Radioactive Waste and Spent Nuclear Fuel Management in Russia

View of Non-Government Organizations

Sosnovy Bor – Murmansk – Chelyabinsk – 2017

Radioactive Waste and Spent Nuclear Fuel Management in Russia: View of Non-Government Organizations

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DECOMMISSION - International Network of NGOs established in 2003 http://decomatom.org.ru
The Network mission: promotion of safe, socially and environmentally acceptable decommissioning of old nuclear power plants' reactors with due regard to the positive world experience and participation of all stakeholders on the ground of democratic principles.

Translated from Russian by Zhanna Shuklina and Nathaniel Trumbull.
Editor Oleg Bodrov.

DECOMMISSION
WITHDRAWAL OF OLD NUCLEAR POWER PLANTS

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Dear reader!

The DECOMMISSION International Network invites representatives of government authorities, the nuclear industry, and the public of Russia to send your comments and suggestions about this report. We hope that, thanks to your participation, that the most optimal technlogical, socio-economically, and environmentally acceptable models of treatment of radioactive waste and spent nuclear fuel can be developed.

Your suggestions may be directed to this email address: decomissiya@gmail.com

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A group of Russian participants on a visit to Olkiluoto nuclear waste repository in Finland

Introduction

One of the areas of state policy in the sphere of radioactive waste and spent nuclear fuel management is the provision of environmental safety for the population.

On the basis of general legal principles, the state policy of Russia on radioactive waste (RW) and spent nuclear fuel (SNF) management, should not contradict the fundamental rights and legitimate interests of its citizens. The right to a favorable environment, ecological and radiation safety, and sustainable use of natural resources belongs both to the current and future generations. These rights are legally important and they must determine the essence of adopted normative acts. For this purpose the state policy of RW and SNF management cannot contradict the national environmental policy.

*Russian and international non-governmental organizations have their own opinion on the problem of RW and SNF disposal outlined in various documents. NGO members of the DECOMMISSION International Network have been analysing the experience of safe disposal of RW and SNF for over ten years.**

*This analysis is based on the official printed state documents and positions of the NGOs – members of the DECOMMISSION International Network.*** .

The authors of this report would like to express their appreciation to Oleg E. Muratov, member of the Public Council of Rosatom, for his valuable observations and comments, many of which were included.

Abbreviations

AMB – water-cooled graphite-moderated channel type reactor;

CATU – Closed Administrative Territorial Unit;

Ci – Curie, a unit of radioactivity.

DUSF – Deep Underground Storage Facility for radioactive waste;

EGP - heterogeneous loop reactor;

FSUE Mayak – Federal State Unitary Enterprise "Mayak" (Rosatom enterprise);

LLRW – Low-Level Radioactive Waste;

LRW – Liquid Radioactive Waste;

MCP – Mining and Chemical Plant in CATU Zhelenogorsk, Krasnoyarsk Territory (Rosatom facility);

NFC– Nuclear Fuel Cycle;

NO RAO – National Operator on Radioactive Waste Management;

PDF – Pilot Demonstration Facility;

RBMK – Reaktor Bolshoy Moshchnosti Kanalny, (High Power Channel-type Reactor), graphite-moderated nuclear power reactor;

RSC – Radiation Safety Criteria;

RTG - Radioactive Thermoelectric Generators;

RW – Radioactive Waste;

RW Law – Federal Law No 190-FZ "On Radioactive Waste management and on amendments to a number of normative acts of the Russian Federation" of 11. 07.2011;

RWDF – Radioactive Waste Disposal Facility;

SCP – Siberian Chemical Plant JSC (Rosatom state corporation facility);

SFR – Sodium Fast Reactor;

SNF – spent nuclear fuel;

TWS – Techa River Multi-reservoir system;

URL – Underground Research Laboratory;

VVER – Water-Water Energy Reactor (pressurized water reactor).

*Concept of DECOMMISSION, see http:// greenworld.org.ru/sites/default/greenfiles/conception_ rus_1610.pdf

** http://decomatom.org

Section1. Handling radioactive waste

Current problems of radioactive waste management in the Russian Federation

In Russia, the volume of accumulated radioactive waste as of 31.12.2015 amounts to 5.58 x 108 m3 with a total of 8.9 x 1019 Bq* (excluding the amount from used nuclear fuel), which are located in 44 regions of Russia at 120 enterprises with 830 storage sites of that radioactive waste**, all numbers according to Rosatom. These sites represent a great potential danger, and handling of waste management at these facilities is associated with significant safety issues of regional and global scale.

The Russian Federation bears high costs for supporting acceptable safety levels of the existing RW depositories. These costs are mainly covered from budget funds. Among the most important examples of environmental problems related to RW handling, the following should be noted:

Table 1. Annual build-up of solid radioactive waste (thous. cubic meters) Waste sources *

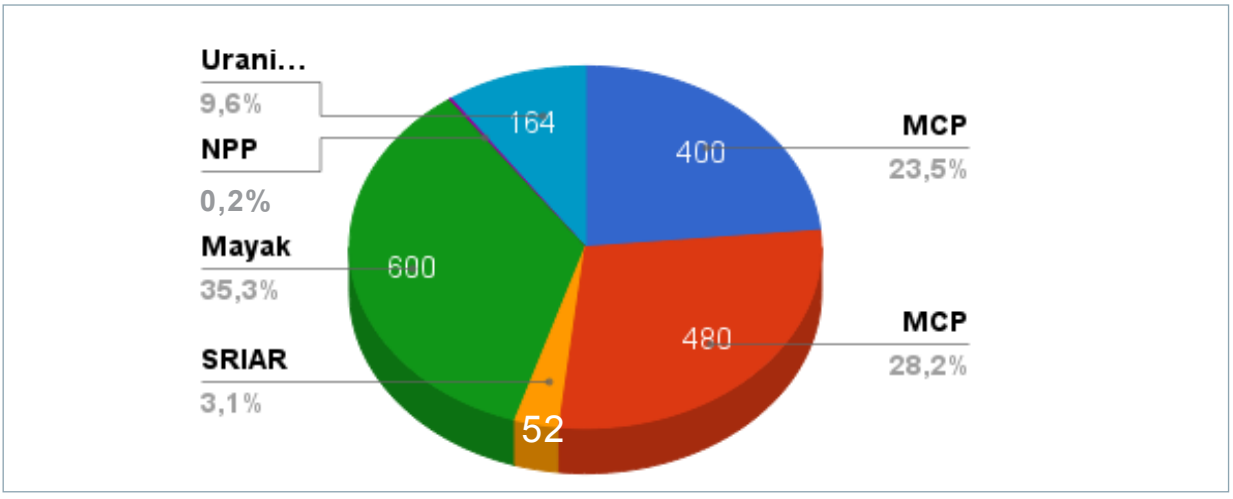
Waste sources			
MCP	Mayak	NPP	Uranium production
2,25	4,5	7,1	1243

- open surface water basins – depositories of liquid RW, including the Lake of Staroye Boloto and the Techa multi-reservoir system (Mayak plant);
- underground liquid RW storage sites (Mining and Chemical Plant, Sibirsky Chemical Plant, State Research Center "Research Institute of Atomic Reactors", and the radioactive 'lens' over the Lake of Karachay (Mayak plant);
- surface reinforced concrete reservoirs for highly radioactive liquid waste;
- near-surface solid RW storage facilities built without compliance with modern safety requirements.

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

Since the Federal Law No 190-FZ "On radioactive waste management and on amendments to a number of normative acts of the Russian Federation" (hereinafter RW Law, July 2011) came into force, the annual RW accumulation in Russia is about 1.2 mln.

Figure 1. Annual build-up of liquid radioactive waste (thous. cubic meters) **



** Publichnyi godovoi otchet GK Rosatom za 2015 g. (Public annual report of the state corporation Rosatom for 2015), see http://www.rosatom.ru/upload/iblock/e21/e21ced22b2cc8d7fed8d83cadab6d0b8.pdf*

*** Chetvertyi natsional'nyi doklad Rossiiskoi Federatsii o vypolnenii obiazatel'stv, vytekaiushchikh iz ob'edinennoi konventsii o bezopasnosti obrashcheniia s otrabotavkhim toplivom i o bezopasnosti obrashcheniia s radioaktivnykhi otkhodami (Fourth national report of the Russian Federation on implementation of those responsibilities of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management), see http://www.rosatom.ru/upload/iblock/6a1/6a10d74afc8b64b31f1c0dae05525ab8.pdf*

m^3 of solid RW and 1.7 mln. m^3 of liquid RW*.

The biggest amount of liquid RW is generated at the Mayak plant, about 600 thous. m3 per year. A small portion of Mayak highly radioactive liquid waste is vitrified, the rest is discharged into storage reservoirs V-9 (Karachay), V-17 (Staroye Boloto) and the Techa system consisting of water basins V-3, V-4, V-10, and V-11.

The Mining and Chemical Plant (MCP), the Siberian Chemical Plant (SCP) and the State Research Center "Research Institute of Atomic Reactors" generate about 932 thous. m3 of liquid radioactive waste (400 thous. m^3, 480 thous. m^3 and 52 thous. m^3 respectively), practically all of it is dumped into the underground collecting formations.

Nuclear power plants generate about 4 thous. m3 per year. The remaining liquid radioactive waste (about 164 thous. m^3) is generated by uranium mining plants (JSC "Atomredmetzoloto"), research institutes of the nuclear weapons complex (All-Russian Research Institute for Experimental Physics, Institute of Physics and Power Engineering) and TVEL JSC plants (Machine Building Plant in Electrostal).

A separate problem is DECOMMISSION of radioactive thermoelectric generators (RTG). Their storage sites are not guarded or protected; there were cases of their unauthorized opening (town of Kandalaksha, 2001). In view of their high beta-activity (initial level of about 500 kCi), unauthorized access can lead to drastic consequences. There were cases of RTG losses, in particular ones with lighter bio-shield. Taking into consideration the high-beta activity of these devices (Primary - 500 CCTs), access by unauthorized persons can lead to serious consequences. There were cases of loss of the RTG, in particular with a lightweight biological protection. In Kamchatka the use of Rowan 12 RTGs continues. *

A big volume of RW is generated in non-nuclear industries. In particular, that RW come from chemical water treatment systems of thermal stations, oil slime in petroleum industry, etc. Currently there are large volumes of low-level radioactive scrap metal from out of service petrochemical equipment.

Altogether in Russia there is about 500 mln. m^3 of liquid RW. The amount of sold RW is 90.4 mln. tonnes, and the total activity is 8.9×10^{19} Bq*.

Temporary storage of RW is organized in special facilities of the Federal Unitary Enterprise "Radioactive Waste Management "RosRAO" (former system of the Specialized Integrated Plants "Radon") and storage sites at nuclear power plants, nuclear fuel cycle plants, etc..

The Russian government has adopted a "Targeted program 'Processing and recycling of metal radioactive waste" for the processing of 600,000 tons of metal radioactive waste (MRAO) accumulated in Russia. By 2002, the main operation ("Ekomet-S") of the program had built only one of the 20 planned plants in Russia. This plant in the Leningrad nuclear power plant processed more than 25 thousand tonnes of MRAO from different regions of Russia. In effect, this plant "Ekomet-S" has become part of the national infrastructure and management of radioactive waste. At the same time all the burdens of the processing in the form of secondary waste remains on the Baltic coast and in need of long-term isolation.

Filling of the Lake of Karachay, storage of medium-level radioactive waste (Mayak plant, closed administrative-territorial unit of Ozersk, Chelyabinsk region)

** Publichnyi godovoi otchet GK Rosatom za 2015 g. (Public annual report of the state corporation Rosatom for 2015), see http://www.rosatom.ru/upload/iblock/e21/e21ced22b2cc8d7fed8d83cadab6d0b8.pdfru/upload/files/ru/ROSATOM_Annual_Report_2015.pdf#215*

*** Chetvertyi natsional'nyi doklad Rossiiskoi Federatsii o vypolnenii obiazatel'stv, vytekaiushchikh iz ob'edinennoi konventsii o bezopasnosti obrashcheniia s otrabotavkhim toplivom i o bezopasnosti obrashcheniia s radioaktivnykhi otkhodami (Fourth national report of the Russian Federation on implementation of those responsibilities of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management), see http://www.rosatom.ru/upload/iblock/6a1/6a10d74afc8b64b31f1c0dae05525ab8.pdf*

Radioactive Scrap Metal Accumulation in the Baltic Sea Region (JSC Ecomet-S)

Reprocessing plant ECOMET-S, Sosnovy Bor, Leningrad region

Radioactive Scrap Metal (RSM) Producer

Name of the Company	Distance from RSM producer to reprocessing plant (km)	Amount of transported RSM (tones)
FGUP SevRAO, Murmansk Region	1300	40.6
Kola NPP, Poliarnyje Zori, Murmansk Region	1100	900
Kalinin NPP, Udomlya, Tver' Region	460	600
Smolensk NPP, Desnogorsk, Smolensk Region	1000	2200
Chepetsk Mechanical Plant, Glazov, Udmurtia Region	2100	215.2
Balakovo NPP, Balakovo, Saratov Region	1700	3000
Leningrad NPP, Sosnovy Bor, Leningrad Region	3	10879
Russian Research Centre KURCHATOV Institute, Moscow	710	205.7
Elemash, Electrostal', Moscow Region	770	15.0
Kursk NPP, Kurchatov, Kursk Region	1300	2955
Kaliningradmorneft' (oil company), Kaliningrad region	1000	7.0
Rosneft Stavropol'neftegaz NK (oil company), Stavropol' Region	2200	19,4
Total		21035

The planned location of one of the first Russian radioactive waste disposal facilitiess (RWDF) next to the plant JSC Ekomet-S may be the final link in the national infrastructure structure for disposal of radioactive waste from various regions of Russia.

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 RW.

The first class RW (the most dangerous) include solid and solidified highly active waste that must be buried in deep underground storage facilities (DUSFs) with prior holdup to reduce their heat release.

The second class RW 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 DUSFs.

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 DUSFs.

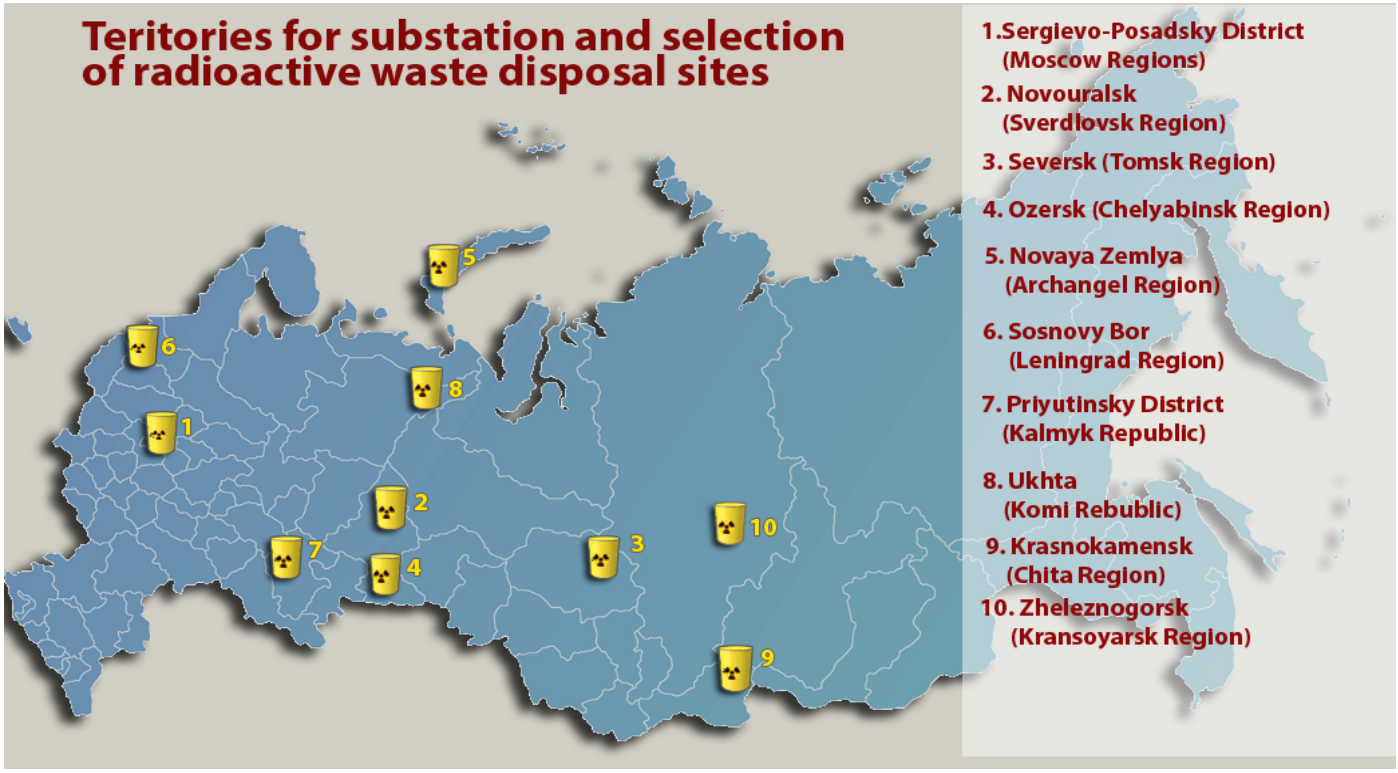
The sixth class includes RW generated during production and processing of uranium ore and other activities without use of nuclear power related to extraction and processing of mineral and organic raw materials with high concentration of natural radionuclides that must be buried in near-surface disposal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

Rosatom plans for creation of radioactive waste disposal facilities (RWDFs)

Rosatom issued Order No 1/382-P of 11.04.2013 where they name potential areas for further justification and selection of RW disposal sites in the Russian Federation. These sites were identified in 18 regions of the country. For each site preliminary design works are required in order to have a comprehensive comparative assessment of the sites, including opinions of the population and regional administrations about the creation of NW disposal sites on their territories.

Rosatom developed the rule of "three conditions" for selection of RW disposal sites. Such places are selected on the basis of the following criteria: cost-effectiveness, close proximity to places of generation



10 priority sites for RWDFs

and accumulation of RW, and appropriate geological characteristics of the site.

Among thirty of the selected sites 10 are priority ones where a lot of RW has been accumulated (see map).

Moscow Region (Sergievo-Posad District), Sverdlovsk Region (Novouralsk),

Tomsk Region (Seversk), Chelyabinsk Region (Ozersk), Archangel Region (Novaya Zemlya), Leningrad Region (Sosnovy Bor), Republic of Kalmykia (Priyutnensky District), Republic of Komi (Ukhta), Chita Region (Krasnokamensk), Krasnoyarsk Krai (Zhelenogorsk). A RWDF was built only in the town of Novouralsk, Sverlovsk Region; other sites may be revised. Therefore the location of future RWDFs may change on the basis of survey works.

Examples of sites for RWDF

Novouralsk (Sverdlovsk Region). This radioactive waste disposal facility (RWDF) is in fact at the Uralsky Electrochemical Works. There are big amounts of waste that they plan to qualify as 'special', i.e. unrecoverable and buried on-site.

It is also planned to create a new RWDF of a near-surface type. The biggest part of works for this site was done by the plant itself. Currently they are discussing transfer of this RW disposal facility to the National Operator RAO.

The capacity of the new RWDF is 10 thous m^3.

Sergievo-Posadsky District (Moscow Region). It is planned to create a RWDF at the premises of Moscow Research and Development Center "Radon". Currently there are plans to transfer the disposal facility to the National Operator RAO. This enterprise is well equipped; it has substantial research and production possibilities for class 3 and class 4 radioactive waste disposal and all modern methods of RW handling: from collection and transportation to conditioning

Radon in Sergievo-Posadsky district, Moscow Region

and storing, including monitoring of technical processes and environment.

Ukhta (Republic of Komi). It is planned to build a RWDF for disposal of radioactive waste from the enrichment "Progress" Plant producing radium. The land allocation certificate is available, but there is no full package of design documentation. National Operator RAO plans to build a RWDF with 240 thous. m^3 capacity.

Sosnovy Bor (Leningrad Region). Since 2013 NO RAO has been promoting a project of the national site for permanent disposal of low-level and medium-level RW in the North-West of Russia. They plan to build a semi-buried near-surface disposal facility for LLRW and MLRW. A forecasted amount of conditioned RW is 200 - 250 thous. m3. In Krasnoyarsk Krai (Siberia) they have been discussing a project of a big RWDF for highly active long-lived RW since 2008. The ultimate goal is creation of a deep RWDF. Currently they are applying for a license for construction and operation of a deep underground RWDF and in July 2015 a public hearing was held.

The project also received a state environmental appraisal. A compulsory initial stage of establishing underground RW disposal facilities is creation of an underground research laboratory (URL) for justification of safe RW disposal (IAEA recommendation). After a stage of URL operation, changes may be introduced into the project, for example, the hazard class of RW might change. Options for the underground RWDF:

Expected option – 4.5 thous. m^3 of first class RW; 155 thous. m^3 of second class RW.

Less expected option – lower amounts of class 1 and class 2.

Least expected option – underground RWDF for class 3 RW.

This is the only planned underground RWDF for high-level RW of class 1 and class 2 generated in the whole territory of the Russian Federation.

Radioactive waste problems related to foreign spent fuel reprocessing

A separate legal problem is waste generated in the process of reprocessing foreign spent nuclear fuel (SNF). In accordance with the current Russian laws and international agreements, RW generated in the course of foreign SNF reprocessing must be returned to the country of origin of the nuclear materials. However, even now there is a big amount of such RW, for instance, at the Mayak plant, and not a single kilogram of RW was sent back to the countries-producers of SNF. Moreover, during reprocessing of foreign SNF a lot of RW is disposed into the environment (the Lake of Karachay, Staroye Boloto, TWS). Rosatom plans include transportation of class 1 and class 2 RW from the Mayak storage facilities to the underground RWDF in Krasnoyarsk Krai for ultimate disposal. As a result these plans do not comply with the current Russian laws.

Problems of radioactive waste transportation

Another problem is transportation of RW from one region to another. In accordance with the RW Law a unified state system of radioactive waste management is established in Russia. On the basis of principles for this system creation (provided in the Law) any RW generated in the Russian Federation can be transported to any temporary RW storage or RWDF.

The transportation process is controlled exclusively by the National Operator RAO. Article 21 of the RW Law specifies a responsibility of the organization, supplier of RW, using their own resources or with the assistance of specialized organizations to transport RW to the disposal site given by the National Operator RAO and transfer the RW together with their passports to the National Operator under a handover protocol.

In such a way RW may be transported from one region to another and there is no regulated public control over such transportation.

In addition to this the RF Government Decree No 1491-p of 14.10.2003 specifies a list of sea ports for transportation (arrival and departure of ships and water crafts) of nuclear materials or radioactive substances and products containing them (see map).

List of ports for receiving RW approved by the RF Government Decree No 1491-p of October 14, 2003

Proposals of Rosatom for safe handling of radioactive waste

On the 15th of July 2011 Federal Law No 190-FZ "On radioactive waste management and on amendments to a number of normative acts of the Russian Federation" was adopted. This comprehensive act forms the legal ground for regulation of RW management.

Using the norms of this law Rosatom took a decision on ultimate disposal of practically all RW. For these purposes a unified state system for radioactive waste management was created. Under the aegis of Rosatom the national operator for radioactive waste handling is established (NO RAO).

At the same time, in line with the RW Law, it is allowed to carry out ultimate disposal of long-lived liquid RW underground, i.e. in deep geological formations without necessary isolation from the environment (Article 30). The regulator went even further by acknowledging a natural site as a disposal site for special RW and a site for conservation of such RW, which is a revolution in the area of environmental law, since natural sites cannot be nuclear facilities.

In addition to this Article 31 of the RW Law stipulates disposal of foreign SNF in Russia in the form of different sources of ionizing radiation (class 2 RW), which is not a guarantee of the right to radiation safety for the present and future generations. The procedure for receiving and disposal of such RW is regulated by law. Government Decree No 1186 of 19.11.2012 regulates the mechanism of transportation of spent sealed sources of ionizing radiation into the Russian Federation.

It is planned to collect payments for RW disposal in the assigned disposal sites from plants generating RW. The Russian Government determined the rates for RW disposal (Decree of the Ministry of Natural Resources No 89 of March 13, 2013).

To date there is no scientifically justified, safe and acceptable way of RW disposal.

The problem is worsened by growing amounts of RW every year. Unfortunately, the Russian regulator allowed disposal of RW in the natural environment

Site for future underground research laboratory

without isolation by acknowledging a natural site as a disposal site for special RW and a site for conservation of such RW.

This concept is used in no other country of the world. Such 'regulation' in the Russian context obviously contradicts the principle of equal environmental safety for the present and future generations.

Consideration of public opinion in the process of selecting sites for RWDF is limited to public hearings without clarification of principal positions of the participants "for" or "against". The RW Law lacks norms for regulating a possibility and mechanisms for real public participation.

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DECOMMISSION Network position

The DECOMMISSION International Network believe that the principle of ultimate disposal of radioactive waste must be reconsidered toward long-term controlled storage of RW.

First, under this approach it is easier to monitor the condition of RW. Second, if scientifically based and safe ways of RW disposal are developed, it will be possible to handle RW in line with the new technology. Third, controlled storage is safer judging from a possibility to access RW and quickly eliminate negative consequences in case of unexpected accidents and extraordinary situations of natural or manmade causes.

The requirement of safe RW management and democratic principles of decision-making are inseparable in a rule-of-law state.

The policy of RW management, including location of RWDFs, must consider not only safety requirements for RW disposal, but also principles of sustainable development of regions, fairness, acceptability and equal environmental safety.

Citizens of Russia living in the area of long-term isolation of radioactive waste in accordance with the Constitution must be able to take a final decision whether it is acceptable to place such facilities there.

Approval of a RWDF location by residents and public interest groups is a factor of assurance of project safety and its social acceptance.

The population living in the area and future generations will have to be in contact with harmful impact of ionizing radiation on their health.

The mandate of the RF regions in the sphere of natural resources management and environment protection allows development of a regional regulatory framework that can and must take into account and

revise deficiencies of the federal normative acts.

For instance, the question of approving locations for nuclear and radiation hazardous facilities within the Declaration of Intention procedure should be clearly regulated in the regional legislation. Currently the procedure for taking and approving decisions by a constituent entity of the Russian Federation is adopted in the Leningrad and Tomsk regions. In the latter there is a special regional law issued on the 17th of November 2014.

Within this procedure regional legislators are entitled to ensure participation of population in decision-taking. In the course of implementation of this procedure the Government of Russia will inevitably provide all necessary guarantees of environmental safety of a facility for RW storage or disposal. And for the purposes of having a positive decision the federal structures will have to 'interest' the region and plan social and economic development of the area in question for many decades ahead. And herein lies the principle of sustainable regional development. And this approach is really socially responsible and fair, it takes into account interests of the population of a certain region.

A group of Russian participants on a study trip to the underground RWDF in Sweden

Within this framework it is necessary to expand both regional and federal legislation with a describing ensuring the participation of every citizen in making decisions on the RW management.

Regional legislation should contain norms of public control on nuclear and radiation safety when handling RW. For example, in a corresponding normative act there should be a provision for an Oversight Council in the structure of regional government bodies and its formation with active participation of general public and local authorities.

It is advisable that the final decision on the location of RD or SNF storage or disposal site is made by a representative agency of State power in the region, this will ensure an extensive discussion of such decisions.

Secured by law right of local self-governing bodies (municipalities) to veto decisions on building nuclear (radiation)-hazardous facilities in their territory can become a guarantee of full participation of the population in decision-taking and consideration of regional interests.

With regard to the above the following principles should be followed:

1. Priority of protection of human life and health, present and future generations, and environment from negative impact of radioactive waste.

Political or economic factors, as well as interests of nuclear industry or corporations cannot prevail over environmental safety and health of the population.

2. Appropriateness of geological characteristics to eliminate the possibility of radionuclides penetrating the environment.

Because of the extreme danger of radioactive substances and nuclear materials, selection of sites for

RWDF must guarantee that radionuclides will not penetrate the natural environment through the storage barriers.

3. Elimination of ultimate RW disposal practice and introduction of the principle of permanent controlled RW storage.

We believe that ultimate disposal is an insecure way, because it is not possible to ensure safety of the environment in the conditions of a long-term radiation threat. In order to ensure nuclear and radiation safety for future generations it is necessary to provide access to radioactive waste in storage sites. In this case if new reliable and well-grounded technology of RW disposal becomes available to future generations, they will be able to transfer them to a safer condition. This is especially relevant in view of hard-to-predict natural (global climate change) and other risk factors.

4. Sites for long-term isolation of RW must be in maximum proximity to places where it is generated.

We believe transportation of waste is extremely dangerous at all stages, that is why it should be done only in extreme necessity and over a minimum distance from the place where it was generated. At the same time it is necessary to consider the principle of appropriate geological characteristics for creation of a RWDF.

5. Radioactive waste should be placed for permanent and controlled storage in the region that got benefits from the use of its source.

The region that consumed 'nuclear' electricity or/and got other benefits from the use of nuclear power should bear the burden of responsibility for the generated RW. In line with the principles of controlled storage and equal environmental safety of regions, the generated RW must be placed for long-term storage in the corresponding constituent entities of the Russian Federation (federal districts for federal cities).

6. Local self-governing bodies should have a right to veto decisions on location of RWDF or other radiation-hazardous facility.

Interests of the majority should not adversely affect interests of the minority. Population of the corresponding territories must be able to fully participate in decision-making on the location of hazardous facilities and they should be responsible to future generations for such decisions.

7. Equal participation of all stakeholders in taking decisions on RW disposal.

As the question of RW disposal is settled for a long period of time, all possible stakeholders (scientists, civil society representatives of corporations, politicians, etc.) must be involved in the process of discussion and taking decisions.

8. Minimization of RW build-up.

The process of SNF reprocessing leads to formation of even bigger quantities of RW. We believe such practice is unacceptable. It is also necessary to stop generation of RW and SNF through speedy DECOMMISSION of nuclear reactors.

9. When taking decisions on the location of RW and operation of RW storage it is necessary to follow the principle of priority of environmental and social interests of people over the interests of financial viability.

St. Petersburg, a picket near the Mariinsky Palace against construction of a RWDF in the territory of Sosnovy Bor, Leningrad Region. Participants: deputies of the State Duma, Legislative Assemblies of St. Petersburg and Leningrad Region, members of the public

It is intolerable when locations for long-term isolation of RW (SNF) are selected exclusively on the basis of saving costs for construction and transportation to a safer place (within a region) and the least effort principle when such facilities are placed in closed administrative territorial units (CATUs).

Underground RW combined storage and repository in Norway (Himdalen)

Measures radiation intensity

Section 2. Handling spent nuclear fuel

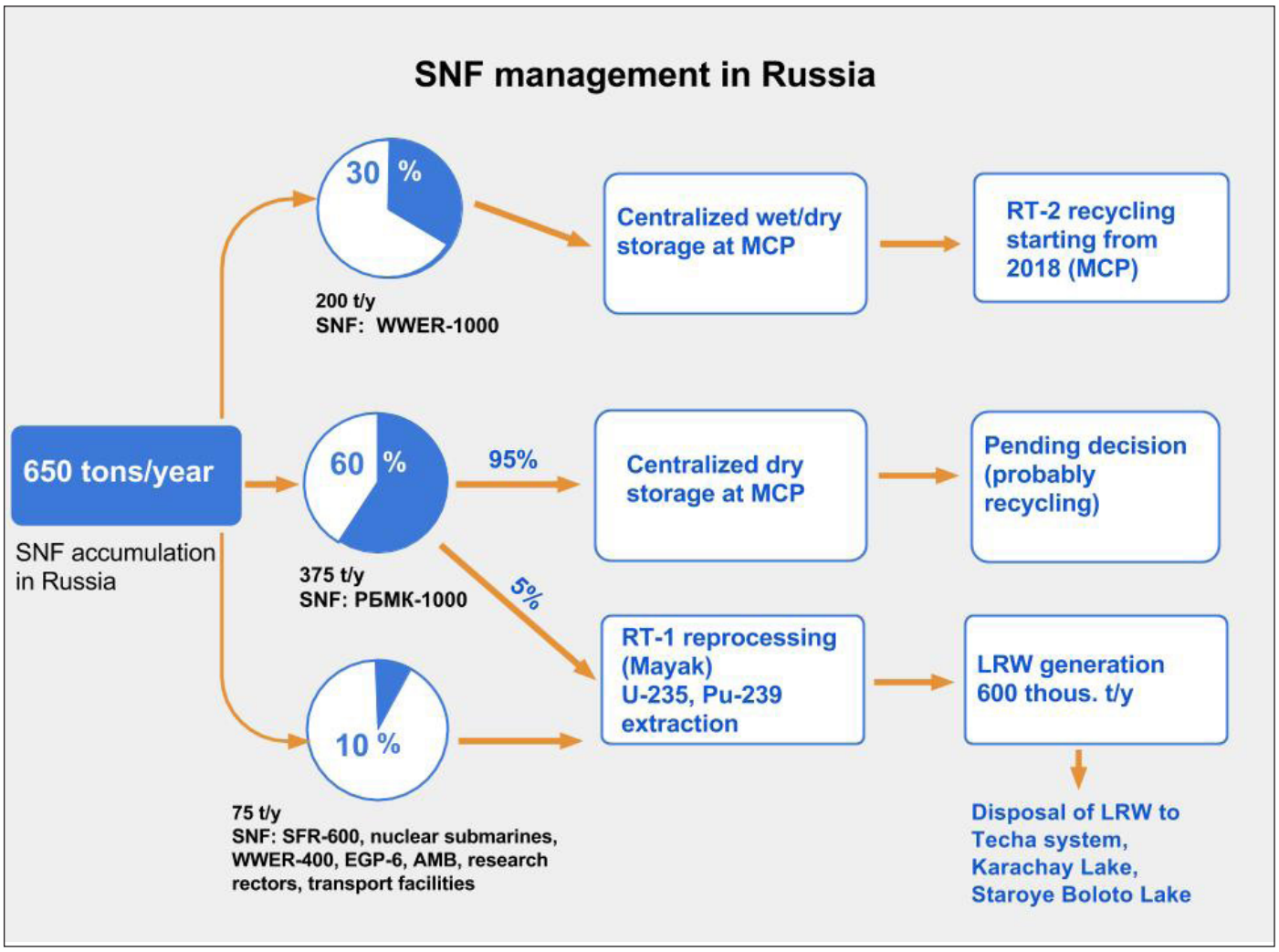
Current problems of spent nuclear fuel (SNF) management in the Russian Federation

To date about 23 thousand tons of SNF has been accumulated in Russia. Every year this amount increases by another 650 tons. The problem of handling SNF that was accumulated during several decades (including foreign SNF) is not solved at an acceptable technical and technology level not only in Russia, but nowhere in the world. Normative documents in the area of SNF management do not comply with the world principles of equal environmental safety and protection of future generations (Declaration of Environment and Development, Rio de Janeiro, 1992).

The biggest part of SNF is stored in spent fuel storage pools at nuclear power plants, in the storage of the Mayak plant in Ozersk (Chelyabinsk Region), in 'wet' and 'dry' storage of the Mining Chemical Plant (MCP) in Zheleznogorsk (Krasnoyarsky Krai) and on some other sites.

Every year a significant amount of SNF from abroad and the North-West of Russia is brought for storage and/or reprocessing to the Chelyabinsk Region and the Krasnoyarsky Krai (see Scheme 1). By solving the problem of radiation safety in other countries and the North-West of Russia, the State Corporation Rosatom moves all social and environmental risks together with SNF to the Urals and the Siberian Region.

Scheme 1. Ways of SNF management in Russia



A huge amount of SNF is accumulated at the Mining Chemical Plant in Zheleznogorsk, Krasnoyarsky Krai where conditions are created for construction of the all-Russia (International) storage of RW and SNF. The interests of the Krasnoyarsky Krai population are not considered and there are no relevant financial, technical, or organizational conditions for safe handling of radioactive waste and SNF.

The process of reprocessing SNF at RT-1 plant (Mayak) in the Chelyabinsk Region is accompanied by creation of enormous amounts of radioactive waste. Its volume increases by thousand times in comparison with the initial volume of reprocessed SNF.The plant capacity is 400 tons per year for SNF from power reactors VVER-440, SFR-600, marine installation reactors and multi-purpose reactors of the Mayak plant itself. During the time of RT-1 operation (Mayak) SNF was received not only from Russian but foreign nuclear power plants as well: Paks in Hungary, Loviisa in Finland, Nord and Greifswald in Germany, , Kozloduj in Bulgaria, Dukovany and Rzhezh in Czech Republic, Bogunice in Slovakia, and Rovenskaya in Ukraine. Since 1996 no SNF from Finland and Germany has been brought to RT-1 plant (Mayak). Before that 311 tons of SNF was brought to RT-1 from Finland and 235 tons from the GDR.*

As of 2015 the total of 5,650 tons of SNF was reprocessed at RT-1 (Mayak).**

** http://www.greenpeace.org/russia/Global/russia/report/2008/1/50-2.pdf*

***https://www.google.ru/url?sa=t&rct=j&q=&esrc=s&source=web&cd=8&ved=0ahUKEwjNiJvIndjJAhWrn3IKHY5eBiMQFghHMAc&url=http%3A%2F%2F2015.atomexpo.ru%2Fmediafiles%2Fu%2Ffiles%2Fmaterials%2F6%2FPohlebaev.pdf&usg=AFQjCNGTglIkOrscycKbXvxi23E3NyZUNQ&sig2=5vQ0aBqZAYyk3BZ-SRl--w&cad=rjt*

Mining Chemical Plant (CATU Zhelenogorsk, Krasnoyarsk Krai)

Mayak Plant (CATU Ozersk, Chelyabinsk Region)

Rosatom proposals for safe management of spent nuclear fuel

Using the Soviet experience of SNF reprocessing the state corporation Rosatom developed the Concept of SNF Management that was approved by Order No 721 of 29.12.2008. The main principle of the concept is partial closure of the nuclear fuel cycle for a more thorough use of nuclear materials by means of SNF reprocessing. For this they plan to expand the range of reprocessed SNF at the functioning RT-1 plant in the Chelyabinsk Region and build a new plant RT-2 with a greater capacity in CATU Zheleznogorsk, Krasnoyarsk Territory.

In that regard Rosatom proposes three stages of development of SNF reprocessing infrastructure.

The first stage includes the following activities within the federal targeted program "Nuclear and Radiation Safety 2008 – 2015":

- capacity of the existing SNF storage at the MCP and the Mayak plant;
- a dry SNF storage was built for VVER-1000 and RBMK-1000 reactors at the MCP with the capacity of 33 thousand ton and a SNF storage for VVER -1000 reactors at the Mayak Plant;
- reconstruction of the functioning plant RT-1 at the Mayak in order to reprocess SNF from VVER-1000 reactors;
- construction of the Pilot Demonstration Facility (PDF) in Zheleznogorsk for SNF reprocessing using the 'dry' technology;
- plant for producing Mixed-Oxide fuel in Zhelzenovodsk (Krasnoyarsk Territory) was put into operation.

However, not all planned activities were implemented. For example, the installation for cementation of liquid medium-level RW at the Mayak has not been put into operation, although it was planned for 2014. So far the Government of Russia has not confirmed the inventory of all RW.

During the second stage (2016 – 2020) mainly with budget financing it is planned to build RT-2 plant at the MCP on the basis of the PDF where Rosatom plans to reprocess SNF both of local and international origin. The planned capacity of RT-2 is from 1.5 thous. tons of SNF per year. In addition to this, according to the General Director of the Mayak, RT-1 will be reprocessing SNF from VVER -1000 , RBMK, AMB, EGP-6, and RS-150 reactors.

It is declared that at the third stage financing of the SNF handling system will be provided mainly from Rosatom and service providers' funds and foreign trade contracts*.

As was mentioned before, reprocessing of SNF leads to creation of large amounts of RW, and their management does not comply with basic environmental requirements. There continues disposal of radioactive waste into lakes: Staroye Boloto, Tatysh, the Techa River system and then to the Ob and the Arctic Ocean. Such activities contradict the Russian environmental norms (Article 51 of the Federal Law "On environment protection", Article 48 of the Federal Law "On the use of nuclear energy", Article 56 of the Water Code of the Russian Federation, etc.)**.

During 65 years of the Mayak plant operation there were several extreme accidents that caused contamination of dozens of thousands square kilometres of the Russian territory. Up to now rehabilitation of these areas has not been duly performed. People are forced to live on radiation contaminated areas and consume radioactive food products of local origin. This leads to multiple diseases and very expensive treatment. As a consequence, there is a decline of the income and the social status of people who live on the contaminated territories. The problem is worsened by the lack of radiation monitoring of food products in the Chelyabinsk Region.

Model of the Pilot Demonstration Facility for SNF reprocessing with the use of 'dry' technology (MCP, Zhelenogorsk)

Four generations of people living in the polluted areas demonstrate a growth of oncological diseases. Their number from 2013 has increased by now and reached over 400 cases per 100 000 people. Unfortunately, for 20 years the Chelyabinsk Region has been the leader in the Urals by the number of oncological diseases. Fifteen big cities of Russia, as well as the River Volga, the Ob and the Yenisei are exposed to risk related to transportation of SNF through the whole Russia.

** http://www.rosatom.ru/resources/f4c962804b1b97c38ae09fa6d2e38703/progr_oyt_04_04_2012_yrb.pdf*

*** http://za-prirodu.ru/uploads/docs/fil_forum_dialog_programma_05.06_fin_.pdf*

DECOMMISSION Network position

We, the DECOMMISSION International Network, believe that:

SNF handling at the Mayak plant is **dangerous for future generations**, as SNF reprocessing is accompanied by disposal of huge amounts of RW into the environment. We also think that it is immoral to transport SNF from abroad and the European Russia to the Chelyabinsk Region and the Krasnoyarsky Krai, the most polluted regions of the world.

This violates the fundamental principle of equal environmental safety for people who live in different parts of the planet; it does not solve the problem, but only moves it to another territory. On the basis of the above principles of safe RW management we are convinced that:

- **SNF must be placed** for permanent and controlled storage in the federal region of Russia where the nuclear power was consumed;
- **Transportation of SNF to other federal regions** is possible only after declaration of people's will in a referendum in the region (constituent entity of the Russian Federation) of the proposed disposal of SNF;
- **Local self-governing bodies** should have a right to veto a RW and SNF storage or any other facility;
- **Environmental and social interests of people** should be a priority over economic feasibility when taking decisions on possible location of RW and/or SNF disposal sites;
- **It is necessary to eliminate SNF reprocessing** until a new environmentally and socially acceptable technology is developed that will exclude penetration of RW into the environment.

Process of plutonium production at Mayak Plant (Ozersk, Chelyabinsk Region)

Conclusions and proposals of DECOMMISSION International Network

The enormous volume of radioactive waste in our country is not just an unfavourable factor; it is totally unacceptable in the modern world where there exists significant experience in the reduction of radiation effects on all elements of the environment. It is necessary to reduce the volume of RW through the use of new technologies, by at least a factor of ten; and most waste-generating technology, processes and stages should be excluded from the nuclear fuel cycle.

The RW Law must comply with the international principles, norms and rules of handling RW and SNF. It is advisable to combine legal regulation of RW and SNF management in one legal act as it is done on the international level.

It is necessary to expand the RW Law with the norms of public control over provision of nuclear and radiation safety in the process of RW management. For example, the Law should include a provision for an Oversight Council in the structure of the competent authority on RW management, its formation should provide for active participation of population and local authorities.

The final decision on approval of the location of a RW or SNL storage and disposal site should be the responsibility of a representative body of state power at the regional level; this will contribute to awide discussion of the relevant decision.

It is necessary to define the control procedure for expenditures from the radioactive waste management fund.

It is necessary to make amendments to regional legislation with the aim to ensure the right of local self-governing bodies to veto placement of nuclear and radiation-hazardous facilities on their territory.

There is a need for a more detailed regulation in the sphere of managing RW from nuclear power plants that are beyond their design lifespan.

It is advisable to have clear requirements to RW disposal sites in the Law on the use of nuclear energy and the RW Law like in the Federal Law "On production and consumption wastes". For this purpose it is necessary to create DECOMMISSION funds for every nuclear power plant and establish regional Oversight Councils with participation of representatives of federal government bodies, national and international NGOs.

It is necessary to expand the federal nuclear energy legislation with norms prohibiting transportation to the Russian Federation of international SNF, nuclear materials and radioactive substances for the purposes of storage and/or disposal and leave RW formed in the process of reprocessing of the above materials and substances on the territory of the Russian Federation.

From the point of view of constitutional and international legal principles, disposal of RW from other countries is a discrepancy between the concept of equal environmental safety embodied in international agreements and the actual implementation of this concept.

Environmental welfare of one state cannot be provided at the expense of or disregarding (an)other state(s).

Economic interests of a particular subject, including the sphere of nuclear power use, should not prevail over the public interest. Natural resources are property of the people living in our country. Nature is the foundation of life for the present and future generations.

These principles are recognized in the current Constitution of Russia that was adopted 22 years ago by a nationwide referendum.

Underground RW disposal facility (Himdalen, Norway)

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www.decomatom.org.ru – DECOMMISSION Network

www.greenworld.org.ru – "Green World"

A group of Russian participants on a visit to Olkiluoto nuclear waste repository in Finland, organized by the DECOMMISSION Network, 2014. Representatives of Rosatom and civil society.

Comparison of positions of the DECOMMISSION Network and Rosatom on the management of radioactive waste and spent nuclear fuel

DECOMMISSION International Network	Rosatom (Federal Law №190 «On handlingradioactive waste ... ")
Burial of radioactive waste	
Long-term controlled storage	Mandatory burial
Place of burial / storage	
Suitable geological formations with minimal risks of contamination of sources of drinking water and natural ecosystems	Geological formations, natural site without necessary isolation from natural environment
Public participation in decision-making on the management of radioactive waste	
Russian citizens under the Constitution Act should take the final decision in determining the sites of the repositories of radioactive wastes	The law does not foresee an active role of the public and locally elected officials in determining the sites for burial of radioactive wastes
Transfer of RAO	
Depositories of radioactive waste have to be in accordance with the principle of social justice, and located in the region of their production.	Radioactive waste can be moved from one region to another.
Reprocessing of spent nuclear fuel	
Recycling of spent nuclear fuel leads to a multiple increase of the volume of radioactive waste and contaminated land around their processing plants. It is essential to stop the production of new spent fuel and radioactive waste through speedy DECOMMISSION of nuclear reactors.	The Soviet experience of reprocessing spent fuel was approved by Order of 29.12.2008 number 721, the Concept of SNF. The main principle of the concept - a partially closed loop of the nuclear industry for fuller use of nuclear materials by reprocessing.
Participation of local authorities in the decision-making process on radioactive waste and spent nuclear fuel	
Local government should have the right to «veto» on the decision to deploy depositories of radioactive waste or other radiation-dangerous sites.	Local government does not influence the decision on placement of radioactive waste storage or other radiation-dangerous sites.

DECOMMISSION international network founded in 2003. http://decomatom.org.ru

Mission of the network - to promote a safe and socially and environmentally acceptable DECOMMISSION of nuclear power plants that have lived past their projected timeframe, taking into account positive world experience with the participation of all interested parties on the basis of democratic principles.

В интернете доступны другие материалы международной сети «Декомиссия»:

- Концепция по выводу из эксплуатации энергоблоков АЭС. Взгляд общественных организаций. 2007 г.
- дистанционный курс обучения по теме «Вывод из эксплуатации АЭС:http://decomedu.com
- короткие информационные ролики по различным аспектам вывода АЭС из эксплуатации, размещенные в Youtube.

(в поисковой строке наберите #decom_roliki),

- видеофильмы, созданные студией «Зеленый мир» на тему декомиссии и другим пролемам ядерной безопасности:
  - Когда приходит час (2006 г.);
  - АЭС Грейфсвальд. Остановка по требованию (2007);
  - Территория не пригодная для жизни (2009 г.);
  - Все, что в наших силах (2010 г);
  - Вермонт штат против Вермонт Янки (2011 г.);
  - Балтийский ядерный треугольник (2015 г.);
  - Особенности национальногомогилостроения (2015 г.);
  - Ханхикиви (2016 г.);

Все эти фильмы можно найти в Youtube, введя в поисковой строке название фильма