The International Institute for Strategic Studies

Northwest Russia in the Baltic Sea Region

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Regional Cooperation in the Sphere of Nuclear Safety: a Case Study of the Dismantling of Nuclear Submarines at Severodvinsk Shipyard

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The main industrial activity in Severodvinsk is shipbuilding, a fact reflected in the original name of the town – Sudostroi ('shipbuilder'). Since the delivery of the Russian Navy's first nuclear submarine in 1957, the development of such ships has made its mark on the life of the town. In 1992, the State Russian Nuclear Shipbuilding Centre was established in Severodvinsk. Ensuring nuclear safety in the Nuclear Shipbuilding Centre is a key concern, as the plant's inventory includes 25 nuclear-powered vessels and more than 60 vessels and facilities containing radioactive sources. Severodvinsk also hosts the Northern Fleet's Belomorsk naval base, which has a factory for refuelling the reactors of nuclear submarines.

Different types of nuclear-related work are carried out in Severodvinsk's naval yards, such as: the transportation and loading of fresh nuclear fuel; starting up reactors for operation; unloading spent fuel; loading spent fuel into consignments for transportation and storage; transhipment of the consignments to special trains and dispatch for reprocessing at the Mayak reprocessing plant. Specific elements of this work are carried out when a new nuclear submarine is commissioned or when a nuclear submarine is modernised or dismantled. There is a transhipment point for spent nuclear fuel in Severodvinsk. In the centre of the town, there are dozens of spent fuel compartments in the reactors of the nuclear submarines and in the storage facilities of the special surface ships of the Russian Navy.

Severodvinsk is the main point for dismantling nuclear submarines decommissioned by the Russian Navy. In accordance with the START-1 and START-II international treaties and on the basis of Government Resolution No. 548 of 28 May 1994, 156 nuclear submarines should have been decommissioned by 2000, two-thirds of which are in the Northern Fleet. In effect a full or partial dismantling of more than 15 submarines has been carried out at the plants of the Nuclear Shipbuilding Centre. First and second generation submarines are now being fully decommissioned.

The extremely strict deadlines fixed by the international agreements on strategic arms cuts demand that nuclear-powered submarines are dismantled at a fast pace. In Severodvinsk, this means no fewer than 6–8 submarines a year. This is causing an imbalance between the speed of arrival and removal of spent nuclear fuel and radioactive nuclear waste, and has led to a stockpile. In the dismantling process, a large amount of solid and liquid radioactive waste is generated. At the town's yards, there are five storage units for liquid radioactive waste, three for solid waste and one deep-depository landfill site for solid radioactive waste at Mironova Hill awaiting disposal.

The best-known source of information about the state of affairs of nuclear-powered and radioactive vessels in the Northern Fleet and at the shipbuilding yards of North Russia is the so-called Blue Report, issued in 1996 by the Norwegian non-governmental organisation Bellona. The report is available on the internet and, despite being not absolutely accurate, contains a lot of detailed information.

In the rest of this paper, we try to throw light on those positive developments which have taken place over the last 2–3 years at the shipyards of the Nuclear Shipbuilding Centre.

At the moment, dismantling nuclear submarines is a loss-maker. The financial situation has got even worse since the cancellation in 1995 of favourable export duties on scrap metal for the foreign market. [Scrap metal from decommissioned subs is sold. Ed.] To ensure the terms of the strategic arms limitation treaties, the US has been financing the dismantlement of Russian submarines [but only those which come under START provisions. Ed.]. In 1991, the US Congress instructed the US Defense Department to draw up a programme for 'Cooperative Threat Reduction'. With a fund specially created within the framework of that programme, a unique piece of equipment for cutting the submarines' scrap metal was set up at the Zvezdochka shipyard in Severodvinsk. This equipment significantly reduced the labour-intensive nature of the scrapping operation. Dismantling nuclear-powered submarines was partly funded by this fund. In 1996, the inter-governmental Arctic Military Environmental Cooperation (AMEC) programme was set up, run by the defence ministries of the US, Russia and Norway. In 1998, Norway and Russia signed an inter-governmental framework agreement on projects for guaranteeing nuclear and radiation safety in the northwest of Russia. Within the framework of these programmes, there is funding for setting up new infrastructure or modernising old facilities for treating solid and liquid radioactive waste.

It is worth pointing out that the condition of the

vessels used for treating the radioactive waste and spent nuclear fuel do not fully comply with modern safety standards. The Russian Navy's special ships for nuclear and technological service (used for refuelling the reactors of the nuclear-powered submarines) are periodically repaired by the Zvezdochka shipyard.

The problem of treating radioactive waste has become far more serious. Until 1991, the Russian Navy regularly sank liquid and solid radioactive waste in the Kara and Barents seas, which was considered a main source of radioactive threat in these seas. But in the third (Yellow) Report from Ballona, presented in Murmansk in autumn 2001, some new leading players joined Russia on the list. Today, the main contributors to the radioactive pollution of the Barents and Kara Seas, according to Ballona, are European plants which reprocess spent nuclear fuels, namely, La Hague in France and Sellafield in the UK. Their discharges are carried by the Gulf stream and take 4–6 years to reach the Barents Sea.

From the outset, the storage facilities at the Nuclear Shipbuilding Centre's yards were inadequate for the increasing volume of liquid and solid radioactive waste generated by the dismantlement of a large number of nuclear-powered submarines. The proposed solution for solid radioactive waste – as backed by both the Russian government and Ballona, is to dig a deep land burial site in Novaya Zemlya or on the Kola Peninsula. At these locations, it would be possible to bury reactor compartments that have been cut out of the nuclear submarines, as well as different kinds of solid radioactive waste, including that generated by reprocessing liquid nuclear waste. To date, a project has been drawn up for such a site at Novaya Zemlya. It has been checked by specialists, approved by public opinion and sent to international specialists for their approval. If it is approved, 1.1 billion roubles will be required to implement the project. A specially fitted ship will be needed to transport radioactive waste there. If the financing is to come only from the Russian Federation, then the implementation of the project could take time. Joint funding from those countries with an interest in protecting the ecology of the Barents Sea would move the project along more quickly.

At the Zvezdochka shipyard in Severodvinsk, the purification of liquid radioactive waste is carried out at the EKO-3 unit, made by Radon Moscow Scientific Production Association. More than 1,000 cubic metres of solid radioactive waste have been reprocessed. Before this, liquid radioactive waste was put into consignments in Severodvinsk and then sent to the Kola Peninsula for purification.

To resolve the problem of storing solid radioactive waste using financing from the Russian Federation federal budget, in 1999 a temporary storage site for solid radioactive waste came into use at Zvezdochka. This site has been approved by Russian state ecological experts and ensures ecologically safe storage of radioactive atomic waste. In accordance with an intergovernmental agreement with Norway, repairs have been completed on four containers with a capacity of 2,000 cubic metres for storing liquid radioactive waste at Zvezdochka shipyard. Repairs have been carried out on the equipment used to transport this waste from the ships. A project has been agreed upon for the disposal of the solid radioactive waste storage sites at Mironova Hill. In October 2000, a complex for reprocessing all types of low- and medium-activity solid and liquid radioactive waste was put into operation. A 'floating workshop' (technical service ship) has been renovated with funding from the US.

The situation surrounding the despatch of spent nuclear fuel has stabilised after the transfer of responsibility for this work to Minatom (the Russian Ministry of Atomic Energy). In 2001, four special trains were sent off to the Mayak chemical plant carrying spent nuclear fuel that had been offloaded from scrapped nuclear submarines. In November 2001, the State Quality Control Commission began to draft a project to improve the infrastructure for processing spent nuclear fuel from nuclear-powered submarines at Zvezdochka shipyard. This project is being set up with joint financing from the Russian Federation and the US. In February 2002, the plans will be presented to this State commission.

Russian-made equipment is now used more frequently. At the Onega design bureau in Severodvinsk, specialists have put together a project for a mobile modular unit for the primary processing of low-activity solid radioactive waste. It will be manufactured within the framework of the AMEC programme and used at Russian Navy bases from summer 2002. Prior to this, French equipment was used in the stationary processing units.

In the second half of the 1990s, international academic and practical seminars and conferences on the topic of dismantling nuclear submarines were held regularly. The most recent seminar took place in summer 2001, confirming what foreign experts have recognised as Severodvinsk's open information culture on matters of radiation and nuclear safety.

The complicated ecological situation in Severodvinsk is made worse by the fact that at the end of 2001, the governor of Arkhangelsk *oblast*, A. Efremov, and the Russian Federation Minister for Atomic Energy, A. Rumyantsev, signed a declaration of intent to build an atomic power station in Arkhangelsk *oblast*. The first option for the location of the atomic power station is in the area of Arkhangelsk. The second option is near the village of Rikasikh, equidistant from Arkhangelsk, Severodvinsk and Novodvinsk. The second option is preferred: in the opinion of *oblast* leadership, it will resolve the problems of supplying heat and electricity to all three towns. At present, electricity tariffs in Arkhangelsk

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oblast are amongst the highest in Russia. This has a negative effect on the investment climate in the region and on payments to the energy providers [i.e., the high cost to users means they are often in debt to the electricity suppliers. Ed].

Erratic fuel supplies by Severodvinsk thermal electric power stations at the end of the 1990s (one is fired on coal and the other on fuel oil), together with high energy tariffs led the management of the Nuclear Shipbuilding Centre's yard to the conclusion that it was necessary to set up a floating atomic power station, using the resources of Sevmash enterprise to meet the Nuclear Shipbuilding Centre's energy needs. Initial ideas – using the Navy's decommissioned nuclear submarines – did not undergo any expert technical analysis. The technical and economic rationale for building a floating atomic power station from a new design has been drawn up, but has not yet been approved. Documents have been prepared for checking by ecological experts, and the public has been invited to comment.

With the aim of finding a multi-level solution to the problem of ensuring the state's nuclear and radiation security, at the beginning of 2000, the Russian government approved a federal programme for the period 2000–06, entitled 'Russia's nuclear and radiation security'. Part of this programme's remit is to ensure the nuclear and radiation security of the shipbuilding industry, while building, repairing and dismantling the Navy's nuclear submarines, nuclear-powered ships and atomic-technical service ships. Financing for this programme has been allocated and the programme is underway.

Conclusions and recommendations

Mutually beneficial cooperation in the sphere of increasing nuclear and radiation security in the northwest of Russia has strong prospects. Joint action, whether bilateral or multilateral, can take various forms: financial input to the dismantling programme; establishing the infrastructure for processing radioactive waste and spent nuclear fuel in Russia; and scientific, manufacturing and technical cooperation.

1. Threat reduction for the region's ecology. Finding a solution to the problem of storing accumulated solid nuclear waste is important. As mentioned above, it has been proposed that a facility for the long-term storage site will be equipped on Novaya Zemyla or on the Kola Peninsula, and that the existing technology for reprocessing solid nuclear fuel will be modernised. At the moment, solid nuclear fuel is partly reprocessed in Severodvinsk. The allocation of funds by the European Union and the effective spending of the resources already issued will allow for existing storage sites for liquid and solid nuclear fuel to be brought into line with modern standards. These measures should be taken not only in Russia but also, judging by the comments of Bellona's leaders, in France and Britain. A detailed list of the tasks for expanding international cooperation in dismantling nuclear submarines and increasing nuclear and radiation security was drawn up at a seminar held in Severodvinsk in June 2001, attended by 200 Russian and 80 foreign scientists and specialists.

2. For Russia and other countries with nuclear submarines, there is a lot of interest in manufacturing and technical cooperation in the sphere of dismantling decommissioned ships. Russia is interested in accelerating the dismantling process and increasing its economic efficiency. Other countries, in particular Britain and France, are interested in acquiring dismantling technology. At present, Britain has decommissioned no less than ten nuclear-powered submarines and France, three, but not one of them has actually been dismantled. Cooperation with Russian organisations could give them access to the appropriate technology, and quite possibly, reduce the costs of dismantling.

3. A concept for the development of northern Europe's special conditions. Despite the fears of ecologists and the demands of ecological pressure groups for restricting the use of nuclear energy, and despite the increasing use of new energy technology, a complete rejection of nuclear energy is unlikely. The climatic conditions of northern Europe demand high energy usage. In many northern Europe countries, atomic power stations are already in use and nuclear energy facilities are used by European navies. The time is right for international cooperation in not only the use but also the subsequent dismantling of decommissioned vessels. It is also time to draw up a scientifically and ecologically sound course of action to reduce these risks.

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