NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

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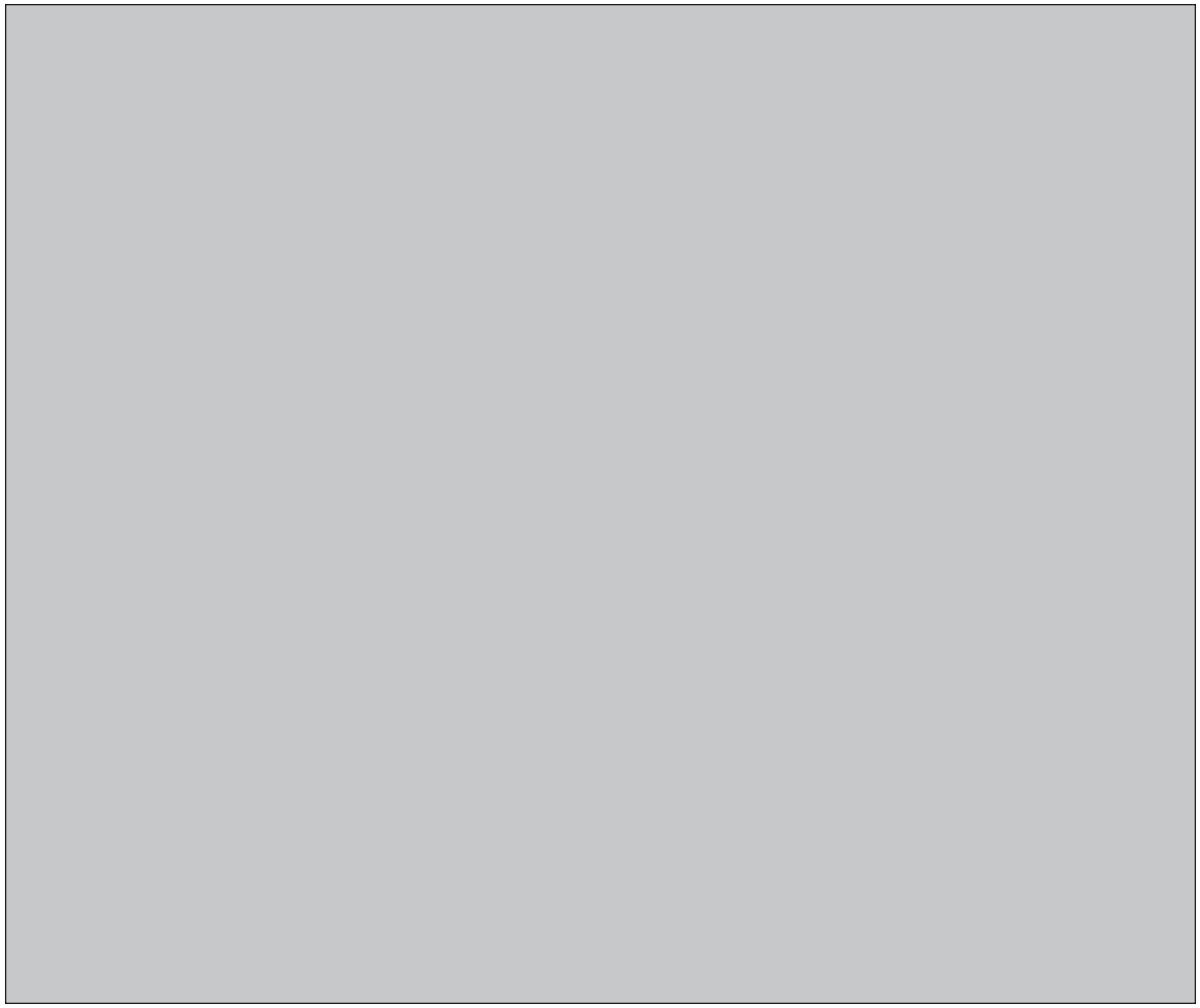
NWMO BACKGROUND PAPERS
7. INSTITUTIONS AND GOVERNANCE

7-5 STATUS OF CANADIAN EXPERTISE AND CAPABILITIES RELATED TO HIGH-LEVEL RADIOACTIVE WASTE MANAGEMENT (HLRWM)

EXECUTIVE SUMMARY

Dr. George Bereznai, Professor and Dean
University of Ontario Institute of Technology



EXECUTIVE SUMMARY

This background paper provides an overview of the current status of Canadian expertise and capabilities related to high-level radioactive waste management (HLRWM). The complete nuclear fuel cycle is reviewed, in order to put into perspective the expertise and capabilities specific to HLRWM: many areas share similar expertise, others are unique. Spent nuclear fuel is the principal high level waste that needs to be managed, although certain reactor components, such as pressure tubes that have been removed from the reactor, also fall under this category.

The tasks and time periods to be considered for the management of spent fuel in Canada include the study phase, during which the NWMO will analyze the alternatives and recommend to the Canadian Government the preferred method for managing Canada's nuclear fuel waste (3 years), selection of site or sites for the preferred method for storing the fuel (3-5 years), environmental assessment and approval of the site (2-3 years), preliminary design and approval of the facility (4-6 years), design and construction of the facility (5-7 years), and its operation, that would start (assuming the above range of estimates hold) between 2020 and 2027. Therefore the total time-frame for which Canadian expertise and capability are considered in this report is up to 25 years, and the nature of the expertise and capability that has been assessed covers the above six phases of the project.

The NWMO's mandate is to study three already defined alternatives, namely

(i) storage at nuclear reactor sites,

(ii) deep geological disposal in the Canadian Shield,

(iii) centralized storage, either above or below ground, and

(iv) other approaches.

This background paper concludes that the necessary expertise and capability exist to implement the already defined three alternatives for HLRWM. If some other, not yet identified alternative is selected, the Canadian expertise and capability for such an approach will need to be assessed when the alternative is known. However, since in this background paper "Canadian expertise and capabilities" have been broadened to include foreign partners of Canadian companies, there is little doubt that whatever expertise and capabilities are needed in the future, they will either already exist in Canada and amongst the partners of Canadian companies, or they will be transferred to one or more of these companies.

In total 41 Canadian Companies, 8 Universities, and 9 Government Agencies/ Departments with involvement in HLRWM were surveyed. In each of these categories, and in particular by recognizing the fluidity of the movements of experts between the various parts of the industry, the required level of capability and expertise exists today to proceed with the management of spent fuel in Canada. Because of the long timelines involved, all the above parties will need to take responsibility to ensure that the level of expertise and capabilities are maintained and new skills are developed, as the phases of the HLRWM project progress and as the waste management method to be implemented is finalized.

The following table summarizes the total number of people with expertise relevant to one or more phases, and one or more HLRWM alternatives, working for the 41 companies surveyed. The number of companies with full or partial capabilities, and the number of experts employed by them, have been grouped by company type, and are given in the following table:

Company type	number of companies		number of expert staff
	full capability	partial capability	
Large Integrated	10	0	500
Large Engineering	1	8	220
Large Environmental	3	2	210
Small & Medium Specialists		13	120
Mining and Utilities		4	50
Total	14	27	1100

The above numbers reflect the total number of experts working in Canada who could be assigned to one or more aspects of HLRWM. Including the experts from the foreign affiliates and subcontractors, the number of experts would more than double. Capability for the multinational companies includes the foreign parent company.

The following two tables show the expertise and capabilities currently available in the 41 companies for each phase of each alternative.

Number of Experts in the Companies surveyed:

	HLRWM Alternatives			
HLRWM Project Phases	**A. On-site**	**B. Deep geological**	**C. Centralized**	**D. Other**
1. Study	# of experts: 340	# of experts: 400	# of experts: 440	# of experts: 30
2. Site Selection	# of experts: 295	# of experts: 340	# of experts: 370	# of experts: 25
3. Environmental Assessment and Site Approval	# of experts: 380	# of experts: 460	# of experts: 470	# of experts: 25
4. Preliminary Design and Facility Approval	# of experts: 375	# of experts: 420	# of experts: 480	# of experts: 25
5. Design and Construction	# of experts: 305	# of experts: 390	# of experts: 450	# of experts: 10
6. Operation	# of experts: 140	# of experts: 260	# of experts: 270	# of experts: 5

Number of Companies in the survey with Full or Partial Capability:

	HLRWM Alternatives			
HLRWM Project Phases	**A. On-site**	**B. Deep geological**	**C. Centralized**	**D. Other**
1. Study	full capability: 14 partial capability: 24	full capability: 14 partial capability: 23	full capability: 14 partial capability: 26	full capability: 1 partial capability: 10
2. Site Selection	full capability: 14 partial capability: 17	full capability: 14 partial capability: 17	full capability: 14 partial capability: 19	full capability: 1 partial capability: 7
3. Environmental Assessment and Site Approval	full capability: 13 partial capability: 19	full capability: 13 partial capability: 19	full capability: 13 partial capability: 21	full capability: 1 partial capability: 7
4. Preliminary Design and Facility Approval	full capability: 11 partial capability: 23	full capability: 10 partial capability: 25	full capability: 11 partial capability: 26	full capability: 1 partial capability: 7
5. Design and Construction	full capability: 10 partial capability: 20	full capability: 10 partial capability: 20	full capability: 10 partial capability: 22	full capability: 1 partial capability: 4
6. Operation	full capability: 8 partial capability: 7	full capability: 8 partial capability: 7	full capability: 8 partial capability: 9	full capability: 1 partial capability: 3

It should be noted that the total number of experts identified for the study phase (1,210) is more than the total number of experts in all the companies (1,100), since experts for many of the common tasks would contribute to (and are therefore counted under) more than one alternative. Similarly, the total number of experts for all six phases of any one of the three identified alternatives is over 1,100, and again several experts would be contributing to more than one phase, as the timelines for the various stages were implemented. Typically no more than a partial overlap between two phases is expected to happen.

Expertise at government agencies and universities was not quantified, but both categories are judged to have the capability to carry out their respective tasks. This judgment is based on the general abilities of government departments to either have the necessary expertise in-house to fulfill their mandates, or to acquire it as they need the expertise to carry out government programs. University faculty and researchers have sufficient flexibility and mobility world wide to respond to the challenging opportunities that the HLRWM would offer.