DECOMMISSIONING RUSSIA'S OLD NUCLEAR POWER REACTORS

STATUS UPDATE ON KEY PROCESSES

RUSSIAN SOCIAL-ECOLOGICAL UNION/FRIENDS OF THE EARTH RUSSIA,
KOLA ENVIRONMENTAL CENTER, ZA PRIRODU/FOR NATURE,
PUBLIC COUNCIL OF THE SOUTH COAST OF THE GULF OF FINLAND,
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Status update on key processes 2019

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For more information, please contact the participating partners directly or refer to our reports, which can be found at the web site of Russian Social-Ecological Union (Friends of the Earth Russia): http://rusecounion.ru/eng/decomatom and at the web site of Naturvernforbundet (Friends of the Earth Norway): http://naturvernforbundet.no/decommissioning-reports

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За природу
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Russian Social-Ecological Union
Friends of the Earth Russia

Naturvernforbundet
Friends of the Earth Norway

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Content

Introduction

Russia's fleet of nuclear power reactors is aging. In fact, 23 out of 35 operating reactors have passed their designed lifetime, which means 66% of the reactors are overdue. Chapter 1 tells about the current status of nuclear power reactors in Russia.

Plans and information on decommissioning is missing. A law from February 2019 requires all Russian nuclear power plants must have a decommissioning concept. But when we have asked operators of the nuclear power plant to provide these concepts, and to inform about when they plan to end operation, we don't get satisfactory answers, as shown in chapter 2. This can provide an example of the difficulties to work with nuclear and other environmental issues in Russia.

Leningrad nuclear power plant is making more detailed plans, but lots of important questions remain. What should be done with the graphite from the reactor moderator, is not clear. Chapter 3 provides status and gives recommendations to authorities.

One of the main challenges in decommissioning nuclear power plants, concerns how to deal with the radioactive waste and spent nuclear fuel. Chapter 4 presents background information on the issues, in order for the reader to get a clear and correct overview of the situation.

The current situation for radioactive waste is presented in a series of articles in chapters 5, 6 and 7. First, about the main legislative changes in 2019, then about subsoil use for disposal of radioactive waste, and finally on environmental threats from import of foreign radioactive waste.

This year, our status report consists of articles which can be read separately according to interest. All information in this report is collected from open and available sources. We have put the information together in a way that we hope is understandable and readable to everyone, also for non-experts in the field. Our aim is that our report will provide understanding and help different stakeholders to involve in decommission-related issues.

1.Current status of nuclear power reactors in Russia

Daria Matveenkova (Public environmental movement Kola eco center)

Introduction

Rosenergoatom Concern, the operator of Russian nuclear power plants, manages ten nuclear power plants with 35 generating units and two generating units without generating energy.

In 2018 and 2019, two units were stopped - Leningrad NPP-1 and Bilibino-1. Even though the stations do not conduct electricity, they are still dangerous objects, as the fuel remains unloaded.

After removal of fuel, the power unit receives a different status of a non-nuclear hazardous facility. This status has the first three power units of Novovoronezh NPP and the first two Beloyarsk nuclear power plants. In 2017, the removal of spent nuclear fuel from the first and second power units of the Beloyarsk NPP for reprocessing at Mayak began.

In 2016, work to create infrastructure for decommissioning units 1 and 2 of the Novovoronezh NPP was completed, the units are in the process of decommissioning. Also, at the 1st and 2nd units of the Novovoronezh NPP, tests on the systems for decontamination and processing of radioactive waste were conducted.

Below is information on all nuclear power plants in Russia.

Updated information for 2019

Kola NPP

In January 2019, KNPP Unit 2 was stopped for repairs for 279 days. Large-scale modernization was carried out to extend the life of 15 years until 2034. The reactor was commissioned in 1974 and has been in operation for 45 years.

The Federal Service for Ecological, Technological and Nuclear Supervision (Rostekhnadzor) conducted an audit to issue a license for the Kola NPP for the extension of 2 power units. Public hearings were not organized.

On November 20, power unit No. 2 of the Kola Nuclear Power Plant was included in the grid after receiving permission from Rostekhnadzor for its operation in accordance with the current (old) license.

Bilibino NPP

On January 23, the Federal Service for Ecological, Technological and Nuclear Supervision (Rostekhnadzor) issued Rosenergoatom a license for Operation without Generation for power unit No. 1 of the Bilibino NPP.

After it Rosenergoatom will be able to receive a license “For complete decommissioning” from Rostekhnadzor. On January 14, the unit No. 1 of the Bilibino NPP was stopped, the spent nuclear fuel was unloaded from the reactor into the substation holding pool.

The Academician Lomonosov Floating NPP, which arrived at the port of Pevek in September 2019, was declared a substation station.

Novovoronezh NPP-2

The second unit of the Novovoronezh NPP-2 began the final stage before putting the power unit into operation - the pilot operation phase.

The first inclusion of power unit 2 into the network took place on May 1, 2019. The Rostekhnadzor approved the commissioning of the unit 2 June 3, 2019, after which testing of the equipment in various modes has started with an output to 50 % power.

On October 31, power unit 7 with a VVER-1200 reactor was put into operation 30 days ahead of schedule.

Leningrad NPP

On December 21, 2018, at 23:30, power unit 1 of the RBMK-1000 series was shut down.
Rosatom, made a decision on the urgent dismantling of a shutdown reactor. The first phase of decommissioning will take 5 years. During this period, fuel unloading, and decontamination will take place.

Rostov NPP

On January 22 and 24, 2019, public hearings were held to discuss preliminary materials on the environmental impact assessment during the operation of Unit 3 of the Rostov NPP in the 18-month fuel cycle at a reactor plant capacity of 104% of the nominal with cooling towers.

In November, the foundation laying process for future cooling towers of power unit No. 3 has started. By early December 2019, the first foundation slab should be installed.

Floating NPP Academician Lomonosov

The Akademik Lomonosov floating nuclear station left the port of Murmansk on August 23 and completed its transition from Murmansk to Chukotka on September 14 and stood at the pier in Pevek.

In the coming months, the final stage of commissioning will be carried out to prepare it for the supplying with electric and thermal energy the coastal infrastructure. It is planned that the first kilowatts of electricity will be delivered to the grid by the end of December 2019.

Symbols in the table:
Red - power units are operated with an extended project resource;
Black - power units are operated with an incomplete estimated service life;
Green - the power unit is stopped, fuel is unloaded;
Purple - the power unit is finally stopped, the fuel is not unloaded, is operated in the mode without generation;
Blue - power unit under construction.

Table 1: Nuclear power plants (NPPs) of Russia

Name of Power Unit	Satellite cities of nuclear power plants, regional centers and distances to them	Type of power unit	Power Gross MW	Generation of power unit	Year of commissioning	Year of the end of the designed lifetime	Planned end after extended operation.
Kola 1	Polyarnye Zori	VVER-440/230	440	1	1973	2003	2033
Kola 2	11 km	VVER-440/230	440	1	1974	2004	2034
Kola 3	Murmansk 170 km	VVER-440/213	440	2	1981	2011	2036
Kola 4		VVER-440/213	440	2	1984	2014	2039
Leningrad 1	Sosnovy Bor 3,5 km	RBMK-1000	1000	1	1973	2003	End 2018 (21.12)
Leningrad 2	Saint Petersburg 35	RBMK-1000	1000	1	1975	2005	2020 (12.12)
Leningrad 3	km	RBMK-1000	1000	2	1980	2009	2025 (31.01)
Leningrad 4		RBMK-1000	1000	2	1981	2011	2026 (26.12)
Leningrad NPP - 2-1		VVER-1200	1200	3+	2018	2068	
Leningrad NPP - 2-2		VVER-1200	1200	3+	2020	2070	
Smolensk 1	Desnogorsk 3 km	RBMK-1000	1000	2	1982	2012	2027
Smolensk 2	Smolensk 150 km	RBMK-1000/	1000	2	1985	2015	2029
Smolensk 3		RBMK-1000	1000	3	1990	2020	2034
Kursk 1	Kurchatov 4 km	RBMK-1000	1000	1	1976	2006	2021
Kursk 2	Kursk 40 km	RBMK-1000	1000	1	1979	2009	2023
Kursk 3		RBMK-1000	1000	2	1983	2013	2028
Kursk 4		RBMK-1000	1000	2	1985	2015	2030
Kursk 5		VVER TOI	1255	3+	2020		
Kursk 6		VVER TOI	1255	3+	2022		
Novovoronezh 1	Novovoronezh 3.5 km	VVVER-440/210	417	1	1964	1984	End 1984
Novovoronezh 2	Voronezh 45 km	VVER-440/365	417	1	1969	1989	End. 1990
Novovoronezh 3		VVER-440/179	417	1	1971	2001	End. 2016
Novovoronezh 4		VVER-440/179	417	1	1972	2002	2032
Novovoronezh 5		VVER-1000-187	1000	2	1980	2010	2036
Novovoronezh 6		VVER-1200	1114	3+	2016	2077	
Novovoronesh 7		VVER -1200	1114	3+	2018	2078	
Kalinin 1	Udomlya - 4 km Tver -	VVER-1000	1000	2	1984	2014	2044
Kalinin 2	125 km	VVER-1000	1000	2	1986	2016	2047
Kalinin 3		VVER-1000	1000	2	2004	2034	2065
Kalinin 4		VVER-1000	1000	2	2011	2041	2073
Beloyarsk 1	Zarechnny -3 km	AMB-100	100	1	1964	1981	End 1988
Beloyarsk 2	Ekaterinburg - 15 km	AMB-200	200	1	1967	1989	End 1989
Beloyarsk 3		BN-600	600	2	1980	2010	2025
Beloyarsk 4		BN-800	880		2015	2075	
Balakovo 1	Balakovo -12.5 km	VVER-1000	1000	2	1985	2015	2045
Balakovo 2	Saratov - 145 km	VVER-1000	1000	2	1987	2017	2048
Balakovo 3		VVER-1000	1000	2	1988	2018	2048
Balakovo 4		VVER-1000	1000	2	1993	2023	2053
Bilibino 1	Bilibino - 4 km	EGP-6	12	1	1974	2004	End 2019 (14.01)
Bilibino 2	Anadyr - 610 km	EGP-6	12	1	1974	2004	2021
Bilibino 3		EGP-6	12	1	1975	2005	2022
Bilibino 4		EGP-6	12	1	1976	2006	2022
Rostov 1	Volgodonsk - 11 km	VVER-1000	1000	2	2001	2031	2062
Rostov 2	Rostov-on-Don - 250	VVER-1000	1000	2	2010	2040	2071
Rostov 3	km	VVER-1000	1000	2	2014	2044	2075
Rostov 4		VVER-1000	1000	2	2018	2048	
Floating NPP "Akademik Lomonosov"	Pevek, 0 km Anadyr, 610 km	KLT-40s	70		2019		

2. Access to information, schedules and status of decommissioning conceptions and plans for NPP reactors

Vitaly Servetnik (Russian Social-Ecological Union / Friends of the Earth Russia)

According to Russian legislation, all nuclear power plants, including those that were put into operation before the adoption of modern legislation, must have a decommissioning concept after February 2019. The rule applies both if decommissioning is planned at the design stage of nuclear power plant, and for reactors where the operation time has been extended. The decommission concept shall define the basic principles for decommissioning the nuclear power plant units. Five years before the end of the design life of the reactor, a decommissioning program should be developed. The program shall define specific organizational and technical measures for preparation and decommissioning of the nuclear power plant unit, as well as the timing and sequence of their implementation. According to the program, when deciding on the decommissioning of the nuclear power plant unit, a specific project for decommissioning the nuclear power plant unit is developed. Among the 3 decommission documents mentioned in the law, the concept is the most general, the program is more concrete, and the project is the most specific.

In order to check if these concepts have been prepared, and whether they are available to the interested public, Russian Social-Ecological Union (RSEU) Anti-nuclear program initiated a series of requests to asses accessibility of this information.

In April 2019, regional organizations and members of the RSEU requested information on the availability of concepts for all Russian nuclear power plants. Anticipating possible problems with access to information, we duplicated requests through the online journal https://7x7-journal.ru/

We received only a few answers. Some requests were forwarded to Rosatom in Moscow. Later we received an answer from Rosatom, which was neither complete, nor comprehensive.

Later in December, we also sent a request to Rostechnadzor, the regulatory body. After two months, no response was received, despite the requirement of legislation to respond to media inquiries within a week.

The difficulty of access to information and the fact that there are no answers on the requests, show that there is lack of decommissioning conceptions for the nuclear power plant units, and the regulatory body also does not fulfill its function.

Background information

The Safety Rules for decommissioning of a nuclear power unit (NP-012-16[1]) stipulates that a concept for decommissioning of the unit should be developed no later than five years before the design life of the nuclear power unit expires, or within two years after the rules enter into force. This deadline expired in February 2019.

[1] FEDERAL NORMS AND REGULATIONS IN THE FIELD OF USE OF ATOMIC ENERGY "SAFETY RULES FOR THE DECOMMISSIONING OF A NUCLEAR STATION UNIT" (NP-012-16) https://www.consultant.ru/document/cons_doc_LAW_213331/b8628c26f6e50229eb3f4de7a89f3495f09b383a/

Years before the design life of the NPP unit expires, a decommissioning program should be developed in order to define specific organizational and technical measures for the preparation of decommissioning of the NPP unit, as well as the timing and the sequence of their implementation. This is in accordance with the requirements of Order of the Federal Service for Ecological, Technological and Nuclear Supervision of October 3, 2018 No. 486 “On approval of the safety guidelines for the use of atomic energy” “Comments on federal norms and rules“ General provisions for ensuring the safety of nuclear power plants ”(NP-001-15)"[2].

The concept of preparation and decommissioning of nuclear power plant units of Rosenergoatom dated July 3, 2017 [3] says:

“No later than five years before the design life of the NPP unit expires, the operating organization shall develop a decommissioning program for the NPP unit based on the concept of NPP decommissioning, as well as the results of the analysis of design documentation and operating experience.” (p. 19)

"In accordance with the requirements of NP-001-15, five years before the end of the design life of the NPP unit, a decommissioning program is being developed, which, inter alia, defines specific organizational and technical measures for the preparation and decommissioning of the NPP unit, as well as terms and sequence of their implementation. As of 01.01.2017 decommissioning programs have been developed for 26 operating units and 5 units stopped for decommissioning. " (p. 14)

It should be noted that most of the operating nuclear power plant units in Russia have already passed their design life, but have been granted extended operating life. As Rosenergoatom refers to “design life”, means that all units operating beyond their design life, should have a decommissioning program. Whether or not extended operation is planned or even permitted, should not be relevant, the decommissioning program should be made anyway. This understanding corresponds well with Rosenergoatom’s information that decommissioning programs having been developed for 26 operating units. However, as these programs are not made available, even after requests, we doubt that they are in fact made.

It should be noted that for Leningrad nuclear power plant, the situation is different. Rosenergoatom has developed "Decommissioning Program for Unit No. 1 of the Leningrad NPP" and "Decommissioning Program for Unit No. 2 of the Leningrad NPP". Both programs were put into effect on 1. January 2018. A detailed decommissioning project is under development, but important conceptual decisions are still lacking. This primarily relates to the long-term storage on spent nuclear fuel, the place of long-term storage of radioactive waste, and how to deal with the reactor graphite.

Information requests

The same following questions were directed to the all nuclear power plants.

1. When is decommission of the units of all ten nuclear power plants (Balakovo, Beloyarskaya, Bilibino, Kalinin, Kola, Kursk, Leningrad, Novovoronezh, Rostov and Smolensk) planned? Who, when and on what basis has made such a decision?

[2] Order of the Federal Service for Ecological, Technological and Nuclear Supervision of October 3, 2018 No. 486 “On approval of the safety guidelines for the use of atomic energy” “Comments on federal norms and rules“ General provisions for ensuring the safety of nuclear power plants ”(NP-001-15)" https://www.garant.ru/products/ipo/prime/doc/71967528/

[3] http://zakupki.gov.ru/223/purchase/public/download/download.html?id=43042182 или в веб-архиве: http://webcache.googleusercontent.com/search?q=cache:6iT6D0N8yIUJ:zakupki.gov.ru/223/purchase/public/download/download.html%3Fid%3D43042182+&cd=1&hl=ru&ct=clnk&gl=ru

2. Have you developed decommissioning concepts for all ten nuclear power plants (Balakovo, Beloyarskaya, Bilibino, Kalinin, Kola, Kursk, Leningrad, Novovoronezh, Rostov and Smolensk)?
   If so, when did the work on the developments of the concept begin? What condition and status are they in? Where can we access the decommissioning concepts for all ten NPPs? Please indicate the links or send the concepts for review.

3. Have you developed decommissioning programs for all ten nuclear power plants (Balakovo, Beloyarskaya, Bilibino, Kalinin, Kola, Kursk, Leningrad, Novovoronezh, Rostov and Smolensk)?
   If so, when did the work on the developments of the programs begin? What condition and status are they in? Where can we access the decommissioning programs for all ten NPPs? Please indicate the links or send the concepts for review.

4. Have consultations been held with the public and the local population when developing concepts and programs? If so, please indicate where and when. Please inform us where we can get access to the consultation materials.

Similar questions were sent to Rostekhnadzor, as well as the following additional question:

Has the head of the Federal Environmental, Industrial and Nuclear Supervision Service checked the implementation of the Safety Rules for decommissioning of nuclear power units (NP-012-16) regarding the development of decommissioning concepts for nuclear power units after February 2019?

Information received

Balakovo, Beloyarsk and Kursk nuclear power plants reported back that the request was redirected to the head office of Rosenergoatom in Moscow.

Only the Kola nuclear power plant on May 24, 2019 gave a response to the request of the Public Movement Kola Ecocenter, signed by the acting Director I.V. Marakulin and containing the following information:

Planning for decommissioning of Kola NPP units is carried out at all stages of the life cycle by developing the concept of decommissioning of the NPP unit and its subsequent revision (clarification). 5 years before the end of the additional lifetime of each unit of the Kola NPP, an assessment (analysis) of its safety is carried out, based on which the operating organization (Rosenergoatom Concern JSC) decides on whether to continue its operation or to prepare for decommissioning. For the units of the Kola NPP, decisions on decommissioning were not taken.

For the units of the Kola NPP, the decisions on continued operation were adopted and then executed as follows:
Unit No. 1 - the term of operation is extended by 15 years (until June 30, 2033);
Unit No. 2 - an investment project is currently being implemented on preparations for extending the service life to 60 years;
Unit No. 3 - the operation period is extended by 25 years (until April 4, 2036);
Unit No. 4 - the term of operation is extended by 25 years (until December 7, 2039).

If the operating organization (Rosenergoatom Concern JSC) takes a decision on the final shutdown of the Kola NPP units for decommissioning, appropriate design documents will be developed for which the necessary procedures will be carried out as provided for by the legislation of the Russian Federation.

On April 30, 2019, the online magazine 7x7-juurnal.com received a response from Rosenergoatom signed by the Deputy Director of the Communications Department - Head of the Internal Communications Department O.N. Brednikov. The letter contained the following information:

Beloyarsk NPP: There are two operating power units with BN-600 reactors - unit No. 3 and, BN-800 - unit No. 4. In addition, power units No. 1 and No. 2 with reactors AMB-100/200 – are finally stopped. The current operating time of block No. 3 is 45 years. Currently, preparatory work is underway to extend its life to 2040. The estimated operating time of block No. 4 is 40 years. In 2055, according to research of the equipment condition, it is possible to extend its life.

Kola NPP: Four power units with VVER -440 reactors are in operation. The licenses for operating of the units are as follows: No. 1 – until 2033, No. 2 – until December 2019. However, work to modernize the unit in order to extend its lifetime is currently underway), No. 3 - - 2026, No. 4 – until 2039.

Comment:
The planned end-year for reactor 3 is stated to be 2036 in other sources, for instance Kola NPP response to Kola Ecocenter, so it would seem that there is a typing error in this response.

Kursk NPP: Four power units with RBMK-1000 reactors are in operation. In 1994-2009 all units underwent a deep technical modernization. Obtained licenses of Rostekhnadzor for the extended life of power units are as follows: No. 1 - until 2021; No. 2 - until 2024; No. 3 - until 2023 (extended to 2028); No. 4 - until the end of 2030.

Kalinin NPP: Four power units with VVER -1000 reactors are in operation. Obtained licenses from Rostekhnadzor for the extended operation of power units are: No. 1 - until June 2025 (extended to 2044); No. 2 - until November 2038 (extended to 2046). Blocks No. 3 and No. 4 operate in the design lifetime (2034 and 2041) with the possibility of further extension.

Rostov NPP: four units with VVER-1000 reactors are in operation. The license for the operation of power units is valid, and they operate in the design life (No. 1 - 2031, No. 2 - 2040, No. 3 - 2045, No. 4 - 2048) with the possibility of further extension.

In accordance with the requirements of federal norms and rules, after shutting down the unit, regular operations are carried out to remove spent nuclear fuel from the reactor installation, run of the systems and components that remain in operation, drainage, shutdown, blackout of systems and elements, and decommissioning are carried out. The unit is operated in accordance with the license issued by Rostekhnadzor for the operation of the unit, which was stopped for decommissioning. During this period, a project is being developed for decommissioning the unit, which, among other things, is undergoing a public hearing.

The answers from Rosenergoatom presented above, are summarized in table 1.

Table 1: Planned end year of each reactor at nuclear power plants, according to Rosenergoatom

Power plant	*Reactor No. 1*	*Reactor No. 2*	*Reactor No.3*	*Reactor No. 4*	*Comments*
Beloyarsk	Stopped	Stopped	Being extended to 2040	License to 2055, possible extension	

Kola	License to 2033	On December 20, 2019 received a license to work until 2034.	License to 2036	License to 2039	In the letter it is said 2026 for the 3rd reactor, but other sources clearly says 2036
Kursk	License to 2021	License to 2024	License to 2023, planned extension to 2028	License to 2030	
Kalinin	License to 2025, planned extension to 2044	License to 2038, planned extension to 2046	License to 2034, possible extension	License to 2041, possible extension	
Rostov	License to 2031	License to 2040	License to 2045	License to 2048	

Findings

1. NPPs in the regions (with the exception of the Kola NPP) do not provide information on the closing time, and not on availability of concepts and plans for decommissioning reactors. Instead, they redirect requests to the head office of Rosenergoatom in Moscow.

2. The replies received contain only information on the planned operation of the nuclear power plant reactors, but not the planned time for the decommissioning of the units. This should be part of the decommissioning program, which should have been prepared for most units.

3. Rosenergoatom does not give answers regarding the Safety Rules for the decommissioning of a nuclear power unit (NP-012-16), requiring the development of a concept for decommissioning a nuclear power unit “no later than five years before the design life of the nuclear power unit expires or within two years after the entry into force of the Rules.” Despite the fact that this period expired in February 2019, the concepts of decommissioning nuclear power units are not even mentioned in the answers and are not provided.

Conclusion

The lack of provided information on the development of concepts for decommissioning of NPP units shows that the Russian nuclear power plants, with the exception of Leningrad nuclear power plant, have no concepts for decommissioning units. This violates the Safety Rules for decommissioning a nuclear power unit (NP-012-16). Several units should also have a decommissioning program (more concrete than the concept), but this is also not provided.

In addition, we note that the answers provided even lack reference to the subject in question, namely planning for decommissioning. We might disagree about the time of closure, but at some point, the reactors must close, and planning for decommissioning is important.

Rosenergoatom displays its eagerness to extend the operating life of old nuclear reactors, but fails to relate to the necessity for decommission concepts according to Russian law. We therefore find it disturbing that nuclear power plant operators seem to disregard Russian law.

3.Decommissioning of Leningrad nuclear power units: status of the process in 2019

Oleg Bodrov, Chairman of the "Public Council of the southern coast of the Gulf of Finland" - an interregional social & environmental movement in Leningrad region and St. Petersburg

Introduction

21 December 2018 at the Leningrad Nuclear Power Plant, the world's oldest power unit with Chernobyl-type RBMK-1000 reactors, was finally stopped. It worked for 45 years since December 1973, 15 year longer than its designed lifetime.

In accordance with the “Concept for decommissioning of power units of the Leningrad NPP with RBMK-1000” developed by the operator Rosenergoatom, it is planned to decommission it to the state of “Brownfield” by the end of 2053.

The order of Rosenergoatom Concern JSC dated November 29, 2019 approved the “Roadmap for the establishment in Sosnovy Bor of an Experimental Demonstration Engineering Center (EDEC) for decommissioning of NPP units with channel-type reactor plants”.

This is a very important decision, which was sought by the public. It will provide an opportunity to accumulate experience that was first decommissioned from RBMK-1000 power units. In the future, this experience can be used to withdraw the currently operating power units of this type at Smolensk and Kursk NPPs. It is of fundamental importance that EDEC accumulates not only technological, environmental, but also social experience - interactions with the authorities, the expert community, and the interested public.

The second, third and fourth power units are planned to be finally stopped in 2020, 2024 and 2025 respectively. They plan to create a “Brownfield” on the site of all four LNPP power units with RBMK-1000 reactors by 2060.

“Brownfield” means that the site after the decommissioning of all power units will not need to be monitored by the nuclear and radiation safety regulator (Rostekhnadzor) and can be used for industrial activities. This is an alternative to the “Greenfield”, when the site after the decommissioning of the NPP returns to its natural state and can be used without restrictions. For example, to create a park, build a kindergarten, or in any other way.

2019 developments on decommissioning planning

In 2019, the first stage (7 years) of decommissioning of the first power unit continued. It will continue until 2025. During 2019, the following work continues for the first power unit:

- development of a decommissioning project;
- preparation of the Safety Justification Report (SJR);
- Environmental Impact Assessment (EIA);
- spent nuclear fuel (SNF) unloading from the reactor to the holding pool;
- transfer of cooled SNF from the cooling pool to the station wet SNF storage.

The second power unit of LNPP continues to operate until its final shutdown in December 2020. It carries out a comprehensive survey of the current state for the development of the decommissioning project, as well as SJR and EIA.

In parallel with the decommissioning of RBMK-1000 reactors at an adjacent site, 1 km from the coast of the Baltic Sea, power units with VVER-1200 water-cooled reactors are being constructed. The first unit was commissioned in 2018. The second unit reactor is planned to be launched at the end of 2020. In total, it is planned to build four VVER-1200 units to replace RBMK-1000 decommissioning reactors.

Rosenergoatom Concern has developed the Decommissioning programs for the first[4] and second[5] units.

Both programs were put into effect on 01.01.2018 by Order No. 9/59-P dated 01.22.2018. A.Yu. Petrov, General Director of the Rosenergoatom Concern.

The 180-page decommissioning Program of the Leningrad NPP contains programs for the decommissioning of individual buildings and structures, as well as an estimate of the cost of decommissioning Unit 1, taking into account the annual costs of the decommissioning process, for RW disposal, but without estimates of the cost of possible solutions for long-term isolation SNF reprocessing.

The cost of the preparation for decommissioning of unit No. 1 of LNPP according the Program will be:

- routine maintenance of operation of Unit No. 1 after the final shutdown, performed by Leningrad NPP personnel, including the removal of nuclear fuel from a power unit in the Spent Nuclear Fuel Storage Facility (Building 428) and to other units - 1,969,739,000 rubles per year (excluding tax value added, VAT);
- maintenance work on block No. 1 after the final shutdown, performed by contractors - 608,418,000 rubles per year (excluding VAT);
- design and construction of treatment facilities for the production of industrial and drainage and storm water at the first stage site (1st and 2nd power units) of LNPP - 944 112 000 rubles (excluding VAT);

According to estimates for December 2014, the cost of preparing for decommissioning of the 1st and 2nd power units will amount to 64,000,000,000 rubles (excluding VAT), taking into account the disposal of radioactive waste, but excluding the (long-term) final isolation of spent nuclear fuel.

This is more than 3 times less than the current cost estimate after 10 years of decommissioning the Ignalina nuclear power plant with two similar reactors, without solving the problems of long-term isolation (disposal) of spent nuclear fuel.

According to available information, the previously created Russian financial reserve for decommissioning Russian nuclear power plants has not accumulated sufficient funds for decommissioning and the management of this reserve is not transparent enough.

[4] *"Decommissioning Program for Unit No. 1 of the Leningrad NPP" (PRG 1.2.2.15.004.0087-2017)*
[5] *"Decommissioning Program for Unit No. 2 of the Leningrad NPP" (PRG 1.2.2.15.004.0088-2017)*

In 2018, the "Public Council of the South Coast of the Gulf of Finland" organized and conducted a public examination[6] of the official "Concept for decommissioning Leningrad NPP units with RBMK-1000, developed by the operating organization - Rosenergoatom Concern. English-language readers can read the main recommendations of the independent experts for the decommissioning Leningrad NPP in the Decommissioning of Russia's old Nuclear Power Reactors. Status Update on Key Processes.[7]

The expert report prepared by the experts of Russia and Lithuania was sent to Vladimir Pereguda, Director of Leningrad NPP, other interested persons and organizations, and also published in the professional nuclear issues.[8,9] Vladimir Pereguda, in a letter dated 22 November 2019 to the *"Public Council of the South Coast of the Gulf of Finland*", described the ongoing work being carried out at the station to ensure safe decommissioning. In particular, he said that in March 2019, the Leningrad NPP Decommissioning Concept, adopted in 2015, was clarified and passed the expertise of the regulator Rostekhnadzor, while receiving a license to operate the LNPP Unit 1, which was stopped for decommissioning.

Current situation with Spent nuclear fuel (SNF) management at Leningrad NPP

It should be noted from the letter of the director Vladimir Pereguda, that new infrastructure has been created for handling spent nuclear fuel - "*a total technological chain, including a transportation system, a complex for cutting spent fuel assemblies and preparation for dry storage at nuclear power plants, and a regional "dry SNF storage" facility that allows storing ... the entire volume of SNF unloaded from RBMK reactors for the entire period of their operation".*

This is a regional "dry storage" on the territory of the Leningrad NPP *"... of a chamber type, which provides for the reception, unloading of ampoules from SNF and their installation in canisters, which, after filling with inert gas, welding and tightness control, are placed in hermetically sealed long-term controlled storage separate storage sockets."* According to Vladimir Pereguda this design provides tightness control and in case of depressurization of the can there is a possibility of eliminating non-tightness.

From the letter of the Director of Leningrad NPP it follows that this made a possible to:

- *"ensure SNF removal at a faster pace; that is those despite the operation of RBMK power units, the total number of SFAs (spent fuel assemblies) at the Leningrad NPP site is noticeably reduced;*
- *increase the safety of spent fuel storage based on the transition from "wet" to safer "dry storage";*
- *reduce the cost of storage of spent nuclear fuel."*

[6] Conclusion of a public examination on the "Concept for decommissioning power units of the Leningrad NPP with RBMK-1000 reactors", pages 19 – 23 http://decommission.ru/wp-content/uploads/2019/04/Konception_LAES_24.04.2019_nasite_obrez.pdf

[7] Decommissioning of Russia's old Nuclear Power Reactors. Status Update on Key Processes, pages 19-23 http://decommission.ru/wp-content/uploads/2019/04/Status_update_on_key_processes_2018.pdf

[8] Conclusion of a public examination on the "Concept for decommissioning power units of the Leningrad NPP with RBMK-1000 reactors", "ProAtom", May 27, 2019" http://www.proatom.ru/modules.php?name=News&file=article&sid=8614

[9] Tamara Devyatova, Public examination on the "Concept for decommissioning power units of the Leningrad NPP with RBMK-1000 reactors", Atomic Strategy magazine, May 2019 http://www.proatom.ru/files/as150.pdf

Thus, from the letter and from the official Concept on decommissioning of Leningrad NPP it can be concluded that after the transport of the SNFs to the "dry storage" in CATU Zheleznogorsk with a 50-year guarantee of safety, the scenario of safe decommissioning for LNPP ends without final (long time) solution for the isolation of the spent nuclear fuel. In fact, this means that the final burden of solving SNF problems is shifted to future generations.

At the same time, there is an expert assessment[10], by the beginning of the 2070s, spent fuel assemblies (SFAs) in a dry temporary storage facility in CATU Zheleznogorsk, Krasnoyarsk Territory, could leak due to the formation of gases inside the spent fuel assemblies' shells.

Thus, neither the director's letter nor the official LNPP decommissioning concept (2015) describes conceptual solutions for socially-environmentally and economically acceptable technologies for the final isolation of spent nuclear fuel for the entire time that it poses a danger to living systems or its transfer in a safe condition.

Suggestions for the development of such solutions and their inclusion in the updated Concept of decommissioning of Leningrad NPP were contained in the aforementioned "Conclusion of public expertise ..." prepared by experts from Russia and Lithuania.

Current status of radioactive waste (RW) management at Leningrad NPP

In his letter, director Vladimir Pereguda describes current plans for conditioning of radioactive waste, selection of appropriate containers, loading of waste into them and transfer for disposal to the National Operator on Radioactive Waste Management.

Neither in the letter, nor in the Concept of decommissioning of Leningrad NPP there is a description of conceptual solutions for the long-term isolation of reactor graphite - biologically significant radioactive carbon ^{14}C. These radioactive waste of the 2nd hazard class, in accordance with the decisions adopted in Russia, should be buried in geological formations. Such burial grounds (long-term storage facilities), as well as technologies for transferring graphite to an ecologically safe state, do not exist yet.

Thus, in the plans for radioactive waste management, when decommissioning the LNPP, conceptual solutions have not yet been described for *"ensuring reliable isolation of the radioactive waste from the environment, protecting present and future generations, biological resources from radiation exposure in excess of the norms and rules in the field of atomic energy use limits"* in accordance with Art. 48 of the Federal Law on the Use of Atomic Energy (No. 170 Federal Law, October 20, 1995).

Environmental protection during decommissioning of the 1st power unit of Leningrad NPP

Decommissioning of nuclear power units needs license in accordance with Art. 26 of the Federal Law of November 25, 2017 No. 170-ФЗ "On the Use of Atomic Energy".

The materials of the rationale for the license (MRL) must undergo the State Environmental Review procedure (Article 3 of the Federal Law of 10.01.2002 No.7FZ *"On Environmental Protection"*). To make a decision on the possibility of decommissioning, an EIA is required in

[10] Dementy Bashkirov, SNF reprocessing. Relevance. Expediency. Danger? ProAtom 06.01.2018 http://www.proatom.ru/modules.php?name=News&file=article&sid=8052

accordance with the Regulation on the Assessment of the Impact of Planned and Other Activities on the Environment in the Russian Federation, approved by Order No. 372 of the State Committee for Ecology of Russia of 16 May 2000. At the same time, **materials from the EIA should contain information on conducting public discussions**.

Thus, we can expect public discussions on the MRL EIA for decommissioning of the 1st and 2nd power units starting from the end of 2020, when, in accordance with the Decommissioning Concept, these documents should be ready.

On the effect of evaporative cooling towers of Leningrad NPP-2 power units with VVER-1200 reactors

The letter from the director of the Leningrad NPP states that the effect of the thermal and chemical factors on the microclimate and terrestrial ecosystems is insignificant during the operation of evaporative cooling towers. It is noted that their impact will be limited to the sanitary protection zone of the new nuclear power plant.

At the same time, the letter does not mention the possible consequences of emissions of up to 200,000 tons / day (from 4 power units with VVER-1200 reactors) of a steam-water mixture of brackish waters of the Gulf of Finland. This can become critical for neighboring nuclear hazardous facilities, including open switchgears and high-voltage transmission lines in frosts of more than 20 degrees. This can create additional accident risks for operating and decommissioning RBMK-1000 reactors.

About the reserve source of water supply in Sosnovy Bor

When decommissioning the Leningrad NPP, it is important to ensure reliable drinking and household water supply in the city in which the workers involved in these works also live.

The current source of water for 67,000 residents of the nuclear city of Sosnovy Bor is the Sista River, less than 10 km from the nuclear cluster. In accordance with Art. 34 of the Water Code of the Russian Federation[11] *In order to provide citizens with drinking water in case of in the event of an emergency, the sources of drinking and domestic water supply are backed up on the basis of underground water bodies protected from pollution and clogging... ".*

According to the director of the Leningrad NPP stated in the above letter, *"the issues of the need to reserve water sources in Sosnovy Bor are not the objects of consideration of the Decommissioning Concept"*.

In accordance with paragraph 2 of the Rules for the reservation of sources of drinking and domestic water supply[12], the reservation should be carried out by the "*State authority of the subject of the Russian Federation in coordination with the territorial body of the Ministry of the Russian Federation for Affairs civil defense, emergency situations ... "*

[11] Article 34 of the Water Code of the Russian Federation https://www.consultant.ru/document/cons_doc_LAW_60683/814f76c933059091b59d1e16017ae944260a729e/

[12] Resolution Of the government of the Russian Federation of November 20, 2006 N 703 " on approval of Rules for reserving sources of drinking and household water supply" https://base.garant.ru/12150667/#friends

A reserve source of water supply has not yet been created, which casts doubt on the possibility of safe operation of the entire nuclear cluster on the southern coast of the Gulf of Finland in emergency situations, including during decommissioning of the LNPP.

On media engagement by the public

Judging by the letter from the director of the LNPP, the main mechanism of interaction with the public during the decommissioning of the LNPP is considered to be work with the Public Chamber of Sosnovy Bor.

The procedure for the electing members this body, is mainly associated with inviting members of the public which are loyal to the authorities.

The public Chamber of Sosnovy Bor consists of 21 people. Seven members of the Public Chamber are appointed by the Head of the city, and 7 more members are deputies of the City Assembly. The remaining 7 seats in the Public Chamber are claimed by self-nominees. They are chosen by 14 members of the Public Chamber appointed by the city authorities.

In this case, the Public Chamber is unlikely to be an effective tool for finding balanced socio-environmental solutions to the challenges that inevitably arise during decommissioning of nuclear power plants. Especially when there is no experience in decommissioning of Leningrad NPP - the largest employer in the nuclear single industry city.

It is advisable to use German (NPP Nord, Greifswald) or Lithuanian (Ignalina NPP, Visaginas) experience in creating a Public Council for social and environmental monitoring of decommissioning of the Leningrad NPP. This experience is described in the "Concept of a decommission plan for old nuclear power reactors. Guiding Principles from Environmental NGOs».[13]

"The Council under the President of the Russian Federation on the development of civil society and human rights" after the appeal of the "*Public Council of the South Coast of the Gulf of Finland"*[14] and subsequent discussions on nuclear cluster security issues on the southern coast Gulf of Finland, developed and published (15.06.2019) on its website recommendations for ensuring the safe decommissioning of Leningrad NPP.[15]

1. The Government of the Russian Federation

- *Consider establishing a National Operator to Decommission Nuclear Power Plants, Manage Spent Nuclear Fuel, Radioactive Waste and Develop Socially and Environmentally Acceptable Technologies for their Long-term Isolation.*
- *Consider ratifying the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) and the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters.*

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[13] *"Concept of a decommission plan for old nuclear power reactors. Guiding Principles from Environmental NGOs», 2008, http://greenworld.org.ru/sites/default/greenfiles/conception_eng_1610.pdf*

[14] Appeal of the "*Public Council of the South Coast of the Gulf of Finland" to the Council under the President of the Russian Federation on the development of civil society and human rights"* http://decommission.ru/2018/10/16/yuzh_bereg_finzaliv_seichas/

[15] *RECOMMENDATIONS of the Presidential Council for the Development of Civil Society and Human Rights based on the results of the 28th exit (128th) meeting in the Leningrad Region October 15-19, 2018 http://www.president-sovet.ru/documents/read/656/*

2. The Accounts Chamber of the Russian Federation

- *Check the timeliness and proportionality of the formation of reserves intended to ensure the safety of nuclear plants at all stages of their life cycle, including for decommissioning and development, as provided for by Resolution of the Government of the Russian Federation of January 30, 2002 No. 68.*

3. Rostekhnadzor

- *Check the implementation of the Safety Rules for decommissioning of a nuclear power unit (NP-012-16), approved by order of Rostekhnadzor dated January 10, 2017 No. 5, regarding the development of a program for decommissioning of Leningrad NPP units: no later than 5 years before the expiration the design life of a nuclear power unit or within 2 years after the entry into force of the Rules.*

4. The Government of the Leningrad Region together with the Administration of St. Petersburg

- *Consider the creation of an inter-regional environmental laboratory in the metropolitan area of St. Petersburg and the Leningrad Region to conduct integrated environmental monitoring of land and marine ecosystems on the southern coast of the Gulf of Finland.*

5. The Legislative Assembly of the Leningrad Region

- *Together with the expert community, analyze the decision-making practice on the location and safety assessment of radiation hazardous facilities in the Leningrad Region, and based on it develop and adopt the regional law "On Radiation Safety of the Leningrad Region", which would ensure wider public involvement in decision-making on these facilities.*

6. Rosenergoatom Concern OJSC, directorate of Leningrad NPP:

- *Timely provide complete and objective information at the request of citizens and public organizations;*
- *Ensure the participation of interested persons and public organizations in decision-making on commissioning, extension of terms, decommissioning, and public control of the activities of nuclear facilities.*

Conclusions

According to the operator of Leningrad NPP (letter from the director of Leningrad NPP), the current plans for decommissioning comply with the requirements of Russian law and regulatory requirements of the regulator.

At the same time, the interested public, as well as the "*Council under the President of the Russian Federation for the Development of Civil Society and Human Rights*", proposes a number of measures that will improve the safety and socio-environmental acceptability of decommissioning plans for LNPP in the long term.

It is necessary to continue consultations with the LNPP operator in 2020, as well as initiate discussions, round tables with the participation of representatives of the Rosenergoatom Concern, authorities of various levels and the public.

4.Background on radioactive waste and spent nuclear fuel in Russia 2019

Andrey Talevlin (Russian Social-Ecological Union/ Friends of the Earth Russia)
and Kjersti Album (Naturvernforbundet/ Friends of the Earth Norway)

Introduction

In this article, background information is given about amounts and handling of radioactive waste and spent nuclear fuel. The aim is to provide an understandable basis for the challenges in handling of the waste.

Radioactive waste and spent nuclear fuel will be treated in separate chapters, as in Russia spent nuclear fuel is not considered waste, but instead a resource. The Russian strategy to reprocess spent nuclear fuel, is criticized by environmentalists.

More information can be found in our previous reports, all to be found at
http://naturvernforbundet.no/decommissioning-reports

1. Situation on radioactive waste

1.1 Amounts and annual build up

In Russia, the volume of accumulated radioactive waste as of 31.12.2018 amounts to about 565 million cubic meters - excluding the amount from spent nuclear fuel.
(Source: RW and SNF management report, page 5).

In 2018, it was added 1 550 000 cubic metres ($1{,}55 \times 10^6$).
(Source: Public annual report of Rosatom for 2018, page 154).

Also, there are radioactive waste from non-nuclear industries.

Currently the main source of formation and accumulation of new radioactive waste is nuclear fuel cycle facilities.

The annual radioactive waste accumulation in Russia is about 1.2 million m^3 of solid RW and 1.7 million m^3 of liquid RW *(RW and SNF report, page 5).*

We also need to consider the radioactive waste from decommissioning. It will be huge amounts of all classes of radioactive waste.

Solid radioactive waste: The total amount of solid radioactive waste in Russia is 90,4 million tons *(RW and SNF report, page 6).* We don't have new data in the Rosatom's 2018 report.

Annual build-up: According to information provided in our report *(RW and SNF report, page 5)* annual build-up of solid radioactive waste is 1,2 million cubic metres. We don't know if this changed.

Please note that this number is given in tons, whereas the annual build-up is given in cubic meters.

Liquid radioactive waste: The amount of liquid radioactive waste in Russia is about 500 million m^3. Also here it is no new data, in the Rosatom annual report.

Annual build-up of liquid radioactive waste is 1.9 million cubic metres, according to page 5 of our report. We don't know if this changed.

Table 1:
The annual build-up **of solid radioactive waste** is presented in the table

Waste sources (thous. cubic meters) *(from our RW and SNF report, page 5):*				
MCP (mining and chemical plant)	Mayak	NPP	Uranium production	**Total**
2,25	4,5	7,1	1 243	**1 256,85**

Table 2:
The annual build-up **of liquid radioactive waste** is presented in the table

Waste sources (thous. cubic meters): *(numbers from RW and SNF report, page 5-6)*				
Mining and chemical plant (MCP), Sibirian Chemical plant (SCP) and State research center "Research Institute of Atomic Reactors"	Mayak	NPP	Uranium production (mining), research insitute of nuclear weapons, TVEL plants	**Total**
400+480+52= 932	600	4	164	**1 700**
Practically all is dumped underground into natural stone formations not specifically designed for storage	Small portion vitrified, rest is discharged into reservoirs			

1.2 Classification rules

In accordance with the classification approved in the Russian Federation *(Government Decree of October 19, 2012 No 1069),* all radioactive waste apart from their physical state and other threat criteria are divided into six classes. This classification can be used only for disposable radioactive waste *(RW and SNF report, page 7).*

The first class radioactive waste (the most dangerous) include solid and solidified highly active waste that must be buried in deep underground storage facilities with prior holdup to reduce their heat release.
The second class radioactive waste includes high-level and medium-level long-lived RW (with half-life time of over 31 years) that must be buried without prior holdup to allow decay in deep underground storage facilities.
The third class includes solid and solidified medium-level and low-level long-lived RW that must be buried in near-surface RW disposal sites at the depth up to 100 meters.
The fourth class includes solid and solidified low-level RW that must be buried in near-surface disposal sites at the ground level.
The fifth class includes medium-level and low-level liquid RW that must be buried in deep underground storage facilities.

The sixth class includes RW generated during production and processing of uranium ore and other activities without use of nuclear power related to extraction and processing of mineral and organic raw materials with high concentration of natural radionuclides that must be buried in near-surface disposal sites.

It should be noted that in February 2015 the Government Decree of October 19, 2012 No 1069 was amended and certain RW were transferred from the second class to the third (for example, radioactive waste with Cesium-137).

Probably the main reason was saving of disposal costs. Disposal costs for second class RW are five times lower in comparison with the third class.

1.3 Current storage and handling

The waste is located in 44 regions of Russia at 120 enterprises with 830 storage sites of that radioactive waste, all numbers according to Rosatom *(RW and SNF management report, page 5).*

The Radon facilities

In the Radon facilities there are low and medium waste, classes 2, 3 and 4.

Radon started 50 years ago, under the communal ministry, not nuclear. In the beginning, they received waste from medical services, later also from nuclear industry.

In the beginning the Radon facilities were on regional level. Now they are on national level, which makes conflict. As we could see in Sosnovy Bor: regional representatives against federal representatives, since the waste from Kursk was to be transported to Sosnovy Bor.

Radon became RosRao in 2008, and the responsibility for all the waste that have been accumulated during 60 years, was given to RosRao.

RosRao, or the Federal State Unitary Enterprise «Radioactive Waste Management Enterprise «RosRAO» is a specialized company that arranges radioactive waste (RW) management all over the Russian Federation. RosRao has 15 departments, which are facilities for preparation and storage of radioactive waste.

In 2011, NoRao, or the Federal State Unitary Enterprise “National operator for radioactive waste management”, was established in addition to RosRao. It deals with radioactive waste disposal and has six departments: Zhelesnogorsk, Seversk, Mayak, Novouralsk (where they have the first repository), Olyanovsk (where they store liquid waste underground) and Moscow (headquarters).
Both RosRao and NoRao sort under Rosatom and they have a common head.

Please note that RosRao also took responsibility for the communal waste. Their activity will be 80% industrial and communal waste, and only 20% radioactive.

The waste that is now in the Radon facilities will be placed in new repositories (please see map below).

Storage in Krasnoyarsk

There is no place for long-term storage or disposal for the second class radioactive waste. Rosatom plans to store it in Krasnoyarsk. So only 3rd and 4th class are planned to be moved to the new repositories. For instance, strontium.

Our opinion is that classes 2, 3 and 4 should remain at the RosRao facilities (previously Radon facilities).

1.4 Plans for new facilities

Rosatom has a plan to move the radioactive waste from the current Radon facilities, into new disposal facilities. So far, only one has been build.

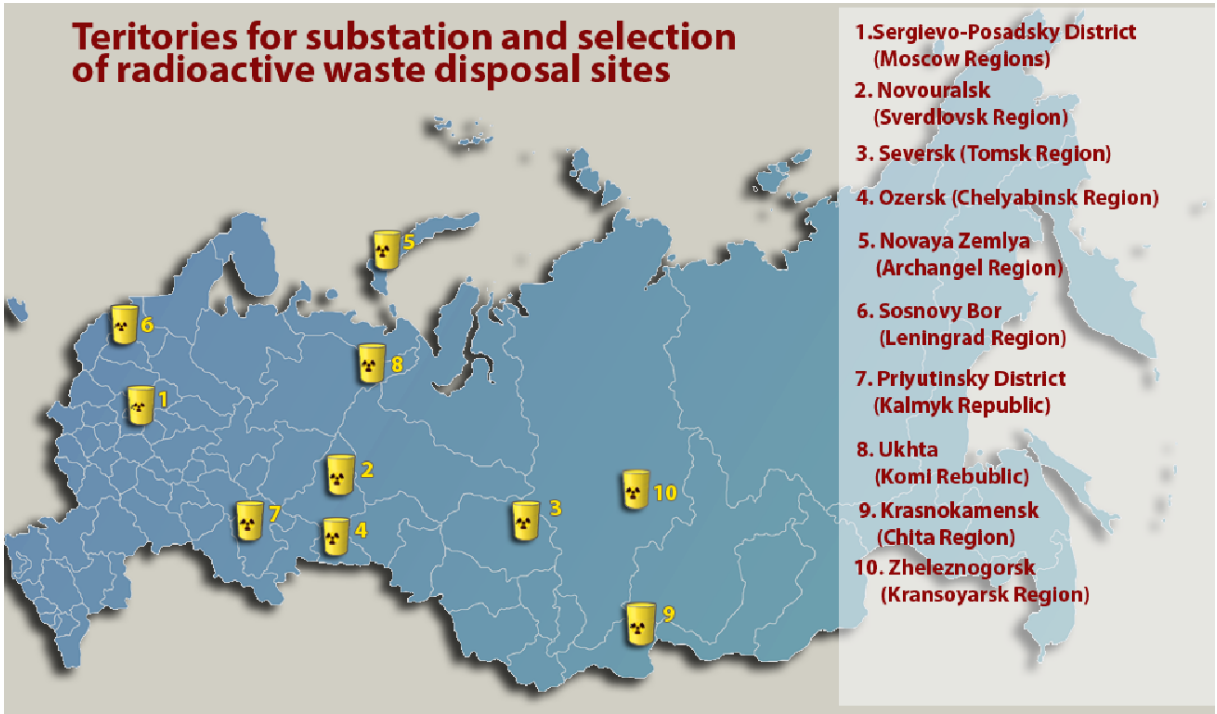
In Novouralsk (number 2 in the map), the first Russian waste disposal facility was commissioned in 2018. Thus, a new model for radioactive waste management began to work.

But during 2019, the plans have been increased in size compared to the original plans. The work to largen the repository started in 2019.

In Zelesnogorsk (number 10), the construction also started in 2018, but is not ready yet.

In Ozursk (4) and Seversk (3) the construction of repositories started in 2019.

In the other sites there are no construction yet, but different locations are discussed.



10 priority sites for RWDFs based on Rosatom's order of 11.04.2013. Page 8 of "Radioactive Waste and Spent Nuclear Fuel Management in Russia. View of Non-Government Organizations. 2017".

2. Situation on spent nuclear fuel

2.1 Amounts and annual build-up

To date, about 23 000 tons of spent nuclear fuel (SNF) has been accumulated in Russia. *(RW and SNF report, page 14).*

Annual build-up of spent nuclear fuel is normally 650 tons.
(RW and SNF report, page 14)

In Rosatom's annual report for 2018, the number of spent nuclear fuel increased more than usual: As much as 943,84 tons of spent nuclear fuel was added in 2018. *(Rosatom's annual report 2018, page 154-155).* Maybe the 2018 numbers include foreign spent nuclear fuel, this does not say.

Only 35 tons were reprocessed in 2018. We don't know why less is reprocessed, but it could be because some technical problems at Mayak.

Significant amounts of spent nuclear fuel from abroad is added to Russia's amount every year. How much is secret information. But we know from which countries it came from in 2017; namely Bulgaria and Ukraine. For 2018 there is no information *(Rosatom's annual report, page 143).*

2.2 Current storage and handling

The biggest part of spent nuclear fuel is stored in spent fuel storage pools at nuclear power plants, in Mayak storage and in wet and dry storages in MCP in Zhelesnogorsk.

After cooling at the nuclear power plant sites, spent nuclear fuel is transported to Ozersk or Zhelesnogorsk for reprocessing (Mayak) and temporary storing (Zhelesnogorsk). However now a reprocessing plant is being built in Zhelesnogorsk. Where the spent nuclear fuel is sent, depends of the type.

Mayak can now reprocess all types of spent nuclear fuel. However, reprocessing RBMK 1000 fuel has shown problematic, as something was broken. This seems to be a constant problem.

In 2019, Mayak announced its intention to build an additional spent nuclear fuel reprocessing line for fuel from BN-600 and BN-800 reactors.

The reprocessing plant RT-2 in Zhelesnogorsk is not ready. Still, spent nuclear fuel is sent to Krasnoyarsk.

In Rosatom's annual report for 2017 and 2018, there is information how many fuel elements goes where:

In 2017: *(Rosatom's annual report 2017, page 143)*

- 6 912 fuel rods RBMK 1000 to Zhelesnogorsk
- 317 fuel rods VVER 1000 to Zhelesnogorsk
- 41 fuel rods VVER 1000 to Mayak, and all this was reprocessed in 2017

- 378 VVER-440 fuel rods to Mayak , no information about reprocessing or storage
- 267 breeder reactor fuel rods from Beloyarsk nuclear power plant to Mayak

In 2018 *(Rosatom's annual report 2018, page 155)*

- 5 760 fuel rods RBMK 1000 to Zhelesnogorsk
- 228 VVER 1000 fuel rods to Zhelesnogorsk
- 306 RBMK 1000 fuel rods to Mayak (a large difference from 2017)
- 432 VVER 440 fuel rods to Mayak
- 257 fuel rods from breeder reactor to Mayak

51 VVER 1000 to Mayak.

SNF from VVER-440 reactors

Spent nuclear fuel from VVER-440, as well as nuclear submarines, research reactors etc, is sent to Mayak. The reprocessing at Mayak generates 600 000 tons of radioactive waste every year, of which most of goes into the surrounding water system.

Spent nuclear fuel of the Kola NPP is stored in pools for 3-5 years at the NPP itself. This spent nuclear fuel is then transported to Mayak by rail.

SNF from VVER-1000 reactors

Spent fuel from the VVER-1000 reactors are sent to Zhelesnogorsk for preliminary storage and a small part to Mayak, probably for testing reprocessing. Mayak can reprocess all kinds of spent nuclear fuel, also from VVER-1000 reactors. Small parts of this fuel were reprocessed in 2018. This rest is accumulated in Zelesnogorsk.

The spent fuel is stored in wet and dry storages in Zhelesnogorsk waiting for reprocessing in RT-2. The construction of this reprocessing facility is delayed, it was supposed to be ready in 2018.

SNF from RBMK-1000 reactors

The spent fuel from RBMK-1000 is sent to Zhelesnogosk, but a small fraction of the RBMK spent fuel is sent to Mayak for reprocessing and extraction of Uranium-235 and Plutonium-239. The spent nuclear fuel from the RBMK reactors is stored in a quite new centralized storage in Zhelesnogorsk, awaiting a decision (probably reprocessing).

In 2018, the transporting of spent nuclear fuel from the cooling pools of Leningrad NPP (building 428) to ZATO Zhelesnogorsk, continued.

Also in 2018, spent nuclear fuel that was damaged, was sent to PO Mayak for reprocessing.

The remaining spent nuclear fuel is in a temporary storage inside Sosnovy Bor.

The main facilities for SNF

Mayak facility (Rosatom ownership)

The Mayak facility is situated east of the Urals by the closed city Ozersk, in Chelyabinsk oblast. The facility produces plutonium, from both spent nuclear fuel from nuclear power plants and from nuclear weapons material. Owner of the facility is Rosatom, a state company with responsibility for both civil and military nuclear industry in Russia.

The area around the Mayak facility is amoung the most radioactively contaminated areas in the world. The facility was established after the second world war, for development of soviet nuclear weapons, and not much considerations for humans and environment were taken.

Today, the production is more modern, but the legacy waste has not been cleaned up, and radioactive emissions from the facility continue. In total, there are 54 storages at the facility, with at total volume 406 million cubic metres radioactive waste. *(Mayak report, page 3)*

Spent nuclear fuel is sent to Mayak for reprocessing. Spent fuel from the VVER-reactors at Kola nuclear power plants have always been sent to Mayak. Now that the Mayak facility can reprocess all kinds of spent nuclear fuel, some of the RBMK fuel has been sent to Mayak also, after being stored on site of the nuclear power plant.

How much spent nuclear fuel is sent from the different power plants, remains classified. But we do know that approximately 650 tons is annually produced at Russian nuclear power plants. Only approximately 10% of this is being reprocess, despite of the Russian policy for reprocessing spent nuclear fuel.

From Mayak, each year it is produced 4 500 m3 solid radioactive waste. And each year it is produced approximately 600 000 m^3 liquid radioactive waste, which is 35% of total amount in Russia. *(Mayak report, page 8)*

You may read more about Mayak in our report, available in Russian and Norwegian.

Zhelesnogorsk
Zhelesonogorsk in Krasnoyarsk holds a large facility with testing options, and repositories for both spent nuclear fuel and radioactive waste.

The reprocessing plant RT-2 is being constructed and was supposed to be finished in 2018, but is delayed.

Sources/ read more

Report on RW and SNF: Radioactive Waste and Spent Nuclear Fuel Management in Russia. View of Non-Government Organizations. 2017.

Mayak report (in Norwegian language): Reprosesseringsanlegget Majak. Tilstand og problemer. 2018. Published by Natur og Ungdom and Naturvernforbundet.

All reports are available at https://naturvernforbundet.no/decommissioning-reports/

5.Main trends of modern Russian legislation in the field of nuclear energy use

Andrey Talevlin (Russian Social-Ecological Union/ Friends of the Earth Russia and Public Movement "For Nature")

The article considers changes in the state policy and, as a consequence, the legislation in the field of atomic energy use. A comparative analysis of legislative changes aimed at expanding the import into the territory of Russia of foreign spent nuclear fuel and other nuclear materials (radioactive waste).

For the past 20 years, amendments have been made to the natural resources and environmental legislation, weakening the requirements of environmental protection or expanding the possibilities of uncontrolled nature management.

Since the adoption of the Law of the RSFSR “On Environmental Protection” in 1991, it has been repeatedly amended to reduce the environmental function of the State. The regulatory framework for the protection of the environment in the management of radioactive waste under this Law has also undergone changes of a certain nature.

Clause 4 of Article 48 of the current Federal Law "On Environmental Protection" establishes the possibility of importing into the Russian Federation from foreign countries irradiated fuel assemblies of nuclear reactors for the implementation of temporary technological storage and (or) their processing. The Law establishes that the procedure for the import into the Russian Federation of irradiated fuel assemblies of nuclear reactors is established by the Government of the Russian Federation on the basis of the basic principles of ensuring non-proliferation of nuclear weapons, environmental protection and the economic interests of the Russian Federation, taking into account the priority of the right to return radioactive waste generated after reprocessing to the state of the origin of nuclear materials or ensure their return.

In connection with the adoption of the Federal Law of February 5, 2007 No. 13-FL “On the peculiarities of managing and disposing of the property and shares of organizations operating in the field of the use of atomic energy, and on amending certain Legislative Acts of the Russian Federation”, Article 48 of the Federal Law “On Environmental Protection” has been amended again.

Earlier, paragraph 3 of Article 48 of the aforementioned law prohibited the import into the Russian Federation of both radioactive waste and nuclear materials from foreign countries for the purpose of storage or disposal, as well as flooding, shipment of radioactive waste and nuclear materials for the purpose of disposal into outer space, except cases concerning the import of spent nuclear fuel.

The current version of this law prohibits the import into the Russian Federation of only radioactive waste from foreign countries on the basis of storage agreements, including for the purpose of burial, as well as flooding, shipment for the purpose of disposal into outer space, except for cases of import of spent nuclear fuel.

Thus, first, it has become possible to import any nuclear material from foreign countries into the territory of the Russian Federation, including for the purpose of storing or burying them. Secondly, the literal interpretation of the rule means that foreign radioactive waste may also be imported into the territory of the Russian Federation under any other agreements (e.g., for

processing followed by the disposal of radioactive waste, processed in the Russian Federation), except for storage contracts.

These legislative changes are related to specific legal relations between Russian commercial organizations and their foreign partners. So, in 1996, between the open foreign joint stock company Techsnabexport and the URENCO company, a contract was signed for the supply to Russia of low-enriched uranium (uranium tails) for reprocessing, followed by the abandonment of most of the reprocessing products in the Russian Federation. Under this agreement, low enriched uranium hexafluoride formed at German enterprises in the manufacture of reactor fuel is imported into the territory of Russia. This substance belongs to nuclear materials, as it contains isotopes of fissile elements. After additional enrichment at the enterprises of the Federal Atomic Energy Agency (in the cities of Angarsk and Pervouralsk), up to 90% of the volume of imported substances remains on the territory of these enterprises. The contract was valid until 2009. However, in 2019 it became known that in 2016 a new contract was concluded for the import of low enriched uranium hexafluoride into Russia.

In addition, on October 13, 2018, Presidential Decree No. 585 “On the Approval of the Fundamentals of State Policy in the Field of Nuclear and Radiation Safety of the Russian Federation for the Period until 2025 and the Future Prospect” was adopted. One of the goals of this decree is the development of the foreign economic activity of the Russian Federation in the field of atomic energy use, including an increase in the volume of obligations to provide services to foreign countries in this area, including the reprocessing of spent nuclear fuel.

In connection with the adoption in July 2019 of the Federal Law “On Amendments to the Federal Law On Production and Consumption Wastes ”and the Federal Law“ On the State Atomic Energy Corporation “Rosatom”, in addition to radioactive waste management, Rosatom has the authority to manage waste 1 and 2 hazard classes. In the near future, Rosatom is to create a unified state system for handling such waste. Thus, Rosatom today regulates the basic issues of handling both radioactive waste and hazardous industrial waste.

At the moment, the de-ecologization of natural resources and environment protection legislation is aggravated with changes that are anti-democratic.

Unfortunately, we have to admit that the listed legislative changes are aimed at weakening the influence of civil society on the internal political life in Russia. Public control loses its significance, which negatively affects the state of the environment, allows nature users to uncontrollably exploit Russian natural resources by making decisions bypassing the interests of the Russian population.

6.Features of legal regulation of subsoil use for the disposal of radioactive waste

Andrey Talevlin (Russian Social-Ecological Union/ Friends of the Earth Russia and Public Movement "For Nature")

The article deals with the legal regulation of the injection of radioactive waste into the subsoil, highlights the conflicts of legal norms of natural resource legislation and environmental legislation of Russia.

Currently, various changes and additions are being made to environmental protection and natural resources legislation with enviable constancy. Along with some positive trends (unification, systematization, etc.), regressive moments are observed that weaken environment protection requirements or expand the possibilities of uncontrolled nature resources management.

If we talk about the trends of de-environmentalization of the legislation governing the management of radioactive waste (hereinafter referred to as RW), then, first of all, it is necessary to note some conflicts of the said legislation, which do not allow to optimize the law enforcement process.

In the Russian Federation, there are three landfills for the disposal of liquid radioactive waste into subsoil areas (Ulyanovsk Region, the city of Demitrovgrad, Tomsk Region, the city of Seversk and Krasnoyarsk Territory, the city of Zheleznogorsk).

On the one hand, Russian environmental legislation prohibits the disposal of radioactive waste in the components of the environment, including subsoil. On the other hand, some norms of natural resource legislation and legislation in the field of radioactive waste management allow such activities. For example, clause 2 of Article 51 of the Federal Law “On Environmental Protection” is contrary to the norms of the Federal Law “On Subsoil”. The environmental law contains a categorical ban on the disposal of radioactive waste in the subsoil, but within the meaning of the norms of the Federal Law "On Subsoil", such activity is permitted. The presence of by-laws in this area confirms this thesis.

Article 1 of the Federal Law "On Subsoil" indicates that specific relations associated with the geological exploration and extraction of certain types of mineral raw materials, as well as the disposal of radioactive waste and toxic substances, may be regulated by other federal laws in compliance with the principles and provisions established by this law. Article 9 of the aforementioned law states that the users of the subsoil during the work on the extraction of radioactive raw materials and the disposal of radioactive materials, waste of I - V hazard classes can be legal entities created in accordance with the legislation of the Russian Federation and can have authorized by federal executive authority permits (licenses) for the extraction and use of radioactive substances, for the use of waste I - V classes of danger.

Consequently, one of the types of the right to use subsoil is the burial of radioactive materials. However, if we turn to article 6 of the aforementioned federal law, this article does not provide for the disposal of radioactive waste as a type of subsoil use. Moreover, the list of types of subsoil use is exhaustive.

Clause 1 of Article 10.1 of the Federal Law "On Subsoil" establishes, as one of the grounds for the right to use subsoil areas, the decision of the Government of the Russian Federation adopted for the disposal of radioactive waste of I - V hazard classes in deep horizons that ensure the localization of such waste.

According to article 16 of the law, the procedure for considering applications for the right to use subsoil for the disposal of radioactive and waste I-V hazard classes in deep horizons ensuring the localization of such waste, as well as when establishing the fact of discovering a mineral deposit by a subsurface user who carried out work on geological exploration of subsoil sites, inland sea waters, territorial sea and the continental shelf of the Russian Federation at its own expense, for exploration and production purposes, is established by the Government of the Russian Federation.

In accordance with this provision, the Government of the Russian Federation adopted a resolution of 22 December 2004 No. 827 "On the approval of the Regulation on the consideration of applications for the right to use the subsoil for the disposal of radioactive and Waste I - V classes of danger in deep horizons, ensuring the localization of such wastes" which details the requirements for the subjects of radioactive waste disposal activities, and regulates the list of documents, necessary for the implementation of such activities.

And since July 2011, the Federal Law No. 190-FL “On the Management of Radioactive waste and on Amending Certain Legislative Acts of the Russian Federation” [16]has been in force in the Russian Federation. This law allows the final disposal of long-lived liquid radioactive waste in deep geological formations, i.e. without the necessary isolation from the components of the natural environment (Section 30 of the Law). Moreover, the legislator went even further, recognizing under the point of disposal of special radioactive waste and the point of conservation of such waste a natural object, which is a kind of revolution in the field of environmental law. This concept is not applied in any country in the world. This “regulation” in the context of Russian reality is clearly contrary to the principle of equal environmental safety of present and future generations, therefore, violates the right of everyone to environmental safety. Further, the normative regulation of relations for the injection of radioactive waste into the bowels of the earth was reflected in many by-laws (Decree of the Government of the Russian Federation of October 19, 2012 No. 1069; Order of the Ministry of Natural Resources of Russia of December 11, 2013 No. 586; Order of Rostekhnadzor of Russia of December 22, 2016 year No. 551; Order of Rostekhnadzor of Russia dated June 23, 2017 No. 218; Order of Rostekhnadzor of Russia dated October 10, 2017 No. 418, etc.).

The presence of the above norms allows us to conclude that the right to use subsoil for the disposal of radioactive and other hazardous waste in deep horizons, within the boundaries of a mining allotment, is enshrined in law. Thus, in the current legislation there is a conflict between the norms of the Federal Law “On Environmental Protection” on the one hand and the Federal Laws “On Subsoil”, “On the Treatment of Radioactive Waste and on Amending Certain Legislative Acts of the Russian Federation” on the other.

[16] On the management of radioactive waste and on amendments to certain legislative acts of the Russian Federation: Federal Law of the Russian Federation of July 11, 2011 No. 190-FZ // Russian Newspaper. 2011. July'15.

The existence of these rules allows us to conclude that the law enshrines the right to use the subsoil for the purposes of dumping radioactive and other hazardous waste in deep horizons, within the boundaries of the mountain drain. Thus, in the current legislation there is a conflict between the norms of the Federal Environmental Protection Act on the one hand and the Federal Laws on the Bowels, the Treatment of Radioactive Waste and the amendments to individual legislation of the Russian Federation" on the other.[17]

In addition, the injection of liquid radioactive waste into deep underground horizons may involve the contact of such waste with groundwater, groundwater bodies (groundwater basins, aquifers). Therefore, there are contradictions with the water legislation (for example, the norms of Article 56 of the Water Code of the Russian Federation).

The practice of burial of radioactive waste in the subsoil also contradicts the basic principles enshrined in both the Federal Law “On the Management of Radioactive Waste and Amending and Adding to Some Legal Acts of the Russian Federation” and the main by-law in this area NP-055-14. The disposal of radioactive waste. Principles, criteria and basic safety requirements (approved by Order of Rostekhnadzor of Russia of August 22, 2014 No. 379). So, the indicated above main goal of legal regulation is to ensure reliable isolation of radioactive waste, ensuring the radiation safety of humans and the environment for the entire period of potential hazard of such waste. The principle of multi-barrier is enshrined as guarantees - the long-term safety of RW disposal in the period after the closure of the deep disposal site for liquid RW should be ensured by the use of a system of safety barriers to the spread of ionizing radiation and radioactive substances into the environment; violation of the integrity of one of the safety barriers or a possible external event of natural or man-made origin should not lead to a decrease in the level of long-term safety of the radioactive waste disposal system.

The indicated goals, in the author’s opinion, are the implementation of the principle of absolute isolation of radionuclide from the components of the natural environment during the period of their potential hazard, which is, of course, a positive point (today the principle is taken not to exceed the effective dose for humans and the acceptability of radiological risks).

The problem of liquid radioactive waste management is compounded by the concept of rejection of such waste at the disposal stage in almost all countries. Relevant recommendations are approved by the IAEA.

Summing up the above, firstly, it should be noted the unstable nature of the development of federal legislation in the field of environmental protection and nature management; secondly, today in the Russian Federation there is no systematic approach to solving the problems of radioactive waste management. The absence of such an approach is reflected in the sphere of legal regulation in the studied area: the system of legal norms governing the management of radioactive waste has not been fully formed.

The existing legal regulation of radioactive waste management is subject to de-ecologization trends, it is extremely contradictory and does not reflect the interests of present and future generations of Russian citizens and the environment as a whole.

[17]Water Code of the Russian Federation of June 3, 2006 No. 74-FZ // Sobr. legislation of the Russian Federation. - 2006. - No. 23. - Art. 2381

7.Environmental threats due to the accumulation of spent nuclear fuel and radioactive waste from implementation of intergovernmental agreements

Andrey Talevlin (Russian Social-Ecological Union/ Friends of the Earth Russia and Public Movement "For Nature")

The article analyzes the international agreements of Russia on the construction of nuclear power plants abroad, considers the environmental consequences for Russian citizens in case of their implementation. A comparative analysis of the legally defined terms “radioactive waste”, “spent nuclear fuel”. Issues on changing Russian legislation in order to ensure the right of everyone to radiation safety are examined.

Since the beginning of the atomic era, the scale of the negative consequences of the exploitation of nuclear facilities has increased by several orders of magnitude. The danger of nuclear technologies, as well as the inability to safely dispose of radioactive waste, have become objective and insurmountable factors for some countries in the further development of nuclear energy. Such countries (mainly European, non-nuclear weapons States) are gradually abandoning the use of atomic energy.

Nevertheless, many countries continue to develop or maintain nuclear technologies at a certain level, by building new nuclear power plants. Today it is mainly the countries of the Asian region. Transnational corporations, such as Rosatom, Westinghouse, Atmea, and others, provide and promote the construction of nuclear power plants in various parts of the globe. In the relevant areas of interaction, intergovernmental agreements are concluded.

Rosatom activities at the international level at the moment, in our opinion, are aimed at satisfying purely corporate goals - making a profit. Representatives of this agency do not think about the consequences of their current activities, about the future of Russia, about the health of citizens and about the state of the natural environment. Negotiations that Rosatom is engaged in with foreign partners, in our opinion, do not meet the interests of the country, these negotiations do not take into account the consequences for Russia, which may come as a result of the signing of some of such agreements. [18]

According to official information, Rosatom is increasing the volume of services both for the construction of new nuclear power units abroad, as well as services for the management of spent nuclear fuel and radioactive waste. As of 2018, the state corporation expects to build 36 power units in different countries of the world (some units are already under construction), with a total value of more than $ 130 billion.

The risks posed by activities related to the implementation of intergovernmental agreements in the field of the use of nuclear energy are: the import of spent nuclear fuel (hereinafter referred to as SNF) and its reprocessing, the import of sealed sources of ionizing radiation and other nuclear materials (for example, low enriched uranium hexafluoride) and radioactive substances, the accumulation of radioactive waste (hereinafter RW), which jeopardizes the radiation safety of present and future generations

[18]. Rosatom Public Annual Report for 2018 Стр. 27, 46. URL: https://rosatom.ru/upload/iblock/24a/24a1cc1a92f3609d80fb0a60d7770dfe.pdf

In this article, we will focus only on the problem of accumulation of SNF, since other risks require independent analysis. With regard to the management of spent nuclear fuel, the practice of its reprocessing leads to the formation of more radioactive waste, the treatment of which does not meet the basic environmental requirements. Radioactive waste from reprocessing continues to enter the environment: water bodies, subsoil and atmospheric air. Unfortunately, every year the volume of accumulated SNF is increasing, also due to reprocessing of spent nuclear fuel from abroad. As a result, both the volume of its processing and the volume of generated RW increases. According to the plans of Rosatom, in the near future it is planned to increase the volumes of reprocessed SNF, in connection with which a new plant (RT-2) is being built in the Krasnoyarsk Territory.

Rosatom has already concluded agreements on the import of SNF or framework agreements in this area with such countries as: Hungary, Bulgaria, Czech Republic, Bangladesh, Iran, Egypt, Belarus, Turkey, etc.

In accordance with Russian legislation, radioactive waste generated after reprocessing can be sent to the country of SNF origin. However, until recently, relevant contracts have not been concluded yet, and not a single kilogram of radioactive waste has left the territory of the Russian Federation.

The principle of priority and direct effect of international law is fundamental only for some states (Austria, Germany, Russia, etc.). Thus, if this is not a constitutional principle of any state, then in such a state national legislation takes precedence over international. Therefore, it is impossible to admit the possibility that SNF in these countries is considered, firstly, as radioactive waste, and secondly, the import of radioactive waste into the territory of these countries is prohibited. It can be assumed that if foreign spent nuclear fuel (according to Russian terminology) is brought into Russia, then sending it back, even if it is simply stored, is almost impossible. Let us pass from the field of assumptions to the actual circumstances of the state of the atomic legislation of some countries. The concept of SNF, for example, does not exist for the USA, Sweden, Finland, Spain, in these countries such radioactive materials are called - radioactive waste.

The principle of priority and direct action of international law is fundamental only for some states (Austria, Germany, Russia, etc.). Thus, if it is not the constitutional principle of any state, then in such a state national legislation takes precedence over international legislation. It means that it is not possible that the IED in these countries is considered, firstly, radioactive waste, and secondly, the import of radioactive waste into the territory of these countries is prohibited. It can be assumed that if foreign RESEARCH (according to Russian terminology) will be brought to Russia, it is almost impossible to send it back, even if it is simply stored. Let's move from the scope of assumptions to the actual circumstances of the state of nuclear legislation of some countries. The concept of NUCLEAR, for example, for the United States, Sweden, Finland, Spain does not exist, in these countries such radioactive materials are called - radioactive waste.

If Rosatom of Russia speaks about the import of foreign nuclear equipment, in the countries of exporters such activity is called the disposal of radioactive waste and for these countries the problem of radioactive waste is solved simply - export "for storage" to Russia.

In international law, the term "spent nuclear fuel" is found in many legal documents. Thus, in the Joint Convention on the Safety of Spent Nuclear Fuel Management and the Safety of Radioactive Waste Management (Vienna, 1997), SNF refers to nuclear fuel irradiated in the

reactor core and finally removed from it. The International Convention for the Safety of Life at Sea, 1974, defines a slightly different definition of spent nuclear fuel. In this document, spent nuclear fuel refers to material containing isotopes of uranium, thorium and (or) plutonium, which were used to provide a self-sustaining nuclear chain reaction.

Analyzing international and Russian sources of legislation governing relations in the management of spent nuclear fuel, several conclusions can be drawn. Firstly, the concepts of spent nuclear fuel in many regulations are not identical. On the one hand, spent nuclear fuel belongs to the category of nuclear materials and is one of the types of the latter. Based on other sources, spent nuclear fuel is a form of radioactive waste.

Secondly, unlike many other countries, Russia allows reprocessing of spent nuclear fuel in order to extract various components from it (unburned uranium, plutonium, and other isotopes of various elements). The only facility reprocessing SNF is located in the Chelyabinsk Region - the Mayak Production Association. The technological process of the production capacities of this association includes emissions of radioactive substances and nuclear materials into the air, their burial at special landfills and discharges into water bodies.

Thirdly, Russian legislation allows the import of spent nuclear fuel from abroad into our territory. The rules for handling foreign spent nuclear fuel, as enshrined in Russian legal acts, allow to leave the waste generated by reprocessing in the territory of the Russian Federation or to store foreign spent fuel in the Russian territory for a long time. Such provisions are contained exclusively in Russian legislation, which, in our opinion, is an attractive condition for other states not so much as to import spent nuclear fuel for reprocessing into Russia as to get rid of it forever. In addition, the indicated legal regime for SNF management does not comply with the principle of international law - equal environmental safety for all states.

While concluding international treaties that are characterized by long duration and unpredictable consequences, first of all, it is necessary to proceed from: the principle of universal respect for human rights, the right of everyone to life and health, the right of future generations to dignified existence, the principle of equality of subjects of international law, as well as the interests of Russia.

It is necessary to introduce in the national legislation on the use of nuclear energy rules prohibiting the import into Russia of foreign: spent nuclear fuel, nuclear materials and radioactive substances for storage and/or disposal, and to leave radioactive waste from the processing of these materials and substances in Russia.