



Risk and environmental impact assessments for the decommissioning of radioisotope thermoelectric generators (RTGs) around the Baltic Sea area

The removal and safe disposal of RTGs and their replacement with solar panel technology in the Baltic Sea is a priority area under the Norwegian Nuclear Action Plan. 26 of the 87 RTGs around the Baltic Sea have been removed as of 7th October 2009. The removal of RTGs around the Baltic Sea was initiated in 2009 as part of the Norwegian-Russian cooperation with funding from Norway, which requires that risk and environmental impact assessments are carried out during the planning phase. Finland and France will also be contributing to the work of removal and safe disposal of the RTGs around the Baltic Sea.



Map showing locations of RTGs around the Baltic Sea.



A defective RTG. Photo: County Governor of Finnmark.

Lighthouses powered by RTGs

An RTG is a radioisotope device which transforms thermal energy from the decay of radioactive material into electricity. In Russia, RTGs are used in areas with harsh climatic conditions to supply power for unmanned automatic navigational aids such as lighthouses, located on remote parts of the coast and in similar areas. Russian RTGs generally utilise highly radioactive sources (Radioisotope Heat Source or RHS) containing strontium-90.

The total number of RTGs around the Baltic Sea is 87. Norway, Finland and Russia are cooperating on the dismantling of 71 of these and France and

Russia has started the process of dismantling of the remaining 16.

On the 19th of May 2009, a Memorandum of Understanding was signed by the Norwegian Ministry of Foreign Affairs and the Federal Atomic Energy Agency of the Russian Federation regarding disposal of 71 RTGs located in lighthouses around the Baltic Sea and replacement with solar panel energy units. Sixty-three of these RTGs are located in the Finnish Bay and 8 in Kaliningrad. On the 10th of November 2009 the Norwegian Ministry of Foreign Affairs and the Finnish Ministry of Foreign Affairs signed a contract on cooperation with Russia regarding the removal of the abovementioned 71 RTGs in the

Baltic Sea. France has financed the dismantling of 4 RTGs and intends to finance the dismantling of additionally 12.

The project managers from the Norwegian and Russian sides are the County Governor of Finnmark and the Murmansk Regional Administration, respectively. The dismantling project in the Baltic Sea corresponds to the Norwegian-Russian project in the Northwest Russia and aims to ensure environmentally secure waste management and long-term storage of the strontium batteries taken from Russian lighthouses. In the Finnish Bay the radioactively powered lighthouses represent a significant safety risk. Most Russian RTGs are unguarded against potential thieves or intruders and lack basic security measures such as fences or warning signs.

Russia will dismantle the collected RTGs, remove the strontium batteries and transport them to the long-term storage facility at Mayak in Chelyabinsk, Urals. According to the above-mentioned Memorandum of Understanding the RTG powered lighthouses in the Baltic Sea area will have their energy sources replaced by solar panels by 2012.

The current phase of the Norwegian, Finnish and Russian project involves the removal of 22 RTGs from lighthouses around the Baltic Sea in 2009, where 8 were located in Kaliningrad and 14 in the Finnish Bay. The RTGs are then transported to the Russian dismantling institute NIITFA by the distribution firm Izotop. The project is proceeding according to the programme and plan.

Decommissioning of RTGs

In general, a number of distinct steps can be identified in the decommissioning process:

- Inspection of RTGs in-situ, to determine status.
- Removal of RTGs from their operational locations and transport to a temporary storage point.
- Transfer from the temporary store to a dismantling facility.
- Extraction and packaging of the RSHs.
- Onward transport of packaged RSHs.
- Processing of RSHs for extended storage prior to disposal.

Risk and environmental impact assessments

From the Norwegian side, the focus on risk and environmental impact assessments for nuclear safety projects in Russia is intended to give a systematic review of potential consequences for the environment, health and safety. The role of the Norwegian Radiation Protection Authority (NRPA) is to review and quality assure such assessments. NRPA has also cooperated with Russian regulatory bodies to develop a new regulatory framework focusing upon the regulatory requirements and regulations.

The robust nature of the RTG unit and its low potential for significant releases of activity to the environment under normal conditions has previously been demonstrated. Potential accident scenarios have been identified and countermeasures introduced to reduce risks and mitigate hazards. Handling of damaged or partially dismantled units has been considered and provisions made on a case by case basis. In addition, the scope and depth of information provided by the relevant Russian bodies has evolved and progressed throughout this project.

The objectives for performing and reviewing risk and environmental impact assessments are to:

- Improve the safety and security of radioactive sources and waste.
- Reduce potential environmental radioactive contamination.
- Ensure that activities are carried out in accordance with international recommendations and Russian laws.

Conclusions

Unsecured RTGs pose a radiation risk to human health and the environment due to the high activity level. The Norwegian-Russian RTG decommissioning project around the Baltic Sea has resulted in the removal of approximately 1/3 of the RTGs in the region to date. Furthermore, this project will reduce the radiation risks and environmental hazard in this area. Close dialog with the Russian regulatory and supervisory authorities regarding the regulation of RTG removal has been essential. This has resulted in the development of a new regulatory basis, methodology of supervision and inspection work.