

RECENT DEVELOPMENTS IN NUCLEAR WASTE MANAGEMENT IN CANADA

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ABSTRACT

This paper describes recent developments in the field of nuclear waste management in Canada with a focus on management of nuclear fuel waste. Of particular significance is the April 2001 tabling in the Canadian House of Commons of *Bill C-27, An Act respecting the long-term management of nuclear fuel waste*. At the time of finalizing this paper (January 15, 2002), Bill C-27 is in Third Reading in the House of Commons and is expected to move to the Senate in February. The Nuclear Fuel Waste Act is expected to come into force later in 2002. This Act requires the three nuclear utilities in Canada owning nuclear fuel waste to form a waste management organization and deposit funds into a segregated fund for nuclear fuel waste long-term management. The waste management organization is then required to perform a study of long-term management approaches for nuclear fuel waste and submit the study to the federal government within three years. The federal government will select an approach for implementation by the waste management organization. The paper discusses the activities that the nuclear fuel waste owners currently have underway to prepare for the formation of the waste management organization. As background, the paper reviews the status of interim storage of nuclear fuel waste in Canada, and describes previous initiatives related to the development of a national strategy for nuclear fuel waste long-term management.

INTRODUCTION

The development of a national strategy for the long-term management of nuclear fuel waste in Canada has recently taken a legislative path with the introduction of a proposed Nuclear Fuel Waste Act into the Canadian Parliament. This paper reviews the current status of this legislative initiative, as well as actions taken by Canadian nuclear utilities in anticipation of passage of the Act. As background, the paper reviews the status of interim storage of nuclear fuel waste in Canada, and describes previous initiatives related to the development of a national strategy for nuclear fuel waste long-term management.

INTERIM STORAGE OF NUCLEAR FUEL WASTE

There are twenty-two commercial nuclear power reactors in Canada: twenty in the province of Ontario, owned by Ontario Power Generation (OPG); one in Québec, owned by Hydro Québec; and one in New Brunswick, owned by New Brunswick Power. All three utilities are in turn owned by their provincial governments. In May 2001 OPG signed an agreement with Bruce Power, a private company led by British Energy, to lease the eight reactors on the Bruce site for

an eighteen-year period. Under this arrangement OPG takes ownership of the used fuel and other radioactive waste produced by the Bruce reactors for a fee.

Used fuel, on leaving a reactor, is stored in water-filled pools at each station. When the water-filled pools are nearing their capacity, older fuel is transferred from the water-filled pools to dry storage facilities. Each reactor site in Canada has, or will have, a dedicated dry storage facility.

The used fuel dry storage facility at OPG's Pickering Waste Management Facility has been in operation since 1995, and currently contains about 80,000 fuel bundles (1,620 tonnes U). The dry storage containers in use were developed by OPG and are concrete-filled, steel-shelled vessels each containing 384 fuel bundles (8 tonnes) of used fuel. A similar dry storage facility is under construction at OPG's Western Waste Management Facility located on the Bruce Nuclear Power Development site. The planned in-service date for this facility is October 2002. A dry storage facility at OPG's Darlington site is currently undergoing an environmental assessment, with a planned in-service date of 2007.

New Brunswick Power has had a dry storage facility at its Pt. Lepreau reactor in operation since 1992. Used fuel is transferred to concrete, steel-lined dry storage containers, each containing 540 fuel bundles. Currently 54,000 fuel bundles (1,040 tonnes U) are in dry storage.

Hydro Québec also has a used fuel dry storage facility at its Gentilly-2 reactor. In this case, used fuel is stored dry in above-ground concrete vaults cooled by natural convection. Additional vault modules are added as required. Currently 48,000 fuel bundles (920 tonnes U) are in dry storage.

In total, as of the end of 2001, there are about 1.5 million used fuel bundles (30,000 tonnes U) in interim storage in Canada, of which 182,000 (3,600 tonnes U) are in dry storage.

HISTORICAL BACKGROUND

This historical review begins with a report (1) prepared for the Government of Canada in 1977. This report of three independent experts concluded that Canada urgently needed a national plan for the management and disposal of nuclear waste, and after reviewing possible long-term management approaches, concluded that underground disposal in igneous rock formations was the most promising.

Subsequently, in 1978, the Governments of Canada and Ontario established the Nuclear Fuel Waste Management Program "to assure the safe and permanent disposal of nuclear fuel waste". In this program, the responsibility for research and development on disposal in a deep underground repository in intrusive igneous rock was allocated to Atomic Energy of Canada Limited (AECL). Responsibility for studies on interim storage and transportation of used fuel was allocated to Ontario Hydro, the predecessor company to OPG. In 1981, in response to public reaction related to AECL site investigation studies, the Governments of Canada and Ontario announced that no disposal site selection activities could be undertaken until after the repository concept had been accepted. A federal environmental assessment (EA) Panel was established in 1989 to determine the acceptability of the concept. The EA Panel was comprised

of eight members, was chaired by Blair Seaborn, and was supported by a fifteen-member Scientific Review Group.

AECL's development activities included the construction of an underground research laboratory near its Whiteshell Laboratories site in the province of Manitoba, and the broad-based development of disposal technology. In 1994 AECL submitted a comprehensive Environmental Impact Statement (2) based on the concept of placing nuclear fuel waste in corrosion-resistant containers at a depth of between 500 – 1000 metres in plutonic rock of the Canadian Shield.

The EA Panel submitted its report (3) to the federal government in March 1998 following a 4-year review period which included public hearings in five provinces.

The Panel's key conclusions were:

- Broad public support is necessary in Canada to ensure the acceptability of a concept for managing nuclear fuel wastes;
- Safety is a key part, but only one part, of acceptability. Safety must be viewed from two complementary perspectives: technical and social;
- From a technical perspective, safety of the AECL concept has been on balance adequately demonstrated for a conceptual stage of development, but from a social perspective, it has not; and
- As it stands, the AECL concept for deep geological disposal has not been demonstrated to have broad public support. The concept in its current form does not have the required level of acceptability to be adopted as Canada's approach for managing nuclear fuel wastes.

The panel's key recommendations were:

- A policy statement on managing nuclear fuel wastes should be issued;
- An aboriginal participation process should be initiated;
- A nuclear fuel waste management agency should be created;
- A public review of AECB regulatory documents using a more effective consultation process should be conducted;
- A comprehensive public participation plan should be developed;
- An ethical and social assessment framework should be developed; and
- Options for managing nuclear fuel wastes should be developed and compared.

In December 1998 the federal government issued a formal response (4) to the EA Panel report and later tabled corresponding legislation, which is discussed in the next section.

THE NUCLEAR FUEL WASTE ACT

The Nuclear Fuel Waste Act was introduced into the House of Commons in April 2001 and as of the time of writing this paper (January 15, 2001) is in Third Reading. Only minor amendments were made by the Government as a result of Parliamentary Committee review, which included representations from the utilities, non-governmental organizations, and the public.

As currently drafted, the Nuclear Fuel Waste Act (5) requires:

- The nuclear fuel waste owners to establish a separately-incorporated waste management organization (WMO);
- The nuclear fuel waste owners to establish trust funds for long-term nuclear fuel waste management;
- The WMO to establish an advisory council;
- The WMO to conduct a study of various approaches for the long-term management of nuclear fuel waste and submit the study to the federal government within three years of the Act coming into force [the Act stipulates that the WMO must study deep geological disposal in the Canadian Shield, storage at reactor sites and centralized storage, either above or below ground];
- The federal government to select one of the studied approaches; and
- The WMO to implement the government-selected approach.

With these provisions, the Act provides a legal framework for the long-term management of nuclear fuel waste in Canada, something that has not existed up to now.

The Act also provides for a thorough study of alternative long-term management approaches, with the expectation of a high level of public consultation. During the conduct of public hearings in 1996/97 by the EA Panel, it was clear that the Panel and a number of participants expected such a study. The limited review that had been carried out in 1977 did not meet current expectations.

The Act is expected to be reviewed in the Senate, starting in February, and to come into force later in 2002.

PREPARING FOR THE WASTE MANAGEMENT ORGANIZATION

Following the publication in December 1998 of the government response to the EA Panel report, the waste owners started a series of meetings which led to the signing of a Memorandum Of Understanding (MOU) in the summer of 2000. This Joint Waste Owners MOU committed the waste owners to work together to form a waste management organization and provided the basis for conducting cost-shared programs related to the formation and work of the WMO.

Under the framework of the Joint Waste Owners a number of technical studies have been initiated:

- A review of the life expectancy of dry storage facilities at the seven used fuel storage sites in Canada;
- The development of quantitative models for predicting the behavior of used fuel while in dry storage;
- The development of conceptual designs and cost estimates for extended storage facilities at each reactor site;
- The development of both above and below ground conceptual designs and cost estimates for a centralized storage facility, for all used fuel in Canada;
- The updating of the conceptual design and cost estimate for a deep geologic repository for all used fuel in Canada; and

- The development of conceptual designs and cost estimates for a transportation system required for a centralized storage facility or geologic repository.

These technical studies, when complete in late 2002/early 2003, will provide a starting point for the WMO to conduct the study required by the Nuclear Fuel Waste Act. Undoubtedly, the need for further studies will be identified during the course of the study.

The Joint Waste Owners have also initiated work related to social and ethical frameworks, public participation concepts, and stakeholder identification.

At the time of writing this paper a firm target date for the formation of the WMO has not been established.

SUMMARY

Used nuclear fuel is being safely stored at reactor sites and can continue to be stored that way for many years.

The Nuclear Fuel Waste Act, when passed, will provide the legal framework for the nuclear utilities, together with government and a wide range of other stakeholders, to identify an appropriate approach for the long-term management of used nuclear fuel in Canada.

REFERENCES

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