.

• plugging materials used for wells abandonment (specifications for plugging materials shall be chosen and justified in design projects for wells abandonment and LRW DDF closure.

Natural barriers for LRW DDF are the natural geological formations – bearing strata, introduced by reservoirs and confining layers.