

**Technical Secretariat of the Japan-Russia Committee on Cooperation to Assist the
Destruction of Nuclear Weapons Reduced in the Russian Federation**

**Ex-post Evaluation on the Project for the Construction of
the Blast and Paint Facility for Reactor Compartment
Units of the Dismantled Nuclear Submarines
-- Summary Report --**

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**Center for Disarmament, Science and Technology
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1. Project Overview

Project for the Construction of the Blast and Paint Facility for Reactor Compartment Units of the Dismantled Nuclear Submarines at the Long-term Storage Facility in the Far East of the Russian Federation

- Country name: The Russian Federation
- Field: Nuclear disarmament and environmental conservation
- Form of assistance: Funding for construction and equipment procurement
- Total financial assistance: 726 million JPY (initial budget amount: 734 million JPY)
- Implementation period: February 2013 - April 2014 (14 months)
- Related agencies/facilities: State Atomic Energy Corporation of Russia “Rosatom,” Federal State Unitary Enterprise “Radioactive Waste Management Enterprise (RosRAO),” and DalRAO (RosRAO’s Far Eastern Branch)

1.1. Background and Particulars of the Project

While most of more than 250 nuclear submarines constructed by the Soviet Union were retired after the end of the Cold War, dismantling of these decommissioned nuclear submarines lagged due to disruptions after the collapse of the Soviet Union. In the Russian Far East, more than 70 nuclear submarines were decommissioned by the end of the 1990s. Many of them containing spent nuclear fuels were moored in the area near Vladivostok, which is Japan’s opposite side of the Sea of Japan, or in the Kamchatka region. Thus, prompt and safe dismantlement of these decommissioned nuclear submarines was perceived as an urgent issue from the standpoint of nuclear disarmament and non-proliferation as well as environmental conservation.

In light of such situations, the G8 countries agreed in 2002 to prioritize resolving nuclear legacy issues, including dismantling Russia’s decommissioned nuclear submarines, in the “G8 Global Partnership against the Spread of Weapons and Materials of Mass Destruction” (hereinafter referred to as “G8GP”). In accordance with the abovementioned arrangement, the Japan-Russia Committee on Cooperation to Assist the Destruction of Nuclear Weapons Reduced in the Russian Federation (hereinafter referred to as the “Committee”) assisted, inter alia, to conduct the Program for dismantling decommissioned nuclear submarines in the Far East, named “Star of Hope,” and provide a floating dock and other equipment for the long-term onshore storage facility at Razboynik Bay in order to ensure the safe and stable storage of reactor compartment units.

When then Foreign Minister Masahiko Komura visited Russia in April 2008, Japan and Russia agreed to explore additional areas of bilateral cooperation. They eventually selected

“additional assistance for construction of onshore storage facilities for reactor compartment units” as the first candidate. The Russian side requested cooperation on constructing a blast and paint facility for long-term onshore storage of reactor compartment units (70 years), which requires surface treatment and special anti-rust coating on the exterior surface.

The Committee conducted advance surveys and discussions with Russia’s related agencies, and Japan and Russia decided to cooperate with construction of the facility in June 2012. The Committee and Rosatom concluded the Implementing Arrangement concerning the “Project on the Construction of the Blast and Paint Facility for Reactor Compartment Units of the Dismantled Nuclear Submarines at the Long-term Storage Facility in the Far East of the Russian Federation” (hereinafter referred to as the “Project”) on September 13, 2012; and the Technical Secretariat for the Japan-Russia Committee on Cooperation to Assist the Destruction of Nuclear Weapons Reduced in the Russian Federation (hereinafter referred to as the “Technical Secretariat”) and RosRAO concluded the financing contract on February 22, 2013. (While a total amount of budget was 734 million JPY, total financial assistance was reduced to 726 million JPY because installation of a water supply and sewage systems covered in the original budget was not required.) The Project subsequently launched.

Under this Project, a main building, including the blast and paint facility, and an auxiliary building with the related equipment were constructed. The Project, which took an additional four months because of partial damage to equipment from a heavy storm in the Primorsky region, was completed in April 2014. The opening ceremony of the blast and paint facility was held in June 2014, in which Japanese and Russian government officials, local government officials and others participated, and sincere gratitude for Japan’s assistance was expressed by government officials of Russia.

1.2. Project Details

As an additional assistance for construction of long-term onshore storage facilities for reactor compartment units, this Project was implemented for constructing a blast and paint facility for the purpose of surface treatment and special anti-rust coating of the exterior surface in order to prevent metal corrosion during long-term onshore storage of reactor compartment units. The following are outlines of this Project.

(1) Main building

- Prefab metal structures for the blast and paint facility
- Two ceiling cranes with anti-explosion specifications and 3.2 ton lifting weights for the blast and paint facility, respectively
- Installation of metal sealed partitions between the blast and paint facility

- (2) Auxiliary building: Installation of related equipment for maintenance
- (3) Facility equipment and other items
 - Blast facility: Shot blasting equipment; shot storage hopper; pressurized blast machine; shot recovering and sorting machine; vertical conveyor; silo tank; used shot material sorting machine; vacuum dust collector; ventilation equipment, air-conditioning equipment, compressor, etc.; intake and exhaust equipment with filter; compressor; compressed air-drying machine and others.
 - Paint facility: Painting monitor; airless sprayer; large air-conditioning and exhaust equipment with high-performance filter; paint mist suction equipment and others.

2. Evaluation Overview

2.1. Evaluation purpose

In the Ex-post Evaluation on the Project for the Construction of the Blast and Paint Facility for Reactor Compartment Units of the Dismantled Nuclear Submarines (hereinafter referred to as the “Evaluation”), the Project completed in April 2014 was comprehensively evaluated in accordance with the five provisions of the DAC Criteria for Evaluating Development Assistance, regarding issues, among others: matching Russia’s needs; operation and maintenance of the blast and paint facility; efficiency of constructing the facility; and future operation and maintenance management of the facility. The results of the evaluation are compiled into the ex-post evaluation report.

2.2. Review procedure

The Evaluation was implemented according to the following procedure:

- ① Preparation of an operation schedule
- ② Preparation of an evaluation item list
- ③ Review of documentary records and existing reports
- ④ Preparation of a questionnaire
- ⑤ Holding a pre-departure meeting
- ⑥ Implementation of on-site investigations (including interviews with persons concerned)
- ⑦ Holding an investigation report meeting
- ⑧ Preparation of a report and summary

Overview of the on-site investigation is as follows:

- Investigation period: December 16-19, 2019
- Interviewed agencies/facilities: Blast and paint facility (DalRAO)

2.3. Evaluation criteria

The evaluation was implemented in accordance with the five provisions of the DAC Criteria for Evaluating Development Assistance. The viewpoints regarding the evaluation are as follows:

- (1) Relevance: Whether and to what extent there is consistency regarding the objectives and outputs of the Project with recipient's needs, policies of the recipient and donor countries, and internationally prioritized issues.
 - (a) Matching the Russian Government's policies and needs
 - (b) Consistency with Japanese government's efforts
 - (c) Cooperation and collaboration with international efforts
- (2) Effectiveness: Whether and to what extent the objective of the Project was actually achieved (or likely to be achieved).
 - (a) Achievement of the objective (progress with the blast and painting tasks)
 - (b) Operating status of the system
 - (c) Safety management of work
 - (d) Contribution to dismantling decommissioned nuclear submarine and nuclear disarmament
- (3) Efficiency: Whether and to what extent resources allocated to the Project (funds, equipment, professional technology, time, and others) and results achieved from those investments are relevant or cost efficient.
 - (a) Procurement and work management
 - (b) Project implementation period
 - (c) Project implementation cost
- (4) Impact: What the direct and/or indirect effects (both positive and negative) of implementing the Project are.
 - (a) Cooperation and synergistic effect
 - (b) Existence of other effects
- (5) Sustainability: How much the outcome of the Project has been maintained and/or is expected to continue after the Project concluded.
 - (a) Operation and maintenance system
 - (b) Maintenance status
 - (c) Budgetary measures
 - (d) Future demand

3. Evaluation Results

3.1. Relevance

Under this Project, the blast and paint facility was constructed at the onshore storage facility for reactor compartment units at Razboynik Bay in the Russian Far East as a component of dismantling decommissioned nuclear submarines moored there. Appropriate and prompt dismantling of such submarines and safe long-term storage of their reactor compartment units match the policies and needs of both Japan and Russia from the perspective of promoting nuclear disarmament and non-proliferation as well as environmental conservation. The Russian side, in particular, had strong needs to conduct blast and paint processing of more than 70 reactor compartment units located in the Far East area in just over 10 years. For Japan, prevention of oceanic and other environmental pollution due to an accident with reactor compartment units—moored at Razboynik Bay across from Japan—was also a pressing issue. In addition, the Project was consistent with the international initiative to promote assistance for dismantling Russia’s nuclear weapons under the G8GP. For the abovementioned reasons, therefore, the Project can be evaluated as having high relevance.

3.2. Effectiveness

The Project can be evaluated as having high effectiveness for the following reasons.

First, the facility funded by implementation of the Project has been already operating at full capacity, and blast and paint work for reactor compartment units have been conducted smoothly. Thus, the main objective of this Project has been achieved. At the time of implementing this Evaluation, blast and paint work had already been completed on 55 reactor compartment units; and this left 22 units remaining. Reactor compartment units that have already finished painting have not seen defects, such as peeling of the coating layer. Furthermore, streamlining the tasks and other efforts enables the blast and paint work to proceed at a faster pace than initially expected.

Second, it was confirmed during the on-site visit that the facility funded by implementation of the Project maintains performance from its completion of construction, and has been operating as planned and in a normal manner. Its performance, including specifications of equipment, also meets the actual needs of the site. In addition, the technical process has been improved as appropriate.

Third, during the blast and paint works, safety management has been implemented appropriately. No case of violations or accidents related to labor and environmental safety has been reported since the facility started operating.

3.3. Efficiency

The Project can be evaluated as having been relatively efficiently implemented even though responding to an unexpected situation was required.

First, this Project was implemented with appropriate procurement and construction management. Equipment and technologies utilized by the Project were suited to the objective and application.

Second, construction work required an extension of four months because of damages to shutter gates by a heavy storm just before the construction of the facility was completed. To address this incident, the RosRAO dismantled the shutter gates that had already been installed, and instructed the contractor to procure shutter gates with a more durable structure. All shutter gates at the door spots were replaced to the enhanced type.

Third, the Project's budget and its implementation were also appropriate. Basic design and standard pricing, which were the basis of the estimation, were prepared through an appropriate and rigorous process, including a review by an external expert agency (Russia Design Review Bureau) separate from the designer. As for estimating the appropriateness of the budget for the Project as well as calculating the cost and price, close consultations were held with the Russian side, in which they, for instance, compared with the actual cost of similar projects. As a result, the budget for the Project was less expensive than the actual cost of the blast and paint plant in Northwestern Russia or construction costs for a similar plant in Japan. In the meantime, the RosRAO incurred the additional cost for re-procurement due to the shutter-type gate being damaged.

3.4 Impact

The Project can be evaluated as having had a huge and positive impact for the following reasons.

First, the Project constitutes an integral part of the process related to dismantling decommissioned nuclear submarines. Taking into account progress in their dismantlement, it is assessed that the Project provided beneficial collaboration and synergy effects with various activities, such as nuclear disarmament and non-proliferation as well as environmental safety. Blasting and painting reactor compartment units have been carried out at two locations in Russia – the Far East area and Sayda-Guba in the Northwest area. These two plants have attempted to cooperate on working efficiently.

Second, at the time of this Evaluation, any unexpected impacts or incidents, including radioactive contamination, by implementing this Project have not been reported by the national supervisory body which has periodically conducted monitoring surrounding environment and

residents, as well as the constant environmental monitoring. No employee has suffered any health problems. No negative impact by implementing this Project was identified, including the abovementioned aspects.

3.5. Sustainability

The Project can be highly evaluated regarding sustainability for the reasons explained below.

First, the DalRAO has established the required systems for operation and maintenance management of the blast and paint facility within the company. It has also assigned personnel with expertise and skills required for maintenance and management.

Second, maintenance and management after completion of the Project—such as formulating the maintenance and management plan for equipment, addressing equipment’s failures and malfunctions, conducting periodic inspections and maintenance work, and procuring spare parts and consumables without hindrance—has been appropriate. The DalRAO has also upgraded and updated the equipment: for instance, it replaced the nozzles for blasting to the one originally developed by DalRAO.

Third, the DalRAO has been contemplating how to maintain and train personnel with required specialization and capabilities in light of the plan to fully re-paint the reactor compartment units once every 10 years. In particular, during a couple of years from completion of the initial blast and paint process in 2021 through the start of repainting in 2023, the company plans that some of the workers will remain at the plant, and engage in monitoring and other tasks; and other workers will be retrained and relocated in preparation for resuming operations.

4. Overall Evaluation, Lessons Learnt and Recommendations

4.1. Overall evaluation

In this Project, a facility for blasting and painting reactor compartment units was constructed as part of dismantling the decommissioned nuclear submarines moored in Far Eastern Russia. This enables the objective of the Project, that is, long-term storage of reactor compartment units at the onshore storage facility for 70 years. While completion of the construction was delayed behind the initial schedule due to damage to shutter gates by a heavy storm, the Project was implemented under appropriate procurement and construction management.

The facility funded by the Project has been utilized effectively since its installation. It completed the blast and paint process for 55 of the 77 reactor compartment units of the

decommissioned nuclear submarines by the end of 2019; and the remaining 22 units are to be completed by the end of 2021. Beyond the initial plan aiming to increase processing capacity up to 10 units per year, the RosRAO explained that it was able to blast and paint 13 units per year owing to enhancements of work efficiency and learning effects. Meanwhile, it has been decided that the reactor compartment units will be completely re-paint every 10 years, and the next round of blasting and painting will begin around 2023. The maintenance and management of the facilities by RosRAO has also been carried out appropriately. Furthermore, at the time of this Review, any accidents at the facility or problems for the environment (including external release of radioactive material) have not been reported.

The RosRAO has appropriately engaged in carrying out personnel training as well as operation and maintenance management of the facilities, equipment and systems funded by this Project, inter alia: an organizational aspect, such as setting the chain-of-command structure, improving guidelines and manuals, and developing human resource; and an implementation dimension, including reserves of spare equipment and parts. On the issue of sustainability, no notable problems were seen on the organizational and technical levels, as well as the financing front.

The aforementioned points all suggest that this Project made a highly successful achievement: in other words, this Project can be highly evaluated.

4.2. Lessons learnt and recommendations

Lessons gained from this Project are as follows.

First, in order for the Project to succeed, it was crucial that both Japanese and Russian sides could share important and specific objectives of dismantling decommissioned nuclear submarines for nuclear disarmament and non-proliferation, as well as environmental conservation, and converged their perceptions that the blast and paint process is the indispensable task for long-term onshore storage of reactor compartment units.

Second, it can be pointed out the salience of cooperation with another facility engaged in similar tasks. Experience from construction and operation of the Northwestern Sayda-Guba blast and paint facility for reactor compartment units was harnessed in building and operating the facility in the Far East. For instance, the facility at Sayda-Guba found problems of the paint originally planned to be used at the facility in the Far East; therefore, the latter could alter the plan and use another paint. According to the RosRAO, cooperation between the two facilities continues, and sharing their experiences has enabled them to carry out their work more efficiently.

Third, the Project highlighted the importance of keeping close contact with not only

suppliers but also manufacturers when constructing and working with the facility. In this Project, there was an incident that the shutter gate was damaged by a heavy storm during construction of the facility. However, in light of replacing them, a more durable product was installed, which was enabled by contacting the manufacturers. Since then, there have been no similar accidents.

Regarding recommendations for future efforts, the following three viewpoints can be acknowledged.

First, as pointed out by the DalRAO, it is necessary to address appropriately the two-year interlude between completion of initial blast and paint work and the resumption of re-paint. Maintaining employment and technical level of employees is essential for smooth resumption of the work.

Second, it would be worth considering whether and how the facility funded by the Project could be utilized for other applications within the scope not violating the Implementing Arrangement while the top priority is to blast and paint the reactor compartment units. Since improved task efficiency, including bolstering skills, has raised the number of reactor compartment units processed annually to 13, and the DalRAO indicates that it could be increased to even more units. This means that there will be considerable idle time for the facility during re-painting 77 units every 10 years. The facility being up and running in the meantime would contribute to maintaining employment and technical levels of employees.

Third, since the reactor compartment units are to be stored onshore for 70 years, it will be necessary to make decisions at some point on matters such as: whether it is possible to continue utilizing the facility funded by this Project; whether it is necessary to refurbish or re-construct the facilities; and whether a new facility which uses new technology available at the time should be built. It is necessary to collect and assess information accordingly.