NKS Seminar on Decommissioning of Nuclear Facilities, September 14-16, 2010

Lessons Learned From the Decommissioning of Contaminated Small Waste Storage Facilities

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Introduction

AB SVAFO (SVAFO) is a nuclear waste technology and decommissioning company. SVAFO is owned by the Swedish nuclear power industry. The company was created in 1992 by Sydsvenska Värmekraft AB, Vattenfall AB, Forsmarks Kraftgrupp AB and Oskarshamns Kraftgrupp AB as a consequence of the Act on the Financing of the Management of Certain Radioactive Waste etc. [SFS, 1988].

SVAFO's main business is to take care of formerly state-owned spent nuclear waste at the site in Studsvik, including small amounts of nuclear fuel and some nuclear buildings mentioned in the Act on Financing. Some of these buildings have been decommissioned.

The aim of the decommissioning project was to free up as much material as possible, i.e. remove waste from the regulatory control regime and also free the remaining structures and buildings for conventional demolition and subsequent reuse of the property.

Four simple aluminium-sheds at the end of their useful life, a delayed dismantling of an evaporation plant that is no longer required, two 150 m^3 underground sludge silos and a waste storage open field have been decommissioned.

They have all been in use since the beginning of the 1960s, the aluminium sheds for the storage of nuclear waste, the evaporation plant to treat liquid waste from two nuclear reactors, the two silos, one for clear liquids, the other for liquid-borne sludge, and sediment and ion exchangers and the open field for the storage of waste containers. Previous experience was obtained from this decommissioning project and the recent demolition of a nuclear laboratory [Hedvall, et. al., 2006; 2008].

Decommissioning project

The very first step was taken in 1979 when the authority, former Radiation Protection Institute, proposed that we treat the nuclear sludge waste in the silos. After a discussion on the right waste treatment methods and a waiting period for regulations from the authority, pumping of the liquid waste began in 1991 and was almost finished in 2005. There were delays due to the need for more characterisation of the material, the choice between pyrolysis and concrete mixing and the need to build a new treatment facility just for the sludge. Final decommissioning took place between 2008 and 2010.

Nuclear waste stored in the aluminium sheds and at the open field began to be removed in 1995. The preparation for decommissioning commenced in 1999 and also included evaporation plant. Some characterisation was performed in 2003. For the open field, a final soil characterisation was done in 2006 and an application for free release is scheduled to be filed in 2010. The aluminium sheds were decommissioned and broken down into small pieces in 2007-08. The evaporation plant was decommissioned in 2008 and an application for free release and a conventional demolition was filed in late 2009.

Metals to be melted down at Studsvik for a probable release for subsequent reuse and recycling were placed in eight standard containers. Most of this was aluminium from the aluminium sheds. Fewer than 100 200-liter drums mainly containing soil and asphalt will later be separated into low level waste and/or waste for a municipal dump. Approximately 800 drums of concrete removed from the silos will be divided into waste bound for a land dump in the near future and waste bound for a later final repository. Small amounts of asbestos materials were taken care of according to standard methods for non-radiological hazardous materials.

Conclusions and lessons learned

A number of conclusions can be drawn from this project and prior experiences from our other projects.

For small projects, form a group of expert personnel with clear responsibilities who have worked together before for an entire project. For a project larger than this, a project management assistant would make follow-up more efficient. Experts in instrumentation and statistics are also important. Knowledge of practical decision-making is an important factor that would make the project more efficient in terms of time. Interviews and historical facts are important when choosing which nuclides are of the most interest for measurement (but be critical). At least one foreman is needed or, if it is a large group, one manager for the radiation protection staff and one for the decontamination staff. Do not forget about the working environment. The longer the project lasts, the better the personal relaxation area must be.

Obtain all permits and identify requirements well in advance.

There has to be a detailed waste plan from the beginning, including all sorts of waste (liquid, wood, lead, asbestos, wire, glass, metals and so on). Use a database to maintain the plan. Place the waste immediately outside the building at designed locations and keep it in locked storage (maybe containers). Calculate and order bins and containers for waste storage well in advance. Stay informed of the updated amount of waste. There must be written instructions for logistics.

Before a decommissioning project begins, review the history of the building to identify events that are important to be aware of. What was the building used for? Were there any incidents? Any rebuilding periods?

Be sure you have all drawings and blue prints you may need in the beginning. Keep them and other documents, including a diary, in a document management system.

Check all individual radiation exposures before the project starts and do whole body measurements both before and after the project. Urine samples should be taken if alpha contamination is a risk.

Take unwanted and “not what you expected” situations into account in the time schedule.

Be aware of contaminations and radiation sources outside the actual area. They might have to be removed, not to disturbe further measurements.

Be aware that some precautions must be taken and other procedures prepared to prevent unplanned damage due to the demolition work, i.e. leaking due to cracks in walls or roofing, inward water seepage due to frozen tubes and so on.

There are always construction design changes due to bad planning. With better planning you do not have to reconstruct.

A project under way for an extensive period of time usually experiences condition changes which will make things more expensive and the project even longer. Also, conditions like authority regulations may change over time. Project managers may come and go, and a document management system will be important to keep track of all documentation.

Devote considerable effort in the beginning of the project when characterisation is done so all radioactive and nonradioactive elements in different places are analysed [Ekenborg et al, 2006]. Do not forget to analyse contamination in the soil under and around the building.

Hold frequent briefings with the personnel for better understanding of the ALARA concept (as low as reasonably achievable) and safety mindedness.

Order the equipment you need in time. Having good quality equipment from the beginning is important, including some spare parts in some cases. Be sure to have appropriate surfaces close to, but not inside the building that will be decommissioned, to keep the things in order. Spare parts and maintenance for some equipment should be regulated by agreements with dealers. Analyse what instrumentation you need and calibrate it in advance.

The number of project reports is proportional to shortcomings of the licensee in terms of a holistic perspective to the handling of waste and of the authorities in terms of rapid decision-making regarding decommissioning and waste management.

Establish an updated plan for the last few weeks of work to motivate the team. Place this plan in a location very visible to the staff and update it daily.

References

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