PROBLEMS ON SHIPPING HIGH-ENRICHED NUCLEAR MATERIALS

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ПРОБЛЕМЫ ПЕРЕМЕЩЕНИЯ ВЫСОКООБОГАЩЕННЫХ ЯДЕРНЫХ МАТЕРИАЛОВ

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INTRODUCTION

On Semipalatinsk test site territory there are two reactor complexes of IAE NNC RK. They were created in the 60-s and 70-s in order to conduct tests under the programs of developing nuclear rocket engines and power propulsion plants. During more than 30 years of operation at these complexes a considerable amount of nuclear materials. Basically this is highly enriched fuel of experimental reactors of nuclear rocket engines manufactured by GosNII NPO "LUCH". In 1993 after the Republic of Kazakstan joined the Treaty on Nuclear Weapon Non-proliferation the preparation of reactor complexes for putting under IAEA safeguards. Along with this there appeared certain problems related to the fact that at the complexes there were Russian nuclear materials. For solving these problems and in order to provide with safe operation of the reactor complexes and to perform scientific researches there certain departments of Kazakstan and Russian in coordination with the IAEA decided to handle a part of Russian nuclear materials to Kazakstan and take the rest of the materials to the enterprises of Russian MINATOM. In 1996... 1998 all Russian nuclear materials were taken out of IAE NNC RK. In this report there are basic tasks related to the performance of this work.

BASIC TASKS

1. Preparation of Russian nuclear materials (NM) kept at IAE NNC RK for transportation.
2. Accounting and control of Russian nuclear materials kept at IAE NNC RK.
3. Arrangement of permit papers for NM transportation.

4. NM transportation from IAE NNC RK to the enterprises of Russian MINATOM.
5. Provision of nuclear and radiation safety in the course of operations with NM.
6. Provision of physical protection for Russian NM.

ARRANGEMENT OF WORK

Work was performed by different organizations of Kazakstan and Russia. The main of them were:

- Institute of Atomic Energy NNC RK – NM preparation for transportation; arrangement of permit, accounting and accompanying papers; provision of nuclear and radiation safety in the course of operations with NM; provision of NM accounting, control and physical protection;
- State scientific-research institute of scientific production "LUCH" – development of technology for NM experimental item dismantling; receiving and storage of non-irradiated NM; provision of nuclear and radiation safety of NM in the course of storing; provision of accounting, control and physical protection of NM;
- Russian Federal Nuclear Center VNIITF – NM transportation; arrangement of permit papers for transportation; provision of NM nuclear and radiation safety and physical protection in the course of transportation;
- Sverdlovsk branch of NIKIET – receiving and storage of irradiated NM; provision of NM nuclear and radiation safety in the course of storage; provision of NM account, control and physical protection;

General control of all the work was performed by the National Nuclear Center of the Republic of Kazakstan from Kazakstan part and by the Department of development and design of atomic reactors and laser facilities of Russian MINATOM from Russian part.

Interaction of the participating organizations with IAEA was performed under control of Kazakstan Atomic Energy Agency (KAEA) and Department of International communications of Russia.

PREPARATION OF RUSSIAN NM FOR TRANSPORTATION

After a part of NM was given to Kazakstan all Kazakstan and Russian NM were placed in separated repositories. Basic amount of Russian nuclear materials that were subject for moving out was in fuel assemblies of the experimental reactors. Totally it was supposed to dismantle 221 irradiated fuel assemblies and 64 non-irradiated. 138 kg of Irradiated uranium-235 and 44 kg of non-irradiated uranium-235 were expected to be taken from the assemblies and packed into transport canisters. Below are basic activities performed in the course Russian NM preparation for transporting:

- Design and coordination between organizations – co-executors of the operations schedule;
- Design and coordination of transport canisters including technical parameters of casks of the Russian Nuclear Center VNIITF and transport reloading equipment of IAE NNC RK and SF NIKIET used in operations with irradiated NM;
- Specifying and coordinating of technologies for dismantling the experimental items and taking NM from them;
- Manufacture of transport canisters and necessary technological equipment;
- Reactor RA core unloading;
- Experimental item dismantling, NM pulling out and packaging into transport canisters;
- Development and coordination of technological process of NM canister load into casks;
- NM canister loading into casks, cask loading onto special cars;
- Development of accounting and accompanying documentation.

All the mentioned operations were performed basically at IAE NNC RK in 1995... 1998.

PROVISION OF ACCOUNT AND CONTROL OF RUSSIAN NM KEPT AT IAE NNC RK

All work on NM preparation for moving out (including accounting of NM shipped) was done under control of GosNII NPO "LUCH" representatives. After shipping a NM party to enterprises of Russian MINATOM, at IAE NNC RK a specially assigned commission that included GosNII NPO "LUCH" and IAE NNC RK representatives made physical inventory of the rest of NM. Since at the reactor complexes there are Russian NM temporarily stored and they are not subject to IAEA control KAEA, MINATOM of Russia and IAEA representatives developed a special procedure allowing simultaneously to implement IAEA safeguards to Kazakstan NM and to prepare Russian NM moving out. This was done in order to help IAEA safeguard applications in relation to Kazakstan NM under condition that at the complexes there are Russian NM that are not subject to IAEA control. MINATOM representatives agreed to IAEA seals use (in addition to Russian seals) at the places of Russian NM storage. When there is a necessity of opening Russian NM repositories GosNII NPO "Luch" representative took the seals away having informed IAEA of that preliminarily.

ARRANGEMENT OF PERMIT PAPERS FOR NM TRANSPORTATION

Permit papers were arranged according to valid legislation of Kazakstan and Russia. From Kazakstan part solving of this task was assigned to IAE NNC RK. From the Russian part it was assigned to the Russian Nuclear Center of VNIITF. An example can be the following procedure of obtaining permission for NM moving out of Kazakstan:

- Ministry of Science – Academy of Science of the Republic of Kazakstan requested the Government to give a directive to corresponding departments to prepare a license for moving NM out;
- Kazakstan Government gave an instruction to the Ministry of Economics and Trade to issue a license in preset sequence;
- Via Kazakstan Atomic Energy Agency IAE NNC RK asked the Ministry of Economics and Trade of the Republic of Kazakstan to issue a license for NM moving out;
- IAE NNC RK arranged a freight customs declaration for moving NM out. Then IAE NNC RK handled this declaration to a corresponding organization of Kazakstan customs when NM were crossing customs border of the Republic of Kazakstan;
- The atomic energy agency of the Republic of Kazakstan controlled NM moving out.

The basis for performing the mentioned procedure was corresponding agreements between the Ministry of Science – Academy of Science of Kazakstan and Atomic Energy Ministry of Russian Federation. The other basis was the agreement between IAE NNC RK – the shipper of NM and Russian Nuclear Center of VNIITF – the carrier of NM.

NM TRANSPORTATION FROM IAE NNC RK TO ENTERPRISES OF RUSSIAN MINATOM

NM transportation was performed by automobile transport of Russian Federal Nuclear Center of VNIITF. This allowed to considerably reduce the cost of transportation in comparison with railway transport and to take the cargo in IAE NNC RK repository and take it directly to NM repository in the point of destination. With this hazardous NM reloading at railway stations was excluded. In 1996 all non-irradiated NM were moved to the repository of GosNII NPO "LUCH". In 1996... 1998 all the irradiated NM were moved by three parts into the repository of SF NIKIET

PROVISION OF NUCLEAR AND RADIATION SAFETY IN THE COURSE OF OPERATIONS WITH NM

During NM preparation for moving out of IAE NNC RK and receiving at GosNII NPO "Luch" and SF NIKIET the nuclear and radiation safety was provided with special equipment, observing valid standards and rules of work with nuclear hazardous and radioactive materials.

For nuclear and radiation validation safety in the course of NM transportation Russian Federal Center selected and certified casks, considered and analyzed different standard and accident situations that can arise during transportation. Also there were made calculations confirming transportation safety. NM transportation was performed according to the requirements of Kazakstan Atomic Energy Agency and Russian Federal Organization Controlling nuclear and radiation.

PROVISION OF RUSSIAN NM PHYSICAL PROTECTION

Physical protection of Russian NM kept at IAE NNC RK in the course of their preparation for moving out was performed by NM repository structures, perimeter of the reactor complex protected area, access and detection control system in NM repositories. Also it was provided with observing the instructions of standard documentation valid at IAE NNC RK as well as with the division of a military unit of home military troops of Kazakstan Ministry of Home Affairs.

NM physical protection in the course of transportation was provided by cask structures, special armor cars carrying NM and by the division of a military unit of home military troops of Russian Ministry of Home Affairs.

Beforehand Russian Nuclear Center in cooperation with the Russian military unit guarding NM shipment performed reconnaissance, arranged documentation and implemented the shipment routes Kurchatov – Podilsk (3700 km) and Kurchatov – Zarechny (1800 km). Kazakstan Committee of National Security, Kazakstan Ministry of Home Affairs and Kazakstan Customs Committee developed a special procedure allowing an armed military division of Russia to enter Kazakstan territory with military equipment and operational task relating to guarding the cargo transferred. In the course of NM transportation the interaction of a military unit of Russian internal troops with competent organs of Kazakstan and Russia along the shipment route.

CONCLUSION

As a result of the operations performed, all NM declared by Russian Federation were taken from IAE NNC RK to the enterprises of Russian MINATOM. The amount of them was 182 kg of uranium-235. This contributed to successful application of IAEA safeguards at reactor complexes of Semipalatinsk test site. The organizations participated gained the experience of activity on transportation of highly enriched NM. This experience can be used in conversion of nuclear facilities.

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