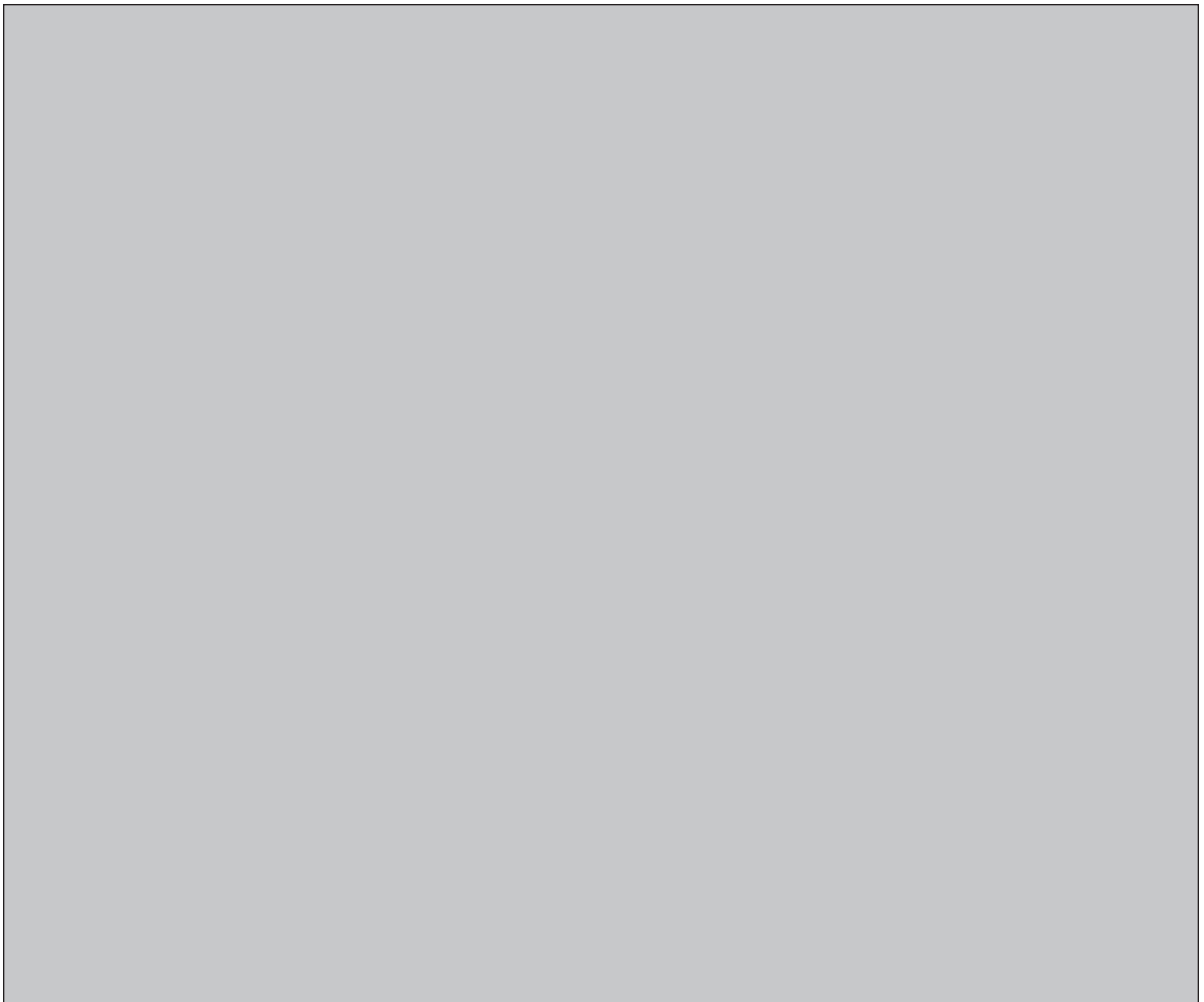


**NWMO BACKGROUND PAPERS****6. TECHNICAL METHODS****6-2 STATUS OF CENTRALIZED STORAGE SYSTEMS FOR USED NUCLEAR FUEL****EXECUTIVE SUMMARY**

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## **SUMMARY**

This document is a background paper on the status of centralized storage systems for used nuclear fuel prepared by Hardy Stevenson and Associates Limited for the Canadian Nuclear Waste Management Organization.

Centralized storage systems are storage facilities and associated systems to store used nuclear fuel in a central location. Producers of used fuel may build such facilities to provide effective management when they have many reactors producing used fuel. Often these are developed in a regional or a national context by the implementing organizations responsible for the management of used fuel.

Used fuel following its removal from the nuclear reactor is highly radioactive and is stored for about a decade in water pool storage facilities at the reactors. Following this period, it is easier to handle and transport used fuel and it can be stored away from the reactor sites. It could be stored either in wet storage (i.e. water pools) or in dry storage facilities, which could be built either at nuclear plant sites or at independent sites. Centralized storage becomes attractive as a storage option at this stage.

Used fuel management programs in twenty countries were reviewed. All the countries reviewed have centralized storage programs or plans to develop them. The review finds that centralized storage systems are already operational in twelve of these countries. Centralized storage is used over a wide range of circumstances from providing a common temporary storage for used fuel from a few reactors to providing a centralized management system for used fuel at the national level. It should be noted however, that at this stage of development, these should not be misinterpreted as long-term alternatives to disposal in these countries, although in many instances, they seem to provide the much-needed time for the development of long-term alternatives.

There are a number of technologies that are available for centralized storage of used fuel. These are water pools, metal casks, concrete casks, silos and vaults. Although several centralized water pools have been built, dry storage casks (metal and concrete casks) seem to be the most preferred option. While water pools do provide the most flexibility with regard to future options, dry storage casks provide the most advantage in terms of capacity building and require less care-taking than water pools. Storage systems have been built with these technologies and a significant amount of experience is available worldwide. Centralized storage systems could be built either above ground or underground and sited either at nuclear sites, at independent sites, or co-located with the reprocessing or disposal facilities. Above-ground systems seem to be preferred in most countries. There are suppliers who provide technologies as well as various storage services for these systems.

There are a number of situations faced by various countries that have influenced their decision-making with regard to the extent of centralization and selection of technologies for the management of used fuel. These are reviewed in detail in the report. Besides providing for the effective and centralized management of the used fuel, centralized

storage systems have been able to meet a number of needs, such as addressing the shortfall of storage space for used fuel at the nuclear plants, the need to remove used fuel from storage systems at the plants at the time of decommissioning, and the need to efficiently manage the used fuel until a facility is available for long-term management of used fuel. The role of centralized storage in the management of used fuel has been evolving over years and is considered in some countries as a technology for providing an alternative to disposal.

Current technologies for centralized storage systems were initially developed for an interim storage period of about 50 years. Many countries are now considering longer storage periods of 50-100 years.

Due to increasing used fuel inventories and either delays or lack of public acceptance of the disposal option, extended storage of used fuel is being reviewed as a long-term management alternative in a number of countries. Although not defined specifically, extended storage could typically encompass timeframes of 50 to 300 years. Long-term centralized storage is a potential management option for extended storage.

For these extended storage periods, the storage systems may need more research and development, particularly in terms of durability of used fuel and storage structures, conditioning of used fuel to assure containment of radioactivity, and cost-effective designs suitable for the long term. Such programs are taken up in a number of countries and in co-operative research programs of the IAEA.