

N.K. Shandala¹, M.P. Semenova¹, V.A. Seregin¹, A.V. Grigoryev², M.K. Sneve³, E. Lazo⁴**The State of Art in Radiation Safety Regulation at the Nuclear Legacy Site on the Kola Peninsula of the Russian Federation: The Point of View of Russian and Foreign Experts**

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The 7th meeting of the Expert Group on Legacy Management (EGLM) of the Nuclear Energy Agency at the Organization for Economic Cooperation and Development (NEA OECD) was held between the 5th and 7th June 2018 in Murmansk, Russia. The objective of the meeting was to familiarize international experts with the Russian experience in remediation of nuclear legacy sites using the case study of the Andreev Bay Site for Temporary Storage (STS) of spent nuclear fuel (SNF) and radioactive waste (RW).

The following EGLM members participated in this event: Edward Lazo (NEA OECD), Malgorzata K. Sneve (Norway), Ludovic Vaillant (France), Miroslav Jurda (Czech Republic), Graham Smith (United Kingdom), Patricia Worthington (United States), Maximo Ciambrella (Italy), Nataliya Shandala (Russia).

The event was organized by the SC Rosatom jointly with FMBC.

The FMBA of Russia was represented by the Deputy Head, Chief Medical Officer over the sites and facilities serviced by the FMBA of Russia, Vladimir Romanov and Deputy Chief of the Department of the State Health and Epidemiological Supervision, Chief of the Division of the radiation safety supervision organization, Nadezhda Pothsyapun. The delegation of FMBC headed by N. Shandala, included: Anatolii Simakov – Chief of Laboratory, Yuri Abramov – Major Researcher; Vladimir Seregin – Researcher; Yuri Bragin – Senior Researcher; Konstantin Chizhov – Researcher; Aleksandr Bobrov – Chief Researcher, and Maria Semenova – Senior Researcher.

The SC Rosatom was represented by: the head of projects of the Management of International Programs in the field of RW, SNF and Decommissioning of Nuclear and Radiation Hazardous Facilities Anatolii Grigoryev and the major specialist Marina Yudina.

The professionals of the Northwest Center for Radioactive waste Management (NWC SevRAO) headed by the Director of the Andreev Bay facility Alexander Krasnoshchekov, Head of the Interregional Management 120 under the FMBA of Russia (IRM-120) Igor Kemsy and senior advisor of the Norwegian Radiation Protection Authority (NRPA) Katarzyna Siegien were also active participants of the event. Local authorities and the public was represented by the Deputy Minister of the economic development of the Murmansk region Ilia Ostapchuk, the representative of the territorial body of the Ministry of Foreign Affairs Eugeny Galkin, the Secretary in the field of

safe atomic energy use in the Murmansk region of the Public Council under the SC Rosatom Sergey Zhavoronkin.

On the first day of the work, on June 5, a meeting was held, anticipating the visit of the participants to the technical site of the Andreev Bay facility. The Secretary in the field of safe atomic energy use in the Murmansk region of the Public Council under the SC Rosatom Sergey Zhavoronkin welcomed the participants.

The response greetings were made by the EGLM Chairman Malgorzata Sneve and Scientific Secretary Dr. Edward Lazo. The presentation of M. Sneve and E. Lazo included information on the Mandate and activities of the EGLM, the description of the content and status of the first EGLM Report (60 pages of the main text and 85 pages of case studies), outlook for future EGLM activities, key lessons and recommendations.

M. Sneve and E. Lazo described the features of the EGLM, which operates the recent two years. It was mentioned that presentations of this day and coming visit to the technical site at Andreev Bay will promote demonstration, understanding and integration of the Russian experience in legacy management into the EGLM activity.

The presentation also informed about the objective of the visit to the technical site at Andreev Bay. The authors hoped that the coming visit to the technical site will make an important input to the holistic and coherent process of dealing with nuclear legacy and to the practical and harmonized approach for the regulation of nuclear and radiological legacy sites in general. Events being scheduled by the EGLM were presented to the participants.

The presentation of the leader of projects of international technical support of the Management of International Programs in the field of RW, SNF and Decommissioning of Nuclear and Radiation Hazardous Facilities Anatolii Grigoryev was devoted to the arrangement of the SNF management at Andreev Bay.

The presentation contained an extensive digression into the history of the creation of the facility after the 1982 radiation accident in the SNF storage facility, where a leakage of cooling water from the storage basins occurred. The state of the facility in the past was described, the preparation of remedial operations, work in the framework of international projects aimed at bringing the radiation situation in normal conditions and the results of these works (fig. 1).

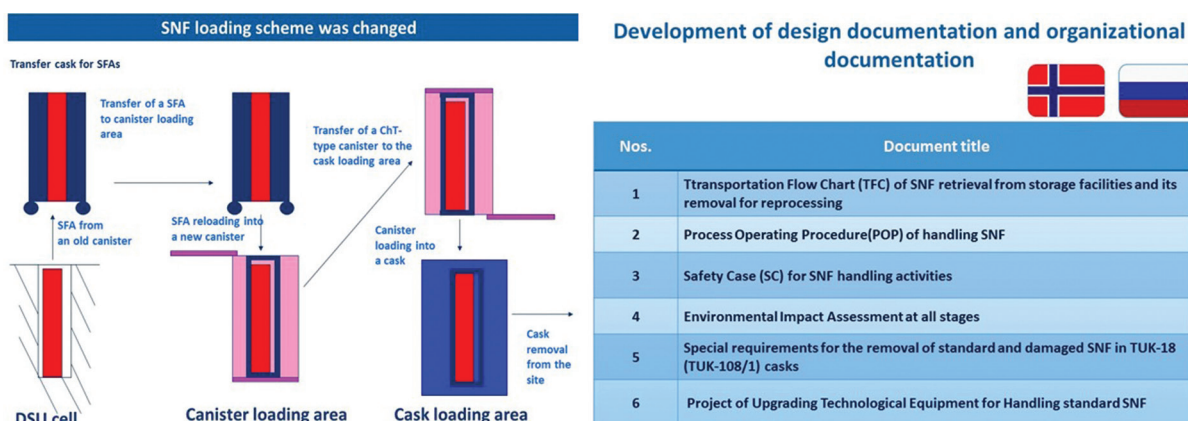


Fig. 1. The SNF loading into the dry storage unit cells and the developed design documents to support nuclear and radiation hazardous operations

New navigation in the Murmansk region was opened on the 27th June 2017. This event was connected with the SNF removal from the storage facilities at Andreev Bay. By the Director General of the SC Rosatom Alexey Likhachev.

The route of this navigation connected the largest storage facility of SNF and RW with the Atomflot territory, where the echelons that take SNF to the production association “Mayak” will be formed. The presentation of A. Grigoryev was accompanied by movies devoted to operations at Andreev Bay and bringing the radiation situation in the vicinity of the dry storage units on the Andreev Bay site into normal conditions.

The history of cooperation between the FMBA of Russia and NRPA was presented by N. Shandala, who described in detail the formation of this cooperation in 2004, when work began within three main project dealing with radiation safety and protection of workers; radiation protection of the population and environment; and emergency preparedness and response. In 2005, an initial threat assessment was made, which helped to identify the priority tasks and areas of work. In November 2008, the historical Agreement between Russia and Norway on cooperation in the field of regulatory supervision during nuclear energy use was signed (fig. 2).

Over 14 years of the cooperation, 30 research project have been completed on radiation safety regulation, including the updated threat assessment, followed by the regulation of large-scale removal of SNF during 2017–2021, subsequent transportation of the fuel to the PA “Mayak”, and

further regulation of the environmental remediation process till 2025.

Innovative scientific developments cover such directions as: the development of visualization and simulation tools; monitoring of the performance reliability of workers involved in SNF management; and environmental assessment of terrestrial ecological systems. Three emergency trainings and exercises with international participation were conducted at Andreev Bay and Gremikha village. More than 20 regulatory documents were developed and introduced. During the period of cooperation, more than 50 meetings on the ongoing projects have been held.

The outcomes of the cooperation were presented by the professionals of FMBC at 30 scientific conferences on radiation protection and safety. In conclusion, the prospects of the regulatory process of the facility in Andreev Bay and the main directions of further research work were presented.

The presentation of V. Romanov dealt with the federal state health and epidemiological supervision implemented by the FMBA of Russia and its territorial bodies in respect to institutions under the SC Rosatom. V. Romanov informed the participants about the establishment of FMBA of Russia in 2004, presented a map of location of the territorial bodies under the FMBA of Russia, list of companies and sites serviced. The participants were informed about the participation of the FMBA of Russia in the priority program “The Reform of the Control and Supervision Activity”, including the updating of mandatory requirements in the field of radiation safety and a program of prophylaxis of



Fig. 2. The initial stage of cooperation between the FMBC under FMBA of Russia and NRPA – regulatory threat assessment

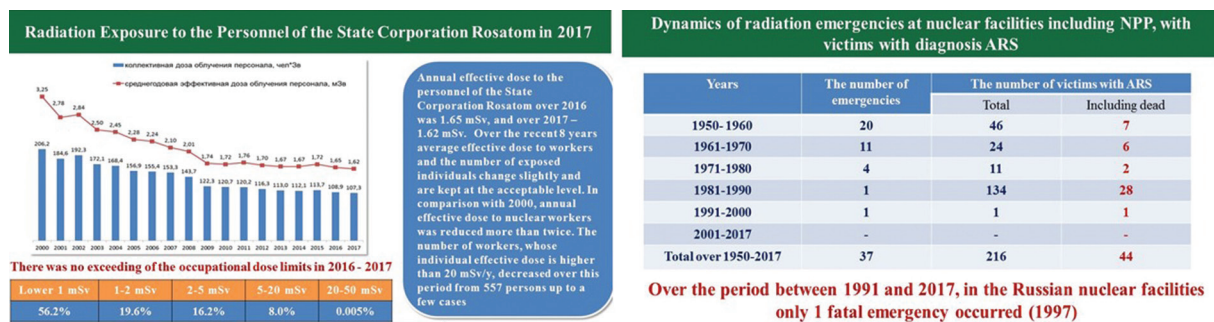


Fig. 3. Average doses to the personnel of the State Corporation Rosatom in 2017. Dynamics of radiation emergencies over the period between 1991–2017

violations of such mandatory requirements in the field of health and epidemiological wellbeing.

Data on occupational exposure at companies under the SC Rosatom over 2016 and 2017 were presented and the dynamics of radiological emergencies at nuclear facilities including the NPPs. V. Romanov mentioned that over the period between 1991 and 2017, at nuclear facilities the only one fatal emergency took place (1997) (fig. 3).

The special attention was paid to proposal of the FMBA of Russia to the draft Fundamentals of the state policy in the field of nuclear and radiation safety for the period till 2025, and the justification of the participation of the FMBA of Russia in the State Program “Social and Economic Development of the Russian Arctic Area”.

The presentation of S. Zhavoronkin dealt with the involvement of the public in the process of decision making and SNF and RW management at the Andreev Bay STS. The participants were informed about the stages of research, analysis of the problem and risks of nuclear and radiation emergencies, and the recent BELLONA's publications were demonstrated, such as “The Atomic Andreev Bay”, “The Northern Fleet” and “The Atomic Arctics: Challenges and Decisions”. The special attention was paid to the participation of the public in the implementation of projects: public hearings, stationary and remote meetings of the Public Council under the SC Rosatom, regional and international Forum-dialogues, and organization and conducting technical tours to the sites of the Murmansk region.

The Director of the Andreev Bay SevRAO facility A. Krashoshchekov made a presentation on the development of the Russian-Norwegian cooperation program from the point of view of the Russian operator.

He described the key areas of the Russian-Norwegian cooperation over the recent 13 years (2005–2018), the main place among which take: radiation safety of the population and protection of the environment; development of remote tools, methods and criteria for monitoring of the performance reliability of workers of the companies involved in SNF and RW management (including the current monitoring of psycho-physiological conditions of persons of hazardous occupations); radiation health physics support of operations of SNF and RW removal from the Andreev Bay SevRAO site.

The presenter with satisfaction informed about the bringing of the radiation situation at the dry storage unit for the abnormal fuel (DSU 3A) in safe conditions. A.

Krasnoshchekov told about the completion of operations of collection, sorting and allocation of solid radioactive waste (SRW) for storage and conveying a batch of SRW to the Saida Bay Facility to reprocessing.

An important are of the cooperation is the development of regulatory documents to control the activity during the SNF and RW management at Andreev Bay. The professionals from FMBC play one of key roles in this sphere, when developing many regulatory documents with the Russian-Norwegian collaborative projects. The most relevant documents, among the developed ones, are: “Radiation safety during remediation of the sites of coastal technical bases (MU 2.6.6.22-05)”, “Hygienic Requirements for Radiation Safety of Workers and the Population during the Planning and Organization of SNF and RW Management at the SevRAO Branch 1 (R-GTPSevRAO-07, 2.6.1.29-07)” and some others.

The special place takes the science-based support of the use of the Information and Analytical System of Radiation Safety of Workers for the purpose of regulatory supervision of remediation operations at the Andreev Bay SevRAO facility, which is required to optimize operations of SFA discharging from DSU. The activities of FMBC within the Russian-Norwegian collaborative projects promotes the convergence of points of understanding between the regulator and the operator in the part of accomplishing the tasks.

The next part of the first working day was devoted to the description of the Russian-Norwegian collaborative projects, within which the professionals from FMBC work during 14 years, focusing on the ongoing projects.

The managers of the projects took the following presentations: A. Simakov (Radiation Health Physics Support of SNF and RW Removal from the Andreev Bay SevRAO Facility), V. Seregin (Ecological Assessment of the Environment at the Andreev Bay STS), K. Chizhov and Yu. Bragin (Scientific Support of the IAS RBP Use for the Purpose of the Regulatory Supervision of the Remediation Operations at the Andreev Bay SevRAO Facility) and A. Bobrov (Development of Remote Tools, Methods and Criteria for Monitoring of the Performance Reliability of Workers of Facilities Involved in Management of Spent Nuclear Fuel and Radioactive Waste) (fig. 4).

K. Siegien devoted her presentation to the approach of the Norwegian regulator to the development of the Russian-Norwegian cooperation Program. She described briefly the outcomes of the project activities and gave a



Fig. 4. The activities of the SevRAO Radiation Safety Service at the Andreev Bay site

high mark to the completed work in terms of improvement of the radiation safety regulation process for the purpose of optimization of radiation safety and protection of workers, the population and environment, enhancing the safety culture and increasing emergency preparedness and response.

The meeting was concluded by the report "Practical experience of regulation in the Andreev Bay SevRAO Facility", presented by I.A. Kemsy. He described briefly sites and facilities under the service of IRM-120 and then presented data on gamma dose rates in the area of the SevRAO impact and average annual individual effective dose to the personnel A group. The presentation describes the results of the determination of concentrations of manmade radionuclides in seawater and preliminary estimation of the drinking water quality in terms of the radiation safety parameters (fig. 5).

Based on these data and information about the natural population growth in the serviced region the conclusion was made that the remedial activity at the sites of the former coastal technical bases of the Northern Fleet and generation of conditions to store radioactive waste of the NWC SevRAO as at 2018 does not have a significant impact either on the environmental media, nor on the medical and demographic indicators and health indicators of the population.

The presenter considers it expedient to bring to the enterprises of the SC Rosatom and shipyards information about the developments of FMBC.

On the second day of the event, on June 6, a visit was made to the technical site of the Andreev Bay SevRAO facility. Before arriving at the former coastal technical

base of the Russian Navy, the participants stopped in the area of the right bank of the Zapadnaya Litsa, 70 km from Murmansk, where a dramatic memorial complex "Valley of Glory" was built on the site of the tragic and heroic battles of the Great Patriotic War, dedicated to the defeat of the German fascist troops in the Arctic. The Russian and foreign participants laid flowers to the complex of the military cemetery – the burial place of 6000 soldiers and officers who valiantly fought in the Murmansk direction, so that the enemy did not go further, deep into the country.

Upon arrival to the site in Andreev Bay, a briefing was held, after which, disguised as overalls, the participants arrived in the area of the demonstrated buildings and the stationary berth. The SevRAO prepared a program of movement through the site and survey of buildings and structures in advance.

During the technical tour at the STS site, a complex for SNF management (Building of the DSU sheltering – Building 153) was demonstrated. The Building 153 is intended to assure the safe SNF unloading from the DSU cells and the SNF loading to the transport radiation shield containers during the entire year. The Building 153 is a two-span heated building with an annex.

The existing DSU canisters, in the cells of which the cases with SFA are enclosed, one case in each cell, are located in the technological hall of the Building, and the DSU units 2A and 2B are in one span of the Building, and the unit 3A in the other. Moving of the reloading container and cases between the technological hall and the annex is done by means of a transfer trolley.

To assure radiation safety of the personnel and environmental media against potential contamination

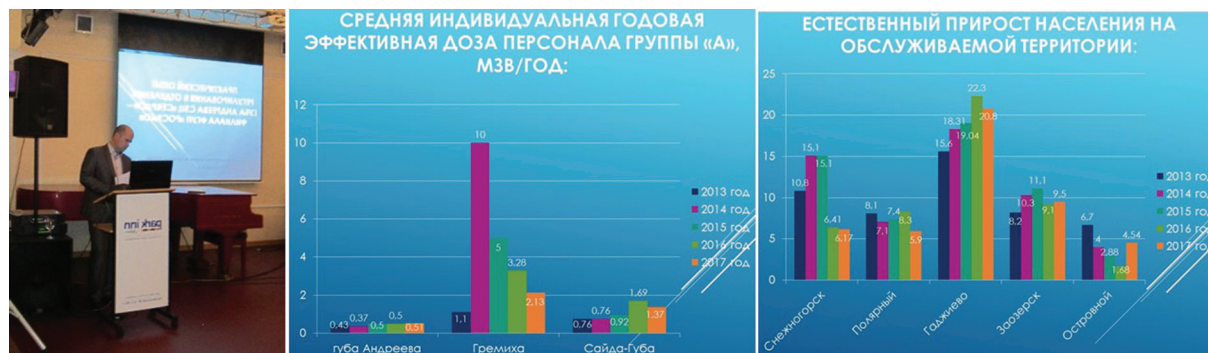


Fig. 5. Activities of IRM-120 under FMBA of Russia in the field of SevRAO radiation safety supervision. Doses to the A group personnel and demographic characterization of the population

in the Building 153, 2 areas are envisaged: periodically serviced premises intended for unloading SFA, collection and unloading of RW and the premises of permanent personnel stay throughout the whole shift. The sanitary pass (decontamination unit) is located between the premises of the first and the second areas.

The group visited the management post for SNF unloading operations. The SFA extraction post from the storage cells 2A with the reloading unit, the SNF re-shipment post and the loading point of the TPC was demonstrated. The TPC loading unit is located in the annex of the Building 153.

The technological operations such as preparation of containers for loading with SNF cases, loading of cases with SFA with the help of a reloading container and preparation of the loaded container for removal from the Building to the storage site by means of an automobile container carrier with the carrying capacity 50 t are carried out in the loading unit.

The infrastructure for assuring the radiation safety of the personnel was also shown (modular sanitary pass in the DSU area (Building 160), post of dose monitoring), special transport for transportation of transport packaging containers and a storage site for storage of TPC (Building 151).

The storage site of the TPC (Building 151) is designed for receiving from a container vessel and temporary storage of empty TPCs, and receiving and temporarily storing TPCs loaded with SNF. The storage site is designed to accommodate 48 TPCs (loaded or empty). The storage site is equipped with a bridge crane with a lifting capacity of 50 tons.

Also, auxiliary infrastructure facilities for management of spent nuclear fuel were shown, such as a diesel power plant (Building 13), the Building 154, intended for repair and decontamination of equipment.

After inspecting the infrastructure for SNF management in the premises of the training center, the members of the EGLM group were demonstrated software developed by the FMBC.



Fig. 6. Group photo of the participants of the EGLM meeting

The participants got acquainted with the operation of the information and analytical system for radiation safety of the personnel, the 3D radiation visualization software Andreeva planner and the programs of pre-shift psychophysiological monitoring of the personnel.

On the third day, June 7, the participants of the event, both members of EGLM, and the Russian specialists exchanged general impressions of the site visit. Each member of EGLM had the opportunity to express their impressions and ask questions to Russian specialists. The initial need for regulatory flexibility due to uncertainty was discussed:

- Performance-based rather than prescriptive;
- “Turning point” when site becomes “within standard regulatory framework”;
- Workers: Planned Exposure Situation;
- Public: Existing Exposure Situation.

The science based support was mentioned, including:

- Uncertainty-driven process;
- Identify issue / problem;
- Study situation;
- Develop way Forward;
- Issue new regulations if needed.

The significance of Innovative Science was stressed, including Dose Modelling, Characterisation assessment, Sensitive-job worker assessment.

In conclusion, as one of the lessons learned Multidisciplinary Nature of regulation was discussed. Each regulation parameter should be taken into account fully, especially in terms of threats: Radiological, Chemical, Nuclear, Environmental, Physical. Simultaneous consideration of all such threats is needed to identify the optimum solution. Need a structural, multi-disciplinary framework to assure appropriate assessment of risks, and development of management approaches.

At the end of this event, a meeting of EGLM members was held, devoted to the formation of recommendations on regulation taking into account international experience, drawing up the table of contents of the report, supplemented by the visit to the technical site, and the results of the meeting were summed up. Finally, the 7th EGLM meeting was completed (fig. 6).

In addition, within the event, at the second part of the day, on the 7th June, the bilateral meeting on the progress in the ongoing projects of cooperation between FMBC and NRPA was held.

The progress in the current tasks was discussed along with difficulties aroused, plans for the nearest months, and proposals of new collaborative projects for coming two years. Based on the outcomes of the bilateral meeting the protocol was signed including information on the ongoing projects and plans for the period 2019–2020.

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