

## Environmental impact assessment for the decommissioning of two Russian nuclear submarines

Norway has financed the decommissioning of two Russian Viktor II class nuclear submarines through the government's action plan for nuclear issues. A British company, Enviro Consulting, has carried out an independent environmental impact assessment, which has been evaluated by the Norwegian Ministry of Foreign Affairs in cooperation with the Norwegian Radiation Protection Authority (NRPA). The environment impact assessment deals with the environmental, health and safety aspects of the entire decommissioning process, from towing the submarines to the delivery of waste to designated locations. Based on the documentation from the Russian side and visits to the shipyards, it is considered that the decommissioning has been carried out in accordance with Russian law and in accordance with international guidelines.



*Photo: The Zvezdochka shipyard*

A total of 56 nuclear submarines are currently laid up at bases on the Kola Peninsula. These have been taken out of service from the Russian Northern Fleet. 33 of these nuclear submarines still have nuclear fuel onboard and many are in a poor condition. There is an international wish to decommission these submarines as quickly as possible in order to deal properly with the nuclear fuel. However, this work is proceeding slowly.

In June 2003 the Norwegian Ministry of Foreign Affairs signed contracts to finance the decommissioning of two Viktor II class nuclear submarines from the Russian Northern Fleet with resources from the action plan for nuclear issues. The purpose of the project was to contribute to removing environmental threats and reducing the risk of the spread of nuclear materials. Following the commencement of the work, a concern emerged in Norway's opinion that the work could be carried out in a manner that would

present a danger to the environment, health and safety. The Ministry of Foreign Affairs thus decided that NRPA should carry out an independent review of the entire decommissioning process with a focus on the environment, health and safety.

In November 2003, NRPA arranged a selection process among consultancies that could carry out such an impact assessment. A contract was signed with a British company, Enviros Consulting, regarding the carrying out of the work. Enviros has reviewed and commented on the documents and assessments produced by the Russians themselves, and carried out their own assessments as needed. On 1<sup>st</sup> May 2004, Enviros concluded its work on its report: "Review and assessment of the environmental impact from decommissioning of two Russian nuclear submarines". NRPA has helped to obtain the relevant documentation for the consultancy, participated in visits to the shipyards, and commented on Enviros' draft report. Enviros is entirely responsible for the report.

### The shipyards

The extraction of the spent fuel and decommissioning of the two submarines, designated 625 and 627, were carried out at the Nerpa yard on the Kola Peninsula and the Zvezdochka yard on the east coast of the White Sea near Archangel.

The contracts that were awarded to the two shipyards outlined the main processes that were to be carried out, established the relevant impact assessments that should be carried out, the regulations that should be complied with, and stated that certificates should be issued for achieved milestones.

### Environment, Health and Safety (EHS)

Some of the documentation supplied by the shipyards during the project was not specifically for the submarines that were decommissioned with Norwegian aid. However, since the EHS area is largely the same for a single area (i.e. for the same type of submarines at the same shipyard) these documents were still highly relevant to the process. Environmental impact assessments have been carried out for the decommissioning of the nuclear submarines by the Russians, but since such documents, in their entirety, proved to be classified, they have been extremely difficult to obtain. However, most of the material from the Zvezdochka shipyard was handed over following repeated enquiries. The documents that describe purely reactor related technical matters have not, for understandable reasons, been released. In general there was a wish that more information should be made available about the methods used to ensure that the guidelines for the handling of radioactive materials were followed.



In those areas where documentation has not been made available, Enviro has carried out independent EHS assessments. In these the possible consequences of the decommissioning have been compared with the possible consequences of the “no action” option, i.e. allowing the submarines to remain laid up for an unspecified amount of time, possibly without removing the fuel.

If the fuel were not removed, this would continue to present a high risk of major discharges of radioactivity into the environment. On the other hand the delayed decommissioning of a submarine from which the fuel has been removed would probably not present a serious environmental risk, even if continuous management and monitoring were required.

### Regulations

Internationally there are great similarities in the regulations for and approaches to environmental impact assessments, including in Russia. For example, it is required that the environmental conditions in the area where a measure is going to be implemented be accounted for as a basis for an environmental impact assessment regarding the measure. Furthermore, there is a requirement regarding looking at individual doses and collective doses for workers and the general population, as well as the effects on the environment.

Radioactive related issues must be assessed, both for the planned work and for accidents. Even though there are many similarities, the Russian regulations are different to Western ones in some areas. As far as environmental impact statements in the decision making process are concerned, these are often used in Russia to support choices that have already been made, while in the West these are more likely to be used to select the best solutions.

The similarities and differences between Russian and Western approaches are described in “Environmental impact assessment in Russia for facilities of potential radiation hazard. Joint Russian-Norwegian Expert Group, May 2001”.

### Conclusions and recommendations

Documentation exists at the yards for each step of the process from reception, to transfer and delivery of the materials. Environmental impact assessments have been carried out at both yards, though the original materials were only released by the Zvezdochka shipyard. Nerpa provided a summary of the original documents as documentation. Enviro concludes in its report that impact assessments have been carried out in connection with the carrying out of the projects and not as part of the basis for making a decision. The assessments do therefore not examine in detail alternative approaches to find the best solutions from an environmental point of view.



Briefing for representatives of the Norwegian authorities on the decommissioning of the Viktor II class submarine 627 at the Zvezdochka shipyard. *Photo: the Zvezdochka shipyard*

Nonetheless, on the basis of the available documentation, Enviro concludes that the decommissioning has been carried out in accordance with Russian law and in accordance with international recommendations.

They further conclude that a “no action” option, i.e. not decommissioning the submarines would only present a continue risk of significant discharges into the environment in the future. Another highlighted factor is the need for a closer look at how non-radioactive waste is managed, as well as the procedures for protecting workers in connection with the breaking up of the hull.

NRPA’s assessment is that even though there is room for improvement in the work of decommissioning nuclear submarines, there is a basis for continuing the financing of this activity. However, it should be a prerequisite that impact assessments of the measures should be made before new contracts are signed. It should also be a prerequisite that Norwegian inspectors be given access to all parts of the decommissioning process.

NRPA sees a clear need for a close dialogue with the relevant EHS authorities responsible for regulating the decommissioning work.

Coordinating the donor countries’ requirements with respect to the Russian parties is important, as is establishing common templates for documenting impact assessments carried out by the Russian side. Factors relating to physical protection have not been key elements of this assessment, but these should also be focused on more strongly in future projects.

### **The decommissioning process**

The most important milestones during the decommissioning of the nuclear submarines are as follows:

Prior to decommissioning

- Transport of the submarines to the shipyards
- Preparatory work prior to removal of the fuel

Breaking up

- Removal of spent fuel, radioactive waste and other waste
- Reloading of spent fuel into transport containers
- Removal of the bow and stern sections
- Construction of a three section hull

Waste management

- Transport of spent fuel to disposal site
- Handling of low and medium radioactive waste
- Handling of hazardous chemical waste
- Recycling of relevant materials

After breaking up

- Towing of the three section hull to Saida Bay for storage

### **Environmental impact assessments**

An environmental impact assessment is a systematic review of all phases of planned work. The goal is to obtain an overall overview of the work’s potential consequences on the environment, health and safety, and to make priorities. As well as being able to plan how the work can be carried out in such a manner that one can avoid or minimise these consequences or risks before they can occur.

There are guidelines for environmental impact assessments. At their most comprehensive, these should be carried out as part of the decision making process and should in these cases account for both alternative methods and systems for minimising possible consequences so that the best environmentally executable approach can be chosen. An environmental impact assessment should cover people and the environment in general. In the case of people they should take account of individual and collective consequences, both for those involved in the work and for the general population in the area. Broadly speaking these assessments should differentiate between the effects on the environment and health due to planned actions and due to unwanted incidents. Other factors can also be taken into account, such as the damage to financial interests.