

IBR™

Russian & NIS Nuclear Fuel Cycle Back-End Industry

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**Department of Nuclear Power Engineering & Nuclear Fuel Cycle
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New legislation, concepts, programs

ROSATOM to adopt in 2010 a concept for decommissioning uranium-graphite reactors

This year, State Corporation ROSATOM is planning to adopt a concept for decommissioning uranium-graphite reactors used for breeding weapon-grade plutonium, chief of the Department for contacts with public organizations Igor Konyshev said to reporters.

According to chief of the Department for handling of SNF and RAW and decommissioning of ROSATOM's nuclear facilities Yevgeny Kudriavtsev, that concept envisages localization of reactors with the expired service life in deep wells by means of unique compositions. "Without dismantling those reactors, we would create a protective shield around them in wells using cast concrete, which would ensure safe storage for many hundred years."

"The cost of burial for a single reactor is about 2 bn RUB. In the event of sufficient funding, safe burial of all thirteen Russian uranium-graphite reactors (the operating reactor is only one – at the Mining & Chemical Combine in the Krasnoyarsk Territory) could be completed by 2020-25."

Ye. Kudriavtsev supposes that funding should be provided by the government as responsible for solving the problems of Soviet nuclear legacy.

ROSATOM has elaborated a concept for NPS dismantlement program

Speaking at the international forum "Atomtrans-2009" in St. Petersburg (September 29), Deputy Director-General of ROSATOM said, in particular:

"Following the RF Government's instructions, ROSATOM has elaborated a concept for a program concerning dismantlement of nuclear-powered submarines (NPS) and surface ships with onboard nuclear installations as well as rehabilitation of coastal technical bases for 2015 and until 2020."

"In 2010, we would submit that program to the Government so that we could start its implementation in 2011. Under the current

program, 191 of 198 deactivated NPS would be dismantled until the end of 2010."

The concept for a new program includes jobs that were not finished during the current program, e.g. vessels providing technical support to nuclear-powered ships. Those vessels were brought to safe state afloat, but were not placed in the onshore storage facility. The new program also envisages dismantlement of surface ships with onboard nuclear installations. Three such ships are already removed from the Naval Forces."

"Besides, the new program deals with the conversion of three-compartment reactor blocks into single-compartment ones followed by putting them into long-term storage in onshore storage points. One of them is located in Saida bay; another would be built in Razboinik Bay in the Far-Eastern region."

"Rehabilitation of onshore technical bases would also continue. In particular, SNF would be removed from Andreev Bay and from Gremikha. We are expecting that conditioned and non-conditioned fuel would be removed from Gremikha in the framework of the current program. Cores from damaged reactors with liquid-metal coolant would be withdrawn in the following five years."

Important events concerning management and control bodies

Denis Kozyrev: The RosRAO image would be formed by 2010

Reorganization of RosRAO, a specialized enterprise for handling RAW, would be completed by the end of 2009, director-general of state enterprise RosRAO Denis Kozyrev stated at the international forum "Atomtrans-2009" in St. Petersburg.

RosRAO was established in 2008 based on fifteen special combines RADON, which were transferred to ROSATOM, and several other facilities and burial grounds. "For the past period, we manage to form a new enterprise from fifteen different organizations. This new enterprise faces new tasks, new volumes of jobs, and new markets. Until the end of 2009, RosRAO plans to finish elaboration of domestic regulations, solve problems relating to funding, spread electronic circulation of

documents to all subdivisions, and introduce information systems.

Boris Kovalchuk, Rosatom Deputy Head, has taken charge of “Inter RAO”

“Inter RAO EES” Board of Directors at a meeting held on November 25 elected Boris Kovalchuk, Deputy Director General of the State Corporation “Rosatom”, the acting Chairman of the Board.

B. Kovalchuk was appointed Deputy Head of the state corporation for development in April 2009. In “Rosatom”, he supervised over projects related to the development of non-core activities, including traditional energy and nuclear medicine. B. Kovalchuk is also a member of the “Inter RAO” Board of Directors. The former “Inter RAO” Head Evgeny Dod, on November 23 headed JSC “RusHydro” (integrating most of the Russian hydroelectric power plants and being under the state control), taking the place of Vasily Zubakin, then the acting Chairman of the Board. The staff reshuffle was dictated, among other things, by the accident at the Sayan-Shushenskaya hydroelectric power plant on August 17.

B. Kovalchuk, a son of Yury Kovalchuk, a shareholder of the “Rossia” bank, before taking his position at Rosatom, held the office of the Head of Top-priority National Projects Department in the RF Government.

Later, on December 10, Anton Badenkov, the former Head of “TVEL”, was appointed adviser to the Head of “Inter RAO EES”.

Anton Badenkov in 2006-2007 was the acting president of JSC “TVEL” Nuclear Corporation.

The terms of reference for the new adviser to the Head of “Inter RAO” are still under discussion.

Important events concerning enterprises and sites

SNF unloaded from damaged reactor at ZVEZDA

The Far-Eastern Plant ZVEZDA, in association with and under supervision of specialists from the Dollezhal Institute NIKIET, unloaded spent fuel assemblies (SFA) from the damaged

reactor of the deactivated nuclear submarine, serial No. 541, subject to dismantlement. In the course of that operation, which was held in October 2009 and took ten days, 58% of SFA were unloaded in compliance with the standard procedure, 36% required certain efforts stipulated for off-optimum situations, and 6% of spent fuel assemblies were left in the reactor “for the fear of their breakage above the upper plate level”.

At present, the damaged reactor is being prepared for isolation by means of a special furfural-based preservative agent that was developed at the NIKIET Institute. The reactor isolation is another measure for ensuring its safety in the course of long-term storage on a coastal site. The nuclear submarine, serial No. 541, is of project 675. The 39,000 hp power installation includes two 70-MW reactors VM-A. Nowadays, all submarines of the above project are withdrawn from the Naval Forces or deactivated.

Sevmash delivers first packaging set to Leningrad NPP

PA (production association) Sevmash has delivered a first packaging set UKH-109 for spent fuel storage to the Leningrad NPP. UKH-109 is the new type of packaging sets exceeding – by size – the previously supplied articles by almost a half: 2.4 m diameter, height of about 4 m, weight exceeding 80 t. A set of ampoules (144 pc.) delivered would be used for loading spent fuel elements.

Using UKH-109, the Leningrad NPP specialists would improve the fuel unloading procedure. UKH-109 was certified for conformity to specifications and documents in force in the nuclear industry. At present, Sevmash is producing 22 packaging sets, and 8 sets will be manufactured later. The enterprise plans to sign a contract for deliveries of 36 sets with the customer – Energoatom Concern.

Dry storage for SNF is ready by 70%

Deputy directors-general of ROSATOM Ivan Kamenskikh and Yevgeny Yevstratov supervised progress of two construction projects in Zheleznogorsk: a dry storage for SNF at the Mining & Chemical Combine and a heat & power plant. The MCC is among ROSATOM’s eight strategic enterprises as its site is used for fulfilling a number of significant large-scale projects. Therefore, deputy directors-general responsible for the project fulfillment are regularly visiting the construction

site. As of mid October 2009, the volume of building & assembly jobs completed at the dry storage-2 for SNF was 70% of the planned figure. Commissioning should take place in compliance with the schedule – in October 2010.

In the course of the inspection, the ROSATOM leaders noted that the delay in construction operations caused by the change of the general contractor had been overcome, which should lead to regular financing of the project in 2010. Besides, several decisions taken should help the MCC reach the key efficiency indicators specified for 2009. Dry storage-2 for SNF is being erected by BureyaGESstroy (general contractor), Department of special construction No. 9, and a dozen of building companies from Zheleznogorsk and Krasnoyarsk. Until the end of 2009, jobs worth 2.2 bn RUB were to be made. Construction of a dry storage for spent fuel from reactors RBMK-1000 and VVER-1000 at the MCC is financed in the framework of the Federal Target Program “Assurance of Nuclear and Radiation Safety for 2008 and until 2015”.

RosRAO to withdraw 700 cubic meters of RAW from Kurchatov Institute by January 1, 2010

Until the end of 2009, state enterprise RosRAO, the integrated national operator of RAW, would remove 700 cubic meters of RAW from the territory of the Russian Research Center “Kurchatov Institute”, director-general of RosRAO Denis Kozyrev said to the RIA Novosti Press Agency. In compliance with the contract signed, prepayment to MosNPO RADON (Moscow), which would act as a general contractor, was made.

Kola NPP: laboratory research of LRW cementing

Specialists from MosNPO RADON in association with colleagues from AREVA NP are testing the process of liquid radwaste (LRW) cementing at the Kola NPP's complex for processing liquid radwaste (LRW). The main task of this activity is determining a cementation formula for obtaining the final product – cement compound – conforming to specifications for solidified waste. According to foreman of the RAW handling shop at the Kola NPP Mikhail Stakhiv, the results of testing would be used later, during commissioning and operation of the cementing system.

Mounting of the LRW cementing system (the so-called installation A3) is also underway. In

the framework of the TACIS program, equipment for that system was delivered to the Kola NPP by a consortium of AREVA NP and SVERdNIIKhimash. Atomenergoprojekt (St. Petersburg) acted as a general designer of the processing complex. The LRW cementing system was to be commissioned in the end of 2009.

The LRW processing complex was put into operation at the Kola NPP in early 2007. It is intended for the following operations: (a) extraction of LRW from storage reservoirs, (b) purification of LRW from radionuclides, (c) concentration of radionuclides in the minimal volume, and (d) radionuclides transfer to the solid phase ensuring safe storage for 300-500 years. The technology applied at the LRW processing complex allows reducing fiftyfold the amount of RAW subject to disposal. In 2008, the project of that complex was given an award of the RF Ministry of Natural Resources as the best environmental project of the year. Similar complexes would be built at the Kalinin, Kursk, Smolensk, and Leningrad nuclear power plants. New projects of NPPs already envisage radwaste processing systems.

Industry news

EDC project to be sent for state examination in December 2009

In early December, the project for the Experimental Demonstration Center (EDC) for RAW processing should pass state examination. That was announced by Angelica Haperskaya, chief of the nuclear technology sector at ROSATOM's Department for handling of SNF and decommissioning of nuclear facilities, at the round-table discussion “Perspective SNF Management Technologies” that was held in Moscow as part of the Third International Conference ATOMECO-2009. The project concerning creation of an EDC for processing SNF of water-moderated reactors at the Mining & Chemical Combine is being fulfilled in the framework of the Federal Target Program “Assurance of Nuclear and Radiation Safety Until 2015”. According to A. Haperskaya, testing of equipment for cold test benches is underway. Construction of the EDC should start after the project approval, in 2010 or in 2011.

Technology news

Russia possesses technologies for SNF and RAW utilization in space

According to Igor Khamits, head of the research & design center at the Rocket & Space Complex ENERGIYA, Russia could put into orbit SNF and RAW for subsequent utilization.

“There are no technical problems for this. SNF and RAW might be put into high-altitude orbits where spacecraft could exist a hundred years. Besides, a certain orbit could be selected for those purposes. It will only require a certain sum of money.”

“Still, the above materials should not be put into geostationary orbits. The matter is that the geostationary zone is ‘packed’ with non-operating satellites, and additional ‘stuff’ is unnecessary.”

The ENERGIYA specialists suppose that SNF could be put into distant orbits and left there until reaching a safe condition or destroyed with microexplosions.

Economy

Atomstroyexport purchases Nukem Technologies

Atomstroyexport and German uranium trader Nukem GmbH closed a bargain on Atomstroyexport's purchase of Nukem Technologies GmbH, a Nukem GmbH subsidiary.

From the Russian side, the protocol was signed by first vice president of Atomstroyexport Alexander Glukhov, from the German side, by managing director and chief financial officer Dirk Martens.

Thus, Atomstroyexport, Russian operator of NPP construction abroad, acquired 100% of

the German engineering company Nukem Technologies.

During the ceremony, Alexander Glukhov said: “Demands for management of RAW and SNF as well as for decommissioning of nuclear power plants are growing in European countries and in South Africa. Nowadays, we can satisfy those demands using Nukem Technologies expertise along with reference technologies elaborated for the EU.”

The German engineering company specializes in handling of RAW and SNF as well as in decommissioning of nuclear facilities such as power, research, industrial and shipborne reactors and nuclear enterprises.

The contract on selling Nukem Technologies was signed by the companies on July 10, 2009. Some months were spent on buy-in actions.

Of most significant projects that were implemented by Nukem Technologies, the following are worth mentioning: construction of RAW processing center at the Bohunice (Slovakia), Balakovo, and Leningrad nuclear power plants, construction of a complex for processing and storage of solid radwaste at the Chernobyl NPP, and turn-key decommissioning of the Kahl NPP (Germany). Nukem Technologies also took part in decommissioning of the Ignalina NPP, which should be completed by 2011. In association with GNS (Gesellschaft für Nuklear-Service) Nukem should build there a storage facility for RAW.

Decommissioning of the Ignalina NPP was one of necessary conditions for Lithuania's joining the EU. Nowadays, Lithuania might face energy deficiencies.

According to the schedule, the Ignalina NPP would stop generating energy in late 2009. Lithuania is planning to build a new nuclear power plant, Ignalina-2, but terms of its commissioning are not determined as yet.

International cooperation

Russia's import of irradiated fuel assemblies (IFA) for storage and reprocessing in the 3rd quarter of 2009

No.	Supplier/commodity	Recipient	Date, supplied (m/y)	Net weight of cargo (IFA)/ Net weight of U in fresh FA, kg	Number of IFA, pc.	Price, \$/kg of heavy metal
01	Horia Hulubei National Institute of Physics and Nuclear Engineering / VVR-C	PA Mayak	07/2009	209.9 / -	70	-
02	Kozloduy NPP / VVER-440	PA Mayak	07/2009	51,840 / -	240	-
TOTAL:				-	310	-

Supplement 1 Roadmap for Establishing Unified State System for RAW Management

Development of systems for handling RAW and SNF as well as for solving the problems of decommissioning and nuclear legacy takes place in the framework of the Federal Target Program (FTP) "Assurance of Nuclear and Radiation Safety for 2008 and Until 2015".

That FTP envisages creation of RAW management infrastructure. Besides, the Program specifies the commencement of work relating to burial of high-level waste (an underground laboratory) and gives grounds for selection of sites (presumably seven) for interregional mortuaries of low- and medium-level waste. Sectoral facilities should form the basis for establishing a national RAW management system.

Though being a necessary condition, creation of infrastructure along with development of required technologies is not a guarantee for solving all specified problems. A system approach is needed, where preference should be given to efficient legal and normative regulation of issues pertaining to nuclear and radiation safety.

It is evident that full-scale solving of RAW management problems demands first creation of legal mechanisms that could put an end to the growing number of unsettled issues in the field of nuclear and radiation safety. The State Corporation ROSATOM specified establishment of a RAW management system as the priority task. The RF Government supported that initiative. In 2008, ROSATOM elaborated a draft law "On Handling Radioactive Waste", and its coordination with interested federal agencies began. It is expected that this draft law would soon be submitted first to the Government and then to the State Duma.

The draft law should harmonize the national legislation with the provisions of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, which was adopted by Russia in 2005. The subject of the draft law is regulation of relations that emerge while handling all radioactive waste formed (activities stipulated in the Federal law "On Nuclear Energy Utilization") as well as in the course of development, testing, operation, and dismantlement of nuclear weapons and military-use nuclear power installations.

The draft law aims at establishing legal grounds for handling all radwaste (accumulated and newly formed) including RAW management principles and procedures. To achieve this aim, it is envisaged to set up a unified state system for handling RAW (called "the USS" in the further text). The draft law specifies the basic principles for the USS, functions and authorities of the USS entities including those concerning safety control while arranging any kind of activity in the nuclear field as well as managerial, technological, financial, and economic bases of the USS functioning in the Russian Federation.

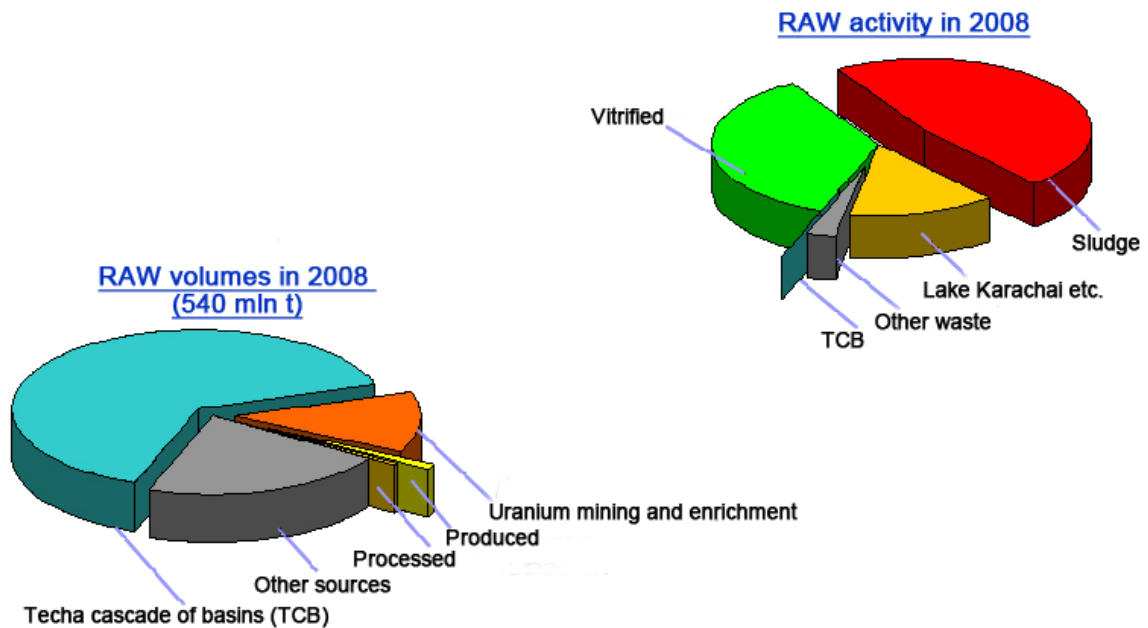
The major task of the USS is ensuring safe and efficient management of RAW including its compulsory burial. The USS should help create conditions, under which RAW producer would bear full liability for all radwaste formed. As to previously accumulated RAW, it would be put in storage in situ or in centralized storage points and the Government would provide financial support.

Elaboration of the above draft law (2007 thru 2009) along with the earlier research of RAW management principles (2004 thru 2006) were used while developing a Roadmap for establishing the USS. The Roadmap aims and tasks are as follows:

- develop the USS trends and programs;
- determine priority tasks for a short-term perspective.

Establishment of the USS is considered as a complex process, which includes legal, financial, economic, and scientific-technical aspects, and develops in a particular managerial, technological and financial-economic situation involving all persons engaged in utilization of nuclear energy.

Structure of accumulated RAW



Aim of the draft law on RAW management: activation of tools for solving accumulated problems and preventing their emergence in the future, using the following principles:

- priority to protecting human health (present and future generations), biological resources, and environment against hazardous impacts of RAW;
- reliable isolation (burial) of all radioactive waste;
- management of RAW is part of nuclear energy utilization;
- realistic RAW classification system;
- coordination of liability and property issues;
- introduction of RAW storage limits and RAW burial criterions;
- creation of financial mechanisms.

Key provisions of the draft law

- Management of RAW would be executed in the framework of the USS in compliance with the rules common for all organizations whose activity leads to formation of RAW.
- Management of RAW would aim at its compulsory burial. For that purpose, a special organization – National RAW Management Operator – would be established.
- Settlement of all issues concerning ownership of RAW and storage points as well as liability for safety.
- Creation of mechanisms reducing the volume of RAW formed.
- Financial support of safe management of RAW as long as dangerous properties are preserved, using radwaste producers' funds.

The Unified state system for RAW management covers as follows:

- federal authority agency supervising management of RAW;
- federal executive bodies supervising utilization of nuclear energy;
- federal executive bodies supervising safety during utilization of nuclear energy;
- state power bodies of Russian entities as well as local authorities executing their duties in the field of RAW management in compliance with this law or other pertinent legal acts;
- national operator;

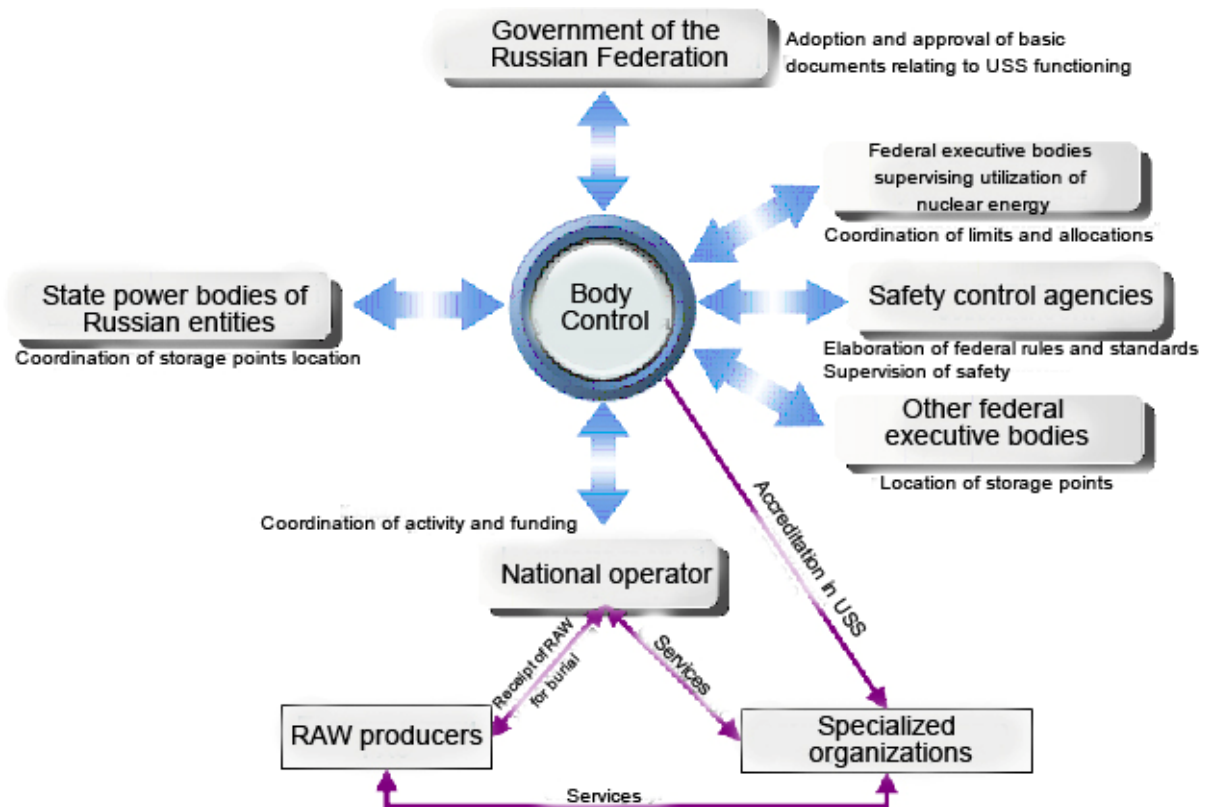
- radwaste producers;
- specialized organizations.

Work on a law on RAW management started over ten years ago. One draft law was declined by the President.

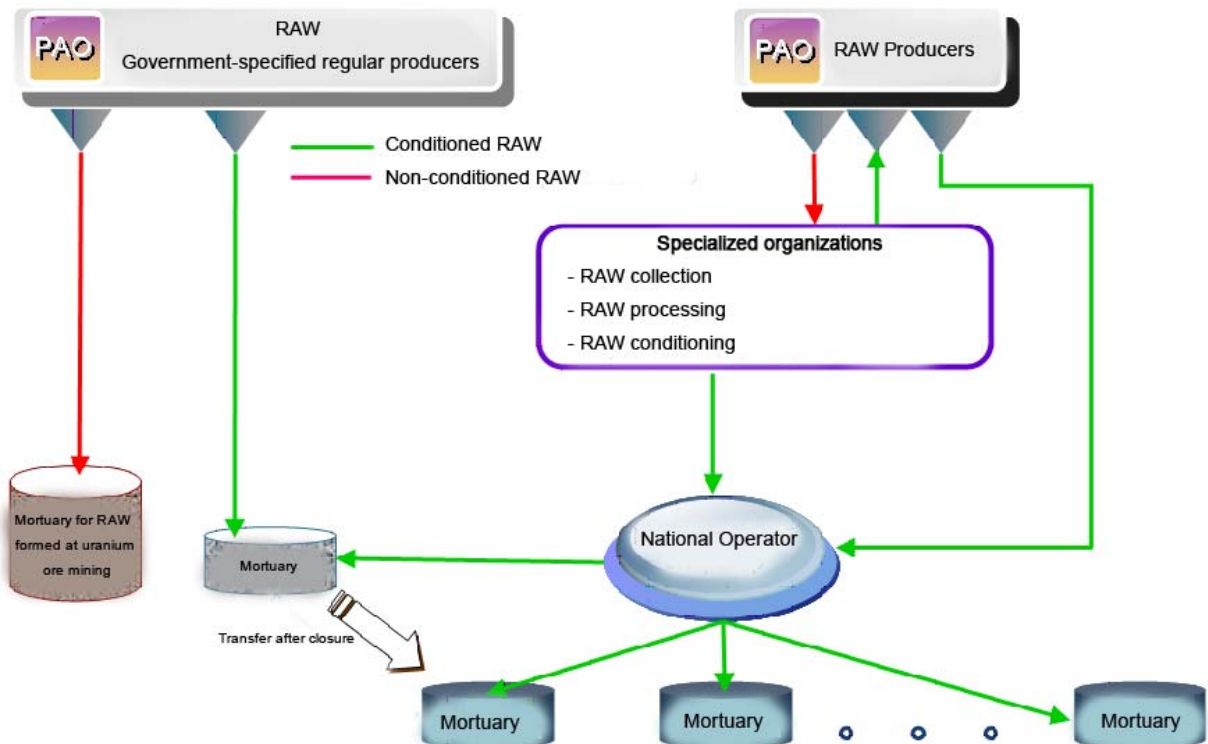
Legislative activity accelerated in 2008. The draft law proposed now contains some revised approaches.

ROSATOM experts are sure that if a law on RAW management is adopted, it would greatly reduce expenditure and risks in the given field.

Intercommunications in the USS for RAW management. Schematic



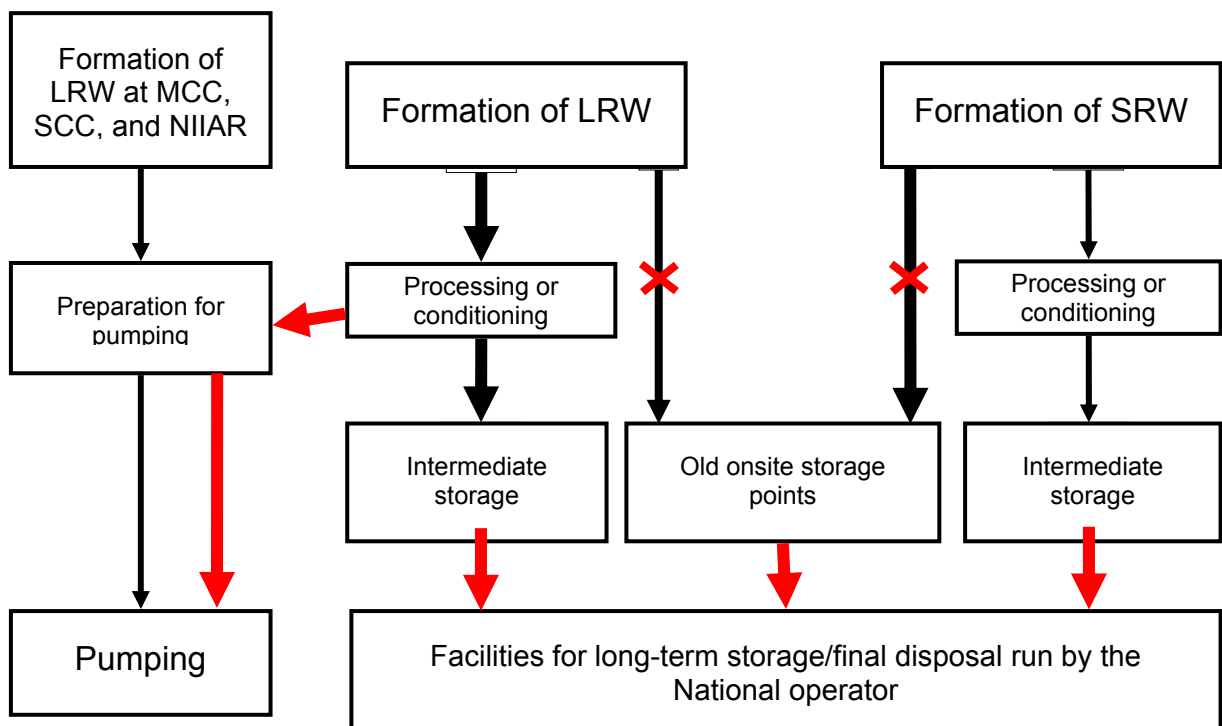
RAW flows in compliance with the draft law



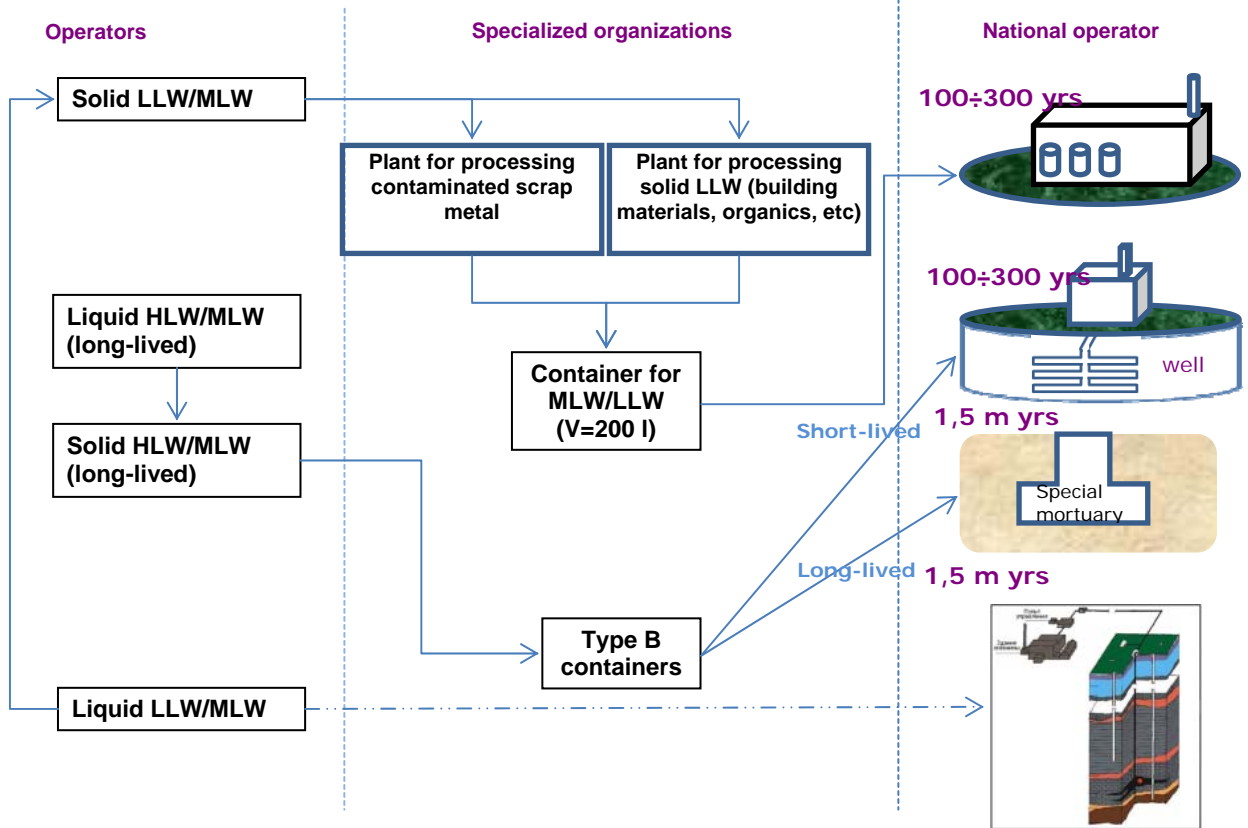
Priority tasks

- Elaboration and adoption of necessary legal acts, federal regulations and state standards.
- Formation of basic organizations of the USS.
- Creation of financial mechanisms, arrangement of funding.
- Coordination of different elements of the USS.

Management of RAW. Possible scheme



RAW management cycle

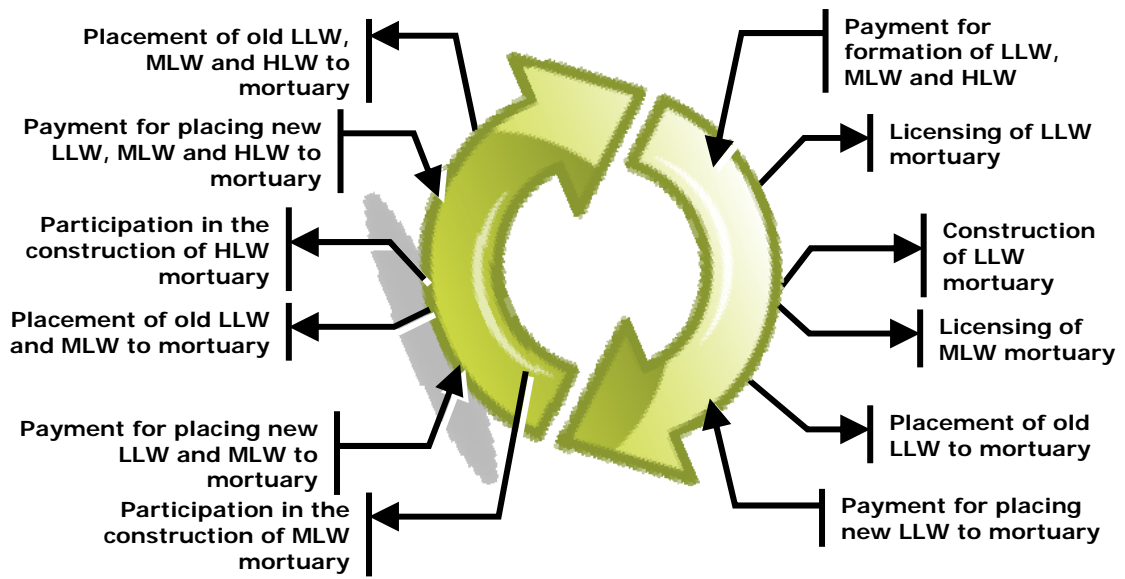


Financial and economic aspects of the USS for RAW management

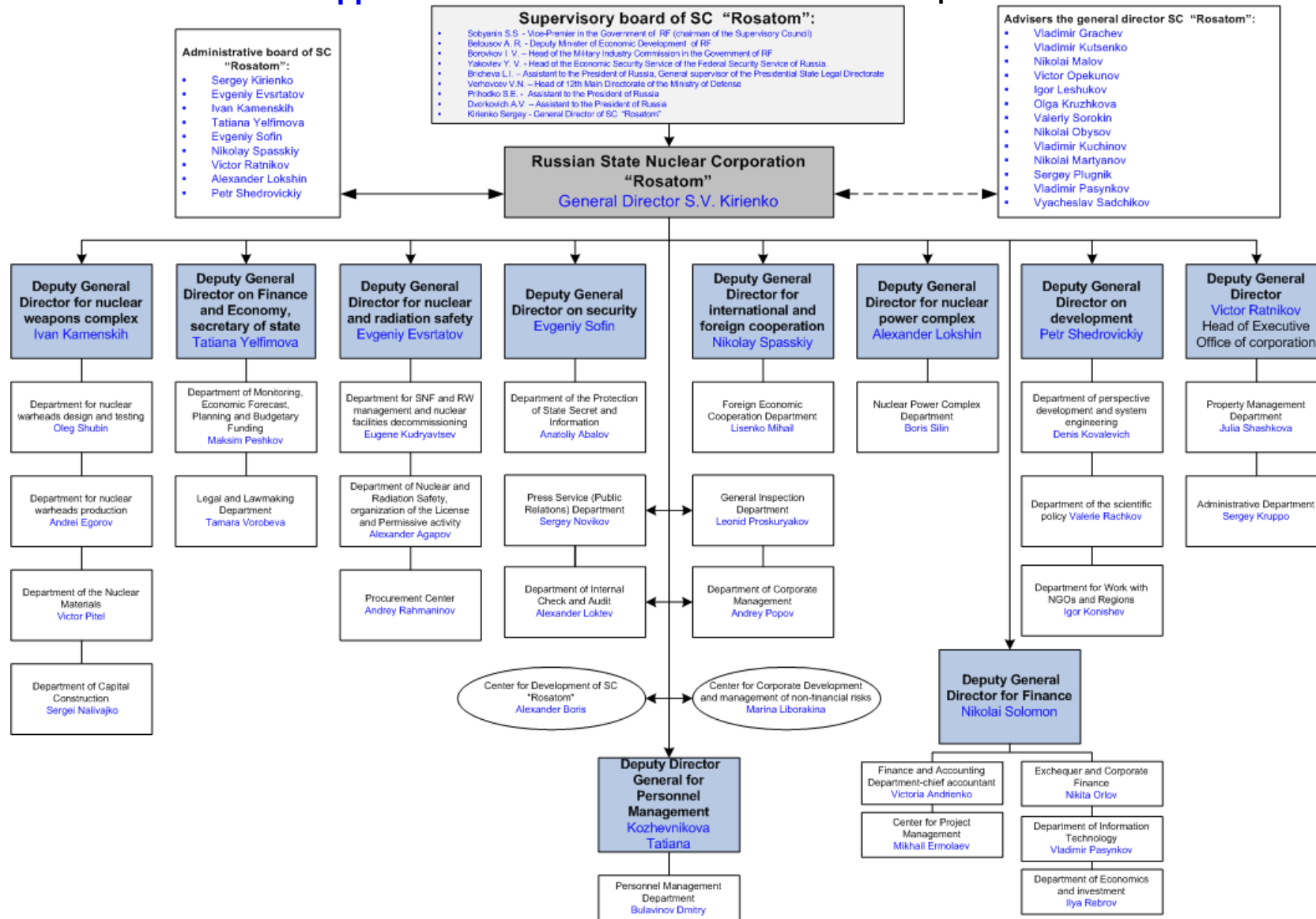
New structure of RAW management costs:

- Processing and conditioning.
- Conformity to admissibility criterions.
- Transportation.
- Burial:
 - Creation of mortuaries, operation of mortuaries, closure of mortuaries, after-closure monitoring (deferred charges).

Financing of RAW burial using ROSATOM's special reserves



Supplement 2 Structure Russian State Nuclear Corporation Rosatom



Supplement 3 Interview of First Deputy Director of SevRAO Vladimir Khandobin

Dismantlement of nuclear-powered submarines (NPS), rehabilitation of SNF storages, and decontamination of coastal technical bases earlier maintained by Russian Navy – these are examples of Russia's cooperation with foreign partners. In the Russian north-west region, the above work is carried out by a specialized state-owned enterprise called SevRAO (Northern federal enterprise for handling RAW).

– Vladimir Alexeevich, at what facilities does SevRAO focus its activity at present?

– Nowadays, the bulk of work is performed in three places – Andreev Bay, Gremikha Settlement, and Saida Bay. These three sites greatly differ from each other, not only by facilities located but also by the character of jobs to be performed in the near future.

The territory of the former coastal naval base in Andreev Bay accommodates spent fuel from over a hundred NPS. To start its removal to PA Mayak for processing, it is necessary to restore infrastructure for handling RAW and SNF. Work is complicated by the small size of the site and its contamination

The former naval base in the settlement of Gremikha also accommodates SNF in containers along with extractable parts of NPS reactor compartments. The settlement is located 400 km from Murmansk, and one can get there by sea only. After many defense enterprises had been shut down, living conditions greatly deteriorated, and no wonder that many residents moved to Russia's central regions. Therefore, we should protect existing facilities and remove as soon as possible all SNF and – if possible – solid RAW, using the experience of specialists that still live in the settlement. In the future, the territory would be rehabilitated until the "brown lawn" state (in-situ burial of radwaste).

A ground-based facility for long-storage, being at present constructed in Saida Bay, would incorporate all reactor blocks of dismantled NPS, which are now placed afloat to a temporary storage point. In the future, a complex would be commissioned there to process all SRW (solid radioactive waste) from Russia's north-west region. Since this complex is being built in conformity with modern requirements, it would be the safest from the radiation point of view.

– Could you call most significant projects being fulfilled with the help of foreign countries?

– First of all, it is necessary to mention large work that was done in Andreev Bay to restore infrastructure that had been completely destroyed by 2000.

Norwegian partners were the first to come to the rescue. They provided funds for the personnel's work, without which rehabilitation of the base would be impossible. An administrative building with amenity rooms was built on the site. Besides, the water line and a 15-km section of the road to the engineering area were restored. Somewhat later, other nations such as Sweden, the Great Britain and Italy as well as the European Bank for Reconstruction and Development joined the project.

The matter of great importance was ensuring radiation safety for people. Using British financial aid, we built two mobile and two stationary decontamination stations for people, two sites for equipment decontamination (one of them rated for year-round work), and introduced an automated system to monitor a radiation environment in the whole territory. Altogether, Norway, Sweden, and Russia spent 120 mln RUB on creating a system of physical protection and control of nuclear materials.

Nowadays, the site is prepared for erection of infrastructure facilities for handling RAW and SNF. The berth is being restored; old buildings are demolished with the exception of the building that was turned into a laboratory and the notorious building 5 (storage of SNF). In a year or two, we should select an option for its decommissioning. At present, this building is being prepared for repair to prevent degradation of structures and ensure safety for the personnel working inside the building or close to it.

– Please give a detailed account of infrastructure for handling SNF and RAW in Andreev Bay and in Gremikha. When are you going to start removing spent fuel?

– Using French, Russian, Eurocommission's and EBRD's funds, we repaired in Gremikha a dock, a diesel electric plant, and industrial buildings. Besides, we introduced a physical protection system and took certain actions aimed at localization of radioactive sources and normalization of radiation environment on the open SRW storage site. Of jobs being performed at present, I would mention repair of the SRW storage facility, transfer of SNF in containers from the open site to the accumulation

site, and reconstruction of a special vessel for SNF removal. I hope that this year we would be able to send a first train with spent fuel to Atomflot and then, by rail, to PA Mayak for processing.

Start of SNF removal from Andreev Bay is scheduled for 2014. This spent fuel would be also transported by sea to Atomflot as bridges and roads to Murmansk are not rated for such cargoes.

Now, using British funds, specialist are preparing a detailed design for an SNF processing complex, where spent fuel would be reloaded from dry storage blocks and re-packed for transportation. It is a large building, sized 140m x 60m x 18m.

Unloading of SNF is a dangerous operation. To minimize radiation risks for the personnel, special transshipment equipment is being developed in Italy. For its decontamination, a technological building would be built as part of the SNF processing complex.

Creation of the above complex demands a good number of builders. To ensure good working conditions, a construction camp would be arranged. Prior to the start of construction, it is necessary to improve radiation environment in the dry storage block, i.e. provide biological protection. Elements of such protection are being designed now at the machine-building enterprise Zvezdochka.

– *What are relations with donor countries? What partner is easiest for contacts?*

– We have established mutually understanding relations with all foreign partners. Working with Norwegians is easy because their system is simple. After Storting (the parliament of Norway) has adopted our projects and their total value, necessary reserves are transferred via Norwegian Ministry of Foreign Affairs to the governor of province Finmark, our direct partner. In the course of work, we apply to the Norwegian side for reserves for the next month. At the end of each month, we report on the application of proceeds. Each month, a Norwegian official inspects work performed.

However, many donor countries do not practice advance payments, which causes certain problems. As dollar and pound rate relative to ruble is gradually decreasing, a sum received after job fulfillment may one day appear insufficient for covering all expenses. Besides, prices for building materials, e.g. concrete and metal, are quickly rising, and hedge buying seems expedient, taking into account the volume of work. But as we have no spare money, our contractors experience financial risks.

– *Could you enumerate basic Russian partners of SevRAO?*

– Various Russian organizations took part in fulfilling our tasks. Design solutions and scientific support are provided by the general designer – VNIPIET (Research & Design Institute for Complex Power Technology, St. Petersburg), NIKIET (Dollezhal Research & Design Institute of Power Engineering), Russian Research Center “Kurchatov Institute”, Russian State Scientific Center “Physics & Energy Institute”, Afrikantov Special Design Office, etc.

Last summer, MosNPO RADON helped us to process liquid radwaste from reservoir 2B of the dry storage block. We hope that we would be able to use experience of RADON specialists, e.g. during rehabilitation of building 5.

– *Does your activity find support of the Murmansk administration and of the public?*

- As to the Murmansk regional government, we maintain close ties. We launched together all initial projects. The Murmansk administration still acts as the third party in signing SevRAO contracts with Norway and Sweden, thus undertaking an obligation to check purposeful use of funds.

We managed to establish friendly relations with local public organizations as well. In the beginning of jobs in Andreev Bay, local mass media was displeased because people lack actual information about our activity and did not realize its significance. A joint Russian-Swedish project on public relations helped improve the situation. We found the right way for providing local citizens with information about our work, we make contacts with mass media closer by inviting reporters to construction sites, and gradually they began to give true information. Besides, data on the progress of our projects regularly appear on the Murmansk government's site called *Kola Atom*.

Supplement 4 Interview of first deputy director general of PA MAYAK Yuri Glagolenko

Last year, PA (production association) Mayak marked its 60th anniversary. Production successes in the beginning of Mayak's activity were accompanied with contamination of the environment and caused serious ecological problems. The Federal Target Program "Assurance of Nuclear and Radiation Safety for 2008 and until 2015" (called "the Program" in the further text) attaches particular attention to solving these problems. First Deputy Director-General of PA Mayak speaks about the FTP progress.

– Yuri Vasilyevich, what Mayak facilities are focused by the Program?

– Our tasks in the framework of the Program are determined by the history of the enterprise and by its particular features.

PA Mayak is an engineering & technical complex incorporating reactor, radiochemical, chemical-metallurgical, and isotope plants, facilities for processing high-level waste (HLW) as well as research subdivisions and a number of auxiliary services.

Mayak is the pioneer of Soviet nuclear industry. Our history began on June 19, 1948, since commissioning of Eurasia's first reactor "A". Forced development of Mayak for reaching parity in nuclear weapons brought about heavy environmental problems caused by regular discharge of liquid radwaste (LRW) into the Techa River in the 1940s-1950s and operation of special basins for LRW storage (the Techa cascade of basins - TCB) as well as by the accident of 1957 and some other emergencies. To improve the situation, we have arranged ramified monitoring on the industrial site and in the radiation control area. That monitoring system is being constantly improved and modernized.

The adoption of the Program helped us concentrate efforts on ensuring nuclear and radiation safety at hazardous facilities that were either objects of the Soviet nuclear legacy or appeared as a result of Mayak's current activity.

Issues requiring particular attention are as follows: (a) improvement of processing methods that should lead to reduction and – in perspective – to elimination of LRW discharge into industrial basins, (b) handling of RAW that were accumulated during fulfillment of defense programs, (c) isolation of special basins used for storage of medium-level waste (MLW), and (d) development of plants for deep processing of all types of LRW. In addition, we are considering creation of a surface storage for solid radwaste (SRW) conforming to all modern requirements.

One more rather acute issue is possible regulation of the TCB level depending on yearly precipitation. To solve this issue, we decided to create a combined sewerage system including regulating sills at dam V-11 that closes the TCB.

As you can see, we are to carry out a great volume of design, engineering, technical, building, and assembly jobs. Over 14 bn RUB would be allocated to fulfillment of all actions envisaged in the Program for solving the Mayak problems.

– Could be tell us about the basic measures for enhancing the level of safety? What is already done?

– Due to its large scale and a rather short period specified for each stage, the Program demanded new forms of planning and control for the whole scope of work. Now it started bringing results.

I will mention most significant measures that should improve the environmental situation on the industrial site and enhance nuclear & radiation safety.

First of all, it is everything associated with the TCB. The main problems here are as follows: possible overflow of basins, destruction of dam P-11, and radionuclides filtration from basins into the open hydrographical network.

Reconstruction of dam P-11 was completed in 2007. It included installation of an anti-filtration screen "wall in ground" from a mud fill as well as an anti-filtration screen from metal piles, and strengthening of the downstream side. The above actions helped raise the dam stability (including filtration) and increase the free volume of cascade basins.

Creation of a combined sewerage system also continues. Fulfillment of this project would reduce input water to 5 million cubic meters a year. The first stage of the sewerage system would be commissioned this year.

Another important aspect is elaboration of purification methods allowing processing of unbalanced water of the TCB. The corresponding research has showed that the barometric water purification scheme is most optimal for all technical-economic parameters. In particular, the membrane technique helps obtain purified water with the activity of less than one intervention level by Sr-90, which allows directing it to the open hydrographic network. Life tests for the above method, which are scheduled for 2009-10, should help prepare initial data for the design of a large-scale plant.

Isolation of basins such as V-9 (Lake Karachai) and V-17 (called Staroe Boloto – Old Swamp) as storages for medium-level LRW is of great importance.

Isolation of V-9 started in the 1970s. By present, over 80% of the water area is closed with rock and special blocks, which ensured localization of 95% of the basin activity. This work should be finished by 2015.

The project for V-17 isolation was elaborated in 2007. This year, we are expecting to make an examination and approval of design estimates. In the course of the basin isolation, the technical solutions applied while isolating basin V-9 would be used as well. Finish of work is scheduled for 2023.

– *What is the state of things with the RAW management system?*

– Improvement of the RAW management system is an important aspect of the Federal Target Program in question.

PA Mayak is engaged in RAW processing since 1987 by turning waste into sodium aluminum phosphate glass in direct-fired kilns. Melters EP-500 provide for full processing of currently formed waste and partial processing of accumulated waste. At present, about 25×10^3 cubic meters of HLW have been processed. The resultant glass melt included 5.3×10^{11} Ci of β -activity and 7×10^9 Ci of α -activity. In March 2007, one more kiln, EP-500/4, was put into operation. To ensure continuity of the RAW processing, a decision was taken to elaborate two considerably updated versions of kilns: EP-500/5 and EP-500/6.

To ensure processing of RAW, which were accumulated while fulfilling the state defense order, it is necessary to improve LRW vitrification technology with the help of the cold crucible technique. This year, we would build an experimental test bench for testing pattern solutions, whereupon we would prepare initial data for designing a pilot industrial installation.

Cementing is chosen as the basic method for processing medium-level waste formed as a result of Mayak's current activity. R&D work being conducted now should help improve the technology and conduct tests of separate units of the future pilot industrial installation. Manufacture of that installation would start this year.

While handling low-level waste, preference is given to the partially tested membrane-sorption purification technique. After creating a pilot installation (this is scheduled for 2010), and conducting life tests, the results obtained would be used to determine initial data for designing a pilot installation of higher capacity.

– *With what organizations do you cooperate while fulfilling the Federal Target Program?*

– PA Mayak has vast experience of long-term and fruitful cooperation with leading Russian research, design, and building organizations such as VNIINM (Russian Research Institute of Inorganic Materials), NIKIET, Institute for Safe Development of Nuclear Power Engineering, Reactor Institute, VNIPIET (St. Petersburg), Afrikantov Special Engineering Design Office (Nizhny Novgorod), Sverdlovsk Research Institute of Chemical Engineering, etc. Concentration of scientific and engineering force allows us to feel confidence while realizing different stages of the Program.

On the other hand, the Program fulfillment would help PA Mayak to reach a new stage of development. Really, one of the Program tasks is forming an attractive image of the oldest nuclear enterprise not only for specialists but also for the public at large, which does not always receives true information about the current situation and plans of development relative to PA Mayak and to the national nuclear sector.

We realize that speaking about large-scale nuclear power engineering under modern conditions is useless if there is no clear-cut position of State Corporation ROSATOM and its subsidiaries on perspectives and – which is really vital – on safe development of Russian nuclear industry.