

Background

The department "Management of Waste and Technical Liabilities" is entrusted with the management of the decommissioning activities of SCK•CEN's own installations, the back-end of nuclear material and the waste.

SCK•CEN launched its technical liabilities and waste management program in 1989. The main decommissioning activities at SCK•CEN are focused on the BR3 reactor. The BR3 decommissioning project started with a Full System Decontamination of the primary loop and of the associated circuits followed by the dismantling of the internals and the reactor vessel. The dismantling of auxiliary components is almost completed. During this phase of the project particular attention was paid to the waste minimization by using decontamination technologies and recycling techniques. The decontamination of parts of the infrastructure is now going on. In the past, 4 laboratory buildings of SCK•CEN were fully cleaned before they were transferred for unrestricted reuse to a non nuclear institute. Other decommissioning activities are also continuously carried out in other SCK•CEN facilities. These activities mainly concern old equipments and experiments which have to be decommissioned to make room for new R&D projects.

The management of spent fuel and nuclear material is also part of this program. It mainly concerns the back end of BR2 HEU (Highly Enriched Uranium) spent fuel of the BR3 LEU (Low Enriched Uranium) and MOX (Mixed Oxide) spent fuel. In 1994, an urgent relief of 240 HEU elements was decided due to saturation of the on-site storage capacity. They were reprocessed at the UKAEA-Dounreay facility (UK). The recovery of U allowed fabricating fuel elements at 72 % U5. The reprocessing of these spent fuel elements leads after cementation of the liquor to a production of cemented 500 l drums belonging to the MLW (Medium Level Waste) category. At the end of 1996, it was decided to opt for a long term commitment with AREVA NC (former COGEMA La Hague France): reprocessing and dilution of the recovered uranium. 18 transports with a total of 1122 fuel elements were successfully carried out at the end of 2006. The processing of the spent fuel elements leads to a production of vitrified waste belonging to the category HLW (High Level Waste) and some technological waste. Regarding the BR3 LEU and MOX spent fuel, the possibility to reprocess the spent fuel was first studied. It became evident that this solution has to be disregarded due to the difficulty to reuse the recovered uranium and plutonium in the industrial production of fresh fuel and due to the low solubility of the Pu which imposed to an additional dissolution step and the use of a pilot reprocessing facility. Therefore it was decided to keep as solution the dry storage of the spent fuel into 7 CASTOR® containers in a dedicated building on the site of Belgoprocess.

Several processes were developed at lab and even at pilot scale to treat ³H bearing effluent/waste and contaminated Na/NaK and to recover boron from PWR coolant.

Objectives

The main objective of our nuclear and waste decommissioning programme is to participate in delivering a clean and safe environment to the next generations. The tasks have to be performed in the most safe and economical way. To meet this main goal, we develop management tools, technologies and procedures for decommissioning, decontamination and waste minimisation. Our purpose is to protect man and environment from the potential hazards related to contaminated sites and radioactive waste and this starts by preventing and reducing the waste production during the entire lifetime of any nuclear installation i.e. from design through operation and decommissioning. We valorise the built up know-how around decommissioning and waste management by collaborating with the industry and by transferring the acquired know-how to the nuclear industry. We also provide training and education.

Principal results

In 2005, we issued an up-dated release of the decommissioning plans and of the inventory of nuclear liabilities. These files give a complete picture of our nuclear and waste management programme including the provisions and financing issues. These files were analysed and recently approved by NIRAS/ONDRAF (B). This new assessment was the 4th exercise since 1989. It allows observing the changes over the period 1989-2006 impacting the costs and the long-term financing of the clean-up activities. Changes like the development of the legislation regarding the decommissioning and the mission of the Authorities have some impact on the decommissioning costs but this impact is rather limited when comparing the impacts of the constant increase of the waste tariff and the new set of clearance levels. The differences between the assumption regarding inflation and interest rate made by the State to secure the Technical Liabilities Fund and the observed economical conditions also lead to main concerns.

The reprocessing of the 240 HEU spent fuel elements by UKAEA (Dounreay, UK) will lead after cementation of the liquor to a production of 124 (\pm 5%) drums of 500 l belonging to the MLW category. These wastes have to be return to Belgium before 2019. We subcontract the fabrication of 2 flasks to the consortium Robatel (F)/Transnubel (B). In the early of 2007, we performed the return of 3 vitrified canisters. This return was possible by using the free space in the 14th transport organised by SYNATOM. These 3 canisters representing a total volume of 540 l of HLW correspond to the processing of 92% of the spent fuel sent up to now to AREVA NC. The next transports of spent fuel to AREVA NC and the return of the corresponding waste amount depend on the approval of a bilateral intergovernmental agreement between France and Belgium.

In 2007 we spent a lot of effort to complete the characterization of historical special waste i.e. special waste produced before 1999. This characterisation concerns waste belonging to the future processing campaign of Belgoprocess and allows after approval by NIRAS/ONDRAF to transfer the responsibility and ownership to the waste management agency.

In 2007 we got two main valorisation contracts. We enter into a contract with the University of Ghent for the management of the decommissioning of their Thetis research reactor including the management of its spent fuel. We also enter into a contract with Belgonucleaire for the development of an integrated decommissioning software tool. This integrated decommissioning software tool is based on software's developed by SCK•CEN to fulfil its legal duties in the management of nuclear material, radioactive waste and decommissioning project. Both contracts are joined activities of the expertise groups D&D and MWL.

Future work

We intend to continue the implementation of our nuclear waste and decommissioning program. In the future we are willing to update our decommissioning cost estimates based mainly on the return of experience from the BR3 decommissioning project. We will also make the decommissioning of huge hot-cells and the clean-up of several laboratories up to free release levels.

We intend to resume the transport of HEU spent fuel to AREVA NC as soon as the bilateral intergovernmental agreement has been approved. We also plan to launch the procedures for getting the approval by the Authorities and Agencies of the return of the cemented waste from UKAEA Dounreay.

The research on waste management and minimization will concern the improvement of decontamination processes, the optimization of the treatment/conditioning of the secondary waste and the definition of the treatment/conditioning processes for new waste streams generated by new reactor types.

We are willing to continue and to increase our activities in valorisation of our know-how.

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Main reference

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