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ANALYSIS OF NATIONAL ACTIVITY FOR EXECUTING THE JOINT CONVENTION ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT*

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Analysis of the results of the activity of the State Atomic Energy Corporation "Rosatom" and the Federal Service for Ecological, Technological and Nuclear Supervision for preparing the Russian Federation reports at meetings of the contracting parties to fulfil the obligations arising from the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management was performed.The main content of the report refers to the fourth national report of the Russian Federation submitted to the IAEA in May 2015. The main results of the activity for the formation of a unified state system for RW management were considered. Analysis of the questions of the Member States of the Joint Convention to the content of the national report was performed. A review of the activities of the FSUE "RosRAO" in terms of solving the basic problems for the safe management of radioactive waste was presented.

Keywords: *nuclear power, radioactive waste, the Joint Convention, the analysis activity.*

The present state policy for ensuring radiation safety and protecting the human and environment is supplemented with a new aspect pertaining to the solution of a whole complex of accumulated and modern problems concerning radioactive waste (radwaste) management – the creation of a uniform state system for managing radioactive waste. A wide range of tasks related to the creation of this system is specified by the Federal law of July 11, 2011 No. 190-FZ "About radioactive waste management and about modifying specific legislative acts of the Russian Federation". Article 5 of the law establishing authorities of the Russian Federation government in the field of radwaste management orders the obligatory approval of a list of radwaste burial points, radwaste long-term storage points, special radwaste placement points and special radwaste preservation points according to the results of primary registration of radwastes and conditions of their placement. In fact, this specifies a long-term strategy for eliminating the "historical heritage" in the form of existing radioactive waste storages, as well as for creating modern objects for final isolation (burial) of radioactive wastes.

Analysis of the activity of Rosatom State Corporation and Federal Service for Environmental, Technological and Nuclear Supervision regarding radioactive waste management is presented in national reports of the Russian Federation made at meetings of Contracting parties for fulfilling the obligations following from the Integrated convention on the safety of spent fuel

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treatment and on the safety of radioactive waste management [1, 2]. The fourth national report of the Russian Federation was presented to IAEA in May, 2015 [3].

Due to the objective need for developing the coordination of activities for safety of SNF (spent nuclear fuel) and radioactive waste management and due to stimulation of its progress in each state the Integrated convention on the safety of spent fuel management and on the safety of radioactive waste management was accepted in 1997. By 2015, 69 contracting parties became participants of the convention. The Russian Federation signed the Integrated convention in 1999 and ratified it in 2006.

The format of preparing and considering national reports assumes carrying out two main procedures:

1. Submission of national reports on the website of IAEA with a parallel explanation of particular aspects of activity and of matters that caused particular interest of the contracting parties for understanding additional specific information.

2. Oral submission of national reports with the analysis of the received questions about the fulfilment of obligations taken by the states at Meetings of the contracting parties.

Meetings of the contracting parties for considering the fulfilment of the obligations following from the Integrated convention are convoked at least once in three years. The Russian Federation takes part in the Meetings since the Second one, in 2006, at which the national report was submitted. Since the Third Meeting, the Russian Federation participated in full, including the preparation of national reports, the preparation of written answers to the questions of other Contracting parties concerning the national report and questions to national reports of other countries [4]. Besides, arrangements for the consideration and discussion of various aspects at group sessions, as well as participation in the preparation of documents of the convention at plenary sessions were held.

The preparation of national reports according to the Integrated convention in the Russian Federation is coordinated by the State Atomic Energy Corporation "Rosatom" and the Federal Service for Environmental, Technological and Nuclear Supervision. The preparation and maintenance of the submission of all four reports of the Russian Federation in IAEA was supported by the Nuclear Safety Institute of the Russian Academy of Sciences and the Federal Budgetary Institution "Scientific and Technological Center for Nuclear and Radiation Safety".

The analysis of the results of activities for the fulfilment of obligations within the Integrated convention in the national reports of the Russian Federation during 2006–2015 indicates the existence of a positive trend in the realization of arrangements for providing and increasing safety in the field of SNF and radioactive waste management. Essential positive changes happened also in the spheres of legal relations and standard and normative legal regulation.

The results of the positive dynamics of removing atomic energy objects from operation are presented in Table 1.

Table 1. Dynamics of removing atomic energy objects from operation

State of work for removing atomic energy objects from operation	2006	2015	Indicator growth, %
Object stop	198	263	32.8
Object preparation to removing from operation	77	160	107.8
Object in the process of removing from operation	34	54	58.8
Work for removing from operation finished	10	52	420.0

The amount of stopped objects considerably grew. The amount of objects where works for removing from operation are in progress (107.8 % growth) is growing at a quick rate. Besides, works for removing 52 objects from operation are complete (420 % growth).

In 2006 the situation in the field of radioactive waste management was characterized as a state with a number of unsolved safety problems. Among other things, radioactive wastes were placed for long-term storage without plans for burial.

In 2015 the results presented in the Fourth national report make it possible to conclude that many aspects of activity related to safety significantly improved. As for radioactive waste management:

1. The first stage of the formation of the Integrated state system for radioactive waste management is complete. Its highlights were the creation of legal frameworks, the approval of tariffs for radioactive waste burial and the creation of a reserve fund for radioactive waste burial.

2. The government of Russia determined the National operator for radioactive waste management (the Federal State Unitary Enterprise “NORAO”), the implementation of primary registration of radioactive waste from the "nuclear heritage" and the development of a scheme for regional planning of placement of radioactive waste burial points.

3. In the course of the performance of the federal target program "Ensuring nuclear and radiation safety for 2008 and for the period till 2015", 12 nuclear and radiation hazardous facilities of various categories including critical test facilities in the Institute of Physics and Power Engineering (RF-GS) and in the All-Russian Scientific Research Institute of Chemical Technology (PKS SO-2M), the research nuclear reactor RBT-10/1 (the Research Institute of Atomic Reactors), objects for producing uranium tetra- and hexafluoride of the Kirovo-Chepetsk Chemical Plant (RosRAO) were taken out of service.

The national report of the Russian Federation attracted particular interest of the Contracting parties. The regulations of the Integrated convention in the obligations of the Contracting parties for the preparation of written explanations concerning the national reports and the asked questions about national reports of the other countries involve a mechanism of detailed understanding of processes for ensuring the safety of SNF and radioactive waste management. In particular, the maximum quantity (126) of written questions from other countries about the 2015 national report of the Russian Federation were asked.

Analyzing the questions asked about the report of the Russian Federation allows revealing, first of all, the scope of trouble spots for foreign countries. Figure 1 shows some aspects of the procedure of the Contracting parties interaction concerning subjects of unfailing interest.

The undiminishing interest of the countries in obtaining more detailed information on the Russian Federation reports is related to the search for answers in order to solve the national tasks by analogy with the approaches and mechanisms of radioactive waste management already applied or developed in Russia. The interest in obtaining information on the policy and practice in the field of SNF and radioactive waste management in the Russian Federation is shown in questions of the USA, China, Sweden, Hungary and Ukraine concerning the return of sealed radioactive sources from foreign countries. China, Hungary, Ukraine and Finland show interest in the storage of SNF; Ukraine, Great Britain, Germany, Switzerland, China and Finland – in the accumulation and use of the nuclear facilities reserve fund; Sweden – in the problem of radioactive waste inventorying.

The keen interest of the foreign countries should be an additional argument for the Russian Federation nuclear industry. It should stimulate a careful and deep study of approaches to solving problems in these directions and the preparation of appropriate information materials.

Certainly, the Federal law of July 11, 2011 No. 190-FZ "About radioactive waste management and about modification of some acts of the Russian Federation" was a key contribution to the formation of a legal framework allowing to solve efficiently safety problems in radioactive waste management. The new law and the Federal law of November 21, 1995 No. 170-FZ "About the use of atomic energy" make a basic legal framework for safety control in SNF and radioactive waste management.

Государство	Кол-во вопросов
Австралия	12
Беларусь	3
Болгария	1
Великобритания	3
Венгрия	8
Вьетнам	5
Германия	3
ЕвроАтом	7
Канада	5
Китай	13
Корея	1
Литва	6
Люксембург	2
Марокко	1
Польша	14
США	4
Украина	17
Финляндия	6
Франция	7
Швеция	3
Япония	5
Всего	126

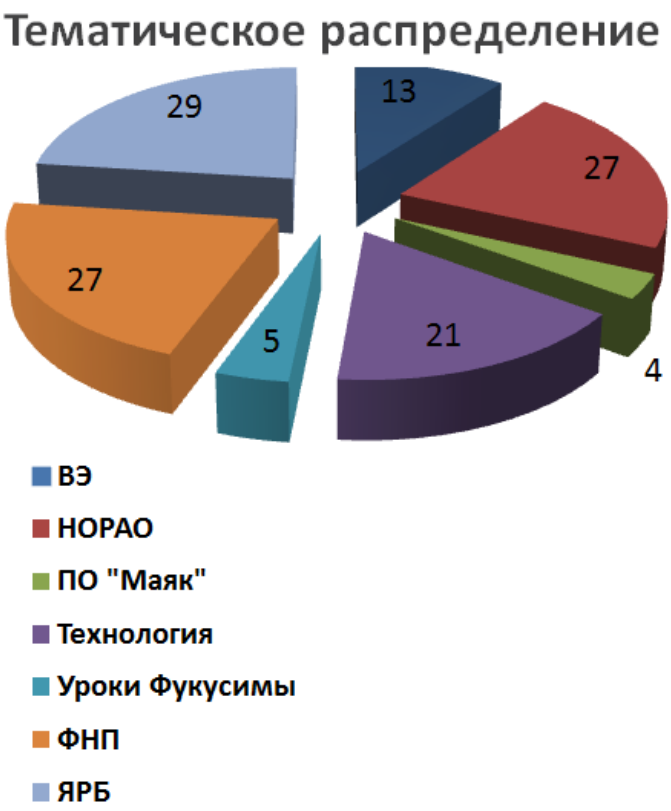

Figure 1. A brief analysis of questions concerning the Russian Federation report.

Государство means State; Кол-во вопросов means The number of questions;
List of States (in the table): Australia, Belarus, Bulgaria, Great Britain, Hungary, Vietnam, Germany, EuroAtom, Canada, China, Korea, Lithuania, Luxemburg, Morocco, Poland, USA, Ukraine, Finland, France, Sweden, Japan;
Всего means Total amount; Тематическое распределение means Subject distribution;
ВЭ means Removal from operation; НОРАО means NORAO; ПО «Маяк» means Industrial Group "Mayak";
Технология means Technology; Уроки Фукусимы means Fukusima lessons; ФНП means Federal Rules and Guidelines. ЯРБ means Nuclear and Radiation Safety.

In order to implement the provisions of 190-FZ, a number of regulations and orders of the Russian Federation Government were adopted. They initiated carrying out important actions and established current legal notices for regulating safety in radioactive waste management in the Russian Federation, namely:

– The order and terms of creating a Uniform state system of radioactive waste management, the main objective of which is to organize and provide safe and economically justifiable radioactive waste management, including their burial, were determined.

– A new classification of radioactive waste, criteria for classifying radioactive waste as special and disposable, criteria for classing disposable radioactive waste were created.

– Property right to radioactive waste and points of radioactive waste burial were determined.

– The National radioactive waste management operator was created for planning and implementing activities for radioactive waste burial.

– The powers and functions of the state body in the field of radioactive waste management were determined.

The solution of these ambitious problems requires developing new approaches based on scientifically grounded principles and criteria allowing to carry out true forecasts of the future condition of the whole state complex of radioactive waste management, as well as solving specific technological tasks for ensuring radiation safety.

In this context the following directions of research can be of particular interest:

1. The formation of a mechanism for complex management of radioactive waste in the territory of Russia for the period till 2025.

2. Improvement of elements of the system for state administration of radioactive materials and radwaste.

3. Development of new approaches to creating radioactive waste containers.

4. Development of new materials used to produce packings for radioactive waste subject to burial.

5. Creation of mobile technological systems and complexes for processing and conditioning radioactive waste.

Carrying out works for the restoration of territories polluted by radionuclides with the obvious requirement of performing such works on a turnkey basis should be considered as separate types of future activity.

The enterprises belonging to the division of the life cycle closing stage, first of all, the Federal State Unitary Enterprise ROSRAO should take an active part in solving the listed tasks.

For a viable solution of these problems, the former special integrated plants "Radon" engaged in collecting, storing and processing radioactive waste in all the territory of the Russian Federation were transferred under the management of the State Atomic Energy Corporation "Rosatom". In the summer of 2008 consolidation of assets of these enterprises was carried out, and the Federal State Unitary Enterprise ROSRAO was organized. The enterprise was assigned the functions of centralized collecting and sorting of radioactive waste of low and average activity, their transportation, conditioning and storage.

The competence of the enterprise also includes target activity directed at planning the amount of radioactive waste formation and the technologies for their processing, operation of storage points, rehabilitation of territories that underwent radioactive pollution and their subsequent radiation monitoring.

The following stage of the Federal State Unitary Enterprise “ROSRAO” development was in 2010. According to the Decree of the Russian Federation President, the Federal State Unitary Enterprise “Far East Federal Enterprise for Radioactive Waste Management” (Vladivostok) and the Federal State Unitary Enterprise “Northern Federal Enterprise for Radioactive Waste Management” (Murmansk) were transferred under the management of the enterprise. Both enterprises were awarded the status of branches: the Northwest center “SEVRAO” and the Far East center “DALRAO”. Besides, the list of competences of the enterprise considerably extended. A whole complex of works on the management of nuclear fuel and of radioactive waste accumulated in the course of navy activity, as well as radioactive waste formed when disposing of nuclear submarines and the surface ships with nuclear power installations were added. In addition, works on the ecological rehabilitation of radiation-hazardous objects in the territory of Primorsky Krai and the Kamchatka region were added.

The created structure of the enterprise allowed also realizing efficiently large projects within the FTP “Nuclear and radiation safety for 2008 and for the period till 2015”, as well as within the implementation of actions of the state defense order [5].

Figure 2 presents the relative geographical positioning of the enterprises of JSC “TVEL”, JSC “Concern Rosenergoatom”, the radiochemical enterprises of Rosatom State Corporation and the offices of Federal State Unitary Enterprise “ROSRAO” in the central part of the Russian Federation.

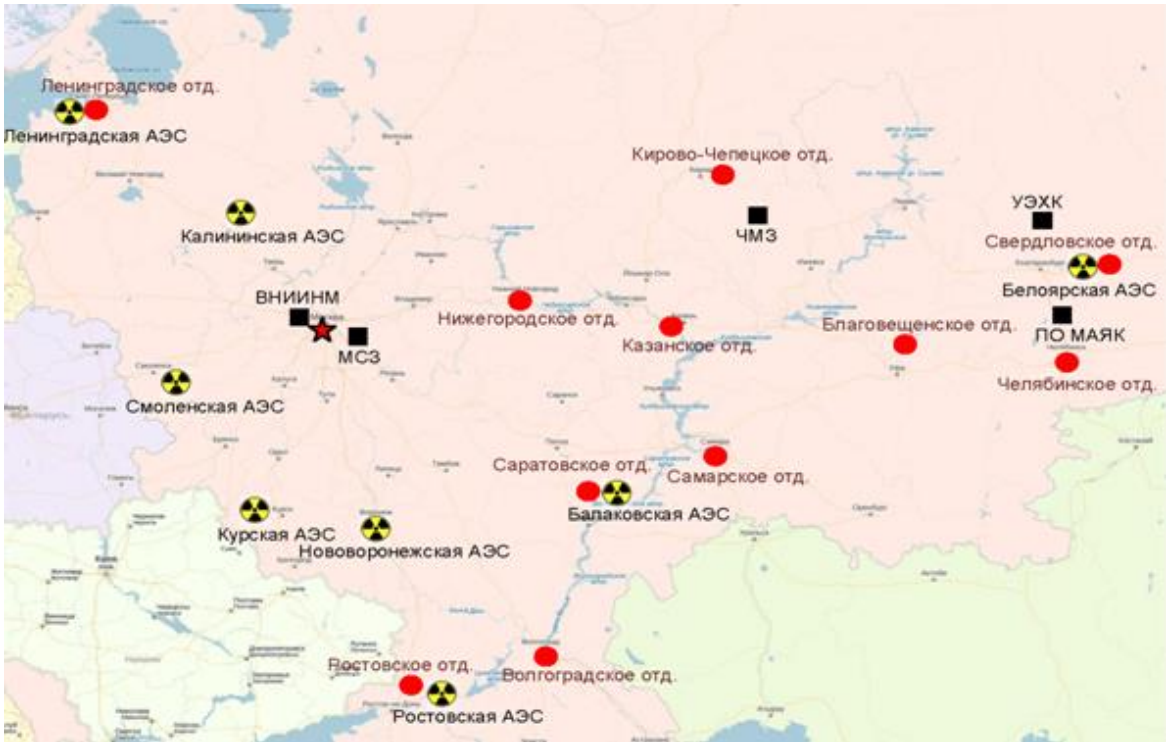

Figure 2. The geographical positioning of the enterprises of JSC "TVEL", JSC "Concern Rosenergoatom", the radiochemical enterprises of Rosatom State Corporation and the offices of Federal State Unitary Enterprise "ROSRAO" in the central part of the Russian Federation.

Names on the map (from left to right): Leningrad department; Leningrad NPP; Kalinin NPP; VNIINM; MSZ; Smolensk NPP; Kursk NPP; Novovoronezh NPP; Rostov department; Rostov NPP; Volgograd NPP; Balakovo NPP; Saratov department; Samara department; Nizhny Novgorod department; Kazan department; Kirovo-Chepetsk department; ChMZ; Blagoveshchensk department; UEHK; Sverdlovsk department; Beloyarsk NPP; Industrial Group "Mayak"; Chelyabinsk department

An independent sphere of activity for interaction with JSC "NZHK", JSC "EHZ", JSC "AEHK", JSC "SHK" and Federal State Unitary Enterprise GHK opens for the Novosibirsk and Irkutsk offices of the Federal State Unitary Enterprise "ROSRAO" (Figure 3).

Figure 3. Spheres of influence of the Sverdlovsk, Novosibirsk and Irkutsk offices of the Federal State Unitary Enterprise "ROSRAO" in the Siberian part of the Russian Federation.

1. JSC "AEHK", Angarsk, 46 km from Irkutsk
2. JSC "EHZ", Zelenogorsk, 165 km from Krasnoyarsk and 70 km from GHK
3. JSC "SHK", Seversk, 12 km from Tomsk
4. JSC "NZHK", Novosibirsk
5. JSC "UEHK", Novouralsk, 67 km from Ekaterinburg and 120 km from Industrial Group "Mayak" (Ozersk)
6. JSC "ChMZ", Glazov, Udmurt Republic
7. JSC "MSZ", Elektrostal, 55 km from Moscow
8. JSC "VNIINM", Moscow

км means km
Sphere of influence of the Sverdlovsk department
Spheres of influence of the Novosibirsk and Irkutsk departments
Saint Petersburg; Sosnovy Bor; Kalinin NPP; Smolensk NPP; Kursk NPP; Novovoronezh NPP; Balakovo NPP; Rostov NPP; Beloyarsk NPP; ChMZ; Glazov; Novouralsk; UEHK; Industrial Group "Mayak"; NZHK; SHK; Novosibirsk; Seversk; Zelenogorsk; Industrial Group "EHZ"; AEHK; Angarsk

Certainly, the actions for the rehabilitation of the polluted territories were the main direction for the Federal State Unitary Enterprise ROSRAO when implementing the Federal Target Program for Nuclear and Radiation Safety. In 2014 a set of works for the rehabilitation of the industrial site of the former plant "Mosrentgen" located in the territory of Moscow was completed.

As a result of a radiation accident that occurred when recharging the sources, the burial of radioactive waste at the industrial site has been discontinued since 1962. The main pollutants are cobalt-60 and caesium-137 (Figure 4). As a result of the works radwaste of 675 m^3 weighing 850 t was removed from the site. Grading of a 0.53 hectares territory was carried out. For the first time in the practice of solving the "heritage problems" we succeeded in engaging a private investor to financing of the works.

The Federal State Unitary Enterprise "ROSRAO" carries out national objectives for ensuring nuclear, radiation and ecological safety for the management of all types of radioactive waste, guaranteeing a firm basis of the nuclear branch development, forming the public trust in Russia and abroad, leadership of technologies and competences of Rosatom State Corporation in the global market. Since the enterprise is the center of competences for radioactive waste management in the Russian Federation, its aim is to create a branch infrastructure of processing, conditioning and long-term storage of radioactive waste before transferring to the National operator.

Figure 4. The appearance of a building of the former plant "Mosrentgen" under a protecting cover at work.

To do this, the following prospective activities of the enterprise are being implemented:

- the formation of a complete production cycle for radioactive waste management based on modern scientific and technological achievements for radioactive waste management;
- optimization of the existing technology concepts and development of new mobile technologies for processing radioactive waste at the site of its formation and accumulation;
- development of a transport and technological infrastructure of the leading specialized Russian scale enterprise and integration into the uniform state system of radioactive waste management;
- complex works for the disposal of nuclear submarines, nuclear equipment vessels and rehabilitation of former Russian Federation Navy objects;
- expansion of works and active advance of services in the sphere of removal from operation, elimination and disposal of atomic energy objects, rehabilitation of the polluted territories;
- entry into new markets of services in the management of materials polluted by natural radionuclides above the level of release from under the regulating control according to the radiation factor (creation of disposal sites for low-level radioactive waste; solution of problems of polluted equipment of the fuel and energy complex);
- leadership in the Russian Federation in the field of the nuclear back-end within the implementation of the state policy for nuclear and radiation safety.

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