

# **Major achievements and current state of activities under the Russian Programme for Comprehensive NPS Dismantlement and Remediation of Radioactively Contaminated Sites**

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During last 10 years of operation of the IAEA Contact Expert Group (CEG) it provided a lot of support in the area of resolution of the Cold War Nuclear Legacy problems. We could be proud of this because we achieved a lot helping to the Governments and to the decision makers. We may remember that the idea of the MNEPR Agreement was brought up at the CEG meeting, and later CEG greatly facilitated the negotiations of the Agreement, which after it's signing, established a mechanism for international co-operation with Russia. This is a great achievement of CEG, because Northern Dimensions Environmental Partnership (NDEP) and G8 Global Partnership Programme Against the Spread of Weapons and Materials of Mass Destruction (GPP) are based on MNEPR.

Nuclear submarine (NS) dismantlement recently gained a good progress. Current status is illustrated by Table 1.

**Table 1**

**State of NS dismantlement as of 1 October 2006**

	<b>Total</b>	<b>Northern Region</b>	<b>Pacific Region</b>
NS retired from the Navy	197	120	77
NS dismantled	137	92	45
NS under the dismantlement	25	11	14
NS waiting the dismantlement	32	16	16
Sunken and accident NS	3	1	2

In 2005-2006 two spent reactor cores (SRC) of the Alfa-class submarine reactors have been defuelled. This is an outstanding achievement. Practically complete overhaul of the engineering infrastructure of the SRC unloading complex in Gremikha has been accomplished for provision of safe unloading of SRC. In spite of the fact that similar operations were not conducted since 1992, a team of experts from several Russian organisations under the leadership of SevRAO enterprise successfully solve this task and conducted safe defuelling of the Alfa-class reactors. One more reactor will be defuelled next year.



**Figure 1. Preparation of the Alfa-class submarine for defuelling**

One of the major challenges is provision of safe isolation and long-term storage of two submarines that are stored in the Pavlovsky Bay in the Far East Region of Russia. About two decades ago these submarines experienced severe accidents resulted to heavy radioactive contamination of the submarines even now, that makes it impossible to unload the fuel from the reactors. These submarines are stored afloat contaminating the bay and posing high risk of radioactive release to the environment. According to conventional concept of the accident submarine handling, they should be isolated in specialised shelters that will be built on the shore. Design of such facility was developed and it is being reviewed by the Russian regulatory authorities. However, the total cost of this project is more than 40 million US\$, and international assistance is needed.



**Figure 2 Accident submarines in the Pavlovsky Bay**

Another important problem is dismantlement of nuclear powered surface vessels. In total five such vessels were build in Russia. As of today two of them are withdrawn from the service and are to be dismantled. One of them – nuclear cruiser "Admiral Ushakov" – is stationed in

Severodvinsk and the other one – "Ural" located at the Far East. SNF is not unloaded from the reactors of these vessels. Provision of their safe storage afloat becomes more and more difficult. There is not experience in dismantlement of such vessels. Currently documentation for unloading the fuel from the reactors is being developed. Italian Government agreed to finance SNF unloading from the reactors of the Admiral Ushakov cruiser and for preparatory work for her further safe storage afloat. However, funding for the future dismantlement of the cruiser is not available. International assistance is required and cooperation of several donors is desirable.

One of the tasks of the Comprehensive NS Dismantlement Programme is the dismantlement of nuclear service ships (NSS). Today 15 NSS are withdrawn from the service. These ships were used for maintenance of nuclear submarines and nuclear icebreakers. In many cases compartments of these ships where SNF and RW were stored are heavily contaminated. According to the adopted concept of their dismantlement at the first phase the ships should be prepared for storage afloat at least for 5 years. In 2006 preparation of 4 NSS was done. During actual dismantlement of NSS in the future a large amounts of solid RW (SWR) will be generated, and for treatment of these waste Regional waste management centres are to be established. Therefore, only when these centres are available dismantlement of NSS could be started.

A special issue is NSS "Lepse" with more that 600 SFAs on board. The project on the Lepse dismantlement has been discussed since long ago, but actual work on it started only recently: development of the design for SNF discharge from the ship is performed with a good pace. Hope that NDEP Operational Committee supports allocation of funding for the further Lepse dismantlement.



**Figure 3. Floating technical base "Lepse"**

Very successful project was implemented at the Atomflot site - cask storage facility for unprocessable SNF from icebreakers was built there. This SNF currently is stored on board

of the NSS "Lotta". The whole project was financed by the UK Government. 52 metal-concrete casks for this facility are being manufactured now and later SNF from the Lotta ship will be transferred to these casks.



**Figure 4. Storage facility for unprocessable SNF at the Atomflot site in Murmansk**

Final stage of the NS dismantlement is placing of the reactor compartments (RC) in coastal storage for further keeping them there for 70 and more years. Until recently all RC resulted from the NS dismantlement were stored afloat. This solution is not the most optimal and safe in the long term perspective. Last summer a first stage of the coastal RC storage facility was commissioned in Sayda Bay in the Murmansk Region. First bunch of the specially prepared RC has been accepted there for the storage. After the second stage of the facility is completed reactor compartments from all submarines dismantled in the North West Region of Russia will be stored there, and also reactor units of the nuclear powered surface vessels and several nuclear service ships.

Similar storage facility is needed also at the Far East. About 40 reactor compartments are stored afloat there. We continue negotiations with Japan on funding building this facility and its construction has been started already under the Russian budget money.



**Figure 5. Storage of the reactor compartments afloat in the Razboynik Bay**



**Figure 6. Construction of the coastal RC storage facility in the Razboynik Bay at the Far East**

One of the main current priorities is remediation of the coastal technical bases taking over by Rosatom from the Navy. There are four such bases; in Andreeva Bay and in Gremikha – in the Murmansk Region; and in Sysoeva Bay and in Gorbushchya Bay – in the Primorsky Territory. The following works have been completed there recently:

- upgrading of the physical protection system of the site and the facilities has been completed,

- engineering and radiological surveys of the territory and the structures was accomplished,
- Justification of Investments for establishing infrastructure for SNF and RW management in the Andreeva Bay was developed,
- several facilities for provision of radiation safety at the site have been constructed and equipped, including administrative building, personnel changing rooms, temporary shelter for SNF storage unit, two mobile radiation check points, decontamination station, emergency medical point, radiological laboratory, reconstruction of the access road and the main water supply pipeline.
- several old buildings and structures have been demolished.

In the Gremikha site currently stored: 8 spent reactor cores (SRC) of the Alfa-class reactors, 788 SFAs, 1500 m<sup>3</sup> of solid RW and 200 m<sup>3</sup> of liquid RW. The following activities are performed there:

- upgrading of the physical protection system is nearly completed,
- reconstruction and repair of the equipment for the SRC unloading from the reactors with liquid-metal coolant (LMC) was completed,
- two SCR were unloaded from the Alfa-class reactors,
- mobile radiation check points were commissioned,
- personnel is equipped with the radiation monitoring devices and individual protection means,
- remotely controlled equipment for conducting surveys is being produced now,
- engineering and radiation surveys of the facilities for SNF and RW storage are being performed,
- equipment for safe storage of SNF and RW in Gremikha is being performed.

In the Sysoeva Bay at the Far East the following items are stored: 5000 SFAs, 19347 m<sup>3</sup> of SRW and 1407 m<sup>3</sup> of LRW. In general the situation there is better than in Andreeva Bay. The following tasks are solved there:

- physical protection system of the site has been established,
- infrastructure for the site operation was repaired,
- solid RW has been removed from the open storage pads,
- construction of the radiation check point is nearly completed in the Building No.1,
- storage facility for solid RW are being constructed,
- design for upgrading the infrastructure necessary for the SNF unloading and transportation for reprocessing at the Mayak plant was developed,
- radiobiology and radiochemistry laboratories have been upgraded,
- decontamination station for motorized vehicles was constructed,
- SNF casks accumulation pad was extended for up to 35 casks of TUK-108/1 type.

It is necessary to build additional vaults in the Sysoeva Bay for the solid RW storage with the volume of 50,000 m<sup>3</sup>. Recently a facility for storage of RTGs was commissioned there. The storage is designed for 250 RTGs and it was built under the USA funding.



**Figure 7. Extension of the SNF casks accumulation pad in the Sysoeva Bay**



**Figure 8. Construction of the solid RW storage at the DalRAO site in the Sysoeva Bay**



**Figure 9. RTG Storage in the Sysoeva Bay**

In conclusion we can say that during the last years substantial scope of work has been accomplished. This demonstrates once again that the Russian Federation will fulfill its international obligations in the area of NS dismantlement and initiate spacious activities on remediation of the former naval coastal technical bases.